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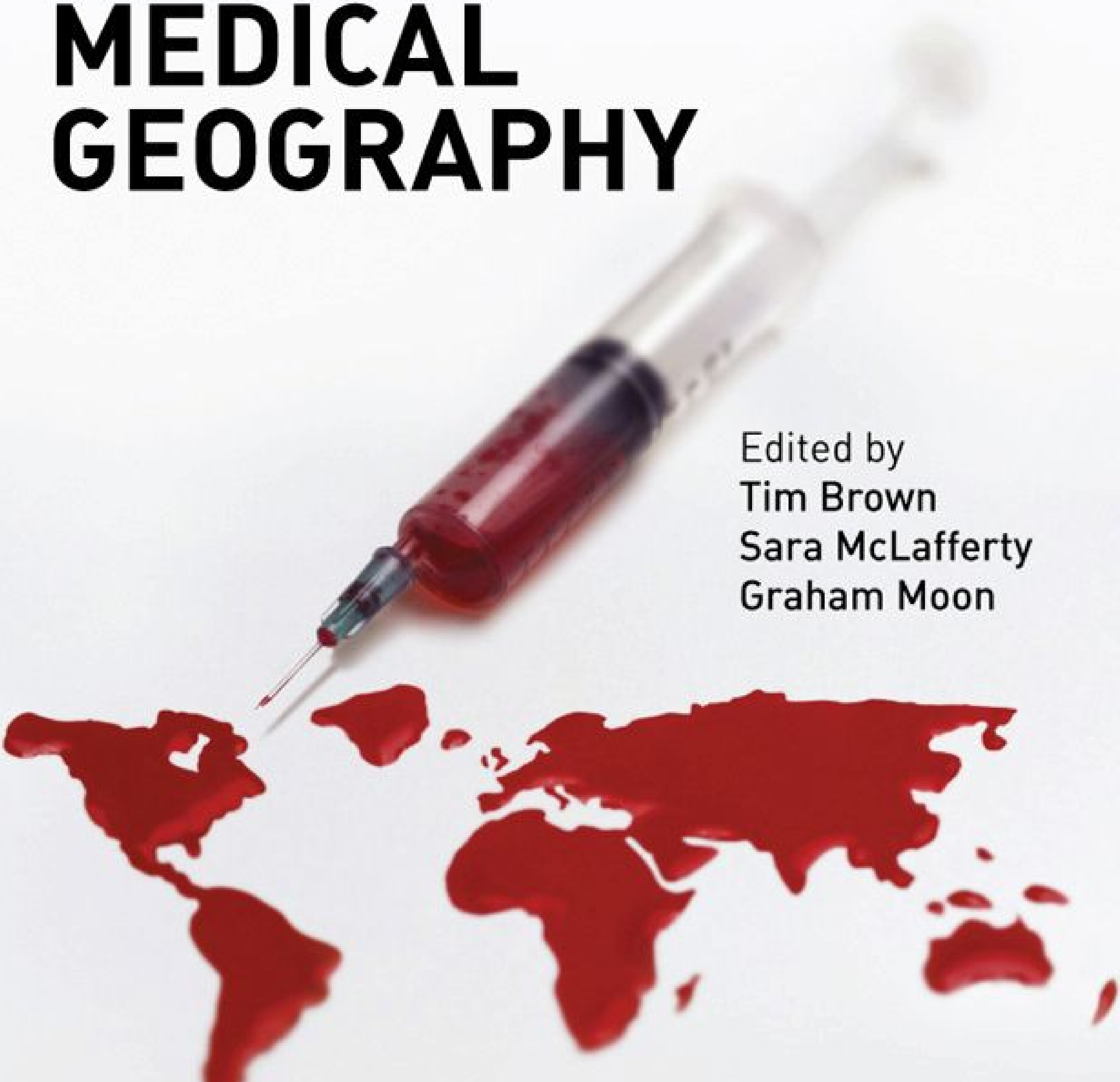
A COMPANION TO HEALTH AND MEDICAL GEOGRAPHY

Edited by
Tim Brown
Sara McLafferty
Graham Moon



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A Companion to Health and Medical Geography

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Tim Brown, Sara McLafferty, and Graham Moon

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A Companion to Health and Medical Geography

Blackwell Companions to Geography

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Tim Brown is a Lecturer in Human Geography in the Department of Geography, Queen Mary University of London. His work is primarily concerned with the problematizing and critique of contemporary (public) health discourses. His research has been published as both authored and co-authored papers in such journals as *Area*, *Cultural Geographies*, *Environment & Planning D: Society & Space*, *Health & Place*, *Social Science & Medicine*, and *Transactions of the IBG*.

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Andrew Power is a Researcher at the Centre for Disability Law & Policy at the National University of Ireland, Galway. He is currently leading a project examining the Modernization of the Disability Service Sector in Ireland using international comparisons. He has a background as a human geographer with an ongoing interest in disability, caregiving, and voluntarism. His doctoral thesis examined the geographies of family care in Ireland using international comparisons with the USA and England. He subsequently completed an ESRC Post-doctoral Fellowship at the Institute for Health Research at Lancaster University.

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Chapter 1

Introduction to Health and Medical Geography

Tim Brown, Sara McLafferty, and Graham Moon

As an opening to this volume, we believe that it would be useful for readers to be aware both of the rationale that underpins it and, perhaps a little more unusually, of the process that led to its production; especially the critical role played by the academic reviewers of the original proposal. The former is important because the idea for the volume materialized out of the recognition that debates regarding the constitution of the sub-discipline had re-opened (for an extensive review see Andrews & Evans 2008). In reality this debate has been ongoing since Kearns' (1993: 144) decisive intervention in the early 1990s, which saw the sub-discipline rupture (albeit productively) along the now familiar lines of "health" and "medical" geography. However, although most commentators agree that the scope and scale of research conducted by scholars on both sides of this divide has expanded considerably and areas of intersection have increased, few agree upon the nomenclature under which this endeavor takes place. Are we health geographers, medical geographers, post-medical geographers, or something else entirely?

This volume was initially conceived as a prime opportunity to reflect upon this expansion, to highlight the variety of research that is conducted by scholars associated with the sub-discipline, and also as an opportunity to reflect further on the key debates that had been taking place. This ambition is clearly demonstrated in the opening paragraphs of the proposal that we submitted to the publishers for possible inclusion in the Blackwell (now Wiley-Blackwell) Companions to Geography series:

> The global strength of the sub-discipline is in part related to the shift away from its traditional focus on disease ecology, disease mapping, and health service provision. This change followed substantial debate regarding the sub-discipline's apparent over-reliance on positivism and quantitative methods, which was argued to limit its ability to engage with themes important to theoretically minded human geographers: most notably those influenced by the "cultural" turn. Arguably the result of this debate is a more nuanced sub-discipline, one that is concerned with questions of culture and difference, inequality and power, representation and meaning. At the same time, health

> mapping and modeling has been reinvigorated by the application of GIS, multilevel modeling and advanced spatial analytic methods and by its engagement with questions of health inequalities, population health and environmental degradation. In sum, the sub-discipline has emerged as one that now speaks to a much broader body of scholars both within and beyond the discipline of Geography.

Clearly, the tenor of this passage reflects the hyperbole that is necessary to sell an idea. However, when stripped of this excess, it should be apparent that the paragraph set out an image of a sub-discipline that had expanded beyond its "traditional," and dare we say parochial, roots to embrace ideas and debates, notably those associated with the "cultural" and "spatial" turns, that had become well established within the wider discipline and beyond. Not to be seen as partisan, and reflecting the expertise of the various editors, this all important opening statement also acknowledged that the sub-discipline has made significant theoretical and methodological advances in other areas, some of which might be regarded as being more closely associated with its "traditional" foci. So, an image of a methodologically and theoretically rich sub-discipline, and one capable of speaking to a diverse range of scholars located within and beyond the discipline of geography, was presented to the publishers and ultimately to the reviewers. Further, this difference was reflected in the detail of the book, which was organized thematically, but with chapters from differing ontological and epistemological perspectives positioned adjacent to each other. For example, chapters on disease modeling and mapping were closely followed by ones that would reflect upon the experience of living with disease or being labeled as diseased.

Almost inevitably, the "vision" that we set out in our proposal was questioned; the original organization of the volume, its coverage, its rationale, and so on, all came under critical scrutiny. However, we recognize that the process of writing is a relational one and the input from the reviewers was regarded as valuable; so much of this critique was received with appreciation and taken up in subsequent iterations. Why mention this in an introduction? Amongst all the critical commentary that we received, there was one observation that came as a surprise. We will not quote this commentary directly, as this does not seem appropriate, however in summary the reviewer felt that the proposal that we presented to the publishers was in danger of re-enforcing, rather than seeking to relax as was our implicit intention, the sub-disciplinary boundaries between health and medical geography and, at the same time, disavowing research that sought to work across and rupture them (notably here research that might be defined as "post-medical"). We were in short accused, albeit very politely, of boundary maintenance (on which, see Douglas 1966).

If this thoughtful commentary on our original proposal is read alongside current debates about the role of geography textbooks, and of course their authors/editors, in maintaining, and legitimizing, particular disciplinary visions (e.g. Johnston 2006; Hubbard & Kitchin 2006), and as such as a form of disciplinary politics, it might be regarded as being critical indeed. It is, in part, for this reason that our introduction to this volume begins with this discussion. What follows is inevitably a reflection of our collective thoughts on the sub-discipline that we have seemingly (re)constituted as being only "health" and "medical" geography, on the areas of research that we regard as being of particular significance to it, whether in the past, present, or perhaps even in the near future, and on those topics that we believe should coalesce within the individual themes that we have identified in the book.

Although this is the case, we do not regard this as an attempt at reifying a particular "field of vision" or at demarcating what might be regarded as problematic sub-disciplinary boundaries. Rather, we responded to the reviewers by rethinking the ways in which the book would work, by considering how a broader range of perspectives and positions could be incorporated within it without extending the scope and scale of the book too far, and how we might acknowledge the significance of both health and medical geography without being bound by the restrictions that these two terms appear to connote. Further, we encouraged the authors of the individual chapters to play their part. Thus, they were asked not only to describe the current content of their particular sub-fields but, where appropriate, to question the boundaries and limitations of them, to think about where research has gone in the past and where it might go in the future, and to use our guidance on the chapters as an indication of what might be covered but not as a strait-jacket. In this sense, we have encouraged the authors to talk for themselves.

A "Companion to Health and Medical Geography"

Though slightly altered and adapted, the main chapters in this volume continue to be organized thematically and begin with "Debates in Health and Medical Geography," which incorporates three chapters that seek to chart developments that have taken place within the sub-discipline and includes chapters on "Health Geography" (by Robin Kearns and Damian Collins), on "Medical Geography" (by Jonathan Mayer), and a chapter entitled "Doubting Dualisms" (by Mike Dorn, Carla Keirns, and Vincent Del Casino). For those already knowledgeable about such matters, the inclusion of Kearns, Mayer, and Dorn appears particularly apposite. After all, we have in these individuals the main protagonist for, and some of the key critical commentators on, the emergence of a distinct geography of health in the early 1990s (see Kearns 1993; Mayer & Meade 1994; Dorn & Laws 1994). There were, of course, others already calling for a shift in perspective prior to Kearns' groundbreaking paper (see for example Jones & Moon's (1987) call for the establishing of a "critical medical geography"); however, the debates that took place both at this time and subsequently have helped to define the contours of the sub-discipline that we see today.

What is interesting about these first three chapters is that they reflect upon and offer a critique of these debates; though they do not dwell on them. Kearns and Collins use this productive rupture in the sub-discipline to explain why it is that a focus on health and place, especially one that foregrounds theory, remains such a crucial element of what we do. As they argue, the importance of the turn to "health" was its recognition that medical geography, as then conceived, tended to employ geometric constructions of space that limited our understanding both of the ways in which ill-health and disease (and for that matter good health) were experienced and lived and what role "place" played in this regard (see also M. Brown 1995). Their chapter offers much more than this, however; as they also trace the emergence of key and emerging themes within this sub-field: "wellbeing," "criticality," "risk," and "care" being chief amongst these. Kearns and Collins complete their chapter with an air of caution; reminding readers that the ongoing concern with health, and more recently with wellbeing, should remain a critical and place-sensitive endeavor. Further, that in addition to whatever theoretical or intellectual interests that health geography may pursue, it should remain committed to the dual concerns of equity and social justice.

Some might regard Mayer's account of "medical" geography as an all too obvious attempt to counter-balance the chapter that precedes it; after all, it was medical geography that Kearns (1993) called into question. Yet, Mayer's is a much more nuanced chapter than this. Indeed, from the very outset he questions the use of the term "medical geography" as a sub-disciplinary nomenclature; noting that there is actually very little that is "medical" about medical geography. In this sense, he forces us to concede that the original name adopted for the sub-discipline was perhaps a compromise and one whose origins are difficult to determine (what is interesting here is that historians of medicine are as likely as historians of medical geography to comment on the origins of this field of inquiry. See for example Rupke (2000)). Further, Mayer offers a considered, and quite personalized, account of the role that he and several colleagues played in the response to Kearns' call for a "post-medical" geography of health. Here he acknowledges that, in retrospect, it is apparent that Kearns did not seek to confine medical geography to history but to open up new possibilities and to more carefully define the intellectual territory that some health geographers were concerned with.

This acknowledgement allows Mayer to take the chapter on "medical" geography in a range of fruitful directions rather than simply pursue what might be regarded as rather sterile debate. To this end, he not only traces the intellectual stimulus afforded the field by scholars such as Jacques May, Andrew Learmonth, Mansell Prothero, and more recently Gerald Pyle, Neil McGlashan, Melinda Meade, and, quite rightly, of himself, but he also highlights the ways in which shifts in geographical methods and concepts have been adopted to great effect by current practitioners. More specifically, Mayer notes that through their knowledge of, and critical engagement with, disease ecology and with advances in spatial modeling and mapping techniques, medical geographers, however defined, are able to make a considerable contribution to the understanding of epidemic disease. Thus, medical geographers are not only able to offer commentary on why it is that specific diseases might occur in certain places but are also extremely well qualified to chart the passage of diseases through time and across space.

The final chapter in this opening part builds on the previous two; however it does so by engaging more critically with them. To this end, Dorn and colleagues adopt a novel approach to their reading of the sub-disciplinary trajectories of both "health" and "medical" geography. More specifically, they employ Foucault's genealogical method to further disrupt, and bring into question, the authority of this dualism. In using this approach, Dorn et al. do not attempt to trace lineages or locate the intellectual origins of these two seemingly divergent pathways. Rather, they present their endeavor as a productive enterprise, one that starts by problematizing the dualism of health and medical geography, and seeks to explore alternative pathways and open up new ways of thinking. In this sense, then, they are critical of attempts to define too narrowly the boundaries of what is or is not "health" and/or "medical" geography and to bring into question what they regard as key tensions that exist in many accounts of these sub-fields. For example, that one is oriented towards medicine and the other towards health, that one is scientific in epistemological terms and the other humanistic, that one is objective and the other subjective and so on.

These "tensions" would, we are certain, be acknowledged by the authors of the previous chapters. However, by employing a genealogical approach Dorn et al. bring these tensions to the foreground and force us to try and think beyond, or as they state, to doubt, the dualisms that we appear to have constituted for ourselves and for our sub-discipline. It is with this spirit in mind that we encourage readers to approach the remainder of the volume. It is organized, perhaps a little awkwardly, into a further four parts: "disease," "health and wellbeing," "public health and health inequalities," and "health care and caring." However, as we have already argued, readers should not simply seek to map these parts onto the sub-disciplinary dualisms discussed by Dorn et al. It is not our intention to rehearse these dualisms in this volume and this point should become apparent when the content of each of the parts is read in more detail.

If we start with the part on "disease," there are a total of seven contributions with topics ranging from disease ecology (Oppong and Harold), disease mapping (Rican and Salem), disease diffusion (Sabel, Pringle, and Schærström) and disease modeling (Gould), to emerging and re-emerging diseases (Emch and Root), the politics of disease (Donovan and Duncan) and the lived experiences of those people affected by either chronic or infectious diseases (Del Casino Jr). Inevitably some of these chapters align themselves more closely with "traditional" descriptions of medical geography; however, when taken as a whole the part encourages readers to consider the many and varied ways in which geographers approach this important topic.

Further, this part, like all of the others, is not self-contained. The authors, to a lesser or greater extent, talk across and blur its boundaries. For example, Oppong and Harold's discussion of disease ecology is picked up, albeit indirectly, in later chapters that cover the close association between environmental risk and public health concerns (Jerrett with Gale and Kontgis; Curtis, Riva, and Rosenberg) and Del Casino's chapter on the lived experience of disease might easily be read alongside the chapters on the geographies of care (Milligan and Power) and on complementary and alternative medicine (Andrews, Adams, and Segrott). Thus, although we have tried to distinguish between the various fields that make up the sub-discipline we recognize that each is connected to the other in what should be regarded as interesting and productive ways.

This attempt at encouraging critical dialogue between the chapters and across the various parts of the volume is repeated throughout. In the following part, which covers "health and wellbeing," we have included six chapters and again there is considerable diversity in topics. The part begins with a wide-ranging review of the therapeutic landscapes concept by Allison Williams, and is proceeded by chapters on sexuality and gender (Sothern and Dyck), impairment and disability (Chouinard), mental and emotional health (Parr and Davidson), landscapes of despair (DeVerteuil and Evans), and is brought to a close by Craddock and Brown's contribution on the representation of healthy and unhealthy bodies. There is, of course, a degree of interconnectivity amongst these chapters; however, there also exists a good deal of (productive) tension. For example, where Williams tends to foreground the health-promoting value of therapeutic landscapes, Davidson and Parr point to the ways in which this logic was deployed, in quite specific historical contexts, in support of the construction of asylums that were designed to separate spatially the "mad" from mainstream society. Further, elsewhere in the volume we are reminded that what remain for some as spaces of exclusion and containment have once more been recast for others as therapeutic sites where stressed individuals can seek solitude and respite from the world outside (see Andrews, Adams, and Segrott).

In this part we are also encouraged to engage with many of the other forms of dualism that are encountered in society: for example, between the healthy and unhealthy, the normal and the impaired, and, perhaps most importantly of all, between the male and female body. Here, Sothern and Dyck's contribution stands out because it not only highlights the ways in which health and illness are experienced differently by men and women but it also problematizes these very categories. More specifically, they remind us that dualisms are socially constituted and refer readers to the autobiographical writing of Jim Sinclair, whose intersexuality prompts us to not only reflect on the meaning of gender but also on the powerful role that medicine plays in defining and defending its very boundaries; a perfect example, if any were needed, of why geographers should not lose sight of the need to engage critically with medicine.

Clearly, the chapters in this part take us much further than this brief discussion of dualisms allows for and each illustrates how our understanding of health and wellbeing has been enhanced considerably by the application of critical thinking. In Chouinard's chapter we are presented with a comprehensive account of the contribution of critical social and feminist scholarship, which, inspired by the disability rights movement, enabled us to move beyond medical models of disability. Davidson and Parr build upon this chapter and chart the sub-discipline's engagement with mental health and emotional geographies, and they demonstrate the significance that the "spatial turn" in theory has had in this regard. They finish by suggesting that there is a need to explore the limitations of contemporary social policy, especially with regards to the notion of social inclusion. This call is, to some extent at least, taken up by DeVerteuil and Evans whose chapter on "landscapes of despair" highlights the potentially negative outcomes of poorly thought out social policies that reposition care in the community.

As we note above, we do not regard these as self-contained parts but recognize that they talk to each other. Craddock and Brown's contribution is a good example here. Not only could it be read alongside the chapters on disease in the previous part but it also speaks to the discussion that takes place in the following part, which covers public health and health inequalities. After all, their exploration of the ongoing relevance of social constructionist theory to the sub-discipline focuses on historical and contemporary representations of diseased/sick and healthy/well bodies. Importantly, such concern invites critical reflection on key ethical and moral questions regarding the ways in which certain bodies are normalized and others stigmatized, whether because of their shape, size, or appearance (e.g. the fat or obese body) or because of the social and cultural values associated with the acquisition of specific types of disease (e.g. tuberculosis or syphilis). Though the questions raised by Craddock and Brown are, in some ways, quite distinct from those that we encounter in the part on public health and health inequalities, they do share in common an ongoing interest with the issues of equity and social justice, which are regarded as so important by Kearns and Collins.

Opening with an extensive review of the association between health geography and public health (Curtis, Riva, and Rosenberg), this part goes on to examine a range of topics: "migration" (Boyle), "health inequalities" (Kulkarni and Subramanian), "neighborhoods and health" (Ellaway and McIntyre), "environmental risk" (Jerrett with Gale and Kontgis) and "environmental risk perception and neighborhood response" (Elliot), "health behaviors" (Twigg and Cooper), and finally "governance, risk, and health" (Brown and Burges Watson). Though diverse, empirically and in some cases epistemologically, this collection of chapters reflects the scope and scale of geographers' engagement with public health issues. As Curtis et al. reveal, this engagement, like much else within the sub-discipline, has long roots and could, if we were so minded, be linked to the work of the Victorian sanitary reformers or even to Hippocrates' *On Airs, Water and Places*. The connection here lies in a shared concern with the "environment" or, more precisely, with the idea that diseases, whether infectious or chronic, are a product not only of a person's behavior but also of the interaction of people with their environments.

This interconnection is, perhaps, most explicitly outlined in the two chapters that focus on environment and risk. In the first of these, Jerrett and colleagues review trends in what they refer to as "environmental health geography." In addition to outlining key theoretical and methodological developments that have taken place within this field, the authors draw on the concept of environmental equity or justice as a means to frame their discussion of research that explores the health-related consequences of inequitable exposure to environmental toxins. As they demonstrate, a geographical perspective is not only invaluable to exploring the impact of such exposures in the present but, because of advances in statistical methods and spatial analysis, can help understand the significance of potential risks in the future; most notably here the possible implications associated with global climate change. Although similarly focused on environmental risks, Elliot's contribution is quite distinct from Jerrett and colleagues. Here, an understanding of the close interrelationship between environmental pollution and human health remains important; however, Elliot shifts attention to the individual and community responses to such exposure. In so doing, she reveals that the impact on human health of such exposure can be manifested in both physiological responses (e.g. increased rates of cancer) and psychological terms (e.g. increased rates of chronic disease).

Of the remaining chapters in this part, Ellaway and McIntyre's is the one that is most clearly concerned with the association between environment and health. However, their contribution extends our view of the environment to incorporate, more obviously, what might be referred to as the "social" as well as the physical environment. This chapter also directs the reader to key debates that have been taking place within the sub-discipline, notably that relating to the idea that it is not simply "who we are" (composition) but "where we live" (context) that affects our life chances. Drawing on their extensive research in this area, Ellaway and McIntyre provide a comprehensive overview of current research on this topic and cover such important issues as deprivation, ethnicity, and gender. It is worth noting here, that they also highlight research that is specifically concerned with children and young people (which the editors acknowledge is an area that is underserved by this volume, especially given the recent growth in the sub-field).

Closely related to this contribution are the two chapters by Twigg and Cooper on "health behaviors" and by Subramanian and Kulkarni on "social inequalities in health." Though related, both are, of course, quite distinct. In the former, Twigg and Cooper consider how geographers have approached the question of health-related behaviors. As they note, the particular, and perhaps even unique, contribution made by geographers to this sub-field is their recognition that such behaviors (whether related to diet, physical activity and exercise, tobacco consumption, and so on) are influenced by place and space. In making this observation, Twigg and Cooper build quite explicitly on the ideas of "context" and "composition" discussed by Ellaway and McIntyre. However, their chapter extends this discussion by providing a wide-ranging review of the influence that advances in statistical modeling, and especially multi-level modeling, have had. That said, Twigg and Cooper do not limit their intellectual gaze to the quantitative side of the sub-discipline, as they finish their chapter with some thoughtful observations on the potential value of other, more qualitatively oriented, approaches to enhancing further our knowledge in this area.

In the chapter by Subramanian and Kulkarni we also have a contribution that seeks to engage critically with current debates. The authors deliberately distinguish between "health inequality" and "social inequalities in health" because the latter reflects their explicit concern not only with the social factors and conditions that explain disparities in health but also with issues of fairness and justice. This chapter is not, then, simply a review of previous research, but it is an attempt to re-conceptualize an already extant idea. In seeking to reposition inequalities in health research in this way, and especially by turning to Bourdieu's notion of relational interaction (see also Dunn & Cummins 2007; Cummins et al. 2007), Subramanian and Kulkarni highlight the ways in which the sub-discipline continues to interact with, and engage in, debates taking place in the social sciences more broadly.

This is perhaps no surprise given the current and past disciplinary affiliations of these particular authors. However, it is an observation that is pertinent to many other chapters in this volume, including those by Boyle and Brown and Burges Watson, which open and close this part respectively. In the former of these, Boyle builds on the "mobility turn" in the social sciences to discuss the significant impact that population movement has on health. Boyle's is an extremely nuanced chapter. He opens with an account of the ways in which mobile populations have historically been represented as the harbingers of epidemic disease and, as such, have been prone to often exclusionary and stigmatizing discourses. Here there are clear overlaps with the chapter by Craddock and Brown. However, once established, he moves beyond the representational to consider how the migration of people impacts upon our understanding of the distributions of disease and exemplifies this through reference to a wide array of research.

In the chapter by Brown and Burges Watson, we return to the question of health-related risk, which either implicitly or explicitly runs throughout many of the contributions in this part of the volume. However, for these authors, the question is not so much about defining the factors of risk that shape people's health in the present/future but considering the implications of this in terms of the Foucauldian concept of governmentality. Put differently, they seek to problematize the ways in which ideas relating to health and wellbeing are made visible through factors of risk and are mobilized as a form of (self) governance within contemporary society. Thus, although quite distinct from other contributions in this part of the book, and perhaps more generally, the chapter encourages geographers to think carefully about their scholarly endeavor and suggests that there is scope for critical reflection even in the seemingly universally accepted search for health and wellbeing.

The volume is brought to a close with a part on "health care and caring," which alongside chapters on such "traditional" concerns as "health care provision" (Barnett and Copeland), "location-allocation planning" (Tanser, Gething, and Anderson), and "access to health care" (Ricketts) includes chapters that focus on much more recent areas of concern, such as the "geographies of care and caring" (Milligan and Power) and "complementary and alternative medicine" (Andrews, Adams, and Segrott). In making this observation, we do not imply a pejorative reading of the "traditional" rather we merely seek to highlight the expansion – in empirical focus, theoretical influence, and methodological approach – that has taken place in recent years. Of course, such change is not limited to differences that might be apparent *between* the individual chapters but is also reflected in the ideas that are explored *within* them.

We begin this final part, then, with Barnett and Copeland's chapter on health care provision. This chapter offers an in-depth and comprehensive review of key changes that have taken place in national health care provision over the last twenty years or so. However, as the authors note, this particular sub-field, has shifted from studies that employed such notions as the "inverse care law" or "distance-decay" to search for "universal empirical regularities" in the provision of health care to those that recognize the influence of a changing socio-economic landscape, of shifts in governmental ideology, and of place more broadly on patterns of health service delivery. Such intellectual manoeuvres do not deny the important contribution that earlier research has made, and in some instances continues to make; however, they do help us to identify what might be regarded as the significant gaps in, and limitations of, such studies.

This point is also reflected in the contributions by Ricketts and by Tanser et al. In the former, Ricketts maps out the development of the key theories and concepts associated with access to health care research. As he reveals, in its narrowest sense, access might be considered simply in terms of "distance to care"; that is, as a measure that employs a Euclidean measure of distance. Clearly, access to care cannot be regarded as simply a spatial problem and, as Ricketts observes, the concept has been thought about in increasingly broad terms: whether in relation to the impact that larger societal forces have on health care systems, the positioning of access to health as a measure of social justice, or the ways in which individual and/or societal belief systems influence patterns of health service use. However, even though models have been developed which seek to capture this much broader understanding, Ricketts notes that many still fail to reflect the ways in which access is embedded in the complex reality of people's everyday lives. For Ricketts this is important because we need to recognize that access is as much about the cultural and social practices that influence and shape people's health-seeking behaviors as it is about the spatial location of the static structures that make up a health care delivery system.

To some extent, the "messiness" that Rickett's describes is also acknowledged in the following chapter by Tanser et al. However, in their contribution the main focus of attention is on the development of GIS models that allow geographers to capture, at least some, of this complexity. Indeed, what Tanser and colleagues present is a quite detailed explanation of the value of GIS to the problem of location-allocation planning, especially in resource-poor countries where researchers face a host of other issues, not least amongst which is access to appropriate data. A further feature of this, and for that matter Ricketts' chapter, is the emphasis placed on policy relevance. What is especially interesting here however is also the recognition that using such techniques as GIS does not necessarily result in health care facilities being located in what might be regarded as the optimum locations. As Tanser et al. note, (local) politics and other factors such as economic viability strongly influence the decision-making process.

Although, as we have indicated already, the last two chapters in this part cover quite different aspects of "care," they do, of course, share a common interest in the concept and how it has been deployed and researched by geographers. In the first of these chapters, Milligan and Power are primarily concerned with recent discussion about the ethics of care and with the ways in which changing welfare regimes are implicated in the process of shifting "care" from institutional to family/community settings. Clearly, the kinds of settings referred to in this chapter are quite different to those explored both by Ricketts and by Tanser and colleagues. However, when combined with the contribution from Barnett and Copeland, what we are provided with in this chapter is a clear insight into the impact that the ideological landscape within which decision-makers operate has had both on the idea of where responsibility for care and caring lies, on the places within which care should, and increasingly does, take place, and upon the interrelated question of who is providing such care (whether informally or formally for example in the so-called "third sector"). Thus, although debates around access to, and location of, care overlap with this particular research agenda the principal focus of it lies with these interrelated issues.

Clearly, this chapter extends our understanding of "care and caring" in interesting and important ways. So too does the chapter by Andrews, Adams, and Segrott. As these authors reveal, the practice of health care, at least as far as it is experienced in the formal sector of most advanced industrial nations, increasingly involves therapeutic practices whose origins lie either in "traditional" medicine and/or outside the boundaries of western biomedicine. It is upon developing an understanding of the scope and scale of these complementary and alternative practices, and how we might begin to engage, theoretically and empirically, with them, that Andrews et al. focus. Of particular importance is research conducted under the general banner of the therapeutic landscapes concept, which emphasizes forms of healing that lie well beyond the scope of the biomedical model. However, as Andrews and colleagues demonstrate, there is also a recognition in recent research, that the growth of these particular forms of (self)care are also associated with wider geographies of production and consumption.

We end our introduction here and will now let the individual authors talk for themselves.

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Part I Debates in Health and Medical Geography

Chapter 2

Health Geography

Robin Kearns and Damian Collins

Introduction

In this chapter we consider the emergence and characteristics of the field of geographical inquiry known as "health geography." Drawing on the contentions of Kearns and Moon (2002), we argue that it is a broad field, reflecting geographers' evolving methods, empirical foci and philosophical "takes" on health and medicine. It retains connections with the medical geography from which it emerged, particularly through a continued interest in pathological matters (e.g. morbidity and mortality) and sites and systems of care (e.g. hospitals, other health care services, and related policies). At the same time health geography has introduced allied constructs of wellness, identity, and place experience. Given that it is these constructs which represent the most significant departure from "traditional" medical geography, we grant them the most attention in this survey. Yet, notwithstanding a mounting focus on wellness, identity, and place experience, we argue that work in health geography has maintained strong interest in the study of disease and health care services.

We begin this chapter by examining the emergence of health geography from the more established field of medical geography, surveying evidence for its distinctiveness. We next consider three constructs that are central to the field: place, health, and wellbeing. Two hallmarks of health geography have been conscious theorizing and attempts to be critical. Our next two sections therefore consider the place of theory and critical inquiry in the field. We then survey two concerns in which health-geographic scholarship is flourishing and finding intersection with other disciplinary perspectives: risk and care. We close with some reflections on the future prospects for the field.

Evolution or Revolution?

There remains considerable slippage in the use of the sub-disciplinary labels "medical" and "health" geography. For some, the terms may be interchangeable.

Nevertheless, those researchers who staunchly identify as *health* geographers note a shift since the late 1980s from a fundamental concern with the medical world towards an increased interest in wellbeing and broader social models of health and health care. Kearns and Moon (2002) chart the transition from a past medical to a present and future health geography by reference to key publications in the 1990s, and a synopsis of their survey warrants mention here.

First, with its nod to postmodernism, the somewhat tongue-in-cheek call by Kearns (1993) for a "post-medical" geography of health attempted to prompt the sub-disciplinary focus towards a cultural/humanistic direction through directing attention to health and wellness. This call prompted debate and dispute with the post-medical challenge being (inevitably?) a case of insufficient for some, but not enough for others. Dorn and Laws (1994), drawing on disability studies and post-structuralist thought, lamented Kearns' lack of engagement with the literature on the body, while Mayer and Meade (1994) and, later Paul (1994), voiced concern for the enduring relevance of medical geography's disease ecology tradition.

A second marker of transition is the set of reports on "medical geography" in the journal *Progress in Human Geography* which indicate a shift in sub-disciplinary concerns and subject matter. As Kearns and Moon (2002) point out, these critical reviews have tended to be framed as catalysts for change, with reviewers choosing to explore potential avenues for novelty. Authors have often looked outside the sub-discipline, and even outside geography itself, for new areas to which health geographers might contribute. By way of example, they cite Jones and Moon's (1993) engagement with ideas of composition and context from health sociology, Kearns' (1995) advocacy of links to postmodernist ideas of difference, and Parr's (2002) embracing of embodiment ideas.

Third, Kearns and Moon (2002) see the 1995 launch of *Health & Place* as additional evidence of the changing nature of the sub-discipline. The journal's concern for studies "where place matters with regard to health, health care, and health policy" (Moon 1995: 1) was echoed in the journal's title. While its geographical content is arguably similar, at least in name there was a definite distancing from concerns reflected in the title that had hitherto been the main forum for research by medical geographers: *Social Science & Medicine*.

In summary, new geographies of health have been cast as emphasizing the centrality of place in the study of health. Other claims found repeatedly in the literature include suggestions that new geographies of health might take a more critical perspective; would probably be less likely to use quantitative methods; would be concerned with a more holistic view of health; would draw strongly on developments elsewhere in geography and other (social) sciences; and, as a consequence of the last point, would present more theorized perspectives, drawing particularly on cultural theory (Parr 2003). Given the centrality of the terms health and place in both Kearns (1993) and the new journal, we now devote some attention to each of these constructs before exploring their connection through a further term that is fast gaining currency within health geography: wellbeing.

Place

We turn first to constructions of place, a near-universal concern within human geography (e.g. Cresswell 2004). The *Dictionary of Human Geography* (Johnston et al. 2000) entry for medical geography stresses the biomedical model of health and a focus on quantitative methods, whereas *place* is a lead theme for the health and health care entry, along with a socio-ecological model of health, and methodological pluralism. Contemporary health geography, then, is attentive to changing theorizations of health, and methodological developments in the wider social sciences, while foregrounding the concept of place, understood as an "operational and living construct which 'matters' as opposed to being a passive 'container' in which things are simply recorded" (Kearns & Moon 2002: 587).

In contrast to the geometric constructions of space often employed in medical geography (Kearns & Joseph 1993), health geography has emphasized constructed and experiential aspects of place (Moon 1990; Kearns 1991). In practice, this has often taken the form of case studies grounded in the specifics of particular localities in which health or ill-health is experienced, risk factors are negotiated, and services organized and utilized. Thus, notions of "emplacement" became central to research into the lived experience of disability and ill-health, as demonstrated in Dyck's (1995) work on women with multiple sclerosis, and Wilton's (1995) on the "diminishing worlds" of people living with HIV/AIDS. Such approaches to health geography research were reflected in the title of Kearns and Gesler's 1998 collection, *Putting Health into Place: Landscape, Identity and Wellbeing*.

An overarching theme in this work is that "places matter" with regard to health, disease, and health care. Kearns and Moon (2002) identify three approaches within this scholarship. First, there have been studies of particular localities, which have been "read" as place, with researchers drawing on positivist, political economy and humanist traditions. Arguably, the humanist-inspired work has provided the most nuanced contributions to knowledge. Following Eyles (1985), either implicitly or explicitly, such work has considered both literal experiences of place, and associated but more metaphorical notions of "place-in-the-world" (drawing on Heideggerian notions of dwelling and identity). Recognition of this dynamic has demanded attentiveness to the voices of those researched, and has been particularly effective at the interface of health geography and feminist and disability studies (e.g. Butler & Parr 1999; Moss & Dyck 1999).

Second, "landscape" analyses have brought heightened awareness of the intersection of cultural and structural forces in spatial experiences of health care and health promotion. Applications of the term, such as "landscapes of despair" (Dear & Wolch 1987) and "therapeutic landscapes" (Gesler 1992), have contributed much to the expansiveness and purchase of health geography, connecting it to the tradition of landscape analysis in cultural geography, while also helping to distinguish it from the established concerns of medical geography. Health geographers have often employed "landscape" to refer to the diverse and converging layers of history, social structure, and built environment at particular sites. This site-specific focus is significant; although "landscape" can imply a broader focus than "place," in practice most self-identified studies of landscape by health geographers center on particular, spatially confined case studies. This has been the case since Gesler's pioneering work on three sites with established reputations for healing – Epidauros (1993), Lourdes (1996), and Bath (1998) – although regional (Einwalter 2007), national (Kearns & Collins 2000), and even global (Hoyez 2007) landscapes have also been considered. While pluralist use of the term – including as a synonym for place – can be confusing, "landscape" suggests a holistic concern for the quality of local environments, and as such has become one "the hallmarks of a new geography of health" (Kearns & Moon 2002: 611).

A third deployment of place is reflected in the growing popularity of using multilevel models (Moon et al. 2005), a development within health geography (adopted via educational statistics) that has had a substantial impact in other parts of the parent discipline. This approach is a contemporary expression of a long-standing tradition: the application of the generalized linear model to addressing issues of health equality/inequality. One area in which this approach has been significant is in exploring the relationship between neighborhood socio-economic status and measures of health status and risk factors (e.g. Haynes et al. 2003; Oliver & Hayes 2005). In broad terms, it enables specific hypotheses about the relationship between health and place to be tested, typically with reference to pre-existing quantitative data. Although there is a risk of this approach "tell(ing) us more about data collection strategies than the realities of place effects" (Kearns & Moon 2002: 611), multilevel models represent a clear example of another approach to place-sensitivity in contemporary health geography.

To summarize, the three expressions of place we have identified are distinct, yet collectively central to the place-identity of the new geography of health. In the first, the specific, material sites where the study is undertaken are central. The second category – "landscapes" – has involved analysis of multiple layers of meaning present in particular environments, and in so doing has helped to move health geography from an overtly quantitative emphasis towards a position of methodological pluralism. The third, multilevel analysis, is an effective method for identifying and quantifying some important connections between place and health.

Health

A key focus in health geography is, self-evidently perhaps, health as something more than the absence of medically defined ailments. Indeed, there has often been a focus on healthy communities (rather than healthy individuals *per se*). This implies a shift in mindset from biomedical preoccupations to a concern for a more collective population health and, significantly, reflects trends within medicine at large. As a population health perspective has taken hold within policy and public health practice, we see the maintenance of personal health increasingly regarded as a necessary but not sufficient goal within an overarching aim of promoting the wellbeing of *all* members of a society. It follows that a commitment to sustaining the health-maintaining potential of the environment at large is necessary and this entails attentiveness to social/cultural, political, built and natural components of place-based communities.

Such all-encompassing views of health draw on the breadth of vision in the World Health Organization's (WHO's) Alma Ata declaration of 1978 – which advocated "health for all" – as well as recent socio-ecological formulations that promote holism, and a future orientation to anticipate health threats (Gesler & Kearns 2002). The use of the term "wellbeing" in the WHO's definition of health ("more than the absence of disease … a state of complete social, physical and mental wellbeing") may be interpreted as an attempt to bypass the frequently medically captured term "health," with its implicit disease-orientation, and to signal a broader, positive orientation centered around human potential.

While increasingly *conceptualized* in a positive fashion, health continues to be *measured* in predominantly negative terms. This conceptualization occurs with respect to personal as well as population health. In its crudest manifestation, mortality rates are used as indicators of health status. Other measures, such as rates of high blood pressure, or years of life affected by serious illness or disability, at best speak indirectly to how well individuals or populations feel about themselves and their environments. Certainly, there are exceptions: rates of immunization, and levels of access to safe drinking water, may be interpreted as positive proxies for health status. So too, may life expectancy rates. Generally speaking, however, health is measured and assessed via opposites and absences.

Work by health geographers has maintained that a more positive and holistic view of health is warranted; one consonant with the socio-ecological model, and with a positive orientation that can support policy formulated around ideas such as empowerment, community action, and capacity building. The challenge is to transcend conceptualizations of health as a "state of absences," and instead theorize and articulate it in terms of the potential for individuals and groups to experience a positive place-in-the-world, and contribute to the common good. In so doing, it is critical to be attentive to the ways in which understandings and experiences of health and wellbeing can be "bound into local cultural understandings and colonial histories" (Kearns et al. 2006: 243). Recent work by health geographers exploring indigenous perspectives on wellbeing clearly illustrates the limitations of universalizing perspectives (e.g. Wilson 2003).

Wellbeing

Efforts to broaden geographical concern for health beyond such traditional concerns as disease and sites of care have been associated with a symbolically – and empirically – significant shift towards investigating aspects of wellness. It might have been expected that emerging geographies of health would have been accompanied by a decreased concern with dead and diseased bodies and greater interest in healthy bodies. However, a fundamental tension within ideas of wellbeing is that being well (or getting well) implies a progression away from being ill or impaired. Thus, wellness may be conceptualized as the naturalized positive outcome that medical intervention seeks to achieve. However, it has been argued, beyond discourses of medicine, wellbeing is widely evoked as a condition far removed from an absence of ailments. This is especially so from the vantage point of health geography, while in other sub-disciplines of human geography terms such as "economic wellbeing" and "community wellbeing" have increasing purchase (Morrison 2007).

Within this emerging research stream, the long-established geographical concern for landscape has taken on new emphases and meanings. Researchers have moved on from the medical-geographical understanding of landscape as a physical barrier to health service provision and utilization, to consider the complex layerings of history, social structure, symbolism, nature, and built environment that converge at particular sites, and may enhance or corrode human wellbeing. One prominent application of the term, understood in these simultaneously cultural and political ways, has been "therapeutic landscape" (Gesler 1992) which has achieved rapid uptake in health geography. Within 15 years of Gesler's seminal paper, two book-length collections on the topic have appeared (Williams 1999, 2007a), alongside myriad articles.

The present diversity of research that engages with matters of human wellbeing contrasts strongly with early medical-geographic interests which almost exclusively focused on disease ecology (before expanding to encompass disease mapping and geographies of health care provision). While wellbeing is, to an extent, *implied* in such work, it is frequently *to the fore* in the new geography of health, by virtue of its more explicit interest in the experience of *being* well. This interest has been facilitated through a closer relationship with the fields of social and cultural geography.

One important contemporary point of convergence between cultural and health geography is the interest in emotions, a field that has recently blossomed (see Anderson & Smith 2001; Davidson et al. 2005). Geographical research into emotional responses to, and within, places is inflected with humanistic ideas that were infused into geographical thinking in the 1970s. It has canvassed such themes as fear (Andrews & Chen 2006), awe (Smith 2001), loss and longing (Bondi with Fewell 2003), and togetherness and love (Rose 2004). Attention has also been paid to the therapeutic aspects of simultaneously emotional and material encounters with "natural" environments (Collins & Kearns 2007; Williams 2007b).

This burgeoning interest suggests, as Kearns and Andrews (2009: 4) contend, "the two implied domains of human experience are interconnected (i.e. *being* well generally involves *feeling* well)." They argue that emotion involves the ways an experience is felt (in terms of positive or negative valences), while wellbeing is "a longer-term state-of-mind (and body, if not spirit), and is often regarded as synonymous with perceived quality of life" (2009: 2). Emotional states such as contentment and happiness, while potentially fleeting, are nonetheless shaped by experiences of place, and contribute to experiences of wellbeing across the life course.

Whereas health has often been associated with the absence of its opposite (ailments, illness, injury), attempts to articulate the character of wellbeing are built on two traditions: from urban planning and economic geography, the interest in indicators of quality of life (frequently used to rank cities or countries, but often invoking only material aspects of life) (Ley 1983); and, from health philosophy, the holistic ideas of health that emerged in the latter part of the twentieth century to identify dimensions of human experience such as positive relations with others, relative autonomy, and environmental mastery (e.g. Breslow 1972). It is these ideas that were captured in (and, to a degree, popularized by) the WHO definition of health. It is noteworthy, however, that their holism was long-preceded in the constructions of health developed by indigenous peoples such as Maori (e.g. Durie 1994) and First Nations in North America (Wilson 2003). In the Maori worldview, for instance, culture, place, and health – constructs only recently linked in western geographical thinking – have long comprised a deep understanding of *hauora* (wellbeing). By way of example, a Maori framework articulated by Durie (1999) sees *mauriora* (secure cultural identity), *waiora* (environmental protection), *toiora* (healthy lifestyles) and *te oranga* (participation in society) as crucial pillars of the *whare* (house) of wellbeing in health promotion (Kearns et al. 2006).

As geographers have worked on, and with, ideas of wellbeing, they have shifted priorities towards everyday mental and physical health, understood in a broad sense.

Phenomena such as health and fitness cultures (Andrews et al. 2005), sites of spiritual experience (Gesler 1993, 1996) and holistic therapies and lifestyles (Williams 1998; Wiles & Rosenberg 2001) have entered the panoply of research themes within the sub-discipline. Further, traditional fields of inquiry for medical geographers, such as mental health care, have been recast as health geographers embrace and explore alternative modalities of treatment, such as art and private spaces of care (e.g. Parr 2008; Moon et al. 2006). Others, less likely to identify as health geographers, have nonetheless extended the remit of health geography through investigating common, yet often neglected and trivialized, psychological problems. Phobias, addictions, and compulsive disorders impact significantly upon people and their wellbeing, and involve, at times, distinct spatial practices (Davidson 2005; Doel & Segrott 2003; Wilton & DeVerteuil 2006).

Placing Theory, Locating Criticality

Health geography is ultimately characterized by more than attention to place and wellbeing, however. Therefore, we now turn to consider the place of theory and critical inquiry as hallmarks of the contemporary expression of the field. We also note the new methodological approaches that have accompanied shifts in conceptual concerns.

Theory

As Kearns and Moon (2002) point out, application of ideas such as central place theory in spatial-analytic medical geography, and Marxism/political economy in studies of health (care) inequality, are long established. However, health geography has entailed more self-conscious (Litva & Eyles 1995) and sustained engagements with theory, adopted and adapted from diverse sources. This heightened theoretical awareness has coincided with the notion of health itself coming under increased scrutiny.

Diverse theoretical traditions inform contemporary health geography. Positivism continues to exert influence, particularly in aggregate studies (e.g. of neighborhood effects on health; environmental health; population health), and research in this area has been invigorated by the uptake of multilevel modeling techniques. Similarly, the concern for inequality/equality, and its partner exclusion/inclusion, found in areas of medical geography, is significant in health geography (Barnett et al. 2000; Oliver & Hayes 2005; Curtis 2004). This speaks in part to the enduring influence of Marxism and political economy. Alongside such relatively well-established theoretical influences exist a range of other (post-positivist) approaches – feminism, governmentality, post-colonialism, queer theory – often selected in a relatively flexible manner, because of their perceived "fit" with particular research project or problem (Kearns & Moon 2002).

One theoretical framework that has offered the capacity to link diverse theoretical perspectives currently deployed in health geography has been the structure and agency dynamic articulated by Giddens (1984), and adapted by Wolch and Dear (1989). It has been employed to integrate people and places, as well as the local and the global (Dyck & Kearns 2006), and facilitates generalization outwards from small-scale case studies (e.g. Kearns 1998). With care, structure/agency can also be used to confront a key challenge for more theorized health geography: the incorporation of time. While medical geographers have grappled with time in the charting of epidemics (Schaerstrom 1996; Smallman-Raynor & Cliff 1999) there is, metaphorically, potential to move from taking sequential snapshots to making movies through longitudinal studies. In brief, a greater engagement with the processes of change around health status is warranted.

While the utility of the structure/agency framework is well recognized within health geography, another theoretical development has remained (paradoxically) under-utilized. Work on the body has featured in broader geographical inquiry (e.g. Longhurst 1997), but has, until recently, been absent within the corpus of health geographic knowledge. This gap was initially pointed out by Dorn and Laws (1994), and while bodily processes such as birth, death, and pregnancy have been selectively considered (e.g. Abel & Kearns 1991; Brown 2003; Fannin 2003), a fully embodied health geography has been slow to develop. Writings by geographers working on issues concerning disability and mental health have increasingly addressed this gap, aided by their engagement with broader literatures in social and cultural geography (see Dyck 1995; Hall 2000; Litva et al. 2001). Ultimately it is theory that will assist this process. For instance, following Foucault, bodies – like landscapes – can be "read" in ways that reveal past embodied geographies and which have implications for contemporary bodies and spaces. In this, bodily geographies are, as Parr (2002, 2003) argues, enabling geographers to revisit and re-vision the medical.

The increasing theoretical diversity of health geography has been accompanied by a proliferation of methodologies, including qualitative approaches essentially unknown in the former medical geography. While this represents a significant point of divergence, the ongoing use of quantitative methods by many health geographers represents a key point of continuity. As Kearns and Moon (2002: 614) argue the positivist "quest for law-like regularities that characterizes *medical* geography" also has a place within health geography, where its "applications are often particularly well-made." A key development among such applications is the place-sensitive work using multilevel modeling (e.g. Duncan et al. 1998). A renewed emphasis on theory alone, however, does not characterize health geography. Rather, another point that *distinguishes*, but does not *divorce*, health geography from its medical forebear is its frequently critical orientation.

Critical inquiry

Critical geography is broadly characterized by concern for domination and resistance, opposition to oppressive relations, advocacy of social justice, and commitment to the development and application of theory in the pursuit of activist and leftist goals (Blomley 2006). Health geography – with its sustained concern for unequal and oppressive social and political arrangements (a research theme informed by Marxism/political economy, with a strong lineage in medical geography) – both contributes to this scholarship, and is influenced by it. However, as Kearns and Moon (2002) point out, what is not clear is whether this ongoing attention has, in any real sense, entailed *action* as opposed to *assessment*. A second criterion of criticality, a commitment to social justice and equity, has at least implicitly informed inquiries into the health (care) implications of neo-liberal policies for equity of access to services, gradients of health status, and discursive understandings of patients (e.g. Hayes 1999; Barnett & Kearns 1996).

Interactions and collaborations with specialists in public health medicine, and myriad other academic fields, have helped to ensure that health geography is exposed to critical theories in other disciplines. Thus, while "mainstream" medicine was once medical geography's main ally, for health geography there is now a veritable smorgasbord of transdisciplinary connections. Further, if medical geography suffered from any degree of isolation from the parent discipline, health geography, with its interest in constructs like place, identity and wellbeing – and its often critical bent – is garnering wider interest among geographers through its very distancing from medicine. Yet, just as geography has changed, so too medicine has altered to increasingly embrace ideas of health. This suggests the timeliness of a greater rapprochement between endeavors. Indeed, as Kearns and Moon (2002: 617) state:

> geographers tend to have a rather outdated vision of medicine. This is at least as problematic as the stereotypes that many health care professionals hold of us as demographers, map-makers and spatial fetishists ... While we ignore medicine and medical power/knowledge at our peril, we also need to avoid setting up medicine as some sort of folk devil from which we are "progressively" distancing ourselves.

With this view in mind, we now turn to consider two promising and related trends in contemporary health geography: risk and care.

Risk

Petersen and Lupton (1996) consider the emphasis of the "new" public health to be the provision of behavioral norms against which individuals are measured, and the process of persuading people to acquiesce to these goals. The modes of public persuasion are a plethora of messages that are variously packaged to emphasize the negative eventualities of risky behavior. Alongside such messages is a concern for surveillance of the population, its behaviors, and the environments in which it is potentially exposed to risk. These characteristics invoke the notion of governmentality. Originating in Foucault's thinking, governmentality refers to the strategies the state and other institutions enact so as to influence the conduct of individuals for the sake of their own interests (Lupton 1995). From this perspective, the act of "governing" occurs both through bureaucratized processes like government and through the influence and imposition of strategies that affect bodies (individual, or collective).

In a 2002 paper, Brown and Duncan called for health geography to work "towards the understanding of how the discursive practice of the "new" public health movement works in particular place-based settings" (p. 336). This call, alongside the increasing prominence of "new public health" movement itself, has led health geographers to focus on a new range of concerns: the prevention (and not merely occurrence) of illness and injury; the production and maintenance of healthy living and working environments; and the empowerment of individuals in relation to their health experience.

Institutional spaces have been important contexts for inquiry. In the school context, for instance, implementation of the new public health requires a restructuring of social and physical environments so as to facilitate the guided uptake of "healthy choices" (in terms of food, exercise, sexual conduct, sun protection, etc.) through an internalization of responsibility by the individual subject (Collins et al. 2006; Rawlins 2008). The regulatory regime of the school setting is distinctive, however, in that it can easily translate persuasion into imperative. For example, while uptake of skin protection measures promoted in "SunSmart" social marketing campaigns is essentially a matter of individual choice in relatively unbounded environments such as beaches, in schools they can become an imperative (Collins et al. 2006; Collins & Kearns 2007). Such compulsion is made possible not only by the authority of the school, but by profound uncertainty as to whether children can be, or should be, independent agents responsible for making their own (healthy) choices (Rawlins 2008). It follows that a range of relatively banal health-related behaviors may come under formal school surveillance: from wearing hats and sunscreen when outdoors, to walking to and from school (Kearns & Collins 2003), to food choices during the school day (Rawlins 2008).

Geographies of health promotion are good examples of the ways that individuals and populations are governed at the micro-level, and how particular behaviors are encouraged so as to reproduce, at arm's length, a particular idea of an ordered and rational society. The focus on analyzing images and discourses in this work has led geographers to draw on Rose's (1999) view that power in this context is not necessarily oppressive. Because it forms and articulates the social order, power can be creative. The expansion of the public health gaze away from traditional concerns such as hygiene has been readily adopted in market-based societies that have constructed individuals as responsible for managing their own lifestyle, provided they are sufficiently educated about scientifically derived notions of risk (Brown & Duncan 2002; Rawlins 2008).

Through its health promotion ideas and activities, the "new" public health generates normative statements about a broad spectrum of health-related activities, and the landscapes in which exposure to health risk takes place. As Brown and Duncan (2002) argue, drawing on Lupton (1998), the construction of "risk" is central – theoretically as well as practically – to the regulation of everyday life. With respect to the example of sun exposure, "while symptomatic *individuals* (e.g. those developing melanoma) remain in the domain of medicine, the public health imperative is managing the behavior of asymptomatic *populations* whose members may only potentially experience the onset of disease at some time in the future" (Collins et al. 2006: 441). This emphasis on the surveillance (of disease, and by extension, behavior) can also be seen within screening programs (Lovell et al. 2007). Research in such areas provides another connection between health geography and the wider discipline, where notions of "gaze," surveillance, biopolitics, and the internalization of responsibility have become influential, informed by both governmentality theory and empirical developments such as CCTV.

Care

Recent health geography scholarship has been further informed by a meeting of political economy and cultural concerns coalescing around the notion of *care*

(Milligan 2000; Wiles 2003a, b). In a sense, health promotion and the identification and management of risk discussed in the foregoing section can be seen as a bureaucratized form of care, promoted by the state, and adopted to varying degrees by individuals and institutions. At a more medicalized level, geographers have long been concerned with the socio-spatial organization of health care and inequalities of access (e.g. Joseph & Phillips 1984). This amounts to a health systems approach, and one that those identifying as health geographers have taken further, by posing and addressing the questions of how care is experienced, by whom and where (e.g. Milligan 2000). This has amounted to a move from spatial location to place-based experience.

New directions involve the reworking of what is meant by care and caring work (Del Casino 2001), especially in aging societies (Andrews & Phillips 2005). The "where of care" is not restricted to a focus on older people, however, with a life course approach suggesting care is essentially relational and pervasive in human wellbeing. Yet, while we may all care for others, some have more acute time and place-specific need. Andrews and Evans (2008) contend that health care *work* has been relatively neglected in both medical and health geography, notwithstanding limited investigations of decision-making and labor issues within health care systems. Presently, most health geographers writing about health care "display far more concern for health care consumption than production, or otherwise focus outside system interactions on illness and wellness issues in the community" (Andrews & Evans 2008: 4). This is a missed opportunity, given changes in clinical practice motivated by growing concern for wellbeing, the spatial diffusion of health care into homes, workplaces and communities, and the wide range of health care work issues already subject to critical examination in other social sciences.

A further prompt identified by Andrews and Evans (2008) is the ongoing transformations of hospital environments. Here, the question posed has been: if care has to be institutionalized, how can institutions (such as hospitals) be rendered if not home-like then at least less "institutional"? Examining a range of settings, including children's (Kearns & Barnett 1999), psychiatric (Gesler et al. 2003) and private hospitals (Kearns et al. 2003), geographers have examined the efforts – sometimes driven by mixed motives – to craft more caring treatment settings. Perhaps for ethical and access reasons, provider perspectives have been more commonly explored than user responses. Yet exploring the latter remain a promising direction within new landscapes of health care, and promise to reflect the impetus of a contention within the care literature: that the quality of life and quality of care are more important that debating the dichotomy between home and institution.

Hospitals are, however, simply the apex of a "care" hierarchy and geographies of care within a wide spectrum of other locations have been explored. Indeed, in an implicit link to the "emotional turn" in geography, Phillips (2007: 104) remarks:

> The location in which care is performed and negotiated can be stigmatized (for example in the institution), stereotyped (the retirement community) or sentimentalized (as with home). All these images may reflect myth rather than reality but have important consequences in how care relationships are played out.

The efficacy of informal settings and networks facilitating care has been highlighted with, for instance, Milligan et al.'s (2004) work on gardening and Parr's (2008) exploration of artistic endeavor. These are examples of health geographers moving laterally to explore the implications of specific intersections of people, place, and participation and the outcomes in terms of belonging and social support. To be cared for, in other words, may involve a sense of being home but away from the literal home-as-dwelling place. Thus while housing is critical to health, it may not necessarily be the key determinant of a sense of home.

A further concern, raised by Parr (2003) has been perceived to be "intellectual imperialism" whereby western constructions of care are imposed within developing country contexts. The challenge is to discern and understand the importance of local expressions of informal networks and discourses of care. Care has thus taken health geographers into sites and settings both within and beyond health care systems. In so doing, this journey has arguably aided reconnection between health and sociocultural concerns within geography. For, as Phillips (2007: 119) summarizes "care is not about looking after or being dependent; it encompasses the whole of life."

Widening Horizons

This chapter has contended that health geography is a diverse yet distinctive subdiscipline; while there are some clear continuities with the traditions of medical geography, the emergent field's attentiveness to theory, its diverse and flexible methodological approaches (including, importantly, qualitative methods), and its wide-ranging empirical concerns, constitute a substantively "novel" area of geographical inquiry. It is a field that has evolved since the 1980s – reflecting degrees of interdisciplinary influence and broader thinking about health policy, public health, and health care delivery – as well as more particular developments within the field of geography, such as the emergence of an influential (if sometimes inchoate) "critical" school (see Blomley 2006). It was once contended that medical geography consisted of two distinct traditions, disease geography, and health care geography (Mayer 1982); because *both* of these concerns endure in contemporary health geography, the distance between it and medical geography should not be overstated. They are not parallel universes, and nor should they be, for, as Parr (2002) and Philo (2007) argue, health geographers must be attentive to "the medical" if they are to understand the complexities of health, illness, space and place.

What, then, is different? First, in some areas of inquiry, the rate of uptake of new ideas (such as therapeutic landscapes) has certainly been fast (Williams 2007a). The appearance of general texts also speaks to the rapid uptake of ideas in health geography (Gatrell 2001; Gesler & Kearns 2002; Curtis 2004). Similarly we note an increasing, if belated, interest in embodiment and informal care. As Parr (2002) notes, if geographers are fully to understand relations between health and place, we need to broaden interests to include the social construction and experience of bodies. This call has recently been galvanized around the issue of health work, the domain in which bodies and care coincide (Andrews & Evans 2008). Other areas, such the links between neighborhoods and health, and broader environments and health have been only briefly discussed in this survey, but represent important points of geographical cross-over into critical public health (see e.g. Sooman & Macintyre 1995; Pearce et al. 2006; Ross et al. 2004; Wakefield et al. 2001).

Second, the suite of methods and approaches employed by health geographers has expanded immensely. As recently as the 1980s, the use of photographs, diaries and participant observation would have been almost unheard of at a medical geography conference. Now, a diversity and creativity of approaches (including mixed methods within particular studies) is routine and even encouraged within health geography, and qualitative analysis more generally is normalized.

Third, we contend that even in the 1990s, a survey such as this would have had substantially less emphasis on *wellbeing*. Health geography's increasing embrace of this term is assisting closer engagement with broader concerns in human geography. Work in this area does encounter the problem that although health is increasingly conceptualized in a positive fashion, it continues to be measured in largely negative terms. Nevertheless, engagement with the concept of wellbeing does offer some relief from this "negative capture." Put simply, "wellbeing" is more difficult to medicalize than "health" (with the latter term often used, in popular discourse, as a synonym for medical care/intervention). The essential breadth and vitality of "wellbeing" suggests linkages to a range of domains of human experience.

While welcoming interest in wellbeing, and the conceptual and empirical avenues it opens, we caution that a critical and place-sensitive perspective must be maintained. Specifically, we emphasize that local experiences of colonialism, racism, and power – as well as local knowledges – shape both the meaning of wellbeing, and the opportunities for it to be realized (see Kearns et al. 2006). A closely related concern is the moral obligation for geographers to be vigilant that any cultural or other "turn" to wellbeing is not undertaken at the expense of ignoring inequalities in, and structural determinants of, health (Pearce & Dorling 2006). Persistent social gradients in income, employment opportunities, nutrition, addictions, and access to transport and services (among other factors relating to quality of life and sense of inclusion) are key determinants of health status, and shape significant inequalities at the population level (Marmot & Wilkinson 2001). The ongoing challenge for health geographers is to rethink the issue of wellbeing by contextualizing it into both personal and population-based experience of place, while holding firm to traditional concerns for equity and social justice.

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Chapter 3

Medical Geography

Jonathan D. Mayer

Introduction

In retrospect, what came to be called "medical geography" is actually a misnomer. This is because very little of medical geography's content is actually medical, if by "medical," one means "[t]he science or practice of the diagnosis, treatment, and prevention of disease" (OED 2008). Perhaps medical geography and some medical geographers are involved in prevention. However, there is little in the field that addresses diagnosis and little that deals with treatment in a direct sense, although the geography of health services analyses themes such as access to treatment.

Because of this, what came to be labeled "medical geography" might have better been labeled "epidemiologic geography," "the geography of disease," "public health geography," or, to encompass all approaches to the field, "the geography of health and disease"; or, variations of those words. However, at the time that medical geography was first labeled as such, the word "epidemiology" was not yet in widespread use, and "public health" was not a set of academic disciplines that were found in universities. From a historical sense, then, it is easy to understand why medical geography came to be so labeled (for historical analyses of medical geography, readers are referred to works by Nicholas Rupke (2000), a historian of science, and medical geographer Frank Barrett (e.g. 1993).

The purpose of this chapter is to analyze some key features in the development of the geography of disease, or the "epidemiologic" side of medical geography. This is a very selective and incomplete intellectual history, therefore. It is necessarily selective and omits many important works. Like all fields, medical geography has undergone a great deal of evolution and change as the underlying concepts of the field have changed and as techniques and technologies have evolved that have allowed new approaches to the analysis of disease. One example is the rapid growth and knowledge of human genetics and the associated development of techniques that allow for the identification of an organism's genome (for an introduction to genetics see Hartwell et al. 2004). Thus, the researcher is now able to consider the genotype of an organism. This allows us to identify what variant of a particular bacterium or virus is implicated in a chain of contagion. This is potentially of considerable interest to medical geographers because such genetic methods have allowed us to understand, for example, the geographical paths of spread of particularly serious strains of antibiotic resistant bacteria (e.g. Oliveira et al. 1998), as well as to identify east central Africa (Gabon and Cameroon) as the area of origin of HIV-1 (e.g. Keele et al. 2006), a virus which is now reckoned to have been circulating in the human population as early as 1900 (Worobey et al. 2008). These concepts are only beginning to be applied to "institutional medical geography" (those medical geographers who are officially affiliated with geography departments) but have been used to answer many geographical questions by those in epidemiology, virology, bacteriology, and infectious disease research, among other fields.

There are, of course, other examples and the development of geographical information systems (GIS) and spatial analytic techniques that are linked to GIS would be another. Both have been used within the formal discipline of geography, in other disciplines, and outside academia in public health practice to understand the spatial patterns of disease, in both cross-sectional and in dynamic terms. However, before moving on to explore some of this and other examples of innovation in medical geography in more detail the paper will progress as follows. I will first outline the background for a major change in paradigm that occurred throughout the 1990s, and, in so doing, will set the context for outlining the backgrounds of the two major approaches in epidemiologic or medical geography: disease ecology and spatial analytic approaches. Both will be illustrated using examples. The spatial analytic approach will be exemplified with the examples of cancers and of models of disease spread. I will then argue that epidemiologic medical geographers are still very productive and present in major publications, but not necessarily in geographical publications, and will raise some questions about where publication might be done most fruitfully.

Calls for a New Paradigm

Any field that is unchanging in its basic assumptions and has practitioners who are unwilling to consider change is frozen and stagnant. All fields must change, or they will be nothing more than historic artefacts. Moreover, a school of thought must be seen both within its historic context, and within the intellectual milieu in which it finds itself. Prior to the early 1960s, medical geography had been dominated first by disease mapping, and then by disease ecology, both of which suggested explanations of why disease occurs at specific places and times. Beginning in the 1960s, those trained in quantitative analysis and newly developed theoretical understandings began to apply these techniques and concepts to disease. Gerald Pyle, for example, changed our understanding of cholera by linking it convincingly to the urban hierarchy in the United States using diffusion theory (Pyle 1969). Quantitative analysis was readily accepted in medical geography, and the acrimony found elsewhere in geography was absent.

The 1990s demonstrated a greater resistance to change, at least initially. A major direction in the social sciences and in geography was the application of a new set of social theories, different from those of the 1980s and the majority of the 1900s in sociology and anthropology. These theories examined the roles of individuals and groups, the power of place, and questioned the need to generalize. Some geography departments were largely unaffected by this movement, as were economics and demography. Medical geography, however, was to come under pressure to change. The triggering event was a publication by Robin Kearns in 1993 (Kearns 1993) that called for a "reformed medical geography" and a "post-medical geography of health." However, this was just a trigger for what, in my opinion, was an interesting and valuable encounter.

Kearns' call for a reformed medical geography was within the general context of justice in health and health care – something that has now become ingrained and essential in bodies such as the World Health Organization, the United Nations Development Program (UNDP), and all basic and applied academic disciplines that deal with prescriptive analyses of health care. Indeed, the WHO has just released the report of its Commission on the Social Determinants of Health, which in many ways is a reflection of a major direction of epidemiologic, health, and social sciences research that emphasizes the fact that health is a product of the context of the individual, groups, and communities, as well as the conventional host-agent characteristics (CSOH 2008). It was also based upon developments in understanding the role of the social environment in states of health and disease, and in developments in social theory within geography.

As described before, the setting for the call for a reformed medical geography was one in which the perception of many was that the mainstream of geographical thought had shifted to issues of social theory, and an emphasis on the richness of place that is qualitatively different from "place as location" or, as I put it, geography as applied geometry. Following Kearns, "what occurs in a place has profound importance to health," furthermore, "a closer focus on the link between place and health is all the more pressing given the developments in contemporary health philosophy. One such development is the emergence of a conceptual model firmly based on ideas of health rather than disease" (1993: 141). Thus, Kearns argued, it was time to reformulate the label "medical geography," and to incorporate the WHO's concept of positive health into the field. It was also time, he argued, to bring the geography of health and disease into tight relationships with new formulations in social and cultural geography, both of which were and have undergone transformation since the 1980s, as well as with social theory, particularly integrated with a place-oriented epidemiology.

This is neither the time nor the place to re-evaluate this argument in light of developments in the past sixteen years. However, it is worth noting that epidemiology was undergoing a vaguely analogous change, although it did not entail fundamental changes in philosophy and basic understanding of the human experience. It entailed new conceptualizations of causation that went beyond "risk factor epidemiology" and culminated in the institutionalization of social epidemiology. Nancy Krieger suggested that the complexity involved in causation was a "web" of multiple scales, interactions, and relationships, including social and ecological relationships. Merwyn Susser (1998) suggested that causal relationships are similar to a set of "Chinese boxes," one nested within the other. The two metaphors are remarkably analogous, as were their intents. As of 2008, though, few in epidemiology have espoused the need for individual subjective understanding of person and place that has been adopted in geography, although social context and understanding measurable individual risk factors have become crucial underpinnings in social epidemiology. There is no published intellectual history of epidemiology. Acceptance of Kearns' ideas in geography was much easier than the acceptance of social epidemiology within epidemiology. The rest of the narrative is told elsewhere in this volume.

Kearns's article met with a negative response from two groups of medical geographers working on the spatial analysis of health and disease, as well as those working mostly in disease ecology. It cannot be said that they were all old, although the frameworks that they had been using had contributed something, and had served them well. I was one of the main authors of the major refutation of the Kearns' article (Mayer & Meade 1994), and I was 39 years old at the time. In retrospect, my reactions were mostly intellectual, partly defensive, and partly a reaction to what I considered to be an overdose of social theory in some corners of geography. In particular, I reacted to an environment of postmodernism, which claimed that one meta-narrative had no more authority than another. At the time, I had recently completed a three-year fellowship in medical ethics and served as Chief of Service of the Clinical Ethics Consult Service at one of the Seattle hospitals. We dealt constantly at the bedside and at the conference table with difficult decisions of how and when to discontinue life support systems, how to mediate between family members with conflicting wishes for a comatose patient, and so on. Mostly we mediated; we were not a "death committee." However, I saw, in postmodernism, for better or worse, a moral relativism that, if taken to the extreme, would suggest that one outcome would be ethically as good as the next, and in that, I saw nihilism and the potential for immense abuse of authority and power. I was confusing epistemology and ontology with ethics, of course, yet for those reasons postmodernism (except in art) still makes me cringe. And that was what I saw being espoused around me, in some geographical literature, and in some of the social sciences.

Upon rereading Kearns' paper, most of the argument now seems appropriate, and I cannot say whether this reaction is partly a matter of greater acceptance of place, context, and society in epidemiology and the geography of health and disease, or the disappearance of a defensive reaction on my part, or the course of time. Nonetheless, it is important to summarize the differences at the time. Melinda Meade and I argued that Kearns had neglected to consider disease ecology, and that ecological formulations did include understandings of place, sense of place, culture, and context. Furthermore, because behavior is, in part, a creature of culture, then culture "creates" disease, in a sense. Finally, we advocated acceptance of a diversity of approaches, and interpreted the reformulation as rejecting diversity in its reformulation. In a subsequent issue of the *Professional Geographer*, Bimal Paul (1994) criticized Robin Kearns' formulation for ignoring the biological approach, not mentioning ethno-medicine and issues of the Third World, and not clarifying whether he was advocating a "complete transformation of medical geography," or only that the sub-discipline will be incomplete without the new direction he suggests in his article (p. 505). Kearns answered many of these criticisms very reasonably in retrospect, and the title of his response, which contains the words "[t]o reform is not to discard," gives the gist of some of his reply. He wrote, quoting his original paper, that "a reformed medical geography needs to consider *both* the experience of place *and* issues of relationship" (p. 506). And so changing paradigms go. While Melinda Meade, Bimal Kanti Paul, and I were not the only people who disagreed with Kearns' argument at the time, we were the people who refuted his paper in the journal where it was published. Meanwhile, research continued, new techniques such as multilevel modeling were incorporated into the contextual understanding of place, spatial analysis spread to epidemiology and elsewhere, and other trends occurred that are mentioned in this chapter. While there may not be total agreement in the health and medical geographic community concerning philosophy and approach, this is as it should be, as long as there is evolution and change.

Disease Ecology and the Ecological Understanding of Disease

Disease ecology is commonly understood to be one of the deeply rooted intellectual traditions in the epidemiologic approach to medical geography. Disease ecology has been commonly understood to include features of the environment, population, and culture in the explanation of patterns of disease, in answer to the questions of "why is this disease here?" or "why is this disease in places like this?"; where "places" are sets of locations with common attributes. These attributes include culture, environment, and population.

Many accounts of medical geography begin with May, yet there were other medical geographers who were productive while May was still alive, and shortly thereafter. Mansell Prothero, who ended his career in the 1980s at the University of Liverpool, did most of his work in Africa, and did a great deal of applied research for the World Health Organization. He is best known for his volume, *Migrants and Malaria* (1965), which summed up a great deal of his previous research in Africa, and that of others. He did not espouse any particular theoretical framework. His empirical studies added greatly to the knowledge of how migration in Africa was a major factor in changing malaria prevalence. He moved seamlessly between academia and organizations such as the WHO, and between disciplines such as geography and epidemiology or tropical medicine.

Andrew Learmonth was as towering a figure in medical geography as he was modest – and not particularly tall! Unlike Prothero, Learmonth worked mostly in Asia. He, too, moved easily between disciplines, and after living in India, he returned to the University of Liverpool, and then moved to Australia. His biography is summed up by Blunden (1983). A volume of excellent essays was published in honor of him in 1983 (McGlashan & Blunden 1983). The book contains excellent essays on medical geography in a number of regions, and on diverse topics by some of the discipline's leaders in 1983: Melvyn Howe, Helmut Jusatz, Yola Verhasselt, Mansell Prothero, Gerald Pyle, Neil McGlashan, himself a prominent disease ecologist and geographical epidemiologist, among others.

But back to May. He was not a theoretician primarily, concerned with articulating overall theories of how and why disease comes to be distributed how it is. He was, at heart, an empiricist, examining individual diseases and individual places, areas, and countries. At the same time, his introductory portions of *The Ecology of Human Disease* (May 1958) contain passages that served as organizing principles for his thought, and continue to serve as organizing principles for research, both within geography, and, to a significant degree, in portions of fields such as epidemiology, medical entomology, ecology, and many others. For example, "[e]cology is the science of habitat. Hence … (disease ecology) deals with the relationship between disease and the geographical environment in which it occurs" (p. xxiii). Furthermore, "[d]isease cannot arise without the convergence at a certain point in time and space … of two orders of factors: factors that take the form of an environmental *stimulus* … and second, factors that conditions the *response* of the tissues. These vary with the geographical or cultural location. The response is conditioned by the genetic make-up of the recipient" (May 1958: 3). May emphasized the role of ecological niches, drawing from natural ecology, in which organisms or human societies grow.

The description of this work by May, which is cited very frequently but is not read as frequently, because it is very difficult to find, needs to go further. This is not to reify May, but rather to acknowledge his contribution to further work. May refers to stimuli. He specifies that stimuli include "inorganic," "organic," and "social and cultural" elements. This is an interesting scheme, and was neither standard at the time, nor has it become standard now. Nonetheless, it was reasonably inclusive. By "inorganic," May was referring to physical factors including climate and weather, soil composition, and water composition. All of these are now understood to have direct or indirect etiologic effects on diseases, and many of these, such as the roles of iodine deficiency in beriberi, or arsenic toxicity in several diseases, are understood at the molecular level (e.g. Alavanja et al. 2004). Others are beginning to be understood at a systemic level, such as the role that climate plays in local and global infectious disease patterns, and that climate change may play in the redistribution of vectorborne diseases (e.g. National Research Council 2001).

"Organic stimuli" were less well defined, but pertained to the interplay of organisms. These range from micro-organisms to groups of organisms in an ecosystem. In May's thought, there appears to have been close correspondence between our familiar conception of pathogens, and his conception of organic stimuli, except that his concept of organic stimuli appears to have extended to multiple scales, and to communities of organisms at variant scales. Thus, with a vectorborne disease such as malaria, humans, anophelines (the types of mosquito that spread malaria), and plasmodia all interact. It is interesting that one of the emerging frontiers of research in infectious disease is the microbiome, to the extent that the National Institutes of Health has developed the Human Microbiome Project, such that "we will be in a position to expand our understanding of the human genetic landscape to include the microbes that reside in and on the human body and contribute to human health and disease." Further, the mission of the Human Microbiome Project is stated as being to "generate resources to enable a comprehensive characterization of the human micriobiota an analysis of its role in human health and disease … determining whether individuals share a common human microbiome; understanding whether changes in the microbiome can be correlated with change in human health; developing the new technological and bioinformatic tooks needed to support these goals; and addressing the ethical, legal, and social implications raised by human microbiome research" (Lampe 2008: 2523). Effectively, the microbiome project is aimed at understanding how populations of micro-organisms, communities of micro-organisms, and the ecological niches that they occupy within the body, and mainly within the gastrointestinal system fit into a multiscalar complex that is strikingly similar to that proposed by May at a very different scale. It helps to illustrate what May might have had in mind. The literature on the microbiome is extensive, yet the research is just beginning. It is disease ecology, in a sense, at the micro-scale. One may ask, though, what about social and cultural influences?

These were the third set of stimuli articulated by May. How, May asked, do cultural and social influences interact with pathogens and physical influences to cause human disease? By culture, May adopted the frequently articulated conception that "culture is the sum total of the concepts and techniques that human groups use and abide by in the environment in which they are placed" (May 1958: 29). He adds, after that, "in order to survive." There may be some disagreement now over this, but as a concept in ecological anthropology and cultural ecology, one might add, "as adaptive strategies" or "as coping strategies."

May characterised contagious diseases passed via the respiratory route, for example, as "two-factor." Vectorborne diseases with no animal reservoirs he called "three-factor diseases" and vectorborne diseases with animal reservoirs he named "four factor diseases." This typology, as far as I can tell, originated with May, and did not spread very far. Several geographers adopted the terminology, but it has not remained a standard set of descriptors, and it certainly did not spread to epidemiology and elsewhere. Nonetheless, it is an interesting typology because it indicates the increasing complexity of transmissible systems and with the ecological complexity comes increasing sensitivity to climatic and environmental conditions. Thus, concern over the sensitivity of pathogens and resulting diseases to climatic change has been mostly devoted to vectorborne diseases, although there have been some notable exceptions, such as cholera. In the case of cholera, whose ecology was discussed by May (1958), increased vibrio counts have been causally linked with algal blooms, which are now clearly linked to the ENSO phenomenon (El Nino Southern Oscillation) in affected regions (Pascual et al. 2000; Lipp et al. 2002). Colwell (2000) has shown that *V. cholerae* enters a viable, non-culturable state in phytoplankton, to emerge during these blooms. The appearance of a new strain of cholera in South America in the 1990s has been shown to be due to this mechanism. It is, perhaps, worth noting that Colwell, who is an aquatic microbiologist by training, and former director of the National Science Foundation, gave the Gilbert F. White Lecture in the Geographical Sciences at the National Research Council in the United States of America in 2009, and adopts the disease ecologic framework in her research.

Many have used May's framework in their subsequent research, changing it and modifying it as they have proceeded. One of the most prominent was John Hunter, who spent most of his career at Michigan State University, and served as an advisor to the World Health Organization and other similar organizations. He made few overarching statements, and contributed greatly to empirical research, mostly on contagious diseases in Africa. He did, however, argue that medical geography is relevant to every specialty in geography, by demonstrating that urban geography and urban health have great overlap; development geography and the role of disease in development have obvious development; transportation geography and accessibility to health care have overlaps, and so on. Much of this argument was put forth at professional meetings and informal gatherings, but this was the central point of his chapter at the First North Carolina Symposium on Medical Geography (1980).

While a complete review of Hunter's work is beyond the scope of this chapter, his research just prior to his retirement was typical of his much of his research. Hunter's many empirical contributions added to our knowledge of issues such as how water projects contribute to schistosomiasis prevalence (Hunter 2003), and dracunculiasis (guinea worm) (Hunter 1997).

Melinda Meade was one of Hunter's students, and his knowledge of infectious diseases, population, and disease ecology was evident in her research and writing. She also studied with R. Warwick Armstrong, a medical geographer-epidemiologist at the University of Hawaii who has moved with ease between disciplinary boundaries and academic departments. Another individual with an eye to empirical contributions rather than philosophically overarching statements, his many contributions to the understanding of cancers in Asia (e.g. Armstrong et al. 1979) and of soil chemistry and disease, among other things, have continued. His regional knowledge of Asia was reflected in much of Meade's research.

The central concepts in most Meade's research integrate population, behavior, culture, and environment. Her research has been typically preceded by an articulation of the concepts in which her work is framed. For example, in her analysis of movement and health in Malaysia, in which she retraced daily movement patterns of her research subjects to ascertain exposure to micro-environments, she articulated a new framework for medical geography that both synthesized the older work of May and others, and added her own conceptualization. She argued that disease is not just a biological entity, but, following the work of Audy (e.g. 1958), states of health are defined by "adaptability," or the ability to rebound from stress: "when health is considered as adaptability, the concept of disease is transformed from a biological entity, as it was used by May and others. It becomes a measure of the maladaptive measure among the familiar triad of population, environment, and culture" (Meade 1977: 382). Characteristics of the host, such as genetics, nutrition, immunologic status, and demographic composition were all included under the category of population. Environment was broadly defined and included psychosocial stresses, access to care, as well as the physical environment which is what we more characteristically think of as environment. Finally, culture is conventionally defined. Although she did not use the idea of the totality of norms and adaptive behaviors, it is implicit in her examples. In terms of individual and group exposure to pathogens, environmental toxins, and other agents, behavior is crucial, and this is explicit in this paper. Finally, Meade added the dimension of time, foreseeing time-geography in many ways. Just prior to her empirical analysis, Meade argues that:

> This concern for the cultural transformation of the environment and the resulting implications for the human population as developed in the past and developing in the future is an integral part of geography. The focus is on the core population–culture–environment interactions. The importance of holism in medical geography and the challenge of medical geography in its relevancy to all aspects of geography has been noted by John Hunter, but only as interdisciplinary human ecology progresses is an integrative theoretical framework developing that embraces all of the above tributaries to medical geography. (Meade 1977: 384)

In the rest of her analysis, Meade reveals considerable methodological sophistication in her painstaking revelation of fieldwork linking micro-environmental exposure and movement at a variety of scales to diseases such as malaria, and to symptoms and signs such as diarrhea and dermatologic issues, by self-report. Finally, tying the research and conceptual issues together, Meade writes that: "a focus on population movements … has the advantage of relating to cultural interaction with the environment through the people involved, yet leaving the complexity of their conceptual and social world unreduced" (1977: 393). Importantly, then, Meade was articulating a major modification to May's medical geography and disease ecology by integrating the concepts in cultural ecology, "health as adaptation," micro-environments and culture, and a human dimension that was not as apparent in May's work, and there, was grounded mostly in observation rather than in integrated research and both geographical and multidisciplinary theory.

Another dimension of Meade's work is found in her article on land development in Malaysia (Meade 1976). Here, she traces the ways in which Malaysian land development schemes for rubber plantations increased the risk and prevalence of malaria among rubber workers by altering the environment and making it more conducive to anopheline replication because of greater exposure of the land to sunlight. She rearticulates the importance of culture, and further integrates the importance of time in the sense that changes in land use, themselves the product of human decisions, occur over time, and tests the assumption that development leads to better health. This was before there was a great deal of research in other fields in this area. The answer was "no" because of motor vehicle accidents, malaria, and other health issues.

This research was at the beginning of a productive career, but it represented a considerable extension and modification of May's disease ecology. It integrated it into geography more fully, and drew upon several sub-fields in geography, as well as anthropology and other fields. Because of this, disease ecology gained sophistication while retaining many of its roots. While not rejecting what had come before, Meade synthesized other areas of knowledge into a new framework that continues to be articulated in her jointly authored editions of *Medical Geography* (Meade & Earickson 2000).

Many followed this intellectual tradition, citing May in their work, while not adhering to the limitations of his early formulations. Meade's publications were important in their analyses. There were no major conceptual modifications to the disease ecologic model, however, until Mayer (1996) argued that merging political economy and disease ecology into a model of the political ecology of disease could help to unfurl the effects of politics and power that were important in the shaping and alteration of ecological relationships, such as in the increasing prevalence of diseases in Meade's analysis of rubber plantations in Malaysia, or the increasing prevalence of malaria and schistosomiasis following completion of the Akosombo Dam (Volta River Dam) in Ghana in the mid-1960s. This facilitated the explicit consideration of overt and implicit political power to be incorporated into an ecological framework. After all, he (I) reasoned, environmental and land use patterns are frequently the result of human decisions, and those decisions may be explicitly political – made by a national government, as in the case of the Akosombo Dam – or as the result of political pressure of a more subtle nature. Thus, the human–environment relationship is influenced by these decisions, and therefore disease patterns are, in part, a product of politics, as mediated by environment, behavior, economy, host and vector biology (in the case of vectorborne diseases), or gene–environment interactions, among others.

Political ecology was, by the 1990s, a thriving interdisciplinary field, and both geographers and anthropologists were leaders in this area (Bryant & Bailey 1997; Bryant 1998). The development of thought in this area is fascinating but is beyond the scope of this chapter. Because of this, and citing the work of Mayer, a number of articles appeared subsequent to his 1996 article that adopted the political ecologic framework to analyze specific empirical examples (e.g. Kalipeni & Oppong 1998; Hanchette 2008), including emerging infectious diseases (Mayer 2000), which is an area of vast public health and societal importance, as summarized recently by the Institute of Medicine of the National Research Council in the United States (Smolinski et al. 2003). Emerging infections, as found by this same institution a decade earlier (Lederberg et al. 1992), have appeared largely as a result of human and social factors such as changing demographics and land use, technological change, and travel patterns and commerce. These reports, more than any other, have galvanized action and research in the area of emerging infections (see Emch and Root this volume). Implicitly, in places, the analysis is reminiscent of a political ecologic approach, although neither adopts a particular theoretical framework, nor should they have. Thus, the disease ecologic tradition continues, although, as in all fields of research, with changes and innovations.

Other researchers integrated some of the concepts of political economy in their work, and this was mostly in Asia and Africa. David Phillips wrote about the global inequalities in health decades before "global health" would become a separate field. He and Belgian geographer Yola Verhasselt worked together on development and health issues and that necessarily entailed understanding inequalities in health status at the global scale (Phillips 1990; Phillips & Verhasselt 1994). Doing so required an understanding, too, of individual diseases, and their ecologies.

Spatial Analysis of Disease

Two journals arrived in my office in the Department of Epidemiology today. One, the *American Journal of Tropical Medicine and Hygiene*, is the journal with the largest global circulation that deals with vectorborne diseases, and the focus is no longer on tropical diseases. *Tropical Medicine and International Health* is the British equivalent (the audiences overlap). The other was *Emerging Infectious Diseases*, which is one of the major infectious disease journals, and it concentrates on those diseases that have recently emerged, or are increasing in prevalence, or are newly recognized. The former journal has one article titled "Geophagy (soil-eating) in relation to anaemia and helminth infection among HIV-infected pregnant women in Tanzania" (Kawai et al. 2009); another is "Spatial clustering by disease severity among Rocky Mountain spotted fever cases in the United States, 2001–2005" (Adjemian et al. 2009), and a third article is "Melioidosis risk in a tropical industrial environment" (Inglis et al. 2009). All three of these articles could just as well have been in geographical journals, because they use spatial methodologies and concepts. The first is a study in disease ecology, but identifying risk factors associated with geophagy, which poses particular hazards in the face of immunocompromise. The second article is a study in geographical clustering using a set of statistical techniques intended to identify potentially problematic cancer clusters (Kulldorff and Nagarwalla 1995). The third article identifies environmental and other risks associated with a mine site of melioidosis, an emerging infection now recognized to be a major public health threat in Asia. *Emerging Infectious Diseases* also has several articles that use spatial methods and concepts. All would be interesting to those who use spatial analysis (and, in fact, most articles in both journals are relevant to my work, but as an infectious disease epidemiologist).

Why do I mention this? Because geographical methods and concepts are now found commonly in journals such as those that I have mentioned, and in epidemiology journals such as the *American Journal of Epidemiology*, *Epidemiology*, and the *International Journal of Epidemiology*. They are also found frequently in disease-specific or system-specific journals such as *Cancer*, or the *Archives of Neurology*, or *Spine*. GIScience and spatial analytic techniques have appeared in the *New England Journal of Medicine* and *Lancet*. These journals are aimed at audiences in excess of 100,000 and the Impact Factor (for what it is worth) of articles in the *New England Journal of Medicine* is over 51, which is an order of magnitude greater than any geographical journal. This journal has the largest readership of any medical or public health journal in the world. Thus, concepts of medical geography have spread to a very large readership, and are used both in mainstream epidemiology and in clinically applied contexts.

Medical geography is no longer confined to geographical journals or geographers, if it ever was. The applications are enormously useful, and the concepts important. Spatial analysis is used in identifying the spread of contagious disease, both by agencies responsible for surveillance, by those who are developing predictive models, and by those who are describing recent epidemic patterns. It is used in identifying cancer clusters, however problematic they may be. And, because of the relative paucity of geographers compared to others who might use these analytic concepts and methods, a relatively small proportion of the articles are authored by "geographers." In January, 2009, a PubMED search of the word "spatial" yielded 113,931 hits. Some are suspect, because this term is used in anatomy, histology, and radiology, among others. Nonetheless, many of the articles are in environmental health, infectious disease, epidemiology, and related fields. A search for the stem "geogr*" yielded 76,774 hits, "spatial analysis" yielded 938 hits, and "GIS" or "geographical information systems" yielded 2,448 hits. If "medical geography" is dead, then its ghost is very lively.

Since 1993, when Robin Kearns wrote his article calling for reform, "medical" geography has proceeded in the refinement of methods, the development of others, and the incorporation, to some extent, of concepts that were derived from Kearns' analysis. Where the two approaches come together, most plainly, is in the application of statistical techniques such as multilevel models to understand the contributions of individual and contextual factors in influencing health and disease. In addition, the analysis of income disparities, as one surrogate for overall disparities in social power, has been profound in several fields. Both of these developments have been underpinnings of social epidemiology, and my analysis as an epidemiologist, is that had it not been for this solid statistical base, social epidemiology would not have the base and support that it now enjoys, with one of the main leaders in the field, Dr. Nancy Krieger, now serving as Past President of the American College of Epidemiology. Some of the health/medical geographers with formal appointments in geography departments have been extensively involved with multilevel analysis (e.g. Moon et al. 2007).

Power and power dynamics are mediators of health and are most frequently analyzed through understanding the roles of income inequality. Income inequality is a surrogate – however imperfect – for inequities in social power generally, and is part of the "social determinants of health," which I would rather call the "social influences on health" because "determinants" is … too deterministic (Marmot & Wilkinson 1999; Wilkinson 2005). Sarah Curtis is one geographer who has worked on this issue for years, and published *Health and Inequality: Geographical Perspectives* (2004) that summarized much of her work as of 2002–2003. The Public Health Disparities Geocoding Project is a large NIH funded project that does more than geocoding. It examines health disparities spatially, at a number of scales, and geographer S. V. Subramanian is one of the main investigators of the project (e.g. Subramanian et al. 2005). This project has been one of the most influential in social epidemiology. Although recognizing this, the remainder of this section will focus on the application of spatial analysis in two areas: cancer and HIV/AIDS and epidemic spread.

Applying spatial analysis to cancer research

The *Global Burden of Disease: 2004 Update* (WHO 2008) analyzes both the most prevalent causes of death globally, and the most disabling and debilitating conditions. In terms of mortality, cardiovascular diseases, infectious and parasitic diseases, cancers, respiratory infections, respiratory diseases (non-infectious, including chronic obstructive pulmonary disease: COPD), unintentional injuries, perinatal conditions, digestive diseases, intentional injuries, and neuro-psychiatric disorders rank from 1 through 10, respectively. There are tremendous differences in the rank of causes of death in resource-rich and resource-poor countries, with infectious causes ranking higher in developing countries. Developing countries, though, face a dual burden of both chronic and infectious diseases, particularly in the rapidly proliferating urban areas (e.g. Harpham & Molyneux 2001). Each of these has been addressed using geographical and spatial analysis at a variety of scales, both by those with formal academic affiliations with geography departments, and those with other affiliations. Space precludes even a cursory analysis of the research on each of these broad categories. Given this, I will focus here on the example of cancer.

Cancer research using spatial methods and concepts has been prominent for several reasons. Many cancers have aetiologies that are not clearly known. Individual risk factors may be identified from cancer registries and population-based studies, and genetic association and linkage studies are good population-based tools that facilitate the identification of small polymorphisms in the genome that are associated with increased risk, or in the identification or testing of candidate genes that may be responsible for a particular cancer. Most cancers are a product of gene–environment interaction, and the genetic bases are "complex" – not following simple Mendelian laws of dominance and recessiveness. On top of that, penetrance is never complete. However, it is clear that many to most cancers are, to some degree, heritable. One example is prostate cancer, where there have been dozens of spatial studies. There is convincing evidence that has been found since the late 1990s that vitamin D metabolism plays a strong role in immune status, calcium absorption, and endocrine function, among others. A recent study has examined spatial associations between prostate cancer and vitamin D (e.g. Grant 2004). Spatial associations that are *biologically plausible* may then proceed to case-control studies (Lipworth 2009), and, following the hierarchy of strength in epidemiologic studies, to prospective cohort studies, or at least to retrospective cohort studies. It was this process that established that fluoride exposure was protective against dental caries (cavities) in the 1950s.

Why, then, are spatial studies important? By identifying spatial patterns, one can sometimes also identify a series of associated environmental or population factors that co-vary at the same scale. This is useful both for exploring possible associations in order to test individual-level risks, and, ultimately, cause, as well as identifying areas of risk that may be targeted for intervention. Parkin and Bray (2006), both well-known cancer researchers who have studied descriptive geographical variations in a variety of cancers, summarize the issues involved in geographic studies of cancers:

> Artifact aside, the principal question posed by observed geographic differences in risk is how much is due to variation in exposure ... and how much is the result of inherent differences in susceptibility to such exposure resident in a particular place (and hence genetically determined). Of course, the major exposure to carcinogens is not through variations in the external environment (e.g. air, water, radiation), so much as in differences in lifestyle (e.g. reproduction, diet, tobacco use). (2006: 105).

The relative contributions of genetics, individual lifestyle factors, and areal "environmental" factors is not well understood for the few cancers for which all have been studied, and are totally unknown for most cancers.

There are hundreds to thousands of spatial studies of cancer in the United States of America that have been funded by the National Institutes of Health (NIH), and the National Cancer Atlas (www3.cancer.gov/atlasplus/) is an important data source for cancer deaths between 1950 and 1994, particularly for cancers with high prevalence rates. Data are downloadable at several levels of aggregation. Established researchers have access to cancer registry data, but must geocode the data to a level where individuals cannot be identified (see Rushton et al. 2006). For example, like most epidemiology departments, the Epidemiology Department at the University of Washington has a primary data requirement for its PhD dissertation. One of its major strengths is in cancer epidemiology, and students regularly use registry data and patient data at the Fred Hutchinson Cancer Research Center in Seattle.

Spatial analysis, including the use of GIS and modeling, has been important in cancer epidemiology and environmental health, as well as in medical geography, of course, for two reasons. First is the one articulated previously. Second is the use of modeling, spatial interpolation and extrapolation, and GIS to estimate exposure to potential and known carcinogens. The same has been true in studies of asthma and other respiratory diseases (Jerrett et al. 2008). Publications are far more extensive outside of disciplinary geography than within, which is largely due to the fact that there are hundreds or even thousands of researchers outside of academic geography who have done this sort of research. It is important that this be done well (for a review, see Elliott & Wartenberg 2004).

Cancer clusters are always intriguing, yet can also be exasperating for public health practitioners and epidemiologists (Aldrich & Sinks 2002). Far more sophisticated than the older method of looking at pins on a map – which was still used as recently as the 1990s – spatial methodologies offer a degree of sophistication to reveal patterns that are not apparent visually. Cancer clusters may be meaningful because they may reveal that people are being exposed to an environmental carcinogen at elevated rates. Yet, they can be vexing because: (1) clusters will occur randomly; (2) clusters are usually reported by the public, yet a perceived cluster may not be a statistically verifiable cluster; and, (3) because of the long lag between exposure to a carcinogen (10 years-no upper limit), it is essential to identify migration rates, and trace individuals who have migrated from an area of exposure. Only then may a study meaningfully proceed to a case-control analysis. An intriguing example of a cluster was a small group of childhood leukemia cases in Woburn, MA – the subject of the film, *A Civil Action* and a book of the same name (Harr 1995). In the Woburn case, citizens reported what they thought to be a meaningful cluster. This turned out to be a significant cluster of cases. The cluster was meaningful to the population (Brown 1987; Brown & Mikkelsen 1997). Phil Brown labeled this "popular epidemiology." Similar frames have been used by John Eyles and others at McMaster University (Driedger & Eyles 2003). Litigation ultimately gave the citizens some vindication, and the difference between epidemiology/geographic proof and legal proof present intriguing questions of what constitutes proof.

Applying spatial analysis to HIV/AIDS and epidemic spread

There is a long history of spatial analytic studies of infectious disease. Disease ecology was originally confined to this area. Spatial analysis has been used for everything from descriptive studies to predictive studies, and from surveillance to unveiling the underlying structures of epidemics. In addition, very productive and important work has been done on HIV/AIDS "beyond epidemiology" – incorporating qualitative analysis and the social implications and causes of HIV/AIDS with quantitative studies to gain an overall understanding of HIV in Africa (Kalipeni et al. 2004). Those of us who continue to work in Africa, both as researchers and as members of NGOs, cannot help but be reminded each hour that subjective understanding and experience is deeply important. In this section, two examples of geographical and spatial studies are used. The first are analyses of HIV/AIDS, and the second are studies of disease spread.

HIV/AIDS

HIV/AIDS has now eclipsed tuberculosis as the top cause of infectious disease mortality in the world, although this works in concert with tuberculosis, since latent TB becomes active due to impaired immunity. Emphasis on HIV/AIDS in the broadly defined geographic community parallels that of other approaches. HIV/

AIDS is possibly the major humanitarian challenge of the past few decades and will continue into the future. It also presents opportunities for the scientific, social scientific, and humanistic study of an evolving pandemic. Finally, and in a cynical sense, a whole industry of research, funding, careers, and institutions have been built around HIV/AIDS.

The development of this epidemic met with a rapid response from the geographic community, again broadly taken, although it is both puzzling and disturbing that this humanitarian societal issue has been addressed by so few geographers in general. The *Geography of AIDS* by Shannon and Pyle (1991) was a book that represented the culmination of a series of articles by combinations of these individuals in the previous few years. The book traced some of the history of the epidemic, and, in retrospect, was naïve in some of its causal explanations (Mayer 2005). Shortly thereafter, Peter Gould published *The Slow Plague* (Gould 1993). Both books provided simple sketches of the virology of HIV, as it was then understood, and analyzed the spatial structure of the pandemic, with emphases on the descriptive geographic epidemiology, and patterns of spread. Gould was influenced by the work of Rodrick and Debra Wallace, who published a series of papers on the concentration of HIV/AIDS in the Bronx, and argued that high rates there were, in part, a result of deliberate neglect on the part of municipal authorities (e.g. Wallace 1993). This argument was prescient: infectious disease physician/medical anthropologist Paul Farmer would make a similar argument in a series of books and articles, arguing that "structural violence" is a major co-factor – a cause, really – of HIV and other infectious diseases (e.g. Farmer 2001). This argument was to prove enormously influential, and the NGO that Farmer founded along with Jim Kim, former director of the HIV division of WHO, Partners in Health, would grow rapidly because of efforts to overcome structural violence. Farmer and his work are the subjects of a popular book by Tracy Kidder (2003) that is also accurate, and provides an introduction to some aspects of global health.

Spatial analysis was used for forecasting the progress of the HIV epidemic in the 1990s. The work of Marku Löytönen was structurally sophisticated, and his analysis progressed in a series of papers, frequently using the Finnish backdrop (Löytönen & Maasita 1997). The challenges to prediction that are presented by rapidly spreading respiratory diseases such as influenza are not as problematic with HIV/AIDS, since spread is far less rapid. This is one reason that most research on HIV/AIDS has been largely empirical. Yet understanding the structure of the epidemic at a variety of scales continues. South Africa accounts for the greatest number of HIV and AIDS cases in sub-Saharan Africa, although the disease prevalence rate and the sero-prevalence rate for the country as a whole is less than that of some other countries in the Southern Cone. The relative abundance of research facilities in South Africa, and the ties between South Africa and countries where predictive epidemiology and geographic analysis have traditionally been very strong, have made this country a focal point for study. One of the best household surveys of HIV/AIDS in Africa was conducted in 2003, and provides data for some excellent studies. For example, a well known multidisciplinary team published the results of their disaggregated analysis using Bayesian methods in 2007 (Kleinschmidt et al. 2007).

Using Africa as a setting, both disciplinary geographers and others have combined epidemiologic approaches with social scientific approaches in a manner that would not be construed as "social epidemiology." Some of the same names keep on recurring: Joseph Oppong and Ezekiel Kalipeni are among the most prominent, and they have demonstrated convincingly that this combined approach is highly productive (e.g. Kalipeni et al. 2004; Kalipeni & Ghosh 2007; Moore & Oppong 2007). However, spatial and geographical research on HIV/AIDS is far too extensive to review further. Modeling, prediction, and empirical analysis are all plentiful, albeit dwarfed by the immensity of the published research on the virology, epidemiology, and immunology of HIV/AIDS. The policy literature is also immense, in the form of books, journal articles, and technical reports/white papers. Many geographical issues of policy are being confronted, ranging from those of supply chain logistics – getting medications and testing facilities to people at points of demand – to anticipating areas and regions of future need and demand.

Epidemic spread

As the US panel on climate change and infectious disease noted in its final report (National Research Council 2001), predictive epidemiology is not yet at a point where infectious disease prevalence may be predicted at relatively local scales. It is difficult, if not impossible, to predict where the first cases of influenza will occur in the United States or any other country during an epidemic year. The temporal and spatial scales are coarse, given existing predictive models. However, as understanding improves, predictive models will, hopefully, also improve. Our understanding of the basic transmission dynamics of contagious diseases is improving. At this point, though, this understanding has not yet extended into successful prediction. For example, it was impossible to predict that the spread of SARS to North America would be most intense in Toronto.

The behavior of pathogens at all levels of aggregation, ranging from the household to social networks to small areas and then to large areas is the crucial focus of efforts to develop predictive models. The first detailed study of viral transmission within and among families was conducted by Fox and his team in Seattle in the 1950s through the 1970s (Fox & Hall 1980). Those dynamics are better understood following this pioneering work. Although social networks have been established as being crucial to social support, and therefore a major focus for social epidemiology, it is only recently that the spread of viruses through social networks has been fully appreciated. This was spurred largely by HIV/AIDS and other STIs, and resulted in the publication of a major volume on this topic (Morris 2004). Analysis of social and friendship networks demonstrated, for example, that serial monogamy, and not concurrency, has been the main factor behind HIV transmission, and this changed the state of knowledge. Even now, there is a widespread misimpression among the public, among social scientists, and among some public health and medical professionals that concurrency is the main driver.

On a regional basis, the analysis of disease spread accelerated following the publication of Hägerstrand's work on innovation diffusion (e.g. 1952). Ever since, geographers have applied the term "diffusion" to the spread of disease. While this sets the context for disease spread within existing research on innovations, the term is unfortunate because it is not recognized in any of the health sciences, and confuses readers outside of disciplinary geography. Thus, the term "disease spread" is not only less jargon laden, but it is the term that is used almost universally.

Peter Haggett and his colleagues have spent much of their careers elucidating the dynamics of epidemic spread. Interestingly, Haggett and colleagues are seldom mentioned as "medical geographers," although they have contributed profoundly to understanding disease dynamics. Indeed, Haggett is probably the geographer who is best known outside of disciplinary geography who has worked on spatial aspects of disease. Because of his pioneering work, Haggett was elected in late 2008 as a foreign member to the US National Academy of Sciences – a very select group. A marvelous and short book by Haggett, based upon his Clarendon Lectures in Geography and the Environmental Sciences at Oxford, is virtually unknown, but it is a masterful synthesis (Haggett 2000). A more recent book, by most of this group, minus Ord, was published in 2000, and is the culmination of decades of work using the microcosms of islands as variably isolated systems for elucidating the transmission and regional dynamics of epidemics (Cliff et al. 2000).

Geographical work is being integrated into overall predictive models of the temporal dynamics of pathogen spread, and the most extensive work is on viral transmission. Large groups are working on similar models, both collaboratively and individually, at Imperial College, London; Oxford University; and a consortium in the United States. This consortium is part of the NIH's "MIDAS" project – the Models of Infectious Disease Agent Study (see www.nigms.nih.gov/initiatives/MIDAS/). The group at the University of Washington, led by Dr Ira Longini, is the largest of the MIDAS groups, and models both between-host dynamics and within-host viral dynamics. Spatial models play a large role in this group. The ultimate aim may be basic understanding, but the more immediate aim is effective prediction for intervention and surveillance. Geographic studies of vaccine efficacy are included. This is an area that has been pioneered empirically by geographer Michael Emch, who has demonstrated both the degree of spatial sampling bias that is inherent in most vaccine trials, using data on a novel cholera vaccine, and has also begun developing methods to correct such biases (Emch et al. 2009). Thus, Emch and collaborators have discovered that there is considerable spatial heterogeneity in the efficacy of a vaccine within a sub-national unit – a finding that is both novel and highly significant in the design of vaccine trials, and has major policy implications in vaccine distribution (Emch et al. 2006). Implicitly, these studies and methods also seem relevant in increasing equity in a new context: vaccine equity as well as vaccine efficacy.

Conclusion: Where Are the "Epidemiologic Geographers"?

That medical geography is so named is an accident of history, yet it is not alone. Medical anthropology and medical sociology are both well-established fields. I have come to think that the epidemiologic approach to geography should be called "epidemiologic geography" more appropriately. Furthermore, it is important to recognize that researchers from disciplines other than epidemiologic geography publish thousands of excellent articles and studies per year that are geographic in every sense. Any analysis that excludes these because their authors are not geographers is far too narrow.

Yet, epidemiologic geographers have, by and large, been silent in contemporary published debates in health geography. While this has been sometimes interpreted as supporting the contention that epidemiologic geography either has been eclipsed in contemporary health geography, or that "medical geography is dead" (with apologies to Nietzsche), the explanation lies elsewhere. There are two reasons for the silence of epidemiologic geographers, spatial epidemiologists, and environmental health researchers and others who use spatial theories and techniques.

The first reason, which is unarticulated in any published literature, to my knowledge, is this group feels that they would rather "get on with the research" and not spend time in what is perceived to be arcane argumentation, removed from the empirical realities of whether exposure to traffic triggers myocardial infarction, or how to predict new outbreaks of emerging infectious diseases, or the development of early warning systems for avian influenza, or bioterrorist attacks, through real-time surveillance systems. For this group, it is partly a value judgment of where to devote effort, but it is also a truly human psychological coping mechanism acknowledging the reality of the fact that the time in a day is limited, and that devoting time to topics in which one is interested, and which one thinks are most important is the top priority. When questioning researchers at professional meetings in geography, epidemiology, and infectious diseases, these conclusions – judgments of importance, time, and interest, are virtually universal.

This is, of course, not a scientific survey, or even research, but an impression. This is very much consonant with the aim of others in public health, medicine, and much of geography as well. It is not that abstract argument is absent in these groups.

Methodological debates, contrasting views of causality that have delved into philosophy, the ethical implications of epidemiologic findings, and the policy implications of epidemiologic findings are all evident in current publications and at professional meetings. However, the background to examine philosophical issues is missing from training programs in epidemiology and research fellowships in clinical disciplines (I say this as one whose academic appointments are in all of these disciplines).

The second reason for the relative absence of these groups from contemporary debates in health geography follows, in part, from the first reason. It is a value judgment of where to publish research, and what audience to target. In many cases, it is an issue of publishing in geography journals where perhaps several hundred people will read the article with intense interest, or in public health or medical journals, where this figure reaches 10,000 or greater, and can have a direct influence on both clinical care, and public health practice and policy. And, of course, many individuals who are actually in geography departments have chosen to publish in geography journals as well as health science journals.

To conclude, then, geographic analysis of disease has undergone gradual and then rapid evolution over the decades. It has addressed some important questions such as patterns of spread of HIV/AIDS, geographic patterns of cancer, and modeling disease spread. Some major global issues have not been prominent in disciplinary medical geography – including the health implications of global climate change, the health consequences of disasters, the consequences for development of emerging infectious diseases, and urban slum health – and other major global issues need to be further incorporating. Yet, it is important to recognize that medical geographers *do* contribute to understanding in these and other areas, but they do so in scientific journals that are sometimes outside of the sub-discipline's intellectual gaze.

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Chapter 4

Doubting Dualisms

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Introduction

According to the standard interpretation, there were two dominant subgroups of medical geography in the mid-to-late twentieth century (Mayer 1982; Paul 1985). The first subgroup – disease geographers (or ecologists) – typically traced their lineage back to the work of Jacques May in Southeast Asia during World War II and his subsequent employment by the American Geographical Society (AGS) to produce the first world atlas of disease (May 1950; Mayer & Meade 1994). The second subgroup – the "access to health care" researchers (or health care geographers) – then became concerned with medical services planning during the "spatial science" era of the late 1960s and early 1970s (Pyle 1983).

In the 1980s and 1990s disease ecologists and health service planners in medical geography were joined by a third tradition, health geography (or the geographies of health), drawing on themes in critical cultural and social geography, and exploring health in broad terms, particularly the experiences of service users, sick people, and groups bearing biomedical labels (Eyles 1985; Gesler 1991; Kearns 1993; Del Casino 2009). Within this and other common renditions of the sub-discipline's history, medical geographers are expected to identify with one term of a dichotomous pair of traditions: space as container or place as process; spatial analysis of diffusion or place integration; human ecology or social engineering; biomedicine or alternative medicine; geographical epidemiology or health systems planning; humanism or science; physical or mental illness; health or medicine. These dueling traditions each have a set of practitioners, methods, and audiences; and funders and consumers of medical geographic knowledge typically analyzed problems, such as the spread of communicable diseases or the optimal placement of new facilities, lending themselves to one mode of analysis or the other.

Like many other commentators, the authors of this chapter were put off by the exclusiveness of the divisions that have historically been constituted in the programmatic literature of medical geography. The recent effort to reconstitute medical geography as a new, holistic "geography of health" therefore enjoyed particular appeal (Kearns 1993; Dorn & Laws 1994; Phillips & Rosenberg 2000; Kearns & Moon 2002; Pearce 2003). After much conversation, however, and reading and re-reading of this new body of work, we found that our frustrations have not so much been alleviated as compounded. Programmatic statements often re-center medical geography around particular theoretical nodal points that depend upon new sets of dualisms. Furthermore, these statements appear as innovations when in fact they tend to be embedded in a project of legitimizing medical and health geography's importance to the academy by situating its work in relation to the discipline of geography as a whole, cultural studies, or health science. Thus, while the period since the 1980s has seen tremendous growth in all three of these geographic approaches to understanding and explaining the multiple scales, settings, and landscapes in which health, illness, and disease meet diagnosis, treatment, and consequences, we believe that we need to push further past the "traditions" model of writing about the historicizing geographic thought as it relates to "health" and "the medical." As such we are much more sympathetic with those who have recently sought to find common ground and synergies among medical and health geographies, pointing to the ways in which understandings of disease, health services, and health more broadly are all essential to understanding the health of populations, the meanings of illness, and the nature of medical knowledge (Rosenberg 1998; Parr 2004; Philo 2005).

In this chapter, we examine both the origins of the fault lines that have divided medical and health geographies and the possibilities for transgressing or renegotiating these boundaries to bring a fuller appreciation to our understandings of the geographies of health, illness, and medical care. We begin with a brief explication of "genealogy" and how such a method opens up medical geography in relation to the construction of various identity categories. We argue that examining the programmatic statements of the past tells us a lot of the "now," how we got here, what choices were made, and what paths forgotten. By taking this genealogical approach (Foucault 1995), we want to historically situate the current debates and push them in new directions. In doing so, we direct our attention largely to dictionary and encyclopædia entries, book reviews, and progress reports of different sorts since the 1980s. While important contributions in their own right to debates over directions and priorities in medical and health geography, these texts also commonly refer to a variety of practical knowledge-productive activities, including the patterns of conference organizing and external funding. Unlike Ron Johnston (2000, 2006) on the politics of "changing human geography's agenda," we are less centrally concerned with textbooks, since they often are lagging indicators.[1] The reviewed works, which we characterize as programmatic statements, often seek to redefine medical and health geographies in relation to changes in the broader discipline. Our own reading seeks to differ from these accounts by resisting the temptation to construct a new "holism" or constitute a new nodal point for the sub-discipline. Instead, we want to "open up" the historiography of medical and health geography to the recognition of multiple origins, interpretations, and affiliations, examining the ways in which medical geographers situate their work vis-à-vis geographic, medical, and other disciplinary projects (Philo 1996).

The Genealogical Method

Richer stories of medical geography will emerge at the interface between disciplinary history and studies of science, technology, and society. Borrowed from intellectual historians, genealogy is a method of analyzing the significance of social practices, which recognizes the reciprocal relationships among knowledge, practice, and disciplinary identity in shaping both the investigator and the social world. Power and knowledge operate in a mutually generative fashion (Foucault 1972; Bernauer 1990), and function to shape landscapes of health and illness, the tools we use to analyze them, and the embodied experience of illness and wellness. "Power relations have an immediate hold upon [the body]; they invest it, mark it, train it, torture it, force it to carry out tasks, to perform ceremonies, to emit signs" (Foucault 1995). In this chapter, we adopt a genealogical approach in order to investigate the historical structuring of medical geographic discourses as well as its practices of marking bodies and investing subjects in depth.

The genealogical method was developed by researchers in the history of human mores and ideas (Lash 1991; Schacht 1994). Its recent resurgence in the history of geography can be traced back to the French historian and philosopher Michel Foucault's writings on the history of the social and behavioral sciences, and even further to Friedrich Nietzsche on the evolution of modern morality (Dreyfus & Rabinow 1983). For Nietzsche (1956), a "genealogical" approach entails studying the way that words are passed between generations and how their meanings change through use and reuse. Foucault's genealogical writings trace a history of the body and the formation of the modern subject, through the surveillance of modern disciplines such as law, police, psychiatry, and medicine. In this, Foucault is following the eighteenth and nineteenth century theorists he writes about, who saw within the duties of public physicians the creation of medical topographies to understand the nature and causes of diseases, medical jurisprudence under which fell protection of the community with quarantines, and medical police, which included the counting and classifying work of vital statistics and asylum policy.

The important difference between the genealogical approach and other approaches to writing the histories of medical and health geography is that the genealogist begins with a problematization or "sign of danger" in the present and then allows this to guide the choice of "site" for historical analysis. Critiques of medical geography from interested observers to social and historical geographers whose work has often been situated in productive tension with the sub-discipline, have often chosen HIV/AIDS as their productive focus (M. Brown 1995; G. Kearns 2007). Their writings have tended to be avowedly political, however, with the intention of clearing the ground for better, newer perspectives. However, once the genealogist arrives at a site/archive, the work of patient discursive reconstruction (or, in Foucault's terminology, "archaeology") should serve to unsettle such a presentist orientation. The purpose of the excursion is not to confirm a new truth of the present, but to uncover possible alternative paths towards deriving "truths," opening ways of thinking and approaching the present (Castel 1994).

We take recent discussions about "traditions" in medical geography, and the positing of the new field of health geography, as an opportunity to open up the subjects, limits, and methods of medical geographic practice and health geography for dissection, and to reread them against the genealogy of medical geographic ideas, revealing some of the "situated messiness" of this form of geographical practice (Livingstone 1992). We seek to illustrate some of the ways in which medical geography was conceived in the late eighteenth century as an enlightenment project to explore the physical, social, and political factors which both damaged and sustained population health, how it was narrowed to the two traditions of disease ecology and health service planner in the mid-twentieth century because of the constraints of methodology and the interests of funders, and how the new health geography has reinstated and expanded this enlightenment vision. In all this, though, we also seek out the ruptures and partialities that mark the transgressions that make possible a much more complex medical and health geography that works across the grain of binary logic and thinking instead of through it.

The "Two Traditions" of Medical Geography

Assorted versions of the "two traditions" have been employed to characterize medical geography's spatial science rejuvenation during the 1960s and 1970s. As Gerry Pyle (1983) notes, differences in perspective were institutionalized in disciplinary settings and representational bodies after a crucial 1972 meeting of the International Geographical Union (IGU) Commission on Medical Geography between US-based and UK-based geographers. At that meeting geographers noted the differences in their concerns: medical geography in the United Kingdom rested on a much stronger tropical medicine and disease mapping legacy, while in the United States medical geographers owed a larger debt to sociology, psychology, and health policy. With the demise of the IGU Commission on Medical Geography, this split identity lived on in the textbook chronicles of disciplinary development, the contest over publishing outlets and in the representation of the field at international meetings (Pyle 1977; Learmonth 1978; Mayer 1982; Kearns 1995). At ongoing international symposia, parallel streams of papers focused around the dual "approaches."

Programmatic statements of the period briefly traced lines of descent in their introductions or literature reviews. In Britain, the disease ecology school developed around the writings of Dudley Stamp (1962) and Andrew Learmonth (1978), whose disease mapping illustrated the spatial conditions for health and illness in the tropics, while the access to health care group was led by David Phillips (1981), and supported by the needs of the growing National Health Service. A far richer pre-Soviet history of medical geographic inquiry was recognized by Russian scholar Markovin (1993), yet only a small portion of this overview was made available in English translation (Markovin 1962). Soviet medical geographers dated progress towards a scientific approach to disease ecology to E.N. Pavlovskii's (1956) foundational investigations into the natural territorial complexes of disease during the 1930s; training and infrastructure for medical geographic investigations expanded as part of Soviet centralized planning, particularly with regard to the development of the Siberian frontier (Shkuriatov 1963). Medical geography in Central Europe was distinguished by the successful production of disease atlases, from Finke's 1792 *World Map of Disease* (discussed by Barrett 2000b, 2002) to August Hirsch's

1859–64 *Handbuch der historisch-geographischen Pathologie* to the *Seuchen-Atlas*, published during World War II, and Jusatz's 1961 *World Atlas of Epidemic Diseases* (Jusatz 1983; Verhasselt 1983).

Theoretical debates in succeeding decades drew upon a taken-for-granted set of binary oppositions that coalesced as part of this historical moment. Originating in the long-established practice of differentiating between description (topography) and prescription (police), the followers of one or other perspective grew apart, methodologically, conceptually, and temperamentally. Eventually, these perspectives became codified standpoints (the "ecologists" versus the "engineers" (Learmonth 1978; Girt 1980), "geographical epidemiology" versus "health systems planning" (Mayer 1982), "man-land relations" versus "spatial analysis" (Meade 1986)), territorializing and organizing the activities of sub-disciplinary practitioners. Devotees of each tradition solidified their position by formulating a lineage and claiming historical figures as precedent. The historical imagination of medical geographers suffered accordingly as key figures were lifted out of their historical context, brushed off, and modernized according to the programmatic requirements of the present. British geographical epidemiologists turned to John Snow's investigations of cholera in London as an example of the power of maps in generating public action (McLeod 2000). American disease ecologists positioned themselves as part of a family tree with Jacques May at the pinnacle (T. Brown & Moon 2004), while the health care geographers resurrected the nineteenth-century work of the Massachusetts sanitarian, Edward Jarvis (Hunter & Shannon 1985). Rarely did these groups consider the social milieu within which this classic work originally emerged (Philo 1996).

It is, in fact, now well understood that they selectively appropriated historical figures in their efforts to legitimate and authenticate their own research agendas. While the health concerns and the policy dilemmas that drove medical geography varied from place to place, the traditions of disease ecology and spatial health services planning met the needs, respectively of militaries and public health authorities, and national health systems and private health service providers, so the split was replicated from the tropics to the tundra. For its own pragmatic and political reasons, medical geographic literature in developing regions highlighted slightly different lines of descent and sought out indigenous antecedents, while remaining closely aligned to a two traditions model of the sub-discipline (Pessôa 1960; Rojas 1998; Akhtar 2007).

English-language reviews of the progress of the sub-discipline during the 1980s either assumed the objective reality of these divisions or traced these traditions back to their earlier enlightenment roots. While francophone scholars in the Annales school focused primarily on the history and evolution of work in disease ecology (Grmek 1963), the recorders of history and progress in anglophone geography either worked within or attempted to extend the two traditions model. That is, they either accepted outright the older tenets or added new theoretical paradigms and/or ontological categories to strengthen and expand previous approaches. For example, Mayer's 1982 review article "Relations between two traditions in geography," explored attempts to reconcile the anxiety felt by medical geographers by calling for a greater sensitivity to the "diversity" present within the sub-discipline. Yet Mayer's reticence to interrogate the entire premise only reinforced the already fixed beliefs of medical geographers, that there was and would continue to be two traditions.

While the "disease geographer" and the "health services geographer" are not essential types, these figures have become reified through the institutionalized practices deployed by medical geographers whose purpose has been to understand, represent, and intervene in a varied landscape of health practice (Foucault 1973). These dual identities are held in place by local networks of power and knowledge, not by any overarching design. As such, they are also not easily dislodged (Rabinow 1984). In particular, disease geography is closely tied to epidemiology, outbreak investigation, and public health practice, and is therefore funded by government agencies and other organizations interested in disease surveillance. The ecological niche of the health services geographer is straightforward in industrialized countries with centralized delivery of health services such as Britain's National Health Service, and in those with strong government health ministries concerned with ensuring equity in service provision, from the Netherlands to Botswana. In countries with fewer resources, or in the special case of the United States where no one is responsible for the growth, health, and monitoring of the providers of health services or that they meet population needs, health care geography may be an itinerant, underfunded, and under-appreciated task. It may also be that these less hospitable climates for health care geography lead work in these areas to make more linkages to health policy.

Inscribing Two Traditions: Enlightenment Projects

The relations between the two traditions in the discipline of medical geography can be clarified by tracing their differentiation and evolution since the eighteenth century. In doing so, we find that the differentiation between disease geography and health services geography (and later the geographies of health or health geography) does not take place along simple axes of medical versus social models of disease and illness, subjects of health versus disease versus health care, or methodological axes of induction versus deduction or qualitative versus quantitative, though all of these simplifications have some role in the defense of boundaries. These perspectives are instead a reflection of the multiple aspects or faces of emergent concerns for population health, which are already visible as early as the late eighteenth century. So while one can begin to differentiate between environmental medicine practitioners (or medical topographers) on the one hand and public health planners (or health geography bureaucrats) on the other in the nineteenth century, at the time, their work was seen to derive from the same concerns for population health through understanding of local diseases and environments. Medical theory held that specific landscapes and regions had their own diseases, and that the same diseases manifested differently in different environments, which made the practices of disease ecology, public health planning, and clinical medicine deeply intertwined (Warner 1986; Savitt & Young 1988; Numbers & Savitt 1989; Dorn 2003).

The scope of the early medical geography was broad and deep, including landscape, disease, treatment, and indigenous ideas about health (Barrett 2000a). The "topography of disease" emerged as part of a far broader enlightenment project intent on understanding the lands, waters, airs, agriculture, and resources of nations, particularly those not previously known to Europeans. The "doctrine of specificity" (Worboys 1993) held that God had placed the cures for diseases in the same place that those diseases were naturally found, leading to extensive catalogues of medicinal plants of the new world, such as the one that King Philip of Spain commissioned from his personal physician, Francisco Hernández (1628). From the 1740s to the 1770s, botanist Carl von Linné (Linneaus) was classifying plants sent to him by students who traveled the world precisely because knowledge of the plants of the new world had thrown the old European classifications into chaos (Blunt 2001; Fara 2004). Following this enlightenment practice of classification, the first known world disease map, tracing the indigenous diseases of the world, was produced by Leonhard Ludwig Finke as part of the research for his 1792 three-volume treatise on world medical geography (Rosen 1953b; Barrett 2000b). Medical geography also had a tradition of geographies of nutrition, exploring both starvation and macronutrients (Grivetti 2000) and linkages between diet and disease (Trowell & Burkitt 1981). These earlier works thus take a broad view of human–environmental relations of disease, linking the nature of terrain, the constitution of human individuals and populations, and the propensity for disease (see eg. Dorn 2000; Rupke 2000; Valenčius 2003).

These enlightenment studies of health and disease fed into a re-thinking of human–disease relationships by nineteenth-century medical topographers and advocates of environmental medicine – the builders of stronger nations through the production of environmentally sensitive practices related to disease (Sigerist 1933; Jordanova 1979; Worboys 1993; Osborne 1996; Dorn 2000). These medical topographers aimed to preserve the racial stock jeopardized in hostile climates, and as such they were complicit in imperial endeavors (Curtin 1989; Harrison 1994; Arnold 1996a). Simultaneously, they constructed categories of the nation and the "Other" in ways that placed Europeans at the top of a hierarchy of racial identities, arguments that make for interesting reading now because they had to find ways to explain that the greater susceptibility of Europeans to malaria, yellow fever, and other "tropical" diseases, demonstrated that superiority (Curtin 1961; Arnold 1996b; Anderson 2006). These movements, while frequently subsumed under the names "sanitarian" and "sanitary science," manifested differently in urban centers, port cities, and colonial contexts. In cities where the local production of disease-creating filth was undisputed, sanitarians focused on solutions from hygiene to engineering (Duffy 1990; Rosen 1993). In port cities, questions of whether disease was being imported or locally produced had important implications for trade, producing conflict over both theory and practice of public health (Ackerknecht 1948; Humphreys 1992).

From a slightly different angle, the nineteenth-century public health bureaucrat was concerned less with tracing the ætiology of disease than he was in creating rationalized, hierarchical, panoptic state medical systems (Garrison 1929; Foucault 1973; Higgs 1991, 1996). Linked to the rise of hospital medicine and statistical methods, the bureaucrat's concerns focused on the health of diverse populations (D.S. Barnes 1995; Craddock 2000). As Graeme Davison (1983), Felix Driver (1988), and Mary Poovey (1995) note regarding the Victorian city, just as sick people were subjected to careful classification and observation in the clinic, and criminals to the constant panoptic supervision, so were the "vast, anonymous, and unruly" urban classes counted, classified, and located in new ways. The social sciences assumed the responsibility for observing the effects of urbanization and industrialization, and reforming undesirable behaviors. Concern for the effective utilization of hospitals and asylums was part of this effort to maintain administrative control, a topic that has been explored much more fully in geographers of mental disability (Radford 1991; Philo 1995) than by health services geographers more generally.

The disease ecologist and the public health planner were not, therefore, mutually exclusive practices. Their duties often overlapped as they worked in tandem, each focusing on one aspect of building rationalized, imperial nation-states (see Table 4.1). The "medical topography" of localities – investigations of disease patterns through the documentation of changing people and place characteristics, and the "medical police" of populations – and guidance to governmental authorities on the best policies for improving health of the state, were complementary responsibilities expected of public health officers whether in Prussia, France, or the early American republic (Finke 1946; Rosen 1953ab; Peter 1967; Frank 1976; Cassedy 1984; Riley 1987). In keeping with growing German dominance in microscopy, by the close of the nineteenth century sanitary reformers were laboratory bacteriologists pressed into service in crises, rather than engineers or public health physicians (Evans 1987). William Farr is known today as the father of British vital statistics (Eyler 1979), and Edwin Chadwick as a famed sanitary reformer (Hamlin 1998) – yet, both were health reformers concerned for improving the condition of Britain's working classes at the height of the industrial revolution, and promoted reforms in wages, working conditions, nutrition, and hygiene (Hamlin 1995). Sir Arthur Newsholme, the leading British voice for social medicine at the turn of the twentieth century, similarly crossed these boundaries freely with a far-reaching vision of public health and social medicine (Eyler 2002). Early nineteenth-century France saw a similar pairing, where A.J.B. Parent-Duchatelet (1790–1835) pushed for sanitary reform (La Berge 1992) and Louis Rene Villerme (1782–1863) established with statistical certainty that the French working classes lived in unhealthy conditions and died before their time (Coleman 1982); both had major public roles in advocating for improved health conditions through individual and state action. Colonial settings may pose the greatest challenge to the distinction between disease ecologist and public health planner, both because high deaths rates among immigrants and local residents led many to question the tenets and effectiveness of European medicine, and because disease surveillance, hygiene, reform, and health services planning were usually combined in the work of a single (usually military) health officer (Arnold 1993; Curtin 1998; Anderson 2006).

Table 4.1 Dual roles of the health officer in the nineteenth century

Practice	*Orientation*	*Identity of subjects*
Medical topography	Nation-protecting	• *Bearers of disease* • *Beneficiaries of imperialism*
Medical police	State-building	• *Rational health seekers* • *State surveillance system*

The separation of medical geography into disease ecology and health care planning in the twentieth century derived not from inherent features of the subject matter, but from the needs and interests of militaries trying to protect their troops from malaria (Ackerknecht 1945; T. Brown & Moon 2004) and national health systems seeking to rationalize services (WHO 1965; Small 1989). The growth of separate career paths and literatures in medical and health geographies from the 1940s to the 1990s, then, reflects the conditions of employment, grants, contracts, and audiences for the work of disease ecologists, who were frequently speaking to public health and epidemiology audiences, and health service planners, who were looking at the concerns and limitations of health system administrators and government health agencies.

In many ways, the disease geography and ecology tradition emerges out of the long held ties between epidemiology and sanitary reform. For much of the past two hundred years, in fact, these two traditions have been inextricably linked, yet regionally articulated, according to (1) the support for medical institutions and ideologies; (2) variations in statistical approach; and, (3) the constraints of perceived and actual environmental risk. The epidemiologic transition from infectious to chronic diseases, however, opened up new relationships between disease ecology and health service provision (Omran 1971; Bourdelais 2006): the emergence of cancer, heart disease, and other chronic illnesses as the leading causes of illness in the industrialized world between the 1920s and 1950s changed the methods of epidemiology, the nature of vectors of illness, the chronicity and complexity of health care, and the nature of understandings of risk (Rothstein 2003; Jorland et al. 2005; Fairchild et al. 2007). With the emergence of antibiotics (Bud 2007) and the idea that infectious diseases were on the verge of disappearance – since proven disastrously misguided (Dubos 1987) – disease ecologists turned to non-infectious diseases or changed their focus to the developing world.

The spatial analytic medical geographer reprises the role of the public health planner who takes on the task of building a rational state apparatus by using geographical information systems (GIS), telemedical networks, and other locational and communication techniques to further rationalize the current health care system (Thomas 1990; Bashshur et al. 1997; Burstein et al. 2005). While some of these current public health spatial planners link their work to this geographic tradition, others have taken up geographic information systems (GIS) as the solution to their problems without explicit consideration of the social, cultural, political, economic, or regional meanings of their spatial analyses. In so doing, these "scientists" seek a technological fix for a complicated set of issues related to who is to be served, reading out of their work the systematic ways in which the rural poor, inner-city minorities, and illegal immigrants are outside the design of both national health systems and particularly the profit-making health sector in the United States for example (Hart et al. 1991; Ziv & Lo 1995; Pati & Danagoulian 2008). In an ideal world, the medical establishment would produce a spatially even, and color/gender-blind, system of care, but this is not an ideal world (Shannon & Dever 1974). While an earlier generation of work saw gender and racial disparities in health care as a product of spatially determined inefficiencies (Earikson 1970; Shannon & Dever 1974; Mohan 1984, 1995; Cromley 1992), more recent health systems geography has contributed understanding to the roles of transportation, residential segregation, and other spatial features to the growing field of health inequalities and health disparities (Curtis & Jones 1998; Hayes 1999; Popay et al. 2003; Smyth 2008).

Towards Another Dualism? Medical and Health Geography

Emerging work challenging the centrality of biomedicine in geographic inquiry served to upend the so-called two traditions while positing a third alternative. *Health & Place*, launched in 1995 as a new publishing outlet for work in this area, can be read as an attempt to re-situate medical geography as a "geography of health" closely tied to movements towards both "new public health" and "new cultural geography" (Gesler 1991, 1992; Kearns 1996). This transition is evident in the reports written by Jones and Moon for *Progress in Human Geography* (1991, 1992, 1993). The first report argued that the original two traditions divide still needed to be bridged. In subsequent reports, however, Jones and Moon noted that "place" has historically been constructed in medical geography as a container of aggregate data. In pushing medical geography beyond its positivist framework, they argue that "place" is also a mechanism through which health and illness behavior is defined as a lived experience. As such, both broad-scale comparative research (i.e. between nations and/or regions) and locally specific studies should inform any medical geography. Their agenda becomes even more clear in 1993 when they call for stronger links between medical geography and both the "new public health" and "new cultural geography" schools, taking seriously the "socio-structural pressure" that constrains health. In so doing Jones and Moon (1993) pay closer attention to the mediation of locality through comparative studies between and within locales, the impact of migration, and the "uses [of] national surveys … sensitive to local differences" (p. 519). This perspective grows out of discussions amongst a group of medical geographers about moving beyond the dominant paradigm of spatial analysis – space as container – and signals the growing recognition of a crisis of identity and mission within the field.

Paralleling the programmatic statements of Jones and Moon is a series of articles in the early 1990s expanding the epistemological and methodological underpinnings of medical geography beyond a two-traditions model. New programmatic statements by Robin Kearns, Isabel Dyck, and Jonathan Mayer, amongst others, upset the uneasy equilibrium that had been asserted between the two supposedly self-contained perspectives for much of the history of the sub-discipline. Of all of these various challenges the 1993 *Professional Geographer* article by Robin Kearns generated the most response, catching the attention of scholars located both inside and outside the sub-discipline. For some insiders (Mayer & Meade 1994; Paul 1994) Kearns' call for a "post-medical geography" was tantamount to a wholesale abandonment of the unitary "core" of medical geographic tradition, which, as we discuss above, draws upon enlightenment traditions, later caught up in the emergence of biomedicine. Yet, for others advocating for geographies of the body and social theory, Kearns had not gone far enough (Dorn & Laws 1994).

Contrary to some of his critics' anticipations, Robin Kearns was not calling for the death of medical geography in the 1993 article. "Rather than advocating a renaming of medical geography," he suggests, "two interrelated streams can be identified within the medicine/health/geography nexus: medical geography and the geography of health." In short, the "two traditions" embedded in enlightenment thinking (read: positivist science) would remain intact, neither challenged nor deconstructed. Instead, a new "geography of health" would consider "the dynamic impacts of both health services and the health of population groups on the vitality of places." This distinction is legitimized by reference to a return in geographical theory to discussions of "place." In particular, Kearns draws on the insights of Entrikin (1991: 7) that the optimal understanding of place lies somewhere between the subjectivity of experience of place and the knowledge of place as object. In doing so, Kearns follows the lead of Wil Gesler in *The Cultural Geography of Health Care* (1991) in providing a parallel intellectual stream of thought that works "beyond" the two traditions of scientific medical geography with a "geography of health" that refers back to the subjective senses of place and "placelessness" (as articulated in the work of Buttimer (1980), Relph (1976), and Seamon (1979)).

Unfortunately, Kearns' division between medical geography and the geography of health re-inscribed the artificial, yet historically powerful, split between humanist and spatial scientific perspectives in geography and phenomenology more generally (Pickles 1985). The move by medical geographers toward large data sets, GIS analyses, diffusion modeling, multilevel modeling, and regression allied them with statisticians, programmers, and continued to link their work to biomedical models. The move by health geographers to phenomenology, ethnography, and social theory has helped to support a two-cultures view of the discipline, encompassing the scientific and the post-scientific, where geographical phenomenologists risk being consigned to the pre-scientific world. Phenomenological work in geography, according to John Pickles (1985: 58) "ignores the scientific, as another realm, and hence fails to appreciate the possibility of the world of science as a phenomenon in its givenness; that is, fails to appreciate the phenomenology of science, a lifeworld that contains science, or indeed the possibility for phenomenology to deal with any 'higher level' social abstractions such as society, institutions, power relations, etc." Ron Johnston's (2000) analysis of the contemporary publication patterns amongst anglophone geographers reaffirms this observation, that differences in methods and subject matter have led physical and human geographers, and in our case medical and health geographers, to speak to different audiences and publish in different outlets, pulling the sub-disciplines apart centrifugally (see also Mayer in this volume).

While health geographers have progressed in their methods and perspectives since these concerns about epistemology and phenomenology were voiced back in the 1980s, the fact remains that using statistics to study health care practitioners and diseases and qualitative methods to study the lived experience of patients risks reifying a notion that medical practitioners are rational and scientific and patients are otherwise. Chris Philo (2007) and Hester Parr (2004) have argued that ceding criticism of the "medical" decreases the power of critiques of medical ideas and practices. They propose models such as French physician-philosopher Georges Canguilhem (1989) whose criticism of the medical habit of taking statistical norms of height, weight, and laboratory values as the same as "natural" and "healthy" is all the more powerful because of Canguilhem's insider status. Since the 1970s, scholars in science and technology studies have explored the construction of scientific and medical knowledge using ideas such as social construction and methods such as ethnography and situational analysis that are familiar to critical human geography (T.J. Barnes 2001), but take medical rationality as the object of study (Zussman 1992; Christakis 1999). Ludwick Fleck's critique of uncertainties in the Wasserman test for syphilis shows how a detailed consideration of scientific techniques can demonstrate the limitations of what appear to be scientific certainties (Fleck 1979).

Health Geography: Synthesis or Alternative

Rather than bridge the two traditions, Kearns (and others) thus created another. This "new geography of health" has flourished since the 1990s, not by merging with the traditions of disease ecology and health services planning, but by creating a "new tradition" in contradistinction to the medical one (Kearns & Moon 2002). Drawing on social theory and the subjective experience of place, this new tradition is more closely aligned with critical cultural and social geography in both its concerns and methods (Parr 2004). Health geography has relied heavily on human geography's qualitative and humanistic methods, including interviewing, ethnography, life history, and narrative (Kearns 1997), sometimes finding that it is not so easy to avoid the clinical gaze in its own approach to research subjects (Parr 1998). Health geography has also moved itself consciously away from the concerns of the medical and healing professions, taking instead subjects that emphasize the subjective experiences of health and illness, including therapeutic landscapes (Gesler 1992; Williams 1999; Smyth 2005), "the body" (Parr 2002ab), and experiences of care (Milligan 2000, 2003; Conradson 2003; Parr 2003). And, as Parr avers, health geographers do this at their own peril, re-inscribing the falsehood of "the medical" and "the healthful" means that health geographers have lost site/sight of the powerful dynamics of "the medical" and what the discourses and practices of medical life mean to our everyday understandings of bodies, places, and subjectivities.

Since the mid-1990s, then, while this new perspective has captured the imagination of the discipline, gradually making its appearance in textbook chronicles and historical studies as well (Craddock 1995; Curtis & Taket 1996; Digby 1997; Rosenberg 1998; Gesler & Kearns 2002; Del Casino 2009), both medical geography and health geography have flourished in relative autonomy. As Mayer suggests earlier in this volume, medical geography thus conceived has thrived by incorporating new methods, subjects, and a recognition of the importance of the field to both the broader discipline of geography and to the health sciences, where questions such as emerging infectious diseases, regionalization of services, and neighborhood effects on the health of individuals have led many researchers to appreciate the importance of geographic perspectives.

A number of recent developments indicate the new division at work. The first *Geography in America* volume, published in 1988, included a group-authored essay (Earickson et al. 1988) organized around in two sections: "disease ecology and malnutrition" and "medical and health services location and utilization." In the second 2006 edition, *Geography in America at the Dawn of the 21st Century*, Wil Gesler (2006: 492) pointed to the evolution of "a new geography of health less concerned with disease and the medical world and more with wellbeing and social models of health and health care." By this point in time, several specialty/study groups within national geography associations had changed their names to

"Geography of Health" or "Geography of Health and Health Care," leaving the Medical Geography Specialty Group (MGSG) of the Association of American Geographers as a last holdout.[2] In the face of such moves, "medical" geographers have merely shifted their focus, pushed their work into new outlets, and continued their spatial scientific tradition in parallel to health geography. It is therefore ironic that there is no Wikipedia entry entitled "medical geography," while the one entitled "health geography" (edited November 6, 2008), explains that health geography was "initially referred to as medical geography … based on the biomedical model of health and grounded in the logical positivism philosophy." Similarly, the fourth edition of *The Dictionary of Human Geography* includes separate entries for "medical geography" (Mohan 2000b) and the "geography of health and health care" (Mohan, 2000a) both written by a critical health geographer. The first entry refers to many publications by medical geographers from the 1970s and 1980s, while publications cited in "geography of health and health care" entry are almost entirely from the 1990s.

One only need read the pages of *Health & Place* to see how the "new two traditions" of medical and health geography work in parallel to each other, publishing in the same outlet but rarely engaging each other. As Jonathan Mayer suggests, arguments that health geography has subsumed or superseded "older" traditions of disease ecology and health services geography do not bear the weight of empirical scrutiny. The terms of debate – although there really is not much of a debate at the present time because the programmatic statements tend to be written by health geographers – now turns on questions of methodology, modeling, and statistical analysis versus critical social theory, perspectives of physicians and health workers versus patients and citizens, and alliances with medicine and the health sciences versus with human geography and critical social science. Dualistic understandings of work in this subfield persist, even though the two categories are now occupied by new knowledges, practices, and theories of the relationship between disease and (dis)ease or health and illness. In order to understand these shifts, it is helpful to look at other social science disciplines for similar moves and to learn from studies in the philosophy of science. In doing so, we extend and work through our dualities as medical and health geographers, just as others in our field now work through multi-methodological approaches to answer important socio-spatial questions and concerns (Del Casino & Jones 2007).

From Medicine to Health in the Social Sciences

New approaches to the geography of health need to be seen as part of larger attempts by social scientists to explore the phenomenology and agency of sick people and healthy people, and of lay movements to bring new insights and perspectives to attempts to understand and mitigate sickness. Kearns' call for geographers to focus on wellness, health, and the perspectives of patients and communities has seen parallels in all of the social sciences, which study health and medicine. Sociologists have focused on social movements and "embodied health movements" which seek to bring community perspectives to medical research, public health investigations, and health policy. Work on women's experiences and reproductive health (Martin 1987; Rapp 1999), AIDS activists (Epstein 1996), and breast cancer (Boehmer 2000;

Kasper & Ferguson 2002; Moffett 2003; Ericksen 2008; Klawiter 2008) have emphasized the roles of lived experience, political activism, and challenges to medical authority. Anthropologists have given voice to alternative perspectives on reproductive health (Martin 1994), illness, treatment, and recovery (Aldridge 2004), and the subjectivity of pain (Finkler 1991). Historians have unearthed generations of patient perspectives on tuberculosis (Rothman 1994), sickle cell anaemia (Wailoo 2001), and menopause (Houck 2006). All of these fields are responding to the critiques of social theorists, the move away from authority since the 1970s, and growing intellectual trend toward seeing individual and group agency and everyday experience as critical to understanding how systems and ideas function in the world.

The divides between medical and health geography are similar to the tension that medical sociology has long faced between "sociology of medicine" and "sociology in medicine"; that is, a distinction between sociologists studying medical systems to answer sociological questions about social structure, agency, and function, and those using sociological tools to answer medical questions (Straus 1957). Sociologists have become allied with one or the other of these approaches, or have straddled them, depending in part on the questions they ask and the methods they use, but also because of mundane issues like the nature of their employment and the sources of funding. More recently, work in health inequalities has split along similar lines, with one group of health disparities scholars working to identify points of intervention to improve the health of poor people (Marmot & Wilkinson 2006), while the other sees poverty as a fundamental cause of disease which will reproduce biological and social pathology until the structural causes of economic, political, and social inequality are ameliorated (Link & Phelan 1996; Phelan et al. 2004).

Finally, medical anthropology has also been split by struggles over how closely to ally itself with traditions of bioculturalism and applied anthropology (Singer & Baer 2007), in which the research agenda is set with a goal of improving human health among the population studied, political economy and cultural analyses which explore the structure of plural and parallel health services (Kleinman 1995), and interpretive traditions that focus on the phenomenology of embodiment and critical cultural theory (Scheper-Hughes & Lock 1987). In all of these disciplines, the traditions and goals of biomedicine are weighed against or in tension with traditions of cultural analysis which may instead make social structure, power relations, and subjectivity the main subjects of analysis. These choices stem not only from disciplinary traditions, but also from research findings which show that sometimes biomedicine has a "magic bullet" to offer, but in others, social relations are fundamental to the distribution of health and disease (Henderson 1997; Mann 1999).

Conclusion

We began this chapter with the hopes of finding order in the traditions of medical and health geography. The story we tell here is one of evolution, growth, and rapid change, always driven as much by external forces as by internal relations. Disease geography, health services geography, and the geography of health can each only be located in relation to their companion perspectives as part of a "trialectic," just as the epidemiologist is expected to consider the relations between pathogen, environment, and host characteristics. Disease geography and health services geography, perspectives abstracted out of the geography of health during geography's colonial encounter, were the first over the bar of scientific professionalization and disciplinary articulation. But the geography of health (including the geography of nutrition) has always constituted an essential backdrop from which the "two traditions" emerged. The re-emergence since the early 1980s of a "geography of health" perspective as a component of an enlarged and politicized medical geography is perhaps a predictable response to the broader "linguistic" or "anthropological" turn in the discipline of geography as a whole, a movement Chris Philo (2007) describes as a rediscovery of vitalism in geography.

The two-traditions model was always only one of numerous modes of reading the lore of the medical geographic tradition, but for a time it came to capture the sub-disciplinary imagination. For those who engaged in more public reflection on such matters, the two traditions did not constitute antithetical modes of practice, but instead described a continuum, that is, moments within the development of a single perspective that linked disease to the imperative for biomedical treatment. Robin Kearns, on the other hand, contrasted the *status quo* medical geographic traditions with his explicitly anti-medical "geography of health." Yet, while his contemporary history differed from Pyle or Mayer when interpreting where medical geography should go, Kearns retained a fairly similar historical story of where medical geography had been. By doing this, he ended up simply replacing the old set of dualisms with a new set.

Through our brief examination of some more recent debates and an explication of the historical origins of links between geography, health, and medicine, we have attempted to open up these rhetorical boundaries which attempt to fix the limits of the sub-discipline. In summary, our examination of the programmatic literature reveals at least five sites of tension between different "traditions": (1) the tension between medical and non-medical approaches; (2) the tension between scientific and humanistic understandings of place; (3) the tension between more subjective or qualitative, and more objective or quantitative measures; (4) views of space as container and place as construction, including place as lived experience and the body as lived experience; and, (5) the tension that revolves around medical geographers' participation in the state's surveillance system and the construction of national subjects. In doubting dualisms, we recognize each of these five couplets as sites that medical geographers move between, rather than oppositional categories that they must defend. Tensions once thought to be debilitating instead become valuable loci for conversation. And gradually models of two or even three traditions lose their internal coherence.

A more historical approach will allow us to recognize that the variety of medical geographies exceeds even a three-traditions rendition, as the differences are hard to maintain in practice. Human behavior with regard to health always exceeds the interpretive scope of such models; the world is far messier than our theories of it. Our perspective arises from the concern that actual medical geographic practice is much more varied than its historians represent it to be. Perhaps such "traditions modeling" does a disservice to the heterogeneous linkages that medical geographers, both academic and non-academic, make in the academy and in the field of medical inquiry.

Notes

1 In his review of medical geography textbooks for *Antipode*, however, John Mohan [Mohan, J. (1989), Medical geography: competing diagnoses and prescriptions. *Antipode* 21, 166–77.] found that two works by Jones and Moon (1987) and Eyles (1987) in fact pointed towards the possibility for a "critical medical geography" within what remained largely a conservative discipline.

2 The MGSG membership, polled in fall 2008 on the question of whether to change the specialty group's name, chose "health" over "medical" as their preferred option.

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Part II Disease

Chapter 5

Disease, Ecology, and Environment

Joseph R. Oppong and Adam Harold

Introduction

The geographic distribution of disease is neither random nor uniform. Rather, diseases vary spatially. Diseases that are always present (endemic) in certain locations are often completely missing in others. For example, while malaria is endemic in tropical Africa, it is rare in Western Europe. Similarly, diseases that are globally present, such as pandemic HIV/AIDS, vary spatially in prevalence and severity of impact due to spatial differences in access to health care, immunity, sexual behaviors, and other factors. For example, due to poverty and other factors, sub-Saharan Africa has been more severely impacted by HIV/AIDS than any other world region. A person's risk of exposure to infection varies with their social context, including sexual contacts and behavior, and genetic factors including current health and nutrition status and immunity.

The disease ecology framework provides an explanation for this uneven geographic distribution of diseases. In its most basic form, the framework argues that any disease may be attributable to three sets of factors – genetics, environment, and behavior. Genetics refers to biological characteristics of people, environment to the geographic context in which people live, and behavior to people's choices, activities, and interactions. These factors play out differently in different places, giving rise to distinct ecologies of disease. This chapter discusses how the disease ecology framework is used in examining geographic variation in disease. Drawing on examples relating to the natural environment including geology and physical geography, the built environment, and neighborhood characteristics, we argue for a broader understanding of environment as a factor in spatial variations of disease. We begin with a brief discussion of how ecology contributes to spatial variations in disease, followed by an examination of the environment. We conclude that by providing the context of livelihood itself, environment may be the most critical factor in the geography of communicable and degenerative diseases, and we call for an expanded view of environment that emphasizes the concept of place vulnerability.

Disease Ecology and Environment

The earliest work on environmental influences on health has been traced to French geographers Maximilien Sorre (1933) and Jacques May (1950) who wrote of the geographical influences on disease and the pathological aspects of geographical regions. While Sorre is credited with developing the concept of a disease (pathogenic) complex (Pyle 1983; Verhasselt 1983; Learmonth 1988; Barrett 2000; Brown & Moon 2004), Jacques May, known as the "father" of medical geography, shaped the concepts of disease ecology into a distinct sub-discipline (Meade & Earickson 2000). Sorre (1933) argued that the occurrence of diseases may depend on physical, biological, and social factors or more specifically, climate, natural biological environment, and the anthropogeographical environment. Thus, environmental conditions, conditions for the life of the pathogen, and characteristics of people influence disease occurrence (Sorre 1933).

May's approach focused on the role of the environment in shaping human disease and the significance of geography to the mapping of disease patterns (Light 1944). For May, the pathological factors of disease or "pathogens" could only be fully understood if they were located within a broader understanding of the geographical environment within which they occurred. May successfully codified medical knowledge about the causes of particular diseases and highlighted the significant contribution that geography could make to the study of disease patterns and causality. He provided a theoretical framework for understanding spatial disease patterns by correlating individual pathogens with various geographical factors or, in his terms, "geogens." He constructed an intellectual space for medical geography by defining it as the study of the environment within which disease pathogens emerge (Brown & Moon 2004). In the first report of the newly established Commission on Medical Geography, May (1952) defined medical geography as: the study of the distribution of manifested and potential diseases over the earth's surface and of factors which contribute to disease (pathogens) followed by the study of the correlations which may exist between these and the environmental factors. Traditional disease ecology models focus primarily on the transmission and spread of infectious diseases. However, a broader disease ecology perspective can explain the occurrence and prevalence of degenerative diseases as well. Meade and Earickson (2000) formalized such an expanded disease ecology model based on the triangle of human ecology. Habitat, population, and behavior comprise the three vertices of a triangle, with a person's state of heath located somewhere within the enclosed space. These three components are broad, elastic characterizations of the various aspects of human life. For example, habitat encompasses the natural environment – topography, water, plants, animals, and climate conditions; the built environment – the urban and residential landscape in which people live and work; and, the social environment of people, communities, and societies. Humans continually interact with each of these habitats, not as passive recipients but active shapers of the natural, built, and social environments. Recent works in disease ecology emphasize this broad definition of environment and see the environment not as static but continually dynamic. In the following sections, we discuss each of the three dimensions of habitat and the impacts on human health.

Natural environment and disease

Traditionally disease ecologists focused on the impact of the natural environment on disease, and these impacts continue to attract interest among geographers.

Aspects of the natural environment ranging from naturally occurring elements and minerals to climate, latitude, and elevation have a broad impact on health and disease. Many naturally occurring elements are necessary for human survival and humans usually eat, breathe, and drink minerals or trace elements with harmless effects. However, a deficiency of certain essential elements or overexposure to others creates health problems. Just as the geographic distribution of diseases is not uniform, neither is the distribution of elements. Early civilizations of China, Greece, Rome, Egypt, and the Incas of Peru knew the links between the naturally occurring elements and health problems (Meade & Earickson 2000). We illustrate this with two examples – arsenic and lithium.

Arsenic, a naturally occurring element that is released mainly from erosion and volcanic emissions, provides one of the best-known links between physical environment and disease. While human exposure to arsenic may be through air, food, water, and soil contamination, groundwater poses the greatest threat as exemplified by reported mass exposures in Bangladesh, India, Taiwan, Thailand, China, Myanmar, Hungary, Vietnam, Nepal, Mexico, Argentina, and Chile (Selinus et al. 2004). Low-lying, flat areas with geologically young sediments and slow groundwater flow are ideal for arsenic contamination. Exposure to arsenic from groundwater has been linked to dermatological manifestations such as raindrop pigmentation, hyperkeratosis, and skin cancer (Tseng et al. 1968; Smith et al. 1992).

Lithium, which occurs in trace amounts in nearly all rocks, has been reported as a factor in suicide behavior and mortality (Cipriani et al. 2005). Schrauzer and Shrestha (1990) observed highly significant inverse associations between water lithium levels and the rates of homicide, suicide, and forcible rape. Inverse correlations of water lithium levels with the incidences of robbery, burglary, and motor vehicle theft, have also been reported (Schrauzer & de Vroey 1994). Lithium carbonate is considered beneficial in manic-depressive illness and is one of the most widely prescribed psychiatric drugs (Schrauzer 2002). Thus, dissolved lithium concentrations in groundwater may provide a protective function because many of the common foods and vegetables eaten daily contain trace amounts of lithium. In Texas, counties with lower dissolved lithium concentrations in their groundwater had significantly higher suicide mortality rates (Figure 5.1) (Flanagan 2006). Although the pathways linking trace elements and human health are complex and difficult to establish, these examples emphasize that what humans eat, drink and breathe directly impacts their health.

Another aspect of the natural environment that has been linked to health issues is the physical geography, including proximity to water bodies, climate, latitude, and elevation (see Box 5.1). Climate often plays a significant role in determining which diseases occur in particular places. Temperature and humidity are limiting factors for the survival of bacteria, viruses, fungi, and allergens in air. For example, bacteria can often withstand extreme temperatures but can be seriously affected by humidity. Viruses can survive in the air anywhere from a few seconds to a few hours. Fungi and pollen are suspended in the air. The survival and dispersal of these potentially disease-causing agents depends upon factors such as humidity, rain, wind, and temperature (Meade & Earickson 2000).

Most disease vectors, whether ticks, mosquitoes, or rodents, thrive best in particular biomes. Consequently, due to subtle differences in the ecological require-

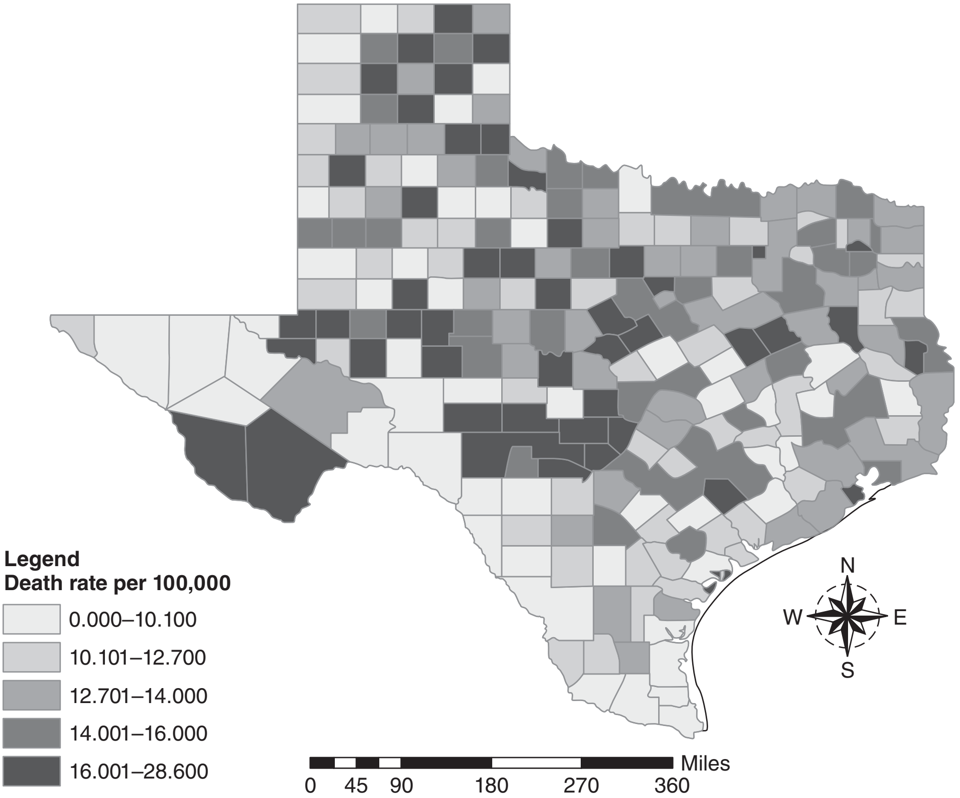

Figure 5.1 Suicide mortality rates by Texas County, 1980–1998. *Source*: Flanagan, W. (2006) Dissolved lithium concentrations, gender, race, and the geography of Texas suicide mortality rates 1980–1998: a correlation study. *The Eagle Feather* (http://www.unt.edu/honors/eaglefeather/2006_Issue/flanagan.shtml). Copyright 2006 Honors College, University of North Texas. Reproduced with permission of *The Eagle Feather*, University of North Texas.

ments of a range of disease vectors, an intricate geographical pattern of vector-borne disease in different parts of the world is the norm. For example, globally malaria infects between 100 and 200 million people each year with between 1 and 2 million deaths, however, 80–90 percent of cases occur in Africa. Temperature, humidity, and availability of clear water bodies (standing or slow moving) are key for the survival of the female anopheles mosquito, the vector of malaria. Consequently, such physical environmental characteristics determine the spatial limits of the disease – north/south latitudinal extent, altitude, desert areas – and its temporal (seasonal) limits. About 40 percent of the world's population lives in regions where malaria is endemic (Meade & Earickson 2000).

Even in areas with similar latitudinal location and environmental characteristics, the cultural ecology may provide protection or vulnerability to infectious disease. May (1958) describes the differential impact of malaria in Vietnam. The highland Vietnamese who built their homes on stilts, tied their water buffalo and cattle under

Box 5.1 Buruli ulcer

Buruli ulcer, caused by *Mycobacteria ulcerans,* provides a particularly poignant example of an environmental disease with unknown aetiology (Asiedu et al. 2000). Infection leads to extensive destruction of skin and soft tissue with the formation of large ulcers usually on the legs or arms. The disease typically starts as a painless swelling in the skin. A nodule, teeming with mycobacterium, develops beneath the skin's surface, and a toxin produced by the mycobacterium destroys skin tissue while suppressing the immune system. Massive areas of skin and sometimes even bone are destroyed, causing gross deformities, extensive scarring, restricted movement of limbs, and other permanent disabilities.

Although the exact mode of Buruli ulcer transmission remains unknown, researchers agree on environmental causation (WHO 2005). Proximity to water bodies is the most frequently cited environmental factor (Raghunathan et al. 2005). Swamps, slow moving streams, stagnant water, and artificial lakes are all associated with increased risk of Buruli ulcer (WHO 2005). In the Daloa region of Cote D'Ivoire, people who participated in rice farming were 2.57 times more likely to contract the disease than people who did not farm; people involved in corn farming were 2.5 times more susceptible than those who did not (Marston et al. 1995). Studies in Uganda associated cases with certain grasses, sage (Barker et al. 1972), and aquatic insects such as the Naucoris and Dyplonychus species (Eddyani et al. 2004).

Environmental modification, ranging from deforestation, dam, and road building, to farming and mining, has been associated with a higher prevalence of the disease. For example, in Benin, the rate of Buruli ulcer in environmentally modified areas was 180 per 100,000 compared to 20 per 100,000 in other areas (Asiedu et al. 2000). Soil arsenic level has also been associated with the disease; areas with arsenic-enriched soils had higher prevalence rates (Duker et al. 2004). Finally, land elevation has also been associated with Buruli ulcer prevalence. Low lying areas have a higher prevalence than areas of higher elevation probably because they are catchments for water and other materials, for example arsenic (Duker et al. 2004).

Buruli ulcer has been reported in over thirty countries mainly with tropical and subtropical climates. In Africa, it was first detected in Uganda, but is now present in all countries along the Gulf of Guinea. In Côte d'Ivoire, up to one-sixth of the population in some villages is affected. Comparably high rates have been reported in Benin, Ghana, Cameroon, and the Democratic Republic of Congo, but underreporting may be a big problem. Some cases have been reported from China and Brazil where it may be endemic in the areas bordering French Guyana. Buruli ulcer is the world's third leading mycobacterium Buruli Ulcer Bb (for additional information, go to http://www.who.int/gtb-buruli/).

their homes on the ground and cooked with firewood in their homes, were less severely affected than the lowland Vietnamese who built theirs on the ground, kept their animals in barns, and cooked in sheds that were separated from their homes. Epidemic malaria, spread by the local species of anopheles mosquito – a nocturnal feeder and weak flier, deterred by the heights of the stilts and the smoke in the homes – decimated the lowland Vietnamese whose cultural practices provided easy access during the feeding times of the disease vector. While the two groups lived in the same physical environment, the cultural practices of the lowlanders created an environment that made them more vulnerable compared to their peers whose practices provided a formidable barrier against disease.

Similar climate-dependent and latitudinal variations in degenerative diseases have also been observed. For example, the link between latitude and multiple sclerosis has been researched for decades. Kurtzke (1993) identifies three "bands" of prevalence rates: a high prevalence band from 37 to 52 degrees latitude, a medium prevalence zone from 30 to 33 degrees latitude, and a low prevalence zone from 12 to 19 and 63 to 67 degrees north latitude. This correlation with latitude applies even outside the Americas. Nevertheless, efforts to unravel what factors in these "high prevalence bands" account for the geographic distribution of multiple sclerosis have proved futile, and conventional meteorological variables have been ruled out (Norman et al. 1983). Similarly, seasonal variations of coronary heart disease have been demonstrated with winter peaks and summer troughs, both north and south of the equator (Pell & Cobbe 1999).

Social environment

A person's social context can drastically affect their vulnerability to disease. The World Health Organization's *Commission on Social Determinants of Health* states that the toxic combination of bad policies, economics, and politics is, in large measure, responsible for the fact that a majority of people in the world do not enjoy the good health that is biologically possible (CSDH 2008). Even after considering a person's physical environment, behaviors, and genetics, the social environment strongly influences health and disease. The social environment in which one lives includes the presence of social and cultural groups, their relationships, and the societies in which they are embedded. Socio-economic differentiation based on income, gender, culture, and education is also part of the social environment.

An excellent example of this is how social class impacts health and disease (Marmot 1986; Harpham et al. 1988). The Whitehall Studies conducted in England (Marmot 1986) linked social status to health by demonstrating that clerical/manager civil servants had three and half times the mortality rates of senior administrator civil servants. Also, mortality rates due to coronary heart disease for men age 15–64 and respiratory disease for men 65–74 increased with each successive drop in socio-economic status. Amazingly this trend held true for all cases of mortality over time during the period of the study. Marmot et al. (1987) concluded that all modern analyses must now control for social class as they do for sex.

Social class is strongly related to other social factors such as poverty, which has often been linked with disease. This is true on a global scale, where most of the disease burden in low-income countries is rooted in poverty, poor nutrition, indoor air pollution, and lack of access to proper sanitation and similar factors. In fact the World Health Organization estimates that diseases associated with poverty account for 45 per cent of the disease burden in the poorest countries (Stevens 2004).

Tuberculosis (TB) exemplifies the links between poverty and disease. While one-third of the world's population is infected with latent tuberculosis, 98 percent of the world's active TB cases are in developing countries. Persons with active TB have symptoms and feel sick, whereas those with latent TB are infected but have no symptoms. The concentration of active TB in developing countries is strongly related to poverty. The poor live in conditions of high stress, poor nutrition, crowded housing, and poor sanitation, resulting in weakened immune systems which make them vulnerable to TB. Studies have shown that poverty is a risk factor for contracting TB while race/ethnicity is not (Hawker et al. 1999; Elender et al. 1998). Furthermore, after contracting the disease, persons with reduced immunity and resistance produced by inadequate nutrition and relatively poor living conditions have a higher risk of developing active TB. Finally, the chance of being diagnosed and treated depends on the programs and services offered in the area a person resides; services are often unavailable and unaffordable for the poor, increasing their risk of death from TB.

The geographic distribution of HIV/AIDS provides another excellent illustration of how the social environment impacts disease risk and spread. Differences in sexual behavior norms create spatially variable risk of disease exposure. Poor health systems in countries with high HIV rates increase people's risk of exposure to HIV in health care facilities. This is the situation in sub-Saharan Africa, the region most severely affected by HIV/AIDS. By December 2007, it had 68 percent of the world's HIV/AIDS cases, about 90 percent of its HIV-infected children and experienced 76 percent of AIDS deaths reported that year (UNAIDS 2007). The devastation of HIV/AIDS varies throughout the region, however. National adult prevalence rates range from less than 1 percent in some countries to more than 15 percent in Southern Africa. In fact, HIV prevalence exceeds 15 percent in 8 Southern African countries – Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe (UNAIDS 2007). At a local scale, regions, districts, villages, or ethnic groups coping with high levels of infection are scattered across countries with low prevalence. In such high-infection environments, routine sexual activities and use of health care facilities carry high risk of HIV infection.

With one in three of the adult population infected, Swaziland had the world's highest AIDS prevalence rate in 2007. King Mswati, the so-called "playboy" king, banned sexual relations with girls under age 18 for five years in 2001, but shortly after became engaged to a 17-year-old woman, although he already had 12 wives. The polygamous lifestyle of the 38-year-old monarch, an environment of traditional practices, including child marriage, polygamy, and widow inheritance, compounded by the comparative powerlessness of women in Swazi culture, provides an optimal environment for HIV spread. In addition, the limited economy that sends men to work in South Africa for long periods of time separating them from their families is an important factor. As of 2007 fewer than 20 percent of the population knew their HIV/AIDS status because of severe stigma and shortage of resources.

In 2006, South Africa had the world's largest number of people living with HIV/AIDS. An estimated 5.5 million people were infected; many were not aware of their HIV status. The HIV/AIDS prevalence rate was 18.3 percent in 2006, significantly higher than the rate in sub-Saharan Africa (5.0 percent) (UNAIDS 2007). Young females, particularly those aged 15–24 are significantly more likely to be HIV-infected, and females aged 25–29 have the highest rates of infection in the country. Overall females account for 55 percent of the adult cases. Average life expectancy was estimated in 2007 at a mere 47 years for men and 49 for women, instead of the estimated 64 years if there had been no HIV/AIDS (UNAIDS 2007). In 2006, it was estimated that 21 percent of teachers in South Africa were living with HIV (UNAIDS/WHO 2006). Despite South Africa's strong economy, only a third of those needing treatment were getting antiretrovirals in 2007. President Thabo Mbeki has questioned the link between HIV and AIDS and the efficacy of antiretroviral drugs, while the health minister has been widely criticised for promoting nutrition and herbal treatments instead of antiretrovirals.

Neighborhood environments and health

The location and condition of one's neighborhood is yet another dimension of social environment influencing disease risk. Food deserts provide good insight into how the neighborhood in which one lives can affect their health. A food desert is a neighborhood or community with limited or no access to foods necessary for maintaining a healthy diet. Often the result of urban sprawl, a food desert is void of grocery stores (that have moved to suburban locations), but served by plenty of fast food chains. Long travel distances to grocery stores make it difficult for residents of food deserts to eat healthy meals at home. Consequently, residents may be at risk for poor diets and associated problems of cardiovascular disease, obesity, and hypertension. A study conducted in south Los Angeles, observed that poorer neighborhoods with a higher proportion of African American residents have fewer options available for purchasing healthy foods and eating healthy foods outside the home (Lewis et al. 2005). Lack of food opportunities made it difficult for residents to maintain a healthy diet.

Zenk et al. (2005) explain that "four of the 10 leading causes of death in the United States are chronic diseases for which diet is a major risk factor." Racial disparities in the burden of these chronic, diet-related diseases are well documented, with African Americans often having the highest morbidity and mortality. Because health risks and resources are spatially and socially structured and African Americans disproportionately live in economically disadvantaged neighborhoods, increased attention focused on how residential environments shape health and contribute to racial disparities in health. An extensive body of literature now associates residence in economically disadvantaged neighborhoods, with a variety of adverse diet-related health outcomes (Zenk et al. 2005).

Turshen (1984), using examples from the impact of colonialism and capitalism on disease in Tanzania, has criticised research approaches that separate illness and health from political struggles. Hanchette (2008), looking at the political ecology of lead poisoning in North Carolina, argues that although occurrence of lead poisoning throughout the United States has declined since 1991, many areas still face pockets of high lead poisoning rates which cannot be explained by poverty, race, or housing characteristics alone. The lead poisoning concentration in eastern North Carolina is linked with the production of tobacco, which is the primary agricultural product in the region and has dominated the economic landscape of eastern North Carolina. Hanchette shows that the spatial distribution of lead poisoning corresponds strikingly with the flue-cured tobacco markets in previous decades.

Kalipeni and Oppong (1998) argue that the desperation and destitution prevailing in refugee camps provide an optimal environment for the emergence and spread of disease. This is due to the chaotic nature of war and violence that produces refugees and environmental conditions in the camps. By disrupting livelihoods including agricultural production, food supply, health service provision, and contributing to famine and widespread malnutrition, the geographically uneven violence that produces refugees facilitates disease spread. Health services are similarly disrupted. Inside refugee camps, we often find an environment where poor sanitation, contaminated food and water, and overcrowding make diseases bloom.

Built environment

Another factor that influences disease prevalence is the built environment – structures that humans have created for themselves. The built environment includes not only houses, office buildings, factories, and facilities like highways and incinerators, but also building and zoning codes that regulate land use. Humans spend much of their time inside buildings, therefore it is important to consider what people are exposed to while occupying these spaces. Such diverse factors as pets, lighting, age of the building, and types of technology used may all affect human health. Modern industrial society has created new environments that humans never have been exposed to before. New structures, such as interstate highways, often bring unwanted side effects such as pollution (see Chapter 22 this volume). Although disease and illness may be caused by a virus or toxic substance, socially constructed environments create the circumstances in which people come into contact with these disease-inducing agents (Gesler et al. 1997).

Many facets of the urban built environment can be conducive to good health, such as access to education, health care, social support, physical security, and material resources. However, the urban environment also brings risks – poor sanitation, crowding, accumulation of human excrement and household waste, social disorder, industrial and other accidents, pollution, and so on (McMichael 1993). Headaches, eye strain, respiratory problems, communicable diseases, depression, stress, anxiety, injuries, car accidents, and cancers can all be negative outcomes of poor-quality urban environments.

One way in which the built environment affects health is its influence on physical activity and obesity. Gordon-Larsen et al. (2006) find that recreational facilities are less available in areas where disadvantaged populations live. This in turn leads to decreased physical activity and increased obesity. The built environment also affects whether one engages in an active or more sedentary mode of transportation. Frank et al. (2007) suggest that creating walkable environments results in higher levels of physical activity, less driving, and slightly lower obesity prevalence.

Sick building syndrome is a general term for the multiplicity of health problems that can occur just by being in an indoor environment. Health problems can arise due to the type of paints and solvents used, heating, venting, and air conditioning (HVAC) systems, presence of molds and fungi, air quality, lighting, and acoustics. Numerous studies describe health problems that occur just by being indoors. For example, Burt (1996) finds that over-exposure to infrasound (sounds below 20 hertz) can cause symptoms such as fatigue, headache, nausea, concentration difficulties, disorientation, seasickness, digestive disorders, cough, vision problems, and dizziness. Stevens and Rea (2001) show that electric lighting systems potentially contribute to circadian and endocrine disruption and may increase the risk of breast cancer in industrialised societies. Building-related diseases not necessarily associated with sick building syndrome include Legionnaires' disease and viral infections that spread among workers.

Sick building syndrome is just one example of built environmental changes associated with the broader process of urbanization. Urbanization is perhaps the most important contributor to environmental changes that affect human health. Some of these effects are positive such as the decline of child mortality and the treatment of sewage and water. However, increased population densities in cities have facilitated the spread of infectious diseases such as measles, tuberculosis, and HIV/AIDS. The ease and efficiency of travel has made it possible for diseases to cover large distances in a short amount of time.

The urban situation, while producing numerous economic and health advantages for some, is rapidly deteriorating in many developing countries because of excessive population growth, poor levels of hygiene, and increasing urban poverty. Aside from densely packed housing in shanty towns or slums, there exists inadequate drinking-water supply, garbage collection, and surface-water drainage systems which combine to create favorable habitats for communicable diseases. As a result, diseases such as malaria, lymphatic filariasis, and dengue are major public health problems associated with rapid urbanization in many tropical countries (Knudsen & Slooff 1992).

Urbanization can influence health in a wide variety of direct and indirect ways. It changes social relationships and behaviors. It exposes people to new microbiological, chemical, and physical hazards. McMichael sums up why urbanization is one of the most important factors to be considered in public health:

> City living is the keystone of human ecology. Humans are social animals, craving comfort, security, variety and opportunity. Cities are sources of ideas, energy, creativity and technology. They can foster enlightened, congenial multicultural living. However, cities also continue to be sources for poverty, inequality and environmental health hazards. Populations in the cities of less developed countries typically experience the double environmental health jeopardy of the traditional risks from infectious diseases and the physical and chemical hazards that accompany poorly regulated industrialization, substandard housing, traffic hazards, and social violence (2000: 1123)

The health related problems that result from urbanization will require a multidisciplinary approach to identify solutions. Combining insights from disease ecology, epidemiology, urban planning, and medical/health geography is essential for understanding how urbanization influences population health and developing effective policy responses.

Discussion: Towards Vulnerable Places

Historically, the disease ecology framework has provided a useful framework for examining the major components of spatial variations in disease. In this regard, the key contribution of health/medical geographers has been to underscore and illuminate the importance of the environment, particularly its spatial variation, as a factor in disease causation. However, recent work on the complex ecologies of disease suggests the need for a new concept – vulnerable places. Whether it involves risk behaviors, population, or place characteristics, vulnerability to disease is inevitably tied to specific places. The behaviors and choices of vulnerable people create vulnerable environments that weaken or undermine people's resilience and result in poor health. For example, in their study of the health-related behaviors of residents in four neighborhoods in Glasgow, Ellaway and Macintyre (1996. See also Chapter 21 this volume) show that after controlling for the effects of gender, age, social class, and household income, residents' behavior relating to diet, smoking, and exercise were directly affected by the particular neighborhoods in which they lived.

Basically, more disadvantaged people tended to live in more disadvantaged places and were more vulnerable to poor health. In contrast, "socio-residentially advantaged" residents, lived in more affluent districts, were less likely to live in overcrowded accommodation or, if male, to be unemployed. They were most likely to own a car and be of higher socioeconomic status. They were also most likely to eat healthy foods, least likely to eat unhealthy food or smoke, and most likely to enjoy sporting activities. The authors suggested that place characteristics were crucial in understanding differences in health and wellbeing. Similarly, socially and economically impoverished settings exacerbate health disadvantage. Curtis and Jones (1998) argue that the relationship between social class and its geographical location, capital, power, and control have a particular geographical dispersal. Health disadvantage can thus arise from any combination of the material conditions in the physical environment, such as quality of housing and employment opportunities; the range and quality of services and amenities available, such as food outlets, health services and parks; and the overall ecological state.

In essence, the geographic concentration of vulnerable peoples creates an environment of heightened vulnerability to disease, while vulnerable places attract vulnerable people. Lacking the power to oppose environmentally unsafe development, the poor are more likely to be located near such developments, while the healthy and powerful migrate to safer destinations. Thus, the spatial concentration of disadvantage increases. In the United States, such poor regions tend to lack opportunities for nutritious foods, recreation, high-quality education and employment. They often lack health care facilities due to low numbers of insured residents, and have high crime rates. Thus, the spatial concentration of vulnerable people creates vulnerable places that are least able to resist disease. Healthy people who live in such vulnerable places are more likely to have poorer health status compared to those living in more advantaged places.

Conclusion

Clearly, then, environment is important as a factor in understanding the geography of disease spread, but rather than viewing environment in narrow physical terms, as geochemistry or climate, a wider view is warranted that includes the social and built environments. In fact, we advocate reframing the environmental component of disease ecology to combine the physical, social, economic, and other factors that characterise spatial variations in vulnerability to disease, and to consider place vulnerability and vulnerable places. Geographers should take the lead in developing this intrinsically geographic concept which has wide applicability to health and other disciplines. Indeed where you live influences your vulnerability to disease.

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Chapter 6

Mapping Disease

Stéphane Rican and Gérard Salem

Introduction

Health maps have become widespread. The increased availability of local health data, the development of software solutions, progress in computer capabilities, and a growing interest in health inequalities have promoted the rising profile of health mapping. There are now many health atlases permitting, at national, regional, or local level, the study of health disparities. The paper form of the map has increasingly been supplemented or supplanted by digital and web forms, allowing rapid updating and online consultation. Recently we have seen the emergence of user-led map production.

But if maps continue to fascinate, they are not without problems when it comes to the analysis of health issues. Maps have many advantages in representing health information. Cartographic representations can illustrate important points in a succinct fashion: they are useful for descriptive purposes and decision-making (Brewer 2006; Gatrell 2002; Pickle 2002). They display local health variations and highlight specific disease clusters or concentrations of people at risk. They can also be used for analytical approaches, to explore the impact of possible exposure sources, for example. But beyond their visual power, these representations can never trace the complex processes at work in the creation, for example, of health inequalities. A map is the result of a succession of choices (scale, level of generalization, data, smoothing technique etc.). Each choice may influence the final representation (Monmonier 1991). Particular attention must also be given to the conditions under which the map is produced – by whom, for what purpose, and for which audiences? In some situations, it is difficult to translate phenomena of interest to health researchers and policy-makers into map form.

In the following pages we first consider historical aspects of mapping diseases. We then focus on uses and misuses of maps, including the capacity of the map to answer spatial questions. This section is illustrated by studies from France. We also discuss innovative strategies for the dynamic display and visualization of health data. We conclude by setting out new challenges for mapping diseases.

Mapping Diseases: Historical Aspects

It is impossible to draw up a comprehensive overview of the many attempts to map diseases. Recent studies that provide detailed discussion include (Howe 1986, 1989; Cliff & Haggett 1988; Barrett 2000; Walter 2000; Thouez 2003).

Mapping disease is now a common practice, perhaps even a banal practice. It has been facilitated by developments in software capabilities including geographic information systems (GIS) and internet mapping systems such as Google Earth, advances in geocoding, and increases in data availability. Nonetheless, interest began at the end of the eighteenth century. A "spot map" of yellow fever in New York published by Seaman in 1798 is widely regarded as the first map of the distribution of a disease. Barrett (2000) also mentions an unpublished global map of diseases by Finke in 1792. Throughout the nineteenth century, maps accompanied the analysis of epidemic events (cholera in Europe, yellow fever in the United States) and were used in the miasma-contagion debate. These maps were most often "spot maps" with cases represented by dots. They were used for cluster detection.

The most famous was the spot map by John Snow in London, in the second edition of his essay: "On the mode of communication of cholera." Published in 1854, this map supported his hypothesis about the spread of cholera through contaminated water, insofar as the map showed spatial clustering of cholera cases near a particular water pump (Brody et al. 2000). Very quickly, interest in the analysis of the spatial distribution of disease extended to chronic and degenerative diseases, and underlying population denominators were taken into account. In 1875, Haviland analyzed the distribution of the crude death rates for chronic diseases, including cardiovascular diseases, cancers, and tuberculosis in England and Wales. In the 1920s and the 1930s, Stocks produced a series of cancer mortality maps for England and Wales, including, for the first time, an adjustment for age, sex, and the level of urbanization for each county. More recent work in the post-World War II era included the production of atlases of disease by May and by Jusatz (Meade & Earickson 2005).

Starting in the 1950s and 1960s, spatial analysis techniques developed quickly, allowing statistical analysis of spatial patterns. Techniques like spatial autocorrelation, cluster analysis, geographical smoothers, empirical Bayes methods, correlation, and regression further enhanced the utility of mapping and pointed in new directions. At the same time, improvements in health data coverage at national and local levels, allowed the production of many atlases on mortality, morbidity, or risk factor exposures. Following the work of Howe in England, the production of health atlases increased in the 1960s and 1970s. More recently, the interactivity permitted by the worldwide web has furthered the impetus for map production, allowing users to create and display their own maps. For example, the web site for the *Atlas of Cancer Mortality in the U.S.* allows users to create customizable maps of cancer mortality for a wide variety of cancer sites for varying time periods and levels of geography (http://www3.cancer.gov/atlasplus/). Geographic information systems, which allow the integration of a multitude of data layers including those of remote-sensing origin, make it possible to overlay health information with data describing the natural, built, and social environments (Twigg 1990; Bullen et al. 1996; Albert et al. 2000; Cromley & McLafferty 2002; Maheswaran & Craglia 2004).

Objectives for Mapping Diseases

Widely used today, as much in epidemiological studies as in geographical research, mapping has several objectives. Two major functions can be identified: the map as analysis tool and the map as communication tool. Of course neither role is exclusive. Maps contribute to verifying hypotheses concerning factors associated with the distribution of diseases (for example, sources of exposure, social determinants). As communication tools, maps can be used to highlight populations at risk or to anticipate situations of risk. These roles are often complemented by geostatistical tools of spatial analysis and visualization.

In every case, a map is an interpretation and a graphic translation of an external real-world reality. The map links geographic identifiers (spatial units or geographical objects) with information about these locations (thematic information). The spatial entities can be points (patients, care units, cities), lines (roads, rivers), fields (continuous surface data such as temperature), or areas (administrative areas, census tract). The thematic information can be either qualitative in nature (e.g. a typology or photograph) or quantitative (numbers, rate, ratio, density). The goal of cartographic representation is to communicate this information graphically with minimal distortion.

Investigative maps

One of the first objectives of a map is to be able to locate a phenomenon and report relevant spatial associations. The distribution of cases may not be known and the display of cases (death, disease, risk behavior) on a map can allow the identification of possible concentrations, spatial continuities or discontinuities, gradients etc. If the cases are accurately geocoded according to the place of residence, the place of diagnosis, or the place of care they can be represented by dot-points, every point representing a case. When the cases are aggregated within a spatial grid, the corresponding numbers can be represented either by dot-points (a proportional number of points distributed randomly within the area, or by proportional symbols centered on every spatial unit (Figure 6.1). In the first case, the map allows us to understand the densities of patients, in the second, the focus in on the proportional impact on an affected population.

These maps help to analyze and identify the location of diagnosed health events. They locate the populations that need to be addressed by the health care system. Large numbers of cases typically occur in areas with large populations: this is evident in Figure 6.1, which shows that the largest number of road accidents in France occurs in the densely populated Paris region.

In contrast, maps of standardized rates can compare the relative importance of health events independently of the main factors associated with their variation (population, age, social composition, level of urbanization). Rates can be calculated by any method, such as dividing cases by an appropriate denominator population

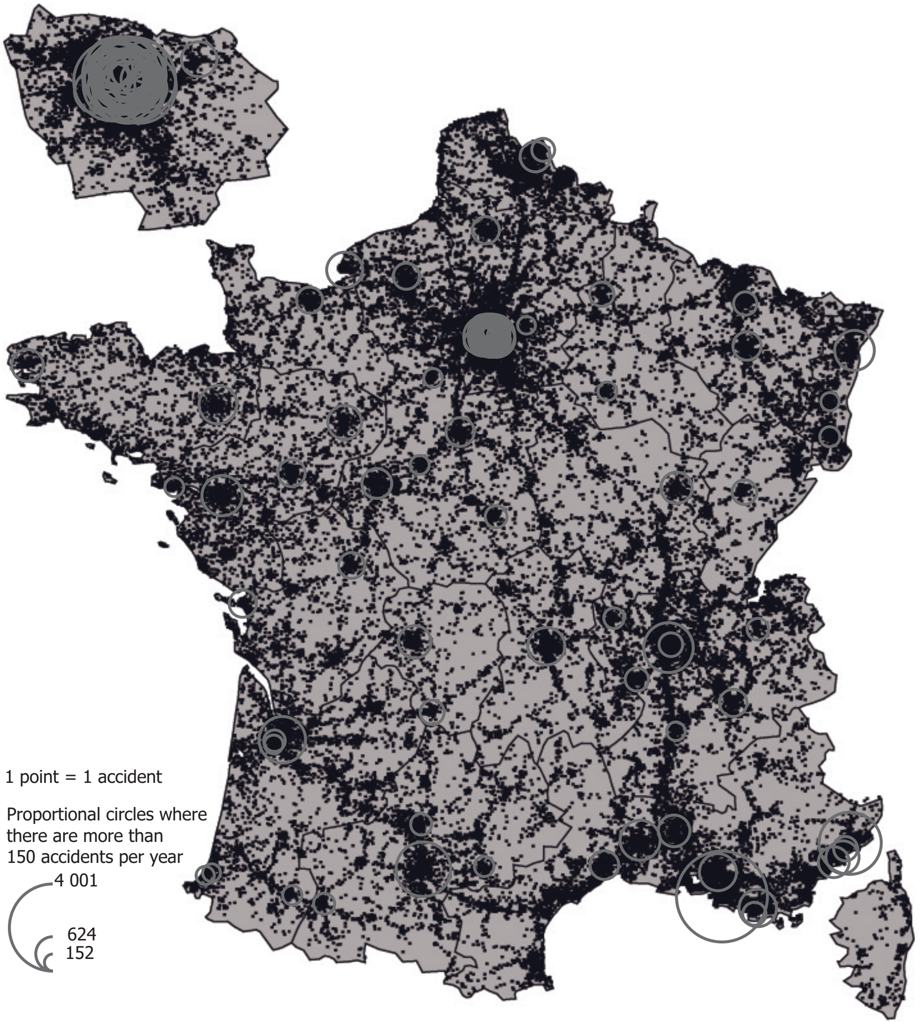


Figure 6.1 Annual total of car accidents, by commune in France, 1996–2000. *Source*: Salem, G., Rican, S., and Kurzinger, M.L. (2006) *Atlas de la Santé en France. Vol. 2. Comportements et Maladies*. John Libbey Eurotext, Paris. Reproduced with permission from *Atlas de la Santé en France*, pub. John Libbey Eurotext.

or using direct or indirect standardization methods. Once rates have been computed, choropleth mapping can be used with colors of varying intensity to symbolize ranges in the data. Note that these rates are spatially "filtered" (or "smoothed") insofar as data on both disease cases and denominator population are aggregated over space, either based on geopolitical zones or user-defined regions (Rushton 2003).

Debates about resource allocation generally involve the analysis of maps of both absolute numbers and maps of rates. The example of "avoidable" mortality in

France is a good illustration. This indicator includes a set of causes of death arising before 65 years of age. We consider that these deaths could have been avoided if curative and preventive care had functioned well (Salem et al. 2000). The analysis of standardized rates of avoidable death for "*bassins d'emplois*" (employment regions) in France reveals very strong disparities with a ratio of 1 to 5 between the lowest and the highest rates (see Figure 6.2). The spatial distribution is characterized by a strong regional pattern, with the northern and central region (high rates) contrasting with the western center, south-west, and the Mediterranean regions with low rates.

Analyzing the numbers of deaths which could have been "avoided" shows a different pattern, emphasising the Paris basin, big cities, and the Mediterranean coast – areas with high population densities. In order to examine the trade-offs between equality, equity, and efficiency in planning and evaluating health care resource distribution we need to consider both maps.

These investigative maps constitute a first indispensable stage in the analysis of the spatial distribution of a health phenomenon. They reveal visually the existence or the absence of spatial patterning. They are at the heart of numerous health atlases. Displaying disparities and spatial patterns leads inevitably to the elaboration of hypotheses about associated factors. These hypotheses will reflect choices about the scale of analysis, indicators, and graphic representation: many biases can intervene, linked in particular to small numbers. It is thus necessary to be able to understand statistically the spatial patterns that maps track down visually.

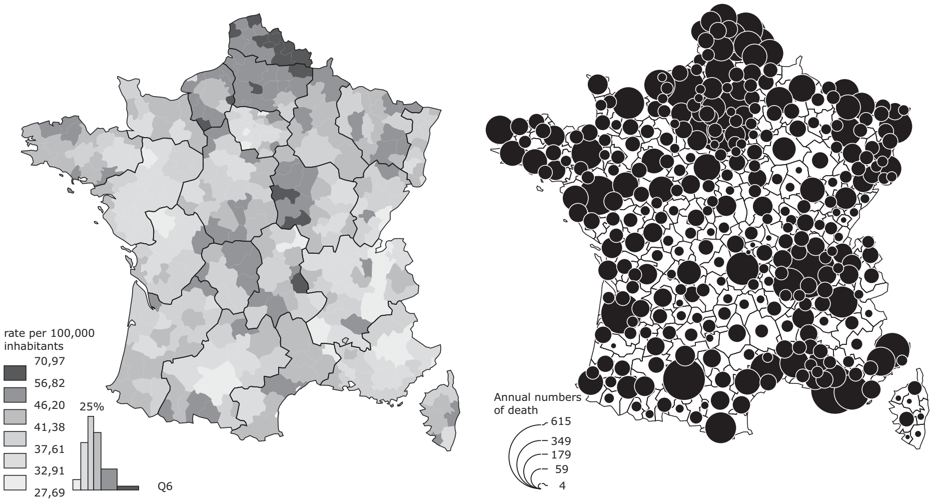


Figure 6.2 "Avoidable" death in France by employment region, 1997–2001. *Source*: Salem, G., Rican, S., and Jougla, E. (2000) *Atlas de la Santé en France. Vol. 1. Les Causes de Décès*. John Libbey Eurotext, Paris. Reproduced with permission from *Atlas de la Santé en France*, pub. John Libbey Eurotext.

Maps for understanding

Health outcomes are often rare or infrequent; and, they are even less frequent if they are geolocated in "small areas." Mapping health data for small areas – areas with small populations – raises a host of statistical problems. Disease rates calculated for small areas/populations are unstable and vary greatly over time due to random variation (Bailey & Gatrell 1995). Consequently, it is necessary to be able to distinguish "true" from random areas of disease excess. Numerous techniques have been developed to try to validate the existence of spatial clusters of disease. We shall not detail here all these methods (for detailed information see Bailey & Gatrell (1995), Elliott et al. (2000), Rushton (2003), and Waller & Gotway (2004)). Rather, we focus on cartographic approaches to: (1) point data concerning possible concentrations of cases in connection with a source of exposure and (2) aggregated data on the distribution of rates across a spatial grid where the interest concerns questions about rate variation between areas.

Dot-point analysis

The analysis of dot-points is often used to track down unusual concentrations of cases across space. These concentrations can be tested by various criteria: their geometrical pattern, their association with the distribution of the population or other associated factors, their linkage with previous cases, or sources of contagion.

Two types of method allow us to identify the existence of unusual concentrations. The first involves analyzing the distances separating cases: concentration is equated with small distances between cases while dispersion is linked to high distances. The observed average distances are generally compared with the average distances stemming from a completely random process (normally a Poisson process) or with known average distances for population at risk. These tests are strongly influenced by the size, shape, and extent of a study area; it is often necessary to add correctives to these tests for boundary (edge) effects (Elliott et al. 2000).

The second set of methods concerns the density of cases across a surface. This technique applies "moving windows" to the study region and determines the significance of the number of cases that occur within the windows. Observed-numbers can be compared to numbers that would be expected based on a random process. Results depend on the size and form of the windows (circle, square, rectangular); using a small window results in a spiky map that shows local areas of concentration, whereas using a large window results in a smooth map that highlights regional scale variation. It is generally necessary to repeat the process for different-size windows and with different starting windows. Both methods are able to validate the existence or the absence of case concentrations.

Numerous applications of these techniques exist. One of the earliest was the geographical analysis machine (GAM), a "density" method developed by Openshaw and colleagues (1988). While Openshaw's method was heavily criticized, it revealed unnoticed concentrations of childhood leukemia in England. Since the 1980s, many new methods for identifying spatial clusters of health events have been developed. These new methods overcome some of the statistical problems associated with earlier approaches (Rushton & Lolonis 1996) and they address new issues such as analyzing clusters in space and time (Rogerson 2002), identifying irregularly shaped spatial clusters (Alstadt & Getis 2006), and assessing the impacts of covariates such as age, gender, and risk behaviors on cluster locations.

Rates analysis

Point data are not systematically available for health information because of confidentiality and privacy considerations. Cases are more often aggregated to the area-level and rates are calculated by taking into account the structure of the population by age, sex, or social category. In assessing the spatial distribution of these rates we try to answer the following question: are close areas more alike than distant ones, and do high-rate areas cluster in space? This calls for the measurement of the degree of spatial autocorrelation (spatial clustering of similar values) using the approaches of Moran or Geary (Cliff & Ord 1981). A positive spatial autocorrelation indicates similarity between the rates of nearby areas and a negative spatial autocorrelation corresponds to the contrary situation where rates for distant areas are more alike than rates for close areas. An absence of spatial autocorrelation indicates the absence of an underlying spatial structure – no association among rates based on location.

This degree of autocorrelation can be measured for various levels of neighborhood. A correlogram expresses the change in spatial autocorrelation based on varying definitions of neighborhood. This technique used for mortality rates by respiratory diseases allows us to confirm the strong regional component to mortality in France (see Figure 6.3). The spatial autocorrelation is positive with vast continuous homogeneous areas.

When local variations are dependent on small numbers, smoothing techniques allow us to highlight the main regional patterns by erasing micro-local variations. Smoothing techniques adjust the rates of every zone by taking into account rates in neighboring areas. The result of the smoothing will depend on the way the neighborhood is defined and on the function used for the calculation of the smoothed values (average, weighted averages according to the distance from areas etc.). These parameters are fixed according to the spatial characteristics of the studied phenomenon, by taking into account the level of spatial autocorrelation or the variogram of the distribution (Haining 2003). Applied to standardized mortality ratios (SMRs) at the cantonal scale in France, smooth data confirms regional patterns of the distribution of mortality (see Figure 6.4). Contrasts between central areas and peripheral areas appear, corresponding to the contrast between urban areas, which have lower mortality due to their better economic situations, and rural areas which are less favored. Smoothing techniques can also erase significant local variations, such as are evident in the Parisian area. When numbers are very small, Bayesian smoothing techniques are more suited (Elliott et al. 2000).

These techniques, however sophisticated and precise they are, are subject to many limitations. It is necessary to be cautious in interpreting smooth maps. Comparison studies of various methods for the analysis of the same phenomenon show that results are conditioned by the choice of method (Elliott et al. 2000). The size of the

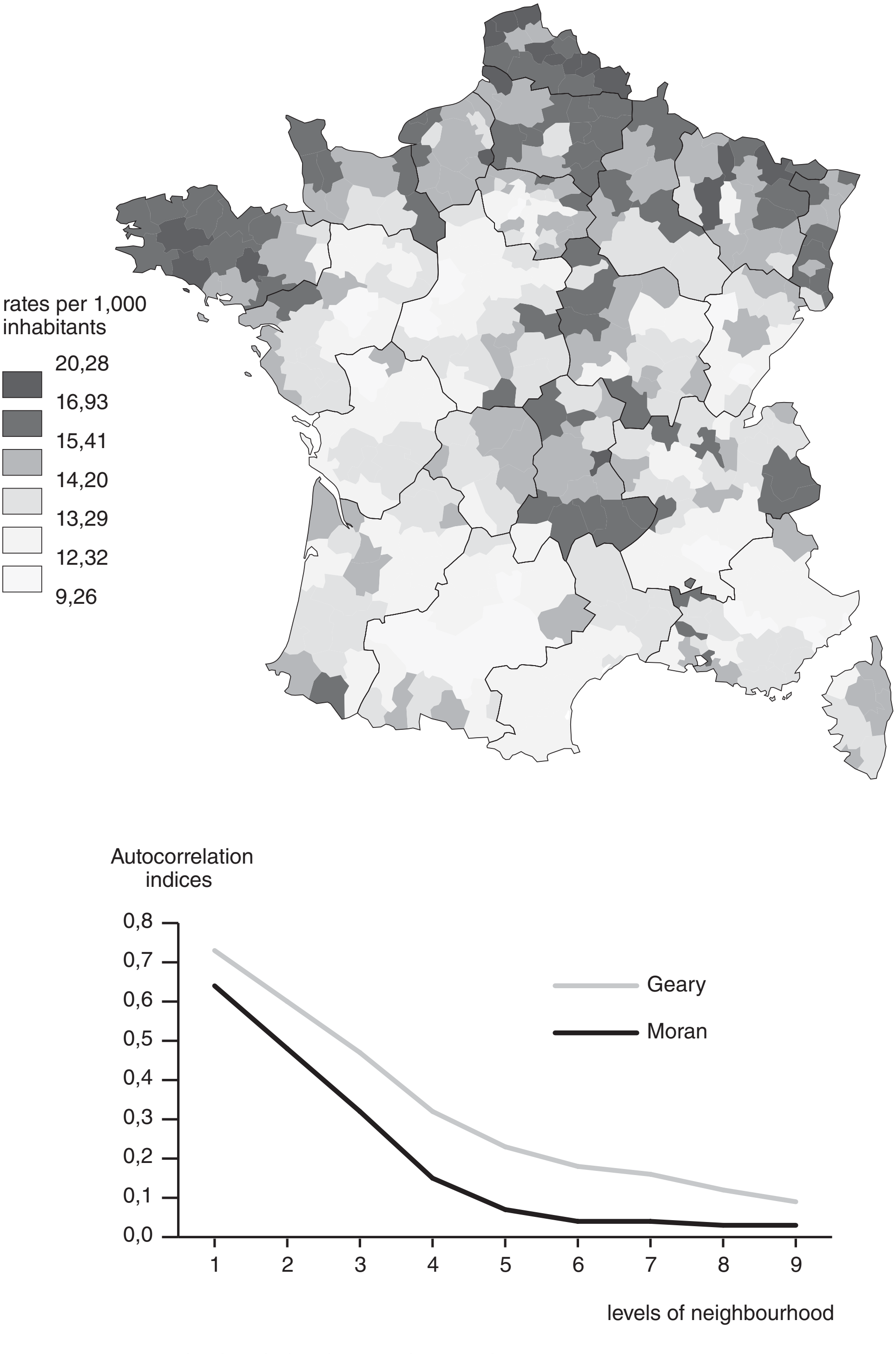


Figure 6.3 Standardized death-rates by employment region in France, 1988–1992. *Source*: Salem, G., Rican, S., and Jougla, E. (2000) *Atlas de la Santé en France. Vol. 1. Les causes de décès*. John Libbey Eurotext, Paris. Reproduced with permission from *Atlas de la Santé en France*, pub. John Libbey Eurotext.

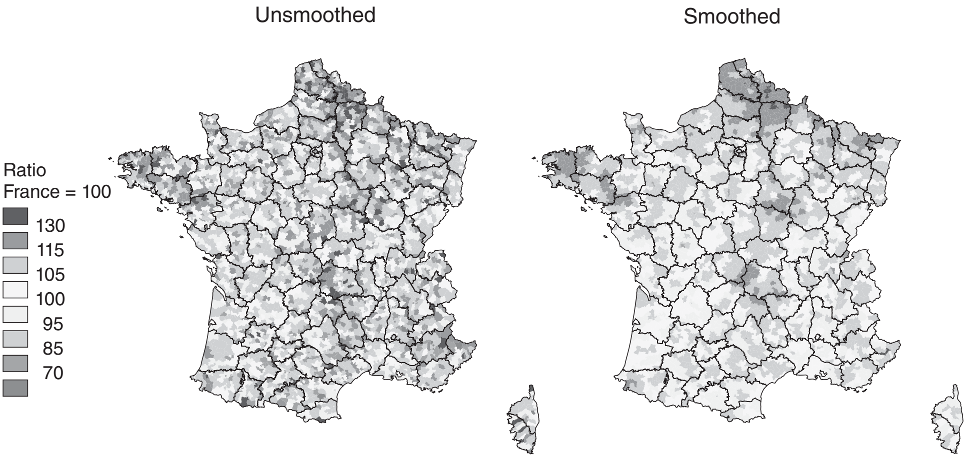


Figure 6.4 Standardized mortality ratio at cantonal scale in France, 1997–2001. *Source*: Salem, G., Rican, S., and Kurzinger, M.L. (2006) *Atlas de la Santé en France. Vol. 2. Comportements et Maladies*. John Libbey Eurotext, Paris. Reproduced with permission from *Atlas de la Santé en France*, pub. John Libbey Eurotext.

smoothing window, form of the neighborhood weights matrix, and choice of smoothing function can each influence the final result. There is no single best approach and every method must be developed in connection with the research hypotheses.

Cartograms

An innovative approach to mapping health data involves the use of cartograms. Cartograms are maps in which the sizes of areal units have been distorted in proportion to their populations or socio-environmental characteristics. On a traditional map, the sizes of areas correspond to their land areas; on a cartogram, the sizes of areas correspond to their populations or other characteristics. Danny Dorling (2007) has created a series of cartograms to depict inequalities in health and health care availability at the global scale. The sizes of countries represent their levels of ill-health. For example, Dorling's map of early neonatal infant mortality reveals the huge concentration of infant deaths in South Asia and Africa. Places like Japan, Australia, and Western Europe almost disappear from the map because of their small numbers of infant deaths. Data and visual impact are in agreement on a cartogram – areas with the most pressing health concerns appear largest on the map. The disadvantage of cartograms is that they are unfamiliar. It is difficult to find places on a cartogram because they look different. However, as we become accustomed to the strange "shape" of cartograms, they can offer dramatically new perspectives on health and wellbeing.

Mapping disease combinations

Disease maps mainly concern the spatial distribution of one disease, however an important question is: how, in the same space, do various diseases combine? This question has received little attention (Salem et al. 2000; Rican et al. 2009). Multivariate techniques allow us to classify areas according to their similarities on various health indicators. We illustrate these methods by analyzing mortality by cause profiles for employment areas in France (see Figure 6.5). Age standardized rates are calculated for different causes of death in each area and a typology of these areas is constructed, bringing together all the areas with the same structure of mortality according to causes of death. We can see that six groups are defined. In order to describe these different groups, the local position for each cause of death in relation to the national situation is assessed, with a plus when the level of mortality is higher than the national average and a minus when the level of mortality is lower than the national average.

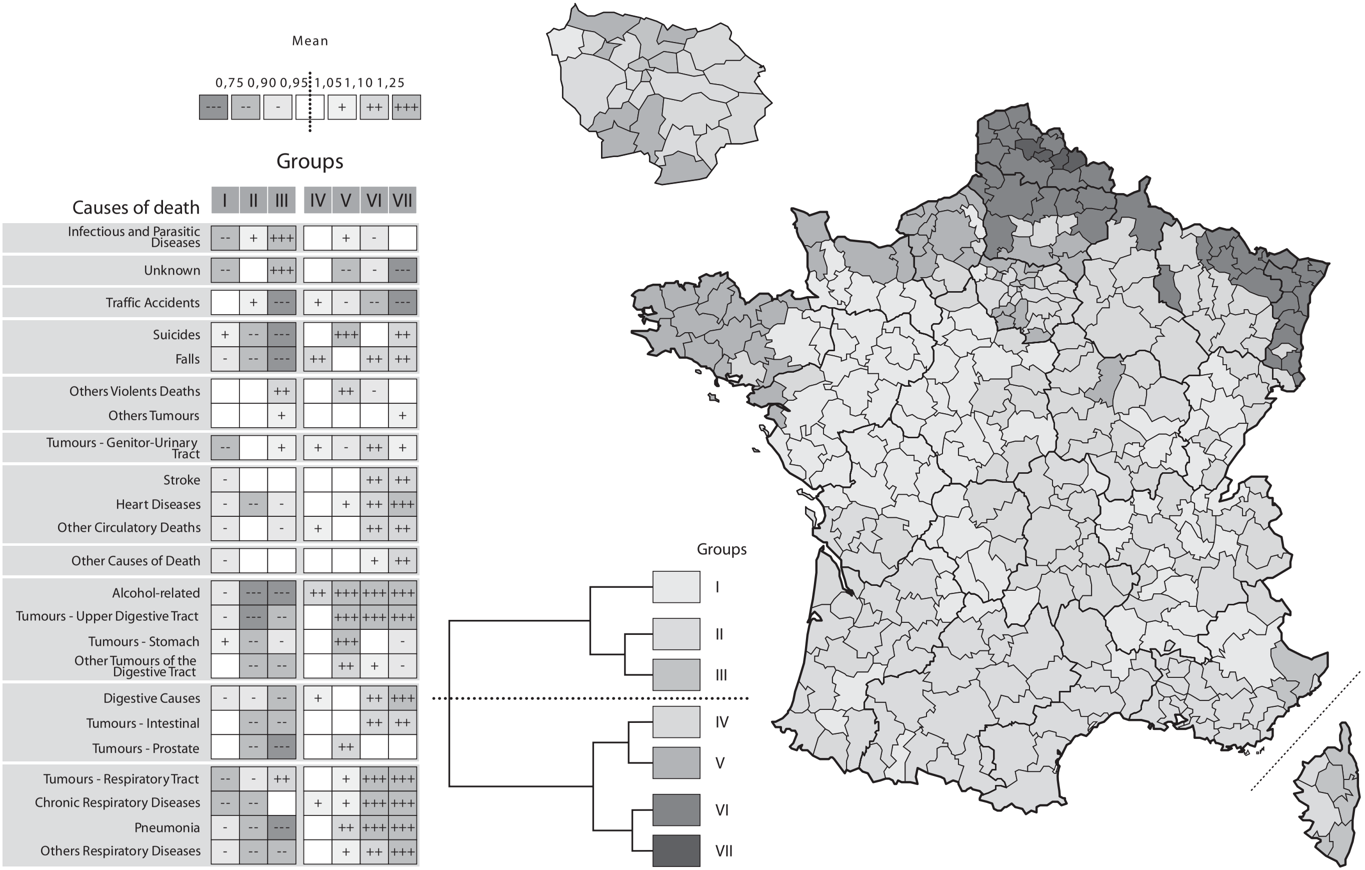
What we can note first is a strong division between areas with low mortality for all causes of death (groups I, II, and III) and areas with high mortality for all causes of death. The map shows the same contrast seen in Figure 6. 4 for all causes of death in France: a division between north and south. However, a strong regional pattern to the mortality structure is also evident. The high level of mortality in the north-west of the country is not based on the same causes as the high level of mortality for the north-east of the country. Causes associated with alcohol consumption and eating habits, like digestive diseases, are responsible for high mortality in the north-west and causes associated with tobacco consumption and professional risk factors, like respiratory diseases, are responsible for the high mortality of the north-east of the country.

Statistical methods and mapping

Statistical approaches like simple or multiple linear regression allow us to look at relationships between variables. Mapping the residuals from these analyses enables us to identify particular places that do not conform to general trends (Salem et al. 2006). This analytical approach to mapping can reveal additional variables for study or combinations of factors specific to particular places. Residuals from multilevel analyses allow the analysis of these matters at various scales.

GIS also offers analogous analytical capacities and can additionally offer useful spatial selection and buffering tools (Kistemann et al. 2002). Applications are extensive and include such possibilities as identifying zones of potential risk for diseases like asthma (Maantay 2005). GIS tools are widely used in analyses of health and health care, allowing, for example, the identification of catchment areas for health care facilities or zones of contagion for infectious diseases or pollution impact zones around hazardous facilities such as incinerators or major roadways (Cromley & McLafferty 2002). Maps representing the associations between health outcomes and environmental characteristics can easily be generated, providing a platform for statistical analysis of spatial associations.

There are few technical barriers to statistical mapping though more advanced geostatistical methods are less well integrated. What remain as challenges are



Causes of death	I	II	III	IV	V	VI	VII
Infectious and Parasitic Diseases	--	+	+++		+	-	
Unknown	--		+++		--	-	---
Traffic Accidents		+	---	+	-	--	---
Suicides	+	--	---		+++		++
Falls	-	--	---	++		++	++
Others Violents Deaths			++		++	-	
Others Tumours			+				+
Tumours - Genitor-Urinary Tract	--		+	+	-	++	+
Stroke	-					++	++
Heart Diseases	-	--	-		+	++	+++
Other Circulatory Deaths	-		-	+		++	++
Other Causes of Death	-					+	++
Alcohol-related	-	---	---	++	+++	+++	+++
Tumours - Upper Digestive Tract	-	---	--		+++	+++	+++
Tumours - Stomach	+	--	-		+++		-
Other Tumours of the Digestive Tract		--	--		++	+	-
Digestive Causes	-	-	--	+		++	+++
Tumours - Intestinal		--	--			++	++
Tumours - Prostate		--	---		++		
Tumours - Respiratory Tract	--	-	++		+	+++	+++
Chronic Respiratory Diseases	--	--		+	+	+++	+++
Pneumonia	-	--	---		++	+++	+++
Others Respiratory Diseases	-	--	--		+	++	+++

Figure 6.5 Male mortality combinations: employment areas in France, 1988–1992. *Source*: Salem, G., Rican, S., and Jougla, E. (2000) *Atlas de la Santé en France. Vol. 1. Les Causes de Décès*. John Libbey Eurotext, Paris. Reproduced with permission from *Atlas de la Santé en France*, pub. John Libbey Eurotext.

mapping latency periods, allowing for population mobility, ensuring the quality of information, and recognising confounding factors.

Spatiotemporal dynamics

The introduction of a historic dimension constitutes a further way of bringing elements of understanding to the spatial distribution of health events. The identification of continuities and discontinuities in map patterns can help to emphasize social, economic, or cultural determinants of health disparities.

Map comparisons for different dates show significant changes in the spatial distribution of cancer mortality in France from 1975 to 2000 (see Figure 6.6). Relative deterioration or improvement is concentrated in specific regions and specific places. These changes in mortality reflect changes in the social, economical, cultural, and physical environment. During the last quarter of the twentieth century significant changes appeared in France: an increase in the urbanization of the society, a redistribution of economic activities, and a deconcentration of industrial activities. These changes were accompanied by significant changes in health practices such as alcohol consumption, tobacco consumption, and eating habits as well as changes in health care delivery. The spatial redistribution of cancer mortality reflects all these changes. Difficulties accompanying the interpretation of the two maps concern changes in mortality coding, changes in the underlying geographical units and population mobility (Cossman et al. 2003).

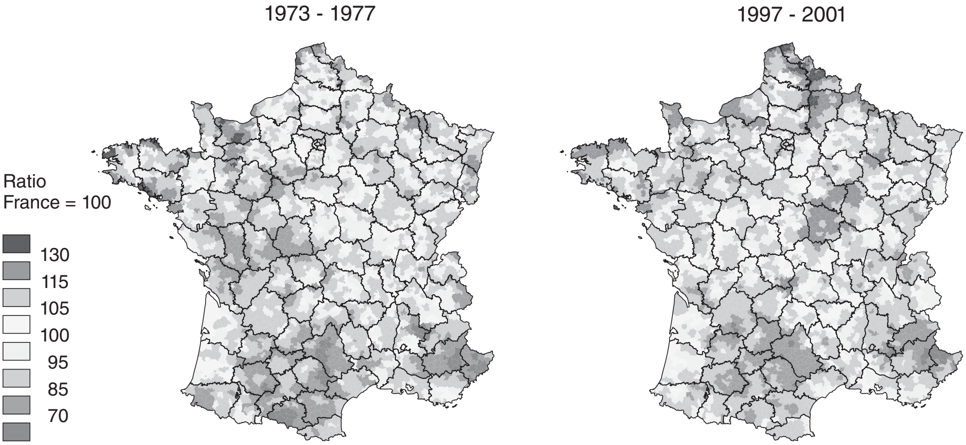


Figure 6.6 Standardized mortality ratio for male cancer in France: canton scale, 1973–1977 and 1997–2001). *Source*: Salem, G., Rican, S., Jougla, E. et al. (2009) *Atlas de la Mortalité par Cancer en France (1970–2004)*. Inca, Paris. Reproduced with permission of the authors.

The introduction of a temporal dimension is indispensable in describing the spread of contagious diseases and examining how health inequalities change over time in particular places (AvRuskin et al. 2004). Dynamic maps, comprising a "film" of the events constitute a recent interesting development (Reinhardt et al. 2008). Animation techniques are used in creating dynamic map sequences. Maps showing the uneven spatial distribution of disease at specific points in time are presented at regular time intervals in a video, time-lapse display. Although interesting to view, map animations are often difficult to comprehend because they show a great deal of information in a small amount of time.

Scale and mapping

Much health data is protected by privacy and confidentiality restrictions that limit the geographical scale at which data are released. Detailed health data are often unavailable at the fine-grained, local scale that is necessary to reveal associations between local environments and health. Lack of geographically detailed data is particularly problematic in countries with little tradition of public health, such as France, and also in the less developed world. Researchers are developing innovative ways to use satellite imagery and other remotely sensed information to estimate population and environmental data in situations where data are not readily available.

Another important issue concerns the scale of analysis and the spatial entities to be compared. The appearance of a map and the information conveyed depend on the scale of analysis. The small numbers problem and other technical issues are clearly scale-dependent. Scale is not only a technical problem, however. It is a matter of identifying the relevant scales for linking the spatial distribution of a disease to processes and to the spatial distribution of risk factors. A spatial analysis of lung cancer death, deals not only with tobacco consumption but also with occupational risks and environmental factors such as air pollution (Rican et al. 1999).

Conclusion

Mapping diseases for descriptive or analytical purposes has benefited from significant technical advances in recent decades. Frequently used as a first step in order to describe health spatial patterns or generate new hypotheses, maps, as communication tools, also allow considerable insights into the processes of spatial inequality. Improvements in GIS technology offer new analytical capacities. Mapping disease is not, however, a simple process of projecting statistical information onto a system of geographic coordinates. It has to answer clearly formulated hypotheses and reflect choices that often remain implicit.

Future research agendas in disease mapping include the representation of mobility and multiple local affiliations. Other challenges include reconciling cartograms with user-interpretability, integrating geostatistical advances into GIS and cartographic display, and improving visualization methodologies. Animation and web-based mapping are additional areas of development. All are crucially dependent on high quality geo-referenced data.

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Chapter 7

Infectious Disease Diffusion

Clive E. Sabel, Dennis Pringle, and
Anders Schærström

Introduction

It has been assumed that in the developed world at least, infectious disease was largely a thing of the past, and thus public health attention should be focused on chronic disease, such as cancer or cardiovascular disease. We have been sharply reminded that this is far from the case, with the emergence of HIV/AIDS in the 1980s, and more recently West Nile virus, Lyme disease, and SARS, and even the re-emergence of diseases such as measles in the United Kingdom in 2008 due to insufficient vaccination rates as a result of concerns over the safety of the combined MMR vaccine. This global resurgence of infectious diseases, including some new and emerging ones, is a growing and ongoing global threat to human health, particularly in developing countries, at a time when medical advances in the twentieth century had apparently conquered diseases such as smallpox (see Emch and Root this volume).

Infections spread with people, vectors (e.g. animals, birds, insects), and pathogens moving from place to place. With increasing mobility and environmental change, disease diffusion is an urgent public health issue on local, regional, national, and global levels. Recently several infectious diseases, which have been more or less under control or even eradicated from large parts of the earth, have re-emerged, while "new" diseases have appeared and non-infectious ones have expanded in numbers and spatial distribution.

The following discussion begins with an overview of the biology of infectious diseases, covering pathogens, modes of transmission, and infection dynamics. We then move on to discuss diffusion processes and infectious disease modeling, including disease outbreak surveillance and the contribution of time geography, before concluding by considering both the impact of changing conditions, including climate change, on existing and emerging infectious disease, and emerging techniques to help counter these threats.

Infectious Disease Biology

Here we briefly classify infectious diseases into different types of pathogens, before considering modes of transmission, to set the context for the later diffusion discussion.

Pathogens

An infectious disease arises when a host organism (e.g. a human) is colonized by a foreign species (causal agent) that seeks to utilize the host's resources to sustain itself and to reproduce, resulting in an impaired functioning of the host. The causal agent is usually a micro-organism (i.e. a living entity too small to be seen by the naked eye); although in some instances diseases may be caused by larger organisms such as metazoa.

Pathogenic micro-organisms do not have malicious intent – i.e. they do not set out with the intention to cause their hosts harm; rather, they are simply seeking to find their own ecological niche in order to survive and reproduce. In the words of Jacques May (1950: 10), diseases are "merely the by-product of an accidental collision between two or more forms of life, each pursuing its own destiny." Most micro-organisms cause us no harm, and many are in fact beneficial to health. However, a small minority, known as pathogens, are disease causing.

Micro-organisms are ubiquitous throughout nature. Although the majority of micro-organisms are non-parasitic, the pathogenic minority are all parasites. A parasite is an organism that lives on or in another organism (referred to as the host) and depends upon it for nutrition, to the detriment of the host. Parasitic micro-organisms are invariably better adapted to some species of host than to others. Micro-organisms sometimes jump species, but most have a preference for particular species, and even for particular tissues within a particular species (Playfair 2004). Thus, the risk of humans contracting most animal diseases is generally low, although when parasites do jump species the outcome may be devastating.

Fungi are a major cause of disease in plants – e.g. the crop failure that caused the Irish potato famine in the 1840s was caused by a fungus (*Phytophthora infestans*) imported from America (Ristaino 2002). However, about 180 species of fungi can cause diseases (known as mycoses) in humans (Perlin & Cohen 2002). The more common ones are minor but often very irritating (e.g. ringworm, thrush, and athlete's foot).

Protozoa are single-celled micro-organisms that vary in size from about 2 microns (i.e. 2×10^{-6} meters) up to about half a millimeter. Most species are motile (i.e. capable of moving). Only a few protozoa are pathogenic to humans. Amebiasis (amoebic dysentery) is caused by an amoeba such as *Entamoeba histolytica*, malaria is caused by several species of protozoa belonging to the genus *Plasmodium*, whilst nagana (African sleeping sickness) and Chaga's disease (common in South America) are different forms of trypanosomiasis caused by members of the genus *Trypanosoma* (Desowitz 1998).

Bacteria are single-celled organisms which can be classified into four main shapes: cocci are round or oval, bacilli are rod-like, spirochetes are spiral or corkscrew shaped, and vibrios are curved rods shaped like commas. Bacterial diseases include anthrax (*Bacillus anthracis*), bubonic plague (*Yersinia pestis*), cholera (*Vibrio cholerae*), diphtheria (*Corynebacterium diphtheriae),* gonorrhea *(Neisseria gonorrhoeae),* leprosy (*Mycobacteria leprae*), syphilis (*Treponema pallidum*), tetanus (*Clostridium tetani*), tuberculosis (*Mycobacteria tuberculosis*), typhoid (*Salmonella typhi*), and typhus (*Rickettsia prowazeki*) (Snyder Sachs 2008).

Bacteria can be killed by various means, which facilitates both preventive and therapeutic measures to combat bacterial diseases. Most bacteria cannot normally survive temperatures above the boiling point of water (i.e. 100 °C), so boiling provides an easy method for sterilizing water. Cooking food likewise destroys potentially harmful bacteria. Following infection, many bacteria can be treated systemically by antibiotics. These drugs either kill the bacteria or prevent them from reproducing. However, a growing concern is that many bacteria are now developing resistance through natural selection (Mayer 2000; Moore 2001).

Viruses are much smaller than bacteria and lack a conventional cell structure. In many instances they are little more than either a single- or a double-strand of nucleic acid (i.e. either DNA or RNA) enclosed in a protein shell called a capsid. Scientists are divided as to whether they can be regarded as a living organism since they are incapable of an independent existence outside the cell of another organism. Hundreds of known viruses cause a wide variety of diseases in humans, other animals, insects, plants, and even bacteria. Diseases in humans caused by viruses range from the common cold through to some of the most terrifying known to humankind. The list includes: HIV/AIDS, chicken pox, encephalitis, genital herpes, hepatitis, influenza, measles, mumps, poliomyelitis, rabies, shingles, smallpox, dengue fever, rubella (German measles), and yellow fever. Vaccines have been developed for several viruses including measles, mumps, rubella, influenza, and polio (Crawford 2002). Unfortunately many viruses mutate continuously, and thereby manage to evade vaccines and the body's immune defenses (Playfair 2004).

A few other, even smaller, causal agents have been identified in recent decades, with the possibility that some others may still remain to be discovered. The two most significant are viroids and prions. *Viroids* cause several types of disease in higher plants, but as yet have not been identified as the cause of any diseases in humans. *Prions*, first discovered in 1982, are even smaller still – about a hundred times smaller than a virus. They are now believed to cause fatal neurodegenerative diseases of animals and humans including scrapie in sheep, chronic wasting disease in deer, bovine spongiform encephalopathy (BSE or "mad cow disease") in cattle, and Creutzfeldt-Jacob Disease (CJD), kuru, and fatal familial insomnia in humans, although how they replicate without nucleic acid is not fully understood. These diseases were believed until recently to be caused by slow-acting viruses because of their long latency periods (Desowitz 2002).

Modes of transmission

To cause an infection, the causal agent must be transmitted from an infected host to a new host. Although causal agents can be transmitted in numerous ways, the means of transmission can be grouped into a few broad categories reflecting the way in which the causal agent gains access to the body. The skin forms a fairly effective external barrier against most causal agents, therefore the causal agents need either to exploit abrasions in the skin or else gain entry via parts of the body covered by membranes rather than skin – e.g. the sexual organs and internal passageways. Because causal agents tend to be adapted to particular tissues, and because different route-ways into the body (e.g. via the blood stream, the respiratory system, the digestive system) provide access to different tissues, most types of disease tend to be associated with a specific means of transmission. Common means of transmission include the following.

Airborne

Airborne diseases are transmitted when pathogenic agents present in the respiratory tract of an infected person are disseminated in salivary droplets during coughing, sneezing, talking, and breathing. The droplets are very small (less than 1 mm in diameter) and so quickly evaporate, but the pathogens may be left airborne for several hours, during which time they may be inhaled or ingested by a new victim. Diseases spread in this manner include measles, mumps, chicken pox, colds, and influenza (viral); and whooping cough, diphtheria and tuberculosis (bacterial).

Water- and food-borne

Many diseases are transmitted by the consumption of infected food or water. One of the most important pathways is referred to as the "faecal–oral" route. Organisms in the intestines of an infected person are passed in their faeces and may subsequently find their way into the food or water of new victims. Untreated sewage provides a major threat. Sewage containing micro-organisms passed in the faeces of infected people may find its way into the water or food supply of future victims. Diseases such as cholera and typhoid are transmitted in this manner. Diseases of this type are now uncommon in developed countries following the public health reforms in the late nineteenth century, but the absence of clean water supplies remains a major problem facing millions of people in developing countries today. Infected food may pose a threat. Bacteria belonging to the genus *Salmonella*, for example, live in the intestines of cattle and poultry but may find their way into humans via meat or eggs not properly cooked.

Vector-borne

Vector-borne diseases entail the transport of the causal agent by a vector (i.e. another organism). There are two main mechanisms. First, the causal agent may be picked up by the vector and mechanically deposited where it is subsequently picked up by the new host (usually by contaminating food or water). Flies are the major problem in this respect, although cockroaches, beetles, mice, and rats are also hazards. Second, arthropods may transfer the agent when they bite. Blood sucking insects which take a blood meal from an infected person may "inject" the agent into a new victim. Major hazards include mosquitoes (e.g. malaria, yellow fever, dengue); rat fleas (e.g. bubonic plague); and ticks and mites (e.g. typhus, Lyme disease).

Direct and indirect physical contact

In some instances the causal agent may be transmitted by direct physical contact between an infected host and the new host. Venereal diseases (such as syphilis, gonorrhea, genital herpes), for example, are transmitted by direct physical contact between an infected person and the new host during sexual intercourse. In some cases the infectious agent may be transmitted via an inanimate object often referred to as a "fomite." Sharp instruments used to piece the skin provide a means of transmission if not properly sterilized. Instruments used in surgical operations provide an obvious potential risk. Contaminated syringe needles, used either for medical or non-medical purposes (e.g. intravenous drug use), are of particular concern, for example as means of transmission of HIV and serum hepatitis (hepatitis B). Cuts, even if made by non-contaminated instruments, may provide a route-way for infection by micro-organisms in dust or soil. Tetanus (or lockjaw), for example, is caused by the bacterium *Clostridium tetani* which can survive for long periods in a latent form in dust.

Disease-population dynamics

The impact of an infectious disease upon a population will reflect various properties of the pathogen: for example, its transmissibility, its rate of replication, its infectivity, and its virulence. However, the impact of an infectious disease upon a population will also reflect various properties of the population. If the population has been exposed to the disease previously, there may be a high level of "herd immunity," in which case the disease may fail to spread and the number of people infected may remain small. Likewise, if the disease has a long history within a population, its virulence may be attenuated due to co-evolution and it may pass without causing too much damage, whereas if it is a new disease striking a virgin population its effects may be devastating. The worst possible combination is a disease that is highly infectious and virulent (e.g. Ebola).

For each disease, we can identify three subgroups within any given population, which we will refer to as "susceptibles," "infectives," and "immunes." The "susceptibles" are people who do not have immunity, either from a previous infection or from vaccination, and are therefore susceptible to infection. The "infectives" are people who have been infected and are currently capable of infecting others. The "immunes" are people who have acquired immunity either from a previous infection from which they have recovered or as a result of vaccination. Some authorities (e.g. Jones & Moon 1987) identify a fourth group called "latents" – i.e. people who have been infected but who are not yet capable of infecting others. However, for our purposes we can regard latents as part of the infectives subgroup.

During an outbreak of the disease, some susceptibles will contract the disease and become infectives. As the infection takes its course, those that survive the infection will become immunes, assuming the disease is one that confers permanent immunity. The net effect of an outbreak of the disease in a population therefore is to reduce the number of susceptibles and increase the number of immunes. The reduction in the number of susceptibles will be equal to the increase in the number of immunes plus deaths.

In the early stages of an epidemic (especially of a new disease), most of the population may be susceptible; therefore infectives will have little difficulty in finding someone to transmit the disease to, but because the number of infectives is initially small, the incidence of new cases at the beginning of the epidemic will also be small. However, as each new infective infects further susceptibles, the number of new cases will build up, sometimes very rapidly. The speed at which this occurs will depend on how infectious the disease is, the length of the infectious period, and the availability of susceptibles: the more infectious a disease is, the more people will be infected by each infective in a given period of time; whilst the longer the infectious period then obviously the more people each infective can infect. The speed at which the epidemic develops will also be influenced by the length of the latent period: the gap between infections will be longer for diseases with a long latent period (i.e. the time between being infected and becoming infectious), and therefore the outbreak will proceed more slowly.

As the epidemic progresses, the number of available susceptibles will decline and eventually a point will be reached where, although the number of infectives may remain high, the number of new cases will peak and then begin to decline because of a reduction in the number of remaining susceptibles. This decline will accelerate as the number of infectives also begins to decline. Thus, the number of new cases in an epidemic graphed over time tends to have a characteristic bell shape (Scott & Duncan 2004).

Towards the end of the outbreak, the number of infectives will decline as people either die or recover. The number of susceptibles will continue to decline until a point is reached where the remaining infectives may be unable to find anyone new to infect, at which point the epidemic will have burnt itself out. However, the number of susceptibles does not necessarily need to decline to zero for an epidemic to burn itself out. Some susceptibles may remain, but, as long as they are not in contact with the remaining infectives, transmission will not occur. This is more likely to happen in areas of low population density, where the remaining infectives and susceptibles will tend to be more widely spaced than in high density urban areas.

The mean number of people infected by each infective is referred to as the "transmission rate." This will change during the course of an epidemic. In the early stages of an epidemic, the transmission rate will be larger than 1 – i.e. each infective will transmit the disease to more than one person and the number of new cases per time period will increase. In the latter stages, the transmission rate will be less than 1, as the epidemic starts to burn itself out. The higher the transmission rate is in the early stages, the quicker the epidemic will develop, whilst the lower it is in the later stages, then the quicker it will subside. At the peak of the epidemic the transmission rate is 1, and at the end, if the epidemic completely burns itself out, the transmission rate will be 0.

In some cases the replenishment of susceptibles may be sufficiently rapid to prevent the epidemic from burning out completely. In such situations the disease will remain continuously present in a population, although possibly with a low incidence, and is said to be *endemic*. The term *epidemic* refers to periods when there is a build-up in the number of new infections to a level substantially above the norm. If an epidemic extends over a very wide area (i.e. intercontinental or even global), it is said to be a *pandemic*.

The likelihood of a disease remaining endemic is a function of both the size and the distribution of the population. If the population is small or dispersed, then the pathogen may be unable to find sufficient new hosts and the epidemic will burn itself out. On the other hand, if the population is large and concentrated, for example in a large city, then the disease may find a sufficient continuing supply of new hosts due to births and in-migration to remain endemic. However, even in areas where a disease remains endemic, the number of new cases will tend to increase rapidly during periods of epidemic activity, before subsiding to a endemic period of low activity during which the disease simply "ticks over."

Even if an epidemic burns itself out completely, it does not necessarily disappear for good. History shows that repeated epidemics of the same disease are very common. The reason for this is that although the number of susceptibles is depleted during an epidemic, it soon begins to build up again, due either to the in-migration of people from areas not affected by the epidemic or, more importantly, from births. New-born children may carry antibodies received via the placenta from their mother, but they generally lose this immunity within a few months and enter the susceptible sub-group. The number of susceptibles in a population will therefore tend to build up until it reaches a level where it can support the outbreak of a new epidemic.

The time taken for the susceptible population to reach a critical threshold for a new epidemic is a function of both the birth rate and the rate of in-migration. Areas with high birth rates and rates of in-migration will obviously replenish their susceptible population more quickly than areas with lower rates. In the absence of mass vaccination programs, the time interval between epidemics may be reasonably predictable and regular, unless there is a dramatic change in either the birth rate or the rate of in-migration. However, an epidemic will not necessarily occur as soon as the threshold is reached: it still requires at least one infective to spark it off. If the disease has remained in an endemic state since the previous epidemic, the population will already contain some infectives; but if the previous epidemic burnt itself out completely, then the new infectives will need to be introduced from outside. There may therefore be a time delay between the susceptible population reaching a critical threshold and the arrival of an infective to spark the epidemic off. Remote areas, such as isolated islands with few contacts with the outside world, will therefore tend to have a longer and more irregular gap between epidemics than places that are better connected to external endemic or epidemic regions.

The time taken for an epidemic to be triggered in a susceptible population will also depend upon the infectiousness of the disease. If the disease is highly infectious, then an epidemic will be triggered soon after the susceptible threshold population has been attained, whereas if it is less infectious the outcome is much less predictable – i.e. it may occur immediately or it may take months or years (depending upon the disease) before a susceptible just happens to be in the wrong place at the wrong time.

Diffusion Processes

Spatial diffusion theory is a literature used to describe the movements of goods, people, innovations, or ideas. A diffusion process involves numerous events on all spatial levels from intercontinental transport and climatic variations down to homes, workplaces, schools, and hospitals. In geographical terms, a diffusion process involves, besides what is being spread, a place of origin (a source), one or more receiving places, pathways, and modes of diffusion and a force driving the diffusion.

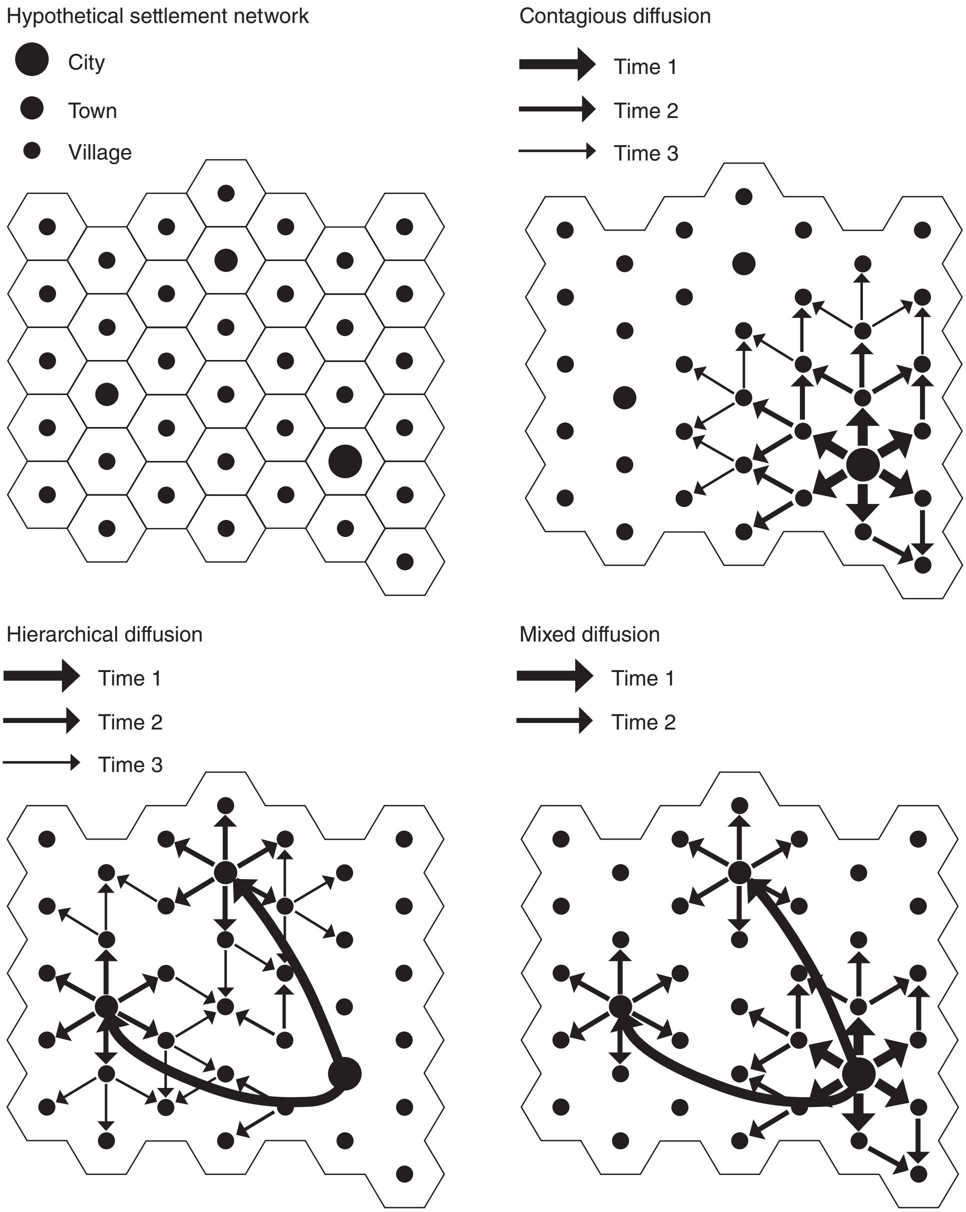
Applied to disease, diffusion theory can help describe how, where, and when the spread of infectious disease can or does occur. Studies of the diffusion of infectious disease draw heavily on the work of health geographers and spatial epidemiologists who want to know how a disease spreads and where cases are likely to occur. The potential for spatial diffusion depends on the character and ecology of the causative agents, such as their transmission modes, mobility, reach, and viability, as well as various determinants. Exposure (i.e. the contact between causes and susceptible individuals) is crucial for transmission and the start of a pathological change in a human or other living being.

Whereas the biomedical tradition focuses on causes, exposure, and transmission of pathogens, and their pathological consequences, geographers are primarily interested in the locations and numbers of cases plus the directions and pathways that diseases apparently follow to reach new "victims" as well as the means and geographical circumstances that favor or inhibit their spatial spread.

Disease distribution or occurrence can be perceived in two different ways. On the one hand, it can be thought of as the places where cases (i.e. affected individuals) are found. On the other hand, it could be perceived as the locations where the necessary circumstances for causing illness, or potential health hazards, are prevalent, for example certain microbes, sources of pollution, or living conditions. In the first view, disease is seen as an outcome which can be observed, like any state of health, in an individual. Thus, information about disease occurrence is linked to the individuals. This view is a basis for epidemiology, measuring incidence and prevalence in search of correlations with circumstances that might clarify the aetiologies of diseases. The occurrence of disease could thus be considered equivalent with the individuals themselves and geographical distribution can be understood as a number of more or less mobile points with varying lifetimes, sometimes appearing in clusters or within more or less clearly distinct regions or zones. This notion has led to important discoveries and progress in epidemiology and medical geography. John Snow's mapping of cholera in Soho is perhaps the most well-known example (Hempel 2006).

The alternative view focuses on the causes, in other words disease occurrence is associated with an area or ecosystem where some potential health hazard prevails. Pathogenic factors may be around, but cases actually occur only when susceptible individuals are exposed to them. For example, many of the new infectious diseases, especially in South America, are associated with the human invasion and destruction of natural habitats (e.g. deforestation to create land for agriculture) causing a pathogen to jump species to infect humans (Garrett 1995; Karlen 2001). This perspective is the basis for identifying risk areas often visualized on maps in vaccination clinics. However, this is often a very coarse-meshed view, which requires closer inspection and analysis. In summary, the process of disease diffusion can be understood in two different ways. Either the cases or the causes and hazards are being spread.

Classically, a contagious disease diffusion model follows a hierarchical neighborhood model, starting in a capital or other primary population center, and then is diffused based on human spatial interaction – people are more likely to interact with closer neighbors than those further away (Figure 7.1). Spread occurs from a metropolitan area to neighboring suburbs due to their proximity before spreading to regional centers and towns further down the urban hierarchy. In this context, contagious means that something tends to spread by proximity – to nearby places, whereas hierarchical diffusion takes place in a stepwise manner – from one, usually


Hypothetical settlement network

Contagious diffusion

Hierarchical diffusion

Mixed diffusion

Figure 7.1 Spatial diffusion patterns. *Source*: Cromley E.K. and McLafferty, S.L. (2002) *GIS and Public Health*. Guilford Press, New York. Reproduced with permission of Guilford Press.

more central, location to the other, not necessarily nearby, locations from which the diffusion may proceed. Spatial hierarchical leaps in infection can occur when individuals move or migrate to secondary populations centers.

In reality, it is not unusual for different epidemic waves of a certain disease to behave differently or display both "contagious" and hierarchical phases simultaneously or sequentially as parts of a larger diffusion process. If we examine the 1848–9 USA Cholera outbreak (Figure 7.2) there appears a diffusion transmission route along the Mississippi River for the outbreak arriving in New Orleans on Day 13, but both later diffusion and velocity were affected by the expanding railway network – as evidenced by leaps in infection locations and dates.

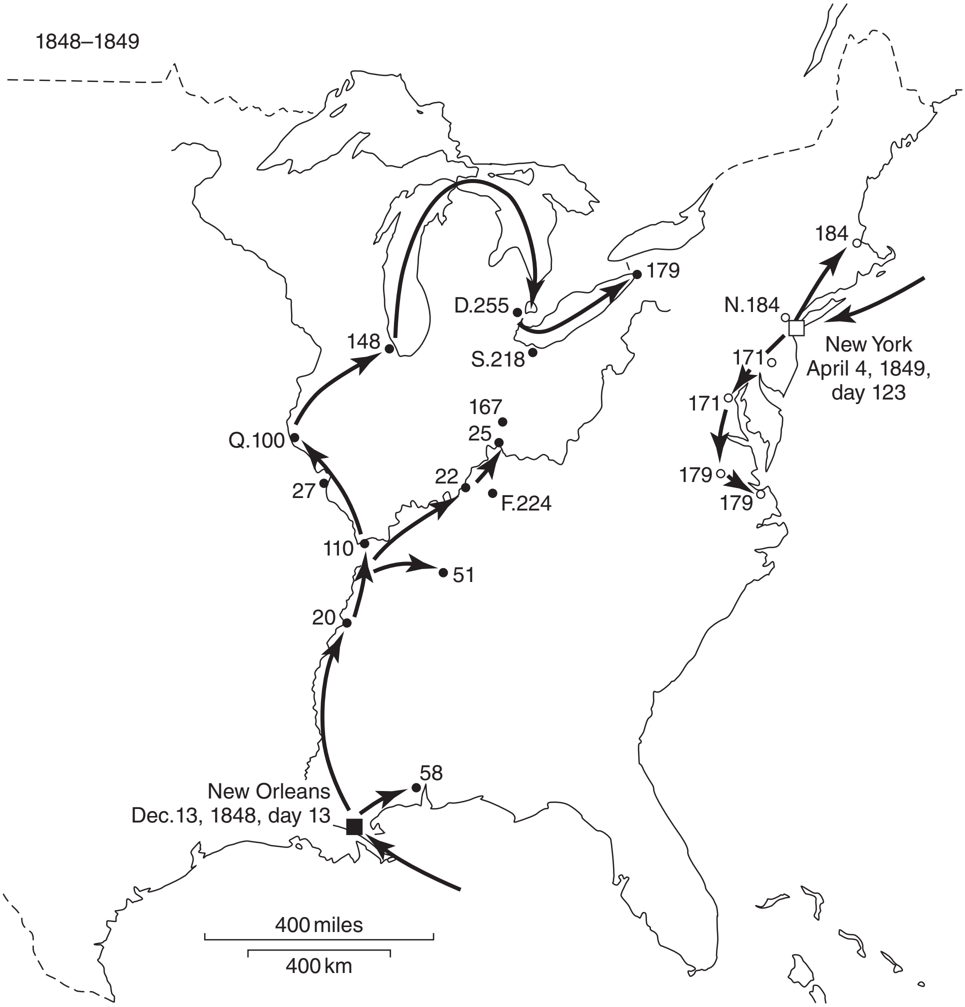


Figure 7.2 Diffusion of US cholera outbreak, 1848–1849. *Source*: Cliff, A.D., Haggett, P., Ord, J.K., and Versey, G.R. (1981) *Spatial Diffusion: An Historical Geography of Epidemics in an Island Community*. Cambridge University Press, Cambridge, UK. Reproduced with permission of Cambridge University Press.

Both social constraints in mobility such as age, social economic status, or health, and physical constraints such as transportation networks and topography can influence spatial disease diffusion patterns. Cliff and Haggett have used Iceland as an almost unique laboratory – a large effectively "closed" island population – to investigate measles and influenza diffusion processes (Cliff et al. 1981; Cliff & Haggett 1988). Cliff and Haggett (1988) attempted to link epidemic models with spatial theory (notably spatial autocorrelation) to help better describe the flow or movement of contagious disease through time and space. In Figure 7.3, a summary of the Iceland measles epidemic of 1950–2 is presented, from the capital Reykjavík, to outlying districts around the island, following the transportation network. Patterns of both contagious and hierarchical diffusion are evident.

Disease diffusion depends on exposure – the innumerable micro-scale events that bring individuals in contact with health hazards. These events involve animals, transport networks, vehicles, and various objects. Occupational conditions, daily personal routines, and attitudes may be decisive for exposure. Social norms and cultural practices play an important role for either spreading or barring infections. For example, promiscuity or fidelity, polygamy, circumcision, and other rites affect the spread of STDs. Highly mobile people form key groups for infectious transmission, for example migrants (such as seasonal or circular migrant laborers), refugees,

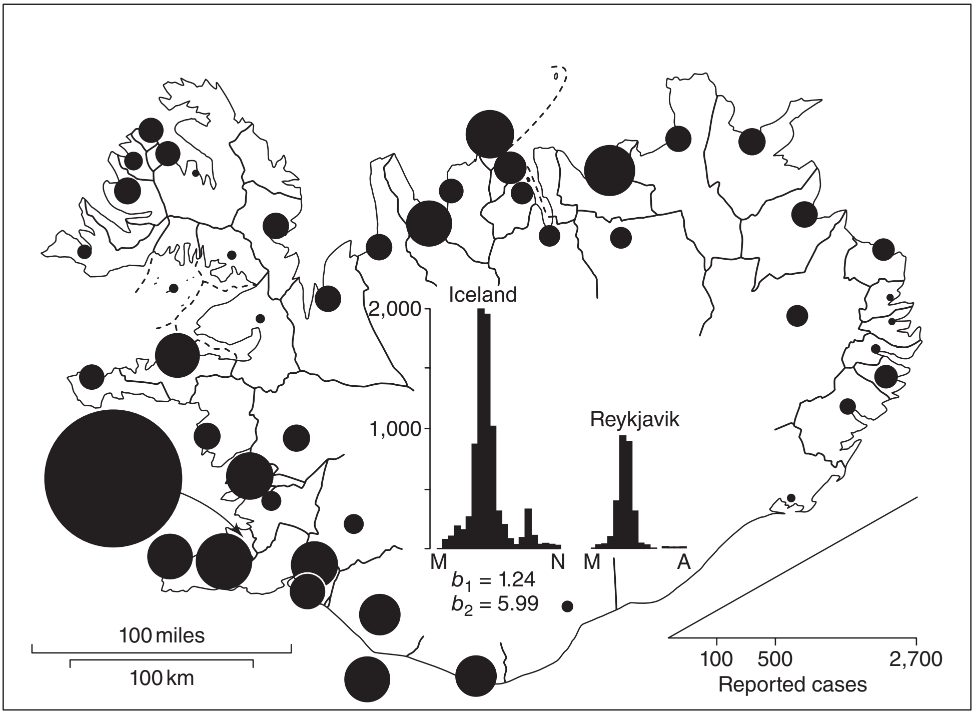


Figure 7.3 Iceland measles epidemic, 1950–1952. *Source*: Cliff, A.D., Haggett, P., Ord, J.K., and Versey, G.R. (1981) *Spatial Diffusion: An Historical Geography of Epidemics in an Island Community*. Cambridge University Press, Cambridge, UK. Reproduced with permission of Cambridge University Press.

truck drivers, and commercial sex workers and their clients. In situations of armed conflicts, troops often appear as another key group. New geographical conditions can also affect the diffusion routes. For example, cholera epidemics swept across the United States and Russia several times in the nineteenth century and it has been ascertained that in the later part of the century both diffusion routes and velocity were affected by the growing railway networks. Instead of advancing slowly to the most nearby places the disease would leap from place to place along the lines.

Like other geographical objects, sources of disease diffusion may assume point, line, area, or diffuse shapes. Infected wells or minor ponds, perhaps food stores or even kitchens could be considered point sources. Line-shaped potential sources could be rivers or riverbanks where mosquitoes breed. Area sources of disease diffusion may be endemic regions and natural reservoirs in lakes, swamps, forests or paddy fields. Finally, certain behaviors, habits, and practices might be regarded as diffuse-shaped health hazards.

The pathways of infections are guided and shaped by available routes and nodes as well as barriers. Contagious diseases have followed people and animals along rivers, roads, railroads, and caravan trails. Eventually railways, steamships, trucks, and buses, to say nothing of airlines, have altered the modes, velocity, and routes of disease diffusion. In recent decades, "airport malaria" has become a recurrent problem, as infected mosquitoes can be transported from endemic areas to higher latitudes and survive long enough to infect someone at the destination (Martens & Hall 2000). Pathogens and vectors may also be transported by winds and water. Thus, foot and mouth disease has probably been spread by winds from farm to farm without any direct contact between infected and susceptible animals. Also contagious diseases may follow social routes without obvious physical manifestations. For example, HIV/AIDS diffusion in personal networks has been traced and mapped (Latkin et al. 1996).

Certain places, where people frequently meet, may be nodes of infections, e.g. urban centers, ports, refugee camps, marketplaces, trading posts, and border towns. Refugee camps are high-risk areas for infections because of their crowded and makeshift sanitary conditions. Thus, sexually transmitted diseases, cholera, dysentery, plague, diphtheria, ebola and lassa fever have been reported in African refugee camps (Brookesmith 1997). Other nodes are large workplaces, shelters for homeless, schools, and prisons, even hospitals. Likewise, not only permanent localities, but certain occasions such as local festivities and similar social events may be transmission risks. It has been suggested that haymaking has been an occasion for spreading measles in Iceland, contributing to characteristic seasonal waves.

Disease diffusion may be stopped or deflected by permanent or temporary geographical barriers. Physical barriers, such as vast spaces of water, mountain chains, or large ice sheets, can be effective against diffusion. Diffusion may be stopped or slowed down by biological barriers, such as widespread immunity and habitats unsuitable for agents or vectors. Social conditions, too, may constitute barriers. Thus, disease diffusion may be precluded by public health interventions and precautions, such as quarantine procedures, disinfection, disinsection, and vaccination campaigns, or by widespread knowledge about personal protection. Even political conditions, preventing or facilitating contacts across international borders, may directly or indirectly affect the potential for diffusion.

In summary, the conditions for disease diffusion have to do with complex ecological circumstances and webs of causes and determinants. Proximal determinants (also called downstream factors) are involved with the actual transmission, such as eating or sexual behavior, whereas distal determinants (or upstream factors) constitute the micro- and macro-scale settings for disease. These include cultural, social, and economic living conditions, poverty, urbanization, as well as climatic and weather conditions. Within this complexity, human mobility – i.e. migration, traveling, and commuting, is essential for the diffusion or spread of infectious disease.

Infectious Disease Modeling

The ability to identify areas of elevated risk, and map emerging areas of environmental exposure can help considerably in exploring geographical patterns of health outcome and aid in the interpretation of patterns of disease. Estimating such exposure, however, is a non-trivial problem, which involves modeling both susceptible populations and the environment through which they move. We are concerned here with modeling modes of infectious disease transmission amongst the susceptible population. Modeling spatio-temporal point processes with covariates taken from geographical information systems (GIS), may (partially) serve this purpose.

Modeling the myriad patterns of movement of the population at risk at the individual level is a challenging task. This is the geography of commuting, socializing, travel, migration; of places of residence, vacation, and work (Briggs 1992). There are considerable conceptual and computational difficulties involved in intersecting, often to a considerable degree of spatial and temporal resolution, data on the distributions of infective agents, and/or the patterns of movements of recipient individuals or groups, reflecting the limitations of available data on environmental conditions and human distributions. With the development of GIS, GPS (global positioning systems) to track individuals, personal environmental monitoring, and wider initiatives such as GEOSS (global earth observation system of systems), to use remotely sensed data to aid detection of changing environmental conditions, the facility for undertaking such analyses is undoubtedly being improved.

In this context it is important to keep in mind that every spatial observation is valid at a certain point or period in time, and disease diffusion is a spatial-temporal concern. From a temporal view, as from a spatial view, disease occurrence can be understood in different ways. In one, official sense, disease occurs when a case is discovered, diagnosed, and registered. In a different, personal sense, disease occurs when an individual feels ill, which often, but not necessarily, happens before the diagnosis is made. Sometimes a disease is discovered at a routine screening before the patient has felt any symptoms. In a wider perspective, a pathogenic process may begin with exposure, when the actual transmission occurs, that may eventually lead to a disease. Between the start of a pathogenic process and the onset of symptoms lies a period of incubation or latency. With influenza, the incubation time is a matter of days, whereas HIV/AIDS, which is caused by a lentivirus, has an incubation period of months or years (UNAIDS 2007) and hepatitis C may remain undetected for decades if it causes only mild or no symptoms. In the meantime, the affected individuals may have moved, which means that the exposure or pathogenic onset may have happened in a different place and a different environment than the place where the case is eventually recorded. This potential dislocation, or time–space lag, complicates analyses of disease occurrence, causes and determinants.

Time geography

Capturing the actual dynamics, in space and time, of infective agents and susceptible populations is an almost insurmountable problem. A partial solution is offered by time geography, which provides an approach to explore spatio-temporal behavior of individuals and their interaction with the environment (Hägerstrand 1970, 1982, 1985; Ellegård 1999). For a primer on time geography, the reader may also wish to consult a recent special issue devoted to the subject.[1] Time geography has rarely been used for epidemiological purposes, but with increasing access to individual residential history data, and computational power, the time–geography approach is regaining popularity in spatial epidemiology (Han et al. 2005; Jacquez, Kaufmann et al. 2005; Sinha & Mark 2006; Jacquez et al. 2007).

Time geography is a coherent ontological framework supported by a visualization technique, the fundamentals of which are shown in Figure 7.4. Individuals are represented by trajectories or life-paths, through space and time. Likewise, various environmental components, including health hazards may be visualized. With its focus on *individuals* (as opposed to aggregated data) time geography opens a potential for flexible groupings. The point is, rather, to discover what is hidden in aggregated, batch data, in macro-perspectives and cross-sectional perspectives. Real life contains innumerable moves in the space dimension, which create trajectories, and by analyzing and modeling these trajectories we can ascertain individuals' behavior

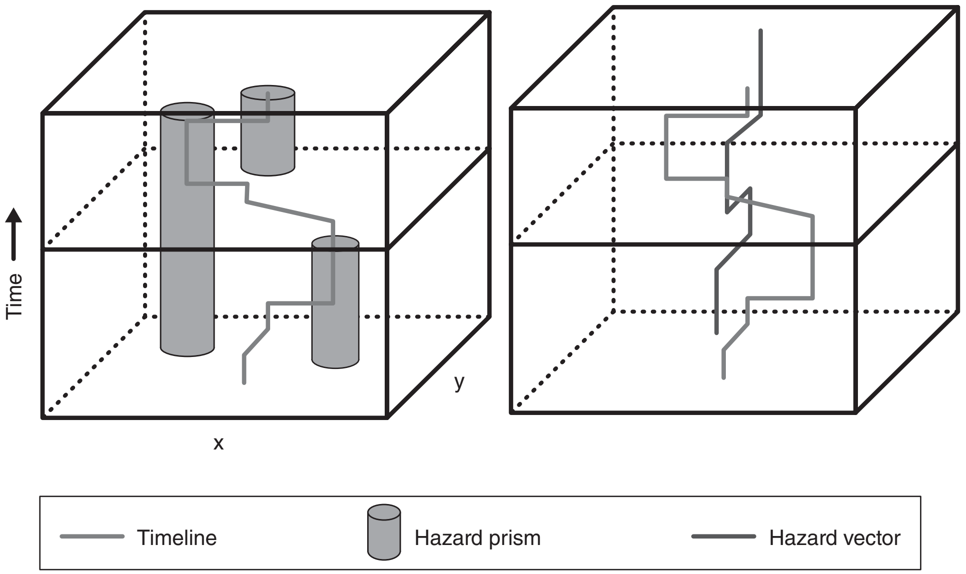


Figure 7.4 An individual space–time activity model for transmission of disease. *Source*: Adapted from Hägerstrand, T. (1970) What about people in regional science? *Papers of the Regional Science Association* 24, 7–21.

and thus begin to estimate individual-level exposure. Moreover, if high-resolution data on mobility and exposure can be accessed, time geography offers a suitable ontological and methodological approach to the intricate problem of mobile populations and complex exposure situations.

Disease surveillance systems

Understanding the geographical diffusion of diseases is highly important for long-term prediction and containment of diseases. Adequate prediction and surveillance is necessary for public health intervention in emergencies. Many conventional maps of disease distribution are crude and inaccurate, but tools have been developed for monitoring, surveillance, simulation, and prediction, based on better understanding of the spatial and temporal behavior of diseases. GIS can be usefully applied to aid disease surveillance, simulation, and analysis, provided that cases and risk factors can be registered with high spatial and temporal accuracy. Remote sensing can be used for surveillance of ecological conditions and habitats for disease agents and vectors. GIS-supported simulation has been used to forecast the diffusion of HIV/AIDS and legionnaires' disease. With sufficiently accurate data, simulation can be applied on any level down to blocks and workplaces.

Early warning is important for national and global security in cases of serious infectious epidemics, whether natural or deliberate, perhaps terrorist-induced, attacks. Since 1992, alarm over emerging and re-emerging diseases has resulted in a number of national and international initiatives to restore and improve surveillance and control of communicable diseases. The World Health Organization (WHO) urged all member states to strengthen surveillance for infectious diseases in order to promptly detect re-emerging diseases and identify new infectious diseases. The success of this initiative depends on the ability to obtain information on infectious diseases and the willingness to communicate this information nationally and internationally.

RODS (real-time outbreak and disease surveillance) is a type of software which can be used for early detection of epidemics. If cases are reported immediately to the system it can discover signs of epidemics which individual physicians are unable to see from their limited perspective. There are many national (and increasingly continental) disease surveillance systems, such as Sentiweb – an internet-based French communicable disease surveillance system (Réseau Sentinelles France 2008). One of the WHO's main means of creating a global surveillance system has been the development of a "network of networks" which links together existing local, regional, national, and international networks of laboratories and medical centers into a super surveillance network.

The ambition would be to combine recent advances in GIS, remote sensing, spatial analysis methods, climate modeling, and disease transmission modeling techniques to develop an early warning system not only to detect emerging epidemics, but also to predict where and when the potential emergence of both conditions and infection could occur. This could be achieved by characterising areas where the climate may become suitable for the transmission of each disease, and employing known climate–vector–pathogen relationships. Alerting public health authorities to areas of potential developing risk should also be part of the system.

Changing Conditions for Emerging and Existing Diseases

The distribution and diffusion of infectious diseases is affected not only by (micro) biological changes, but also by social and structural changes in societies (Haggett 1994). Population mobility is increasing worldwide, whether it is measured in a daily, annual, or lifetime perspective – and whether the number or the length of journeys is used as measure. Migrants will dwell in several more or less different environments during their lifetimes. The respective and combined health effects of these different environments are not easily estimated but cannot be disregarded when looking for the causes and circumstances behind a certain disease. The effect of mobility could be a time–space lag between causes and effects that make conventional mapping spurious.

The conditions for diffusion have been radically altered by increasing spatial connectivity – modern transportation systems as well as increasing and diversified mobility (Prothero 1977; Gatrell 2002). Migration and other types of mobility appear in many shapes with complex effects on the diffusion and distribution of health and disease. Migration will entail large-scale relocation of health-related factors. Commuting entails regular exposure to different environments, while tourism and other long-distance traveling bring people in occasional contact with unfamiliar risks. A recent good example of this phenomenon was the emergence in China in late 2002 of SARS (severe acute respiratory syndrome), the first severe contagious disease to emerge in the twenty-first century (Greenfeld 2006). The outbreak consisted of 8422 cases, resulting in 916 deaths in 32 countries (World Health Organization 2003), rapidly transmitted around the around the world, facilitated by international air travel. Epidemic curves for SARS (Figure 7.5) show marked differences between selected affected countries with respect to the total number of cases and epidemic duration, despite similar levels of effectiveness of control measures.

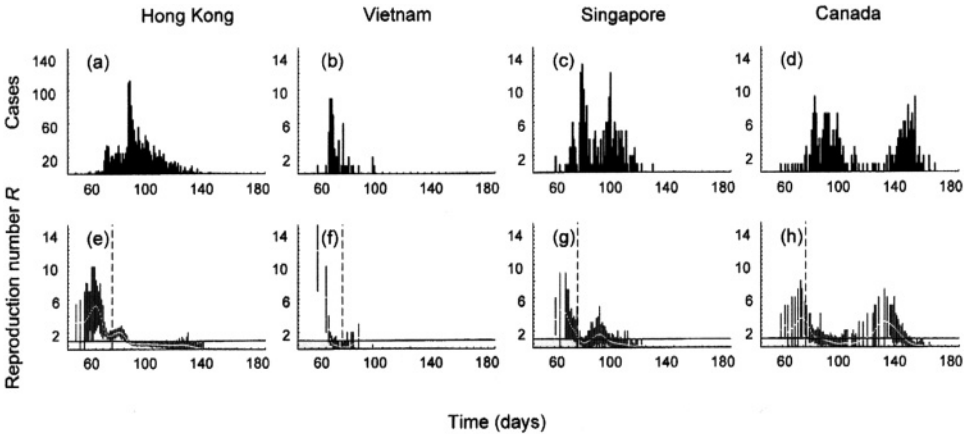


Figure 7.5 SARS epidemic curves, 2003. *Source*: Wallinga, J. and Teunis, P. (2004) Different epidemic curves for Severe Acute Respiratory Syndrome reveal similar impacts of control measures. *American Journal of Epidemiology* 160, 509–16. Reproduced with permission of Oxford University Press.

The globalization of our economic activities and culture, the rapidity of distant contact, the spread and intensification of urbanization, and our increasing reliance on either intricate or massive technology, are reshaping the relations between humans and microbes (McMichael 2004). In particular, we are destabilising ecosystems in ways that favor the proliferation of the small opportunistic species that (in contrast to the larger species such as ourselves) reproduce rapidly, invest in prodigious output rather than intensive parenting, and have mechanisms to efficiently disperse their offspring. Pathogens are typical small opportunistic species, and they live today in a world of increasing opportunity.

Global and local environmental changes alter health prospects. In the future, the living conditions for agents and vectors involved in disease ecology might change in the wake of climatic change, just like prevalent winds and weather conditions might favor or disfavor the diffusion of a particular epidemic. Of recent international concern is the potential for the transmutation of the H5N1 strain of avian influenza to a form that could be directly transmitted between humans (Davis 2005). This could result in a major global human influenza pandemic on a scale similar to that in 1918 (Barry 2005; Honigsbaum 2008). Though H5N1 has not yet transmuted to become transmissible from human to human, that it will do so is a very real possibility. The case mortality rate for humans infected from chickens and other birds in south-east Asia is disturbingly high. Currently, in 2009, a further threat of global pandemic influenza is being posed by the H1N1 "swine" flu outbreak, originating in Mexico, but being quickly spread across the globe, initially facilitated by vacationers returning from holidays in Mexico to their home countries.

In the wake of increasing intercontinental mobility and also changing climatic conditions, infectious and vector-borne diseases are returning to Europe, North America, and other parts of the world where they have been absent or confined for decades. Tuberculosis and malaria provide examples of "re-emerging" diseases with different geographical characteristics. Globally, TB has never been eradicated. According to WHO, the current prevalence is some 14 million worldwide and some 1.6 million deaths per year can be ascribed to TB. Incidence and mortality are highest in the African region, while prevalence is highest in Southeast Asia. The "return" of TB in Europe and the American continents is a consequence of migration, microbiological changes, and social conditions. TB now appears in drug-resistant forms, such as multi-resistant (MDR-TB) and extensively resistant (XDR-TB) forms (Shnayerson & Plotkin 2002).

Since some organisms remain unchanged, infection and survival will yield future immunity, whereas mutations will prevent immunity. The influenza virus regularly appears in new strains, preventing lifelong immunity, while the measles virus remains stable. Current health threats are mutations giving rise to new varieties and drug-resistant forms of causal organisms, for example, methicillin resistant staphylococcus aureus (MRSA) and tuberculosis (TB).

Measles epidemics in Iceland illustrate the effects of changing conditions for diffusion. Measles is not endemic in Iceland, since the country is topographically isolated and its population is too small for the virus to remain in circulation. Thus, each epidemic is introduced from abroad, usually from Scandinavia or Britain. Modeling all epidemics of measles in Iceland from the 1870s has revealed several changes of diffusion, probably reflecting structural modernization. Since 1945 measles epidemics have become more frequent and always started in the capital region, close to the international airport, whereas some previous epidemics started in harbor villages along the coast (Cliff et al. 1981). With increasing urbanization, improved transportation, and a shift from an ambulatory school system in rural areas to fixed schools, the speed of spread of measles across Iceland increased.

Many vectored diseases have been identified as having significant potential for diffusion, but none is more notable than malaria. This disease, which was nearly eradicated in the 1960s, now results in 300–400 million new infections per year and the World Health Organization estimates that the population at risk of developing malaria will increase to 2.5 billion people with scenarios of moderate temperature change (Mayer 2000). Not only can tourists visiting malaria-endemic areas return infected, but persons who have never been there have been diagnosed with so-called "airport malaria" after being bitten by mosquitoes that have been relocated by international flights and survived for some time at the destination. Certain intercontinental flight routes have been identified as particularly risky and the majority of cases have been found in France, Belgium, and United Kingdom. This development can be put down to international mobility, but even nosocomial cases have been found, when patients have received transfusions of infected blood. Although the phenomenon is rare – since the first confirmed case was diagnosed in 1977, on average two cases annually have been recorded – it is a potential future risk. If global warming induces ecological changes, new habitats for malaria might emerge. An even more imminent hazard associated with intercontinental air transportation is the risk that malaria is re-introduced in regions which are currently free but provide favorable conditions for the disease.

Emerging Techniques

There will no doubt be increased use and sophistication of spatial technologies such as GIS, remote sensing and GPS, and the integration of such technologies with disease infection models in the future. We do not intend to review this constantly evolving field here, but due to the substantial hurdles involved in collecting real individual space–time epidemiological data to understand disease diffusion, one promising approach that is attracting increasing attention is a move towards simulation models based on representing social processes at an individual level (O'Sullivan 2008).

Place effects on health emerge from complex interdependent processes in which individuals interact with each other, and their environment, and in which both individuals and environments adapt and change over time. Traditional epidemiologic study designs and statistical regression approaches are unable to examine these dynamic and interactive processes.

Agent-based models and other systems-dynamics models may help to address some of these challenges (O'Sullivan 2008) including within the infectious disease epidemiology field (Yang & Atkinson 2008). Agent-based models (ABM) are essentially computer representations of systems consisting of autonomous heterogeneous micro-entities (agents) that can interact and change/adapt over time in response to other agents and features of the environment. Agents can be given traits and initial behavior rules that organise their actions and interactions. Stochasticity can be included in the assignment of agent characteristics and in determining which agents interact and how agents obtain information, make decisions and learn from these interactions, thereby exhibiting so-called artificial intelligence. The model is run over time and repeated numerous times to obtain a distribution of possible outcomes for the specified system. Using these models, one can observe how macroscale dynamics emerge from micro-scale interactions and adaptations.

Use of these dynamic models may complement traditional epidemiologic analyses and yield additional insights into the processes involved and the public health interventions that may be most useful (Auchincloss & Diez-Roux 2008). An example may help. Suppose one were trying to model an emerging hypothetical infectious disease outbreak, such as avian influenza. ABMs could be used to predict the spread of the disease, taking into account the complex movements and migrations around the world of potentially infected individuals. Agents would be given traits such as infectious state, movement characteristics, and even could be allowed to develop protective or defensive behaviors to help prevent them becoming infected. If the models are repeatedly run, a useful estimate of the range of potential real-world outcomes could be obtained, and thus aid public health professionals plan for future emerging epidemics.

Conclusion

This chapter started by sketching the unique biological processes that operate within the infectious disease field, then moved through (disease) diffusion processes and infectious disease modeling, including disease surveillance, before considering the impact of changing conditions, including climate change, on the diffusion of existing and newly emerging infectious diseases. The discussion concludes by considering emerging techniques to help counter these new and emerging disease threats. Where once society aimed to eradicate so-called nineteenth-century infectious diseases of poverty and squalor such as cholera and plague, we are now facing newly emerging diseases which will challenge the limits of both our ability to model the diffusion processes, and available technology to respond in a timely and appropriate manner.

It is acknowledged that we have presented here a largely biomedical interpretation of infectious disease diffusion. It would be false however, to assume that the biomedical model of explanation of infectious disease – whereby a full understanding of the infectious process would result in total control or disease eradication – provides a full and complete understanding of all infectious disease outbreaks. One has only to take, for example, the rise in measles cases, and deaths, in the UK in 2008 due to insufficient population-wide vaccinations rates, to see the fallacy of this argument. Measles is well understood medically, but clearly there are social factors which can result in diseases remaining endemic or even re-emerging in the future as epi- or pandemics.

Note

1 *Geografiska Annaler: Series B, Human Geography*, time-geography special issue, 86 (4), 2004.

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Chapter 8

Modeling Chronic Disease

Myles Gould

Introduction

This chapter reviews research that has used statistical models to examine patterns and causes of variations in chronic diseases and illnesses. The chapter focuses on coronary heart disease (CHD) and respiratory illness as its case studies. These chronic diseases have received considerable attention from health geographers as well as epidemiologists. The emphasis of the chapter is on the application of regression analysis and other generalized linear models.

Chronic diseases and illnesses such as heart disease, diabetes, asthma, arthritis, cancers, and severe strokes are typically long lasting; sometimes lasting the whole of an individual's life, or middle to later stages of life. The discomfort, pain, and other symptoms associated with chronic disease and illness are frequently managed with medical treatment but never completely relieved; and sometimes can lead to longer-term degeneration and death. Chronic diseases are more prevalent in developed countries that have undergone the later stages of epidemiologic transition, where infectious diseases (e.g. tuberculosis, measles, and cholera) caused by biological organisms spread of from person to person or from other agents, have been replaced as the major causes of death amongst the population (Curtis & Taket 1996).

Data on Chronic Disease

In the past geographers and other analysts were restricted to analyzing routine data published for quite coarse spatially aggregated administrative areas, or alternatively undertaking their own epidemiological surveys (Moon et al. 2000). In the case of the former, this involved using mortality statistics based on official death registration related to some longstanding chronic condition (e.g. CHD, lung cancer) as morbidity data and/or other proxy information was not readily available. There are still many statistical agencies in less developed countries with poor infrastructure that do not have good quality mortality data for specific causes of disease. Today aggregated mortality statistics are *routinely* available for both relatively large regions (e.g. local authority districts in the United Kingdom; counties in the United States) and quite small local areas (e.g. wards in England and Wales).

Analysis of aggregate mortality data needs careful consideration particularly when there are only a small number of deaths for a particular cause (e.g. cancer), for a specific period of time, and for geographical areas with relatively small underlying populations (Cromley & McLafferty 2002; Gatrell 2002; Coggon et al. 2003). Standardizing (e.g. for age and sex distributions) is important in taking account of different populations at risk in different areas. Empirical Bayes mapping can help to reduce the problems of "noisy" chance findings associated with the small-numbers problem when the underlying population denominator is small (Jones & Kirby 1980; Clayton & Kaldor 1987; Langford 1991, 1994; Lawson et al. 2003). It is also important to acknowledge the implications of the modifiable area unit problem for any analysis and modeling undertaken (see concluding section). Usefully, the Office for National Statistics (ONS) also links mortality data from more than one year with the Census to produce a "stable" population base, publishing decennial supplements to allow more reliable and standardized comparisons in England and Wales (see Britton 1990; Griffiths & Fitzpatrick 2001, for example). Marmot and McDowall (1986) used the decennial supplement to explore regional and occupation variations in CHD mortality. Alternatively some studies have made able use of local heart disease registries (Huff & Gray 2001).

An alternative solution to data needs is to make use of existing epidemiological surveys or collect primary data (Moser & Kalton 1971; Alderson 1983; Moon et al. 2000). Due to the considerable costs involved, surveys are sometimes based on a local or regional cross-sectional survey of disease. These typically give a picture of the incidence of disease in a particular population, in a particular region, and at a particular point in time. If well designed, and large enough, these surveys *may* be generalizable to other populations in other localities (assuming the underlying populations are comparable). The British Regional Heart Study provides an example of a survey that has been used to study patterns of CHD (Pocock et al. 1982; Shaper et al. 1985). The US National Health Interview Survey and the Health Survey for England (HSE) are a series of national cross-sectional surveys that provide information on chronic illness including heart disease for a large number of individuals (Colhoun & Prescott-Clarke 1996; Pleis & Lethbridge-Cejku 2007).

In America, the Framingham Heart Study is an example of a series of prospective longitudinal cohort studies (dating from 1948 to the present and including third-generation offspring) that have explored the onset of heart disease amongst a sample of inhabitants in a Massachusetts town (Lloyd-Jones et al. 1999; Fowler & Christakis 2008). The Tecumseh study was undertaken in Michigan, and has been used to determine coronary heart disease mortality and diabetes, again using a prospective cohort (Butter et al. 1985). Elsewhere, the Busselton Health Study has been studying heart disease amongst town residents in Western Australia since 1966. This has used a combination of cross-section and longitudinal epidemiological surveys, some data linkage with hospital records, and physiological measurement and DNA sampling (Coles et al. 2003; Webster et al. 2009).

Another example is the large and comprehensive Health Survey in Scania, Sweden; which has been linked to population, hospital and mortality registers, and used to explore heart disease and mortality (Chaix et al. 2007a, 2008). The 1983–5 Whitehall II longitudinal cohort study explored the nature of social gradient variations in health amongst British civil servants (Marmot et al. 1991). The prospective cohort studies sought to investigate psychosocial influences on health, and factors that might be associated with heart disease (e.g. work environments and social support). Finally, the Longitudinal Survey (LS) in England and Wales has followed a 1 percent sample of the population, and includes amongst other things, individual linked registration data on vital events (e.g. births and deaths) and 1971–2001 Census records (Dale 1993; Hattersley & Creeser 1995). Relatively detailed demographic, socio-economic, and geographical multivariate analyses can be requested from the ONS; and potentially can provide some handle on the relationship between morbidity, chronic illness, and mortality over time.

The rest of this chapter is organized into four sections. The first provides a generic overview of statistical modeling techniques used to fit functional relationships between chronic disease data and a number of "predicator" variables (typically relating to demographic, socio-economic and environment characteristics). The section begins by describing the simplest models before going on to consider other more complex extensions (including multilevel modeling). Statistical modeling is a very large topic so discussion will provide an overview of key concepts and topics that are important to contemporary health geography involving quantitative analysis. The remaining sections consider examples of the application of these statistical techniques from the health geography and epidemiology literatures on CHD and respiratory illness. There is a concluding section that considers the limitation of these statistic analyses and outlines a number of general issues and prospects for future research on chronic disease/illness.

Statistical Modeling

The standard regression model

Figure 8.1a is known as a "scatterplot" and shows a hypothetical example where areal rates of CHD are plotted against some measure of age (reflecting differences in local age profiles). Rates of heart disease increase in areas with more elderly populations (i.e. increase from left to right of the graph). Whilst there is a suggestion that the relationship is causal (increases in age cause increases CHD), this is not necessarily the case until *confirmed* by other information and research evidence from other studies. Other variables also need to be "controlled for." It is possible that age relationship may be confounded such that another unknown variable may be influencing variations in CHD. This hidden variable may actually be co-varying with age, such that age is not really a cause of CHD (although this is unlikely given our general knowledge about the importance of age – see also below). Figure 8.1a provides a useful graphical summary of the trend between the two variables but it would be particularly useful to quantify the nature and extent of the relationship between the two variables (Jones & Moon 1987). Statistical models provide a numerical representation of a fixed relationship between an observed response

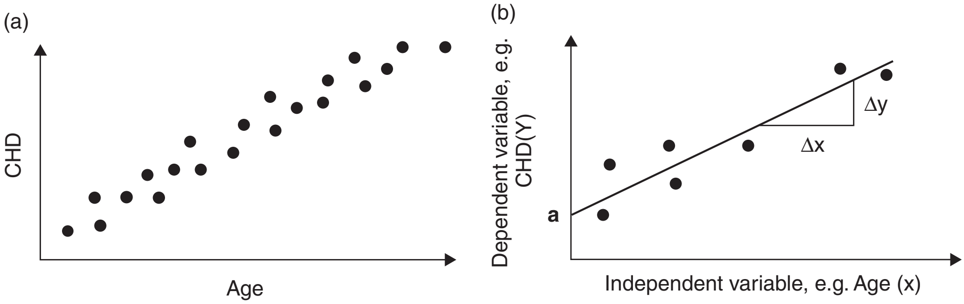

Figure 8.1 Hypothetical example of bivariate relationship between heart disease and age: (a) scatterplot; (b) adding a regression line.

variable, and one or more explanatory variables, together with a measure of uncertainty associated with this relationship (Chatterjee & Price 1991; Weisberg 2005). Figure 8.1b shows a hypothetical bivariate regression model that has been fitted to data for CHD (response/dependent variable y) and age (predictor/explanatory variable x). A linear straight line has been fitted through the cloud of data points (note for clarity that there is smaller number of points than on the previous graph). Having summarized the relationship between the two variables the regression line can be used to predict values of CHD (y) given values of age (x). The equation for such a regression line is given by:

$$y = a + bx$$

where b is the slope of the line in Figure 8.1b (i.e. the change in x divided by the change in y, and denoted: $\Delta x/\Delta y$). We can interpret the regression equation and use it to tell us what the change in y (CHD) will be for a given change in x (age). We can also use the regression line to predict values of CHD given a particular other intervening value of age (that is not actually observed in one's empirical data).

Returning to Figure 8.1b, it can be seen that there is a discrepancy between the observed data points (the dots) and regression line, and it is differences between the values that gives rise to the residuals (or errors). When the predicted value of CHD for a particular age is greater than the observed value, the residual is said to be negative – the regression line over predicting y. The reverse situation occurs when the regression line over predicting y and results in positive residuals. If the observed values of CHD actually fall on the regression line it will have a zero residual. Ordinary Least Squares (OLS) provides one mathematical estimation procedure to find a line of best fit and it does so by minimizing the deviations between the empirically observed data values and those predicted by the regression model (i.e. falling on the regression line). In fact OLS minimizes the sum of each residual squared. There are many ways of deriving the regression line, but OLS is one of the most frequently used approaches (Chatterjee & Price 1991; Weisberg 2005). The sum of the squared residuals gives a measure of how much of the observed data is explained by the regression model/line, and can be summarized using a statistic known as the coefficient of determination (r^2). We can now rewrite the above equation as:

$$\widehat{y} = \widehat{\beta}_0 + \widehat{\beta}_1 x_1 + \varepsilon$$

where:

$\widehat{y}$ is the predicted value of the response variable CHD;
$\widehat{\beta}_0$ is the estimated value of the intercept, i.e. the value of y, when x equals zero;
$\widehat{\beta}_1$ is the estimated value of the slope, and which measures the effect on CHD (y) of a unit increase in age (x_1);
x_1 is the predictor variable age;
ε is the residual (that is $y - \widehat{y}$).

The residuals (ε) are viewed as "errors" or "deviations" from the fixed relationship between response and predictor variables; a result of omitted variables, measurement error (sampling variation), or an indeterminate world (stochastic variation); and a way, in part, of relaxing the rigid assumptions of the traditional regression model shown in Table 8.1 (Jones & Moon 1987; Miles & Shevlin 2001; Gujarati 2003).

The bivariate model can easily be extended to include more predictor variables using a multiple regression model. A simple multiple regression model of chronic illness can be expressed as some function of a number of independent predictor variables thus:

$$y = f(x_1, x_2, \ldots x_n) + \varepsilon$$

Where,

y is a response variable measuring some chronic disease outcome or incidence rate;
$x_1 - x_n$ are a number of independent variables representing demographic social, behavioral, medical, geographical characteristics and factors
ε is the residual error term.

The x-variables are assumed to be unrelated to each other and potentially independent factors associated with CHD. It is possible to include extra terms to model the synergistic interactions between predictor variables (Jones & Moon 1987: Chapter

Table 8.1 Assumptions of classical regression

1 The residuals (or error terms) will have a mean of zero.
2 The error terms will be patternless and unrelated to each other (i.e. there will be no autocorrelation between the residuals).
3 The error terms will have a constant and equal variance (i.e. the residuals will be "homoscedastic").
4 There will be no correlation between errors and the x-variable.
5 The regression model will be correctly specified, i.e. a linear function will have been fitted to linear data, or the variables will have been transformed so that the fitted model is "linear in its parameters."

Source: Adapted from Gujarati, D.N. (2003), *Basic Econometrics*, 2nd edn, McGraw-Hall, New York.

3). For example, and assuming individual survey responses are being analyzed, an interaction term could be included to investigate whether older people who smoke have higher rates of CHD.

Regression assumes that the *x*-variables are related to *y* according to some function certain models may be more appropriate than others and some functions might better fit the data and also better reflect theories and knowledge about the epidemiological, sociological, and geographical processes under consideration. A linear functional form is not always appropriate and can be relaxed using non-linear models; or data can be statistically transformed before model calibration (Jones 1984; Erickson & Nosanchuk 1992), and/or a generalized linear model can be used.

Generalized linear models

The generalized linear model (GLM) provides a general and unifying framework for extending the regression model, particularly when the response variable is not measured on an interval or ratio scale, and/or there are several response variables (Wrigley 1985; McCullagh & Nelder 1989; Dobson 2002; Gujarati 2003). GLMs provide a family of models that relate predictors (the *x*'s) to a dependent variable (*y*) using an appropriate link function (i.e. functional form), and summarize the error terms using an appropriate distribution given the nature of the response variable. Table 8.2 illustrates a number of different GLMs used with different responses, indicating the appropriate link function and error distribution for residuals. For example, when modeling area count data for a rare disease (e.g. a cancer) a Poisson model can be used. When the presence or absence of a chronic disease amongst individuals (i.e. data measured on a nominal scale) is being modeled a binary logistic model is appropriate.

Table 8.2 GLMs: response type, link functions, and error distribution (model type)

	Example(s)	*Model type*
Interval or ratio measurement	Incidence rate in area; forced respiratory volume	Identity with normally distributed error term (i.e. standard OLS regression model)
Binary categorical	Smoker/non-smoker	Logit or probit or log-log model with binomial error term
Proportion	Proportion of individuals in area with CHD (e.g. cell in a multi-way contingency table)	Logit with binomial error term
Multiple categories	Smoke, drink and exercise (all yes/no)	Logit model with multinomial error term
Ordered categories	Low, medium and high physical functioning	Ordinal logistic regression with multinomial error term
Count	No of cases of leukemia in an area	Log model with Poisson random term

Source: Developed and adapted from Dobson, A.J. (2002), *An Introduction to Generalized Linear Models*. Chapman and Hall, London; McCullagh, P. and Nelder, J.A. (1989), *Generalized Linear Models*. Chapman and Hall, London.

Multilevel models: bringing in the geography

Traditionally statistical analysis in medical geography and epidemiology has made use of aggregate/ecological data sources and the geography was "crudely" introduced into analysis; but with the advent of more readily available disaggregate health data, it has become increasingly more common to use the *individual* as the unit of analysis. Multilevel statistical modeling is now readily used to *simultaneously* analyze variations in health and disease between both individuals and geographical areas (or contexts). The technique has become particularly attractive in epidemiological analysis (Rice & Leyland 1996), and perhaps the standard modeling strategy. It has also facilitated a practical and empirical engagement with the wider *composition–context* debate about health variations (Macintyre et al. 1993; Smith & Easterlow 2005; Smyth 2008).

Multilevel analysis provides a very flexible modeling framework and several different "levels" and geographies (e.g. individuals, neighborhoods, hospitals, districts, and regions) can be incorporated into models in different ways (Gould et al. 1997). Multilevel models explicitly acknowledge and properly handle data that is hierarchically structured (Jones & Duncan 1995; Duncan et al. 1998; Snijders & Bosker 1999). Typically, multi-stage sample survey designs have an inherent hierarchical structure due to the clustering of individuals within higher data units (Goldstein & Silver 1989). For example, individual respondents might be nested within wards, which are in turn nested within strategic health authorities (as in the case of the multi-stage design of the Health Survey for England). The multilevel models also allow variations in disease status to be decomposed and attributed to different analytical levels. They also provide precision weighted "shrunken" estimators that take account of differential sampling size, and are therefore superior to estimates provided by OLS Regression (Jones & Bullen 1994).

Multilevel modeling allows some analytical purchase on whether variations in disease/illness are due to the underlying demography and social makeup of areas (i.e. the composition – age and sex distribution, ethnicity, and socio-economic characteristics); or whether the particular contextual characteristics of areas/places have an effects (e.g. including variables such as social-economic deprivation, social capital, and environmental pollution etc.). Moreover, it is also possible to model the interaction between the two; that is, the differential effect of an area in relation to the characteristics of its local constituent population (Jones & Duncan 1995; Snijders & Bosker 1999). Following Jones and Moon (1991) a multilevel macromodel of chronic disease can be summarized figuratively as:

Chronic disease outcome for individual = Individual effect for individual
+ Contextual effect for area
+ Compositional/contextual interaction
+ Individual random effects
+ Area random effects

It is by using such a multilevel model formulation that it is possible to model simultaneously variations in individual characteristics between different geographical areas.

We can visualize multilevel models in terms of a series of graphs (Figure 8.2). The first graph (Figure 8.2a) is our familiar bivariate regression model and shows a positive slope between age and CHD (assumed here to be measured as a continuous variable) for all individuals in all places. That is, the model denies any possibility of there being a varying relationship between areas. Figure 8.2b relaxes this assumption by allowing there to be different "random" intercepts for different places (and assumed to form a statistical distribution). As a result, there are several lines (one for each place) that fall around a thicker bolder line that represents the global relationship for all people in all places. The different positions of the lines give rise to different intercepts thereby indicating place-to-place variations in CHD. Each line is drawn parallel to each other as the relationship between age and CHD is the same (i.e. fixed) for all places. Using such a random intercepts model it is possible to make place-by-place comparisons in CHD allowing for differences in underlying demographic and socio-economic compositional of areas. Figures 8.2c and 8.2d allow the relationship between age and CHD to vary between different places. In the first situation (Figure 8.2c) there is little between-place variation in CHD for young people, whilst there are very large places differences for elderly people (i.e. the pattern of slopes is divergent). The final graph shows a complex, non-straightforward patterning of both random slopes and intercepts for different places.

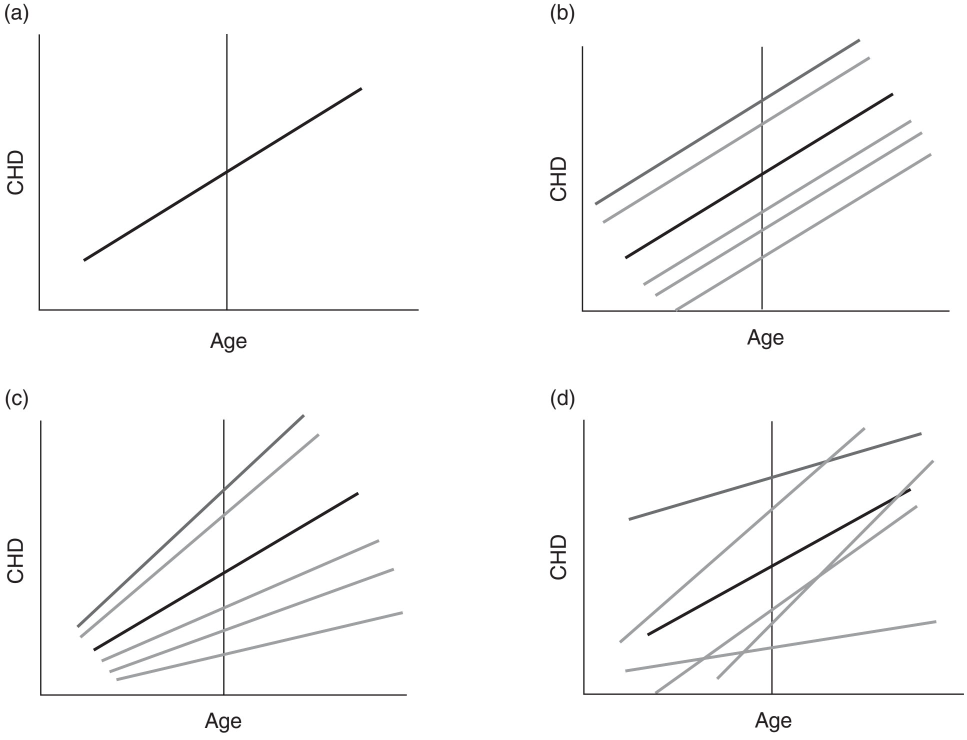

Figure 8.2 Varying relationships between CHD and age: (a) single-level regression model; (b) random intercepts model; (c) random divergent slopes; and (d) random complex slopes.

The different situations shown in Figure 8.2 (and others) are tested to find out which best describes empirical data.

As previously indicated, multilevel models can also *simultaneously* include a number of individual and ecological predictor variables (e.g. associated with neighborhood characteristics) together with their cross-level interaction(s). These variables can be incorporated into statistical models in a number of different ways as conceived in Figure 8.3, and drawing on similar diagrams and discussions in Tacq (1986) and Snijders and Bosker (1999). Figure 8.3a shows a classic micro-level model where variations in CHD are explained by age. Both the predictor and the response variable are measured at the individual level and are displayed below the dotted line that distinguishes between micro-level individual variables and macro-level ecological variables. Figure 8.3b shows the situation where an ecological variable neighborhood deprivation is measured for neighborhoods (drawn above the dotted line) and is used to predict individual-level CHD. Figure 8.3c is shown for completeness, and is the case where individual-level ages have been added together, and averaged for each area, and subsequently used as group-level predictor of aggregate rates of CHD between neighborhoods (again drawn above the dotted line). The next diagram (Figure 8.3d) shows the situation where *both* individual and ecological-level variables are used as separate and independent predictors of CHD (once again measured for individuals). Finally, Figure 8.3e illustrates the hybrid situation where there is a cross-level interaction between an individual-level variable and an ecological neighborhood variable.

Figure 8.4 shows one such possible cross-level interaction between the individual-level characteristic "age" (illustrated here as categorical variable, either young or old); and the place-level variable "socio-economic deprivation." The graph shows three things: firstly,there are differences in CHD, such that the "old" have considerably higher CHD than the "young." Secondly, CHD levels are higher in areas that are more socially deprived. Thirdly, the difference in CHD for the old and young

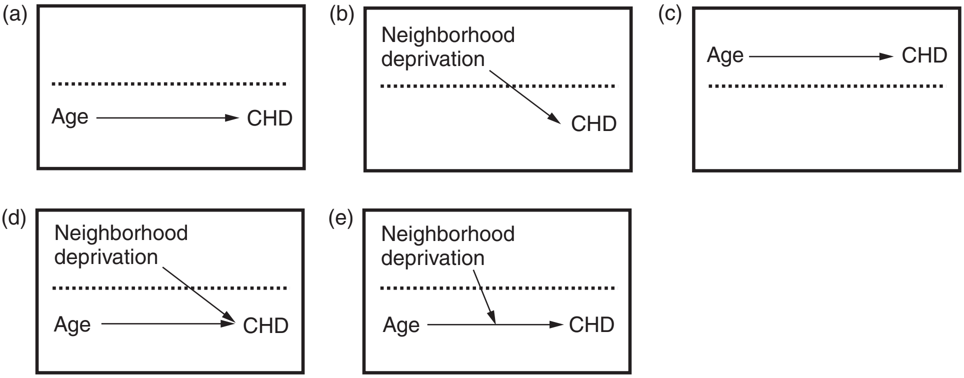

Figure 8.3 Including predictor variables in different micro-, macro-, and multilevel models of chronic disease. *Source*: Adapted from Tacq, J. (1986) *Van Multiniveau Probleem naar Multiveau Analuse*. Department of Research Methods and Techniques, Erasmus University, Rotterdam; Snijders, T. and Bosker, R. (1999) *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modelling*. Sage, London.

Figure 8.4 Cross-level interaction for an ecological and individual variable.

age groups becomes much more marked in areas that are more socio-economically deprived. The nature of cross-level interactions can take on different forms and are discussed in much more detail in Jones and Duncan (1995).

It is worth noting that there are other approaches for explicitly including geographical location and position in statistical modeling. The expansion method and geographically weighted regression (GWR) provide alternative strategies that can be used to model data points that are distributed continuously over space (Foster 1991; Jones & Casetti 1992; Fotheringham et al. 2002). Lawson et al. (2003) note that multilevel models (with shrunken estimation) provide better local estimation over GWR in two epidemiological analyses that they have undertaken.

Chronic Heart Disease

General epidemiology and patterns

Coronary heart disease (CHD) is a very common chronic disease in many developed countries experiencing the latter stages of the epidemiological transition (Curtis & Taket 1996). It results in the greatest proportion of deaths associated with the circulatory system. CHD is also known by the medical name ischaemic heart disease (IHD), and involves the furring up of the arteries, reduced blood circulation (sometimes leading to complete obstruction), and/or blood clots (thrombosis). These symptoms can result in chest pain (angina), irregular heart beat, heart attacks (myocardial infarction), and fatal heart failure. CHD is a major cause of death and morbidity even in developed countries like the United States where total CHD mortality has fallen (Curtis & Tacket 1996: Figure 4.4). Bryce et al. (1994: 678) note that falls in CHD mortality began relatively early in the United States compared to other etablished market economies (EMEs) such as Britain. The World Health Organization (WHO) reported that cardiovascular disease (which includes CHD) accounted for almost 16.65 million deaths worldwide in 2002, representing around 29 percent of all deaths; with 80 percent of these deaths occurring in low- and middle-income countries (WHO 2003). WHO has also estimated that CHD was the fifth major leading cause of non-fatal disease in 1990, accounting for 3.4 percent of total years lived with disability (Mathers et al. 2004). CHD is a major cause of premature death and closely associated with health behavior. Global premature deaths from circulatory diseases *attributable to smoking* are expected to rise 5.4 million in 2004 to 8.3 million in 2030; and account for nearly 10 percent of deaths worldwide, and 80 percent in developing countries respectively (Portela & Santarelli 2003; Guyatt et al. 2004; WHO 2008a).

Variations in heart disease: description and modeling

Descriptive studies have shown clear relationships between CHD (death and morbidity) and age, with higher rates for males than females and variations between different ethnic groups, social classes, and occupational groups (Marmot & McDowall 1986; Marmot et al. 1991). For example, Huff and Gray (2001) found reductions (between 1982 and 1992) in both male and female CHD mortality in their study of Nottingham health authority in England. There are a number of ecological regional studies that have looked at geographical variations in CHD in England (Marmot & McDowall 1986; Mohan et al. 1990; Curtis et al. 1993). Patterns of relatively high mortality rates from CHD are found in northern England with much lower rates being found in the south-east of the country (Britton 1990; Curtis et al. 1993; DoH 1995). Bryce et al. (1994) provide evidence of widening inequalities in rates of CHD between the most and the least deprived English health authority districts despite an overall national decrease in mortality over the period studied (1982–9). They used a number of graphical and statistical approaches; and, with some novelty, compare bivariate regression models of the relationship between male/female mortality and deprivation indicators (see also below) for the eight studies periods. Whilst the slope terms in *each* was always positive and statistically significant; there was only a slight "discernible" change in spatial inequalities between the more and less deprived areas over time, although this temporal trend was not found to be statistically significant (Bryce et al. 1994: 686, Figure 3).

Similar work in the United States has explored change in CHD mortality over time for State Economic Areas (Davis et al. 1985; Wing et al. 1986, 1987). These studies used regression analysis and found that areas starting with mortality rates above the national average had the smallest mortality reductions over the period 1968–78, and that these spatial patterns of inequality were both complex and increasing. Wing et al. (1986) classified State Economic Areas as being "early," "middle," and "late" in terms of the onset year of decline in CHD mortality. They went onto find that areas with more people employed in "white-collar" professions experienced the greatest reductions in CHD mortality (Wing et al. 1987). Later work by Wing et al. (1990) interestingly, reported that increases in CHD inequality were more rapid than for other cardiovascular diseases.

Curtis et al. (1993) explored relationships between local ward-level variations in CHD and different census-based composite indices of "socio-economic deprivation" (for more information about these indicators see: Townsend et al. 1988; Senior 1991). They undertook ecological modeling in a similar vein to that shown in situation (c) in Figure 8.3 (albeit with a different predictor variable). Deprivation showed a positive association with CHD for males in all regions, and there was a similar pattern of results for females other than for East Anglia. The strongest relationships were found when using the Townsend composite deprivation index. In the case of male mortality the individual component variable that showed closest association was the proportion of the population lacking a car; and for females it was proportion working in semi-skilled and unskilled jobs. Other ecological studies have also found delayed and/or widening local geographical variations in deaths from CHD in Scotland and Nottingham, and that these patterns are positively associated with local-scale socio-economic disadvantage (McLoone & Boddy 1994; Huff & Gray 2001). Gould et al. (2004) also demonstrate that local variations in CHD and self-reported long-term illness in the Leeds city region albeit with somewhat crude un-standardized descriptive analysis.

Much more sophisticated multilevel survival analysis of the Health Survey in Scania, Sweden, undertaken by Chaix et al. (2007a) has found that CHD incidence increased with neighborhood socio-economic deprivation, and that there was a weak association with neighborhood residential population stability, after adjusting for individual characteristics (e.g. age, sex, educational attainment, previous heart disease, and occupation). Other work showed that disparities in CHD mortality between the most and least deprived neighborhoods in Scania increased between 1986 and 1996 (when comparing cohorts); and that in 1996 the neighborhood socio-economic effect was of a similar magnitude to that for individual-level income (Chaix et al. 2007b). The researchers also found neighborhood cohesion and safety (based on aggregated residential perceptions) were associated with acute myocardial infarction mortality (Chaix et al. 2008). These examples use models that have a similar structure to that illustrated in Figure 8.3(d).

Other studies have investigated a number of different potential risk factors including health behaviors (Marmot et al. 1991) and these have typically used logistic regression models (e.g. Shaper et al. 1985). Table 8.3 summarizes some of the risk factors that have been suggested as having links with CHD. The table also flags established factors have been found to have strong and statistically significant effects in number of studies over many years (i.e. where there is a robust evidence base). Many of these factors and their relationships with CHD (including high-density lipoprotein cholesterol) have been investigated using the cross-sectional Health Survey for England (HSE) and US National Health Interview Survey. For example, the 1994 HSE showed that blood pressure, cholesterol, and smoking for both sexes was positively associated with reported CHD (Colhoun & Prescott-Clarke 1996). Marmot and Brunner (1991) review the published evidence for the finding of U-shaped curves for the relationship between drinking and heart disease, such that moderate levels of alcohol consumption provide a protective effect, compared to higher rates of disease amongst non- and heavy-drinkers (although they do not use regression analysis).

Multilevel analysis of the US Behavioral Risk Factor Survey by Diez-Roux et al. (2000) found that CVD risk factors (obesity, blood pressure, sedentarism, and smoking) were associated with state-level inequality in income having allowed for individual-level variables (including individual income). Although it should be noted these state-level findings were only statistically significant for women, other than for sedentarism, which was also found to be statistically significant for males. This provides an example of the model structure shown in Figure 8.3e. Jones and Duncan's (1995) multilevel analysis of self-reported heart disease symptoms (together

Table 8.3 Risk factors for CHD considered in epidemiological studies

Factor	*Established risk factor*
Sex	Yes
Age	Yes
Blood pressure	Yes
Personality type and susceptibility to stress	—
Diabetes	—
Obesity and lack of physical activity	—
Cigarette smoking	Yes
Diet (including cholesterol, other lipids)	Yes, in case of plasma cholesterol
Heavy alcohol consumption	—
Social class	—
Social mobility	—
Genetic factors (family history)	—
Water hardness	—
Climate	—

Source: Adapted from Curtis, S., Eames, M., Ben-Shlomo, Y., Marmot, M., and Mohan, J., et al. (1993), Geographical differences in CHD mortality in England: implications for local health planning. *Health Education Journal* 52, 72–8; Farmer, R., Miller, D., and Lawrenson, R. (1996), *Lecture Notes on Epidemiology and Public Health Medicine*. Blackwell, Oxford.

with respiratory function) using the Health and Lifestyle Survey are briefly considered in the next section.

The debate about modeling heart disease and water hardness

Work using the British Regional Heart Study found that geographical variations in mortality from all cardiovascular diseases (including CHD) and death rates were higher in towns that had softer water (Pocock et al. 1982). Ecological analysis (of the same form as Figure 8.3c) made use of multiple regression and found that the relationship remained once adjustment was made for variations in social class and local climate. As the authors note, causal interpretation is difficult as water hardness is closely correlated with other water characteristics; and it not known whether the negative relationship with heart disease is due to the reinforcing effects of bulk minerals (e.g. calcium or magnesium) or the lack of dangerous minerals (e.g. sodium, lead, and cadmium). The other factors found to have associations with mortality rates were: percentage of manual workers (positive relationship); car ownership, used as a proxy for affluence of an area (negative); percentage days with rain (positive); and mean temperature (negative). Again the authors find it hard to provide causal reasons as to why rates of heart diseases are higher in colder and wetter towns. The authors also fit models that specifically investigate the effects of the predicator variables on mortality from stroke and CHD and find broadly similar results, although the effect of water hardness is a little more pronounced for CHD. The results might also be affected by unmeasured confounding factors and the ecological fallacy – the problem of inferring individual effects from aggregated/grouped analysis.

Bringing this debate up to date, Ferrandiz et al. (2004) provide an example of a recent ecological analysis of heart disease and water hardness of 538 municipalities of Comunidad Valenciana (Spain) using time–space models and empirical Bayes disease mapping. Their analysis provides some statistical evidence for a relationship, and this is stronger for CVD than CHD (note the contrast with Pocock et al. 1982), but is more marked for women than males; and also clearer for magnesium than calcium levels. Ferrandiz et al. (2004) note that the effects found are weak but are not conclusive and that it is difficult to separate the influence of socio-economic and environmental factors. This is due to the ecological nature of the analysis undertaken. Marx and Neutra (1997) drew a similar conclusion in their review of several other ecologic studies of the relationship between CHD and magnesium levels in drinking water. Findings are contradictory due to a lack of specificity. Jones and Moon (1987: 134–41) made a similar point in their discussion of the theoretical and technical problems associated with Pocock et al. (1982) and other old studies. In terms of the specificity issue, they note that other conditions (e.g. bronchitis, liver damage, and congenital malformations) have also been shown to have a relationship with water hardness, thereby casting some doubt on the underlying causal mechanism for heart disease.

More recent literature reviews include Tubek's (2006) restricted consideration of studies of the positive and negative effects of trace elements in mineral waters; and a comprehensive review of 77 epidemiological studies of cardiovascular disease and water hardness from around the world (Monarca et al. 2006). The latter again concludes that, whilst many ecological studies have found protective association between heart disease and water hardness, calcium, or magnesium levels, results from other analytical studies (i.e. case-control and cohort studies) are less consistent, with some of these providing little evidence of any effect. It seems the jury is still very much out on the issue and different research is required to uncover what causal mechanisms might link water characteristics and heart disease.

Modeling Respiratory Illness

Chronic diseases of the respiratory system are a diverse range of conditions including: asthma, chronic obstructive pulmonary disease, bronchitis, and lung cancer. WHO (2005) estimated that in 2005 chronic diseases of the respiratory system account for 7 percent all deaths globally (approx. four million) and 4 percent of global disease burden. According to recent WHO (n.d.) estimates, currently 300 million people have asthma, and 210 million people have chronic obstructive pulmonary disease in 2007. WHO (2008b) have reported a reduction in deaths from diseases of the respiratory system in Europe throughout the period 1980–2005, and also shown that there are marked difference in death rates between males and females. Gatrell (2002) notes that health service consultations for asthma in the UK have increased four-fold in the period from the early 1970s to the early 1990s.

In this section we focus on one example of the multilevel modeling of respiratory illness using the Health and Lifestyle Survey (HALS) (Jones & Duncan 1995; Cox et al. 1987; Blaxter 1990). As indicated previously, the data has a hierarchical structure such that 9,003 individual survey respondents are selected from a nationally representative multi-stage sample of 396 wards that are in turn nested in parliamentary constituencies. The response variable is a measure of respiratory functioning known as forced expiratory volume (FEV). A number of individual demographic, socio-economic, health lifestyles, and behavioral characteristics were included in the models. Jones and Duncan (1995) build upon previous multilevel analysis of the HALS undertaken by Humphreys and Carr-Hill (1991) by actually including random slopes for individual effects, and including ecological variables and their cross-level interactions with the individual-level predictors in multilevel models (see also section above). The ecological variables were: ward deprivation, percentage of respondents living in "high-rise or urban environments without adjacent space or garden," and average household income (measured at the parliamentary constituency level). Jones and Duncan (1995) fit a model that has the same structure as that illustrated in Figure 8.3e. They also critique Humphreys and Carr-Hill's (1991) analysis for not controlling for respondents' height, which is correlated with FEV and an important confounding variable.

Table 8.4 summarizes the nature of the effects and relationships with FEV for some of the individual-level control variables included in the initial modeling. Additionally, smokers are shown in later phases of the modeling to have a statistically lower respiratory function than non-smokers. In terms of the ecological effects and their cross-level interactions with individual level predictors, the authors find that respiratory function declines in more deprived areas. This relationship is less steep for people in the higher-status professional classes and in the most deprived areas, there are also very marked differences in FEV between people of different social class (Figure 8.5a). For the interaction between high-rise living/lack of garden (i.e. urban environment) and smoking variables, there is a finding of marked difference

Table 8.4 Nature of relationships between "physical control" and "socio-structural" variables in FEV in Jones and Duncan's (1995) analysis

Variable	*Nature of effect*	*Statistically significant model terms*	*Notes*
Sex	+	Yes	Males have better FEV
Age	–	Yes	Males have worse FEV
Height	–	Yes	Taller have better FEV
Social class	+	Some of the terms	Higher status have better FEV. Skilled non-manual and and other class group were not significant
Unemployment	+	No	Unreliable estimate
Housing tenure	+	Most of the terms	Higher status have better FEV. Missing tenure group was not significant
Income	+	Most of the terms	Higher incomes have better FEV; those with income not reported have lower FEV. Terms for high income were not significant

Source: Based on estimates shown in Jones, K. and Duncan, C. (1995), Individuals and their ecologies: analysing the geography of chronic illness within a multilevel modelling framework. *Health & Place* 1, 27–40.

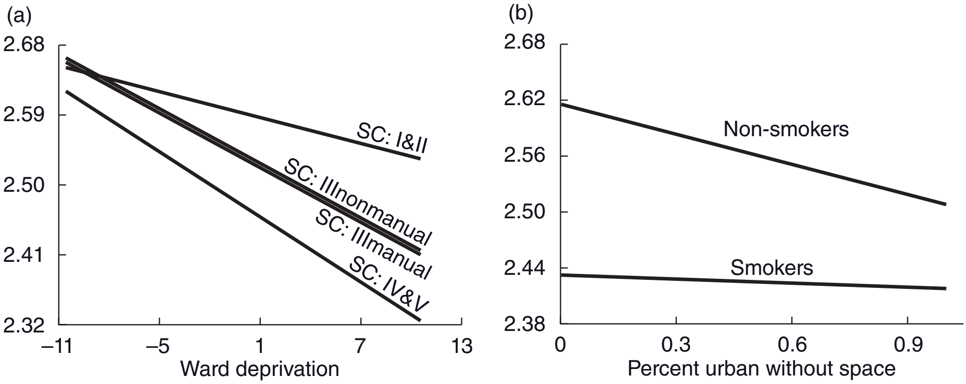

Figure 8.5 Multilevel, cross-level, individual, and ecological-level relationships for forced expiratory volume: (a) social class and deprivation interactions; (b) smoking and urbanization. *Source*: Reprinted from Jones, K. and Duncan, C., Individuals and their ecologies: analysing the geography of chronic illness within a multilevel modeling framework. *Health & Place*, 1, 27–40. Copyright (1995), with permission from Elsevier.

in lung function, but the difference is reduced for people living in parliamentary constituencies that are most urbanized (Figure 8.5b).

Jones and Duncan (1995) also model variations in measures of respondents' general assessment of health status and self-reported symptoms of heart disease (including high blood pressure and stroke). In the case of the latter, a majority of individual effects are not statistically significant due to small numbers, but there are statistically significant contextual variations in the symptoms of heart disease between wards. In terms of cross-level interactions of individual-level poor/rich status (coded as combination of social class, housing tenure, and income) and the ecological variable ward deprivation, they find an interesting result such that "poor people" and "everybody else" have an increasing probability of disease symptoms in areas that are more deprived, whilst they find the reverse situations for "rich people." The "rich" are found to experience high rates of heart disease symptoms in the least deprived areas, similar levels of symptoms compared to the other groups of people in areas that experience averages deprivation, and the most disease in areas characterized by the highest social deprivation. The authors stress the speculative nature of these results, due to the small size of sample and issues of statistical significance. They conclude that there appear to be ecological variations in FEV (and other health outcomes) between both wards and constituencies, and is not completely explained by composition of these places.

Conclusion and Prospects

Statistical modeling techniques have been described for investigating and exploring patterns of chronic disease and illness. These techniques are typically used to look for associations between socio-economic, demographic, behavioral, and environmental factors – particularly in epidemiological studies. Geographical analysis historically relied on aggregate ecological data, an often inappropriate scale of analysis. The results of these studies were affected by the modifiable areal unit problem (Openshaw 1984) and the closely-related ecological/aggregative fallacies (Jones & Duncan 1995). Statistical data collection units remain frequently used in geographical analysis as a matter of convenience that requires explanation. As Humphreys and Carr-Hill note:

> Whilst not suggesting that electoral wards should be considered as a "correct" level of analysis corresponding to a "community" in the sociological sense of sharing cultural and social norms, electoral wards are the most relevant level of analysis available. (1991: 254)

Many spatial analyses have typically treated and modeled space as a "container" or "grid" for mapping and identifying diseased people and their needs without enough real consideration given to the ways in which the actual contextual characteristics of "places" are implicated in (re)producing health (Kearns & Joseph 1993; Kearns & Moon 2002). Multilevel modeling techniques have some utility for both properly including the geographical in statistical models and providing purchase on *compositional* and *contextual* explanations for health variations (Macintyre et al. 1993; Jones & Moon 1993; Duncan et al. 1998; Smyth 2008; see also Chapter 21 this volume).

It is important to stress that many ecological and observational studies have only been able to suggest possible causal associations, rather than provide detailed explanations of underlying causal mechanisms (Jones & Moon 1987: Chapter 9). Careful theoretical development and epidemiological studies with vigorous experimental design can sometimes provide explanations (Moon et al. 2000), although there are limits even to the best studies.

Meanwhile both heart disease and respiratory illness continue to contribute significantly to both global and national patterns of disease burden. CHD is closely associated with growing affluence (at both the individual and societal level) and also health behaviors and lifestyles (practiced by individuals and groups). Obesity, poor diet, lack of physical exercise, and excessive drinking provide considerable challenges for modern societies, medical professionals, and public health agendas. Some respiratory illnesses have some link to environmental and climatic factors, e.g. photochemical pollution (Gatrell 2002). Public health policy has had some recent successes with the promotion of stop smoking programs, the use of nicotine replacement therapy, and the introduction of smoking bans in public premises in many nations. The UK, like other WHO member states, have national targets for reduction of both chronic disease and associated health behaviors (heart disease and smoking). Health surveillance, screening programs, and the targeting of resources (e.g. health interventions) to specific population sub-groups and to socially deprived areas is having some success. There do, however, remain considerable inequalities in health (including CHD) at a number of geographical scales, from the global to the local, and also for different socio-economic and population sub-groups. These will continue to provide concern to societies, governments, and public health practitioners. Geographers will continue to contribute to uncovering these inequalities, as well as being involved in debating the complex causes and solutions to these health variations.

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Chapter 9

Emerging and Re-emerging Diseases

Michael Emch and Elisabeth D. Root

Introduction

Emerging diseases are those that have recently appeared in a population or have existed but are rapidly increasing in incidence or geographic range. Re-emerging diseases are those that once were health problems globally or in a particular region, and then declined, but are again becoming health problems for a significant proportion of a population. In other words, emergence is about changing and expanding spatio-temporal patterns of diseases. Emerging diseases are usually discussed in terms of infectious diseases and the biological and ecological drivers behind them. However, chronic diseases, traditionally more prevalent in advanced, industrial societies, have increased in scope over the past few decades and have begun to emerge as major health problems among populations elsewhere in the world. Disease emergence is the result of changing geographies brought about by alterations in the environment, composition of the population living in that environment, or both. Disease ecology examines the ways that human behavior, as influenced by cultural and social norms and economic circumstances, interacts with both the physical and biological environment to produce or prevent disease. Population, society, and the environment can be thought of as existing in a dynamic equilibrium. If enough stress is placed on any of these factors through changes in land use, climate, migration, population growth, or political conflict, the equilibrium can become unstable (Mayer 2000). This instability often manifests as an increase in disease rates (re-emergence) or the appearance of new diseases (emergence). This chapter begins by describing the different drivers of emerging and re-emerging diseases and then offers case studies of emerging and re-emerging diseases: H5N1 avian influenza is presented as an example of an emerging infectious disease, cholera as a re-emerging infectious disease, and cardiovascular disease as an emerging chronic disease.

Drivers of the Emerging and Re-emerging Diseases

Emergence or re-emergence of a disease is the result of a complex set of interactions between populations and their environments. Operationally, disease emergence can be viewed as a two step process (Morse 1995). A disease must first be introduced into a new population and then establish itself and disseminate within that population. This framework is easily applied to infectious diseases. Many emerging infections originate from pathogens already present in the environment, brought out of obscurity or given selective advantage by changing environmental conditions (Morse 1995). There are also many examples of diseases originating from other species. Zoonotic diseases, those that are transmitted from animals to humans, often have high mortality rates but cannot be transmitted from human to human, limiting their infectiousness until the disease agent adapts to a human host. Still other diseases are variants of existing human infections which, due to microbial adaptation, re-emerge as a new virulent strain. Whatever the origin, pathogens are introduced to a new population, adapt to the new hosts, and reproduce in sufficient quantities to become transmissible.

Chronic diseases, such as heart disease, diabetes, and cancer are often not considered within the emerging/re-emerging disease framework despite the dramatic increase in prevalence and scope over the past several decades. For a chronic disease such as diabetes to become widespread population-level social and cultural norms must change, often because of changes in larger structural environmental factors such as food availability, the built environment, or socio-economic factors. Dissemination occurs as these changes alter individual behaviors, ultimately leading to disease.

The process of introduction and dissemination of both communicable and chronic diseases is mitigated by a variety of social, cultural, behavioral, environmental, and biological factors. Major changes in land use, pollution, migration, population growth, urbanization, or the food environment can lead to an increase in disease rates (re-emergence) or the emergence of new diseases (Mayer 2000). At the same time, people do not respond passively to disease, but act to mitigate the impact of disease so that social and cultural circumstances also contribute to the re-emergence of disease. There are fundamental social and political processes that dictate whether a disease becomes a recognized and legitimate public health priority targeted for intervention or remains unknown and neglected. Advocacy, media attention, epidemiology, and social class can all produce medical recognition of a disease (Packard et al. 2004). Activism and media attention surrounding conditions such as breast cancer and HIV have drawn attention to the emergence of these diseases as serious public health threats and garnered strong public and governmental support. At the same time, diseases that predominantly affect poor social classes or stigmatized groups often face an uphill battle to gain recognition and funding by public health authorities.

Morse (1995) suggests that classifying the drivers responsible for disease emergence is somewhat arbitrary but should reflect the underlying forces or processes that cause emergence. We chose to include categories derived from the Institutes of Medicine's report on *Emerging Infections* (IOM 1994). Drivers include ecological change, evolutionary forces and microbial adaptation, human behavior and demographic change, political conflict and public health infrastructure collapse, and increased mobility and globalization (Table 9.1). Some factors influence the introduction of a disease while others primarily affect the spread or changing geographic distribution of the disease. Many diseases have emerged because of a combination of factors; drivers interact or act in sequence to produce disease (Morse 1995).

Table 9.1 Drivers in emergence/re-emergence of disease

Driver	*Example*	*Disease*
Ecological change	Deforestation/reforestation; flood/drought; climate change; agricultural development; dams/irrigation	Schistosomiasis (dams); hantaviruses (climate); Japanese encephalitis (agriculture); Lyme disease; Rocky Mountain spotted fever (reforestation)
Evolutionary forces and microbial adaptation	Drug resistance (overuse of antibiotics and antivirals); selective pressures in the environment; microbial evolution	Influenza virus; hepatitis B; *Staphylococcus aureus;* multidrug-resistant tuberculosis
Human behavior and demographic change	Population growth; urbanisation and rural to urban migration; aging population structure; dietary changes; lack of physical activity; sexual behaviors; IV drug use	Dengue; HIV; obesity; diabetes; cardiovascular disease
Political conflict and public health infrastructure collapse	Inadequate sanitation and potable water sources; reduction/elimination of disease surveillance and prevention programs; curtailment of vector control measures; insufficient number of trained public health personnel, insufficient coverage of hospitals/clinics	Trypanosomiasis; *Vibrio cholerae*; yellow fever; measles; polio
Mobility and globalization	Air travel; globalization of food supply; worldwide movement of goods and people	Influenza virus; dengue; SARS

Ecological change

Ecological disruption and human intrusion into new ecological settings are often cited as major factors in the emergence of infectious disease. Such disruptions usually increase human exposure to disease agents rather than unearthing new or previously unknown diseases (Morse 1991). Ecological change takes many forms: deforestation/reforestation, construction of dams and irrigation systems, extension of agricultural practices, or climate change. Both deforestation and reforestation enhance "border" contact between humans and disease agents and increase the possibility of exposure to disease. Reforestation and the integration of green space into urban areas are often implicated in the emergence of Lyme disease in the United States (CDC 2007). When farmland in the north-east United States reverted to woodland, the habitat for the primary reservoirs of the disease improved. At the same time, the expansion of suburbia into these forested areas created a large susceptible population and increased human contact with both the reservoirs of the disease and the tick vector (Ostfeld 1997; LoGiudice et al. 2003; Jackson et al. 2006). Deforestation for crop farming and ranching can create supportive habitats for parasites and their host vectors. The primary malaria vector in the Peruvian rainforest (*A. darling*) prefers to breed in grass and crop land and bite rates are much higher in deforested agricultural areas than in the forest (Walsh et al. 1993; Patz et al. 2000; Vittor et al. 2006).

Construction of dams to control seasonal flooding and irrigation systems to support agriculture may also have unintended effects on disease emergence. The snails that serve as the intermediate host for schistosomiasis prefer vegetated, slow-moving waters. The building of dams and irrigation canals has curtailed annual flooding cycles but also increased the incidence of schistosomiasis. For example, schistosomiasis unexpectedly appeared in Senegal during the 1980s after an irrigation system for intensive sugar cultivation was built (Sow et al. 2002). The construction of the Diama dam in 1998 prevented seasonal floods and sea-water intrusion which worsened the problem and schistosomiasis rapidly spread throughout the region (Sturrock et al. 2001). Construction of the three gorges dam in China has also caused concern about schistosome transmission. The dam altered the flow of water downstream creating a more suitable habitat for snails (Xu et al. 2000; Minter 2005). Another link to agriculture is through farming practices such as intensification and expansion which can encourage the geographic spread of disease. For example, the intensification and expansion of irrigated rice production into in the semi-arid regions of south-east Asia since the 1980s has had an important impact on the disease burden caused by Japanese encephalitis. The flooding of the rice fields at the start of each cropping cycle leads to an explosion in the mosquito population. This may cause the virus, which usually circulates among bird and pig hosts, to jump to the human population.

Climate change is another potential driver which shifts the ecological niche or range of a disease. While we may not know the long-term impact of global warming, there are examples of major climatic events causing disease outbreaks in areas that have not experienced the disease before. For example, the 1991–2 El Niño Southern Oscillation (ENSO) brought increased rainfall to much of the "four-corners" region of the southwestern United States. Shortly thereafter there was a sudden unexplained outbreak of hantavirus pulmonary syndrome. Research suggests that the climatic changes brought by El Niño improved habitat quality of the deer mouse. The subsequent increase in density of the rodent population increased the probability of human–rodent contact, resulting in virus-transmission events and an outbreak of the disease among humans (CDC 1993; Engelthaler et al. 1999).

Ecological changes are not limited to the natural environment. Changes in the structural or built environment related to urbanization and industrialization impact the prevalence and scope of both infectious and chronic diseases. The prevalence of infectious diseases such as tuberculosis decreased dramatically with better housing quality and water-borne diseases such as cholera and typhoid are problematic in areas with poor sanitation and water supply infrastructure. In addition, the prevalence of chronic conditions such as diabetes has increased in all age groups since the 1980s. Poor dietary habits and a sedentary lifestyle are responsible, in part, for this dramatic increase. Studies of the risk factors associated with these behavioral choices suggest that living near a high concentration of fast food restaurants may increase the likelihood of consuming unhealthy foods. Changes in the local food environment, such as increases in the availability of fast food or processed/prepackaged meals, may encourage poor dietary habits leading to an increase in obesity and diabetes (Saelens et al. 2003; Morland et al. 2006; Papas et al. 2007).

Evolutionary forces

Bacteria, viruses, and parasites that cause disease are continually evolving in response to conditions in their environment. Selective pressures, such as the use of antibiotics and antivirals or certain animal husbandry practices, drive the evolutionary process causing new "superbugs" or pandemic strains of a pathogen to occur. The emergence of antibiotic resistant strains of common bacterial infections is an example of microbial adaptation and natural selection. Methicillin-resistant *Staphylococcus aureus* (MRSA) infection is caused by a strain of staph resistant to the antibiotics commonly used to treat it. MRSA was originally identified in hospitals and is thought to have evolved due to the overuse of broad-spectrum antibiotics in these settings. Selection for antibiotic-resistant strains of bacteria has become increasingly frequent and new clinical guidelines on the use of antibiotics argue for a more conservative approach to their use (CDC 2006a).

Viruses, with their high mutation and reproductive rates and propensity for genetic re-assortment and recombination, adapt to changing environments extremely well, resulting in the constant emergence of new variants. Re-assortment happens when different viruses exchange genetic material forming a genetically different virus through a recombination of genetic material. Annual epidemics of the influenza virus are caused by gradual "antigenic drift," a process whereby a random accumulation of mutations in viral genes may significantly change the antigens of the influenza virus. Occasionally, the influenza virus undergoes a dramatic "shift," producing a completely new subtype of the disease that people have little or no protection against. Researchers speculate that certain animal husbandry practices create an ideal setting for the emergence of new epidemic/pandemic strains. Antigenic shift can occur either through direct animal-to-human transmission or through mixing of human influenza A and animal influenza A virus genes to create a new human influenza A subtype virus through genetic re-assortment. Antigenic shift is a particular type of re-assortment event. The genetic changes necessary for human transmission are more likely to occur in ecosystems comprised of particular combinations of human–environmental characteristics (Guan et al. 2002; Li et al. 2004; Smith et al. 2006; Smith et al. 2006).

The parasites that cause diseases such as malaria, schistosomiasis, and cholera also evolve resistance to medications commonly used to treat and prevent these diseases. The parasite that causes malaria, *P. falciparum*, has gradually formed a resistance against several anti-malarial medications including chloroquine, one of the first and most widely used to treat and prevent the disease. Scientists believe the parasite has undergone genetic mutations that reduce sensitivity to a given drug or class of drugs (Bloland 2001). Parasites that are not killed off by the anti-malarial drugs reproduce and confer that resistance to future generations.

Human demographic change and behavior

Population growth, migration, and the gradual aging of populations around the world are often important factors in disease emergence. Urbanization in developing countries has risen from 27 percent in the mid-1970s to 43 percent in 2003. By 2030, more than half of the population in these countries will live in an urban area (UN 2006). Intense rural–urban migration in such countries has resulted in overcrowded cities with serious infrastructural deficiencies, particularly in housing and basic sanitation. *Aedes aegypti*, the main mosquito vector for dengue, prefers to breed in small containers that accumulate standing water. The lack of public garbage collection fosters the proliferation of human-made containers, such as used cans and plastic and glass bottles, which become excellent breeding grounds for *A. aegypti*. Poor public water supplies often result in large-scale storage practices (e.g. cisterns and barrels) which also create viable breeding areas (Pinheiro & Corber 1997; Kumar et al. 2001; Tauil 2001). According to Sharp and colleagues (2001), HIV was most likely sporadically introduced into rural populations from zoonotic sources in central Africa. If true, increased rural–urban migration in this area, stimulated by rapid urbanization during the latter half of the twentieth century, would have introduced the disease to the region's cities. Under this scenario, and it is not the only hypothesis, international migration across national boundaries, sometimes due to civil conflict, would then have played an important role in spreading the disease across Africa, while international air travel would have served to spread the disease around the world (Quinn 1994).

In areas with high population density, infections can spread quickly because of increased contact between susceptible individuals. In many developing countries the crowded conditions of urban centers, coupled with poor sanitation and problems supplying clean water, facilitate the spread of pathogens. Cholera has traditionally been a problem in this type of environment and continues to plague cities from Bangladesh to Iraq to Peru. Even in advanced, industrial societies, diseases such as influenza and tuberculosis spread in high-density urban populations (Hunter & Young 1971; Drucker et al. 1994; Viboud et al. 2006).

Demographic aging, the shift in the age distribution of a population toward older ages, is responsible for the emergence of chronic diseases in many developed countries. Chronic diseases, such as heart disease, cancer, and diabetes, are primarily found among the elderly and have rapidly become the leading causes of death in such countries. Indeed, countries with aging populations are seeing the emergence of high proportions of chronic disease morbidity and mortality. According to the United Nations, in 2000 10 percent of the world's population was over the age of 65 and this is expected to increase to 21 percent by 2050. This means that by 2050, the number of older persons in the world will exceed the number of young for the first time in history (UN 2002). Clearly, this will become a more significant challenge both within and beyond those countries most affected at present.

Human behavior can have important effects on the dissemination of infectious diseases as well as the development of chronic conditions. Sexually transmitted diseases are an example of how human behaviors contribute to the emergence of novel infectious diseases. The prevalence of chlamydia has increased steadily in the United States since the 1980s due to human behaviors such as unprotected sex and multiple sex partners (CDC 2006b). The spread of HIV is affected by social norms and the larger social environment both of which directly influence human behavior. Social norms that may influence whether or not a person is infected include the acceptability of specific high-risk sexual practices, social acceptability of promiscuity and multiple sex partners, contraceptive choices, and the use of substances that lower sexual inhibitions or directly transmit the disease. But the larger social environment also influences sexual and drug-using behavior. The presence of commercial-sex workers or brothels, crack houses, and bathhouses create physical environments where transmission is more likely to occur (Royce et al. 1997). The gradual decline in HIV incidence in the United States since the early 1980s demonstrates how prevention programs targeting specific risk behaviors and social norms can slow the transmission of disease (Vu et al. 2002). While the number of new HIV cases has increased in some risk groups, targeted prevention programs, such as needle exchange programs, are effective in reducing transmission among injection drug users (Nelson et al. 2002).

The emergence of chronic diseases has also been heavily influenced by human behaviors, especially among younger populations. Poor dietary choices, lack of exercise, tobacco use, and a stressful lifestyle are just a few behaviors that influence the development of chronic diseases. Consider the example of diabetes. According to the 1999–2002 United States National Health and Nutrition Examination Survey (NHANES), 9.3 percent of persons aged 20 years or over had either diagnosed or undiagnosed diabetes, up from 7.8 percent in 1988–94 (Cowie et al. 2006). One of the main risk factors for diabetes is obesity, which has also increased dramatically over that time period (Ogden et al. 2002, 2006). Behavioral risk factors thought to contribute to both diabetes and obesity include poor diet and low physical activity levels. Such behaviors are often supported by social relationships, with some studies suggesting that individuals whose family or friends are obese are more likely to be obese themselves.

Political conflict and breakdown of the public health infrastructure

Strong surveillance and public health systems are important in identifying disease outbreaks and minimizing exposure to and dissemination of diseases within a population. Even when the incidence of a disease has decreased dramatically due to effective prevention programs, the pathogens that cause that disease remain in the environment. A strong public health system provides funding for clinics and public health professionals, disease control measures, such as vaccination and vector control, and makes these services accessible to the population. The re-emergence of a disease often results from a lapse in public health measures which allow the pathogens to enter into and disseminate through the population once again. Breakdown in public health infrastructure may be due to extreme disruptions such as war and civil conflict or to poor governance strategies which neglect or underfund public health programs. Withdrawal of funding from outside organizations may also lead to the cessation of prevention measures.

Human African trypanosomiasis (HAT), for example, rose dramatically in the Democratic Republic of Congo (DRC) in the 1990s. Detection and control of HAT is dependent on an active "screen and treat" program. Such activities require a network of clinics and doctors to screen the population, an infrastructure to disseminate drug treatment, and a surveillance system to detect outbreaks and monitor interventions. During the 1990s, a civil war, coupled with governmental neglect of HAT control strategies, brought about an increase in the number of infectious people and transmission of the disease (Ekwanzala et al. 1996). The withdrawal of international aid in 1990, on which the DRC had been almost completely dependent, made matters worse. Control efforts intensified in 1998 because of renewed public and private donor interest leading to a major reduction in HAT incidence (Lutumba et al. 2005).

Political conflict is by no means the sole reason for deficiencies in the public health system. Policy-makers are constantly making choices about how to allocate public health funding and important programs may lack adequate funding. Funding often follows interest in hot-button issues such as HIV, bioterrorism and avian influenza.

Increased mobility and globalization

History is full of examples of how international travel, commerce, and war have helped to disseminate diseases to new geographic areas (e.g. smallpox in the "new world"). Advances in transportation technology have played a crucial role in facilitating dramatic increases in population mobility, allowing people to move across national borders and continents with much greater speed (Saker et al. 2004). Human travel and the transport of goods facilitate the movement of pathogens across the world (Aron and Patz 2001). Travelers are exposed to a variety of pathogens while on vacation or business trips, many of which they have never encountered and have no immunity to. Since such trips tend to be short, infected individuals rarely know they are ill until they return home and have had time to transmit the disease to residents of their own country (Saker et al. 2004). As an illustration, Severe acute respiratory syndrome (SARS) first appeared in the Guangdong province of southern China before spreading to Hong Kong; from there it spread very rapidly to Toronto, Singapore, San Francisco, Manila and several other countries via air travel (see Ali & Keil 2006). In Toronto, for example, SARS was initially introduced into the country by an elderly woman who returned from a vacation in Hong Kong where it is thought she was infected (CDC 2003).

International trade of goods and services can also facilitate the spread of disease. Vehicles transporting goods can inadvertently transport pathogens or disease vectors to new geographic areas. The mosquito vectors responsible for dengue fever are thought to have reached cities in the Americas through the importation of used car tires. Mosquito eggs deposited in water caught in these tires were transported to previously non-endemic tropical urban environments and warmer temperate areas (Gubler 1998; Gibbons & Vaughn 2002). Even regional trade of goods and services can facilitate the spread of infectious disease. Early analyses of the geographic distribution of HIV suggested that the virus traveled along major roads between urban areas and other proximal settlements. Truck drivers transporting goods along these routes have been cited as potential vectors for the dissemination of HIV (Quinn 1994).

Interaction of Ecological Drivers

As we have illustrated in the previous section, there are a wide range of ecological drivers that influence the emergence and re-emergence of both infectious and non-infectious disease. Ecological interactions can be complex, with several factors often working together or in sequence. In order to provide a more in-depth explanation of how differing drivers might work together to produce disease, we examine case studies of emerging infectious disease (H5N1 avian influenza), re-emerging infectious disease (cholera), and emerging chronic disease (Cardiovascular disease).

Emerging infectious disease case study: H5N1 avian influenza

During the twentieth century, three influenza pandemics killed millions of people during short outbreak periods. Recent human cases of H5N1 avian influenza in Asia have alerted us to the possibility of the emergence of a new influenza pandemic in the future. This emerging threat is due to evolution of the avian influenza virus (AIV), which is driven by environmental and anthropogenic factors. AIVs circulating in bird populations dynamically mutate to create new genotypes in response to local factors such as climate, farming systems, and bird, human, and animal distributions. Multiple genotypes of AIVs have been identified (Guan et al. 2002; Li et al. 2004; Wan 2005; Smith, Fan et al. 2006) and these genotypes are distributed widely in various geographic areas across Asia. Human cases occurred initially in Hong Kong in 1997 and since then sporadically in Azerbaijan, Cambodia, China, Djibouti, Egypt, Indonesia, Iraq, Thailand, Turkey, and Vietnam, causing more than 300 cases, approximately half of which were fatal. The viral isolates from these human cases show genotype differences in both time and space, thus, showing that the virus is evolving (Smith et al. 2006).

Genetic re-assortment, recombination, and mutation lead to a rapid emergence of novel influenza viral genotypes (Webster et al. 1992; Guan et al. 2002; Wan 2005). Genetic re-assortment refers to the exchange of one or more discrete RNA segments into multipartite viruses. The genetic re-assortment between two co-infected influenza A viruses generates 28 possible genotypes in their offspring. Further gene recombination and high gene mutation rates make the number of possible genotypes in offspring almost infinite. In influenza viruses, genetic re-assortment is often referred to as antigen shift, which can facilitate the creation of generations of pandemic influenza strains. It is generally accepted that both the 1957 and 1968 human influenza pandemic strains were re-assortment strains from a previously circulating H1N1 strain that existed before 1957. Genes in the 1957 H2N2 strain were from avian strains (Webster et al. 1997). The 1968 H3N2 strain was generated from the 1957 H2N2 strain by replacing H2 with another avian H3. H5N1 AIV strains have been isolated from different avian species in Hong Kong and different genotypes of H5N1 AIV from genetic re-assortments have been identified. Multiple genotypes of H5N1 AIVs have been demonstrated to coexist even within a single epidemic in Hong Kong (Guan et al. 2002; Guan et al. 2004). While the World Health Organization (WHO) has sent out an alert that a new pandemic may occur in the near future, we do not know which AIV genotype will cause it or when it will come.

H5N1 has been isolated in geese, chickens, ducks, humans, and several other animal species. It was found in a tiger that was fed dead chickens infected with the virus as well as in pigs, which are thought to be the optimal intermediate host for AIV transmission to humans. The wide range of hosts increases the chances of an influenza virus becoming a pandemic strain. Southeastern China is thought to be the epicenter of influenza (Shortridge & Stuart-Harris 1982). Both the 1957 H2N2 pandemic and the 1968 H3N2 pandemic originated in south-eastern China. People have speculated that the humid climate and diverse animal husbandry practices make the area an ideal setting for the emergence of new epidemic/pandemic strains. In this region it is not unusual to see waterfowl, chickens, and pigs in close proximity to one another. The mixture of domestic animal populations and feeding practices has been hypothesized to increase the chance of virus transmission between different animal species. The distribution of the wild bird population may also affect viral evolution. Diverse migratory bird species can play significant roles in the ecology and circulation of viruses including influenza A, West Nile, Newcastle, and duck plague herpes (Hubalek 2004).

Before 1997, when the H5N1 epidemic began in Hong Kong, there were only two documented human avian influenza cases, both of which were caused by the H7N7 AIV. One was in a 46-year-old man with respiratory symptoms in the United States and the other was in a 43-year-old woman with conjunctivitis in the United Kingdom; neither victim died. H9N2 AIV infections were confirmed in seven people in 1998 and 1999, again with no fatalities. In 2003, a H7N7 infection in the Netherlands resulted in 89 cases, one of which was fatal (Webby & Webster 2003). The severity and numbers of human AIV cases changed dramatically beginning with the 1997 Hong Kong epidemic. In that year, the H5N1 AIV infected 18 people and killed 6 in Hong Kong (Webby & Webster 2003). Mortality due to H5N1 AIV has increased from 30 percent in 1997 to more than 50 percent in 2004. Since mid-December 2004, Vietnam has reported approximately 100 cases, nearly half of them fatal. H5N1 has persisted in Asia even when there has been widespread slaughter of chickens. The persistence is probably due to the H5N1 reservoir in wild birds. Since April of 2004, small outbreaks have been reported frequently in China, Cambodia, Indonesia, Korea, Thailand, Vietnam, Azerbaijan, Djibouti, Egypt, Indonesia, Iraq, Thailand, Turkey, and several European countries. We now have a new understanding of the transmission pathway of AIV. Waterfowl, such as ducks, are the natural reservoir of AIV and they do not usually have disease symptoms. When these waterfowl migrate they can transmit the virus. Contact between wild birds and poultry, and subsequent contact between poultry and humans, can lead to transmission to humans. Furthermore, air and train travel could facilitate a global pandemic if the virus evolves into one that can be easily transmitted from human to human.

Re-emerging infectious disease case study: cholera

Cholera is a severe diarrheal disease resulting from the consumption of food or water contaminated with the bacterium *Vibrio cholerae*. It is a major health problem in poor countries and it is almost completely absent in the world's richest nations. There have been seven global cholera pandemics since the early nineteenth century.

Some regions of the world, including South Asia, have annual epidemics and others have very little or no cholera. Sub-Saharan Africa has seen dramatic increases in recent years. South America had not had a cholera outbreak for more than a century and then in 1991 it re-emerged in Peru (Tauxe et al. 1995). The epidemic spread to 19 countries in Latin America where there were several hundred thousand cases. By 2006 there were almost no cases in the region. The spatio-temporal patterns of cholera are related to both poverty and natural environmental conditions (Emch 1999; Emch & Ali 2001). These large epidemics in Africa would not exist if effective water and sanitation systems were in place. However, they are also driven by variations in aquatic environmental parameters (Colwell & Spira 1992; Tauxe et al. 1995) including conditions in both ocean reservoirs and the brackish water bodies (Drasar 1992). *V. cholerae* survival appears to be dependent on abiotic characteristics including alkalinity, salinity, and iron concentration. These bacteria inhabit seas, estuaries, brackish waters, rivers, and ponds of coastal areas of the tropical world (Colwell & Spira 1993). They flourish in the dense organic matter, algae, and zooplankton and similar ecosystems. These local environmental factors are also influenced by larger-scale climate variability (Pascual et al. 2000; Lipp et al. 2002). The seasonal cycles of cholera appear to be associated with changes in flora and fauna populations in the coastal environment (Miller et al. 1984; Islam et al. 1994; Faruque et al. 2005).

The re-emergence in South America, and the dramatic increases in Africa, are partly related to environmental parameters, such as flooding, presumably because sanitation systems are overrun. In South America, seasonal peaks are reported in summer months, January to February (Tauxe et al. 1995), as well as with the rise in waters following the rainy season in Amazonia, Brazil (Codeço 2001). Major cholera outbreaks have been recorded in eastern African nations including Djibouti, Kenya, Mozambique, Somalia, Uganda, and Tanzania where the majority of outbreaks occur following rainfall and/or floods (WHO 1998). These cholera peaks also coincide with the summer rains. In rural southern Tanzania, the peak of the cholera epidemic is slightly later, in June and July (Acosta et al. 2001). In Mozambique cholera occurs during the hot, rainy months from December to May (Aragón et al. 1994; Bateman 2002).

The re-emergence of cholera in Latin America and Africa is influenced by both local socio-environmental conditions as well as regional and global climate patterns. The perfect habitat for cholera to thrive is one with a dense human population with limited sanitation and water infrastructure where there is a brackish eutrophic aquatic environment in a warm climate (Emch et al. 2008a). As climate change threatens to increase global temperature, resulting rises in sea levels and temperatures may influence the temporal fluctuations of cholera, potentially increasing the frequency and duration of cholera outbreaks (Emch et al. 2008b). Climate change may influence the strength, duration, or appearance of cholera. The potential alterations in seasonal cholera epidemics may leave some countries unprepared for outbreaks and greater numbers of cholera epidemics and more unpredictability may increase both morbidity and mortality.

Massive population displacement and damage to basic public health and water/sanitation services due to events such as war or natural disasters also creates situations ideal for cholera outbreaks. Refugee camps in the Democratic Republic of

Congo, Malawi, and Iraq have all reported serious cholera epidemics due primarily to deficient living conditions (Van Herp et al. 2003; Griffith et al. 2006). In refugee settings, poor site planning often leads to overcrowding, poor sanitation, and inadequate water supplies. Without proper health education and simple public health interventions such as filtration and chlorination of water supplies and construction and maintenance of latrines, cholera often becomes a serious problem. The 2003 war in Iraq caused the disruption of communicable disease-control programs, reduced access to safe water, and destroyed many public health facilities. After a public health surveillance program was implemented by the WHO, a cholera epidemic was reported in the southern provinces of Iraq (Valenciano et al. 2003).

Emerging chronic disease case study: cardiovascular disease

Cardiovascular disease (CVD) is a group of diseases that affect the heart and blood vessels and represents the leading cause of death in most developed nations. Coronary heart disease is the principal type of cardiovascular disease, accounting for about 71 percent of all CVD deaths (Kochanek et al. 2004). In 2002, CVD was the leading cause of death among both men and women in the United States (CDC 2005). It accounts for more hospitalizations than any other illness and costs the United States about $258 billion dollars a year in health care services, medications, and lost productivity (Thom et al. 2006). Heart disease is the leading cause of death for all ethnic groups. Disparities exist, however, and age-adjusted death rates for CVD are 32 percent higher among African Americans than among whites (NCHS 2007a). There is also a great deal of geographic variation of these diseases, with significantly higher rates in the south-east United States.

The high rates of CVD reflect a series of complex interactions between genetic, demographic, cultural, environmental, socio-economic, and behavioral factors. CVD is much more prevalent among the elderly; 83 percent of people who die of heart disease are 65 or older. The high rates of CVD relative to other causes of death reflect the shifting age distribution. Over time, the proportion of the elderly population has grown and so too has the proportion of deaths from chronic conditions such as CVD. This shift has serious implications for the public health system which may become overburdened by the increasing number of people requiring treatment for risk factors or early signs of disease, emergency treatment for first or recurrent episodes of heart attack, heart failure, or stroke, and efforts to reduce disability and prevent recurrent episodes.

While there is a genetic component to heart disease, most studies suggest a number of behavioral risk factors. Cigarette and tobacco smoke, physical inactivity, obesity, and diabetes are the major independent risk factors for heart disease that can be modified or controlled through behavioral change. These factors can lead to conditions such as high blood cholesterol and hypertension, which are also related to heart disease. Smoking rates have decreased over the past decade, especially among younger generations (Messer et al. 2008). As individuals become aware of the myriad health conditions related to smoking, many are choosing to quit or never start. The anti-tobacco movement has also fostered a social transformation that involves the stigmatization of smokers (Bayer & Stuber 2006). These changing social and cultural norms have helped to change individual behaviors, though it is too early to see this reflected in CVD rates.

Obesity, another risk factor for CVD, has risen dramatically since the 1980s in the United States among both children and adults (Ogden et al. 2002). At the same time, 40 percent of adults report engaging in no leisure time physical activity (NCHS 2007b). Ultimately, obesity results from poor diet and physical inactivity but recent research has focused on the role the environment plays in encouraging physical activity and healthy eating habits. Evidence is just beginning to emerge, but obesity has been linked with walkability, land use, urban sprawl, proximity to parks and gyms, and to fast food or grocery stores (Diez-Roux 2003; Papas et al. 2007). The idea behind these studies is that people who live in areas that encourage them to walk rather than drive or use the nearby park or gym are less likely to be obese. Individuals living near fast food establishments rather than grocery stores with healthy food options are more likely to be obese. Similar to smoking, obesity carries a certain amount of social stigma that may act to change individual behaviors. Studies have found clear and consistent stigmatization or discrimination in employment, education, and health care (Puhl & Brownell 2001; Carr & Friedman 2005). Obesity is a risk factor for many chronic conditions including diabetes, hypertension and high cholesterol which are all risk factors for CVD (Harris et al. 1998).

Childhood and adulthood socio-economic circumstances are important determinants of CVD risk. Individuals who experienced worse socio-economic conditions in their childhood, independently of their circumstances during adult life, are at greater risk for developing and dying of CVD. At the same time adults living in poor socio-economic conditions are also at greater risk of developing CVD (Galobardes et al. 2006; NCHS 2007a). These findings suggest that socio-economic conditions across the life course and their impact on the development of major risk factors (obesity, high cholesterol, hypertension, and smoking) are important factors in the development of CVD (Galobardes et al. 2006). The poor are less likely to receive necessary health care early in the development of the disease, thereby leading to worse outcomes.

Cardiovascular disease has emerged as the leading cause of chronic disease morbidity and mortality in most developed nations but is also beginning to be a major problem in other countries (especially those defined as being in “transition”). According to Lopez, estimates suggest that approximately 5.3 million deaths attributable to CVD occurred in developed countries in 1990, compared to 8 to 9 million deaths in developing nations (Lopez 1993). The emergence of this disease in countries previously dominated by infectious diseases is due to the interaction of a complex set of demographic, socio-economic, behavioral, and environmental factors. As such countries, sometimes referred to as “transition” countries, move through the epidemiological transition, fewer people are dying of infectious diseases or nutritional deficiencies early in life and this longevity provides longer periods of exposure to CVD risk factors. Changes in nutrition from diets traditionally high in carbohydrates and low in fat to diets with a disproportionally high fat content are partially to blame (Popkin 1994). This transition is fostered by the availability of inexpensive pre-processed foods and the increase in fast food, especially in urban centers. Rising tobacco consumption in these countries also translates into higher mortality rates of CVD (Reddy & Yusuf 1998).

Conclusion

Throughout human history, diseases have emerged or re-emerged and swept though the population becoming serious public health problems. Many emerging and re-emerging infections originate from pathogens already present in the environment but changes to the environment and the populations living in those environments cause the disease to enter into and disseminate through the population once again. In this chapter, we introduced the concept that chronic diseases, such as cardiovascular disease, can also emerge due to changes in human demographics, behaviors, and upstream changes to the structural environment. Thus, the emergence and re-emergence of disease is linked to the changing geographies where diseases occur. Avian influenza is emerging through genetic changes that occur in particular human-environment ecosystems. Global travel and trade facilitate international spread of the disease. Cholera is re-emerging because of both natural environmental patterns and poor socio-economic conditions in the world's poorest nations. CVD is emerging outside of advanced, industrial economies because high fat food and sedentary lifestyles have become more widespread. It is crucial that we understand how shifting demographic, economic, behavioral, and political forces interact with alterations to the environment to produce new patterns of disease. It is only through examining such complex interactions that we can gain an understanding of spatio-temporal changes in disease distributions. Detailed studies of disease ecologies and strong surveillance systems are the key to understanding why diseases emerge, predicting when and where they may emerge, and how we can effectively prevent them.

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Chapter 10

Situating Politics in Health and Medical Geography

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Introduction

In this chapter, we provide a reading of how politics are situated at the heart of both medical and health geography. In part, this is an effort not only to construct a study of difference that compares and contrasts political lineages, but also to show the inherent common interests of both literatures. We do so in order to disrupt the gap which exists between medical and health geographies and reduces the likelihood of positive collaboration among practitioners.

Despite their oft discussed methodological and analytical differences (Kearns 1993; Mayer & Meade 1994; Gatrell 2002; Kearns & Moon 2002; Parr 2004; Andrews & Moon 2005a), medical and health geography demonstrate a focus on politics through common concerns over health care processes, health care experiences, health status, and health outcomes (Craddock 2000b; Atkinson 2002; Smith & Easterlow 2005). Such processes and outcomes are inherently political, as politics and the political concern issues of power relations (Gilmore 2002; Brown & Staeheli 2003). As we address below, both medical geography and health geography to varying degrees take into account how power relations produce specific health outcomes and configurations.

This common political thread within medical and health geography is more clearly elucidated by addressing politics through an analytical framework as put forth by geographers Michael Brown, Lynn Staeheli, and Eleonore Kofman (Brown & Staeheli 2003; Staeheli & Kofman 2004). Brown, Staeheli, and Kofman argue that politics can be understood as three related processes, which they identify as the distributive, antagonistic, and constitutive. Briefly, distributive refers to the ability to apportion rights and resources, antagonistic to competition among political stakeholders, and constitutive to understanding the ongoing political struggles that shape society. Employing these three elements can help us understand the commonalities between medical and health geography and disrupt the reification of two distinct traditions.

Retracing the narrative of this split occupies the first section of this chapter. The separation of medical and health geography problematizes any appreciation of their common political elements, and complicates the possibilities of cooperation or collaboration. Furthermore, this separation is reinforced by the ways in which each tradition constructs its history, with medical geography drawing from natural sciences and health geography drawing from postmodern, feminist, and post-structural analyses. A summary of the narrative of difference between medical and health geography can be broadly delineated by their methodological, analytical, and epistemological differences.

In order to stress the common political interests of medical and health geography, we draw from Brown, Staeheli and Kofman's argument concerning the three elements of the political: distributive, antagonistic, and constitutive (Brown & Staeheli 2003). Brown, Staeheli, and Kofman base their definition of the concept of distributive politics on Harold Lasswell's (1936) terms, in which the distributive refers to "who gets what and under what circumstances." With respect to medical and health geography, distributive politics and the related patterns of inequality are most frequently associated with the question of access to health care resources (Atkinson 2002; Asthana et al. 2003; McLafferty & Grady 2005; Smith & Easterlow 2005). Brown, Staeheli, and Kofman identify that antagonistic processes are often characterized as struggles over resources. From the standpoint of medical and health geography, the tensions of different stakeholders most frequently center on topics such as the development or closure of health facilities, or aspects of health policy (T. Brown 2003; Halliday & Asthana 2005; Barnett & Brown 2006; Panelli et al. 2006; Tempalski et al. 2007). Finally, constitutive politics addresses the manner in which politics brings together or separates coalitions and political movements through common narratives of political necessity. In terms of medical and health geographies, constitutive politics can be seen in the inclusion or exclusion of sections of society from health processes that reflect struggles concerning justice, equity, and rights (Kalipeni & Oppong 1998; Kalipeni 2000; Bondi & Burman 2001; Chouinard & Crooks 2003; Curtis 2008).

To reinforce the applicability of Brown, Staeheli, and Kofman's conceptualization, we then highlight how both health and medical geography studies address distributive, antagonistic, and constitutive politics. This is not to say that these categories are fixed or discrete. Most of these studies straddle any line distinguishing medical and health geography literature, or lines between antagonistic, distributive, and constitutive politics. Finally, we conclude this chapter by recommending how medical and health geography could function together in a more collaborative framework based on a practical consideration of politics as a central and unifying element.

Politics and Political Research in Medical and Health Geography

This section briefly traces the histories of health geography as distinguished from medical geography. We trace the emergence of this split between medical and health geography in order to elucidate the ways in which both bodies of literature construct barriers to mutual collaboration. In large part, the origins of this separation lie in Robin Kearns' (1993) call for changes in the field of medical geography. Kearns sought a greater recognition of place and identity in geographic scholarship. Moreover, he proposed the creation of a distinct subfield of geography to address these concerns. This article ignited a debate among numerous scholars (Dorn & Laws 1994; Mayer & Meade 1994; Paul 1994), some of whom embraced Kearns' proposal and others who challenged his ideas. Broadly speaking, the outcome of this debate has highlighted epistemological, methodological, analytical, and political differences among health and medical geographers (McLafferty 1995; Dyck 1999b; Elliott 1999; Kearns & Moon 2002; Parr 2002; Andrews & Moon 2005a).

In terms of politics, the debate has led to the characterization of medical geography as outside of politics, or tangential to politics in its interactions through policy development (Atkinson 2002; Curtis 2008). While health geography is considered to be inherently political with a focus on recognizing the underlying politics of medical epistemologies and practices (Kearns 1993). In this section we seek to clarify how the narrative of each tradition seeks to present methodological and epistemological boundaries and territories, and how this ultimately creates obstacles to understanding common political interests. At the same we also address some of the recent work in medical and health geography, such as political ecology, that has sought to disrupt the apparent divisions between the two sub-disciplines.

In general, medical geography has been defined as a sub-discipline with two foci, one on morbidity and mortality, and the other on health services. In both of these contexts there is a strong association of medical geography with quantitative and spatial analysis, as well as with the natural and hard sciences (Meade & Earickson 2000). A significant part of understanding medical geography can be drawn from the genealogy of its popular narrative, which postulates a long history of connection between medical and geographic observation. The most popular progenitor of the field is often identified as Hippocrates, who was the first recorded example of someone relating factors of environment, diet, habit, and customs to health (Meade & Earickson 2000; Andrews & Moon 2005a; Oppong 2006). The next significant figure is often cited as John Snow, primarily because his work on mapping cholera was one of the first examples of geography being used to understand epidemic disease (McLeod 2000). The contemporary medical geography is often considered to begin with Jacques May (1958), who is widely recognized to be the chief founding figure of medical geography in the United States for his contribution of the text *The Ecology of Human Disease* (Meade & Earickson 2000; Brown & Moon 2004; Oppong 2006).

In more recent years, geographers such as Jonathan Mayer (1996, 2000) have reinvigorated the field of medical geography by focusing on the importance of such factors as political ecology. Political ecology in particular has been characterized as a "structural approach that attempts to connect large-scale political, social and economic processes to local health and well-being" (Richmond et al. 2005: 349). In other words, Mayer proposes using political ecology to understand how health and health care processes are situated in a number of interrelated and overlapping contexts. In many ways this is the first explicit example of a medical geography based approach that reflexively seeks to incorporate political factors into its analyses. This approach is exemplified in work by Kalipeni and Oppong (1998) who used a political ecology approach to examine the ways in which political upheaval is an important factor in understanding emerging and re-emerging diseases. As we argue throughout this chapter, contemporary and past examples of work by medical geographers have implicit political foci. In this category could be included early studies that focused on health care restructuring and privatization (Mohan 1984a, 1984b, 1988; Scarpaci 1990b, 1990a, 1991). However, political ecology is among the first approaches that emerged in part as a response to critics of medical geography's apparent apolitical approach. Finally, newer research by the likes of scholars such as Emch (Emch et al. 2008), Curtis (2008), and Atkinson (2002) have shown the discipline to be still growing and taking up analytical challenges in terms of epidemiology and medical service analysis.

In terms of politics, we have attempted to illustrate in the previous paragraph that medical geography literature stresses its foundations in the scientific method and objectivity, in an effort to aid objective policy solutions. This same issue is, however, contested by health geographers, who maintain that any narrative of objectivity evinces a false presumption of apolitical analyses and obscures the underlying biases of the researcher and research questions (Kearns 1993; Dorn & Laws 1994; Dyck 1999b; Elliott 1999). In the next part of this section we therefore take a look at health geography, its traditions and self-narrative, and examine how critique and separation from medical geography is an inherent part of understanding its present dispositions.

Health geography takes as its point of departure a set of literatures that began to diverge from medical geography by focusing more on the importance of place and social identity (Gatrell 2002; Parr 2004). Health geography emerged at a time where its adherents took more of their direction from postmodern trends and developments in the cultural revolution that broadly affected the discipline of human geography. Early practitioners questioned medical geography's claims to objectivity and were critical of its a-theoretical positionality (Moon 1990; Jones & Moon 1991, 1992, 1993). Furthermore, while Kearns' (1993) intervention is often cited as the emergent point of health geography, geographers such as Burnett and Moon (1983) or Dear and Wolch (1992) were already concerned with issues concerning the effects of deinstitutionalization on communities and individuals. The presence of such work before the crystallization of the health geography movement reveals that health and politics were already on scholars' research agendas.

Health geography is replete with commentaries on the significance of place and scale for understanding such disparate issues as health policy, health status, and health experiences (see for example Curtis & Jones 1998; Macintyre et al. 2002; Del Casino 2004; Andrews & Moon 2005a, 2005b; Poland et al. 2005; Cummins et al. 2007; Dyck & Dossa 2007; Grady & McLafferty 2007). Momentum for the focus on the intersection of health, place, and scale emerged from debates and developments in medical geography that have argued the need to understand health and health care processes "beyond the shadow of medicine" (Kearns & Gesler 1998: 3). Health geographers have sought to give attention to diverse geographies in terms of the experience of health and disease (Duncan et al. 1993; Dyck 1995a; Asthana 1998; M. Brown 2003; Gesler 2005). Moreover, the integration of new theoretical perspectives within the realm of health geography has motivated the generation of newer research questions and methods (Craddock 2000b).

The use of social theory including feminist, post-structural, and postmodern theories has moved the focus of geographic studies on health (Brown 1997; Dyck

1999a; Craddock 2001; Brown & Knopp 2006; Philo 2007). Newer scholarship within the sub-discipline has been directed towards understanding the health-related characteristics of place in terms of questions such as what meaning health facilities may or may not bring to the communities they serve or how people experience health and disease (Kerner et al. 2000; Parr 2000; T. Brown 2003; Poland et al. 2005; Wakefield & McMullan 2005; Chouinard 2006; Dyck 2006; Moon et al. 2006). Recognition of the relevance of the subjective interpretation of health care issues has motivated health geographers to conduct analyses at finer scales, including health facilities, the home, and the body. Moreover, to bring greater attention to meaning and experience in terms of health care, geographers of health since the 1990s have increasingly relied on qualitative methods, including interviews, focus groups, and ethnographic research techniques (Elliott 1999; Wilton 1999; Kesby 2000; Wiles et al. 2005; Parr 2007; Thomas 2007).

More recently, health geographers have elaborated on new public health (Brown & Duncan 2002; Kearns & Moon 2002; MacKian et al. 2003). In contrast to old public health, which employed an epidemiological model of disease, new public health emphasizes the relevance of social and psychological factors in understanding health and disease. In their work, health geographers have recognized that contemporary issues related to health maintenance and disease prevention operate through this newer approach.

In this section, we have provided an overview of the histories of health geography as distinguished from medical geography. As part of this we have traced the history of this split in order to show how both bodies of literature construct barriers to mutual collaboration. In the section that follows we consider how this gap might be bridged through a reconsideration of politics as an inherent part of both medical and health geography research agendas.

Repositioning the Politics of Health and Medical Geography

We suggest that rather than contesting the assumed apoliticization of medical geography, as health geographers have, we ought to refocus and understand commonalities in both medical and health geography by positioning the political through Brown, Staeheli, and Kofman's framework of antagonistic, distributive, and constitutive politics. This framework was designed by Staeheli and Brown (2003) originally for understanding the progress feminist geographers have made in political geography. We suggest that this framework is also a useful means of organizing politics as a common thread in both health and medical geography.

According to Brown and Staeheli, distributive politics can be most easily characterized in Harold Laswell's phrase "who gets what and under what circumstances?" This characterization provides a means of framing politics as a process of resource allocation. In modern societies political processes often center on control and access to distribution of resources as a means of achieving particular political goals. The distributive frame also provides a basis for understanding unequal patterns of privilege and inequality in societies. By focusing on the spatial patterns of such phenomena, geographers are in a position to trace lines of power that shape politics.

Antagonistic politics focus specifically on the struggle between groups. The antagonistic frame bears a close resemblance to distributive, in that resources generally form the basis for antagonistic relationships. However, the focus for geographers instead becomes the struggle itself and the spatialization of competition through concepts like territory. As Staeheli and Kofman (2004) point out, antagonistic politics materialize in geographies of elections, policy, state formation, international agreements, and war. Moreover, it can also provide an important way of understanding the political struggles that emerge when groups struggle for rights or recognition with the state or state actors. Geographers in this sense are well positioned to understand how such struggles shape and in turn are shaped by political relations.

Constitutive politics refer to the ongoing political processes performed by groups and individuals that shape democratic societies. That is, they focus on the way in which politics are not just about outcomes, but, rather, they are an end unto themselves. In doing so, geographers focusing on the constitutive look at how space and place formative in the production of political identities. At the same time, constitutive politics are strongly associated with normative elements of politics and the implications that normatization has for issues of equity and social justice in democratic societies. However, Brown, Staeheli, and Kofman emphasize that geographers have more often than not sought to stress how constitutive spaces are used to claim political inclusion rather than exclusion.

The framework devised by Brown, Staeheli, and Kofman offers a compelling basis for understanding how politics operate in variety of contexts. For this reason, they offer a flexible means to bridge the gap between medical and health geography. By understanding politics as a series of overlapping contexts in which groups, individuals, and the state interact, we can postulate a more inclusive definition of the political that resonates with methodological and analytical goals of both sub-disciplines. In the next section we take a closer look at how each political thread can be seen in medical and health geography literature. We do so by specifically focusing on the question of health disparity.

Distributive, *Antagonistic*, and *Constitutive* Politics in Geographies of Health Disparity

In this section we examine the common political elements in medical and health geography studies of health disparities, by focusing on distributive, antagonistic, and constitutive politics. Health disparities as an area of study refer to interests relating to unequal access and use of health care services, as well as unequal determinants of disease burden (Mayer 2000; Asthana et al. 2003; Moon et al. 2006; Panelli et al. 2006). Health disparities, we argue are examples of where medical and health geography intersect in terms of the political. In terms of distributive politics, we focus on access to and availability of health services, distributive of environmental risk, and distributive of disease pattern. Antagonistic politics we consider through issues such as health policy/coverage, environmental justice, and (NIMBYism). In terms of constitutive politics, we focus on the ways in which question of equitable service provision and representation tie into place and space-based political movements.

Distributive

Distributive politics is a matter of who gets what, in terms of health and medical geography and health disparity, this commonly takes the form of research into the distribution of health resources as a political matter. Whereas medical geography concerns itself with patterns of access or the spatial distribution of impacts concerning services or medications, health geography examines distributive politics of health as they relate to places and individuals.

The currents of distributive politics are evident within recent medical geographic analyses that have focused on a range of different issues: for example, the spatial patterning of diseases like dengue fever, cholera, dysentery and the strategies of mass immunization (Ali et al. 2003; Ali et al. 2005; Ali et al. 2008). In this sense, medical geographers examine the significance of access to medicine and the pre-existing location of health resources in determining disease patterns. By and large these studies illuminate how peripheral locations and marginalized individuals are more likely to be at a disadvantage in terms of health coverage. Furthermore, medical geographers have also looked at variations in admissions to psychiatric hospitals, as a factor related to economic status and proximity (Almog et al. 2004). An additional area of focus has concerned women's use of contraception in developing world settings, as exemplified by Chacko's (2001) investigation in India. Such research demonstrates in part how quality of health services is heavily dependent on government public health decisions about the scope and scale of health resource distribution. Other studies have explored maternal and infant health disparities that are related to socio-economic status, country of origin, and changing economic policies (McLafferty & Tempalski 1995; McLafferty & Grady 2005; Grady 2006).

Health geographers have also focused their attention on distributive politics with respect to the allocation of health resources. One thread of research has concentrated on rural areas in terms of how the concept of rurality relates to health services or how such areas are impacted by economic restructuring (Kearns & Joseph 1997; Asthana et al. 2003; Smith 2005). In addition, Sarah Atkinson (2002) focused on the possible impacts of political cultures in northern Brazil on health policy and health systems as a means of overcoming health distribution inequality. Other scholars such as Susan Craddock (2007) have called attention to the relationship between market incentives in the pharmaceutical industry and the distribution of AIDS vaccines in the developing world. Vincent Del Casino (2001) has pushed forward the importance of place based meaning and service provision in order to better understand the geography of health among people living with HIV/AIDS in Thailand. Finally, there has also been attention paid to the impact on environmentally based health disparities as a factor of distributive politics that impact dangerous workplaces and developing countries such as Ghana (Tschakert & Singha 2007).

Antagonistic

Antagonistic politics are best understood as the struggle between groups. In this sense, antagonistic politics in medical geography and health geography commonly take the form of community struggles. This is exemplified in studies that focus on environmental justice and health, as well as studies that consider inter-communal friction over health status.

Antagonistic politics in medical geography are visible in research that has focused on environmental issues and political ecology. In part this has been of interest as a matter of interaction between the state and groups concerned over environmental justice (Richmond et al. 2005). Furthermore, research on state involvement in environmental factors related to health has focused on residential perception concerning health status and environment (Haalboom et al. 2006). As another area of focus, Barbara Tempalski demonstrates the relevance of antagonistic politics to medical geography research in her investigation of concerns over health access toward political sensitivities and NIMBYism surrounding the location and placement of syringe-exchange programs (Tempalski 2007; Tempalski, Flom et al. 2007; Tempalski, Friedman et al. 2007).

Health geographers, by contrast, demonstrate the important role antagonistic politics play by examining community responses to threats to health facilities (Halseth & Williams 1999; Barnett & Barnett 2003; Panelli et al. 2006). In contrast, Susan Craddock (1995, 1998, 2000a) has highlighted the tensions between different social groups as a factor in shaping historical public health responses. Isabel Dyck (1995b, 1995a, 1999a) has brought attention to the ways in which antagonistic politics emerge from struggles of women experiencing multiple sclerosis. In a similar vein, Robin Longhurst (1999, 2000, 2001) has described how pregnant women resist societal boundaries associated with maternal health expectations. Others have sought to highlight the ways in which health and health projects become the basis for political empowerment (MacKian 2008). Similarly, there has been an interest in difficulties to accessing health care as a basis for forming community action (T. Brown 2003; Panelli et al. 2006).

Constitutive

Constitutive politics broadly refer to the formative aspects of politics and the normative practices surrounding political movements. For medical and health geographers, this has emerged most commonly in studies that focus on the ways in which health can be a means of constructing exclusive and inclusive political groups.

In terms of constitutive politics and medical geography, Paul Boyle (2004) has explored how migration and socio-economic inequalities impinge upon the health status of immigrants. Whereas Brown and Staeheli promote those geographers who have shown the inclusive aspects of constitutive geographies, we can also understand them to be an exclusive process. In the instance Paul Boyle describes, we can see how the political constitution of the immigrant leads to differential health outcomes. Similarly, Curtis (2008) examines the relationship of public policy to the provision of health services to particular populations in Europe. Kalipeni (2000, 2004) has focused his attention on health and disease in sub-Saharan Africa, through examining the variables that make populations in this region vulnerable to poor health, including structural adjustment policies. The underlying political economic foundations that drive such policy are important factors in shaping health of populations.

Likewise, Kalipeni and Oppong (1998) have looked at the ways in which the allocation of resources for health maintenance is pivotal in the formation of refugee political claims.

In terms of constitutive politics and health geographies, Bondi and Burman (2001) have looked at feminist practices in providing mental health services. In doing so, they stress the ways in which health provision can be a political intervention. Michael Brown (1995, 1997) has written about the construction of gay men in medical geography and the problem of distance. He emphasizes that the problematic erasure of sexual identity undermines efforts by gay men to participate in politics of public health. Tim Brown (2000) has discussed the ways public health institutions construct boundaries between normal and abnormal behavioral practices. Such boundaries serve as a means of constructing politically legitimate and illegitimate health claims. Vera Chouinard (1999a, 1999b, 2001; Chouinard & Crooks 2003) examines disability studies and rights, emphasizing how unequal access to space is in part constructed on the basis of disability.

Conclusion: Collaborative Politics of Medical and Health Geographies

The overarching goal of this chapter has been to formulate a way in which we can bridge the gap between medical and health geography. To that end, we have examined the ways in which focusing on politics can highlight common threads in medical and health geographic research. We have drawn from Brown, Staeheli, and Kofman's framework of political geography to further emphasize how parallel research agendas can be seen in both sub-disciplines. By focusing on distributive, antagonistic, and constitutive politics to interpret politics in medical and health research, we have demonstrated that there is significant overlap in terms of a common concern for politics as they relate to issues of health disparity.

While both medical and health geography can be shown to overlap politically, few medical or health geographers have worked collaboratively. Despite forums like the journal *Health & Place*, which offer a setting for both medical and health geography publications, the divide that is sustained methodologically and epistemologically still shapes how medical and health geographers interact scholastically. This gap is unfortunate, as both of us believe that there is enormous untapped potential in dealing with problems of health disparity by collaboration among health and medical geographers.

This is not to say that there are not some scholars whose work straddles the divide between health and medical geography. For instance, Jonathan Mayer (1996, 2000) positions political ecology as a framework to address the emergence of disease patterns in both developed and developing world contexts. A political ecology approach looks to explain the overlapping political economic, ecological, and social factors that underlie the spatial patterns of health outcomes. Other scholars have followed Mayer's lead in employing a political ecology approach, recognizing its utility for addressing disparity not strictly as a spatial phenomenon, but also as a product of population and place-based activities (Richmond et al. 2005; Tschakert & Singha 2007; Hanchette 2008). However, besides pushing geographers to adopt a wider set of methods and theoretical approaches, we suggest a more collaborative framework for conducting research and publishing on issues related to the problem of health disparities.

The framework put forth by Brown, Staeheli, and Kofman, as we suggest, is a means of finding commonality between medical and health geography. However, we also argue that it serves as a framework for producing future collaborative efforts. Seeing that the question of politics is relevant to both medical and health geography we posit that Brown, Staeheli, and Kofman's framework provides a twofold resolution. First, the common interest of medical and health geographers concerning distributive, antagonistic, and constitutive politics provides a basis for collaborative research agendas. Second, the recognition that politics is common to both medical and health geography suggests there is an opportunity for geographers to publish works together.

Fulfilling both of these steps is important for showing the complementarity of the two sub-disciplines. In this sense, a collaborative agenda involving distributive politics could bring together medical geography's attention to spatial analysis of health resources and health geography's focus on how distributive patterns have an impact on particular groups and local communities. In addition, an agenda examining antagonistic politics could be furthered by integrating health geography's focus on place-based meaning and experience with medical geography's focus on the ways in which public health policy provokes NIMBYism. Additionally, this could be accomplished by incorporating a health geography perspective in a political ecology approach, such as we have seen in work by Richmond, et al. (2005) and Tschakert and Singha (2007). Finally, research that looks at constitutive politics can draw from medical geography's attention to unequal health outcomes and health geography's related interest in the role of public policy and civil society in constructing exclusive and inclusive groups via health status. By collaborating through this political framework we hope that a more constructive relationship could be evinced between medical and health geographers. While such collaboration clearly has its limitations, we view this as an important step towards challenging and refining the future direction of geographic scholarship that concerns health and health care processes.

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Chapter 11

Living With and Experiencing Disease

Vincent J. Del Casino Jr

Introduction

As this volume suggests, the fields of medical and health geography have gone through dramatic theoretical and methodological transition since the 1970s. These transitions are marked in this section as medical and health geographers discuss how to investigate disease diffusions, clusters, and ecologies. Other chapters trace out the ever-changing landscapes of disease distributions and spread as well as the broader politics that both promote and mitigate against those distributions. Most of this research operates at an analytic scale that works beyond mundane everyday experience. And, yet, as we now know from the development of research by geographers on the embodied experience of living with diseases – from infectious to chronic – and illnesses – broadly conceived as mental and physical – we need to continually interrogate how people negotiate life in relation to the ever-changing understandings of, and relationships to, both disease and illness. Thus, while this turn toward embodied experience does not necessarily deny the importance of investigating disease ecologies or the changing socio-spatial organization of the physical and built environments' impact on disease diffusions, it does suggest that we can re-orient our investigative lens and focus attention on the individual and collective responses to our understandings of, and experiences with, disease and illness, health, and wellbeing. Importantly, then, this chapter suggests that diseases are more than biological processes operating in and across space; they are social processes that have real effects and affects for individuals and communities.

In order to contribute to this broader discussion regarding embodied experiences within the field, this chapter traces the emerging focus geographers have developed on the study of living with and experiencing (dis)ease. The parenthesis is quite important. It signals the contested nature of disease as both a social and biological process, and highlights the critical work geographers are doing to tease apart the meanings ascribed to both disease and illness. Moreover, the parenthesis suggests that there is an intimate relationship between the experience of various diseases and illnesses and place/space, which are tied to the material, day-to-day practices of our identities and subjectivities as healthy and ill, well and diseased. As such, this chapter works across the various approaches in medical and health geography by examining how living with disease is also intimately tied to the various landscapes of health and health care that are part of the everyday experience of our negotiations of our health. To ground this discussion, this chapter briefly traces a comparative of living with and negotiating HIV disease in two distinct contexts, Long Beach, California, and Chiang Mai, Thailand. The juxtaposition of these two sets of experiences and places highlights the important ways in which a similar disease operates differentially in and between various contexts and across the broader global landscape of epidemic infectious diseases.

The Embodied Geographies of (Dis)ease

Diseases are not static objects. They adapt and change over time and space, and they have a different and differential impact on individuals and communities. They also mutate, both biological and socially. Their meanings shift, as do our abilities to mitigate their effects. Put simply, how one experiences and lives with a certain disease (or illness)[1] is dependent on where he or she is, when he or she is, and how he or she conceptualizes his or her relationship to that condition. In some cases, we may be able to change the spatial organization of our worlds to create new coping mechanisms for dealing with certain diseases. In other cases, broader socio-spatial and political-economic processes limit this possibility. Tracing the embodied experience of living with various diseases, therefore, demands that we invest our research with a historical imagination that understands diseases as fluid processes that change over time and place. As Moss and Dyck (2002: 16) thus aver in their discussion of chronic illness: “describing chronic illness as a long-term sickness does not get at the stuff, the nitty-gritty, that makes chronic illness, chronic illness. Using the descriptor “long-term” doesn’t express the intensity of experiencing a specific set of symptoms over a lengthy period of time. Nor does it capture chronic illness as a state of waxing and waning … uncertainty … indeterminancy … fluctuation.” It is the uncertainties and fluctuations that are of particular interest to geographers who study the experience of living with various diseases. Focusing on the uncertainties challenges the linear narrative of disease progression and also embeds a certain spatialized sensibility into our study of disease experiences; these uncertainties are always already spatialized processes because how we think about diseases is relationally constructed to the spaces we inhabit – including our bodies – and the meanings we ascribe to our place in the world as both healthy and ill.

Studying the embodied experiences of living with various diseases thus entails an epistemological and methodological shift away from objective studies embedded in a scientific rationale and toward subjective analyses based in interpretative frameworks. It also demands a shift in how we think about the body itself. The body is not simply an object in space. Rather, the body is a space, both materially and socially constituted through its relationship with other bodies and spaces. Put another way, the so-called diseased body is more than a body that has contracted a particular virus or has manifest a particular genetic change. It is also a social body marked by the socio-cultural and political-economic meanings societies ascribe to the "productive" citizen or the "normal" person. Examining these processes, meanings, and experiences means grounding our work in the everyday lives of people, both healthy and ill. Within the context of the work by geographers interested in (dis)eased experiences – the way individuals are meant to feel "in" and "out" of place because of their relationship to their body's ever-changing social and spatial status (cf. Cresswell 1996) – there is a deep and abiding interest in using qualitative methodologies to thickly describe the complicated nature of living with various diseases and illnesses. The remainder of this section briefly traces how geographers have interrogated the experiences of living with (a) chronic illnesses/diseases and (b) infectious diseases.[2] While there are certainly related experiences that transgress the relatively arbitrary barriers between these disease/illness categories – we could, for example, ask to what extent any disease/illness is dis-abling – there is also some value in teasing out the subtle nuances and complexities that emerge across these categories of disease/illness experience. At the same time, throughout this section there will be signposts through which we might see continuities in the experiences and spaces that engender these various disease/illness categories.

Living with chronic illnesses/diseases

There are certain diseases that produce an ongoing set of symptoms or illnesses that have no clear curative trajectory or end-point. They are thus called chronic illnesses or diseases. They include a myriad number of conditions, such as rheumatic illnesses (Crooks & Chouinard 2006), multiple sclerosis (ME) (Dyck 1995), and myalgic encephalomyelitis (ME) or chronic fatigue syndrome (Moss & Dyck 1999), and each produces a unique set of challenges. Those who experience chronic illnesses have to negotiate not only the ebb and flow of changes to their bodies over time; they must also cope with their changing relationship to their everyday life spaces, such as the home, the clinic, and the neighborhood. As Crooks and Chouinard (2006: 346) argue:

> As the geography of ill women's daily lives changes, for instance to exclude living in a private home or "belonging" in places of paid work as a result of experiencing this process of disablement, other newer places and roles loom larger in women's lives.

Individuals who are chronically ill have to negotiate the complex interrelationships between the spaces they occupy and their evolving identities as so-called "ill" or "unhealthy" subjects. This means reworking spaces they have traditionally occupied, such as the home, and perhaps inventing new spaces, such as support groups, to expand their spatial relationships beyond their self. This extends beyond the face-to-face support, it also extends into the realm of the "virtual" (Crooks 2006).

The work on the geographies of chronic illness thus seeks to describe and understand how living with a chronic illness shifts the relationships between conceptions of self and place: the emergence of a chronic illness demands one think about his or her relationship to everyday life spaces. As the body changes in relation to a chronic illness, "women with chronic illness [for example] restructure social and physical environments by re-learning environments through chronically ill bodies" (Moss & Dyck 2002: 163). This includes having to negotiate the reality that "[m]any spaces are closed off as a result of illness – schools, malls, workplaces, friends' homes, and even part of a woman's own home – because women with chronic illness can no longer be part of them on a daily basis" (Moss & Dyck 2002: 153). In thinking about experiences of their changing bodies, people with chronic illnesses also have to negotiate the dis-abling effects of their diseases, in both a material and social sense. In particular, individuals who live with chronic illnesses have to negotiate the fact that sometimes their "symptoms" do not manifest themselves outwardly on their bodies. This makes it difficult to restructure their own spaces and social relationships to elicit support for their changing bodily experiences. As Dyck (1999: 119–20) suggests, "although women experienced symptoms that caused feelings of illness and prevented, or made difficult, certain activities, the women appeared healthy." What is provocative, and very important within the context of this discussion, is that the experience of living with a chronic illness is often tied, in a social sense, to an occulacentrism that locates ill bodies in space by visualizing what it means to "look sick." Simply put, if you don't look sick how can you be sick. This is very problematic for those people who suffer real pain or fatigue, which fails to result in any material or clear outward effects. Of course, the life course of a particular disease or condition also means that the body may change from time to time. Someone diagnosed with MS, for example, may rarely exhibit outward signs of his or her condition early on in the course of the disease's progression, while someone else with Parkinson's disease may be able to manage the symptoms temporarily through pharmacological interventions. Thus, even though there may be no clear bodily change, individuals living with chronic illnesses still must negotiate everyday spaces in differing ways in relation to their changing abilities.

Living with infectious diseases

While certain infectious diseases, such as HIV, can lead to chronic and ongoing illnesses and symptoms, other infectious diseases may have either acute periods of intensity resulting in a short-term illness or even death. Infectious diseases are also different than diseases that are caused by non-infectious agents, such as genetic disorders or degenerative illnesses, which might be the result of, for example, alcohol abuse, which can cause fatty liver disease, but which does not necessarily result from the introduction of a "contagion" or infectious agent (Meade & Earickson 2000). Infectious diseases are also different than diseases that might be the result of environmental changes and contaminants. In the simplest sense, "*[i]nfectious* diseases result from the activities of living creatures, usually microorganisms, that invade the body…[whereby] transmission of infectious disease agents between people, may be direct through person-to-person contact or indirect through bites of insect vectors or via fomites (or vehicles) such as contaminated blankets, money, or water" (Meade & Earickson 2000: 3). Despite this straightforward medicalized definition of infectious diseases, these diseases carry a wide variety of meanings that deny any simplistic reading of what it means to live with an infection. Infectious diseases are often linked to the politics of "choice," whereby certain diseases are seen as victimizing while others are constructed as the result of life options. On the one hand, are diseases, such as malaria, which are the result of mosquito bites. On the other hand, are venereal diseases, which are the result of bodily contact and exchange of fluids between individuals. In the case of malaria, then, there is a sense that individuals may have little choice about where they live and thus how they may be exposed to this particular infection. Venereal diseases are conceptualized quite differently, constituted through discourses of lifestyle behavior and choice. Moreover, whereas the infectious vector in the context of malaria is a mosquito believed to lack free choice, the infectious vector in the context of venereal diseases is a human believed to live in a world of options. While these constructions are highly problematic (cf. Patton 1990, 1994; Brown 1995; Patton 1995; Brown 2006), they provide a powerful social context for how infectious diseases are interpreted and experienced in material terms.

In fact, infectious diseases, and their construction as diseases of "choice," have powerfully sutured certain spaces to particular ill identities, allowing those in position of power to evacuate both individuals and entire communities out of certain spaces. Susan Craddock (2000) outlines the various ways that certain infectious diseases became associated with a particular ethnic Chinese space in San Francisco in the late nineteenth and early twentieth centuries. In her work, she highlights how epidemic diseases, such as tuberculosis, and sexually transmitted diseases, such as syphilis, were centered in the neighborhoods of Chinese immigrants, on the one hand, and on the bodies of Chinese female commercial sex workers, on the other. In both cases, these diseases were socially tied to the organization of Chinese ethnic space and practice. Thus, even as medical knowledge about infections was evolving and changing, and our understandings of infectious disease transmissions shifted, the social construction of infectious disease remained firmly grounded, discursively, in individual and group body politics. In the context of experience, then, individuals and groups cannot simply "escape" the social context and the spatial organization of certain infectious diseases; diseased identities are, in fact, socially and materially located in certain spaces and bodies. These practices of locating disease and outlining blame (Farmer 1992) have powerful effects on how resources may be allocated and who is allowed to be a "victim" and who might be labeled as "contagion." Historically, then, we need to consider how different infectious diseases are constructed in relation to the logics of individual choice, moral discourses of victim and contagion, and shifting understanding of the relationship between space, identity, and social practice.

On another level, we also have to consider how individuals and communities cope with the emergence of new and old infectious diseases. In general, despite the optimism of the penicillin revolution, the world continues to experience the emergence of new infectious diseases as well as the re-emergence of diseases once thought to be either dormant or extinct (Mayer 2000; Emch and Root this volume). Infectious diseases that were once thought to have been eradicated through the development of antibiotics, for example, continue to mutate, resulting in certain classes of medications becoming anachronistic. Moreover, the mutability of infectious diseases means that the experience of a certain infection, say, for example HIV, varies across time and space, whereby certain variations of HIV react differently to different medical treatments in different places. How people cope with an infection varies quite dramatically depending on where one might be. Ironically, the social imagination that surrounds the myth and power of antibiotics may result in very casual practices that put people at risk for certain infections; the assumption that a disease can simply be cured means that one need care very little about contracting such an infection. This has certainly been true in the social construction of gonorrhea, which is seen as a casual infection that can be easily cured with a shot (it is not hard to trace the social construction of this casualness in the spaces of the media in the post-penicillin period). But, today, gonorrhea has grown resistant to many classes of drugs and it may soon be resistant to all forms of treatment. As such, we may be in a place where we are studying how people cope with their changing bodies as they struggle with their social and material identities as gonorrheal, a notion that would have seemed absurd in the 1980s. It is the changing nature of both the meanings we ascribe to and the biological adaptations of infectious diseases that make the study of how individuals and groups live with and experience these diseases so pressing in context of current medical geographic research.

Beyond the Disease–Health Care Binary

In 1982, Mayer identified the "two traditions of medical geography," arguing that the fields of disease ecology and medical care studies remained rather marginal to each other (Mayer 1982). While he suggested ways to bring these fields together, he also argued that medical geography's "strength may, in fact, lie its eclecticism" (p. 227). Since Mayer's invocation of a duality in the sub-field, there has appeared not less but more difference, as some in field moved to develop a geography of health (e.g. Kearns & Gesler 1998), while others sought to expand the critical study of "the medical" in the discipline (Dorn & Laws 1994; Philo 1996; Parr 2004). In all of these discussions, what has become clear is that in order to understand experiences of living with disease and illness, one needs to interrogate both the spaces of disease as well as the spaces of health care in all their multiplicity. This means, first and foremost, taking "the medical" seriously (Parr 2002), investigating the ways in which bodies are organized through what Foucault identified as the multiple spatializations of medicalized rationality (see Philo 2000 for a detailed discussion of Foucault's geography of the medicalized body). Second, we need to think through Gesler's (1992) challenge to the field, which expands how we think about health as more than biomedical. Health and health care are invested with a plurality of meanings and people utilize a multiplicity of spaces as they negotiate their health on a day-to-day basis (Smyth 2005). The same is true for the experience of disease and illness, which varies quite dramatically in relation to the social and material constructions of the spaces of health care. In examining the embodied experience of disease and illness, therefore, we need to examine how these experiences are managed in relation to both biomedical and so-called alternative health care spaces. What begins to emerge is that health and illness, wellness and (dis)ease are often experienced in a number of ways that transgress the boundaries of allopathic and holistic medical practices (Del Casino 2004).

Biomedicine and the "management" of (dis)ease

Biomedicine is a powerful cultural system that regulates both the meanings ascribed to diseases – through the practice of defining what is and what is not a disease – *and* the organization of the spaces of health care (Foucault 1973). The emergence of the modern biomedical establishment is dependent on the spatial structures of the hospital, the clinic, and the physician's office to reinforce a certain "way of knowing" disease and illness. Hospital spaces organize the logics of the medical gaze, giving medical practitioners access to spaces exclusive to their practices (Philo 2000), while patients enter these spaces with the hopes of getting "expert" help. In this way, the power relationships of many biomedical spaces privilege doctors over patients (Gesler 1999). This, of course, has a dramatic effect on how individuals experience their lives with certain diseases. In the context of these power relations, for example, Crooks and Chouinard (2006: 349) suggest:

> Disempowerment [for women with chronic illnesses] in places of health care clearly disadvantaged women in their struggles to promote wellbeing in other spaces of life (e.g. convincing co-workers or family members of their needs for accommodation). However, it was those women with illnesses whose causes and symptoms are not yet well-understood by medical professionals, notably FMS [fibromyalgia syndrome], who were especially traumatized and disempowered by lack of access to information about their illness, available treatments, and supports.

The power/knowledge systems of biomedicine exist not only with the so-called spaces of health care; they are also stretched into the spaces of the everyday. Without the power of diagnosis and the identification of a "disease," individuals cannot demonstrate their new ill identity. Moss (1999: 160), thus found in her own case that "[i]n my workplace, more people assumed I was stressed from my job and that my physiological symptoms were psychosomatic." The extension of the inscriptive power of biomedicine is particularly challenging for those people living with a chronic illness because chronic illnesses are often problematic for the biomedical establishment's curative logic. Without the ability to cure an illness, medical practitioners are forced to rethink their relationship with patients and their treatment regimens. Within the context of many westernized medical spaces this can often be a challenge to the power/knowledge system of physicians who see their job as one that fixes problems (cf. Foucault 1973). Moving from a curative model to one that might be considered as managed care also shifts the relationship between the person who is identified, or identifies him or herself, as chronically ill and his or her body (Moss & Dyck 2002).

Biomedicine as a cultural system is, at the same time, a fluid and dynamic set of processes, mediated by the imposition of new experiences, technologies, politics, and economics. Rose (2007: 11–12) identifies how biomedicine is shifting its gaze from the " 'molar' level, at the scale of limbs, organs, tissues, flows of blood, hormones, and so forth … [to] the molecular level …Life is now understood, and actor upon … in terms of the functional properties of coding sequences of nucleotide bases and their variations, the molecular mechanisms." In constituting this shift, the meanings we ascribe to unhealthy bodies and how we "treat" them are also in flux. In fact, the value we place on life itself may be further re-structured by our abilities to "read" the cartographies of the molecular body and reorganize that body to meet the needs of an appropriate productive citizen. Put more simply, as we struggle to change the very genetic makeup of the body, through both the mapping of the genome and later through manipulation of that genome, new diseased bodies will be created, ones that do not fit the idealized vision of a capitalist society. There is a critical geography to this process. People in one place may be identified as incurable because of a lack of access to essential medications that operate at the molecular level resulting in the devaluing of certain lives (Kearns & Reid-Henry 2009).

Reciprocally, as we begin to employ new technologies to restructure life at the molecular level we also need to rethink the relationship between disease and place, health and access to care. "Organ transplant [for example] is not merely a triumph of surgical techniques but requires new sets of social relations bringing together donors and recipients across time and space, entailing and generating new ideas about end of life, new senses of ownership of the body and rights to a cure, as well as the complex financial and institutional relations that make the procedures possible" (Rose 2007: 17). Diseased bodies in one place are allowed to extend their lives while others are not. The politics of living with certain diseases thus changes as the biomedical interventions change, opening up new challenges for those who are trying to negotiate their health and wellbeing in the context of a global politics of disease.

Alterities and the "reorganization" of (dis)ease

Scholars working with in geography and beyond consider not only the possibilities of biomedicine in the management of life; they problematize biomedical hegemony through their work on so-called "complementary and alternative" (CAM) medicine. The concept of "the alternative" is not without its problems of course, as it denotes a space of otherness and marginality, a space situated outside of biomedicine. As Doel and Segrott (2003: 131) argue:

> The category CAM is doubly problematic. On the one hand, its formation through negative differentiation means … CAM simply *is not*. On the other hand, the actual content of CAM is … encompassing a diverse range of therapies, from acupuncture to zero balancing via radionics and spiritual healing. In short, CAM is a chaotic conception without taxonomic closure. To confuse matters further, not only may certain forms of CAM appear complementary *and* alternative in different settings, many are being actively integrated into orthodox [bio]medicine, and transformed in the process (their emphasis, see also Del Casino 2004).

At the same time, the notion that there are alternatives for how individuals and communities negotiate their disease experiences is important within a reconceptualized medical geography (Kearns 1995). In the context of HIV, for example, individuals engage a multiplicity of healing practices in their daily negotiations of their disease, including biomedical interventions, when available, support groups, when possible, and herbal remedies, when needed, to name just a few (Del Casino 2001, 2004).

While the work on CAM often falls under the topic of "health care" within medical geography, it is impossible to analyze the experience of disease without also considering the variegated landscapes of health and health care from which people may draw as they manage their health and illness practices. Importantly, we have to consider the multiple spatial possibilities that continue to change how we think about our health and our experience with disease. This is particularly true if we consider the importance of psychosocial support networks for those living with various chronic and/or life threatening diseases. Brown (1997) identifies the importance of "buddy systems" for people living with HIV in Vancouver, for example. These alternative practices work beyond the spaces of biomedical care, expanding how we think about the management of one's disease. In some cases, such as the use of the internet, information on biomedical treatments can be gathered by so-called patients, allowing them to negotiate the management of their disease differently in consultation with their physician (Crooks 2006). In other ways, the development of alternative health care possibilities is sometimes born out of material necessity, as biomedical interventions have failed to "fix" the problem. In Thailand, support groups for people living with HIV and AIDS (PLWHA) developed so that people could share home-based care strategies because the biomedical public and private health care systems remained incapable of providing antiretrovirals or bed space for PLWHA (Del Casino 2001, 2006). Moreover, networks of "traditional Thai healers" have been supported in public health care spaces, providing an inexpensive set of options for PLWHA who are dealing with a significant number of opportunistic infections resulting from their HIV disease (Del Casino 2004). In general, however, what this work demonstrates is that it is difficult to differentiate a space of biomedicine, on the one hand, and a space of alterity, on the other. Rather, in-depth analysis of how people manage the complicated relationship between health and disease demonstrates the co-constitutive nature of health care: diseases are experienced across a multiplicity of spaces and through a plethora of practices. And, as those spaces are reorganized, it may be possible to identify new ways in which the care related to various diseases are being managed and professionalized (Bondi 2004; Clarke et al. 2004).

The Mundane Politics of Life and the Spaces of (Dis)ease

There is no doubt that there is a very complicated geography to disease. It follows, then, that there must also be an incredibly complex geography to living with and experiencing disease. Research on the embodied experience of living with disease suggests that the disease experience–spatiality relationship deserves close attention, as scholars investigate how individual and community spaces are reorganized to "deal with" disease and illness and the everyday management of our health. The previous section attempted to break down the duality of medical geography, suggesting that the study of (dis)ease is always already about health and health care. This is certainly not a new idea. Rather, it is an idea that deserves extended attention. This is particularly true if we consider how the everyday politics of living with and experiencing diseases and illnesses are also always inextricably sutured to the mundane politics of life. This includes not only the negotiation of everyday movement through the spaces of home and work. It also includes the new forms of "biosociality" and "biological citizenship" (Rose 2007) that continue to develop around emergent (dis)eased communities. As an example:

> the new biosocial communities forming on the Web and outside it can be seen as moral pioneers – or perhaps "ethical pioneers" – of a new kind of active biomedical citizen-

> ship. They are pioneering a new informed ethics of self – a set of techniques for managing everyday life in relation to a condition, and in relation to an expert knowledge … Of course, in a certain political, cultural, and moral milieu, this idea of activism in relation to one's biomedical condition can become a norm. Activism and responsibility have now become not only desirable but virtually obligatory – part of the obligation of every biological citizen, to live his or her life through acts of calculation and choice. (Rose 2007: 146–7)

Rose goes on to suggest that there is a critical geography to biosociality, mediated by the experiences of how diseases develop in various local contexts, although he fails to fully problematize those geographies. In particular, Rose's "vital politics" is "centered largely on advanced liberal economics" (Kearns & Reid-Henry 2009: 555). This means that these "medical technologies … are beyond the financial reach of the vast majority of people living" (Kearns & Reid-Henry 2009: 555; see also Braun 2007). What this suggests is that when new technologies are introduced into the debates about life and health, illness and disease, that the cultural interpretations and practices of these technologies will have different effects and affects relative to life "as limit and as capacity" (Kearns & Reid-Henry 2009: 555). Turning to an example of the introduction of one biomedical technology, antiretroviral treatment for HIV, the remainder of this section briefly traces how the mundane politics of life are re-structured in relation to the HIV epidemic in the United States and Thailand. In examining the re-thinking of life in relation to HIV in both contexts, it is possible to ask how new diseases and their treatments both enable new bodies and spaces and regulate how various (dis)eased subjectivities are constituted in and through the performance of healthy and ill social identities.

In the United States, for example, the management of HIV disease through the advanced development of antiretroviral medications suggests that the "new" frontier of AIDS activism is not access to medication but prevention. The new discourses of who should be the caretakers of the HIV epidemic became remarkably present in January 2006 when the Los Angeles Gay and Lesbian Center launched a controversial new HIV prevention campaign titled, "HIV is a Gay Disease." The image of two men on the poster campaign discursively centers HIV among gay men's bodies, while proclaiming with text "Ok, diseases don't have sexual orientations, but in Los Angeles almost 75 percent of those living with HIV/AIDS are gay or bisexual men of all races and ethnicities." So, this campaign suggests the gay community needs to "own it" to "end it." This approach to prevention has developed out of an extended "prevention with positives" campaign, which specifically targets those who are HIV positive to "take responsibility" for the epidemic (Del Casino et al. 2004; Del Casino et al. 2005). It has found powerful allies in the biomedical and behavioral research communities (see the introduction to "prevention with positives" by Gordon et al. 2004 in the *Journal of Acquired Immune Deficiency Syndrome*). This new discourse of responsibility firmly reorganizes the (dis)eased body: it is not enough to have to deal with your own personal health you must now be responsible for everyone else as well. Your body is thus stretched across space into the everyday life spaces of others – your sex or drug partners, your so-called community, and your society more broadly. You are also your disease; your subjectivity is reduced to the reconfiguration of your biological self as HIV positive.

There are problems with this prevention approach, however, as it fails to understand how biosociality operates differently and differentially in and across so-called communities. Put simply, individuals do not only belong to an HIV positive community – if they even claim that identity – they also conduct themselves in and through a number of different spaces that also mediate their relationship between their biosociality and their own subjectivity. Consider Steve,[3] a 32-year-old Latino, someone interviewed as part of a larger study in Long Beach, CA, as he discusses his predilection toward identifying himself as HIV positive in party and play (drug and sex) situations (situations he sees as the essential core of gay cultural life in Long Beach). When talking about whether or not people asked if he was HIV positive or not early on in his diagnosis he said, "What's your status sometimes they'll be like. As of now my test has been coming back negative. Cause I'm not lying." Here, Steve uses his viral load tests, which are undetectable, to shift his identity away from an HIV positive one. He takes on his reformed body, which has been changed at the level of the virus itself, to reconstruct his own identity in relation to the broader sexual spaces in which he is embedded. He does this so that he can participate in the sex and drug cultures of party and play settings without being ostracized or excluded and with limited personal culpability in the transmission of HIV. At the same time, as he becomes more involved in HIV prevention work, he performs his identities in relation to his HIV status as a gay man in new and provocative ways. As he explains, after having been HIV positive for some time,

> this year that I have told everyone before we played. And they're like, "oh." You know what their still stupid. You know what? The gay men heart [community?] is absolutely dumb. Because they're one, there's like a few of them, "Oh, I really want you inside of me. Don't use a condom. You can still cum though it's okay." I told them I'm HIV positive. And their like, still say that.

So, even as Steve "truthfully" manipulates his HIV identity from someone who is "undetectable" to someone who is HIV positive, he remains embedded in a particular definition of gay cultural and community life centered around party and play settings. His sexual partners, when they ascent to unprotected receptive sex with him, manipulate their identities by ignoring their HIV risk or status and instead define that identity by an unbarried intimacy (no condoms) of shared substances. As such, bare backing – sex without condoms – becomes more intimate and significant as a marker of gay identity in this particular context. And, clearly, the embodied experience of this disease is contingent on and related to the constructions of identity and space that Steve must negotiate on a day-to-day basis, however problematic we might find his constructions of so-called gay community and space in Long Beach.

In Thailand, on the other hand, the pharmacological intervention of antiretroviral drugs that stems HIV disease progressions is not made as easily accessible. Biological citizenship thus operates differently for those who may find themselves HIV positive in places, such as Thailand. This was particularly true in the late 1990s and early 21st century when biomedical interventions were almost non-existent in most of the country. And, despite attempts to develop generic alternatives to the very expensive drugs currently produced in the United States and other places, people living with HIV and AIDS must perform their bodies in different ways to maintain their life and good health. This has never been truer than in 2006, when delegations from the United States and Thailand met in Chiang Mai, Thailand's largest northern city, 300 miles north of Bangkok, to complete the 6th Round of their Free Trade Agreement (or FTA) talks. By January 11, *The Nation* (an English-language newspaper in Thailand) was reporting that almost 10,000 people were protesting the meetings. According to *The Nation*,

> 10,000 protesters yesterday broke through police barricades surrounding the Sheraton Hotel, where Thai and US negotiators were engaged in free-trade talks. The ruckus brought the talks to a premature close … After a minor clash with police, about 500 protesters managed to enter the hotel compound, while the rest rallied outside the hotel's main fence. Some 2,000 police officers and security forces formed blockades to prevent protesters entering the hotel … The 500 protesters, most of them from HIV/AIDS groups, vowed to make their way to the meeting room to prevent negotiations on drug patenting and other intellectual property rights … "It is crucial for us to stop the negotiations, because our lives are at stake," said [Khun] Nopparat … from an HIV/AIDS group … "We are fighting against drug patenting with our lives. I know I might get arrested or injured in clashes with police, but we are willing to face that, because we have more to lose if the talks succeed."

Efforts to disrupt the spread of a US-dominated neo-liberal (or free market-centered) economic agenda are not new. What makes the very recent protests in Thailand against the Free Trade Agreement (or FTA) interesting is that people living with HIV and AIDS appear front and center. This is more than simply a question of proletariat protests against the menace of global capital, this is an engaged struggle against the assertion of biopower, what Hardt and Negri refer to in their book *Empire* as "a form of power that regulates social life from the interior, following it, interpreting it, asbsorbing it, and rearticulating it" (2000: 23–4). It is also a struggle over access to new biotechnologies that do more, in Rose's words, than simply "re-establish the natural vital norm." New technologies operate at the molecular level to "change what it is to be a biological organism" (Rose 2007: 17). In so doing, new "ways of thinking" about life are permeating how people experience HIV disease, impacting how individuals and groups utilize and manipulate the structures of health and care and their own (dis)eased identities in their local communities to gain access to these technological advances.

The ability of PLWHA to mount a protest against a US-supported program of free trade is dependent on a very mundane set of daily politics that surround how HIV disease has been socially organized in Thailand. Put simply, the underlying social organization that facilitates this mobility and helps organize this new form of biosociality is a larger support group movement, which developed in the 1990s to restructure health care around the needs of PLWHA, few of whom had access to the latest biomedical interventions (Maniphong et al. 1999; Del Casino 2001; Lyttleton 2004; Del Casino 2006). This support group movement has facilitated a new engagement with HIV disease by shifting the debates away from a health care policy based in prevention only and toward one based in care and support (although this remains a contested and somewhat problematic process, see Del Casino 2006). In the words of one PLWHA activist living in northern Thailand put it,

> If we are talking about the provincial [PLWHA] network … I think that it is good. There are some people who know a lot … They act as representatives and leaders … They deal with the government. For example, with the provincial welfare funds … I have a gone to the provincial welfare office as well [to gather information on programs and apply for funds] … The president [of the PLWHA Support Group Network in the Upper North] is a representative that goes to speak with people in other countries about assistance from abroad and helping the Thai government. The representatives are people who can make them understand [the situation].

The emergence of this new form of biosociality has, to put it rather simply, given voice to those who have historically been marginalized in the larger political decision-making processes related to health and health care in Thailand. It has also given rise to an emergent voice of dissent, developed out of the mundane organising that began to help individual PLWHA gain greater access to the resources they need to live with HIV disease.[4]

What these two brief examples suggest is that we need to further disentangle how an ever-changing "politics of life" and the embodied experience of biological citizenship play, albeit differently and differentially, in the so-called developed and developing worlds. As new ways of managing (dis)ease through antiretrovirals make their way into new spaces, it is clear that debates about who will be responsible for the managing HIV disease as well as HIV positive and HIV negative bodies will also change. What this also suggests is that we will continue to see new social identities and spaces constituted in relation to the dynamic notions of what it means to be a biological citizen. Perhaps, more insipidly, we will also see a changing discussion of responsibility operating through discourses of "biodeviance." In this context, biosociality will lead not only to the affirmation of so-called compliant communities cooperating with the dominant forces of biomedicine. It will also lead to the emergence of alternative biosocial identities and communities, which aim to restructure space to challenge those who try to control how we define and regulate life. In this way, the mundane and embodied experiences of living with diseases intersects with the broader socio-spatial processes that mediate life at the molecular level. In short, it is clear that debates over how we define a "disease" and "wellbeing," "healthy" and "ill" life will continue to be contested as individuals and social groups struggle to negotiate the everyday and embodied experience of living with various diseases.

Conclusion

> If we are serious about fully understanding the relations between health and place, the environment and disease, spaces of healing and health care, can we afford not to focus a little more closely on the materiality and meaning of the body and its messy processes? Should we not debate more rigorously how body spaces are socially constructed and experienced as well as (and not just) biologically determined? I would argue that such questions should concern both those who identify themselves as medical geographers and as geographers of health and health care, as, in an age when geneticists are claiming ultimate expertise in the mapping of human bodies, we might just be out of a job if they do not! (Parr 2002: 247).

This chapter tries to lay out an agenda for how we might examine and interpret the embodied experience of living with (dis)ease. It relies heavily on the assumptions of geographers that consider disease both a social and a biological process. In so doing, it echoes Parr when she rightly asks: "can we afford not to focus a little more closely on the materiality and meaning of the body and its messy processes?" To that, it is important to add that these processes – both social and biological – are always already complexly interrelated to a myriad number of spaces that are biomedical and alternative, enabling and disabling, healthy and diseased. Living with and experiencing disease is not a fixed process, nor does it follow a linear trajectory. Some days are good, while others are not. Some days are filled with hope, while others might be filled with dread. Some days see the death of a close friend, others see the affirmation of life. All of these (dis)eased experiences are relational; they are always already embodied in and through the spaces of the home, neighborhood, hospital, or nation.

As the brief section above suggests as well, the "politics of life," which are also always tied up into the "politics of (dis)ease," are constituted in and through new discursivities and technologies that make it possible to rethink life. The ability, however, to rethink the life–disease relationship is only partially constituted through the possibilities of new medical advances. More importantly, the way we "think" about and "do" our disease is contingent on the mundane politics that expand both our understanding about and our access to new identities and spaces that may or may not incorporate healing possibilities. More generally, the study of the embodied experience of living with (dis)ease suggests that we must think through the multiplicity of medical geographic knowledges if we are to also study and engage new ways of knowing and living with disease and illness.

Notes

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1 The relationship between the terms "disease" and "illness" is a complicated one. But, "[p]ut simply, people suffer illnesses, while doctors diagnose diseases … [At the same time,] [d]isease and illness may or may not be associated, in that it is perfectly possible to feel ill without there being any detectable biological abnormality, while the person who has been diagnosed which such an abnormality might feel quite well" Gatrell, A.C. (2002), *Geographies of Health: An Introduction*. Blackwell Publishing, Oxford. Thus, it

is common to refer to a set of conditions as a chronic illness instead of a chronic disease because there might not be a clear "biomedical" definition of the underlying cause. This does not make the effects of the undefined disease and its resulting illness any less real. It just makes it discursively more difficult to locate the conditions/symptoms/effects/affects within the logics of biomedicine and its capitalistic apparatus.

2 This set of arbitrary classifications could be further problematized by introducing both mental illness and disability studies. These topics, however, are covered in other chapters in this volume and are therefore bracketed in this particular discussion, which is meant to be suggestive. It is possible to apply the conceptual work discussed her to a myriad number of conditions and subjectivities within the confines of medical and health geography.

3 The discussion of Steve comes from a much larger study conducted with Lee M. Kochems, Center for Behavioral Research and Services, which was funded by the California Universitywide AIDS Research Program, Grant no. ID-CSULB-042. This work, and the discussion of "prevention for positives," has also been worked through a number of conference presentations: Del Casino Jr, V.J., Kochems, L., and Fisher, D.G. (2004), *Discourses of Responsibility: Dividing HIV Prevention Efforts between the "Positive" and the "Negative*," poster session presented at the 15th International AIDS Conference, Bangkok, Thailand (WePeC6126); Kochems, L. and Del Casino, V.J., Jr (2004), *Manipulating Multiple Life Identity-Shifts: Points of HIV Risk in Overlapping Drug Cultures and Gay Cultures in Long Beach, CA*, Washington, DC, oral presentation at the American Public Health Association Meetings; Del Casino, V.J., Jr, Kochems, L.M., and Fisher, D.G. (2005), *Queering the Spaces of HIV Outreach: Rethinking the Discourses and Practices of "Preventions for Positives*," Denver, CO, paper presented at the Annual Meeting of the Association of American Geographers.

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Part III Health and Wellbeing

Chapter 12

Therapeutic Landscapes as Health Promoting Places

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Introduction

The growing interest in and use of the metaphorical notion of therapeutic landscapes in health geography and the study of health more broadly has taken place at the same time as has the growing acceptance of the socio-ecological model of health, the population health approach, and the health promotion movement – all of which view the inclusion of diverse causal agents/determinants in disease and health. This association will be elaborated upon within this chapter, which will achieve two objectives, the first of which is to provide a developmental template for the evolution of the therapeutic landscape concept over time. The second, and more central objective, is to examine how the therapeutic landscape concept has been employed within a health promotion approach; this is done by reviewing the links that exist between the therapeutic landscape applications and health promotion strategies, specifically outlined in the internationally known Ottawa Charter (1986).

To achieve these objectives the development of the upstream approach to health will first be briefly reviewed before introducing the therapeutic landscape concept. Next, the contemporary use of the therapeutic landscape concept both within and outside the sub-disciplinary context of health geography is presented. Six different developmental themes are proposed as a way to track the evolution of the therapeutic landscape concept and its applications over time. In discussing each of these developmental themes, this chapter will review how the therapeutic landscape concept is currently employed across numerous and diverse areas of inquiry through highlighting examples from research. Finally, the future use of the therapeutic landscape concept will be discussed, with potential health promotion applications highlighted.

A Short History of Upstream Approaches to Health

Although a number of trends related to what we now call population health have been recognized and explored since the eighteenth century, the development of the actual phrase and framework did not take place until the 1980s. This perspective became the conceptual foundation for large empirical studies worldwide, at various population levels; these studies themselves became incorporated in the development of the "population health perspective." Population health is now central to a number of policy applications, evident in a number of international users such as the World Health Organization (WHO), in their "Summary Measures of Population Health." Health promotion, as a concept, developed at about the same time as the population health concept.

Like population health, health promotion extended beyond what was seen as a narrow biomedical approach, recognizing health broadly and holistically. Public participation and community involvement were emphasized and, by the mid-1980s, health promotion was an international phenomenon and a central policy direction of many governments worldwide. A number of strategies were used, summarized here using those suggested in the internationally known Ottawa Charter (1986): *(1) build healthy public policy, (2) create supportive environments, (3) strengthen community actions, (4) develop personal skills, and (5) reorient health services*. It is evident that a number of health promotion models have located place as central, as these models aim to explain and understand the interactions of human beings with their environments. Proponents of this environment-centric perspective include, among others, Lalonde (1974), Hancock and Perkins (1985), and Kickbusch (1989).

Generally known as employing an "ecological approach," these health promotion models and concepts are collectively known as largely informing the settings or supportive environments movement, outcomes which include, for example, healthy and sustainable cities, health promoting work sites, and health promoting schools. Kickbusch (1989: 267) provides a definition of health promotion that encompasses the ecological approach and reflects similarities to the therapeutic landscape concept, specifically the impact on physical, spiritual, social, and mental wellbeing and the recognition of different scales and types of "conditions":

> Public health is the science and art of promoting health. It does so based on the understanding that health is a process engaging social, mental, spiritual and physical wellbeing. It bases its actions on the knowledge that health is a fundamental resource to the individual, the community and to society as a whole and must be supported through sound investments into conditions of living that create, maintain and protect health.

As argued elsewhere, the increased acceptance of population health and the health promotion movement late in the twentieth century carried with it a change in focus, from treatment to prevention (Rootman & Munson 1990).

Concurrent with this upstream, preventative approach to health has been the evolution and growing acceptance of the therapeutic landscape concept both within health geography and in the study of health and wellbeing more generally. Although originally envisioned to encompass landscapes or places known for their therapeutic qualities, and therefore of interest to those experiencing ill-health of some kind, the therapeutic landscape concept has quickly evolved to encompass places recognized as having health-enhancing effects. The idea of therapeutic landscapes as health promoting places was first suggested in 1999, and was reflected both in the title of the first edited collection, *Therapeutic Landscapes: The Dynamic Between Health & Wellness*, and again in the introductory chapter (Williams 1999: 4):

> Exploring the positive, healing or therapeutic characteristics of place is consistent with the development of health promotion throughout the world. This collection contributes to the process of learning about the factors conducive to providing therapeutic landscapes, and in so doing, assists in meeting the goal of achieving the state of complete wellbeing for all.

When reviewing all the available research that employs the therapeutic landscape concept, it becomes apparent that applications have consistently viewed places/environments/landscapes as being health promoting and/or somehow enhancing health, wellbeing, wellness, and/or quality of life. A wide-ranging vocabulary has been employed in the use of this approach, from supportive landscapes/environments, through to health sustaining/enhancing environments and preventative landscapes. Braubach (2007), for example, uses the term "preventative environment" to frame his quantitative analysis of perceptual data collected in eight European cities; using data from a WHO survey on housing and neighborhood conditions and health, his work provides empirical data to support the application of the therapeutic landscape concept in urban health.

Certainly the theme of therapeutic landscapes as health promoting, and simultaneously disease preventing, is evident throughout the evolution of the concept and in each of the six proposed themes discussed in this chapter. As a collective, all of this work has contributed to the promotion of health in various ways, with the majority of applications highlighted simultaneously addressing numerous health promotion strategies. It is for this reason, that the therapeutic landscape applications highlighted below are discussed from a health promotion perspective with the core action strategy inevitably being the *creation of supportive environments*. Before addressing these themes in more detail, the following section elaborates on the "evolution" of the concept.

The Evolution of the Therapeutic Landscape Concept

The evolution of the therapeutic landscape concept in health geography took place shortly after the emergence and acceptance of these various upstream approaches to health in the larger health and policy discourse. William Gesler, well known for his work in what was known then as medical geography, first introduced the therapeutic landscape concept in 1991, in his book *The Cultural Geography of Health Care*. He later defined it "as a geographic metaphor for aiding in the understanding of how the healing process works itself out in places (or situations, locales, settings, milieus)" (1992: 743). Next, Gesler (1993: 40) defined a model of therapeutic landscape themes, which he categorized as those having either "inner/meaning" or "outer/societal context." Those characteristics of therapeutic places associated with the "inner/meaning" theme included: natural setting, built environment, sense of place, symbolic landscapes, and everyday activities. Those characteristics making up the "outer/societal context" theme were defined as: beliefs and philosophies, social relations and/or inequalities, and territoriality. These ideas were applied to the research Gesler undertook on the traditional sites of Epidauros (Greece), Lourdes (France), and Bath (England), but were also embraced by a growing number of geographers with interests in, for the most part, contemporary places for health – such as summer camps, and gardens for the elderly (as discussed below).

Many health geographers have found, and continue to find, the therapeutic landscape concept a useful framework for inquiry in three substantive areas, all of which operate as the foundation for the ongoing use of the concept both within and outside of geography: (1) physical places known for health; (2) applications in health care sites; and, (3) spaces of significance for particular populations. These three areas of inquiry are reflected in the organizing framework for the two edited collections devoted to therapeutic landscapes (Williams 1999, 2007a), suggesting that these areas of interest operate as consistent macro-categories for the ongoing use of the therapeutic landscape concept. It is worth noting that these three areas have traditionally been, and continue to be, central to the work of health geographers beyond the application of the therapeutic landscape concept, suggesting, perhaps, that the concept itself has become a key framework for geographical work in health research.

With respect to the evolution of the therapeutic landscape concept over time, these three macro-categories of inquiry operate as the first three of six developmental themes proposed in Table 12.1. The remaining three themes include: (4) literary analysis of fiction; (5) use within disciplines outside of geography; and, (6) everyday sites of varied therapeutic value. A number of important caveats in this typology need to be made clear at the outset. First, not all of the pertinent research is referred to or discussed in this chapter; rather, illustrative examples are highlighted. Further, each theme in this typology has not been consecutively developed one after

Table 12.1 The developmental themes of the therapeutic landscape concept

Theme	*Central focus*	*Sample applications*
1 Physical places known for health	Examine sites reputed for healing and health	• Natural wilderness • Summer camp
2 Health care sites/services	Explore the therapeutic elements of various health care sites and services	• Range of medical sites, from hospitals to home • Gardens for the elderly
3 Sites specific to marginalized and special populations	Examine the specific experience of unique groups, often in unique sites	• Cultural groups • Addicts in recovery
4 Literary analysis of fiction	Explore how the therapeutic landscape concept is used as an interpretative framework	• Mann's *The Magic Mountain* • Spyri's *Heidi*
5 Use within disciplines outside of geography	Use of the concept as a framework for discipline-specific research	• Sociology • Anthropology
6 Everyday sites of varied therapeutic value	Use beyond reputed sites; inclusive of potentially non-therapeutic places where social, political and economic context accounted for	• Nature • Agrarian and natural landscapes for Kaqchikel of Guatemala

the other, as the research applications for each theme are ongoing. Finally, many of the research applications, whether or not discussed or referenced in this chapter, can be categorized in a number of the proposed themes, given their wide-ranging characteristics; that is, the themes are not exclusive. For each of the six developmental themes, one or more specific research application is discussed in some depth; these applications have been chosen based upon their relevance to health promotion. Each of these developmental themes will now be discussed in some detail.

Theme 1: physical places known for health

The therapeutic landscape concept has its theoretical origins in a number of different approaches, including structuralism and humanism; this broad approach has provided a framework for the analysis of a wide number of environments – including the natural and built, the social, and the symbolic – as they contribute to healing and wellbeing in places, broadly termed landscapes (Gesler 2003). Gesler's pioneering work on traditional sites historically (and in some cases currently) reputed for health and healing, the Asclepian Sanctuary at Epidauros, Greece (1993), the Marian Shrine at Lourdes, France (1996), and the Roman Baths at Bath, England (1998), provided the template from which further applications emerged. Often referred to as "healing places," the analysis of these sites followed Gesler's thematic model and explored their "inner/meaning" and "outer/societal context," as discussed above. These sites, whether historical or contemporary, are physical sites, often with both natural and built elements. This first, foundational theme explores the health promoting qualities of specific physical environments, where a large number and range of contemporary applications of the therapeutic landscape exist. These include: natural wilderness environments such as Alaska's Denali national park (Palka 1999) or the national forests in middle England (Bell 1999), as well as those environments with mixed natural and built attributes, such as monastery retreats (Conradson 2007), children's camps (Thurber & Malinowski 1999; Kearns & Collins 2000), and yoga centers or Ashrams (Hoyez 2007). This subject area continues to view places as dominantly therapeutic, hence the term "traditional." This area of inquiry maintains that certain places do, in fact, have specific characteristics which contribute to their healing quality, irrespective of the critique that places can simultaneously be hurtful (as will be discussed in theme six). These characteristics are many and wide-ranging, generally understood as addressing health holistically, where the physical, mental, social, and spiritual elements of wellbeing are addressed.

Foremost, these places are reputed to have an "enduring reputation for achieving physical, mental, and spiritual healing" (Gesler 1993: 171). Of the wide range of applications within this first theme, camps may be most representative of health promoting activities given the emphasis on the *development of personal skills within a supportive environment*, the latter which emphasizes the natural environment; they are highlighted here as a sample of the growing work being done in the first theme (Table 12.1). Thurber and Malinowski (1999: 6) were the first to apply the therapeutic landscape concept to the camp environment, specifically to a Young Men's Christian Association (YMCA) residential summer camp in New Hampshire, United States, which:

> is found to display many of the characteristics commonly attributed to therapeutic or restorative landscapes. Children's experience of Camp Belknap – designed to promote spiritual, mental, and physical growth in the boys it serves – is understood through examining camper's interactions with the physical and social environment. Conclusions show that although adjustment to the camp setting may be difficult, even causing clinical levels of depression in some children, most children adjust and report a positive experience by the end of a two or four-week stay. Place preferences of the campers show a diverse utilization of camp resources that indicate that multiple-use environments are crucial to the establishment and maintenance of therapeutic landscapes.

Although there are numerous other studies that explore various types of camps as therapeutic landscapes, Kearns and Collins' (2000: 1057) work on New Zealand health camps for children requires particular mention. In their historical review, they suggest these camps are places of "respite and health promotion," identifying the relevance of "ideas of power, resistance, ideology and historical contingency" in the evolution of children's health camps, which began in 1919 and continue to operate for "at-risk" children today.

There are numerous somewhat similar applications for adult populations; two highlighted here are monastery retreats and yoga ashrams. As Conradson (2007) suggests, the experience of stillness is a sought-after and increasingly required component of the busy, technologically driven lifestyles that are characteristic of the western world. The socio-geographical distribution of stillness is highlighted, with three "spheres of the life-world" discussed – workplace, homespace, and elsewhere. The latter sphere – elsewhere – is explored via monastery retreat settings. Using a similar rationale, Lea (2008) explores yoga and massage retreats as places of recuperation. Hoyez (2007) uses globalization processes to frame her interest in the therapeutic qualities of yoga practice and the place characteristics of yoga centers. Certainly, the ongoing examination of traditional sites continues to inform our understanding of the variant attributes or characteristics that need be taken into account when creating a health promoting environment.

Theme 2: health care sites/services

Although a large part of the work done using the therapeutic landscape concept has examined the descriptive nature of a wide range of service sites (Gesler 2003), three of the more common sites for exploration have included: hospitals (Gesler et al. 2004; Crooks & Evans 2007; Curtis et al. 2007; Gesler & Curtis 2007); long-term care facilities (Andrews & Peter 2006; Andrews and Shaw 2008; Cutchin 2007), contemporary asylums (Moon et al. 2006), respite centers (Conradson 2005); and, home (Williams 2002; Donovan & Williams 2007). The evidence-based research that has been done on hospital design for the mentally ill in the United Kingdom (Curtis et al. 2007; Gesler & Curtis 2007) stresses the importance of the social and symbolic environment, suggesting the need for empowering patients in design decisions. This work provides a good model for substantiating therapeutic claims of place within the therapeutic landscape concept. Further, as has been discussed elsewhere, alternative or holistic health care services and sites are reputed to use a disease prevention approach (Williams 1998). Although highlighted in the next theme, specific to marginalized groups, the community-based alcohol recovery programs for alcoholics (Wilton & DeVerteuil 2006; DeVerteuil et al. 2007) aims to create supportive environments and develop personal skills.

In contrast to the "curative" nature of health care services and sites that follow a biomedical model, the focus of health promotion services/sites is health improvement and the prevention of ill health; this reflects the *reorientation of health services* from "cure" to prevention. Gardens are highlighted here as a disease prevention site for the elderly given the vulnerability experienced by the elderly who are known to be high users of health care services. Milligan et al. (2004), in their work on therapeutic landscapes and older people in northern England, make an argument for gardens and gardening activity as health promoting for the aged. Their research supports the role of gardens and gardening in healthy aging, providing evidence that gardening activity contributes not only to good physical health but positively impacts the mental health of this population. Beyond the satisfaction, sense of achievement, and aesthetic pleasure that elderly gardeners reaped, the communal experience characteristic of allotment gardening was where social inclusion worked to combat social isolation and positively impact mental health. They suggest that research like theirs is needed to further inform "positive ways to develop therapeutic landscapes and places that actively promote health and well-being" (2004: 1790). As with other health care services and sites, this work simultaneously addresses a number of the health promotion strategies documented in the Ottawa Charter (1986), including the *development of personal skills, the creation of supportive environments, and strengthening community action*; the authors suggest how it can also impact on the building of healthy public policy (2004: 1790–1):

> Declining physical ability to manage the garden in later life, combined with the negative impacts on an individual's mental wellbeing are important issues that need to be taken into account by policy-makers when considering the development of programs aimed at supporting older people and facilitating healthy aging … healthy gardening interventions for older people need to be sensitively tailored to individual need.

Such upstream approaches make possible the ability of the elderly to combat various forms of morbidity and dependence, allowing them to live fulfilling lives which nurtures their full potential.

Theme 3: sites specific to marginalized and special populations

The use of the concept in examining the spaces and places related to the therapeutic for marginal and special populations have been many. Among them are numerous health promoting sites, including, the homeless (Bridgeman 1999), zoological parks for families (Hallman 2007), and phobic support group users (Davidson & Parr 2007). Further, a small number of applications have been made to specific cultural groups, including: Canadian First Nations (Williams & Guilmette 2001; Wilson 2003), the Jola of the African Gambia (Madge 1998) and more recently, Jewish survivors of the Soviet Gulag (DeVerteuil & Andrews 2007) and the Kaqchikel of Guatemala (Sperling & Decker 2007). Many of the above noted applications have a clear health promotion message, if not an obvious framework, as many of them address one or more of the three strategies outlined in the Ottawa Charter (1986): *strengthen community action, create supportive environments, and develop personal skills*. These strategies are also addressed in the work being led by Wilton and DeVerteuil (2006) on settings specific to substance abuse treatment and recovery, which is highlighted below as an example of work in this theme specific to marginalized populations (see Table 12.1).

Using a case study approach three different facilities for people with drug and alcohol addictions were examined; each of the three facilities was located in a different urban environment (inner core, outer core, and suburb) throughout Winnipeg (Manitoba, Canada). This work provides insight into the importance of place in substance abuse treatment, and in so doing, highlights how the *creation of supportive environments* operates as key to, in this case, recovery. The makeup of the physical environment in which each of the three facilities are located is recognized as playing a role in recovery, with the inner core environment being unsupportive when compared to the suburb, which is, relative to the other two sites, most supportive. The characteristics of the inner core are viewed as challenges to recovery, with the temptation of frequent drug dealing, bars and taverns, having surroundings described as "stigmatized and devalued" (DeVerteuil et al. 2007: 86). In addition to numerous other challenges, the unsupportive environment of the facility is why clients, when finished the detox program or through the emergency shelter, are often referred to treatment programs outside the inner core.

The "triggers" that can lead addicts to relapse, such as the liquor store, are located in the urban environment. The facility located in the outer core uses these "triggers" as part of their treatment plan, which aims to have clients confront and manage relapse issues in a supportive manner. Characterized as a program which follows the social model, the outer core program nurtures "an all-encompassing therapeutic community that attempts to structure and isolate its clients from their former peer groups/urban environments in order to change their behavior" (DeVerteuil et al. 2007: 86–7). The program works to enhance self-help and social support in *developing the personal skills* needed to "stay clean." Similarly, the facility located in the suburb uses a therapeutic community model, where peer surveillance and peer support are integral to the program. The surrounding middle-class environment is deplete of "triggers." The community setting is used in various ways to work towards the development of the personal skills necessary for recovery.

Theme 4: literary analysis of fiction

Borrowing the idea from cultural geography, health geographers have begun to interpret literature using the therapeutic landscape as an analytic framework (Gesler 2000; Baer & Gesler 2004; Tonnellier & Curtis 2005). As in cultural geography (Simpson-Housely & Norcliffe 1992; Gilbert & Simpson-Housely 1997), literary works are specially chosen by health geographers for use as the central data source in geographical analysis. The symbolic component of the therapeutic landscapes concept is central to literary analysis of "fictive geographies" (Baer & Gesler 2004: 406), as this is what reflects people's perceptions and meanings of both illness and health. Only a few health geographers have used this analytical approach, as reviewed (Williams 2007c: 67) and quoted below:

> Gesler (2000) first examined Mann's *The Magic Mountain*, tracing the main character's journey in attaining knowledge of both disease and health. Baer and Gesler (2004) then embarked on an analysis of Salinger's *The Catcher in the Rye* and, in so doing, extended the concept of therapeutic landscapes more thoroughly by highlighting shortcomings of the concept. This resulted in an expanded understanding of the concept, which encompassed everyday landscapes as ambivalent, nuanced spaces. Most recently, Tonnellier and Curtis (2005) examined Balzac's *The Country Doctor* for aspects of the social and physical environment, as perceived by the author as impacting health and wellbeing. The interpretation of Mann's *The Magic Mountain* (2000), Salinger's *The Catcher in the Rye* (2004) and Balzac's *The Country Doctor* (2005) illustrate the potential of the therapeutic landscape concept in interpreting literary works and in so doing, bringing attention to the socially constructed ideas about health (care).

More recently, the symbolism of the Swiss Alps is explored in Johanna Spyri's well-known children's classic, *Heidi* (Williams 2007c), and is highlighted here as representative of a health promoting *supportive environment* in this developing theme (see Table 12.1). In Spyri's *Heidi*, the Swiss Alps are presented as a supportive therapeutic environment for the main character and protagonist, a young orphaned girl named Heidi, as well as what become, as the story progresses, two of her urban acquaintances who visit from Frankfurt. Written in the 1800s, the environment is discussed in terms of the therapeutic qualities that it offers, including: fresh air, physical exercise as a result of the demanding landscape, medicinal herbs and plants, fresh and natural food gathered, extensive scenery, and sincere and committed social relationships. No doubt influenced by the Romantic Movement in Europe, which was characterized as embracing nature, Spyri's *Heidi* reflects the time in which it was written.

In the novel, rural–urban contrasts are highlighted. The urban world of Frankfurt is depicted as the place where physical, emotional, and spiritual illness appears to permeate every experience Heidi has. The environment of the city, replete with angry, stressed people, and built up streets depleted of nature, is perceived as unhealthy and the reason for the demise of Heidi's spiritual and physical health. Her wellbeing improves dramatically upon her return to the health-promoting alpine environment, where she insists she will remain. This symbolism characterizes the interpretation of "fictive geographies" which, in this case, reflects a health promotion approach via the *supportive environments* strategy.

Theme 5: use within disciplines outside of geography

The versatility and accessibility of the therapeutic landscape concept has made it attractive to a number of disciplines outside of health geography. Although exciting to see, many of the applications appear to overextend the concept in order to have it fit the central point of interest, often which has minimal association with place. Anthropology and sociology are two disciplines which continue to have close alignment with human geography; their respective sub-fields focus on health and increasingly employ the therapeutic landscape concept. For example, sport sociologist, van Ingen (2004) has used the therapeutic landscape concept as a framework for the experiences of members of a running club for sexual minorities. A number of anthropologists recently applied the therapeutic landscape concept to their work, where ethnographic methods are used to explore purposive community in suburban development (Hoey 2007), dementia care in long-term care facilities (McLean 2007), art-making in public spaces (Einwalter 2007), and a hospital as an aesthetic-therapeutic place (Collins 2007).

A number of other disciplines have been formally using the therapeutic landscape concept in their work. Similar to the work of geographers, kinesiologists Goodwin and Staples (2005) used the therapeutic landscape concept to frame their work on the contribution of summer camp to identity development for disabled youth. Although the idea of landscapes as therapeutic is not new in landscape architecture or building design, the therapeutic landscape concept is being used in research being conducted in these literatures (CooperMarcus 2001). Further, nursing has used the term in research specific to settings of care (Andrews 2002; Kennedy et al. 2004; Marshall 2008; Burges-Watson et al. 2007). In so doing, this work builds on therapeutic landscapes as supportive environments, where natural and built environments promote health. The work of anthropologist Athena McLean is highlighted here as representative of work in this theme (see Table 12.1), as it specifically illustrates the health promotion strategy of *building healthy public policy*.

McLean (2007) discusses the importance of a moral landscape of dementia care, arguing for the need for policy change to address improved quality of caregiving in nursing homes in order to better sustain the "personhood" of patients. By first reviewing the Culture Change movement, which suggests the ideal physical and social elements required to ensure nursing homes operate as therapeutic, McLean argues that more change is needed specific to the social elements, and particularly the quality of the caregiving provided. She stresses the importance of the social aspect of therapeutic environments within the context of the psycho-social health of dementia patients, where the "relational person," which is in this case a dementia client, requires intersubjectivity with: the environment, with objects in one's world, and with other persons. The latter, intersubjectivity with other persons, is discussed within an ethical framework, where empathy, vulnerability, and suffering need to be addressed. Recognizing the shortages of trained staff and the continued cutbacks in public dollars, both which impact the increase of part-time, casual, or temporary irregular staff in an increasingly commoditized care site, macro-policy changes are needed if the "personhood" of dementia clients in nursing homes is to be sustained; McLean cautions "that this ideal cannot be realized without accompanying social, political, and economic changes within the larger *moral* landscape."

Quoting Liaschenko (2001: 129), McLean further notes macro-relations involving institutional, regulatory, legislative, and the political-economic are all involved in making this change, extending the responsibility to "*a broader set of morally responsible actors and social relations*" (McLean 2007: 328):

> Since a therapeutic environment depends on multiple relations, everyone involved in creating policies that restrict the development of a caregiving relation, withhold access to therapeutic spaces (like gardens), or ignore the need for therapeutic opportunities to socially connect the elder to her sensory world should also be held ethically accountable.

This argument for *building healthy public policy* is clearly made as a health promoting strategy which supports the importance of meaningful social relations in achieving a therapeutic landscape of long-term care for dementia patients.

Theme 6: everyday sites of varied therapeutic value

Recognizing that there will undoubtedly be more to come, numerous critiques have been made of the therapeutic landscape concept (Wilson 2003; Baer & Gesler 2004; Gastaldo et al. 2004; Andrews & Kearns 2005; Conradson 2005; Wakefield & McMullen 2005), all of which has forced it to evolve further. One critique has been the minimal theoretical development of the therapeutic landscape, although scholars are beginning to address this shortcoming (e.g. Conradson 2007). Another critique suggests that places can be simultaneously healthful and hurtful. Milligan (2007), for example, discusses how wooded and rural landscapes operate as both restorative and risky for individuals experiencing them. A related critique that follows the same line, suggests that the therapeutic potential of any particular site for healing and/or health is variable, dependent upon the individual or group. Carolan et al. (2006) provide evidence for the importance of the subjective experience. In their work on immigrant and minority groups new to Canada, they determined that these individuals construct "personalized place-related memories," made up of a mental therapeutic landscape of memories and events from their past. Sperling and Decker (2007) also illustrate such variability by highlighting the gendered nature of the therapeutic landscape experiences of the Kaqchikel of Guatemala, as will be discussed below. Another critique suggests that healing can take place in everyday, ordinary places, such as work, home or community, in contrast to those places celebrated for their reputed healing qualities. This is keeping with a health promotion focus which recognizes that "[h]ealth is created and lived by people within the settings of their everyday life; where they learn, work, play and love" (Hettler & Hettler 1999: 286). Although not a critique, the relevance of the social, political and economic context has been suggested as being pertinent to the ongoing examination of therapeutic landscapes, particularly given the growing health inequalities and many other changes being experienced worldwide as a result of globalization and other related forces. Many of these issues are addressed, albeit to varying degrees, in the work of Sperling and Decker (2007), in their examination of the therapeutic landscapes of the Kaqchikel of Guatemala.

The everyday worlds of the Kaqchikel people, who live in a developing world context characterized by poverty and violence, is discussed via four themes: daily life and survival; development, success and a better future; "getting out" and the utility of natural beauty; and, negative (non-therapeutic) landscapes. The first theme, daily life and survival, reflects the importance of the health promoting strategy of *developing personal skills* for living. Given the agrarian lifestyle of the Kaqchikel, most of the daily activities revolve around survival, as outlined in the following quote which also reveals the gendered experience of place (pp. 249–50):

> The therapeutic landscapes of the Kaqchikel were highly gendered and embedded in the rhythms of daily life. Men's landscapes were overwhelmingly centered on their fields and/or jobs and were a greater distance from home than women's therapeutic landscapes, which were mainly focused on their domestic roles and located close to their homes (though this was also due to violence, not just traditional gender roles).

The second theme, "development, success and a better future," reveals the efforts that are made to assist individuals, families and the community in progressing forward. Efforts include the acquisition of infrastructure, such as roads, electricity and running water, as well as sharing plants and herbs for medicinal purposes/remedies. Many of these efforts reflect the health promotion strategy of *strengthening community action*. The ongoing efforts of women's community participation, which has traditionally been a male domain, are evident via their political organization and interest in educating themselves to read and write.

The third and fourth themes, specific to "getting out/natural beauty," and "non-therapeutic landscapes," provides a number of excellent examples of the variant nature of certain landscapes with regard to their ability for restoration and/or risk. Although the women saw the natural beauty of the forests, volcanoes and mountains, they were hesitant to leave their homes without an escort for fear of being assaulted. Men, on the other hand, were much more freely mobile to visit and use these spaces, whether within their own town or another close by. Non-therapeutic landscapes were discussed by women as places perceived as being dangerous or violent, including isolated places such as those located in the natural landscapes discussed earlier. Both men and women perceived private property, most of which was owned by absentee landowners, as inaccessible and not to be touched. Other non-therapeutic landscapes included informal garbage dumps and failing crops, the latter which translated into a survival threat. Although the health promoting characteristics of certain therapeutic landscapes is evident in this case study, these landscape perceptions clearly illustrate the everyday nature and variant therapeutic quality of place, while also recognizing the larger social, political and economic context in which they are situated.

Discussion and Conclusion

This chapter has addressed two objectives, the first of which was to provide a template for the development of the therapeutic landscape concept over time. This was achieved through the discussion of the general evolution of the concept, followed by the proposal of six themes of development, as outlined in Table 12.1 and discussed in some detail thereafter. The second and more central objective has been the examination of the links that exist between therapeutic landscape applications and health promotion, specifically addressed via the Ottawa Charter's (1986) health promotion strategies. Through first briefly reviewing the upstream approach to health, early associations made between the therapeutic landscape concept and health promotion were discussed. This was followed by the elaboration of key examples of therapeutic landscape applications, which were then associated to the Ottawa Charter's (1986) five health promotion strategies in each of the six themes specific to the development of the therapeutic landscape concept. What becomes clear is the utility of the therapeutic landscape concept in understanding those aspects of places (and the activities that occur within them) that contribute to the promotion of health and wellbeing; clearly the therapeutic landscape concept provides an effective framework within which places can both actively and/or passively promote health.

As reviewed in some detail elsewhere (Williams 2007b), there are numerous directions for further research. Specific to further contributing to health promoting environments, there are three areas which are suggested here. These areas are certainly not exclusive, but rather represent plausible directions that are based on previous applications. Continuing the first developmental theme, physical places known for health, there are numerous types of population-specific health promoting sites that have yet to be explored. Further to the recognized sites of recreational and health camps for various populations, Conradson (2007) has brought attention to the need for exploring sites that provide relief from the fast-paced, stress-filled lifestyles characteristic of the Western world. In addition to traditional spiritual sites, which have only begun to be explored, there are various forms of health promoting intentional communities that have yet to be explored in detail. Such sites will likely address a number of the health promotion strategies highlighted, including: *the creation of supportive environments, the development of personal skills, and strong community action*.

A second area pertains to the third thematic development (Table 12.1) – sites specific to marginalized and special populations. Little is known, at least not from the perspective of this concept, about the therapeutic landscapes of cultures outside of the western world. Madge (1998), Wilson (2003), and, more recently, Sperling and Decker (2007) and Leach et al. (2008), provide us with a glimpse of the worlds of various cultures, many of which undoubtedly have health promoting landscapes and, within them, practices from which we can learn. The continued interest of anthropologists will make this possible, and we as health geographers need to look for collaborative opportunities.

The third area in which ongoing work is ripe for exploration extends from the sixth developmental theme – everyday sites of varied therapeutic value. Examining ordinary, everyday landscapes and the activities within them, together with the highly variant experiences of such places which may be simultaneously restorative and risky, make research in this area extremely accessible. Seeking out the health promoting characteristics of such places in order to further capitalize on them may provide opportunities for daily health enhancement. Sites that come to mind are daycare programs for those with Alzheimer's or autism, or youth drop-in centers located in inner-city neighborhoods. In contrast, determining the health-reducing elements of ordinary, everyday places provides an opportunity for their impact to be minimized. One cautionary note to keep in mind with respect to these, and particularly this third research direction, is to be sure that the therapeutic landscape concept not become an "all use" framework which highlights the therapeutic/health-enhancing, as well as, more recently, the health-detracting aspects of particular places. This potentiality is possible as a result of the concept's flexibility and adaptability to all different kinds of ordinary, everyday sites, physically real or imagined, for example.

Although exciting to see, the liberal application of the therapeutic landscape concept holds the possibility of the concept being diffused to the degree that it holds little relevance. To avoid such diffusion, those who employ the concept in their work need to be encouraged to use it in a rigorous fashion; one suggested strategy is to use a self-critical and thorough approach in its use. Marshall (2008) offers a model of this strategy, having been mindful about the proper and clear use of the therapeutic landscape concept and its theoretical application to nursing research. If this cautionary note is not paid attention to, the therapeutic landscape concept may continue to be more generally critiqued as a catch-all framework for understanding positive health outcomes, feeding into the perception that it is lacking in comprehensiveness and applicability, particularly for those researchers studying negative health outcomes. These suggested directions have the potential to lay out the ongoing trajectory of the therapeutic landscape concept in health geography and elsewhere, while undoubtedly continuing to reflect an upstream approach to health.

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Chapter 13

"… a Penis Is Not Needed in Order to Pee": Sex and Gender in Health Geography

Matt Sothern and Isabel Dyck

Introduction

> "How do you pee?: … In order to urinate, you need three things: kidneys, a bladder, and some tubes … a penis is not needed in order to pee …" (FAQ's, Jim Sinclair's Intersex Web Page: http://web.syr.edu/~jisincla/peeing.htm. Accessed February 2009)

The title of this chapter comes from the self-help/advice webpage of Autism and Intersex activist Jim Sinclair. Jim Sinclair describes this as one of the most common questions asked in response to intersexuality and as demonstrative of a general lack of basic anatomical understanding. In an effort both to educate and to lobby for change, Jim Sinclair's response is to argue for a separation of genitalia from the physical functioning of the urinary system. The disaggregating of the genitourinary system performed in Jim Sinclair's reply allows for a distancing of the vital bodily function of excreting waste (bladder, tubes etc.) from the socially vital function of symbolic reproduction (the insistence on recognizable genitalia: a penis/a vagina). That this question about peeing is commonly asked is indicative of the degree to which physiological structure (in this case a narrow imaginary of the possible forms of human genital variation) underpins social structure (which in this case is an equally narrow insistence on the dichotomous construction of the sex/gender system, see Dreger 1998; Fausto-Sterling 2000; Johnston 2005; Butler 2004; Edelman 2004; Halberstam 2005).

The self-help/advice webpage of Jim Sinclair provides much of interest to health geographers concerned with questions of sex and gender – of particular purchase for our focus here are the issues raised by Jim Sinclair surrounding the spaces of biomedical science and the role of medical authority in the construction and re-enforcement of social norms about sex, gender, and the body. While the intersexed body of Jim Sinclair has been the site of intense medical regulation, the lived experience of Jim Sinclair's embodiment proves a useful site from which to theorize a critical health geography of sex and gender. In this chapter we use Jim Sinclair's autobiographical narrative as a starting point to introduce some of the interventions feminist and queer theories have made into health geography.

Jim Sinclair, Intersex, and the Medical Gaze

In a self-introduction to the Intersex Society of North America[1] Jim Sinclair describes how Jim Sinclair's birth and early childhood was un-dramatic. Jim Sinclair's intersexuality was a case of "under developed" rather than "mixed" anatomy; Jim Sinclair was simply assumed to be female until reaching early to mid-teens. While the expectation to identify as a girl sat uneasily, it was not until Jim Sinclair's teen years, when the expected physical development of puberty failed to materialize, that Jim Sinclair become subject to the gaze of biomedical science because of an ongoing insistence by Jim Sinclair that Jim Sinclair was not a girl:

> The first response was to send me for intensive psychotherapy to try to brainwash me into accepting a female gender identity and role. In fact I was nearly hospitalized in a psychiatric institution for this, but my parents settled for outpatient brainwashing instead … I was finally evaluated by a team of intersexuality "specialists" at sixteen and a half. Physical examination at that time was external only, plus a digital exam looking for testes and/or a uterus. I turned out not to have either. The recommendation at that time was that since I was adamant about not being female, I should start testosterone injections to make me appear more male. (Jim Sinclair http://web.syr.edu/~jisincla/brief_bio.htm. Accessed July 2008)

Testosterone therapy, however, produced its own unwelcome side-effects. Jim Sinclair goes on to describe how the deepening of the voice and growth of facial hair as a result of this therapy felt as unnatural as the dress Jim Sinclair was made to wear at earlier stages of childhood. We quote the following passage at some length because it concisely demonstrates how medical authority, socially constructed norms, and lived experience intersect in complex (and humorous) ways within the simultaneously discursive and material space of the body of Jim Sinclair. Moreover, we hope that this quote will underscore the call we make latter in the chapter for a fuller engagement with the spaces of biomedical science as one of the principal sites where sex and gender are themselves constructed:

> Presenting oneself convincingly as a male can be difficult if one is five feet two inches tall, has a high voice and no facial hair, and is several years past the usual age of puberty. But The Experts were confident that these difficulties could be overcome with the simple addition of a penis, or a reasonable facsimile thereof. Since I did not have such an appendage, The Experts (who obviously had never tried it themselves) recommended wearing a jockstrap with a rolled-up pair of socks in it to produce a strategically-placed bulge. I spent several weeks staring at people of both sexes, and as far as I could see, there was no visible difference in the crotches of males and females who were wearing underwear and properly fitting trousers. It did occur to me that I might have some peculiar perceptual deficit that prevented me from noticing a difference that was evident to other people; it also occurred to me to wonder, if this was the case, how acquaintances would react if I suddenly acquired a bulge where none had been before. Nevertheless, being a naive sixteen-year-old who believed that The Experts

> really knew what they were talking about, I tried it – once. I discovered the following useful facts:
>
> When you look in a mirror, put the socks in, and look in the mirror again, you can't tell the difference. The socks aren't visible.
>
> When you go about such normal activities as sitting down, standing up, walking, and going up and down stairs, the socks work themselves into visible and thoroughly unnatural-looking conformations.When you ride your bicycle to the shopping mall two miles away, the socks work their way out of the jockstrap. When you arrive at the mall, park your bike, and begin walking across the parking lot, the socks fall out your pant leg onto the ground.
>
> This experience taught me as much about The Experts as it did about the proper use of socks.
>
> Later that year, my indoctrination into the cult of phallus fixation was continued at a special clinic to which my physician referred me. There I was seen by several Experts who took it for granted that since I did not want to be female, I must want to be male, and that therefore I would be very anxious to acquire a penis.
>
> Exploratory surgery was done with my consent when I was eighteen. There were no differentiated ovaries or testes. I do not disclose the nature or direction of [my] improperly differentiated tissues, nor my genotype, as my experience has been that this kind of information gets used to "assign" me to an irrelevant gender.
>
> At 21 I had some urinary tract repair, and had to fend off an overzealous surgeon who was determined to do a phalloplasty.
>
> I remain openly and proudly neuter, both physically and socially. (Jim Sinclair http://web.syr.edu/~jisincla/brief_bio.htm. Accessed July 2008)

There are several initial comments that health geographers informed by feminist and queer theories might make about this passage. The first is that its narrator-protagonist tells the story of intersexuality as a progressive move away medical authority, a rejection of the insistence on dividing the world into male and female (see Johnston 2005; Preves 2005: 144ff.). Secondly, echoing the agenda of much feminist health geography to authorize the voices and experiences of patients themselves (see Sherwin 1992; Dyck 1999b), Jim Sinclair could hardly be described as the compliant subject whose acquiescence to medical authority is complete and uncritical. The vacuum left by the mocking of the voice of "The Experts" is filled by an openly and proudly antagonistic stance – one that self-consciously claims the position of neuter as an alternative to the ability of power to name and to norm. Thirdly, this claim to existence outside of what medical authority imagines as possible – "if you don't want to be female you must want to be male" – is linked both to an embrace of a phenotypical freakery (see Garland-Thomson 1994; Grosz 1994) and to a refiguring of language that challenges the easy conflation of cultural performances of gender with the materiality of the body itself, one of the principal aims of queer theory (e.g. Butler 1993; Jagose 1997; Brown and Knopp 2003). Thus the autobiographical "I" in this story shifts from one which power acts upon (from psycho- and hormone-therapy to the installation of a sock phallus) to one that acts by fending off the physicians' scalpel. The claim to a proud neuterdom is one that links a profound act of the resignification of the subject to the deconstruction of socio-biomedical norms about sex and gender. Finally, as the story was written as an introduction to the Intersex Society of North America, an organization which lobbies for a change in medical treatment of intersex children, it also joins this politics of resignification, subjective experience, and the claiming of voice to call for a radical shift in socio-medical ontology itself (in this instance the dichotomous construction of biological sex and the role of medical experts in policing the boundaries of gender, see Dreger (1998), Fausto-Sterling (2000), and Mol (2002)). The story of Jim Sinclair charges the medical gaze with its centrality to the regulation of normative regimes of gender and the production of normatively sexed bodies. At the same time, however, the narrative of Jim Sinclair's embodiment indexes the failure of medicine to fully interpolate the properly gendered and sexed subject it desires. In this way, Jim Sinclair's brief autobiography provides productive insight into fundamental questions raised by feminist and queer health activism: these include the role of biomedicine in constructing gender and sex norms, the embodied challenge to medical authority by those who are subject to its intensive gaze, and finally a broader set of socio-political transformations surrounding the body, health, health care, and the position of those so-called "patients" who have been the primary objects of medical intervention (see Miles 1991; Sherwin 1992; Oakley 1993; Bennett, T. 2000; Bondi & Burman 2001; Morgan 2002).

In the three following sections we reflect on how health geography has taken up some of these issues. In the first section, "The sex/gender distinction," we outline some of the implications of the primary feminist insistence on a distinction between biological sex and social gender. Echoing the call of health geography to move beyond strict biomedical models of health, feminist health studies has provided an emphasis on the social position of women in the distribution of health outcomes. For many feminist health activists this has necessitated drawing attention to the gendering of the spaces of care where the construction of normative gender regimes unevenly divide the work of caring for the elderly and sick (Doyal 1995, 2000; England 2000). More recently, feminist and queer theory increasingly informed by ideas from post-structuralism has begun to question this strict distinction between biological sex and social gender. The second section on "Gender and embodiment," therefore, discusses a new-found focus on the body and embodiment by drawing on work on the women's chronically ill bodies that connects constitutive material and discursive processes in such a way that has begun to productively challenge normative constructions of illness and health. The final section, "Concluding thoughts: medicine, the body, and the politics of sex and gender," returns to the question of intersexuality to suggest that the spaces of the intersexed body offer one avenue whereby health geography might further this engagement with post-structural gender and queer theories and their concern with the deconstruction of binaries. We are keen, in this final section, to argue that the challenge of feminist and queer theory for health geography is not so much to move beyond the spaces of the medical but to critically interrogate medicine as an especially dense site where knowledge and power both coalesce and collide. But first we want to make some brief comment about (the English) language.

In the foregoing paragraphs we have taken some care not to use the gendering pronouns "he" or "she" nor have we employed the terms "s/he" or "h/er," as popularized by Anne Fausto-Sterling (2000). In the first instance, "he" and "she" as third-person singular pronouns already mark one as interpolated into a highly gendered social (see Butler 1990, 1993). Meanwhile, the grammatically "correct" signifier "it," while refreshingly neutered, performs at the same time something of desubjectification. "It" produces the intersexed person as a strange object, a thing devoid of humanity that is to be studied, catalogued, and displayed rather than a subject with a history, desire, and voice. Finally, in our view the terms "s/he" and "h/er" still maintains a vestige of a kind of polar purity, a spectrum where the ideals of the masculine and the feminine, male and female are maintained as the coordinates that territorialize meaning onto the body of Jim Sinclair. Sinclair's autobiography is explicit in its call for the irrelevance of the divisions between male/female to Jim Sinclair's identity.

We hope that the anxious, clumsy and disjointed language of our retelling of this autobiography, which is at least in part due to our insistence on the constant repetition of the proper noun "Jim Sinclair," will serve as an index of the discomfort and symbolic impropriety – or perhaps more accurately the fecund material queerness – of the intersexed body. Moreover, we have purposefully included extensive extracts of Jim Sinclair's own words for two reasons. First, we feel that Sinclair's "I" does important political work in insisting on a speaking subject beyond the categories through which the subject as such is imagined. Or, to put it another way, Jim Sinclair's insistence on a neutered "I" makes visible that which Sinclair's physicians imagine impossible. Secondly, cyberspace is increasingly recognized as an important space for the formation and expression of dissident, or counter-public, identities (Kitchin 1998; Dicks et al. 2005). Web-sites, however, are non-physical texts and so issues about their temporality and circulation are not easily settled (see Warner 2002: 97–8); there is no guarantee, for example, that a website will not be removed or that is its content will not be edited over time. While this inclusion of unedited passages from the text Jim Sinclair placed on the website does not remove us from the politics of authoring and editorship it does at least provide something of a sense of tone of Sinclair's "self-introduction."

The Sex/Gender Distinction

Often drawing selectively on the theories of Robert Stoller (1968), a UCLA psychiatrist whose psychoanalytic-cum-ethnographic work was with transsexuals seeking sex reassignment surgery, feminism of the 1960s and 1970s revolved around the move to separate sex from gender (or the biological from the social, see Nicholson 1995). Stoller's work with those whose physical appearance did not match their identity or understandings of self led him to propose an analytical separation of the physical body from an individual's professed gender identity, theorizing the later as culturally acquired artefact or what he was to come to call one's "gender core." Stoller's insistence on this separation quickly became central to much feminist scholarship and activism. *Sex* was usually understood as a kind of foundational materiality, the stuff of biology and as such related to the physiological workings of the body. *Sex* named the organs of the reproductive system, its hormones, and their chromosomal underpinnings. Gender, on the other hand, was usually theorized as the socio-cultural context through which sex differences were made both to mean and to matter. *Gender* was the system whereby different obligations, expectations, opportunities, and outcomes are distributed between boys and girls and between men and women. If *sex* is flesh, *gender* renders flesh meaningful by encoding the body and attributing to it social and cultural significance. Thus for Linda Nicholson (1995: 40–1) " 'gender' was introduced as a concept to supplement 'sex,' not to replace it … 'sex' [remained] essential in elaborating the very meaning of 'gender.' "

The separation of a biologically founded sex from a socio-culturally constructed gender allowed for the exploration of the differences *and* commonalities between women (and more recently men); moreover, this distinction enabled, as Iris Marion Young (2005: 103) suggests, a "challenging [of] the conviction that "biology is destiny"… In order to argue for wider opportunities for women, we needed ways to conceptualize capacities and dispositions of members of both sexes that distanced behavior, temperament, and achievement from biological or natural explanations." As Nicholson continues, this distancing from the body did not deconstruct the body but bracketed it as given, taken-for-granted, and fixed even while the gendered meanings ascribed to bodies were radically being challenged by feminists. The body thus emerged as something of a theoretical "coat-rack" onto which different societies imposed norms. While the expression of femininity and consequently masculinity might differ within and between various social formations, and indeed may be mutable over time and space, there nonetheless remained a biological commonality that helped to constitute the category women vis-à-vis men.

This sex/gender distinction therefore allowed for difference "in physique and reproductive function [between men and women], while denying that these differences have any relevance to the opportunities members of the sexes should have" (Young 2005: 103). Thus, understanding of a biological foundation for sex, on which socio-cultural structures of gender are erected, became essential to the formation of some versions of an explicitly feminist politics as it allowed both for the constitution of a political identity of women and for the challenging of the conditions to which bodies thusly constituted were subjected. As Bondi and Davidson (2003) note, within this understanding of gender as separate from yet remaining an elaboration on a foundational sex, the political project of feminism conformed to a liberal tradition that emphasized equality of women over their differences. Thus, questions of race, sexuality, age, (dis)ability, were often glossed over in favor of a collective feminist identity of woman (Brown 1995).

Understood in this way, second-wave feminist politics had been about the denaturalizing of hegemonic gender constructs that systematically privileged men over women. Significantly for geography and other social sciences this included an extended focus on the construction of geographic knowledge itself (Rose 1993). In the early 1980s, for example, the book *Geography and Gender* by the Women and Geography Study Group (1984) of the Institute of British Geographers insisted that an ostensibly gender neutral geography had in effect been a geography of men. Writing in the now defunct activist journal *Contemporary Issues in Geography Education*, Pearson (1989) extended this focus complaining that medical geography was not only genderless but color-blind, implicitly making it both masculine and white. But for such activist scholars "[m]aking women visible is simply not enough" (Women and Geography Study Group 1984: 20). The chapters collected in the *Geography and Gender* book made an explicit argument for gender as an important dimension in understanding processes of socio-spatial differentiation:

> What we argue for in this book is not, therefore, an increase in the number of studies of women *per se* in geography, but an entirely different approach to geography as a whole. Consequently we consider that the implications of *gender* in the study of geography are at least as important as the implications of any other social or economic factor which transforms society and space. We use the term "gender" to refer to *socially created* distinctions between femininity and masculinity, while the term "sex" is used to refer to the biological differences between men and women. Hence, we are concerned to introduce the idea of *feminist geography* – a geography which explicitly takes into account the socially created gender structure of society; and in which a commitment both towards the alleviation of gender inequality in the short term and towards its removal [long-term]. (p. 20)

Feminist geography therefore explicitly linked the project of social transformation to the epistemological project of reinventing academic geography – this was not "neutral" and "objective" science but rather a plea for a committed political activism premised upon an understanding of gender as socially constructed and therefore mutable. This separation of biological sex from social gender was to have a profound impact on feminist studies of health more generally. While "in biomedical theory and practice, the analysis of maleness and femaleness usually starts (and usually ends) with sex differences in reproductive systems" (Doyal 2005: 429) those working in a feminist framework shifted the emphasis away from the biological foundation of sex-specific conditions, and from the biological foundation of pathogens and other degenerative disease, and instead focused on the fault lines of gender and other socially constructed inequalities along which these conditions diffuse.

One area where those working in a feminist framework have been particularly active is the linking of the relationship between health and economic inequality. Doyal (1995, 2000, 2005), for instance, notes a general global pattern where women usually out-live men but their health status throughout the life course is usually lower. Like most feminist researchers while Doyal acknowledges the biological foundations of the diseases that afflict men and women differ she argues that the ubiquity of women's negative health outcomes is often the result of patriarchal structures shaping a capitalist political economy that deny women equal access to resources for sustained health. For Doyal the prioritizing of men and masculinity structures differential access to health care professionals, unequal access to food, shelter, and other resources, and ensures a system that privileges research and treatment of male specific conditions over those associated with women. Likewise, Jaggar (2002) and the influential Harvard Working Group on New and Resurgent Diseases (2001) link the rise in neo-liberal globalization to the declining health status of many women as a result of the increasing feminization of poverty and the gendered implications of structural adjustment policies arising from the debt burden in the so-called global south. Glassman (2001) provides an example of this trend and shows how the new economic geographies of globalization have led to an increasingly industrialized and export oriented economy in Thailand. For Glassman, these shifts in Thai economic structures have resulted in an increasing feminization of the labor force by drawing on and re-inscribing gendered ideologies that construct Thai women as compliant workers. As a consequence of these shifts to a feminized industrial labor base there has also been a shift in the major determinates of mortality from "traditional" causes of infectious disease toward so-called "modern" causes like workplace accidents. As early as 1996, and as a result of this feminization of the Thai economy, more Thai women died in workplace accidents than from HIV/AIDS. It is the way these global economic forces have intersected with gender ideologies, rather than globalizations intersection with the physiology of women's bodies, that has resulted in this disastrous health outcome for Thai women. Meanwhile, health geographers and others have highlighted that changes in familial and labor structures associated with the rise of post-industrial economies in the global north have disproportionately impacted on women's health, especially in the areas of chronic fatigue and stress. A common theme in this literature emphasizes that many women now work "two jobs" struggling in low waged paid employment and with the traditionally gendered and unpaid chores of domestic reproduction (Miles 1991; England 2000; Milligan 2003; Dyck et al. 2005). In this way feminist health studies have stressed the need to understand the way gender influences both the structuring of economic inequality and the profoundly gendered impacts this has on health outcomes.

While these studies have examined the roles played by gender in distributing health inequalities between men and women other scholars have shown how gender is central to the restructuring of the health care system itself. Geographers in particular have examined a shift in the space of health care provision as a result of the emergence of neo-liberal social policy away from the spaces of the clinic and hospital and onto the community and the home (e.g. Kearns & Joseph 1997; Barnett 2000; Milligan 2000, 2003; Wiles 2003). While the focus on the gendering of the division between a normatively masculine public and a feminized private has been central to much feminist scholarship and activism (e.g. Pateman 1988), feminist health studies have shown that the restructuring of health care provision both draws on and helps to re-inscribe gendered divisions between public and private (or between public-hospital and private-home). For example, discussing the marketized reforms to mental health provision in the United Kingdom, Bondi and Burman (2001) note a dual trend that leads to toward both the "professionalization" of previously lay roles, such as counseling, and to the shifting of care work away from the professional arena. They demonstrate that increasing state regulation and the emergence of new professions in mental health care has led to a deepening of exclusion of women who are under represented in professional ranks. At the same time, however, they argue that the exclusion of women from professional roles is matched by a simultaneous pushing of care work onto the shadow-state organizations associated with "the community" in which women assume many of the low status and precarious jobs (see also Pinch 1996; Bondi 2004; Milligan 2007). Alison Williams (2001) suggests that this experience is not unique to the United Kingdom and provides evidence from Northern Ontario to argue that the ongoing economic restructuring of welfare provision in Canada is premised on an assumption "that women will pick up the slack and intensify their paid work and unpaid caring duties" (p. 122). This assumption is realized in an overwhelmingly feminized and devalued work force of Practical Nurses and Home Support Workers that provides the essential labor to shift health care provision from the formal spaces of the hospital to the domestic spaces of the home.

In a similar vein Brown and Colton (2001) analyze the shift in the geography of hospice care and the place of death in Washington State, arguing that a move away from formal institutional spaces of death toward the home is one that emerges from the complex interplay of changes in state welfare provision, the activism of patients rights groups, and the gendering of domestic space. They show that the blurring of the boundaries between hospice and home potentially obscures the labor (usually of women) in the care of the elderly and sick but also disrupts the public/private boundary such that the home may be better described as what Christine Milligan (2003) calls an institutionalized private space (see Twigg 1999; Brown 2003). While Brown and Colton demonstrate how the home has been "hospitalized" through the surveillance of hospice workers in the home and the reorganization of the spaces of the home to accommodate the trend toward home death, Maria Fannin (2003) draws attention to the emergence of "home-like" hospital space where the institutional nature of the hospital is veiled behind the trappings of domesticity. Building on earlier work examining the shift toward home-birth (e.g. Abel & Kearns 1991), a movement that initially emerged as a rejection of increasing medical control over women's fertility, Fannin argues that capital restructuring and gendered ideologies about the domestic come together to produce the birthing suite as "a home away from home" for wealthy Americans with private health care insurance: replete with hardwood floors, colorful bedspreads, whirlpool baths, and gourmet postpartum picnic baskets these new homelike spaces of the hospital draw on powerful norms about class and gender and their centrality to the American fetish of heteronormative domesticity.

While many of these authors differ in their methodological and substantive focuses they nonetheless draw upon a common feminist insistence on gender as a primary structuring force to show how gender intersects with processes of economic change and powerful ideas about the roles of men and women to produce complex landscapes of gendered health outcomes and health-care provision. In this way, the early feminist distinction between biological sex and social gender has allowed feminist health geography to contribute toward the more general shift away from a strictly biomedical understanding of health. Increasingly, however, feminist geography has taken up ideas from post-structural theory and has begun to question this separation of the social from the physical. In part this reconsideration arises because the separation of sex from gender has often resulted in a bracketing of the body that has allowed the rich differences of our bodies to be essentialized or at the very least under theorized (Longhurst 2000). The concern that an overwhelming focus on the social production of gender has marginalized both the physicality of the body and a fuller consideration of embodied sex itself is now indexed in the ubiquitous calls to "bring the body back in."

Gender, Sex, and Embodiment

One of the key outcomes of the increasing integration of feminist and queer theory in health geography has been a proliferation of work concerned with spaces beyond those of the microscope and clinic. Indeed, it is a renewed interest in the space of the body that has occupied most of the energies of feminist health geographers of the past decade. In their review of the impact of what Kirsten Simonsen (2000) calls the "body fixation" in contemporary cultural geography, Moss and Dyck (2003, see also Parr 2002) document a move away from understandings of "the body" as a surface of inscription and as a simple site on which social forces play themselves out, what they call a geography of *the body*, and instead argue for the significance of *embodiment*. For Moss and Dyck the distinction between the body and embodiment is drawn largely along a refusal to separate bodies from their constitutive material and discursive processes:

> embodiment is used to denote constituent aspects of the body, including identity, power and the materiality of the body itself. We conceive the body as a material entity that is complexly constitutive of bodily notions, ideas and inscriptions. We think of embodiment as lived spaces where bodies are location corporeally and conceptually, concretely and metaphorically, materially and discursively. This means *being* simultaneously part of material forms, their social constructs and the materialization of their constitutive interaction. (Moss & Dyck 2003: 60)

To put this another way, while the body might be mapped as a fixed object of knowledge (and placed in categories that make the men different from the women, the healthy different from the sick etc.) such static categorizations elide the complexities of how *bodies* (plural and differentiated) experience their worlds and the processes through which such categories come into existence in the first place. Thus, the focus on embodiment makes an important intervention into feminist and queer health geographies in at least two principal ways: firstly, a focus on embodiment argues for the complexity of lived experience as simultaneously material and discursive; secondly, this insistence on the inseparability of the material and the discursive not only reworks the early feminist division between sex and gender but challenges us to focus on the processes of the construction of both bodies and genders. This challenge has been taken up most productively in literature on disability and chronic illness, as discussed below. This focus is not to discount other work centring the body in analysis that shows the complex relationships among biomedically grounded interpretations of health and bodies, social and cultural understandings of normal or ideal bodies, and bodily experience as played out in the spaces of everyday life (see, for example, Davidson 2000; Litva et al. 2001; Underhill-Sem 2001), but the problematization of disability and chronic illness categories serves our purpose here particularly well.

Just as Jim Sinclair's body threatens the universalist claims of liberal regimes of heteronormativity that insists on dividing us into male and female, so the chronically ill body challenges the healthy/ill binary underpinning biomedical interpretations of the body's corporeality – specifically through the concept of embodiment. Attention to the body in health geography has been pursued primarily in relation to disability research, with the body as a theoretical site and scale of analysis in work committed to a transformative politics (see Chouinard 1997; Crooks & Chouinard 2006; Imrie & Edwards 2007). In the specific context of geographies of disability, Ed Hall (2000: 22) commented on "the disembodied nature of much social theory of health and impairment" and called for the inclusion of the "physicality" of the body (and its complex interweaving with social processes) in a geography of disability that had neglected the messy corporeality of the body. This appeal signalled the tension between the material body and the representational/discursive body in thinking through the construction of disability experience. The politics associated with the conceptualization of the body (or its lack of) in disability work had earlier been recognized in Dorn and Laws' (1994) response to Robin Kearns' (1993) influential statement on forging a way to de-lexicalize geography through the centring of place and utilizing social theory in constructing understandings of geographies of health. Dorn and Law saw inclusion of the medical inscription of the body, as well as taking into account its materiality, crucial to a body politics that recognized the power relations inherent in the constitution of disability. Yet, working with both the body's materiality and its representation has proved to be difficult, without privileging one or the other. Hall suggested the biology of the body needed reinterpretation so that the body's fleshy corporeality could be integrated into analysis, without falling into the trap of biological essentialism. In this quest he refers to the contribution of feminist scholarship and sociological work on masculinities to understanding how "social and cultural processes … become real and fleshy in the body" (p. 26). It is the power dimension of such processes that is of particular interest here.

In health geography it is feminist work, primarily through post-structuralist inspired accounts, that directly addresses the entanglement of power with embodiment. The previous section has included comment on how the queer body materially transgresses and thereby renders specific the universalist claims of biomedicine. Here we draw some parallels, focusing primarily on qualitative research work with women with chronic illness that specifically aims to take up the body and the notion of embodiment centrally in analysis (Dyck 1995, 1998, 1999b; Moss & Dyck 1996, 1999, 2001, 2002). In doing so we argue that the biomedically non-normative, chronically ill/disabled body exemplifies the exclusionary political logic of biomedicine, with its utopian vision of health at its center. Research with women with chronic illness shows that the limits of biomedical knowledge and intervention are repeatedly transgressed, with embodiment as a critical concept in a radical body politic research. The environment is integral to the notion of embodiment, as it is in the spaces of everyday life that discursive constructions of particular bodies are "triggered" (cf. Grosz 1995), reproduced and negotiated or resisted. In their reading of women"s experience of chronic illness, Moss and Dyck (2002: 62) emphasize the ontological simultaneity of discourse and materially, stating:

> embodiment is more than just being about the juncture point of a discursive and material entity; it is also about being connected – temporally and historically – to other discursive and material entities – other bodies – in concrete practices, politically, culturally, socially, and economically.

This sense of embodiment, therefore, focuses on the corporeal spaces – "living spaces of 'bodies in context' " (p. 54) – where the specificity of bodies is articulated and experienced. Empirical work with women with chronic illness such as multiple sclerosis (MS), myalgic encephalomyelitis (ME) and rheumatoid arthritis (RA) as they engage with issues of disclosure, workplace and family relations, the medical profession, and everyday negotiation of home and neighborhood spaces indicates the inadequacy of dominant categories of explanation of non-normative bodies in explaining their experience. For many of these women (but not those with severe, constant body pain or dysfunction) their chronic illness is fluid – temporally, spatially, situationally. Sometimes "ill," sometimes "healthy" they encounter various "other bodies" in the coded spaces of an environment predicated on normative constructions of health/able-ness/heterosexuality, through which their non-normative body/identity is produced and may be resisted.

Gender is a significant dimension of such embodied experience. Take for example, women diagnosed with MS who expressed fear of losing an "able" identity in terms of mothering work and maintaining the home, highly gendered activities associated with the home as a private, feminine, and domestic space (Dyck 1998). Here unsettled marital relationships are negotiated, often with a restructuring of homespace that allows the continued performance of domestic labor. The "chronically ill" body of biomedicine, one that is also open to devaluation through dominant cultural understandings of gendered activity, "becomes" and is contested through the interconnected discourses, practices, and material spaces that span the medical clinic and home. Similarly, in contestation over "ability" in the workplace biomedical discursive constructions of the body are interwoven with women's re-scripting of themselves as employable, competent workers as they reclaim access to the valued resources of paid employment (Dyck 1999a). Spatial strategies in negotiating specific workspaces to "hide" evidence of a changed corporeality or to prove competence were used to defer meanings where there were slippages around the binaries of able/disabled. Tracing "Patience's" (a composite character based on interview research with 50 women with either ME or RA) life with chronic illness, Moss and Dyck (2002) push further the possibility of radical body politic research through a sustained account and theorization of embodiment. Again, dichotomous categories are challenged as women "live" the biomedical inscription of biomedical diagnoses and re-learn their bodies, themselves, and environments through a variety of material and discursive practices in their everyday lives. They conclude that not wanting to be sick anymore for women like Patience "entails not wanting the physical sensation of pain, fatigue, forgetfulness, nausea, dizziness, and foggy thinking as well as not wanting to be inscribed by either an idealized healthy body or fleshed ill one" (Moss & Dyck 2002: 171). In these studies, a key issue is the legitimacy of the self, as a valued, able, woman, within a discursive and material context that tends to work with fixed, binary categories that socially and economically marginalizes those who are not readily classified within them.

Feminist scholars, in particular, have stressed the importance of embodied knowledge in constructing understanding of geographical and social worlds. Knowledge grounded in people's experience can produce the rich texture of a diversity of lived experience, of fluid, multiply-inscribed identities, and the fluidity of space and place. An embodied health geography, built on accounts of lived experience, provides a means of intervening in a production of knowledge based on dichotomous categories grounded in normative constructions related to health/illness; able/(dis)abled; women/men. While such narrative accounts may be emotion laden, little research has expressly brought out the emotional geographies of health and illness (but see Davidson et al. 2005 for examples of work on dying, aging, and mental health). Embodiment clearly has an emotional dimension that deserves recognition and incorporation into analysis. How emotions become represented in medical inscription, or are discounted, could be another dimension through which to examine the articulation of power through a discourse of gender. Jim Sinclair's account of Jim Sinclair's identity journey seems at first curiously unemotional in tone, yet encounters with the "medical gaze" and its practices suggest a deep assault on being and in this regard the camp irony of his response might be read as a kind of queer intervention to the representational politics of marginalization. The body as a site of gender politics is particularly vivid in the normalizing practices of medical and scientific knowledge, which coalesce around the power-laded categories informing "difference."

Concluding Thoughts: Medicine, the Body, and the Politics of Sex and Gender

We now want to briefly return to the story of Jim Sinclair. As we have already suggested Jim Sinclair's autobiography provides a critical invitation to health geographers to theorize the relationship between biomedicine, the body, and the politics of sex and gender. Jim Sinclair – like other intersex activists – is adamant that intersexuality is a social, not a medical problem. Thus, like much health geography, intersex activists are keen to demonstrate the primacy of the social over the biological foundation of their so-called *dis*-ease. Unlike much of "[t]he shift [from medical toward health geography which] has been portrayed as indicative of a distancing from concerns with disease and the interests of the medical world in favor of an increased interest in wellbeing and broader models of health and health-care" (Kearns & Moon 2002: 606, see also Kearns 1994) intersex activists have maintained the spaces of the medical world as their primary site of intervention. As many intersex activists and scholars point out, the assumption that human beings are sexually dimorphous ignores the significant variation in any of the "physical" markers that are used to construct sexual difference (see Dreger 1998; Fausto-Sterling 2000; Blackless et al. 2000). In a review of medical literature published between 1995–98, Blackless et al. (2000) note a wide variety of human sex difference ranging from chromosomal variation (i.e. not XX or XY) and hormone insensitivity, through to physical variations in the morphology of sex organs. They conclude that as many as one in every 100 births do not conform to the strict division between *normal* male and *normal* female with one or two in every thousand births receiving corrective surgery to "normalize" the child. It is the "corrective" treatment of these "abnormalities" that both reproduces and protects the assumption of a physical foundation of an absolutely dichotomous sex system:

> Our culture acknowledges a wide variety of body shapes and size characteristic of males and females. Most sexual dimorphisms involve quantitative traits, such as height, build, and voice timbre, for which considerable overlap exists for males and females … But most consider that at the level of chromosomes, hormones, and genitals, dimorphism is absolute and, by implication are discrete rather than quantitative … Developmental biology suggests that a belief in absolute sexual dimorphism is wrong. (Blackless et al. 2000: 163)

The implication is that sex itself, not just gender, is socially constructed at least insofar as those bodies that might challenge the social investment in the naturalness of two distinct sexes become the site of medical intervention. This does not mean that the body does not have a materiality that to some extent both precedes and exceeds its discursive inscription. Rather, an insistence on the constructed nature of dichotomous sex does imply that the body does not arrive already intelligible but that it is made so by the mobilization of a range of biomedical technologies, the gendering of language, and the legal and cultural conventions that attach to bodies. These cultural and biomedical technologies discipline the intersexed body into the categories through which male and female can emerge as distinct possibilities. Judith Butler (1993) is famous for arguing that sex itself is a construct of language; when the doctor, upon receiving the newborn child, exclaims "It's a girl" this statement is not a constantive utterance relaying naked fact but a performative statement that constitutes the child as a girl and ushers her, henceforth, into the performance of the subject position of girl. Fausto-Sterling (2000) suggests that the linguistic insistence on the gendering of language must often be shored up by medical intervention and that for intersexed infants the transition from birth into subjecthood is somewhat less smooth:

> A child is born in a large metropolitan hospital in the United States or Western Europe. The attending physician, realizing that the newborn's genitalia are either/or, neither/both, consults a paediatric endocrinologist (children's hormone specialist) and a surgeon. They declare a state of emergency. According to current treatment standards, there is no time to waste in quiet reflection or open-ended consultations with the parents. No time for the new parents to consult those who have preciously given birth to mixed-sex babies or to talk with adult intersexuals. Before twenty-four hours pass the child must leave the hospital "as a sex." (Fausto-Sterling 2000: 45)

Fausto-Sterling goes onto document the litany of surgical and hormonal technologies that are mobilized to realize the fantasy of dichotomous biological sex. In this account it is the space of the hospital that emerges both as a principal metaphorical site where sex is produced and as a physical site for the intervention into the flesh of the intersexed body. Similarly, Donna Haraway's masterful (1997) *Modest_Witness@Second_Millenium* provides a spatial ethnography of the birth of the modern scientific method. She argues that the emergence of the space of the laboratory was essential to the construction of the idea that science provided objective truth. Because the laboratory was a space where access could be restricted it tied the emergence of science's claims to universal objectivity to the physical exclusion of women because they were assumed incapable of transcending their fleshly bodies and thus unable to witness the universal truth the exclusionary technology of the laboratory would reveal. In both Haraway and Fausto-Sterling it was the critical interrogation of the physical spaces of the Hospitial and Laboratory that provided crucial lenses into how the physical control of sexed bodies became central to the emergence of gendered regimes of power/knowledge. In this way, critical feminist and queer health studies have not distanced themselves from the medical world – as is sometimes suggested in narratives about the emergence of health geography – but, like intersex activists, they have taken up the challenge to critically examine the socio-cultural work done, and more importantly the power relations supported, by biomedicine (see Parr 2004). As suggested above, feminist and queer geographies of embodiment provide a rich set of ideas about how to begin to think past a simple division between discourse and materiality, and therefore between sex and gender, and their insistence on powers ability to structure both bodies and spaces resonates profoundly with Sinclair's insistence on the vital necessity of carving a life outside of current socio-medical norms.

Note

1 The Intersex Society of North America was founded by intersex activists in 1993 with the goal of preventing early genital surgery on intersexed infants and young children. The society insists that the problem of intersexuality lies not in the abnormality of the individual body but in the narrow social construction of what bodies are deemed acceptable. Politically they favor social education and end to stigma – they do not oppose medical "treatment" for intersexed bodies *per se* but insist that the only proper response must rest with the free and informed choice of the intersexed themselves.

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Chapter 14

Impairment and Disability

Vera Chouinard

Introduction: Exploring Geographies of Impairment and Disability

Since the 1990s, disability and impairment have emerged as important foci of critical social and feminist geographic inquiry. Building on the social model of disability promoted by scholars such as Oliver (1990), which emphasizes how persons with impairments and illnesses are disabled by societal conditions, relations and practices based on ableism, and on embodied conceptions of how individuals negotiate being impaired and/or ill and disabled, geographers have sought to advance our understanding of experiences of being ill, impaired, and disabled and how and why those with illnesses and impairments continue to be marginalized in society and space.

It is important to recognize that conceptions of the mind and body differences that can be considered to be disabling or fall under the category of "disability" vary. For example, in the United Kingdom the mind and body differences traditionally considered to be disabilities have focused on learning/developmental impairments and those of a physical nature (e.g. functional limitations in mobility). But it is equally important to acknowledge that critical disability studies and critical geographies of disability have increasingly broadened the range of impairments and illnesses considered to have disabling and marginalizing consequences in society and space. So, for example, in the health geography literature concerned with processes of disablement there has been growing attention to the disabling consequences of living with "contested illnesses" such as fibromyalgia and chronic fatigue syndrome. Similarly, there has been growing recognition that critical geographies of disability must consider a diverse range *of mind and body differences* including the disabling consequences of negotiating society and space as a person with mental illness. Indeed, as Wolch and Philo (2000) emphasize, an important development in critical social geographies of disability has been the inclusion of mental health issues as a dimension of the experience of disability. Further, the concept of disability and disablement has been increasingly broadened to include, for example, disabling and marginalizing aspects of "fatness."

In this chapter, I explore important themes and issues in this body of inquiry and challenges in advancing our understanding of processes disabling those with physical or mental impairments and illnesses.

From Biomedical Approaches to Disability to Early Social Geographies of Mental Ill-health

Disability, understood as the embodied process of becoming disabled through experiences of physical or mental impairment or illness and the negotiation of relations and practices that value able bodies and minds at the expense of others, is a phenomenon which has traditionally received relatively little attention from geographers.

Biomedical conceptions of disability

Traditionally, a biomedical conception of disability has at least implicitly dominated the post-war medical geography literature concerned with the spatial incidence and correlates of disease, with locational analysis of the distribution and use of health care facilities and statistical description of the characteristics and spatial distribution of disabled populations (for discussion see Park, Radford & Vickers 1998; and with regard to geographies of mental ill-health Wolch and Philo 2000). This model treats disability as unproblematically synonymous with disease and physical and/or mental impairment of functional abilities (such as walking, hearing, seeing, rational thought). Further, it assumes that disability is a biomedical problem with the individual to be treated or better yet cured through the application of biomedical science. Thus in contrast to the critical social and feminist conceptions of disability which emerged in the geographic literature of the 1990s, disability is a biomedical problem rather than an embodied process of the socio-spatial marginalization and oppression of disabled people in a society which values able bodies and minds over all others.

Biomedical conceptions of disability have also dominated post-war geographic studies concerned with assessing the needs of persons with physical impairments (notably those with mobility or vision impairments). Here disability remains constructed primarily as an individual biomedical state although it is recognized that environments need to be planned to take into account the "special problems and needs" of disabled persons. Studies of needs for accessible transportation date back to as early as the late 1960s (e.g. Perle 1969; Kirby et al. 1983: Gant & Smith, 1984). In work dating back to the late 1970s, Golledge has explored the spatial cognition, spatial competence and wayfinding needs of so-called "special populations": initially focusing on the intellectually impaired and socio-economically disadvantaged and in the 1990s turning his attention to persons with visual impairments (see for example Golledge et al. 1979; Golledge 1993, 2005). Although still predominantly biomedical in its conception of disability, this work modifies this slightly by also incorporating behavioral differences into its understanding of what it is to be disabled.

Early social geographic studies of deinstitutionalization and ghettoization of the developmentally challenged and mentally ill

It is in geographic studies concerned with the socio-spatial consequences of and inequities associated with the deinstitutionalization of those with mental impairments and ill-health, however, that we see the first glimmers of social geographic approaches to disability and the opening up of possibilities for a shift toward the adoption of more social models of disability. The rise of radical geography, with its emphases on understanding the social and spatial forces working to marginalize and oppress groups previously neglected by geographers, provided an important impetus to this work. Writing in the radical geography journal *Antipode* as early as 1974, Wolpert and Wolpert (1974) forcefully drew geographers' attention to the ghettoization or spatial concentration of the developmentally challenged and mentally ill and their care facilities in poor, run-down inner city areas:

> The massive discharge of tens of thousands of mentally disabled people from state institutions in the past decade has added a new indigent group to the inner cities of our large metropolitan areas. The disabled must now compete with other welfare recipients for community based treatment, care and services. The former asylum residents, not unpredictably have become ghettoized in those sections of the city which have run down boarding houses, and seedy residential hostels, the dumping grounds for the disadvantaged and their caretakers.

Wolpert, Dear and Crawford (1975), writing on the issue of the location of satellite mental health care facilities, raised the possibility that deinstitutionalization and the spatial concentration of community mental health care facilities in lower income urban neighborhoods had effectively created an "asylum without walls." In an article which, remarkably, anticipated the use of social models of disability in geographic research, Fincher (1978), focusing on the deinstitutionalization of the so-called mildly retarded and mentally ill, argued that the construction of these populations as inherently different from the "normal" population should be seen as a social construct rather than a given biomedical fact. But it is arguably in Dear and Wolch's landmark book on homelessness *Landscapes of Despair*, (Dear & Wolch 1987) that a relatively sophisticated early critical social geography emerges. Here homelessness and the lives of persons in mental ill-health are clearly linked to the political economy of urban change in capitalist societies. While disability per se remained conceptualized primarily as a given biomedical fact the marginalization of the mentally ill was clearly formulated as a societal problem and an issue of power and relative powerlessness in capitalist societies. In this way, Dear and Wolch's *Landscapes* arguably heralded the coming of age of more radical, early social geographic accounts of forces shaping the lives, life circumstances and life spaces of one group of disabled people. In doing so, it helped point the way toward the possibility of, if not the necessity for, conceptions of disability itself as not the inevitable result of an individual biomedical condition but a product of social processes which actively disabled persons with impairments or illnesses.

Asylum studies

Complementing such efforts to develop a more critical social understanding of the marginalization of persons who differed from the mentally able in capitalist society and space were historical geographic studies of the design and use of asylums (both for persons with mental illness and for the intellectually disabled). These studies probed the extent to which asylums were built environments and spaces of life which had disabling or enabling consequences for the persons segregated within them; for example, the extent to which asylums for the mentally ill were experienced as "home" or places of healing or as places of isolation and subjection to oppressive institutional authority or control (see Philo 1987, 1989; see also Philo 1997, for a review of geographic studies concerned with asylums and other mental health facilities).

Radford (1991) explored the ways in which wider social constructions of the intellectually disabled as socially and morally dangerous and, reflecting the concerns of the eugenics movement, as needing to have their sexual activity and reproduction controlled so as to prevent the perpetuation of "feeble-mindedness" in the human race, encouraged segregation within institutional settings and even sterilization initiatives. Further, he focused on the ways in which such constructions shaped the spatial design and operation of nineteenth and twentieth century asylums for the intellectually disabled in Britain, the United States and Canada (e.g. building of separate wards for women and men and their strict separation within the grounds of asylums and associated agricultural colonies) (see also Radford & Park 1993). More recently Park and Radford (1999), in a fascinating historical geographic study of asylums for the "feeble minded" or intellectually disabled in Canada from the mid-nineteenth century to the 1970s, discussed some of the ways in which persons with intellectually impairment were constructed as disabled and a costly burden on society as well as a danger in terms of sexual and immoral behaviors (including reproducing mentally defective children and engaging in criminal activities). Asylum and post-asylum geographies of mental ill-health would continue to be a focus of inquiry in the 1990s and early twenty-first century (Park & Radford 1997; Wolch & Philo 2000; Dear 2000). Unfortunately, until recently, less attention was paid to the post-asylum geographies of persons with intellectual disability (but see for example the 2005 collection edited by Philo and Metzel in *Health & Place*).

Critical Social and Feminist Geographies of Illness, Impairment, and Disablement: 1990s and Early Twenty-first Century

It was during the 1990s that a concerted move was made toward more critical social and feminist geographies of illness, impairment, and processes of disablement in society and space. Inspired by the disability rights movement, the social model of disability being championed by such disability scholars as Oliver (1990) and to a lesser extent the work of feminist disability scholars such as Morris (1991), and building at least in part on the legacies of early critical social geographies of forces shaping the lives of persons with mental ill-health, geographers began to explore in more detail how the social relations, practices and organization of society and space contributed to the marginalization and disablement of those with illnesses and impairments. This was a decisive break from traditional medical models of disability which treated disability as the inevitable outcome of the individual mind or body functioning "abnormally" and as something to be medically treated or cured so as to render the individual as "normal as possible." It also marked a new "wave" in geographic research concerned with impairment, illness, and disability – one aimed at critiquing and challenging our understanding of what it means to be ill, impaired, and disabled and the socio-spatial processes through which people become disabled in society and space. And, importantly, it signalled a growing interest in the struggles of the physically disabled for inclusion in society and space as well as in academic geography (Anderson 2001).

From the early to mid-1990s a handful of geographers were striving to flesh out a critical geographic alternative to biomedical and behavioral models of disability. Imrie and Wells (1993) and Imrie (1996b), writing on how and why urban built environments were designed and developed in ways that dis-abled those with physical impairments, used the term "disablism" (and ableism) to describe prejudicial attitudes and oppressive practices which rendered these environments inaccessible. Imrie (1996b) and Gleeson (1996) wrote at some length about what differentiated critical social from other perspectives on disability (particularly Golledge's behavioral perspective), with Gleeson advocating a Marxist historical materialist approach (see also Gleeson 1999). Dyck (1995) developed a critical framework focusing on socio-spatial forces shaping the lifeworlds of women with chronic illnesses. Chouinard and Grant (1995) drew attention to ableist forms of oppression and exclusion in radical and feminist geography and in academic settings (ableism being defined as relations, attitudes and practices that presume able-bodiedness and value able lives over others) and called for greater attention to the socio-spatial exclusions and oppressions experienced by disabled women.

Reflecting growing interest in cultural aspects of experiences of disablement and more generally the cultural turn in the discipline, geographers increasingly turned their attention to questions of identity formation and difference (see Wolch and Philo 2000, for a discussion of this in relation to work in mental health geography). A 1997 special issue of *Environment & Planning D* (edited by Chouinard & Cormode) included efforts to ensure that issues of mental ill-health were on the new critical social geographic agenda (Parr 1997), explorations of disabled people's experiences of public space as involving reflexive relationships between bodily and social experience (Butler & Bowlby 1997), and an exploration of the social construction of difference in the cases of groups with different types of impairments and illnesses (Dear et al. 1997). As Wolch and Philo (2000) point out, an important development in this and subsequent collections (notably Butler & Parr 1999 discussed below) was a recognition that critical disability studies in geography was concerned with disabling differences in *both bodies and minds* – ending what they characterize as an earlier isolation between geographies of mental health and those concerned with physical impairment and illness. Recognition that critical geographies of disability were concerned with differences in minds as well as bodies would also encourage greater attention to the socio-spatial forces shaping the lives of persons with intellectual disability (e.g. Philo & Metzel 2005).

By the late 1990s a small but significant body of critical social and feminist geographic literatures on illness, impairment, and disability was emerging (e.g. Butler & Bowlby 1997; Moss 1997; Parr 1997; Butler 1998; Dyck 1998; Imrie 1998; Kitchin 1998; Chouinard 1999a; Gleeson 1999; Wilton 1999). Much of this work was captured in a 1999 collection edited by Ruth Butler and Hester Parr entitled *Mind and Body Spaces: geographies of illness, impairment and disability*. Here geographers explored such topics as the role of the abstract able body in the architectural design and thinking of Corbusier, moral constructions of intemperance or alcohol abuse in the nineteenth-century US Midwest, rhetorics informing the regulation of the mentally "deficient" in asylums, technologically deterministic notions of how urban environments can be made less disabling and more inclusive for persons with impairments, women's negotiations of disabled identities in workplaces, the need for more embodied conceptions of ill and impaired persons' experiences including of employment and the labor process, the role of working-class constructions of masculinity in shaping experiences of impairment and disability, and barriers to disabled women's activism. Although theoretically and methodologically diverse, what informed all of this work was a commitment to understanding disability as an embodied, socially and spatially constructed, and hence contestable, phenomenon.

The early twenty-first century has seen critical social and feminist geographers build on this geographic literature in exciting ways. Work on post-asylum geographies of deinstitutionalization and the restructuring of the provision of health and care/support services has provided important insights into what "community care" actually means for those coping with mental illness and trying to access mental health care services as well as affordable housing in areas such as the inner city (e.g. Kearns & Joseph 2000 and see also other articles in the special issue of *Health & Place* in which this article is located). Closer connections have been forged between medical/health geography and geographies of disability; reflecting, in part, shared concerns to critically engage with the role of medical knowledge and discourse in inscribing and placing different corporealities (see Parr 2002, for a commentary) and recognition of the relevance of geographic studies concerned with disability for health geography (e.g. Pearce 2003).

Geographers have delved further into how and why barriered and bounded places for disabled people persist in urban areas (Imrie 2001) – encouraging greater attention to processes of disablement in urban studies. Sibley (2001) explores the reasons for the persistence of binary thinking in urban life and argues for a psychoanalytic approach to understanding how the self comes to be bounded in relation to threatening others (such as the disabled):

> we have to take seriously the propositions of psychoanalysis in relation to the vaguely defined "Western self." Most important is the notion of splitting, between good and bad, pure and defiled, in the formation of the boundaries of the self.

Gleeson (2001) considers how and why disabled people remain subject to an institutional and environmental "apartheid" in cities; arguing for the need to disrupt a regime of urban development in which "the modern city secures the needs of productive bodies, leaving the rest exposed to social and environmental risk" (e.g. disabled people's exclusion from the workforce and associated poverty, exclusion from much of public and neighborhood space). Barriers to disabled people's involvement in decisions about urban regeneration projects (Edwards 2001) and the constraints on disabled people's movement and inclusion in urban areas associated with inadequate provision of accessible public toilets (Kitchin & Law 2001) have also been explored. Imrie and Hall (2001) examine the responses of the development industry to disabled people's access needs arguing that although disabled people's needs tend to be poorly understood by developers that there is also a need to advance our understanding of how and why some developers are more willing to address access needs than others.

Such efforts to advance our understanding of processes of disablement have included the use of a wider range of theories and concepts. Imrie (2001), for example, uses the concept of "dysappearing" bodies to capture how experiences of barriered and bounded spaces in cities force disabled bodies to be absent from certain places but, in doing so, make disabled people more acutely aware of their embodiment as "other." Allen (2004) argues for theoretical frameworks that can help to account for the role of different class and geographic locations in disabled people's negotiations of the impaired body and its environment and uses the concepts of "privileged" and "deprived" habitus (i.e. put simply these are routinized ways of negotiating and placing oneself in the world) to explain why middle-class visually impaired children's ways of negotiating their environments are more expansive and "normalized" than those of children with visual impairments from low income working-class families and neighborhoods.

The early twenty-first century has also seen geographers grapple in more detail with questions of ethics and empowerment in research on disability issues (see Valentine 2003 for a brief review). Chouinard (2000) argued that the involvement of disabled people in all stages of the production and use of knowledge about their lives was vital to ensuring that research was both ethical and empowering. Gleeson (2000) proposed "enabling geographies" as a political-ethical ideal to guide geographic studies of disability – an ideal realized in practice not only through emancipatory research strategies but also through a commitment to creating more just and less disabling academic environments. Kitchin (2000) reports on a study of disabled people's experiences of research which lends support to the importance of inclusivity and empowerment in research designs. Others have considered some of the challenges in practice of realizing such ideals in relation to specific research projects. Metzel (2000), for example, raised the dilemmas associated with conducting research concerned with the lives of disabled people who are unable to give informed consent.

Broadening the range of mind and body differences considered in geographies of disablement

Concerns with the differences in minds, bodies, and experiences of embodiment have helped to encourage geographers to explore the disabling socio-spatial consequences of a wider range of mind and body differences in recent years. This work has included studies concerned with how biomedical knowledge and discourse helps to construct obese bodies as ill and unfit (Evans 2006), experiences of agoraphobic anxiety and their implications for bodily boundaries and socio-spatial constructions of safe and unsafe spaces (Davidson 2000), spatial practices associated with obsessive-compulsive disorder (Segrott & Doel 2004), identity formation amongst D/deaf youth (Skelton & Valentine 2003), and socio-spatial experiences of dwarfism (Kruse 2007). Such work raises intriguing questions about the meaning, limits, and contested nature of "disability."

Increasing attention has been paid to forces shaping the lives and life spaces of intellectually disabled persons – critiquing geographers' long-standing preoccupation with issues affecting the mentally ill (Hall & Kearns 2001). Recent studies have included examination of how processes of self-exclusion and discrimination/abuse limit the social inclusion and life spaces of persons with learning disabilities (Hall 2004) and of the extent to which segregated or ostensibly inclusive spaces provide a sense of belonging and being valued (Hall 2005), historical accounts of the development of segregationist ways of dealing with intellectually disabled people (Richards 2004), and considering the extent to which certain voluntary organizations may perpetuate dependency and limit intellectually disabled people's ability to make independent choices, for example about where to live (Metzel 2005; see also Philo & Metzel 2005 for a brief discussion of work on intellectual disability in geography and an introduction to the special 2005 issue of *Health & Place* focusing on geographies of intellectual disability). Also noteworthy are Holt's efforts (e.g. Holt 2003) to assess the extent to which educational policy emphasizing the inclusion of children with special education needs are translating into inclusionary and supportive learning environments.

Geographers have also begun to explore the implications of neo-liberal restructuring of the economy and state for disabled people. Wilton and Schuer (2006) for example note the increasing emphasis in neo-liberal state policy on employment of persons with impairments and illnesses as a means of social inclusion and in this context explore the attitudes of employers toward hiring and accommodating disabled workers. Chouinard and Crooks (2005) examine neo-liberal restructuring of income and employment assistance to disabled individuals in Ontario, Canada, and the impacts administrative and program changes have had on disabled women's experiences of receiving support through the state. They argue that disabled women are caught up in an increasingly punitive system which constructs them as negatively "other" than the ideal able and employed neo-liberal citizen. Chouinard (2006) explores what she terms the "dialectics of differencing" in disabled women's relations with the neo-liberal state – processes which are placing disabled women in increasingly precarious, vulnerable economic and housing situations.

It is clear that the research agendas being pursued by geographers concerned with disability and impairment have broadened considerably since the late 1990s. And new topics continue to be addressed, for example, challenges in finding ways to include disability issues in school curricula (e.g Treby et al. 2006). The geography of illness, impairment, and disability has clearly emerged as a vibrant and important area of inquiry in the discipline. Nonetheless, there remain important challenges in building on this body of scholarship and it is to these that the discussion now turns.

Moving Ahead: Challenges in Mapping out Ableness and Struggles over Disabling Relations and Practices

What are some of the key challenges in further advancing our geographic understanding of impairment, illness and disability?

Understanding ableness

An important one is developing a better understanding of ableness as a complex and dynamic set of lived, discursive, and spatial relations and practices. In what ways, for example, do neo-liberal social policies help to perpetuate able ideals of citizenship and ways of engaging with state relations and practices guided by able norms? To what extent do such processes encourage disabled people to struggle to embody an able identity and are such struggles geographically uneven and why? Should struggles to embody and retain a sense of being "able" despite impairment or illness be seen as a progressive form of resistance to disablement or a regressive form of denial or perhaps both and what are the implications for disabled persons lives, life spaces, identities, and politics?

Cultural constructions of disabled people

Another important and related challenge is that of delving further into the cultural images, relations, and practices which work to disable those with an impairment or illness. Geographers have yet, for example, to examine in any detail cultural constructions of people with different illnesses and impairments in media such as contemporary television or film (although see Kruse 2007 and Chouinard 2009 respectively). To what extent do these influential representations of persons with impairments or illness continue to construct them as negatively "Other" than the able-bodied norm; as "out of place" in so-called normal spaces of everyday life and at least some times as belonging in segregated spaces? How are disabled people resisting such culturally constructed messages about their lives through alternative representations of themselves and their places in the world conveyed for example through the internet? To what extent are such representations changing ways of relating to disabled people in, for instance, places of work?

Processes of socio-spatial differencing shaping disabled people's lives

There also remains much scope to further advance our understanding of the role of complex, intersecting processes of differencing in shaping disabled people's lives and everyday geographies. Feminist geographers, in particular, have begun to explore how differences such as class, gender, and sexuality help to shape where and how persons with different impairments and illnesses are placed in the world as well as the barriers to inclusion and wellbeing with which they must deal (e.g. Butler 1999; Chouinard 1999b, 2006; Valentine 1999). But we still know relatively little about how other differences such as race and age shape how people are disabled in society and space.

Looking globally

Coming to grips with how disabled people are multiply differenced also requires that we recognize that the vast majority of geographic research concerned with illness, impairment, and disability has been based in western countries of the affluent North. This not only contributes to an unfortunate silence in the literature, it also means that geographers are failing to engage with the perspectives and struggles of disabled women, men, and children in the global south. Such engagement would not only contribute to a more global understanding of disability issues, it would also provide critical opportunities to work in solidarity with those working to challenge processes of disablement in the developing world.

Persistent socio-spatial marginalization

We also have much more to learn about why the suffering and socio-spatial marginalization of so many disabled people persists throughout the world. What, for example, continues to ensure that below poverty level rates of state income assistance to disabled people are accepted or at least not contested by the able majority – even in relatively affluent nations? How can this situation be challenged?

Impacts of health care and social support restructuring on disabled people's lives

There also remains a need to learn more about how disabled people's lives, identities, and places within community life are being reshaped by the restructuring of health care delivery and social supports in different localities. As Knowles' (2005) study of the impacts of these restructuring processes on the lives of those with mental ill-health in Montreal suggests, the shift to "community-based" care has left many with inadequate care and support – leaving them to find their own, geographically complex, and transient modes of survival (e.g. drifting between coffee shops and malls during the day). How are such conditions shaping disabled people's identities, hopes for the future, senses of where they do and don't belong, and capacities to struggle for greater inclusion – for example in terms of greater access to health care?

Questioning the limits or boundaries of "disability"

As noted above, the broadening of geographies of disability to include a wider range of mind and body differences raises intriguing questions about the nature and limits of "disability." To what extent, for example, should obesity be considered a "disability" as opposed to, say, a difference in body type? How do obese people's experiences in everyday spaces influence their identification (or not) with the label "disabled"? What, if any, political or moral consequences stem from embracing or rejecting a disabled identity? And is there a point at which defining "disability" too broadly makes it lose its analytical or explanatory edge as well as its potential as a bases for political action?

Developing more enabling and empowering approaches

Perhaps one of the most difficult but also pressing challenges is to develop approaches to doing geographic research on illness, disability, and impairment that are truly enabling and empowering to diverse disabled people. It is not enough, as some authors have stressed (e.g. Chouinard 2000), to simply "give voice" to the experiences and struggles of disabled people in the research reports and articles we write. We need to go further and involve disabled people in the production and use of knowledge about their lives and struggles. This includes ensuring that disabled people are directly involved in decisions about what types of research need to be done, in the research and knowledge production process, and in deciding how that knowledge will be used to promote social change. Only when disabled people have a voice in determining what does and doesn't count as knowledge about their lives and struggles and how that knowledge will be used can we claim that our geographic studies truly challenge disabling practices of knowledge production and use.

Tackling the exclusion of disabled scholars from the discipline

A very important challenge related to the above is to work together to create conditions in academic geography which will allow more disabled people to work in the discipline. It remains the case that very few geographers working on disability are actually disabled themselves. This is not to argue that the contributions made by able-bodied geographers are not valuable – they clearly are. Rather, it is to acknowledge that including more disabled geographers in our discipline would not only enrich the knowledge we produce and the teaching we do but would also be a concrete and immediate way of giving voice to disabled people in the production and use of knowledge about their lives. While some efforts have been made to make academic environments such as conference sessions more accessible much more remains to be done. A critical challenge, for example, is to ensure that academic departments adequately address the accommodation needs of disabled professors and students in Geography (see Chouinard 1995/1996 for a discussion of the many barriers to inclusion that she experienced in one academic setting as a disabled, female, and radical professor). This is no small challenge requiring as it does efforts to change the very culture of academic environments – cultures which continue to insist, for example, on judging disabled academics' work by criteria geared to the able norm (e.g. in terms of time taken to complete degrees and assessing "success" in terms of the quantity of work produced as opposed to, for example, its impact or significance). We have a long way to go before we in academic geography can be said to have addressed demands from disabled scholars and the disabled community in general that when it comes to who is involved in creating knowledge about disability there will be "nothing about us without us" (e.g. Charlton 1998). It is all of our responsibility to make our academic environments more inclusionary and enabling.

Conclusions

Clearly geographic studies of disability have come a considerable distance since early work informed by medical models or conceptions of disability. Building in part on the legacies of early social geographies of mental ill-health and more social models of disability, geographers have developed conceptualizations of disability and disablement as both socially and spatially produced and embodied. They have significantly broadened the range of theoretical concepts used to understand forces shaping disabled people's negotiations of society and space and have considered how other differences, for example in gender and sexuality, shape those negotiations. They have increasingly unsettled the boundaries of disability itself by considering a wider range of mind and body differences – experiences of which in some instances and certain places may involve claiming disabled identities but in others may not and indeed in yet others may involve claiming simultaneously able and disabled identities. While the same ambiguity and spatial unevenness is evident in the lives of many who embrace a disabled identity (e.g. embracing being disabled in personal spaces such as the home but disguising such an identity in places of work), including differences such as obesity in our geographic studies encourages us to think more critically and inclusively about the range of people who experience disabling practices. We have also seen increasing sophistication in the theoretical ideas used to understand experiences of disablement in society and space – from conceptions of how barriered and bounded spaces are perpetuated in urban settings to efforts to better understand how class location and "habitus" contribute to shaping the worlds of those with impairments.

While we can celebrate many achievements in the now flourishing sub-discipline of geographies of disability, impairment, and illness, much remains to be done. Of these challenges perhaps the most pressing and crucial is that of ensuring that disabled people are given voice and meaningful inclusion in the production of geographic knowledge about their lives. This includes making our own "academic backyards" more inclusive and supportive for disabled scholars. As geographers tackle these and other challenges we can look forward to future advances not only in our understanding of the socio-spatial processes contributing to disablement and differencing but also, and importantly, to efforts to build more inclusive and enabling societies for all.

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Chapter 15

Mental and Emotional Health

Hester Parr and Joyce Davidson

Introduction

This chapter offers a spatial interpretation of mental health, mental health care, and, more especially, the emotional lives of people with mental health problems, in an attempt to explain how "the mental patient" has transitioned from exiled non-citizen to emotional and embodied social agent. Drawing together insights from various strands of geographical thought, including historical geographies of madness and research on the spatialities of disability, chronic illness, and emotion, we explore linkages between mental and emotional health, and map changes in geographies of recovery. We pay particular attention to how spatial shifts in recovery sites – from asylums to community-based care – reflect conceptual and material differences in how mental health and care is experienced. Further, we consider some specific modalities of care such as telephone help-lines, virtual support groups, and newsletters, suggesting that these reflect new spaces of collectivity that contest notions of "helpless" patients while leaving room for individuals to negotiate their own level of participation in collective exchanges. Throughout, we urge scholars of mental and emotional health issues to consider patients as embodied individuals, connected – emotionally and otherwise – to different spaces in different ways that enable different kinds of recoveries. Recognizing that a term like "recovery" is complex and contentious, we define it for our purposes here as referring to "the extent to which someone can recover a fulfilling, satisfying and meaningful life, whether or not they continue to experience symptoms" (Bradstreet 2004: 4), after and during periods of profound illness.

It is our position that mainstream social spaces and mental health patients need not be thought of as "unlike categories." We join those who argue that people with mental health problems can be seen as trying to "actively re-place themselves [in order] to create spaces in which marginality and marginalized collective identities can be embraced and valued" (Chouinard 1999: 142). This argument neither ignores the need for an ongoing critical stance on contemporary forms of discrimination and stigmatization of this group, nor the need to give attention to their often abject material poverty (Knowles 2000ab; Wilton 2003, 2004). Nonetheless, a cautious optimism is forthcoming. We argue that geographical studies not only contribute to understandings of direct experience and treatment, but also that they can help to place the *meanings* of mental health and associated concepts, revealing the ways in which various senses are constructed and contested by popular and professional discourses. The chapter, therefore, aims to place the subject(s) of such discursive practice at its heart. We are concerned to trace a spatial history of "the mental patient" in a way that attends closely to links between physical, symbolic, and social environments and recovery, displacing older notions of institutional isolation and containment in favor of a participatory framework that takes into account situated knowledge and feelings, without which recovery is always already incomplete. To that end, we include a case study that helps to place recovery in context, thereby allowing us to explore the implications of what we contend are hopeful movements in recent geographical thought and practice, towards more inclusive imaginings and representations of certain forms of ill/difference. By considering emotional geographies of rather widespread and typical mental disorders – phobic relations with everyday "natural" environments and objects – we demonstrate how geographers might collaborate with those they study to question definitions and *limitations* of normality. Such "open-minded" approaches can facilitate the emergence of less stigmatizing understandings of mental and emotional health problems, by placing them ever more firmly within, and showing the extent to which they *belong* to, mainstream social space. This relational approach to people and places suggests that mental life in all its various – and always fully embodied – manifestations, at least partially shapes and is shaped by social and spatial circumstance.

Thus, as we aim to show, studies of mental and emotional health reveal the ways in which selves and spaces are mutually constitutive, and highlight the need for alternative spaces of care within which disordered subjectivities might be renegotiated and reconsolidated. Such insights are crucial for understanding the ways in which "madness" is made, and remade, constructed as well as contested at various spatial scales. Understanding the linkages between emotional and mental health holds important implications for patient outcomes, but this recognition is hardly new. More than half a century ago Schwartz (1957: 28) observed that "the emotional environment that you build up for the patient will be a vital factor in his [*sic*] recovery." This insight and its importance seem to emerge and fade from prominence in various times and places, but should, as we will argue, remain forever at the forefront of geographies of mental health.

The Asylum as a Social and Spatial Form

The big story of madness and its transformation into mental illness is fundamentally a story of geography, as detailed at greater length by Philo (1987ab, 1995, 1997ab, 2004; and also Elden 2001). Philo demonstrates that while madness itself has had different interpretations through the years, it is nonetheless clear that people who think, feel, and behave in ways that somehow fall "outside" the social norms for a particular time and place have often provoked particular "environmental" responses.

References to a “condition” which might be associated with madness have been present in historical records from ancient Greece, and are traceable through and beyond the medieval period in Europe (Scull 1996). Interpretations of this condition have ranged from associations with demonic possession, divine inspiration, witchcraft, and versions of illness; leading to what Philo (2004: 139) calls an “untidy geography” of social responses. It is by no means clear that these understandings and responses have *always* and uniformly demanded spatial separations or exclusions. It was not until the 1400s, for example, that the first special “institutional space” allocated to the mad – the quasi-religious hospital of “Bedlam” – began to acquire a reputation for this sort of work in England.

In the eighteenth and nineteenth centuries new geographies of social life emerged in parallel with the evolving British state, wherein conceptions of population and territory were wrapped up with the beginnings of industrial capitalism and an incipient class-based society. Such developments, later reflected in other industrializing nation states, were to have profound implications for those who embodied madness. In the context of what might be called a new governmentality of the poor, the mad were gradually identified as requiring particular attention, witnessed through their “great confinement” in various receptacles (Foucault 1967).

The unruly disposition of the mad in mainstream pauper provision helped to lead, through a century of growth in state-led “disciplinary technologies,” to the lunatic poor being distinguished as different and troublesome. In the emerging capitalist logic of the industrial economy, the mad, along with other poor cohorts such as the old, disabled, and sick, were simply not “productive” enough (see also Scull 1977 and Gleeson 1999 for comments on non-UK spatial contexts). This inability to “fit in” with the industrious life of capitalist society, the new workhouse regimes and in other similar sheltered places for the poor, led, Foucault continues, to a decisive “event” in the history of madness; namely, when “madness began to rank among the problems of the city” (Foucault 1967: 64). The birth of the asylum as one spatial solution to this problem was hence conceived.

The birth of the asylum in the late 1700s and early 1800s can be seen as one possible outworking of the “great confinement” of the poor, although the asylum impulse itself may be understood to be rooted in earlier medical and moral imperatives. Since the early 1600s, for example, there had been private “madhouses” for the rich; profitable spaces where carers reflected on the nervous dispositions of their wealthy clients, contributing to some sense in which madness might be conceived of as a medical condition (Parry-Jones 1972; Philo 2004). Alongside this provision, and partly because of the need for a more mixed economy of care for non-elite clientele, charitable lunatic hospitals emerged from the early 1700s onwards and these were at first associated with general voluntary hospitals, also helping to ensure an emergent “medicalization” of the mad (Philo 2004). Perhaps the most famous of these facilities in a British context was the York Retreat, the charitable rural asylum retreat in Yorkshire, first opened in 1796, and run by the Tukes, a Quaker family (Digby 1985). Although mad people at York Retreat were classified as patients and deliberately spatially segregated from the stresses and supposed evils of the industrial city, the Tukes’ asylum was *not* primarily a medical space but rather one seeking to establish a moral(ized) relationship between disciplined domesticity and recoverable rationality. This famous model for the *moral* management and treatment of the mad served as an ideal(ized) blueprint for the reforming potential of the public asylums that were to follow. The medical emphasis in such spaces of confinement, however, grew more pronounced, and medical expertise came to "insinuate itself within the moral impulse of the asylum" (Philo 2004: 489).

Increasingly large numbers of poor people were identified as mad during this period, perhaps as a result of growing awareness of this (problematic) category of the lunatic, and perhaps as a result of increasing numbers of psychological "casualties" of capitalism (Scull 1979). It gradually became apparent to the emerging state (and various lunacy commissions/ers) that the private and the charitable asylum solutions were not sufficient. In 1808, the UK state, largely as a result of a key Select Committee report into the state of criminal and pauper lunatics, articulated a vision for a public asylum system to be funded by the public purse. Further legislation in 1845 established that the system would be adopted by every county and borough in England and Wales (Philo 2004). Public asylums were to be located in rural areas, away from centres of population, for a variety of medical and moral reasons (Philo 1987a, 2004), serving to separate spatially those people designated as mad from mainstream society, an act constituting a hugely powerful geography of differencing with lasting implications. This spatial separateness contributed to a dark iconography of the asylum, these looming and distant buildings becoming stigmatized places of containment (see Parr et al. 2003).

A staggering number of mad people found themselves institutionally segregated under the public asylum system and any initial therapeutic optimism for reform soon largely vanished. As Scull (1996) notes, while "the lunacy reform movement was driven forward … by a utopian vision of the possibilities of asylum life" (Scull 1996: 8), the effect was one of warehousing the mad:

> The community becomes unwieldy; the cases beyond the capacity of the medical officers; personal intimacy is impossible; recent cases are lost and overlooked in the mass; and patients are treated in groups and classes. An unhealthy moral atmosphere is created; a mental epidemic arises, where delusion, debility and extravagance are propagated from individual to individual, and intellect is dwarfed and enfeebled by monotony, routine and subjection. (W.A.F. Browne 1837: 8. Cited in Scull 1996: 18).

The kinds of problems noted by Browne, the superintendent of Crichton Royal Asylum in Scotland, not only spoke to the sheer numbers of lunatic poor but also heralded the rise of an army of new specialists in the care and management of lunatics. An emergent "medical science of the mind" thus began to signal a new way of conceptualizing and managing the lunatic, one through which mad people were also redesignated as "mentally ill patients." This shift was epitomized through the changing name of the *Asylum Journal* to the *Journal of Mental Science* (see also Philo 1987a). The gradual redesignation of madness as "a medical category with specified symptoms and aetiology" (Rogers and Pilgrim 2005: 42) also marked a new era in the constitution of the difference of the mad. By 1850 their place in special, and specifically medical, spaces was assured and their separateness from mainstream social life further enabled. This was to have a lasting social and spatial legacy.

Return to Community?

Throughout the nineteenth and most of the twentieth centuries, the asylum solution to mental difference held sway in Western Europe and North America. Its purpose as a self-legitimizing solution to the problem of madness deepened in proportion to the expertise of "mental scientists," variously contributing to the disciplines of psychiatry, clinical psychology, and (later) psychoanalysis, although the first of these disciplines is most relevant in the context of this particular spatial history.

It was not until the mid-twentieth century that alternative approaches to mental health care became commonplace. From the 1950s onwards, particularly in Britain and North America, and notably Italy (Jones 2000), there was increasing pressure from different political and social actors to close asylums and reintroduce patients into mainstream social life and spaces, in what was to be rather optimistically termed "community care." A number of explanations have been offered for the post-war policy shift towards community care. Among the most widely recognized are those that peg the shift to social reactions to war-time "shell shock" (Barham 2004), the introduction of anti-psychotic and anti-depressant drugs, and criticisms of the disabling effects of institutional care as advanced by the so-called "anti-psychiatric" movement (Goffman 1961; Foucault 1967; Laing 1967; Cooper 1968). These conventional explanations have been attacked by more radical critics such as Scull (1977), who links the demise of the asylum to more capitalist concerns, arguing that community care was simply conceived as a cheaper alternative to asylum/hospital care (a notion now largely rejected) and therefore a key factor in its development. Whatever the underlying motive for the community care movement, it is clear that a raft of policy changes focused directly upon the plight of the institutionalized "mentally ill" during the mid-to-late twentieth century served to significantly alter the geography of mental health.

Despite the seemingly holistic, near welcoming sound of "community care" as a movement (especially in light of what it appeared to be shifting away from), the reality was that new forms of segregation emerged for those designated as ill. The difficulties for ex-patients in attaining social integration has led some to argue that "one form of confinement has been replaced by another" (Wolpert & Wolpert 1974: 69). The work of Dear and Taylor (1982) and Dear and Wolch (1987) and more recently Knowles (2000a) has laid bare this exclusionary geography of deinstitutionalization, together with the socio-spatial processes that Dear (1977: 588) claimed have constituted new "psychiatric ghettos" and "asylum(s) without walls." As a new chapter in the history of "spatial containment" began to unfold, a new dimension to the differencing of the mental patient came into view. Patients remained isolated, poor, and often uncared for – *but* in community settings, excluded by neighborhood "purification" strategies (Evans 1978), attitudinal stigma articulated as a "not-in-my-back-yard" (NIMBY) syndrome (Dear & Taylor 1982), and ignored by over-stretched human services (Dear & Wolch 1987; Knowles 2000a).

More recently, community mental health care, especially in a UK context, has emphasized the role of joined-up health and social services that (ideally) help people to live more integrated lives in community settings, as well as helping to facilitate the possibilities for their re-entry into paid work and arguably, by extension, mainstream social life. This has been accompanied by a slowly developing legislative framework that addresses both the provision of social support and care, and the exercise and limits of psychiatric power, in ways that have had implications for the rights and citizenship status of mental patients (Gostin 1983; Mental Health Alliance 2005). The spatial shift from asylum to community-based care has not eliminated the relations of difference between the "sane" and "insane" that the asylum both invented and cemented. However, it *is* the case that community care has involved a rethinking of both the geography of mental health care services and the "place" of service users in a variety of ways. While certainly valuable and policy relevant insights can be drawn from numerous geographical studies, including those of a quantitative nature (e.g. Giggs 1973, 1988; Weich et al. 2003, 2006; Curtis et al. 2006), what has been missing in accounts of the history and geography of madness, asylums and community care – at least until recently – are accounts of the *lived geographies* of (ex- and present) mental patients (but see Knowles 2000ab). In fact, the latter remained rather "faceless factors" in both the planning and patterning of services and analyses of community reactions to small-scale facilities, often reduced to "client characteristics" or sets of demographic indicators through which geographers and others might infer local community attitudes to mental health (Dear & Taylor 1982) or speculate upon "coping mechanisms" (Laws & Dear 1988) in deinstitutionalized settings. A few anomalies to this trend have arisen: for example, Smith (1975ab, 1980, 1981) sought to differentiate "community" into types of "receiving" neighborhoods, ones that could then be interpreted through a humanistic conceptual lens "as centre(s) of personal meaning for an individual" (Smith 1980: 365), emphasizing that attention to *informal* support patterns and the lived spaces of ex-patients might be important to contemplate. Kearns (1986, 1990, and see also Sixsmith 1988; Pinfold 2000) found inspiration here, noting a range of personal social geographies in which people with mental health problems might carve out small, transitory niches of survival in the exclusionary city. Here the social situations of ex-and present patients are not seen as just being prescriptively or passively constituted through and by environments; rather, there is an implication that patients are creatively engaging with the city in order to effect their own coping mechanisms.

Our own work has also built on earlier endeavors and has sought to extend their focus, bringing more sharply into view the faces and voices of people with mental health problems and the community geographies that they occupy and embody (eg. Parr & Philo 1995; Parr 2000; Davidson 2001, 2003ab; Parr et al. 2004, 2005). In examining local service-user collectives and access to the public spaces of the city (Parr 1997ab), for example, as well as the embodied experiences of madness/illness (Parr 1999) in both rural and urban environments, this work begins to articulate what community life *feels* like. It seeks to bring "to life" emotional geographies of exclusion *and* inclusion in order to further examine the relations of – and disruptions to – social difference (Davidson et al. 2005).

This orientation, informed by particular theoretical positions, helps to address what Porter (1987: 230) has argued is a lack of voices in histories of madness and mental health. All too often, he argues: "They [the mad] were mutes or muted, or we catch the depressed, disturbed or deranged only though the talk of others – the families, doctors, legal documents or asylum registers." Attention to the lived experiences of those with mental health problems, historically in the asylum and contemporarily "on the streets," is not merely to correct a methodological imbalance, but necessary in order to articulate how the story of madness and illness is not simply, or just, one of exclusion, subjectification, and outsiderness. Instead, people with mental health problems should also be understood as creative actors, often capable of resistance, self and collective empowerment and determination in the diverse spacings of madness, illness, and mental health care (and see Sayce 2000; Barnes & Bowl 2001). Normative claims about how scholars should understand the history of madness and illness find empirical support in studies drawing on the lived experiences and emotions of people who have (and have recovered from) mental health problems. A recent study by Curtis et al. (2007) explores the therapeutic landscape of hospital design from the perspective of individuals with first-hand knowledge of a mental health inpatient unit in east London. Ex-users of the facility emphasize how its symbolic environment influenced feelings of respect, leading researchers to conclude that "specific design features had powerful symbolic force for patients, including location on a waste site near a busy highway and the very visible high fence erected around the secure unit that gave the impression of a prison" (2007: 606). If we accept Schwartz's view that the emotional environment is a vital factor in patient recovery, then understanding how the symbolic, social, and physical aspects of a care facility are *felt* by those who use them is critical. Clearly, this does not come without challenges. As Moon, Kearns and Joseph (2006) point out, contemporary private asylums have capitalized on therapeutic landscape discourse as a marketing strategy, positioning the asylum (recast in some cases as more of a quasi-hotel experience) as a refuge of choice for those who can afford such care.

Recovering Patients

Sociology has done much to bring questions of agency and structure to the forefront of health research (Williams 2003), laying the groundwork in many ways for our own work on geographies of recovery, geographies that recognize the embodied, emotional, resistive, mundane "patient" as an agent in his or her own recovery. Indeed, as we have stated above, any notion of recovery that ignores situated knowledges and feelings is always already incomplete. In this regard, the work of the sociologist Goffman (1961) is instructive, and qualifies Foucauldian perspectives. On one hand, Goffman showed how asylum practices effect what he calls a "mortification of self," through personal defacement (a loss of "civil" identity), submission, and regulatory conduct(s). On the other hand, he limited this visioning by his detailed ethno-analysis of asylum life, which documents how patients can act in solidarity with each other and also how patients might resist social and medical disciplining by "situational withdrawal" and refusals to cooperate (1961: 61–2). In effect, he allowed for the agency of the patient, albeit an agency "stripped bare" of the influence of civil life. Importantly, Goffman considers the institutional mortification of self to be incomplete. Agency accrues to mental patients in Goffman's asylum through tacit agreements with staff in order to occupy "geographies of licence"; places "pervaded by a feeling of relaxation and self-determination" (1961: 230–1). While Goffman's methodological approaches and "reinterpretations" of observed behaviors have been called into question (Gronfein 1999), his work *also* helps to limit the idea of asylums as "forcing houses for changing persons" (Goffman 1961: 12, cited in Gronfein 1999: 88).

In considering "return to community" we want to emphasize interpretations of the category of "mental patient" as something more than just a docile body, and building on Goffman's cues, seek to understand more about the "mental patient," or rather the "*person* with mental health problems." Although there are many possible lines of reasoning here, we concentrate on questions of representation. The figure of the mental patient has been depicted above as "made" by medical discourses and then isolated, first in asylums and then in community settings, as a result of psychosocial stigmatization and ableism. Geographical studies of exclusion and marginalization are, therefore, underwritten by the presumed unpredictability of the mad person – an unstable and unreliable figure that has (always) required some sort of avoidance, containment, and control. Importantly, recent writings on chronic illness have addressed the notion of "ill instabilities" in ways useful as a conceptual counterpoint to these scenarios.

In this regard, Moss and Dyck (2003: 16) have emphasized how chronic illness is often unappreciated as "a state of waxing and waning … uncertainty, indeterminacy … fluctuation." Moreover, that it is "only when unpredictability, instability and unsteadiness are *valued* that persons with chronic illness can be no longer seen as 'different' " (2003: 17). Such a demand requires both a radical praxis with regard to embodied ill uncertainties and encourages us to think in terms of flux when writing ill experiences and identities. In elaborating this position, Moss and Dyck emphasize a politics and practice of "reinscription" – the different possibilities for rescripting bodies, ill identities, and experiences – and call upon progressive exercises to "engage in rewriting the body with and through competing renditions of what it is to be ill and what it is to be healthy" (2003: 100). In envisioning this embodied rescripting, people with chronic illness are often cast as knowledgable actors, tentatively but expertly reworking their mind and body-spaces.

In tandem, a recent international literature on recovery, referring to the recovery of a "meaningful life," whether or not symptoms of illness continue to be experienced, is also relevant here. Recovery has been identified as comprising different key elements including hope, meaning, change, and control (Anthony 1993; Curtis 1997; Repper & Perkins 2003), components which have traditionally been rather sparse in the lives of people with severe and enduring mental health problems. (See also, for example, in the Surgeon General's Report on Mental Illness: Sacher 1999; Curtis 1997; Jacobson & Curtis 2000; New Freedom Commission on Mental Health 2003). Taking these two developments seriously, we can understand recovery, reinscription, and the revaluing of instabilities as thoroughly social and spatial, and as situated processes that are refracted differently through different geographies, as we elaborate below.

In outlining some aspects of the geographies of mad and ill "others," we have sought to cross-reference ideas about mental patients with a historical analysis of their shifting sites of recovery – from the asylum to the community – in order to make sense of their social situations. In arriving at a point whereby contemporary social theory and writings about embodiment and emotion provide openings for imagining different "rescriptive" geographies of recovery, we encourage scholars of mental and emotional health issues to resist being confined to accounts of "psychiatric ghettos" and "asylum(s) without walls" (Dear 1977: 588), and argue that such "static" geographies should be disrupted by alternative and more nuanced accounts reflecting a range of different lived and virtual spaces of connection, spaces which hold profound implications for damaged/recovering subjectivities.

Rewriting the Mental Patient: Pathways to Empowerment

New work on "representational geographies" of mental health, as understood through the voices and narrated lives of people with mental health problems is now emerging (e.g. Parr 2008). We argue that there are particular sorts of "representations" that are best to enable a revisioning of the mental patient. These representations are ones where mental patients can be seen as active agents, resistive workers, and even semi-professionals, engaged in different "fields of contention" in and around psychiatric care (Crossley 2006). Local and national "user movements" around mental heath care have replaced outdated stereotypes, and are documented and critiqued by a range of personal, policy, and academic writings (Chamberlin 1992; Barnes 1997; Parr 1997ab; Sayce 2000; Barnes & Bowl 2001; Wilton 2004), as well as comprising tangible achievements on the ground in terms of "contesting psychiatry" (Crossley 2006).

Crossley (2006) traces a history of psychiatric service "user movements," or what he calls "social movement organizations," in mental health in the United Kingdom from the early 1950s, charting the development of well-known examples like the Mental Patients Union, MIND, Survivors Speak Out, United Kingdom Advocacy Network, Mad Pride, and so on. Here, the very containers of subjugation, the asylum and diagnostic technologies, have, according to Crossley and others, formed "the very conditions for group formation" that usual theories of medicine devalue (Crossley 2006: 159). Following the relaxation of "internal" asylum regimes in the 1950s, the political contexts of the 1960s and 1970s created space for the development of pronounced collectivity, even amongst this marginalized group. Crossley and Barnes and Bowl (2001) locate the collectivity of mental patients in relation to both dominant and alternative politics and protests, ranging from anti-psychiatry, to Marxist, feminist, and identity politics, in addition to self-help, recovery, and consumerist influences. Such developments served to reconfigure mental patients as "survivors," "users," "people with mental health problems," "consumers," and "activists," amongst other labels that clearly seek to rescript "the mental patient." In pressing for changes ranging from body and wards spaces (Parr 1999) to the rights of patients contained under mental health legislation, the reach and influence of collective patient organization has been effectively scaled up and "user voices" have become an important part of both policy formation and evaluation in health care.

There are undoubtedly some parallels between the rise of collective action amongst psychiatric service users and the disability movement in the United Kingdom and elsewhere, although the former is often perceived as a poor relation in this regard and still undermined by stigma concerning the validity of the voice of the person with mental health problems (as rational and competent; see Davidson 2005; Davidson with Henderson 2008). Despite this, Barnes and Bowl (2001: 152) argue that:

> The demonstration of competence in analysis, deliberation and action which user and survivor groups provide, presents a challenge to the association between madness, irrationality and incompetence. At an individual level participants experience this as personal empowerment arising from processes of peer and outsider valuing, while collectively this acts to challenge the categorical connection between severe psychological distress, irrationality and incompetence which underpin the more controlling aspects of mental health policy and practice.

Although these celebratory outcomes should be treated with caution (Wilton 2004), it is, nonetheless, the case that a combination of service user collectivism, social welfare reform, and the effects of wide-ranging post-structuralist identity politics have combined to make it possible to reinvent the static mental patient subject. These gains are not universal, and there are tensions within both service user communities (around identifications as "mad," "user," "survivor," and so on) and policy circles (around a *re*institutionalization of the mentally ill) about what it means and how it feels to have serious and enduring mental health problems in the twenty-first century. Further questions also need to be asked about how people with mental health problems are reinventing themselves and experiencing acceptance and validation in spaces *beyond* mental health services, such as those explored in the following case study.

Emotional Geographies and Alternative Spaces of Care

We depart here from the structure of the traditional literature review in order to introduce a case study that helps to place recovery in context. We argue that the general (literature review) and the particular (case study) contain complementary materials, the latter permitting us to outline findings illustrative of conceptual points discussed above, and showing the ways in which people with mental health problems are actively engaging with recovery and challenging notions of what constitutes a "meaning-full" life. The following ethnographic research was conducted with the UK National Phobics Society (NPS).[1] This volunteer-run organization serves a client group who experience extreme social and spatial exclusion as a result of debilitating anxiety disorders including phobias, and generalized and specific anxieties. Our research has found that the creation and maintenance of particular sources and *spaces* of care is crucial for the support, validation, and positive rescripting of the anxious subjectivities associated with this group.

The anxious qualities of subjectivities and lifeworlds of NPS members differ according to individual context and circumstance, not least, the form of anxiety from which they suffer (Smith & Davidson 2006). In their struggle to make sense of disordered socio-spatial experience, some sufferers describe feeling marginalized and misunderstood, dislocated and "cut off" from the rest of the world. Others describe an agony of proximity rather than distance, of feeling too intimately and inescapably located. In all cases, when confronted with an imagined or actual phobic object – a snake or a spider, a feather or fog – anxiety's embodied and mindful affects work to disrupt protective boundaries of sufferers' subjectivities, and something feels desperately wrong with the world and their place within it (Davidson 2000).

While it is widely considered normal to have emotional relationships with natural environments and objects, some such relations are more socially acceptable than others. For example, feeling nostalgic about and attached to – or perhaps fearful and avoidant of – a particular place or pet, is not normally considered disordered or subject to ridicule, so long as such feelings and their expression remain *within reason*. There are, however, limits to acceptable emotional experience and its manifestation, and questions about rational explanations why certain emotions are "better" considered pathological are complex and dependent on shifting sociospatial criteria. The line that supposedly separates sadness and depression, or happiness and mania, for example, can be rather arbitrarily drawn for different purposes in different contexts; consider expectations around weddings, funerals, or the less emotionally charged space of a typical daytime high street. "Blind" panic might be understandable, even *reasonable*, here, in the face of a knife wielding attacker, but very much less so in response to a feather that falls at one's feet. Emotions out of hand or out of place are a cause for serious concern in mainstream social space, and questions of control are crucial; very rarely is it acceptable to "lose it."

It is fairly common-place and common-sense to assert that the shift towards aberration occurs at the point where feelings interfere with a person's ability to "fit in" or function "normally" in various forms of social space, but this point is obviously not fixed. Thus, first hand accounts of phobic experience help us see that mental disorder, at least in some senses and spaces, may be a normative matter of degree. Our aim here is to highlight a degree of "indifference" between pathological and conventional emotional experience, and to suggest that placing emphasis on commonalities between dis/ordered emotion can help promote understanding and acceptance of mental and emotional ill-health. This attempt to embrace otherness through conceptual openness is not, however, intended to undermine the degree of suffering associated with phobic disorder – which can be extreme, severe, and enduring – or to suggest that phobic relations are "normal." It is, rather, to suggest definitive instabilities around mental and emotional health, and to employ such conceptual flexibility as a means to make space for *different* experience and meanings of emotion – different geographies of recovery – as part and parcel of everyday, mainstream social space.

One of the ways the NPS engages in processes of asserting their members' social significance is by trying to bring discussion of mental health problems of all kinds into the more "normal" – typical and everyday – realm of variations in emotional experience. The NPS works to improve members' lives by advocating for increased awareness, greater acceptance, and accommodation for anxiety disorders, and often, they do so by placing sympathetic accounts of phobic experience in various popular and news outlets locally and nationally. Many NPS staff and members have themselves experienced active involvement with various media in attempts to unsettle and re-place unsupportive stereotypes that circulate without their approval, and would continue to do so without their active intervention. By exercising such challenging views and voices, members become involved in processes of rewriting themselves out of the realm of unreason into the rational public sphere to which they feel entitled and increasingly enabled to belong. Their accounts make connections with "normal" experience, and so continually question constructions of "reasonable" behavior and so also definitions of mental ill-health.

However, such involvement requires a level of wellbeing and (self) determination that many members do not (yet, and may never) have, and this sense of exclusion is often why they approach the NPS in the first place. Anxious subjects need access to experts who understand what they are going through, and the NPS is explicit in placing exceptional value on sufferers' own experience and expertise: "Our belief is that *those who have experienced anxiety disorders are best placed to provide support for other sufferers* because they are able to truly understand the impact these conditions have on people's lives" (www.phobics-society.org.uk). Such experts are in a position to understand the kind of supportive space that members need, but such space isn't straightforward to imagine or create. Anxiety is *relationally* constituted and so difficult to place, and our research suggests that anxious subjectivities require flexible spaces with which they can productively engage and begin to re-establish protective boundaries around a fragile (but recovering) sense of self.

Anxiety – particularly in its intensified manifestation as panic – is never a predictably internal or external affect. Rather, it takes place at the intersections between selves and spaces, feeding off of yet transforming both. That is to say, environments or objects *make* the sufferer anxious at the same time as their anxiety *makes* that environment or object more frightening. The mechanisms of such viciously anxious cycles are at least partially understood and articulable by the sufferers, yet never manageable, without support. The kind of socio-spatial support required involves an intervention that can disrupt the cycle of continually re-established anxious interactions. The person must have access to someone *or somewhere* that short-circuits the anxious-self-fulfilling process by providing a sense of support that enables less anxious affective relations to be imagined, experienced and even tentatively established. Supportive spaces should ideally s(m)ooth and strengthen delicate edges of the self, restore a sense of calm, coherence, and comfortable connection, and so enable less emotionally fractious relations. The kinds of spaces required, however, often exist in a less than conventional, often communicatively mediated sense.

While NPS members do have access to physically situated self-help groups facilitated by fellow sufferers in various locations around the United Kingdom, negotiating access to and participating in these supportive localities requires the bodily presence of users in spaces that are at once highly personal and emotionally charged. The *immediate* experience of such encounters and the perceived lack of protective "distance" can lead to precisely the kind of exposure that many phobics desperately try to avoid. The public (and so often problematic) situation of such groups also renders them inaccessible to many NPS members. Each individual does, however, have access to alternative communicatively mediated supportive spaces that provide a network of social – and potentially supportive – relations, within which the individual can situate themselves.

We have argued elsewhere (Davidson & Parr 2007) that the salient features constituting these communicatively mediated spaces of support are best revealed through understanding the nature of these kinds of social *contact* that require no shared *physical* presence, contact that is (technologically) negotiated. Our interview and survey responses reveal that relations established through telephone, print newsletters, and computer are re-envisaged spatially by participants in such a way that they come to provide some*where* for members to go, a "place" for confidential communication with sympathetic and trusted others, who are (mostly) kept a respectful (and safe) distance from the vulnerable, recovering self (Parr 2008).

Much has been written about physically situated self-help groups (e.g. Allsop et al. 2004), and telephone help-line services might be considered qualitatively similar in their intention to provide social and emotional support through contact with someone experiencing similar difficulties (Galinsky et al. 1997; Lazar & Erera 1998). While the person with whom you are communicating is not physically by your side, neither is the sense of physical connection entirely absent. The person you speak with is *there*, at the other end of a telephone connection which draws you together, if not "here" at least "now" (Teare et al. 1995). This immediacy of response has a form of sensorial, spatial affect. It brings a feeling of *presence* to interactions with another who, though not with you "in the flesh," is partially embodied and brought close, arguably grounded near by the weight of their voice. "People *need* people to support them" (Rhona), and this modality provides a "lifeline" for many. Such shared and supportive experiences might thus be seen to extend Crossley's notion of collectivity beyond "actual" presence to include technologically mediated spaces of communication.

In some senses similar to telephone support groups, the quarterly newsletter provided by the NPS – the *Anxious Times* – can be seen to contribute to the creation of spaces of support within members' own homes. The sense of empowerment that emerges from access to shared information, support, and advice with similar "real" experts is often described as invaluable, and members benefit from others' recommendations, for example, to try relaxations tapes or self help books they themselves have found useful. Newsletters might thus be seen to create "fields of contention," spaces within which professional authority can be constructively criticized, challenged, and resisted relatively safely (Davidson 2007; Parr 2008). Newsletters help "democratize" medical information and so help educate and empower members to make decisions about the course of treatment (or alternative action) that might be best for them. They also enable members to challenge stereotypical and demeaning constructions of themselves, rewriting their identities, sometimes literally, as when members contribute personal stories to the newsletter to help similar others. Mary, for example, describes communicating her successful experience of hypnotherapy to staff at NPS, and how "they were pleased for me and asked me to write that [newsletter] article [...] And I, you know I was really pleased, I just wanted someone, I thought well if I can help just one person."

Within such technologically mediated spaces, NPS members work with and for each other towards recovery, experiencing more meaningful and satisfying lives – despite often continuing symptoms – and practice the performance of a more powerful voice in a space of relative safety (though any emotional exposure is not without risks; see Parr and Davidson 2008; Parr 2008). Increasingly, the internet performs a similar function to these other communicative spaces for anxious subjectivities, as online forums provide some*where* to comfortably incorporate an aspect of their identity that they are normally under pressure to hide. In these supportive online environments, members learn how to look at their behavior in a way that is often constructive, supported and largely stigma-free (Parr & Davidson 2008). In the following account, for example, Aileen reflects on her own use of NPS chat rooms:

> It's a place where people can meet up without particular, for areas that aren't talked about a lot in society and aren't appreciated. Um, and you can, I would be more likely to visit an Internet site than I would a face to face meeting [because of …] just, I suppose the embarrassment factor.

For Aileen, it is the *meaning* of the support space, the emotional and relational rather than physical qualities that matter (Korpela & Hartig 1996). The empowered subjectivity she can practice in this space enables her to feel more confident about engaging with the mainstream, and can help her realize that, despite her anxieties, she need not feel so different and excluded after all.

By providing alternative modalities and spaces of care through telephone, print, and virtual media, the NPS provide access to communicative networks that facilitate a sense of empowerment and validation, helping members experience their lives and relations with others in more positive and meaningful terms. While our case study of alternative spaces of care is small in scale and limited to very particular settings, we hope to have demonstrated the ways in which emergent contextualized insights can, if suitably nuanced, resonate beyond the frame of derivation to enhance understandings of mental and emotional health more broadly conceived. Our work with this group revealed the potentially inclusive and liberating value of seeing states of mental and emotional health as very often not steady, but rather, as taking "place" along a broad and unstable spectrum, a *continuum* of experience between wellbeing and its relative absence. We suggest that such subtly different perspectives have the potential to challenge powerful presuppositions shaping either/or, black and white, notions of in/sanity. This case study has taken seriously the ways in which anxious subjects attempt to represent and at least partially *reinvent* themselves through specific kinds of particularly flexible social spaces and relations. Further research on spaces of care configured in ways appropriate for and inclusive of particular kinds of emotional difference would help advance relational understandings of subjects and spaces of mental and emotional health.

Conclusion: Rescripting Geographies of Mental and Emotional Health

In this chapter, we examined historical linkages between mental and emotional health, and considered a range of socio-spatial processes which have contributed to shifting sites (and meanings) of recovery. It is clear that new possibilities are emergent concerning the "personhood" of the mental patient and its political and social power. This re-evaluation of a previously static, disciplined, and objectified figure is not a simple outcome of geography: in other words, the dismantling of the asylum as a container of difference has not straightforwardly led to the dismantling of the difference that surrounds and even constitutes madness/illness, as the work of geographers who have documented *community*-based segregation and rejection has shown. Rather, various local and national "movements" in combination with different policy and cultural contexts have all contributed to a gradual redefining of mad/ill difference, and of the people who embody associated emotions. Certainly, since the 1980s in the United Kingdom and elsewhere (see Sayce 2000), there has been a concerted effort (with varying results) to "empower" the mental patient *within* psychiatric services. These developments are clearly important, but what is their broader significance when it comes to community life for people with severe and enduring emotional health problems?

Elaborating spaces of participation and recovery for and by people with mental and emotional health problems such as those encountered in our case study must continue to be addressed relative to changing ways in which community social life is conceived by particular aspects of state discourse and different class, ethnic, and interest-based groups. In particular, it is apposite to mention that in the United Kingdom the intensive development of a "social economy" is seemingly unrolling a new "participatory democracy" (Amin et al. 2002: 8), building on a history of the voluntary (or third) sector in providing both welfare and work (see also Dear & Wolch 1987; Wolch 1990; Fyfe & Milligan 2003; Milligan & Conradson 2006) and changing "community" landscapes. In this wider reworking of the basis of civil life, a new emphasis has been bestowed on "active citizens," people locally responsible for making communities "work" and achieving social inclusion (Amin et al. 2002). While clearly a large, problematic, and differentiated undertaking, which can be critiqued from different vantage points, there are new possibilities here for people previously marginalized in community settings.

New research (eg. Parr 2008 and others) highlights the voices and lives and emotions of people with mental health problems in order to understand how this group "feels" community, citizenships and progressive change, and how they experience *meaningful* lives. Critically exploring these new geographies of community participation throws into relief the *limits* to social inclusion for people who can only ever partially live out the ideals of "active citizenship" as they are currently configured by the state (Dear and Wolch, 1987; Wolch, 1990; Amin et al. 2002; Fyfe & Milligan 2003; Milligan & Conradson 2006). Although there are important limits to how participation in "innovative spaces" facilitates belonging and stability for this group, significant gains are nonetheless emergent in terms of the changing social status of "the mental patient" from inert non-citizen to emotional and embodied, valued and relational social agent.

Note

Parts of this chapter have been abridged from the introduction to Parr (2008), *Mental Health and Social Space*, and we would like to thank Blackwell Publishing for granting permission to reproduce this material in its current form. The case study draws on the lengthier discussion presented in Davidson and Parr (2007), Chapter 7 in *Therapeutic Landscapes*. Thanks to the editor, Allison Williams, and Ashgate Publishing, for allowing us to use the material here. We would like to thank the editors of this collection for helpful feedback on an earlier draft of this chapter. The invaluable research assistance of Victoria Henderson is also gratefully acknowledged.

1 There are two separate studies which contributed empirical materials to this case study, both of which were subject to institutional ethics approval. The first was funded by the UK National Health Service (RDO/35'12), and set out to collect and examine service users' experiential accounts of their phobic disorders and their perception of statutory and non-statutory service provision in the UK. Service users were recruited via their

membership of the NPS, and 40 individuals (5 male, 35 female) took part in in-depth individual interviews, which were audio-tape recorded, fully transcribed and anonymized with respondents' permission. Interviews took "place" in one of three ways as chosen by respondents: by telephone (34); face-to-face meeting at respondent's home (5); face-to-face meeting at NPS (1). Interviews lasted between 35 minutes and 2½ hours, with the majority approximately 1 hour in length. Ethnographic methods were also intermittently employed in the NPS office over a period of 3 months, and 10 service providers, recruited via NPS and contacts with health professionals, were interviewed to provide complementary data regarding service provision for phobia sufferers.

In addition, the NPS formed part of a wider study funded by the UK Economic and Social Research Council (RES-000-27-0043) on the internet and mental health problems. In this study the empirical materials were gathered from an extensive on-line Internet user survey designed with a combination of both closed and open-ended questions and completed by 78 respondents. The survey was advertised on 4 UK mental health discussion forums, including the National Phobics Society (www.phobics-society.org.uk). Quotations from survey responses are used in anonymized form. The survey in the study was followed up by telephone interviews with 5 respondents which each lasted between 30 and 60 minutes, were tape recorded and transcribed. Interviews were also conducted with managers or moderators of each web-based forum, and all materials were coded and analyzed. These methods were supplemented with on-line overt ethnography in each of the sites, including participation in various discussion threads and live chat-rooms. All quotations are from NPS members.

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Chapter 16

Landscapes of Despair

Geoffrey DeVerteuil and Josh Evans

Introduction

Michael Dear and Jennifer Wolch wrote the landmark *Landscapes of Despair* (1987: xi) to focus on "the discharge of dependent populations from large-scale institutions and their subsequent fate in the community." The process of deinstitutionalization was one of the most important shifts in the welfare state in the twentieth century in the western world. It is this "subsequent fate in the community" that gives rise to the notion of "landscapes of despair": an *urban condition* shaped by the ongoing evolution of the welfare state, the enduring displacement, containment, and abandonment of service-dependent populations, and the continuing dismantlement, reconfiguration, and re-stabilization of service networks. Service-dependent populations are considered to include formerly hospitalized individuals who rely upon the social provision of care and assistance with basic living in order to maintain an independent life in the community. By connecting urban space and mental health, *Landscapes of Despair* (1987) remains an excellent blueprint of how to fruitfully synthesize health and urban geography.

This chapter explores the continued relevance of this long-established concept and how it has been (re)interpreted within the sub-discipline. More specifically, the chapter begins with a brief outline of the book's precedents and its main contentions, followed by the fate of these contentions within health/medical geography, and to a lesser extent within urban geography. We identify three key perspectives on the fate of deinstitutionalized populations in the community that have persisted since the 1980s within the geography of mental health and urban homelessness: "landscapes of intolerance," "landscapes of re-institutionalization," and "landscapes of caring and wellbeing."

Part 1: Prelude to "Landscapes of Despair"

The key themes of *Landscapes of Despair* (1987) – the treatment of service-dependent populations, public facility location, and NIMBY, stigmatized places –

were all prefigured by research during the 1970s and early 1980s. The empirical motivation for this earlier work was the complex issues raised by the reconfiguration of mental health geographies through deinstitutionalization. With deinstitutionalization, the locus of care thus shifted from formerly rural-based institutions, many of which were made suburban by urban sprawl, to urban-based community care (Philo 1997; Moon et al. 2006). This presumably was promoted to reintegrate people with mental health problems into mainstream society as well as to expose them to a purportedly more therapeutic *milieu*. Based in the contradictory desire for reducing the financial burden of caring for people with mental health problems, while simultaneously addressing their need for more suitable treatment within the community (Scull 1984), deinstitutionalization provoked an enormous amount of policy-oriented research in the 1960s and 1970s. The inherently geographical nature of deinstitutionalization – the process of moving thousands of former psychiatric patients into urban community-based care – would also energize the growing field of welfare geography (DeVerteuil 2000). Borrowing liberally from welfare economics, the goal of welfare geography was to shed light on "who gets what, where and how" (Smith 1987). The role of geographers was to expose spatial inequalities, and perhaps even contribute to better spatial arrangements within society.

In the context of deinstitutionalization and welfare geography, urban geographers focused on how best to locate community-based care across the metropolitan area (Wolpert et al. 1975; Smith 1976, 1978; Dear 1977, 1978; Wolch 1979). This goal dovetailed with the emerging interest in public facility location theory, which aimed at finding the most efficient and equitable locations for public facilities (e.g. libraries, hospitals, incinerators, shelters, etc.) (DeVerteuil 2000). While measuring efficiency was straightforward (e.g. keeping to a prescribed budget), measuring equity was more difficult, particularly when certain facilities have society-wide benefits but very localized externalities and spillover costs. Various surrogates for equity were used, including minimizing distance to service facilities for maximum allotted clients, as well as maximizing the intensity of services to the neediest clients.

Given the theoretical externalities associated with the siting of mental health care facilities (and other services for the very poor) in local neighborhoods (e.g. lower property values, saturation effects, unpredictable clientele), this locational exercise could not help but raise the troublesome issue of community opposition, NIMBY, and stigma (Burnett & Moon 1983; Smith 1983). In their book *Not On Our Street* (1982), Dear and Taylor extended public facility location theory by systematically incorporating a more sophisticated approach to community attitudes to mental health care facilities in Toronto. The authors stated the basic conundrum as such: "faced with the possibility of having a mental health facility located in their neighborhood, residents are typically sympathetic in principle toward the policy of treating the mentally ill in community rather than in institutional settings, but resistant in practice to a facility in the *immediate* neighborhood" (1982: I, emphasis added). Dear and Taylor found that accepting neighborhoods tended to be relatively transient, high-density, and featuring mixed land uses, while rejecting neighborhoods were less educated and predominantly residential. It was the book's focus on NIMBY and stigmatization, along with more theoretical concerns surrounding public facility location theory that would provide some of the groundwork for *Landscapes of Despair* (1987).

Part 2: The Concept of "Landscapes of Despair"

While Dear and Wolch were not the first to examine mental health and homelessness from an explicitly geographical perspective (see work by Smith 1978), they were the first to systematically explore its political, social, and spatial intersections. They did so through structuration theory, an approach that explicitly links agency with structure, the mundane everyday with long-term processes. Space and place both reflect and shape the broader processes of deinstitutionalization, from welfare state restructuring down to the drift of individuals from the asylum to the ghetto, and street. They emphasized that space and place can be emancipatory or constraining, healing or entrapping, but never indifferent in these outcomes. However, they virtually ignored the social causation literature that contends that inner-city overrepresentation of individuals with mental illness may be a *combination* of drift *and* endogenous forces. Endogenous forces involve how predisposed individuals are likely to become mentally ill because of the additional stressors of living in disorganized, residual inner-city neighborhoods (Giggs 1973, 1986; Silver et al. 2002).

The book also derived considerable strength from its geographically aware, multimethod, and comparative approach. Case studies were taken from Canada (Toronto, Hamilton) as well as the United States (San Jose). There was a consistent focus on equity, not surprising given the many normative issues raised by the wholesale shift in treatment for service-dependent populations. The landscapes of despair concept was empirically detailed through a variety of approaches, including historical, theoretical, and model-building. As Dear and Wolch stated, the book fuses a "critical perspective on social welfare in the city with pragmatic tools of public policy analysis" (1987: 6). The authors balanced historical accounts of service-dependency in North American cities with theoretically informed perspectives (structuration theory and theory on power, space, and exclusion drawn form Michel Foucault), as well as an applied planning exercise found in Chapter 9 on how best to redress the shortcomings of deinstitutionalization. The model-building approach helped to sustain the legacy of public facility location theory (DeVerteuil 2000).

Along with a concern for equity came a focus on power and powerlessness, themes that have only grown in importance since 1987. The largely negative fate of service-dependent populations in the post-asylum era was a testament to their own powerlessness, just as the location of the service-dependent ghetto – usually in a heterogeneous, marginal neighborhood in the (inner-city) zone of transition – very much reflected the ability of the powerful to channel and contain services to stigmatized and low-resistance locales, as well as their ability to exclude such services from their own neighborhoods. Borrowing from Foucault, the authors traced the emergence and mutation of a "carceral archipelago" to contain individuals with mental illness as well as others deemed "disruptive" to the larger society.

"Landscapes of despair" were basically the negative outcomes of a series of interconnected processes at various scales and processes. The origins lay primarily in the unintended consequences of deinstitutionalization. According to the authors, this experiment was the "well-intentioned effort to remove the mentally disabled, physically handicapped, mentally retarded, prisoners and other dependent groups from asylums and similar places of incarceration, in order to place them in community settings" (1987: 3). However, a variety of factors conspired against a successful outcome, including ghettoization of former patients and welfare state cutbacks. A key consequence of the social force of deinstitutionalization was the emergence of a particular urban spatial form deemed the urban service-dependent ghetto. The service-dependent ghetto was the convenient co-location of dependent populations and facilities that serve them. The service-dependent ghetto acted as a coping mechanism for discharged patients, albeit one saturated with helping facilities, highly segregated and isolated from mainstream society, stigmatized, and entrapping. The service-dependent ghetto must also be seen as an inadvertent, ambivalent, and makeshift "spatial fix" to the shortfalls of deinstitutionalization and community-based care for a variety of service-dependent groups, especially individuals with mental illness (but also including addicts, mentally disabled, physically handicapped, etc.). The emergence of the service-dependent ghetto was part of what Dear (1980) called the "public city," in which the most vulnerable groups and places ought to be, and in fact were, supported – if grudgingly – by the state.

No sooner had the service-dependent ghetto begun solidifying than it came under increasing attack from a variety of sources. First, welfare cutbacks in the 1980s – both in terms of welfare payments and funding for human services – directly compromised the ability of clients and service providers to continue their mutually beneficial arrangement. Second, individuals with chronic mental illness were increasingly being misassigned to institutional settings that were inappropriate, nontherapeutic, and overly custodial, especially jails and prisons. Third, and along the lines suggested in the previous point, many discharged patients became literally homeless after the dismantlement of service-dependent ghettos in many North American cities, especially the destruction of affordable, albeit last-resort, housing such as SRO (single-room occupancy) hotels.

As a result, the service dependent found themselves increasingly unable to access services, appropriate institutional spaces, and housing itself, thus giving rise to a "landscape of despair" described by Dear and Wolch (1987: 254):

> The perfect metaphor for this terrain is provided by the homeless who nightly populate the beaches of Santa Monica and Venice, California. They sleep next to the ocean at the continent's edge, a little distance from a tide that could sweep them away. This portrait of the landscape of despair presages the collapse of the human-service system and an abandonment of those in need. The lucky and resourceful who manage to survive hang on by their fingernails at the edge of society.

In response, the authors provided extensive policy alternatives to this bleak future so that the "promise of deinstitutionalization" may be delivered (1987: 195). They suggested a concentrated dispersion of (appropriate) services, the so-called "service hub" that replicates the positive features of the service-dependent ghetto (e.g. coordinated and integrated service landscape benefiting from the economies of scale that only clustering can provide), but more equitably across the entire urban region.

In the next section, we will trace the legacy and relevance of this long-established concept to see how it has been (re)interpreted within the sub-discipline. We identify three pivotal facets, all of which owe their existence in some way from the original landscape of despair concept: *landscapes of intolerance/revenge* continues and deepens the existing landscape of despair concept. *Landscapes of re-institutionalization* chronicle the accelerated misassignment and return to institutions (1987: 254), a landscape that reflects "the rebirth of the institution in the 1980s. The trend towards reinstitutionalization will again take the service-dependent out of sight and out of mind … and deinstitutionalization will be recognized as but a brief respite in the history of the enduring institution." These first two facets can be seen as a sequence, in which the backlash against the visibly homeless is leading to their mass re-institutionalization. Finally, *landscapes of caring and wellbeing* signal a rejection of landscapes of despair: "this is a landscape in which the potential and promise of deinstitutionalization will be realized" (1987: 255). By tracing the legacy of these three facets, we also judge how accurate the concept is with regard to current social geographies of homelessness and mental health.

Part 3: The Legacy of the Concept

In this section we trace these three distinct, yet occasionally overlapping, perspectives within the geography of service-dependent populations (especially homeless individuals and those with mental illness) that branched out from key insights of the book, expanding upon the concept of "landscapes of despair" in different directions, both sustaining the legacy as well as openly critiquing it. Our choice of literature combined a sample of works that explicitly cited the book (n = 108, as of November 12, 2007, ISI Web of Knowledge) with key works that clearly drew inspiration from it.

Landscapes of intolerance/revenge

Building on (and critiquing) Dear and Wolch's pessimistic predictions for the fate of service-dependent populations, this literature focuses on the dismantlement (or continued containment) of the service-dependent ghetto in most North American cities, and the persistent exclusion of services and mentally ill clients (many now homeless) from most mainstream spaces of the city. However, this landscape of intolerance/revenge is somewhat uneven and contingent on particular national and regional contexts. That is, the very existence of the service-dependent ghetto is not always evident outside of North America.

Since 1987, the trends of exclusion, dispersion, and dismantlement have only deepened across most North American cities. The pace of dismantling the service-dependent ghetto has quickened since the 1980s, to the point where many have disappeared entirely. The infamous "Hobohemia" of Chicago was whittled away in the 1980s and 1990s to virtually nothing (Hoch 1991; Wright 1997), while the Bowery District, once America's best-known "Skid Row," was unrecognizably gentrified by the early 2000s (Isay & Abramson 2000). In such locales, the intra-urban geography of mental health services has become more dispersed, following the North American trend of urban sprawl since the 1960s (Yanos 2007). Sites have become scattered, isolated, and independent, thereby losing the advantages of co-location within the service-dependent ghetto, and perhaps making it just as difficult to achieve community integration. Moreover, in some depopulating inner-city areas, human services provided by the state have been downsized from the 1970s onwards, part of a "planned shrinkage" (Wallace 1990) that aligns with the literature on urban deprivation/health, as well as stress/health among the urban poor (Ewart & Suchday 2002). However, more research is needed on the geographical implications of these potentially tectonic shifts.

For those significant service-dependent ghettoes that survived the 1980s and 1990s – places such as Los Angeles, San Francisco, Seattle, and Vancouver – there has been increased levels of containment and surveillance (Huey & Kemple 2007). For instance, skid row, Los Angeles, continues to contain a disproportionate number of service-dependent individuals, despite calls for a more equitable distribution of homeless and mental health services (DeVerteuil 2006). Figure 16.1 below shows the squalor of skid row in 2007.

For these and other cities with recognizable service-dependent ghettoes, the latter continue to structure the geographies of mental health services and service-dependent populations. In examining Winnipeg (Canada), a demographically stagnant city featuring a well-developed service-dependent ghetto, DeVerteuil et al. (2007) found that its gravitational pull extensively frames the residential and mobility patterns of individuals with severe mental illness (i.e. schizophrenia). Using a large-scale study with administrative health data and two cohorts (schizophrenia and no mental illness), it was very obvious that individuals with severe mental illness were disproportionately concentrated in the inner city where the service-dependent ghetto was

Figure 16.1 Skid Row, Los Angeles, September 2007. *Source*: Photography by G. DeVerteuil.

contained. It was also obvious that their residential movements were characterized by a drift to the service-dependent ghetto, where they became spatially entrapped (see also Smith & Easterlow 2005). As such, the cohort with schizophrenia was significantly more likely to move to the inner city from the suburbs, and significantly less likely to move from the inner city to the suburbs than the cohort with no mental illness.

Various studies have expanded on the initial premises of the geographies of exclusion that sustain these inequitable patterns, contextualizing NIMBY conflicts by documenting the processes by which communities construct client groups as different and out of place (Lake 1993; Takahashi 1997; Wilton 2002; Brinegar 2003). For instance, Takahashi (1997) illustrated the process of "socio-spatial stigmatization" with regards to the homeless and patients with HIV/AIDS. This is the mutually constitutive process whereby stigmatized populations discredit the spaces they live in, and where stigmatized places can sully populations living therein. In this way, the service-dependent ghetto reinforces the stigma of its dwellers, and vice versa. Both Takahashi (1998) and Wilton (2002) examined how race and processes of racialization intersect with community constructions of disability and homelessness. Racialization is defined as "a process through which ideological, institutional, interactive and discursive practices simplify and transform human differences into Difference" (Wilton 2002: 305). He found that the racialization of human service clients by community opponents in part served to spatially reproduce white privilege in San Pedro, California. Conversely, communities of color are less able to exclude facilities (Takahashi 1998). Figure 16.2 illustrates this pattern between race and homeless service geographies in Los Angeles County in 2000.

Only 149 of the 2055 County census tracts had even one shelter; on average, a tract with at least one shelter was 79 percent non-white, compared to the County average of 67 percent non-white, a pattern not unlike Pulido's (2000) mapping of toxic inventories. Few heavily white areas contain a concentration of shelters, with the exceptions of Santa Monica, West Los Angeles, and Hollywood.

The role of the State figured prominently in *Landscapes of Despair*, and this strand has been sustained through the role of the state in mediating NIMBY, as well as "the broader question of how costs and benefits are spatially distributed in (urban) society" (DeVerteuil 2000: 61). In particular, the use of state theory to frame NIMBY concerns has proven fruitful (Lake & Disch 1992; Lake 1993, 1994). NIMBY becomes more than just local conflict; it can be seen as a management strategy to deflect the tension over the state's balancing act between capitalist accumulation and its own legitimation crisis. As DeVerteuil (2000: 60) notes, "far from being a neutral actor, the state is heavily implicated in the instigation, management, and resolution of locational conflict. Instead of parochial turf politics surrounding supposedly necessary and beneficial facilities, NIMBY sentiments reflect deeper tensions between the state and capital."

Some research has questioned the extent to which the landscape of despair concept, and presumably its continued legacy of dismantlement, exclusion, and containment, is applicable to other locales. The place-specific, uneven, and contingent nature of the concept has been discussed by Milligan (1996, 2000), as well as Gleeson et al. (1998). Milligan emphasizes the "importance of place-specificity in the formation of locational thesis" (1996: 202). She assesses the transferability

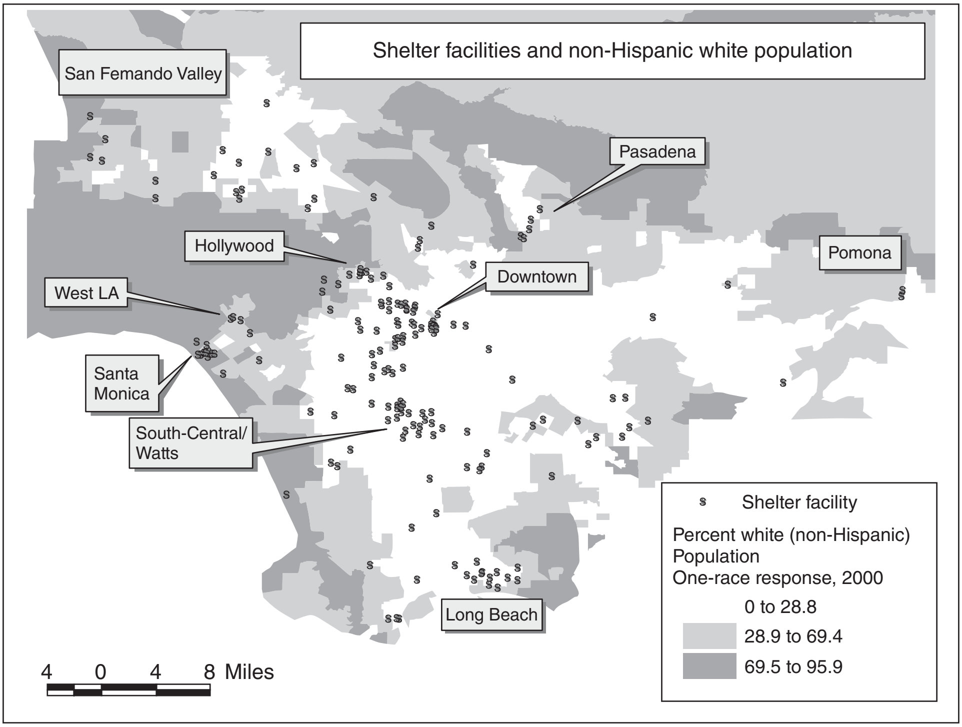

Figure 16.2 Race and shelter geography of Los Angeles. *Source*: 2000 US Census Data; Shelter Partnership (2000) *Short-Term Housing Directory of Los Angeles County, April 2000*. Shelter Partnership, Inc., Los Angeles.

of the service-dependent ghetto concept from North American cities to Scotland, and contends that there is considerable difficulty in applying the concept because the forces concentrating services and users in North America cannot be easily transposed. First, the Scottish government's strong commitment to care in the community has emboldened statutory and voluntary efforts at the regional level to disperse services and supportive housing in the community. Second, the central government's authority over planning controls effectively mutes the exclusionary influence of rejecting neighborhoods by negating their ability to pressure local planning authorities into rejecting proposals for mental health facilities or supportive housing. Third, voluntary agencies have purposefully chosen "low key" locational strategies (ex. smaller facilities) resulting in many location decisions and facilities going unnoticed (see also Veness 1994 on "designer shelters"). Finally, Milligan usefully expands on the role of facility-users in shaping service-dependent geographies by showing how spatial concentrations of service-dependent populations may reflect individual desires for social support provided by coping networks located in the central core.

Similarly, Gleeson et al. (1998) contend that the service-dependent ghetto concept is not completely transferable to New Zealand. They acknowledge that, like North America, New Zealand's deinstitutionalized landscape has been shaped by sociospatial processes such as health care restructuring, deinstitutionalization, land use conflict, demographic trends and social changes, but they disagree that New Zealand's service-dependent geographies can be characterized as "ghettos." They see little correspondence between the "zone of dependence" concept underpinning Dear and Wolch's formulation and the processes shaping the form of New Zealand's urban fabric. First, state-aided housing construction in the suburbs has structured the social geography of poverty in New Zealand's cities by dispersing the poor between peripheral enclaves. Second, New Zealand's unique racial and ethnic history has contributed to divergent patterns of racial segregation outside of the inner city. Third, low levels of inequality have tempered the scope of deprivation and need in New Zealand relative to the United States. Fourth, the creeping urban austerity that has come to dominate North American cities is less prevalent in New Zealand. Finally, urban gentrification has not involved the same level of exclusion as witnessed in North America. For these reasons, Gleeson et al. (1998) offer a more fitting description, preferring the concept of "zones of transience" to describe the level of mobility, rather than dependence, demonstrated by populations that do use services located in the inner city district.

Questions regarding the transpacific and transatlantic convergence of service-dependent ghetto formation appear to center on the divergent patterns of concentrated poverty between cities in North America (where the concept was coined) and cities elsewhere in the world. A presupposition of the landscapes of despair concept is that service agglomerations crystallize in inner-city neighborhoods in which there are already high concentrations of poverty and social dysfunction. As the examples above highlight, some have contended that cities outside of North America display different urban patterns of poverty and therefore the socio-spatial exclusion of the mentally ill and the homeless occurs against a different socio-spatial backdrop. For example, Wacquant (2008) has persuasively argued that while residential segregation and discrimination exists in France, it does not take the hyper-ghettoized form that is associated with cities in the United States. Furthermore, it is often stated that responses to urban homelessness in European countries have not demonstrated the harshness and cruelty that is associated with displacement and containment responses in the United States (Tosi 1996). This is often attributed to the fact that welfare-state restructuring has unfolded differently in Europe compared to North America (von Mahs 2001). However, recent research has shown that there are a number of emerging similarities between cities in North America and Western Europe when it comes to the socio-spatial containment of marginal populations. Comparing experiences in Berlin and Los Angeles, von Mahs (2005) has shown that like Los Angeles, homeless services in Berlin are spatially concentrated in extremely poor, stigmatized neighborhoods in the central city. While these neighborhoods do not quite resemble North American ghettos they nonetheless function as a containment mechanism.

In addition to these critiques on the transferability of the concept, others have critiqued how *Landscapes of Despair* portrayed the historical geography of the asylum (see special issues in *Health and Place* 1997 and 2000). Dear and Wolch contended that in contrast with community care, the care of the mentally ill during the asylum era was rationalized through principles of isolation and separation within a well-ordered institution, exemplified most visibly in Bentham's "panopticon" design. Philo (1989, 1997) demonstrates quite clearly how this presupposition was an overstatement. Philo uses historical examples of asylum designs to show how alternatives to the panoptic asylum such as "detached block systems" and "cottage systems" were used as models for mental health institutions and how sensitivity to these differences is important for understanding the "history of haunted places." People with mental illness were not completely isolated and excluded within closed spaces but rather were, in some cases, treated with tolerance and inclusion.

Despite these criticisms, there is no doubt that within North America, the landscapes of intolerance and revenge are part and parcel of a larger "displacement model" (Wolch & Philo 2000). This model threatens to re-institutionalize the mentally ill and other service-dependent populations, completely nullifying any pretence at community-based care or any pretence at coherent, connected service geographies. In the next section, we examine these worrying developments and how their examination builds on Dear and Wolch's original insights.

Landscapes of re-institutionalization

Building on Dear and Wolch's fears in 1987 of increasing misassignment of clients, as well as an incipient re-institutionalization, this literature focuses on the present management and control of service-dependent populations within a context of sustained exclusion, dismantlement and containment. Growing homelessness and loss of housing, indicating the initial failure in the deinstitutionalization experiment, has now given way to a second stage of failure; the "displacement model" as a new mode of "poverty management" (Wolch & Philo 2000; DeVerteuil 2003). In this model, service-dependent populations are increasingly circulated across and misassigned to informal, inadvertent, and inappropriate institutional settings (jail, prison, shelters, sober living homes, out-of-home placements, hospitals, etc.), effectively constituting an unintended *re-institutionalization* and *trans-institutionalization* of many individuals, what both Moon (2000) and Knowles (2000) called the "revolving door." We contend that at this second stage, the "landscapes of despair" (homelessness) and a new "landscape of haunted places" (re-institutionalization) have blended together, moving beyond intolerance and revenge to expediency and convenience.

The displacement model is based on a new management logic whose *de facto* techniques are largely a result of the sheer mismatch between the scale of need and the resources available to assist. During the asylum era, disruptive populations were incarcerated in supposedly therapeutic rural locales, thus becoming institutionalized and service dependent. During the community-based care era, these same populations were de-carcerated, again for ostensibly therapeutic ends, to urban neighborhoods. The current era is characterized by a more expedient model that lacks any explicit therapeutic aim (Wolch & DeVerteuil 2001). This came about inadvertently, the result of pressures that were only dimly apparent in 1987. The rise in economic marginality during the 1980s in the United States coincided with deep cuts to the welfare state as well as downloading to the local level (Wolch & Dear 1993). Cities, ever mindful of their image, sought increasingly to remove the burgeoning homeless populations from prime urban areas. Faced with greater demands and fewer resources, local service providers also "sought to minimize caseloads and costs, as well as privatize services" (DeVerteuil 2003: 361). The result was an increasingly fractured service landscape, with providers actively seeking to save money by "dumping" costly and troublesome clients –many of whom have mental illnesses- to other, non-related institutional settings. This contradicts HUD's (United States Housing and Urban Development) "Continuum of Care" model: outreach and assessment, immediate emergency housing, transitional housing with appropriate supportive services, and permanent housing or permanent supportive housing arrangements. Pinfold (2000) outlined a similar continuum that moves between high client support (hospital ward) and high client independence (living in the community). Not only is there no explicit continuum of care in this new poverty management, there is also no overarching philosophy beyond cost shedding and the removal of visibly destitute populations from the streets.

Ultimately, the displacement model has created a very complex and dispersed geography of mental health care, homelessness, and service dependency that extends to settings far beyond the hospital-based or community-based care models. This model has engendered a *de facto* re-institutionalization and trans-institutionalization among service-dependent populations. In large American cities, the everyday lives and residential patterns of homeless individuals with severe mental illness are hyper-mobile and deeply institutionalized (Torrey et al. 1992; Wolch & Philo 2000; DeVerteuil 2003). Lacking access to basic services, as well as even a firm base of operations (e.g. the service-dependent ghetto), the homeless mentally ill are churned across a bewildering array of residential and medical settings, especially between the street and the criminal justice system, the latter of which has replaced psychiatric hospitals as institutions of first resort.

An article in the *Los Angeles Times* (Marquis & Morain 1999) revealed the serious lack of treatment and shelter options for the indigent mentally disabled over the 1990s: of 2,509 patients who were released by California state hospitals on July 1, 1991, barely half of the former patients were living independently in 1999, while the rest were either in state hospitals, private rehabilitation homes, jail, or had died. A typical case was Chris Falzone, a 28-year-old schizophrenic and former surfer who has "bounced from board and care homes to hospitals, from jail cells to the streets. He has been in more than 60 facilities in 15 years." Before his most recent arrest, Falzone was living in an unsupervised board and care facility in the San Fernando Valley where he refused his medication. By one account (Kanapaux 2004), there are three times more individuals with mental illness in the prison system than in psychiatric hospitals in the United States. In fact, each of the three largest local prison systems (Los Angeles County, Cook County (Chicago), and New York City) have more individuals with mental illness than the largest psychiatric hospital in the nation. Figure 16.3 shows the Los Angeles county jail, when it was estimated to be the largest American "psychiatric" hospital in 1999 (Wolch & Philo 2000).

This misassignment and churning is compounded by the phenomenon of "dumping" patients. Recently discharged prisoners and hospital patients, including psychiatric cases, are dumped unceremoniously on Skid Row, Los Angeles, and left to their own devices. These individuals tend to be from service-poor suburbs, or hospitals looking to save money. After coverage on national TV (e.g. CNN), a California state law in 2006 made it illegal for hospitals to dump homeless patients

Figure 16.3 Los Angeles county jail: the nation's largest mental health "institution" in 1999. *Source*: Photography by G. DeVerteuil.

across city boundaries without authorization (Winton 2006). Although foreseen by Dear and Wolch in 1987, they probably could not have predicted this massive carceral shift, nor could they have imagined how this misassignment would become so entrenched and systemic.

Within this context in Los Angeles, DeVerteuil (2003) found evidence of institutionalized churning among a sample ($n = 25$) of homeless women. For these women, institutions were crucial in structuring their unstable residential patterns. Settings ranged from jail and prison to recovery homes, the street, and shelters. Many settings were highly informal, with little in the way of therapy and precious little continuity of care; some were chosen merely to avoid sleeping on the street. Institutional churning may be associated not only with the relentless pressure to cut caseloads and client costs, but other factors as well, including the lack of affordable housing options and very low welfare payments for single service-dependent individuals (DeVerteuil et al. 2002). Along similar lines in a smaller urban locale (Albany in New York State), Hopper et al. (1997) focused on how the mentally ill are churned from one institutional setting to another upon release from mental hospitals – the so-called "institutional circuit." Out of a group of 32 mentally ill patients, 20 had spent 59 percent of their last five years moving from one institutional setting to another, including shelters, sober-living homes, rehab centers, hospitals, and jails, suggesting a "durable pattern … of a life lived on the "institutional circuit" with occasional breaks for temporary housing of their own" (1997: 662).

Erratic residential patterns not only disrupt subsistence patterns, they can also foster institutional dependency, making it perhaps easier to subsist but more difficult to actually escape impoverished circumstances (Rowe & Wolch 1990; Stark 1994). The very adaptation to residential churning across varied service delivery settings can encourage individuals to "develop routines based on the availability of services … [becoming] accommodated to street life rather than directed toward disengagement [from it]" (Snow & Anderson 1993: 283). Churning also increases the potential for discrepancies between client behavior and staff expectations at any one particular setting. Aggressive patterns of conduct that proved effective in coping with life on the street or in carceral settings, including acting "tough or crazy," translate poorly into more therapeutic *milieus*, where program competency is measured in terms of participation and rehabilitation, not the ability to intimidate (Weinberg & Koegel 1995). Finally, churning also does great damage to one of the key premises of the deinstitutionalization experiment, that is to encourage client re-integration into the mainstream through his/her community. A pattern of churning effectively isolates the client from his/her former community, making this goal of community integration virtually impossible.

Knowles (2000) examined these intricate "mad geographies" in the Canadian contest of Montreal. The principal apparatus managing madness in Montreal is referred to by Knowles as "the revolving door." This apparatus is defined by the de-carceration of psychiatric patients and their subsequent movement in and out of hospitals. Knowles (2000: 38) found four categories of discharged patients:

> Those who leave under their own steam; those who are directed to homeless shelters; those who enter some kind of supported accommodation system; and those who are boarded-out, technically under the administrative/clinical jurisdiction of the asylum in a re-invention of the nineteenth-century practice of "boarding out" lunatics.

These revolving-door practices create "system nomads" who circulate between a number of semi-institutional sites in the city. In Knowles' view these sites – community mental health facilities, adult foster homes, supervised apartments and rooming houses (see Wilton 2004; Mifflin & Wilton 2005), and homeless shelters – have become the new storage facilities for service-dependent populations. A number of these emerging sites are entirely inappropriate to individuals with special needs (e.g. mental illness, physical disability, addictions), and yet we know relatively little about how clients are experiencing them. For instance, given that many homeless individuals with mental illness use street drugs to self-medicate, it seems inevitable that they will end up in some kind of rehabilitation facility (Wolch & Philo 2000): but to what effect?

Despite the downcast nature of this re-institutionalization, all is not lost. Underneath all of the gloom lies a "landscape of caring," whereby some institutions (and even the state, ambivalently) continue to support the most vulnerable members of our society such as the service-dependent (DeVerteuil 2006). Pinfold (2000) has mapped these rehabilitation pathways in the community by documenting how service users negotiate principles of normalization and integration in the process of finding or creating their own "safe havens." In the next section, we expand on this purported landscape of caring, on how it acts as a counterweight to landscapes of intolerance, revenge and re-institutionalization, and on how its contours are shaped by the agency of the service-dependent themselves.

Landscapes of care and wellbeing

The theme of care and wellbeing was the least developed in the book, and as such, considerable absences have been filled in since 1987. These efforts to infuse the legacy with a more positive tone emerge as an alternative to the negative realities of re-institutionalization, intolerance, and revenge. We address three major components: model-building approaches that advocate more spatially equitable service networks that encourage wellbeing and integration; spaces of care, in terms of both community-based service-delivery settings and the traditional in-patient hospital settings; and, agency-orientated geographies of wellbeing created through the spatial tactics of individuals themselves as they negotiate these service landscapes. This third literature in particular seeks to illuminate the fragile webs of support, dignity, and agency from the catastrophic forces engulfing the mentally ill, the disabled, and the elderly.

In their vision of a landscape of care, Dear and Wolch articulated that there should be a place where "clients would have the right to service provision in their own community and communities would have the obligation to look after their own" (1987: 255). Striving for a more equitable locational pattern for service-dependent populations, Dear et al. (1994) and Wolch (1996) have proposed planning models that simultaneously capture the economy of scale benefits of service agglomerations along with establishing a more equitable distribution of human services. The principal components of these models are service hubs and fair-share planning strategies. At the metropolitan scale, service hubs would be integrated through fair-share planning principles that could yield a "regional hierarchy and distribution of service hubs throughout the metropolitan area" (Wolch 1996: 662). Together, these planning models coordinate the geographical placement and concentration of service-dependent populations in ways that would maximize the self-sufficiency of service-dependent populations and circumvent "ghetto-like" spatial forms of service-delivery. As Wolch (1996: 664) states: "The risks to both individuals and communities of adopting a laissez-faire approach to their planning and local integration are evident: ghettoization, uncoordinated services, and mounting barriers to service access for clients; spatial injustice for community residents; and the squandering of scarce public and private resources because of service fragmentation." In her estimation, however, service hubs and fair-share planning principles have yet to be fully implemented in North American cities.

In spite of the pitfalls of service fragmentation, recent literatures have documented how community-based services can provide a caring landscape. With respect to this second component, Conradson (2003a: 508) defines a space of care as "a socio-spatial field disclosed through the practices of care that take place between individuals." Spaces of care are therapeutic environments produced by, for, and through the interest of one person in the wellbeing of another; interests that include medical intervention, as well as broader dimensions of human welfare encompassing social and emotional domains (Conradson 2003ab; Johnsen et al. 2005ab). In this regard, community-based service-delivery settings such as drop-in centers or homeless shelters can function as a therapeutic environment (Williams 1999) comprised by multiple "spaces of care," offering refuge, support and essential resources (Johnsen et al. 2005ab). In this regard, Hester Parr (2000) has usefully examined the intimate "micro-social spaces" of drop-in centers. Her examination of a drop-in center in Nottingham revealed that such spaces provide an inclusive, safe haven for those individuals who are otherwise out of place in mainstream public space. The inclusiveness of these non-institutional spaces rests in the absence of medical discourses and the collaborative efforts between clients and staff to tolerate "unusual" bodily performances and maintain a space of "license" where clients can be themselves. However, such spaces are not without their own internal spaces of exclusion, where the unusual and transgressive are established through processes of boundary maintenance embarked upon by users.

The turn towards community-based spaces of care can itself be understood as a moral geography in the sense that it has valued community-based modes of service delivery and devalued the institution. Gleeson and Kearns (2001) have thoroughly examined this moral terrain. They identify three ethical cornerstones that framed the turn towards care in the community. These were articulated by a diverse assemblage of patients, advocates, professionals, working in conjunction within a wider anti-psychiatry movement who critiqued existing custodial arrangements. First, custodial institutional care came to be seen, from a professional standpoint, as an ineffective therapeutic practice (Yanni 2007). Second, institutional care was increasingly portrayed as a neglectful, demeaning, and isolating reality that was redundant given advances in psychotropic drugs consolidated the widespread view that these institutions were a pointless violation of basic human rights and were themselves functioning as a landscape of despair (Goffman 1961). Finally, when custodial institutional care was evaluated through the lens of social justice, its therapeutic practices came to be seen as barriers to social participation and social citizenship (Gleeson 1999).

While these ethical cornerstones provided a discursive edifice for deinstitutionalization, others have suggested that the true motives lay in the cost-effectiveness of community-based care (Scull 1984). Notwithstanding the economic backdrop of the community-turn, these ethical cornerstones helped consolidate a political framework for deinstitutionalization. In doing so, however, this framework reproduced a "fundamental normative polarity" that Gleeson and Kearns (2001) contend is a barrier to fully achieving an inclusive "caring community." By demoralizing the institution as "bad" and "wrong" this political-ethical approach de-valorized key social groups with interests in institutional modes of care such as families, organized labor, and service users themselves. By devaluing institutional spaces of care that, in some circumstances, are sought out by individuals and families in distress, this moral polarity presents barriers to fully achieving the aims of community care. In response, the authors propose an alternative inclusionary framework, seeking to maximize welfare of all groups, foster social support needed for community care, and broaden the design of community care services and facilities. This would necessarily involve revaluing the institution as an acceptable mode of care and re-moralizing affective relationships generated within.

Several cases from around the world demonstrate how the institution, despite its demoralization, has resisted outright extinction. A number of idiographic studies of single private institutions have shed light on the survival of the "asylum idea" in mental health care (Joseph & Kearns 1996; Joseph & Moon 2002; Moon et al. 2005, 2006). These studies have problematized the public–private and asylum–

community boundaries in mental health care provision in Canada, the United Kingdom, and New Zealand, suggesting these boundaries have been treated too simplistically. Joseph and Moon (2002) have examined the institutional survival of Homewood, a private, residential mental health care facility in Ontario. Homewood's survival hinged on the ability of its private operators to reposition its services between shifting treatment modalities, commercial opportunities, and government legislation. The authors see the persistence of Homewood as suggestive of the remaining but ideologically unpopular public support for in-patient residential care. The persistence of privatized institutional care is perhaps less surprising when one considers the growing acceptance of public–private mixing in the delivery of health care, the symbolic presence of institutions, local attachments in host communities, the desire amongst the affluent to avoid service ghettos, and the relative flexibility and adaptability of private-sector organizations. Moon et al. (2006) see the survival of these institutions as indicative of a revalorization of confinement in the post-asylum landscape. These developments have seen the "(re)mobilization" of therapeutic landscapes as modes of mental health care, and reflect attempts to make institutional residential care more fashionable in reaction to negative attitudes towards community and hospital modalities of mental health care. As Moon et al. (2006) point out, the notion of the "removed location" and its associated concealment and seclusion are marketed as selling points. Together, these developments represent the re-valorization of institutional care, a significant development when considered alongside the negative connotations of the public city.

The final component of landscapes of care and wellbeing is the recognition that service-dependent populations strategically adapt and take "care of themselves" creating their own identities and geographies of wellbeing in the process. This literature emerges from critiques that *Landscapes of Despair* downplayed the agency of the service-dependent, especially the homeless. Ruddick (1996: 194) states: "They [Dear and Wolch] are sympathetic to the homeless, but construct a theory of power over the homeless, not of power for the homeless. They focus on the way stigma and marginality are reinforced by a particular logic of ordering space, rather than on the attempts to confront this marginality and stigma." Wright (1997: 53) concurs:

> The term *service-dependent ghetto* implies that the type of space produced concentrates and controls in a "total" manner those who receive services there. In fact service-dependent ghettos may be thought of not as a homogenous terrain of surveillance and discipline, but rather as a terrain that is fractured, open to the possibility of resistance. The manner in which Dear and Wolch (1987) chose to analyse the treatment of service-dependent populations privileges a view of spatial power as overwhelmingly dominant and powerful, with little, if any, room for local resistances, fractures, or alternative spacings.

If one landmark contribution of *Landscapes of Despair* was to show how social and spatial forces impact upon the spatial distributions of ex-psychiatric patients and other service-dependent populations, then one legacy of the book is the stream of subsequent research that has since mapped various "alternative spatialities" and "agency-orientated geographies of embodied everyday lives, experiences, identities and imaginings" (Parr and Butler 1998: 183). Within this legacy, we can also criticise the book for its outdated and oppressive vocabulary of disability and impairment, particularly the term "service-dependent" (see Dorn 1994; Gleeson 1999).

By rescuing the active role of homeless individuals, Ruddick (1996) offers an important critique of the service-dependent ghetto concept. In response to the lack of agency in Dear and Wolch's account, she focuses on the constitutive role of space, a medium through which marginality and difference are potentially expressed, confronted, and negotiated. She demonstrates how the stigmatization of homelessness is resisted through the tactics of homeless people and through service arrangements, both of which are embedded within ongoing urban processes of redevelopment, exclusion, and entrapment. The use of tactical subversion through space is a mode of resistance whereby "the homeless create heterotopias, impossible life spaces which graft the subverted meaning of one activity onto the structure of another" (1996: 194). Through "tactics of invisibility" the homeless resist by blending in to conceal homeless identities whereas through "tactics of rupture" the homeless subvert the meaning of spaces and in doing so affirm their marginal identities. In her focus on homeless youth in Hollywood, Ruddick demonstrates how they were able, through multiple tactics, to create their own spaces of survival, which then prompted service providers to locate near their clientele. In effect, service providers adapted to youth subcultures in Hollywood. This is the exact opposite of the service-dependent ghetto, whereby people drifted towards a space already prepared for them. In the case of homeless youth in Hollywood, their tactical insurgencies forced a reconfiguration of service networks "suturing" together new meanings in the process (Ruddick 1996).

A number of geographers have examined the lived geographies of community mental health care, focusing upon the day-to-day struggles, strategies, and negotiations embarked upon by individuals navigating spaces of care and support in the community (Kearns & Taylor 1989; Parr & Philo 1995; Parr 1997; Parr & Butler 1998; Knowles 2000; Parr 2000). By demonstrating how formal and informal places in the community come to constitute "madness in the city," these literatures have illuminated the varied role of place in reproducing mental wellbeing, a topic left unexamined in works such as *Landscapes of Despair*. This scholarship has veered away from issues of facility location to the role of micro-spaces in processes of identity formation and wellbeing. Parr's work in particular has cemented an alternative approach to the spatiality of mental illness, one that is sensitive to the embodied experience of "mad identities" and local "mad geographies." Parr (1997: 442) stresses the strategic importance of "insane spaces": "spaces of relative freedom – ones unconstrained by diagnosis and behavioral coding," where people can simply be themselves on terms of their own. These spaces often involve a "temporary occupation of particular areas of the city (such as parks or city squares) in which people feel able to perform and to display such mad behavior, usually in order to avoid psychiatric regulation or arrest" (Parr 1999: 684). The notion of insane spaces is important because it represents an alternative geographic perspective to that which came before, mental health geographies that uncritically adopted medical diagnoses and categorizations for exploring the spatial patterns of ex-mental patients (Parr & Butler 1998).

Part 4: Conclusions and Future Research

One theme that can be drawn from the review is that responses to urban homelessness and mental illness have been two-sided, consisting on one hand of the regulation and control of the street-dwelling poor and the service-dependent versus acts of care, rehabilitation, and support on the other. Emerging research is beginning to engage with the ambiguity between these seemingly opposed poles. For example, Laurenson and Collins (2007) evaluate local government responses to homelessness in New Zealand, finding that where punitive responses are applied, somewhat ambiguously but effectively, a host of supportive responses are also emerging to signal a possible shift in the tone of urban poverty management regimes.

DeVerteuil et al. (2009) deepen this analysis by pointing to how different places produce different, varied responses to the homeless presence, such that landscapes of landscapes of intolerance, revenge, and re-institutionalization are not inevitable. The Canadian example speaks to this geographically contingent set of responses. On the one hand, Canada enjoys a stronger safety net and federalized homelessness plan than the United States of America, thus "producing" fewer homeless people per capita than its nearest neighbor (Glasser et al. 1999). On the other hand, Canada has apparently embraced aspects of a US-inspired punitive response to the problems of street homelessness. Even so, the recent application of anti-homeless ordinances has been very uneven at the provincial level, with some provinces (e.g. Ontario, British Columbia) adopting "Safe Street Acts" (Collins & Blomley 2003) while others (e.g. Manitoba, Quebec) have yet to move in this direction (Leo & August 2006). The Canadian case is further complicated by fact that, other than a few high-profile cases, the enforcement of such ordinances has by no means been automatic or heavy-handed.

Others preach caution suggesting that regulatory responses and caring responses are perhaps two sides of the same coin. For example, May et al. (2005, 2006) observe that the "roll-back" of the welfare state that contributed to the rise in street homelessness has been responded to by Britain's New Labour government with a more recent "roll-out" of programs targeting visible rough sleepers, many of which aim to increase the supply of emergency accommodation. These programs have been accompanied by tighter restrictions on the voluntary sector and little emphasis on quality of care, leading May et al. (2005, 2006) to question the extent to which these shifts mark the contours of the "creeping shadow state."

The ongoing tension between care and control in the context of shadow state politics is perhaps most evident in the evolution of the displacement model. Lacking any therapeutic rationale and motivated largely by convenience, the "hot-potato" logic of the displacement model is turning out to be incredibly expensive for cash-strapped local governments (DeVerteuil 2003). As a result, new therapeutic rationales such as harm reduction and organizational strategies centring on partnership and collaboration are being pressed into service. The justification for such practices are the dignity and wellbeing of clients but on another more veiled level is the neoliberal specter of cost-savings and system efficiencies hovering nearby. In cases such as these the therapeutic, the managerial and the regulatory – the state, the voluntary sector and the service-dependent themselves – become conflated. Future research is needed to tease out these conflations.

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Chapter 17

Representing the Un/healthy Body

Susan Craddock and Tim Brown

Introduction

Recent media images of SARS, AIDS, and avian flu have made more apparent than ever the critical role representations of bodies play in our understandings of disease, and by default, of health. Photographs of Chinese tourists to Toronto, Vietnamese chicken farmers, or urban gay communities signal transmission routes of pathogens through mobile bodies, the role of social and economic practices in epidemics, and the kinds of bodies at risk for particular diseases. Yet many scholars inside and out of geography in recent years have critiqued such images for lending as much misunderstanding as understanding to diseases, populations, and geographic regions by providing selective information or perpetuating stereotypes of people and places in the midst of documenting pathogenic transmission. In this chapter, we examine representations of diseased and healthy bodies over time and place as a means of situating wellbeing or its absence within a set of social, ideological, and geopolitical relations.

Representing particular kinds of bodies as diseased or healthy is not new to recent epidemics. Historians of colonial medicine have pointed out that constructing "native" bodies as either more or less susceptible to disease and as less hygienic, formed important foundations for subsequent colonial policies regulating labor, settlement patterns, and health care in areas of Africa and Asia (Packard 1989; Arnold 1993; Anderson 1996). Other historians and historical geographers have analyzed examples within the United States and Europe of ascriptions by public health authorities and others of disease or deviance to particular communities, paying close attention to the impact these representations have on perceptions of populations and the places in which they reside (Cresswell 1996; Brown 1997; Craddock 2000; Shah 2001). Another line of inquiry examines notions and representations of healthy bodies and how these have changed over time.

What is revealed in this area of inquiry are the ways in which ideas regarding the "normal," healthy body are presented alongside, and are interwoven with, representations of the diseased "other." Although the construction, or perhaps production, of the healthy body is long-standing (Foucault 1985; Turner 1992), scholars have revealed that there is a close association between the emergence of a "physical culture," from the late nineteenth century onwards, and the key processes associated with modernity (Whorton 1982; Matless 1998; Hau 2003). It is also apparent that the conceptualizations of the healthy body that emerge in this period have a distinct gender dimension and that such representations were often closely connected to anxieties over the health and wellbeing of the nation (Gagen 2004; Zweiniger-Bargielowska 2006). These are themes that will be picked up and explored as issues both of the past and, perhaps most importantly, of the present.

For many of these scholars, Foucault's work on the body as a site of particular regimes of knowledge and power relations has been pivotal in shifting focus towards the kinds of technologies utilized in producing differential understandings of bodies as well as the larger systems of governance at the heart of representational practices (see Foucault 1965, 1977, 1978, 1985). Unlike Foucault, however, most of these scholars recognize that racialized, gendered, impoverished, and other marginalized bodies more often are the subject of representational practices and their contestation, and ask critical questions about the mechanisms, politics, and implications inhering in these discursive-material domains. Although acknowledging the significance of Foucault's oeuvre, this chapter draws, then, on this much broader range of scholarship, from both within and without geography, to consider the ways in which bodies, whether sick or well, healthy or unhealthy, are represented and to explore both the meaning and significance of such representations.

Representing health: from "fitness" to "fatness"

As a way into the themes to be explored in this section, we turn to the work of Sander Gilman and, in particular, to his discussion of the "body beautiful" in *Images of Difference* (1995). This discussion is framed by Gilman's examination of the visual representation of AIDS in a wide array of public health posters that were targeted at different "at-risk" populations and produced in various national contexts. As Gilman reveals, the images used appear very different from those that emerged at the onset of the epidemic, which, as he noted in his earlier work, shared much in common with the iconography of the syphilitic (see Gilman 1988: 248–57). Indeed, what is interesting about the posters is that they build upon, perhaps even distort, what Gilman regards as the "classic model of "health/beauty" and "illness/ugliness"… that accompanies any representation of the ill or healthy body" (1995: 119). Put more explicitly, the target audience for the posters was confronted with images of bodies that represented health, vitality, and wellbeing as well as those that alerted them to concerns over disease, decay, and death.

Gilman offers a comprehensive explanation for this shift in or, perhaps more appropriately, corrective to, dominant representations of AIDS in the mid-to-late 1980s (see Gilman 1995: 119ff.). The question that arises here, however, is the significance of such representations of the "body beautiful" for health and medical geographers. As Dorn and Laws suggested, some time ago now, one of the key tasks for a reformed medical geography was the need to develop a more nuanced understanding of the body – to engage, empirically and theoretically, with it (1994; see also Hall 2000; Parr 2002). More specifically, Dorn and Laws encouraged health and medical geographers to build upon scholarship that had made the body an explicit focus of inquiry – though Dorn and Laws privileged the insights of the philosopher Merleau-Ponty (1940), we could also add the scholarship of sociologists (e.g. Bourdieu 1984; Turner 1984; Featherstone et al. 1991; Shilling 1993) and feminist theorists (e.g. Butler 1990, 1993; Haraway 1991; Young 1991) amongst others. Although we have some reservations about the extent to which this has been achieved, it has to be acknowledged that a concern with the body has emerged within, and on the fringes of, the sub-discipline. For example, attention has been paid to the normalizing of the "able" bodied, particularly within western society, and to the implications of this for the ways in which individuals with physical impairments are *dis*abled (see Chouinard this volume). Another significant area of scholarship has focused on the disciplining of the "mad" body within specific institutions and the more recent emergence of alternative spaces of care for those with emotional and/or mental health problems (see Davidson and Parr this volume).

There are, of course, other areas of research that are of interest to health and medical geographers, including, but not limited to, work that has focused on issues relating to gender (see Longhurst 1995; Moss & Dyck 2001, 2002), sexuality (see Brown 2000, 2006; Del Casino 2007), and bio-technology or bio-geography (see Katz & Kirby 1991; Spencer & Whatmore 2001). As Greenhough and Roe (2006) note, research in this latter area focuses on the complex boundaries between an externalized nature and the human body and explores the transformative possibilities offered by bio-technology (see for example Hall (2003) on genetic mapping, Parry (2004) on "bioprospecting," and Greenhough (2006) on the commodification of bio-informatic derivatives). There is, then, a growing volume of work on the body within health and medical geography. This chapter certainly writes into this scholarship, as we explore the construction of the healthy/unhealthy body and how it has been constituted as such in different temporal and spatial settings. However, we also recognize that for some of the scholars mentioned above, and especially those who write under the heading of (post)medical geography (on which see Parr 1998; Andrews & Evans 2008), the body is both a representational *and* a material entity. Stated differently, the body is identified by some as having a materiality that is "not reducible to cultural meaning" (Jacobs & Nash 2003: 275, cited in Colls 2007: 354). Such research acts to remind us that bodies are not the passive or docile objects they appear to be in some constructivist writing; rather, they are lived and experienced in ways that often run counter to the discourses that seek to construct them as "other" (see Longhurst 2005; Colls 2004, 2007). In the sections that follow, we draw on such insights to enhance our reading of the "fit" and the "fat" body.

(Re)producing fit and muscular male bodies

According to Bordo, the moral coding of the body within the contemporary period represents the "culmination of a developing historical change in the social symbolism of body weight and size" (1993: 191). As she notes, up until the late nineteenth century social representations of the body were closely associated with notions of class, race, and gender. Thus, in mid-nineteenth-century Britain the bulging stomach of white middle-class men remained a sign of bourgeois commercial success as compared to the slender figure of the aristocracy who were seen as being disdainful of such corporal displays of wealth and power; and these fat/slender bodies stood in stark contrast to muscular ones, which were often associated with proletarian status and increasingly infused with racial meaning. While we should treat such sweeping generalizations with some caution, it is apparent that by the turn of the century the social symbolism of bodies such as these, whether fat, slender, or muscular, was beginning to change (Bordo 1993).

Bordo is not alone in making this observation. However, as we do not have the space to consider the full breadth of this scholarship we shall, instead, focus on a specific aspect of it: the normalizing of the fit and slender male body. Here we turn to recent research on "reducing" and "physical culture," both of which are seen as responses to the kinds of lifestyle promoted by cultural, economic, and social processes associated with the mid-to-late nineteenth and early twentieth centuries. What is interesting about this response is that it was linked with a fear of population "degeneration," which is a fear that, in the British context at least, is most often thought about in terms of persistent poverty, wretched living conditions, and the production of the kinds of emaciated urban bodies that littered contemporary social commentary. Further, as scholars of colonial medicine reveal, this fear was also inspired by concerns over the impact of the tropical climate upon European bodies; whether in distant imperial territories or, as Bewell notes, in the hot and humid spaces of the Victorian industrial landscape (see Arnold 1996; Bewell 1996).

Yet, as Zweiniger-Bargielowska explains, our reading of degeneration should not be limited in this way: "Anxiety about degeneration continued to be associated with persistent poverty, but commentators also drew attention to the dangers of excessive consumption of unhealthy, highly refined diets especially in combination with sedentary lifestyles" (2005: 246). For Zweiniger-Bargielowska, this anxiety resulted in the production of a discourse focusing upon the bodies of middle-class, middle-aged men (see also Zweiniger-Bargielowska 2006, 2007); as she notes, the waistline came to represent a "site of conflict between different types of masculinity" (2005: 244). This discourse was extensive, ranging from popular publications such as Eugen Sandow's magazine *Health and Strength* (1898ff.) and Frederick Hornibrook's *The Culture of the Abdomen* (1924), to the research and public commentary of an array of medical professionals and alternative health specialists. In spite of the variety of voices contributing to this public discussion of the male body, Zweiniger-Bargielowska suggests that this discourse coalesced around the notion of the ideal male body. Moreover, she highlights the ways in which this period saw the re-coding of the corpulent male body as "other" and the subsequent emergence of the fit and muscular body as the desired/desirable norm.

The extent to which this re-coding occurred is usefully illustrated through reference to the publicity surrounding the launch of a national health and fitness campaign in Britain during the late 1930s (see also Grant 1990; Matless 1995). This campaign, which began in the autumn of 1937, was in part a response to the anxieties over the physical deterioration of the population mentioned above and also to the perceived failure of the nation's athletes at the 1936 Olympic Games in Berlin. Moreover, it reveals the extent to which "[f]itness was central to the vocabulary" of Britain at this time (Matless 1995: 109). Whatever the stimulus for the campaign, and other factors would have included the increasing commercialism of "healthy"

When everything depends on FITNESS the choice is 'OVALTINE'

The NATIONAL Beverage for NATIONAL FITNESS

IT is significant that in the greatest feats of endurance during recent years 'Ovaltine' has been chosen to play an all-important part.

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Let 'Ovaltine' help you to play your part in making a Fitter Britain. And remember, in your quest for health and vigour, the primary importance of proper and adequate nourishment.

By making 'Ovaltine' your regular daily beverage you ensure that your dietary is complete in health-giving nourishment. For 'Ovaltine' contains, in unequalled abundance, the protective and restorative vitamins and every other vital food element required for building-up body, brain and nerves. But be quite sure it *is* 'Ovaltine.' There is definitely nothing "just as good."

Famous Explorers. Mountaineers, Record-breaking Flyers and Athletes consistently rely on 'OVALTINE'

'Ovaltine' has accompanied some of the most memorable Polar Expeditions.

In the London-Melbourne and other remarkable flights, all competitors carried 'Ovaltine.'

'Ovaltine' was taken by the Mount Everest Expeditions of 1933 and 1936.

In the Six-day Cycle Races in London and overseas, the riders trained on 'Ovaltine' and used it during the race.

'Ovaltine' was used in the training camps at the Olympic Games of 1932 and 1936.

P.337A

Figure 17.1 An advert for Ovaltine published in a special edition of *The Times*, London. *Source*: *The Times*, September 30, p. vii, 1937. Reproduced with permission from R. Twining and Company Limited.

products and the particular vision of masculinity associated with British imperialism, of interest here is the way in which socially valued personal characteristics were represented by a specific bodily ideal. By way of an illustration, consider the adverts taken from an edition of *The Times* devoted to the campaign (see Figure 17.1). As they reveal, commercial enterprises not only sought to take advantage of the nation's growing passion for exercise, they also associated the physically fit male body with notions of "endurance," "vitality," "vigor," and "health."

During this period, then, a physically fit, slender but muscular male body became "imperative to hegemonic masculinity" (Zweiniger-Bargielowska 2005: 245). Clearly, it is important to recognize that this image is contingent upon both space and time; indeed, as Grosz argues, "[e]very body is marked by the history and specificity of its existence" (1994: 142). Despite this, it is possible to argue that this particular embodiment of "healthy" masculinity remains the most valorized within western, and increasingly non-western, culture (see McCormack 1999; Monaghan 2001). It is also necessary that we acknowledge that it is not only the adult male body that was, and remains, subject to such representational discourse. Therefore, in the following section we take a closer look at the imperative for women to themselves conform to cultural ideals regarding the shape and size of their bodies. Here we again examine those bodily types that are constituted as "normal" and "healthy" for women. However, we seek also to move beyond the representational by referring to research that seeks to explore critically the processes through which women (and for that matter men) come to embody these norms.

Problematizing the slender female body

Writing a little before the publication of Bordo's (1993) seminal *Unbearable Weight*, Carole Spitzack referred to the notion that there exists an "aesthetics of health" which necessitates that women monitor their "weight, bulges, muscle, skin tone and texture" (1990: 42). Further, she argued that these are only a few of the dimensions of wellbeing to which women are required to attend as there are "[i]numerable aspects of women's bodies and women's lives… [that are made] both visible and problematic in the discourse of health" (1990: 42). Though we would argue that the imperative placed upon women to monitor their bodies is not limited to discourses of health (see Nichter & Nichter 1991; Bell & Valentine 1997), it is clearly the case that in the very production of a set of beliefs regarding the ideal body, whether female or male, bodies or bodily parts that do not appear to fit this culturally defined norm are problematized. For most, though as some scholars acknowledge (Nichter 2000; Gremillion 2005), certainly not all, women living in the west this means conforming to what Chernin (1981) referred to as the "tyranny of slenderness."

There is, according to Bordo, an identifiable time-scale to the emergence of this tyranny. As she notes, though there is a long history to dietary regimes and other forms of bodily maintenance, it was not until the late Victorian period that large numbers of women "began systematically to deny themselves food in pursuit of an aesthetic ideal" (Bordo 1993: 185). Moreover, she recognizes that it was not only through diet or other "slimming" technologies that women sought to achieve this supposed ideal; indeed, if we return once more to the special edition of *The Times* referred to above we find a useful illustration of this. In an article published under the headline "Physical Culture for Women," Prunella Stack, the leader of the Women's League of Health and Beauty, which was established by her mother Mary in 1930, stated that women do not want "either enormous strength or unyielding muscle"; rather, they desire "grace, elasticity, poise, and, above all, beauty in its deepest sense, the beauty that emanates from exuberant, positive health" (1937: xvi).

As this extract suggests, individuals like Stack promoted a vision of the healthy female body that was quite distinct from that of its male equivalent; with prominence given to such characteristics as "grace," "elasticity," and "poise." The question is how this particular vision of female health and beauty was to be attained. In the following passage, Stack provides a brief outline of the kinds of self-production techniques promoted by the Women's League of Health and Beauty to achieve just that: "this system begins by establishing the "steady centre"… from that pivotal point, it stretches and swings the body in groups of rounded, rhythmic exercises performed smoothly and in continuous movement – namely, without jerk." In so doing, Stack suggested, women would make their "abdominal muscles elastic, not hard" and impart the "slimness and strength at the centre of the body which are universally considered desirable because they are an outward and visible sign of health within" (Stack 1937: xvi). From this illustration, then, we can see that emphasis was placed upon continuous "rhythmic" movement, upon "swings" and "stretches" that encouraged the development of "elastic" rather than "hard" abdominal muscles and ultimately the universally desirable, slim female body.

Stack and the Women's League of Health and Beauty were not alone here, as other researchers have identified the women's physical culture movement was, like the men's, thriving in the 1920s and 1930s (see Zweiniger-Bargielowska 2001). Moreover, as Gagen reveals, the "gestures and movement of rhythmic dance and gymnastic routines" were the most popular forms of physical training for girls as well (2004: 432). What is interesting about this particular discourse on the slender body is that the shape produced by such practices would, as Bordo comments, "now come to seem fleshy" and perhaps far from the current ideal (1993: 59). Although this highlights that an understanding of the spatial and temporal context within which such bodies are produced is crucial, the fact remains that the slender body, whatever its exact size and shape, is still considered the norm for women within most western societies. Further, it is a norm that is not only associated with a particular aesthetic look but with a "healthist" discourse, which equates health with a slender body shape achieved through exercise and other reducing and toning techniques (see Kirk & Colquhoun 1989; Lupton 1996; McCormack 1999).

We wish to bring this section to a conclusion by considering, albeit briefly, recent geographical research that has begun to engage with this particular representation of this normative female body a little more critically. The initial point to be made here is that it has long been established that the norms to which (wo)men, and, of course, children and young adults, are encouraged to aspire are not "simply imposed on the individual from outside; they do not function coercively but are sought out" (Grosz 1994: 143). In this sense, many of the bodies that we observe around us, especially those that seek to adhere to dominant cultural norms associated with a particular "epistemic configuration" (Gagen 2004: 424), are often the result of embodied practices performed by individuals on themselves. Yet, despite such action, it is apparent that people are rarely able to achieve the idealized representations of bodies with which they are faced and, perhaps as a consequence, are often dissatisfied with the shape and size of their bodies (see Longhurst 2005; Evans 2006).

Why should this matter to health and medical geographers? In a recent commentary on the contemporary discourse on obesity, Lee Monaghan stated that "the highly publicized "obesity debate" often focuses upon proposed "solutions" to a taken-for-granted "problem" (or apocalyptic problem in the making) rather than questioning the construction of fatness" (2005: 303). In seeking to qualify his intervention in this debate, Monaghan also thought it necessary to state that, although he was not claiming that " 'being fat' is beneficial to health," there are "many critical arguments that need to be considered as part of this debate." Monaghan's concern that "critical arguments" are being overlooked, might also be raised in relation to much of the health and medical geography research. There are some notable exceptions to this. For example, Bethan Evans (2006) has begun to unpick the moralizing narrative that surrounds the construction of the "fat" body and to consider the impact of this discourse on the willingness or otherwise of young girls to participate in sport (Evans 2006).

In addition, Rachel Colls (2007) has called upon geographers to move beyond the representational and consider the value of "materializing bodily matter." More explicitly, she draws on the concept of "intra-action" to offer a critique of Judith Butler (1990), Grosz (1994) and other such Foucauldian-inspired scholarship which is regarded as constructing bodies as the passive objects of discourse. This is a long-standing criticism of such scholarship and one which these authors do not necessarily hold with. That said, we tend to agree with Colls when she states that we need to acknowledge the "capacities that fat bodies have to exceed their discursive representations" (2007: 358). Thus, we draw attention to the work of Colls because it would seem to us that it offers interesting ways forward for geographers concerned with notions of health and wellbeing, especially as they relate to the body. Moreover, it is possible that research focusing on the ways in which individuals experience their bodies, and the emotional relationships that they forge with them, might also help in the development of a research agenda that is cognizant of the ethical dangers associated with an obesity discourse which reinforces, albeit implicitly, the suggestion that "thinness is the desired goal" (Rich & Evans 2005).

Representing the "Sick" Body

As suggested by the obesity discourses above, one of the key ways of studying social parameters of normativity and the mechanisms for enforcing them is to look at representations of "sick" bodies. By this we do not mean simply images or understandings of bodies that are diseased; we mean a much more expanded investigation of bodies depicted as undesirable, impure, or deviant at various moments in time and place. As evidenced above by the shifting meanings of body thinness, obesity, or fitness, we also emphasize that discourses of the "sick body," as the healthy body, stand at the conjuncture of ideological, economic, and political forces producing sometimes primary and sometimes multiple and competing discourses of what is "normal" and what is "pathological." Foucault's *History of Sexuality*, vol. I (1978), is seminal for example in recognizing understandings of particular types of bodies or behaviors as dynamic processes that must be read through, and which only gain meaning under, specific modes of governance. Specifically, he traces the transformation of homosexuality into deviance – one variation of the "sick" body – through sovereign tactics of regulating desire during the development of the modern western state and its attendant requirements for controlling and harnessing populations. The anthropologist Mary Douglas in her ethnographic work similarly understood rituals for purifying the body as social mechanisms against the dangers of defilement or "matter out of place," a critical part of the semiotic and material ways of organizing daily life (1966).

The scholar who has perhaps done more to make visible the situated understandings of deviance and sickness is Sander Gilman, to whom we return. Through several works (1985, 1988, 1995), Gilman argues that iconographies of disease, madness, and deviance play critical roles in depicting as well as producing meanings of the "other." Whether focusing on photographs, paintings, or medical illustrations, Gilman argues compellingly that representations are key to deciphering the often divergent but related social understandings versus medical definitions of what is pathological. They portray not the "realities" of disease, but, rather, the social understandings of what constitute realities of illness and pathology. Unlike Foucault, who focuses more on understanding madness, disease, and deviance as integral parts of particular regimes of knowledge and governance, Gilman focuses attention on universal reasons why societies create the "other" in part through depictions of illness. It is worth quoting at length from the introduction to his book *Difference and Pathology* (1985) to provide the core of how Gilman explains varying associations and contours of the pathological:

> Our understanding of the pathological is rooted in an awareness of the human organism's fragility – not simply its mortality, though that has always and everywhere inspired fear of the ultimate loss of control, but its susceptibility to disease, pollution, corruption, and alteration, things that we experience in our own bodies and observe in others. Every group has laws, taboos, and diagnoses distinguishing the "healthy" from the "sick." The very concept of pathology is a line drawn between the "good" and the "bad." This accounts for the power that metaphors of illness have. (1985: 23)

A few of Gilman's points need highlighting before going on to some examples of the representation of "sick" bodies. First, Gilman mentions here, and elaborates elsewhere (1988), that notions of the pathological hinge upon control (over bodily functions, behaviors, sexual appetites, death) and the consistent evidence of its loss. Regaining ground against the fear induced by loss of control frequently means attributing greater means and mechanisms of control to certain groups, while ascribing less control to other groups (1988). Those with expanded capacity to produce knowledge, such as physicians, public health authorities, and lawmakers, typically then play pivotal roles in shaping understandings of the pathological, including through various representational means. And finally, Gilman makes the critical point that understandings of the pathological are never neutral. Within representations of illness, madness, or disease, iconographies of deviance are always present and understood within the specific political ideologies of a given time and place. These iconographies are sometimes subtle and sometimes explicit codes referencing both the "who" in ascriptions of pathology, as well as the coordinates of "why" the pathological are undesirable.

Though Gilman consistently focuses on the significance of race, ethnicity, and sexuality in the production of pathologies, other scholars have extended his analyses to encompass critical race, queer, and feminist theories probing the interactions of social constructions in shaping understandings of the "sick" body, and the material and symbolic implications of these understandings for those produced as pathological (Daniel & Parker 1993; Waldby 1996). As suggested above, more recent scholarship has also brought attention to the various means of contesting or appropriating representations of deviance, a critical extension to more one-sided discussions of pathological ascription. One example of a pivotal appropriation of representational tactics came early in the AIDS epidemic in the United States. Angered by the timidity of commercials produced by the Department of Public Health intended to promote safe sex among urban gay communities, the San Francisco AIDS Foundation countered with a poster depicting through the representation of a robust, healthy, and well protected male body the mechanics of condom use as well as their importance in preventing HIV. In doing so, they sent a clear message to a largely homophobic federal administration that gay communities were strong and visible, and that gay sex needed to be dealt with in terms that resonated with gay communities rather than treated them as deviant. More recently, at the 2004 International AIDS Conference, there was a prominent photographic exhibit showing how Nairobi sex workers, deemed "reservoirs of infection" by epidemiologists early in the AIDS epidemic, were upending this ascription by using their work to show clients that safe sex could also be fun sex. The series of oversized photographs depicting professionals with their partners engaged in various acts of foreplay consistently featuring condoms as well as other accessories (like cowboy hats) sent a clear message in a very crowded hallway at a major international conference that representations circulated through medical journals could be very explicitly countered by other representational means.

Work by geographers has brought attention as well to the ways space and place are both utilized and produced in representations of deviance, interpretations of disease, and its intervention (Brown 1997; Craddock 2000). Others have analyzed "geographies of exclusion" (Sibley 1995) as sometimes explicit, but often hegemonic, ways of shoring up dominant understandings of normativity pivoting around fault lines of race, sexuality, class, or gender (Valentine 2000). Finally, as will be discussed further, geographers are also highlighting the implications of global economies, foreign policies, and population mobility to the production of actual "sick bodies" infected with tuberculosis, SARS, or HIV (Davis 2005; Ingram 2007; Ali & Keil 2008). Before moving on to these issues, we extend our reading of the representational, firstly, by exploring the co-production of "sick" bodies *and* "sick" places within colonial contexts and, secondly, by considering the ways in which such representations are politicized.

Sick natives, contagious places

The turn of the twentieth century in the United States, Britain, and elsewhere saw not only the construction of fit bodies as evidenced above, but also the concomitant production of sick bodies as well as diseased places in the course of global expansion of empire and scientific exploration. As many historians have pointed out (Curtin 1989; Anderson 1996; Bewell 1999), the expansion of a western presence in areas of Africa, Asia, and South America brought with it transformative encounters with native populations and places. Disease was predominant in the discourses ensuing from global expansion, as malaria, dengue fever, and other maladies were experienced extensively while tropical heat exacerbated the suffering. In attempting to get beyond this contradiction of western domination and corporal vulnerability, physicians played a key role by formulating theories of disease susceptibility and acclimatization. And as the medical historian Warwick Anderson attests, in doing so "they mixed a potent brew of race theory, geographical pathology, and global politics" (1996: 63).

Representations of immigrant populations as pathological in addition to highly diseased were then not surprisingly rampant in the United States during the same time period. When smallpox struck San Francisco in the late 1800s, the Chinese community, already considered deviant in their domestic and sanitary practices by public health authorities, were immediately blamed for the epidemic despite tenuous epidemiological evidence (Craddock 2000). Eastern European Jewish immigrants were similarly blamed for high tuberculosis rates in large Midwestern and East coast cities (Leavitt 1982; Kraut 1995). These last examples attest in particular to the frequent imbrication of higher burdens of disease among poor and marginalized populations with representations of "sick" (i.e. pathological) bodies. Returning to one of Gilman's points, they also evidence the importance of illness metaphors to constructions of race, deviance, and social marginalization, a point that will be further elaborated in the case of representations of AIDS.

Political anatomies of a new syndrome

AIDS, as noted by Paula Treichler (1999), has been an "epidemic of signification" from the beginning of its visibility in the late 1970s. Its apparent provenance within North America in gay male communities, the initial understanding of it as sexually transmitted, the fact that it was the first infectious disease in almost half a century that modern medicine could not immediately decipher or contain, and its devastating progression through the body all converged to produce understandings of AIDS that rested as much on social bias and fear as on epidemiological observation (cf. Oppenheimer 1992). We do not have the space to tackle the vast literature on representations of AIDS, so for the purposes of our discussion a few examples will suffice. The earliest western images of AIDS patients as white urban gay men were joined soon by depictions of women clearly coded as "prostitutes." This shift in the iconography of the sick AIDS body occurred in part as more cases became apparent globally, and as more cases grew among women.

Yet, the particular focus of representations on the sexually "deviant" female as the dangerous source of infection also invoked longstanding iconographies of syphilis (Brandt 1987; Gilman 1988). In the World War II-era anti-VD poster "She May Look Clean" (Figure 17.2), for example, the woman is depicted as the "girl-next-door" type who looks sweet and innocent but instead – as indicated by the message – is an ill and dangerous sexual deviant poised to infect unwitting soldiers looking for entertainment. Embedded in this public health poster is the acknowledgement of widespread assumptions that signs of pathology can be easily read on the body, assumptions that carry over into "reading" HIV. A 1988 AIDS poster from the Singapore Ministry of Health, for example, depicts a woman sitting on a bed, wearing a short dress that falls off one shoulder, and looking directly but coyly at the observer of the poster. The message in bold print at the top reads "She may be worth a try, but is she worth the risk?" This poster thus takes an approach almost identical to the VD poster in telling an assumed male audience that having easy sex is potentially dangerous. In this poster, however, the danger inhering in the sick female body is more easily read in the attire, the bed she is sitting on, and the "come hither" look she wears.

Simultaneous with these images of the sick AIDS body are representations focusing on the supposed African origins of HIV, much of which again combine epidemiology with racial stereotype and geopolitics. Geographers working early in the epidemic unfortunately contributed to a search for origins that in many ways did more to produce misguided understandings of AIDS than constructive knowledge and interventions (e.g. Shannon et al. 1990; Gould 1993). Though knowing the

Figure 17.2 "She may look clean," public health poster produced as part of an anti-VD campaign. *Source*: Reproduced courtesy of the National Library of Medicine, National Institutes of Health, Bethesda, Maryland. Courtesy of the National Library of Medicine.

origin of a disease can be helpful in ascertaining viral evolution and transmission, in the case of AIDS it also resonated too easily with colonial constructions of African populations and inequitable global political economies. More recent work by geographers and others is addressing these deleterious representations of the sick African AIDS body (cf. Kalipeni et al. 2004), but their circulation is difficult to entirely erase, especially when once again there is an imbrication of problematic iconographies with real burdens of infection.

"Sick" bodies, then, are frequently diseased bodies whose representations are necessarily refracted through political and ideological optics. It is helpful nevertheless to return to the point that representations of "sick" bodies also focus on the ill understood or out of control, or on any category lying outside situated notions of what is normal. Obesity, madness, sexual desire, depression, hysteria, and other social phenomena have been fertile arenas for representing pathology at various moments in time and place. So, too, have some of the mobile bodies described in the next section.

Mobile Bodies, Global Diseases

The mobility of people and pathogens has long caused anxiety for public health officials, epidemiologists, and the public over how and where diseases might spread. The increased commerce of individuals and commodities across virtually every part of the globe in recent decades – that is, "globalization" – has in turn produced heightened awareness of the opportunities thereby created for rapid pathogenic transfer. This anxiety, and its attendant representations in the face of highly mobile societies, constitutes one aspect of what we want to discuss in this section. Another related aspect concerns the sometimes problematic representations of the kinds of mobile bodies more likely to carry disease, and their geographic points of origin. Though such representations are not new, as will be seen below, they continue to have implications for an array of interventions from immigration laws to global disease surveillance technologies. They also provide rich commentaries on formulations of nationhood, geopolitics, and security.

Global "bacterial bonds"

In the 1920 inaugural issue of the *International Journal of Public Health*, the official "scientific organ" of the League of Red Cross Societies, Albert Calmette of the Pasteur Institute described tuberculosis as a disease "wide-spread among all civilized nations … a disease of crowded social communities" that was yet rare "among savage races … still isolated from the great commercial routes" (Calmette 1920: 3). Writing in the same issue, however, George Whipple pointed out that "improved means of communication brought cities and nations closer together and in so doing they have speeded up the transmission of disease from one part of the world to another" – to the point, as he goes on to suggest, that "the world is bound in bacterial bonds" (Whipple 1920: 39). Whipple's observations are particularly interesting given the tendency of current discussions concerning the impact of global processes on infectious disease spread to portray these trends as "new" (King 2003). A 2006 report from the National Academy of Sciences on the impact of globalization on the spread of infectious diseases, for example, specifies that trade, air travel, and global cultural exchanges are expanding the geographic reach of many diseases and placing far more people at risk of infection. While this is true, the sense of urgency implied by this report might be mediated if historical perspectives on the longitudinal nature of these processes constituted a larger part of current understandings. At the same time, Calmette's statement makes clear that then and now, imaginative geographies of disease map on to geographies of mobility to contour understandings of global vulnerability and risk.

Two highly visible cases of infectious disease spread in recent years provide good case studies of the variegated representations of mobility in perceptions of "emerging" or shifting patterns of disease, as well as the impacts these representations have on policies and peoples. The first is avian flu, images of which have been abundant off and on in the media. In this case, pathogenic mobility comes primarily in the form of migrating birds rather than people, but the threat of viral mutation into one that spreads from human to human remains consistently present. The SARS outbreak of 2002–3 was another recent reminder that diseases – in this case a novel Coronavirus – can emerge and spread globally before interventions are effectively mobilized. The first cases of SARS occurred in various areas of Guangdong, China, spread to Hong Kong, and subsequently, to Canada and other parts of the world (Salehi & Ali 2006) via individuals traveling by air.

Each of these cases suggests a slightly different combination of factors and representations. Taking avian flu first, the media was quick to cover initial human cases in 2003 of H5N1 infection reported in China and subsequently in Vietnam, Thailand, and Indonesia, with headlines warning about the virulence of this newest influenza virus and articles outlining rural animal husbandry practices implicated in the transfer of influenza from poultry to humans.

Though the mobile bodies here have been primarily birds rather than humans, there has remained in British and American accounts of avian flu a focus on the pathogenicity of small-scale rural farm production in much of Asia as well as on the pathogenicity of Southeast Asia itself as a "vast reservoir for H5N1" (McKie et al. 2004). In the close proximity between chickens and people maintained throughout areas of Indonesia, Vietnam, China, and elsewhere, H5N1 could begin a rapid transfer not only between birds and people, but between domestic and wild birds, the latter of which in particular could easily expand into Europe and beyond, spreading avian flu through seasonal migratory routes. The focus on "traditional" animal husbandry led government officials in Thailand to support industrial methods of farming, consequently putting many family farms out of business when they could not convert to closed, large-scale production (Davis 2006). These images of "traditional" versus "modern" farmers and sensationalized accounts of viral breakouts from Asia have in this case produced representations of sick regions, "sick" governments responding inadequately or inappropriately to a potentially global threat, as well as diseased bodies.

The SARS epidemic showed early similarities in the emergence of a new virus from China, this time spread through the rapid mobility of humans rather than birds across several geographic regions. From southern China, a physician traveled to Hong Kong where he infected eleven hotel guests who in turn subsequently spread the virus to Vietnam, Singapore, Canada, and elsewhere (Hughes 2004). A woman who traveled to Hong Kong from her home in Toronto returned in February 2003, subsequently infecting her son, who in turn infected several others while in a Toronto hospital (Salehi & Ali 2006). The ensuing outbreak in a major global city caused the Canadian health ministry to consider public health interventions such as quarantine and prompted the WHO to issue advisories against travel to Toronto until further notice (Salehi & Ali 2006).

On the one hand, SARS was the perfect exemplification of Whipple's claim that the world was bound in bacterial bonds through increased opportunities for trade and travel. Indeed, Julie Gerberding, Director of the Centers for Disease Control in Atlanta, echoed Whipple's sentiments in a 2003 interview in stating that "We have to think about the whole world as a place where infections emerge. A problem in one corner of the world could very soon be a problem here [in the United States]"

(CBS News 2003). As the geographers Harris Ali and Roger Keil point out in their work on SARS and global cities, the world is much more vulnerable to "bacterial bonding" than in Whipple's day because of the increased level, speed, and distance of travel relative to the early decades of twentieth century, or even relative to a generation ago. Not only do thirty to forty thousand international air travelers pass through Toronto's airport each day, even the increased size of today's jets multiplies the chances of exposure to infectious disease (Ali & Keil 2006a). Combined with the highly contagious nature of SARS, initial representations of pathogenic places – i.e., China – quickly devolved into representations of diseased urban nodes across transnational divides. At a broad level, then, global agencies such as the World Health Organization mapped pathologies of particular places rather than bodies in their response to regional outbreaks of SARS. Though obviously it was mobile bodies that spread SARS originally to various regions, travel advisories targeted particular places (to the chagrin of city officials in Toronto especially) rather than particular kinds of travelers.

At another level, however, Ali and Keil point out that in the actions of some employers, city officials, and citizens in Toronto, particular kinds of bodies were targeted as primary carriers of the SARS virus. Specifically, SARS was dubbed a "Chinese disease" (Ali & Keil 2006b), an unfortunate racialization that drew from long-standing tendencies to scapegoat marginalized or immigrant communities in times of epidemic, but that also acknowledged the highly mobile and transnational nature of a global city like Toronto. Targeting of Asian communities was widespread enough to prompt Dr Colin D'Cunha, Ontario's commissioner of public health, to declare that "SARS is a challenge for all of society and it is not a disease of ethnicity." Striving to re-educate Toronto's citizens, he went on to point out that "SARS may have emerged in Asia, but a person of any race or color is capable of being a carrier of this disease" (Wharry 2003).

Nevertheless, a report by the Chinese Canadian National Council titled *Yellow Peril Revisited* (2004) outlined the multiple impacts of scapegoating on Asian communities including loss of housing and jobs, a 50–70 percent decline in business in Chinatown, and widespread shunning of Asians in public spaces. Like many epidemics in a time of extensive mobility, responses to SARS displayed the best of instant communication, epidemiological detection, and response time, but the worst targeting of immigrant communities through multiple public health and public representational tactics and their inevitable material consequences.

Conclusion

As may be apparent, this chapter has drawn upon a wide range of literatures, much of which emanate from outside of the field of geography. Of course, this does not mean geographical scholarship has been entirely absent. We have identified geographers who have contributed to research on the history of, and meanings associated with, diseases, especially as they are experienced by alien(ated) "others"; we have pointed to a small, but significant, body of research on contemporary diseases such as AIDS, SARS, avian flu, and other similar threats associated with a globalizing world; and, we have highlighted the input that some geographers have made, and are making, to the promotion of critical understandings of the represented and material body. What surprises us, though perhaps it should not, is the lack of sustained engagement with many of the themes that we have covered by scholars who (openly) identify themselves as health, medical, or indeed (post)medical, geographers.

Our purpose here is not to offer criticism, but rather to suggest that this is an important lacuna. We believe this is so for a number of reasons. The first relates to the need to engage with discourses and practices that seek to produce health, but in a critical and reflective way. Take, for example, Longhurst's discussion of her own "fatness": "As a 'big-boned girl', a 'solid teenager' and a 'plus-sized woman' I have long been aware of the complex politics that inhabit the bodies and spaces of fat people" (2005: 248). Clearly, as some of the chapters in this volume demonstrate, it is important for health and medical geographers to engage in research that seeks to establish the environmental, individual, and population level factors that might be associated with particular health outcomes; here obesity and overweight. Yet, as Longhurst suggests, and individuals like Bethan Evans and Rachel Colls demonstrate, this is only one aspect of a very complex story. Geographers who are interested in the production of health should, in our view, not only be concerned with the ways in which this might be achieved but with the potential consequences for those who either can not or do not fit into medically and socially ascribed bodily norms.

The second point that we would like to make relates to our belief that much of what we have discussed here resonates with broader geographical debates. In order to make this point, we turn quite deliberately to a quote from scholars who are not geographers but historians of medicine:

> In this age of HIV/AIDS, antibiotic-resistant bacteria, the Ebola virus and mad cows, the metaphors and corporeal experience of contagion, resistance and immunity greatly exercise the spheres of government, biomedicine and popular culture … [w]e are interested in the geographies, policies and identities which have been produced in the massive social effort to contain disease – that extensive culture of hygiene known as public health but which we might also call "the dream of hygienic containment." (Bashford & Hooker 2001: 1).

Until relatively recently, the "geographies" to which Bashford and Hooker allude were being explored largely, though as we recognize, not entirely, by those outside of the discipline. For us, it appears somewhat ironic that such work, with its focus on concepts such as mobility, border control, and isolation remains on the margins of health and medical geography scholarship.

The final point that we wish to make relates to the question of ethics, especially as they relate to notions of "care." Current debates within the sub-discipline (see Chapters 16 and 29, this volume), tend to explore the "ethics of care" in relation to either the place(s) within which it is given or through the critical lens of Dear and Wolch's *Landscapes of Despair*. Such research is extremely valuable and raises important issues relating to the ways in which societies care for their most vulnerable citizens. We suggest here that a similar concern might be raised with regards to those individuals and, in some cases, entire communities who are constructed as "other" in discourses relating to the unhealthy or sick body. David Smith (2000) makes an important contribution to our understanding here through his recognition that the "ethics of care" has a distinct geography. Put more explicitly, he reveals that ideas of proximity, locality, and community play a key role in the judgments that people make with regards to those who should be cared for. As recent discussion in Britain relating to HIV/AIDS and the rather inappropriate term "health tourism" highlights, it is often those who are seen as distant from, or outside of, such value-laden concepts who are regarded as being outside of a nation's ethical and moral responsibilities. This is also an area where health and medical geographers could make an important contribution.

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Part IV Public Health and Health Inequalities

Chapter 18

Health Geography and Public Health

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Introduction

This chapter focuses on the associations between health geography and public health and aims to illustrate some of the ways that geography contributes to ideas and practice of public health. Narrowly defined, public health refers to the health of a population; but more often, it is viewed more broadly as a socio-political, as well as medical, strategy of intervention aiming to protect and promote the health of the population (Baggott 2000). The focus of public health is especially on the prevention of illnesses and the promotion of good health in the population, in contrast to clinical medicine, which is more particularly concerned with medical care and treatment for people who have already developed diseases. Public health has been described as "*what we, as society, do collectively to assure the conditions for people to be healthy*" (Institute of Medicine 1988). In 1920, Charles-Edward A. Winslow, an American public health leader, defined public health as,

> the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health.
>
> (Winslow 1920).

This influential definition provided a basis on which the World Health Organization (1946) defined health as a "state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (World Health Organization 1946).

In the discussion below we first consider the historic development of geographical research relating to public health, discussing different conceptualizations of the focus of public health and how these relate to important strands of research in health geography. We then move on to consider some selected examples of recent geographical research in terms of their contribution to four groups of core "Essential Public Health Functions," to demonstrate how contemporary health geography is contributing to public health knowledge and practice.

The History of the Idea of Public Health and the Evolution of Health Geography

To facilitate presentation of different perspectives in public health and health geography, we distinguish, somewhat artificially, between: first, streams of work in public health concerned with "infectious disease prevention" allied with geographical research on biological risks in the environment and traditional ideas from the "sanitary model" of public health; second, public health strategies for "non-communicable" disease prevention and concern for environmental pollutants and individual "lifestyle factors" are considered in relation to geographical research; and, finally, "new public health" strategies, invoking the "social model" of health and associated with geographical research on the social determinants of both physical and mental health. In reality these streams of work in public health and in geography overlap, and although we present them here chronologically in terms of their emergence in the field, it is worth emphasizing that each strand continues to be important today, demonstrating contemporary developments in terms of theory and method which are significant for health geography as well as for public health.

The "sanitary model" of public health and disease ecology

Health geography has very long established associations with ideas and knowledge about public health and it could be argued that the two have developed in parallel ways historically. Very early origins date back as far as ancient Greek authors, and Barrett's (2000) authoritative historical review of "disease and geography" identifies early Chinese and Indian antecedents which may have preceded the Greeks. Barrett reviews the Hippocratic origins of ideas about the associations between attributes of people and the places where they live, which are widely cited in the health geography literature, referencing especially Hippocrates' work *Airs, Waters and Places*. This perspective, emphasizing the links between physical and social environmental conditions and the health of individuals, has an enduring association with ideas in health geography and in public health as they have evolved over time.

A preoccupation with prevention of infectious diseases was a strong feature of classic work, both in public health and also in geographies of health. A dominant theme in this area of health geography could be interpreted in terms of what Brown and Bell refer to as the "medicalization of nature" (Brown & Bell 2007). "Medical geography" of infectious disease was often closely associated with the ecology of specific medically diagnosed diseases. Authors such as Learmonth (1988) have offered excellent reviews of research, which aimed to enhance our understanding and ability to prevent infectious diseases through a better understanding of these relationships. Much of this research has involved studies of infectious diseases in tropical settings, such as malaria or schistosomiasis but there are also many examples from western countries. Geographical research focusing on infectious diseases continues to be very relevant for public health in the world today, especially as we see the re-emergence of infectious diseases, such as tuberculosis in many parts of the world, as well as more newly emergent communicable conditions such as HIV/AIDS and SARS (Smallman-Raynor et al. 1992; Meade & Earickson 2000; Gatrell 2002; Curtis 2004; Liang et al. 2007). A major contribution to bridging our understanding of global pandemics from the past and the contemporary concern of public health with the potential for new global pandemics has come out of the work by (Cliff et al. 1998). As discussed below, these contemporary geographical perspectives on prevention of infectious disease include, but are not restricted to, public health applications of Geographical Information Systems (Gatrell & Löytönen 1998; Cromley & McLafferty 2002; Rushton 2003).

The map as a strategic and analytical tool in geography of public health is another perennial theme. For example, another much cited "classic" work with a strong geographical element to the approach was Snow's work on factors relating to the spread of cholera in nineteenth-century London. This has retained an enduring fascination for geographers because of the way that Snow used information on the spatial distribution of cases of cholera around the source of infection as part of his argument about the need for better public health measures (specifically improved sanitation of drinking water). His work has been revisited by authors such as Koch and Denike (2006), who have re-examined his original data to test the arguments that Snow put forward in the light of present-day methods and knowledge. Snow's work is represented as a landmark in progress in the "Sanitary Model" of public health, which in nineteenth- and early twentieth- century Europe and North America concentrated on improvements in basic hygiene that were necessary to prevent outbreaks of infectious disease occurring in major cities of the time. McLeod (2000) for example discusses the "mythical" attributes of Snow's famous demonstration. She points out that some aspects of the account (suggesting that removal of the pump handle from an infected water-well led to abatement of the epidemic) are probably historically inaccurate. We might therefore view the story of John Snow's work not as a factual report so much as illustrating a sort of public health "parable" through which public health practitioners aiming to prevent diseases achieve public communication of knowledge about public health risk. Public health messages may be most effective when communicated through practical demonstrations and stories of specific, rather dramatic cases. John Snow's work is also an early illustration of the way that public health practitioners provoke and engage collective socio-political action by societies in order to reduce risks to public health. Whether or not geographical mapping was essential to John Snow's campaign, it is certainly the case that cartography still provides powerful images to assist work in public health today, as illustrated in further contemporary examples discussed below.

The theoretical frameworks for much of the earlier geographical research in this field have included extension of ideas about the "sanitary model" of public health (concerned principally with basic hygiene measures) and theories from disease ecology (Learmonth 1988; see also Mayer (Chapter 3) and Emch and Root (Chapter 9) this volume) about the biological pathways of infection. Geography has been able to make an important contribution to understanding how the spatial and temporal proximity of human populations to infectious agents in the physical environment contribute to risk of infectious diseases. Geographical research on infectious diseases has always emphasized an appreciation of the complex processes and relationships in space and time that govern the ways that humans interact with their environment and with each other. To cite an obvious example, geographical studies have often focused on the "city-hopping" pattern of the spread of contemporary epidemics, such as influenza (Cliff et al. 1986) and HIV/AIDS (Gould 1993) which often pass between major cities around the world, before more locally spreading out across a region from the initial points of infection. This pattern of disease diffusion reflects the global connections between major urban concentrations of populations and rapid communications between them and emphasizes the "global" character of human societies and of public health. Another example is the 2003 severe acute respiratory syndrome (SARS) epidemic which spread mostly between large, globalized metropolitan centers in East Asia and North America. As observed by Keil and Ali (2006), "*the geography of globalization is a geography of disease*."

Prevention of risks for non-communicable diseases and "classic" "lifestyle" risk factors

As concern has grown about the international significance for population health of non-communicable, as well as infectious diseases, public health practice (especially in high-income countries) has historically shifted in emphasis beyond the "sanitary model" and toward a preoccupation with the factors governing risks for diseases such as cancers, cardiovascular disease, and endocrine conditions such as diabetes. Practice in health promotion has traditionally placed considerable emphasis on measures intended to modify individual health related behaviors, especially those referred to as "classic" risk factors such as lack of physical activity and over-consumption of tobacco, alcohol, illicit drugs, fats, sugars, and salt. This orientation of public health is informed, for example, by geographical research relating to environmental factors that may present risks for diseases such as cancer, with a particular emphasis on chemical pollutants associated with industry and other human activities. Also, research on socio-geographical variability in health related behavior, such as smoking and diet, have helped public health practitioners to target their efforts at modification of an individual's "lifestyle" practices. The epidemiology of non-communicable diseases is very complex and often involves the accumulated impacts of behaviors and environmental exposures over time and in a range of different settings. In this respect, the geographical perspective focuses as much on *spaces* of risk as on *people* at risk.

For example, there is a well established stream of geographical research on patterns and trends of diseases like cardiovascular disease, and certain types of cancers have offered clues to the environmental factors that may contribute to risks of the disease (for example, various examples have been reviewed by Howe (1997), Meade & Earickson (2000), and Gatrell (2002)). Geographical research has also focused on international variation in the principal causes of death in populations, elaborating on Omran's (1971) model of the "epidemiological transition" and considering the public health significance of the differences between countries and regions in trends in both infectious and non-infectious diseases (Bryce et al. 1994; Smallman-

Raynor & Phillips 1999). As we explain below, contemporary research in health geography continues to contribute new perspectives on these issues which are relevant to essential public health functions today.

The new public health and health geography

The antecedents for the shift to the new public health stem from milestone reports such as the Lalonde, Epp, and WHO reports (Lalonde 1974; WHO 1984; Epp 1986) which placed emphasis on health promotion and coined the phrase, "achieving health for all" which remains an international rallying target for public health. Among geographers, these developments inspired a special focus section in *The Canadian Geographer* in 1990 (Dyck 1990; Eyles 1990; Rootman & Munson 1990; Rosenberg 1990; Taylor 1990). More recent developments have led to a particularly strong emphasis on the social determinants of health and the "social model" of health (Dahlgren & Whitehead 1991). This signals a trend away from a medicalized view of population health and towards renewed concerns about the social and political dimensions of population health. It has reinforced policy messages about need to exercise collective, as well as individual responsibility for health promotion and illness prevention in ways that will reduce inequality in health as well as improving the average health of the population. For example, in England, the "Acheson Report" (Acheson 1998) defined public health as "*the science and art of preventing disease, prolonging life and promoting health through the organized efforts of society*"; whereas public health has been defined in a similar vein by WHO as "*the art of applying science in the context of politics so as to reduce inequalities in health while ensuring the best health for the greatest number*" (WHO 1998). It is concerned with creating conditions supporting good health and wellbeing, on equal terms for all members of society. These are the driving tenets of what has been termed "the new public health" referring to developments in our understanding of the ways in which individual lifestyles, living conditions, and social processes in the wider community, and health outcomes are interconnected.

Accompanying this growth of emphasis on the "new public health" and the social model of public health has been a reorientation in geographical research on population health, encapsulated for some geographers by increasing references to "health geography" rather than "medical geography." Health geography has broadened the scope of geographical perspectives to include, for example, research using theories from political ecology (Mayer 2000), which focus on the social and political processes governing risks to health and also social theories which help us to understand how power relationships and socially and culturally constructed knowledges and beliefs influence the relationships between individuals and settings in ways that are important for health (Butler & Parr 1999). There has been a renewed concern for a theoretically informed understanding of how places and population health are related (e.g. Kearns 1993). Recently, geographical preoccupations with embodiment and socio-geographical understandings of the body have also contributed to geographical research that is relevant for public health (as reviewed, for example, by Parr 2002). In the following section we discuss some recent examples of work in these fields of health geography to show how they contribute relevant knowledge for essential public health functions.

The Relevance of Health Geography for Essential Public Health Functions

Having sketched out above some elements of the history of links between health geography and public health, we now turn attention to the ways that contemporary research in health and medical geography is relevant to public health practice today. We have organized the discussion below in relation to four "core" public health functions and, in considering these, we were interested by the variety and breadth of alternative definitions of "Essential Public Health Functions" (EPHFs). Attempts to define public health functions are linked to the parallel process of defining public health (which as explained above has been subject to various interpretations). The EPHFs have been redefined as public health evolved from a biomedical health framework into the "new public health" driven by the social framework of health with a focus on the determinants of health.

Since the 1990s, many countries and international organizations have defined essential functions of their public health systems. Such definitions may help to "define more clearly and systematically the core areas of public health work for which governments are ultimately responsible" (WHO/WPR 2003). In Table 18.1, "essential" functions of public health from five published frameworks are presented, drawn from: *Three Core Public Health Functions: Nine Essential Public Health Services* from the Centers for Disease Control and Prevention in the United States (United States Department of Health and Human Services 1997), the WHO *Delphi Study: Nine Essential Public Health Functions* (Bettcher et al. 1998), the Pan American Health Organization *Eleven Essential Public Health Functions* (PAHO 2002), the National Public Health Partnership of Australia *Nine Core Public Health Functions* (NPHP 2000), and the WHO/Western Pacific Region *Nine Essential Public Health Functions* (WHO/WPR 2003).

The EPHFs may relate more to the practice of public health, the functions being sometimes referred to as "competencies" (e.g. DoH 2001). From a public health policy standpoint, several nations have identified key issues and challenges facing public health that extend beyond the functions of public health to target more directly the determinants of health and specific health indicators or outcomes. In line with the philosophy of the "new public health," selecting social determinants as public health targets acknowledges that considerable work in public health must take place outside the medical care service (Ågren 2003), and calls for political involvement and decisions from parties external to the health sector. As an example, in the 1990's the European community endorsed a "Health for All" public health policy framework known as Health21 (WHO 1999b; and update in 2005 – WHO 2005); in this document, 21 public health targets were formulated, which provided benchmarks against which to measure progress in improving and protecting health and in reducing health risks in the European Region. Another case is the Swedish public health policy based on 11 objectives corresponding to the most important determinants of health in Sweden; the aim of the Swedish policy is to create the conditions for good health on equal terms for the entire population (Ågren 2003). The targets of Health21 and of the Swedish public health policy are presented in Box 18.1. Many other countries around the world have developed national public health strategies with targets that are adapted to national conditions. From a

Table 18.1 "Essential" or "core" public health functions from five national and international frameworks

	WHO (1998)	*PAHO (2002)*	*WHO/Western Pacific Region (2003)*	*CDCP, United States (1997)*	*National Public Health Partnership, Australia (2000)*
1	Monitoring the health situation (morbidity and mortality, determinants of health, effectiveness of public health functions)	Monitoring, evaluation, and analysis of health status	Health situation monitoring and analysis	Monitor health status to identify community health problems	Assess, analyze, and communicate population health needs and community expectations
2	Protecting the environment (safe water, food quality, and safety, sewerage, drainage and waste disposal, hazardous substance control)	Public health surveillance, research, and control of risks and threats to public health	Epidemiological surveillance/disease prevention and control	Diagnose and investigate health problems and health hazards in the community	Prevent and control communicable and non-communicable diseases and injuries through risk factor reduction, education, screening, immunization, and other interventions
3	Health promotion (community involvement in health, information and education for health and life skill enhancement)	Health promotion	Development of policies and planning in public health	Inform, educate, and empower people about health issues	Promote and support healthy lifestyles and behaviors through action with individuals, families, communities and wider society
4	Prevention, surveillance, and control of communicable disease (immunisation, disease outbreak control, disease surveillance)	Social participation in health	Strategic management of health systems and services for population health gain	Mobilise community partnerships to identify and solve health problems	Promote, develop and support healthy public policy including legislation, regulation, and fiscal measures
5	Legislation and regulations related to public health	Development of policies and institutional capacity for planning and managing public health	Regulation and enforcement to protect public health	Develop policies and plans that support individual and community health efforts	Plan, fund, manage, and evaluate health gain and capacity building programs designed to achieve measurable improvements in health status, and to strengthen skills, competencies, systems, and infrastructure
6	Occupational health	Strengthening of institutional capacity for planning	Human resources development and planning in public health	Enforce laws and regulations that protect health and ensure safety	Strengthen communities and build social capital through consultation, participation, and empowerment

Table 18.1 *Continued*

	WHO (1998)	*PAHO (2002)*	*WHO/Western Pacific Region (2003)*	*CDCP, United States (1997)*	*National Public Health Partnership, Australia (2000)*
7	Public health services (including school health, laboratory services, emergency disaster services)	Evaluation and promotion of equitable access to necessary health services	Health promotion, social participation, and empowerment	Link people to needed personal health services and assure the provision of health care when otherwise unavailable	Promote, develop, support, and initiate actions which ensure safe and healthy environments
8	Public health management (international collaboration, health policy, planning and management, use of scientific evidence, research)	Human resource development and training in public health	Ensuring the quality of *personal* and population-based health services	Assure a competent public and personal health care workforce	Promote, develop, and support healthy growth and development throughout all life stages
9	Care of vulnerable and high-risk populations (maternal health care, family planning, infant and child care)	Quality assurance in personal and population based health services	Research, development, and implementation of innovative public health solutions	Evaluate effectiveness, accessibility, and quality of personal and population based health services	Promote, develop, and support actions to improve the health status of Aboriginal and Torres Strait Islander people and other vulnerable groups
10		Research on public health		Research for new insights and innovative solutions to health problems	
11		Decreasing emergencies and disasters in health including prevention, mitigation, preparedness, response, and rehabilitation			

Box 18.1 Setting targets for public health policy: the examples of WHO European Region Health 21 and the national public health objectives for Sweden

WHO European Region HEALTH21: 21 targets

- Solidarity for health in the European region
- Equity in health
- Healthy start in life
- Health of young people
- Healthy aging
- Improving mental health
- Reducing communicable diseases
- Reducing non-communicable diseases
- Reducing injury from violence and accidents
- A healthy and safe physical environment
- Healthier living
- Reducing harm from alcohol, drugs and tobacco
- Settings for health
- Multisectoral responsibility for health
- An integrated health sector
- Managing for quality of care
- Funding health services and allocating resources
- Developing human resources for health
- Research and knowledge for health
- Mobilizing partners for health
- Policies and strategies for health for all

Swedish National Institute of Public Health: 11 objectives

- Participation and influence in society
- Economic and social security
- Secure and favourable conditions during childhood and adolescence
- Healthier working life
- Healthy and safe environments and products
- Health and medical care that more actively promotes good health
- Effective protection against communicable diseases
- Safe sexuality and good reproductive health
- Increased physical activity
- Good eating habits and safe food
- Reduced use of tobacco and alcohol, a society free from illicit drugs and doping and a reduction in the harmful effects of excessive gambling

geographical perspective this is interesting as it reflects the extent to which action for public health is contingent on local conditions.

Although often sharing common elements, the different EPHFs and public health targets are imbued with geographical ideas and depend on the circumstances and resources specific to each country. For example, improving the health of specific, vulnerable, indigenous populations is seen as one of EPHFs in Australia (NPHP 2000). We therefore observe that what are viewed as "essential" public health functions and as public health targets is contingent upon the specific aspects of health status, health needs, and health infrastructures of each country. This links into the "settings approach" for public health, wherein particular types of place are defined as "major social structures that provide channels and mechanisms of influence for reaching defined populations" (WHO 1999a). This emphasis on the settings of public health actions is partly informed by geographical research on the significance of places for health (Poland et al. 2000; Curtis 2004).

With the aim of highlighting significant links between health geography and public health practice, the following discussion illustrates how work in health geography relates to a conflated set of four "core" categories of public health functions: surveillance/assessment, promotion, prevention, and protection, proposed in Quebec (Federal Provincial and Territorial Advisory Committee on Population Health 2002; Ministère de la Santé et des Services Sociaux (MSSS) 2003). Definitions for these functions are provided in Box 18.2. These core functions of public health are not impermeable; rather, they are combined in different activities and targets of public health. Similarly, the contribution of health geography to public health often spans more than one of the core functions in Box 18.2. In the following section we summarize, using selected examples, some of the ways that geographical research can inform public health practice.

Box 18.2 "Core" public health functions

Surveillance/assessment
The ongoing, systematic collection, analysis, assessment, and interpretation of health data that are essential to the planning, implementation, and evaluation of health practice, and their timely dissemination to those who need to know. Surveillance data are applied to prevention and control activities.

Promotion
The process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and realise their aspirations, to satisfy needs, and to change or cope with the environment.

Prevention
Measures that prevent the occurrence of illnesses, psychosocial health problems, and traumas, such as reducing risk factors, and measures to arrest their progression and reduce their consequences once established.

Protection
Activities in relation to intervention of authorities at the level of individual(s), groups, or entire populations in the face of actual or anticipated threats against health and safety. Providing evidence, monitoring and forecasting health trends (health assessment and surveillance), assessing and responding to health risks and program development form the basis of health protection activities.

Monitoring of population health status and trends

Geography and geo-informatics make a significant contribution to contemporary surveillance of population health and patterns of health related behavior in the population, as well as assessment of variations in other known risk factors in the environment. Cromley and McClafferty have provided an excellent review of a range of applications of Geographical Information Systems (GIS) to monitoring and analyzing health variation (Cromley & McLafferty 2002).

Recent advances in spatial analysis of geographical variations in population health are making it possible to assess variation in relatively rare health conditions at a finer geographical resolution than was possible in the past, and to take into account more effectively the spatial clustering of diseases at different geographical scales (e.g. Rushton 2003). Examples include application of Bayesian modeling techniques (as applied for example by Saunderson and Langford (1996), Congdon (1997), and Middleton et al. (2008)) to produce maps of relatively unusual events such as suicide mortality at the small area level. In the past such mapping at a fine geographical scale was problematic because for a given study small numbers (or total absence) of events in some areas with smaller populations made estimation of local variation in rates unreliable. Bayesian methods are now being applied much more widely to statistically adjust and "smooth" statistical information for each small area, producing maps of disease outcomes that are more meaningful and easier to interpret. These can help to target public health efforts at disease prevention and promotion more effectively or identify local areas where regional or national public health strategies may be "failing" to prevent diseases occurring.

Some aspects of population health of concern to public health specialists are not notifiable in disease registers and are only imperfectly reflected in routine data on health service use. Epidemiological surveys often do not provide sufficient fine-scale resolution to show how health varies in small areas across whole countries or regions. For some time now, geographical studies of variation in health have used statistical modeling strategies to combine information about individuals, their health, and their individual and family risk factors with data on the geographical areas where they are living in order to make synthetic estimations of likely local differences in population health. Recent applications in relation to obesity levels in the United Kingdom, for example by Moon et al. (2007) and Congdon (2006, 2008) have used synthetic estimation techniques to estimate prevalence of psychiatric and cardiovascular morbidity in populations of relatively small districts.

There is a growing sensitivity to the impact of different GIS methods on the results obtained. For example, Dunn et al. (2001) have compared different methods of calculation in GIS and other geographers have considered the implications of varying area definitions for the findings of studies of health variation (Nakaya 2000; Ross et al. 2004; Cockings & Martin 2005; Lebel et al. 2007; Flowerdew et al. 2008; Haynes et al. 2007). Research on public health applications of GIS has also increasingly focused on the extent to which area definitions relate to lay perceptions of neighborhood boundaries, since understanding of the neighborhood among the local population may be more relevant than administrative or professionally defined zoning (Haynes et al. 2008; Lebel et al. 2007).

Understanding risk factors and their distribution

Geographical information systems and geo-informatics can also play a significant role in helping to identify the risk factors that are important for population health, so that public health practitioners can target these in their efforts to prevent illnesses. However, ecological analyses of differences in health for groups of people classified by geographical area do have limitations their potential to help us to understand the associations between risk factors. When examining the associations between potential risk factors and health outcomes, data for groups of people do not offer the same precision as data for individuals. Curtis and Cummins (Curtis & Cummins 2007) reviewed ecological strategies applicable to public health surveillance and analysis of risk factors, acknowledging these limitations, but also demonstrating how recent developments in health geography have begun to overcome some of the constraints of area level analysis.

Recent illustrations include work by Sabel et al. (2007) that has demonstrated the use of spatial modeling to identify local "hot spots" of respiratory disease in Christchurch, New Zealand, after controlling for variations that might be expected due to differences in Pm10 emissions in traffic pollution. Banerjee (2007) analyzed occurrence of birth defects in Iowa to distinguish geographical clustering and the extent to which this was explained by known risks associated with socio-economic conditions of the babies' parents. These two studies illustrate ways that geographical research may help specialists in public health surveillance to identify differences in population health that seem not to be explained by known risks (in these cases, air pollution or individual socio-economic status). This offers potential to identify other, hitherto unknown or underestimated risk factors that may play a significant role in population health. Research on the factors associated with clustering of road traffic accidents (Cloutier et al. 2007; Haynes et al. 2008) has also demonstrated the value of geographical analyses to identify "high risk" areas and highlighting social as well as environmental factors that may contribute to the risks.

Geographical research on area health variation has increasingly combined data on health differences in time and space. Studies of temporal continuities/discontinuities of health inequality (e.g. Shaw et al. 1999) often employ GIS methods to generate information for areas that are consistently defined over time. This is important for public health as a way to monitor trends in population health. Health geography has also increasingly incorporated longitudinal data for both people and places, in order to assess how exposures to risk factors throughout the life course may influence health outcomes. Examples include Curtis et al. (2004) who showed in a study of individuals in England that socio-economic conditions in the place of residence during their childhood showed persistent associations with their health in old age, even allowing for their individual socio-economic attributes and the types of area they were living in when they were older. Research on migration and health (Boyle et al. 2002; Cox et al. 2007) has also started to disentangle the degree to which residential mobility may be important for health differences between areas. To the extent that people in good health show different migration patterns than people in poor health, geographical inequalities in health may be the result of unequal geographical "sorting" of the population. This is important for public health policy and interventions, which are often targeted at populations in their present place of residence and on currently prevailing local risk factors. If populations have been exposed to risk factors elsewhere, that have affected their health, then prevention in the present place of residence may be ineffective. Furthermore, if populations are highly mobile then it becomes more difficult to monitor the effectiveness of local public health interventions for populations who may subsequently be lost to the area.

Geography research related to the surveillance of health and risks is playing a significant role for the protection of health, improving the understanding and monitoring of the spatial diffusion of potential or real risks for health. Processes such as climate change, air and water pollution, environmental disasters, living near noxious facilities, their short- and long-term health impacts and the geographic scale of these effects have been recurring areas of public health concern where geographers have contributed for some time. For example, an international perspective is taken in Garvin and Eyles' (2001) review of the public health responses of Australia, Canada, and England to sun safety, while Garvin and Wilson (1999) focus on sun safety at the local level. The implications of air pollution for public health have been measured in various places and settings (Jerrett et al. 2005; Luginaah et al. 2005; Buzzelli 2007). Dreidger and Eyles have contributed to the debate over the chlorination of water and cancer and how risk is communicated in policy and the media (Driedger & Eyles 2003ab). Lake et al. (2005, 2007) have examined various public health impacts of water-borne contaminants and emergent diseases. Using a socio-ecological approach to analyze disease outbreaks, which suggest that *large scale structural determinants are interacting with micro-scale determinants of the local milieu to produce significant changes in the ecology of disease,* Ali (2004) studied the social and ecological chain of events that led to the 2000 outbreak of waterborne E. coli (from municipal water supply) in the rural community of Walkerton, in Canada. Geographers have tried to measure quantitatively and qualitatively the short- and long-term impacts of exposure to environmental contaminants resulting from disasters such as oil refinery explosions (Luginaah et al. 2000, 2002; Cutchin 2007) and living near noxious facilities (Baxter & Lee 2004). Health geography also contributes to the understanding of social inequalities in the variation of health status in response to consequences of disasters and climate change. For example, Curtis and colleagues (2007) studied the geography of stress among vulnerable poor and ethnic minority groups in New Orleans in the aftermath of Hurricane Katrina (Curtis et al. 2007).

It is likely that, in view of the impact on health of global climate and environmental changes, and with the emergence of new infectious diseases (SARS, the West Nile virus, the "avian flu," and the HIV/AIDS pandemic) in addition to the re-emergence of drug-resistant forms of older diseases (e.g. malaria and tuberculosis), geographical research will closely collaborate with public health protection activities. For example, with the aim of supporting disease monitoring and health protection initiatives, GIS modeling and spatial analyses techniques are being applied to assess and model the risk and predict outbreaks of infectious disease such as west Nile virus (Cooke et al. 2006; Shuai et al. 2006; Tachiiri et al. 2006) and cholera (Ali et al. 2002). Work by geographers such as Emch et al. (2007) is also improving understanding about the effectiveness of preventive strategies such as vaccination programmes.

Social and cultural construction of health and illness

The increasing emphasis in health geography on social and cultural processes by which health and health beliefs are constructed and construed in our understandings of the body are very important for promotion strategies in public health which aim to empower people and communities to take action to improve health and prioritize fitness and wellbeing.

In a special issue of *Social Science & Medicine* concerning this question, Dunn and Cummins (2007) comment on how that research has begun to theorize in more sophisticated ways the causal pathways through which area conditions may relate to health outcomes. Research of this type (Bernard et al. 2007; Cummins et al. 2007; Daniel et al. 2008) informs public health measures at the local as well as wider scale by highlighting the processes that may need to be changed to address inequalities of health more effectively. An improved understanding of contextual processes relating to health may impact on public health policy. For example, Frohlich et al. (2007) argue that caution is needed when drawing public health information from administrative data because the variable interpretations that are possible. The processes may depend on the types of health outcome under consideration as well as the specific features of places and local populations, so that it may not be realistic for public health strategies to develop comprehensive approaches that will work equally well in all settings. On the other hand, variable engagement in public health issues by key public institutions such as schools may be important for the success of public health measures. For example, Collins et al. (2006) discuss the differences between schools in their adoption of measures to address health risks of skin exposure. There seem to be arguments for greater "sensitivity" in public health policies to sociogeographical diversity, which may help make interventions more effective and engage key partners in communities more equitably.

An important stream of research in health geography, drawing on social and cultural theories, has helped to clarify the significance of place for health and the relevance of social power relations to the development of more effective health promotion in particular settings. For example, Veenstra et al. (2005) comment on the idea of social capital as one of the "drivers" of population health and wellbeing, they suggest that issues of empowerment may help to explain the variable relationships between measures of social capital and health outcomes. Research on the ways that areas are perceived by local people, and the links between area deprivation, stigma, and individual sense of identity and empowerment may be of crucial importance in efforts to address health disadvantage in poor and marginalized populations. A recent special issue in the journal *Social Science & Medicine*, introduced by Kalipeni et al. (2007), presented a number of papers which illustrated the significance of power relationships at the family, neighborhood, and national scale for the patterning and spread of HIV/AIDS in African countries. Geographical research by authors such as Popay et al. (2003), Wakefield and McMullan (2005) has helped to show how local residents of disadvantaged areas understand an interpret local conditions in there area, and illustrate the ways that detrimental labeling and stigma are resisted in some cases.

Sensitivity to social and cultural variations in health practices is also important for successful health policies and research by authors such as Wiles and Rosenberg

(2001), Dyck and Dosa (2007), Fleuret and Atkinson (2007), and Hoyez (2007) underline the potential of public health strategies that seek to "work with the grain" of social discourses and understandings of wellbeing and healthy practices, moving beyond "medicalized" models of population health. This work also shows how certain geographical settings can influence the propensity for individuals and social groups to take action themselves to participate in practices that improve their sense of wellbeing and provide benefits for mental as well as physical health.

One example of this trend in geographical research is work that has helped to inform public health strategies for improvement of the spaces for recreation and physical exercise that may help to address concerns over growing levels of obesity and poor mental health in many countries. Research drawing on theories of therapeutic landscapes reported, for example, by Milligan on social forestry and on community gardens (Milligan & Bingley 2007) have contributed to our understanding of the ways that active enjoyment of green space may be important for health. Other authors (Coen & Ross 2007) have drawn attention to social inequalities in access to green space of good quality and in social differences in the ways that public open spaces are interpreted and used (Cattell et al. 2008). Geographers have also made significant contributions to research that may have potential to anticipate and promote the health gains that may be achieved through interventions directed at modification of other aspects of the urban landscape. Curtis has discussed geographical contributions to prospective health impact of urban regeneration schemes, for example (Curtis 2004). A number of geographical studies have critically examined the relevance for health of "food deserts" in developed countries, where, in spite of advanced, nationally coordinated food retail infrastructure, local populations may find it difficult to obtain healthy food and relatively easy to obtain unhealthy food options (Cummins & Macintyre 2002, 2006). Health geographers have also contributed to health promotion and heart health initiatives (Robinson et al. 2006; Driedger et al. 2007; Frank et al. 2007; Gauvin et al. 2008). Studies of other risks to public health in urban environments have also contributed to understanding the accessibility and spatial distribution of video lottery terminals (Wilson et al. 2006; Robitaille & Herjean 2008) and to campaigns in some cities to limit the development of gambling outlets (Wheeler et al. 2006). Work of this type underlines that it is imperative to consider critically the public health implications of features in the social and physical environment, as well as initiatives designed to improve them. Sometimes assumptions that area development projects will result in public health gains are over optimistic, or do not pay sufficient attention to unequal impacts on different population groups, so reference to research, as well as lay and expert intelligence can be important for real progress in terms of healthy public policy that values health and wellbeing outcomes as well as other social and economic benefits.

Conclusion

In the past, health promotion initiatives and public policies aiming to reduce health inequalities may have underestimated the need to adapt interventions to socially and geographically variable conditions and to be sensitive to issues of area perception, stigma, and identity. Geographical research has made important contributions in understanding how and why places influence health and illness through the theorization of the links between places, people, and health. Health geographers are contributing useful research findings concerning the lay perspective and the empowerment of individuals and social groups to take a key role in the design and implementation of health promotion initiatives. At the same time, geographical research concerning political ecological processes, social construction of health, and environmental changes at the global and local scales highlights the tendency for health disadvantage to be concentrated at the regional as well as the very local level, suggesting the need for more effective, broadly based action at central government level and by international agencies. Quantitative methodologies including GIS and statistical modeling have also grown in sophistication and subtlety so that we are now much better equipped than in the past to make a significant contribution to disease surveillance and monitoring of trends and impending epidemics and identification of potential risk factors, and also to take into account the theoretical frameworks that seem most promising in geographies of public health today.

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Chapter 19

Migration and Health

Paul Boyle and Paul Norman

Introduction: The Importance of Migration and Its Role in Health Studies

> I seek to present a manifesto for a sociology that examines the diverse mobilities of peoples, objects, images, information and wastes; and of the complex interdependencies between, and the social consequences of, these diverse mobilities. (Urry 2000: 1)

There is no doubt that the links between the two themes of *migration* and *health*, which are drawn together in this chapter, are becoming increasingly complex at the beginning of the twenty-first century. As international and internal movements of people, information, ideas, and so on continue apace there are those, such as Urry, who argue that this demands a reconfigured way of looking at the world (Urry 2000). No longer can we imagine societies as stable, fixed entities; instead, we should acknowledge the flux and diversity of a world that may be better represented as a series of overlapping and interdependent mobilities. As Urry and others argue, this "mobility turn" in the social sciences has opened new ways of thinking about the way movement impinges on our daily lives (Sheller & Urry 2006). It is also encourages us to think seriously about the role of mobility in our attempts to understand most, if not all, social science phenomena. In this chapter we focus specifically on the movement of people between different places and some of the consequences of this on individual and population health.

As increasingly large numbers of people flow back and forth across and within national borders, governments struggle to balance the various costs and benefits of these mobilities. The social, economic, and political consequences of such mobility are difficult to quantify when it is virtually impossible to calculate accurately how many migrants are involved, and even more difficult to summarize their personal characteristics (Boyle et al. 1998). Despite the awareness of inaccuracies in migration figures, there is a consensus that the scale of such mobility has grown considerably over recent decades. Using the example of the United States, Martin and Midgley (2006) highlight that in 1970 the foreign-born population was around 9.6 million people, or less than 5 percent of the total population, but by 2004 it was around 35 million, or 12 percent. In only ten years between 1990 and 2000, the foreign-born US population grew by 57 percent, and the current projections suggest it will rise to around 42 million by 2025. Partly as a result of these rapid increases, international migrants, particularly those seeking asylum or making illegal moves, have become an extremely contentious political issue which attracts press coverage in many advanced, industrial nations on an almost daily basis. Consequently, political parties from across the spectrum appear more inclined to treat migration as a "problem" than as a solution to many of the demographic and economic challenges facing contemporary society.

Thus, for Tesfahuney the surveillance, racialization, criminalization, and securitization of international migrants have emerged as key aspects of the discursive regimes informing our understanding of migration discourses, particularly in the western world (Tesfahuney 1998). One consequence of this has been a tendency to represent migrants as "others" – as a different, often marginalized group who have no place in the mainstream. For some sections of society migrants are threatening, competing for jobs and public services, but also a group to be feared and resisted. As a result, numerous far-right organizations portray an anti-migration stance as perhaps the most obvious focus of their activities and even among more mainstream political bodies migrants remain an awkward group who need to be carefully managed.

As Ahmed argues, it is often through their very movements and proximities that bodies are marked as "different" in the first place and one expression of this is the common tendency to regard migrants as harbingers of disease (Ahmed 2000; see also Kraut 1994; Cresswell 2000). There are numerous historical examples of the role of migrants in spreading disease and even in contemporary society a major justification for the surveillance of international movers is the possibility (and often assumed probability) that they will carry disease. In the second section of this chapter we provide some historical and contemporary examples of the relationship between migrants and disease spread using, first, the classic case of "Typhoid Mary" in the United States and, second, the example of tuberculosis (TB), which remains a significant infectious cause of death even in advanced, industrial societies where it was once felt the problem had been eradicated (see for example Gandy & Zumla 2003).

However, it is not only through the spread of disease that migrants play a major role in our understanding of health. One of the most fundamental activities in epidemiological studies is the study of health inequalities. While some studies compare health outcomes between different income, social class, or ethnic categories, numerous other studies consider geographical variations in health, be they between different countries, regions, or neighborhoods classified by some surrogate measure of socio-economic status, such as deprivation. Understanding geographical inequities is important not only for academic inquiry, but also because they provide the justification for many geographically targeted public health interventions and policy recommendations. However, because migration is selective, it is quite possible that apparent differences between population sub-groups or geographical areas may be over- or under-estimated as a result of mobility. In the third section we therefore provide some important examples of the potential influence of migration on population health, focusing on the role of health-selective migration in explaining, first, the widening health and mortality gap between those living in more or less deprived areas in the United Kingdom and, second, the paradoxical mortality rates of Hispanics in the United States.

In the final section of this chapter, we turn our attention to the valuable role that migration can play in helping us understand the relationship between genetic and environmental influences on disease. In this case, migration provides a kind of natural experiment which is a useful tool in teasing out the complex relationship between genes and environment. This is a valuable approach which is likely to become increasingly important as more and more data are collected on genetic characteristics in large cohort studies (Manolio et al. 2005). In the first part of this section, we consider how health characteristics change among immigrants during the process of "acculturation" and, in the second, we focus on the specific example of multiple sclerosis (MS) where migration has been used as a quasi-experiment to help reveal the underlying aetiology.

We conclude by arguing that the various relationships between migration and health have attracted surprisingly little attention in epidemiological studies, despite the important role of migration in various types of study (Boyle 2004). Part of the explanation for this is a lack of appropriate data, as it is rare to have detailed residential histories in disease or mortality registers. However, it is also important that health researchers are aware of the pitfalls of ignoring migration in what is becoming an increasingly mobile world. The relationship between migration and health is complex, involving those that move but also those in both the origin and host communities that migrants pass between. This chapter therefore aims to summarize a few of the diverse ways in which migration is linked to health.

Migration, Disease, and Public Health

Perhaps the most obvious link between migration and health, which has been recognized for centuries now, is the role of mobility in spreading disease. While the medical approaches for disease control have improved remarkably over recent decades, even advanced, industrial societies remain vulnerable to diseases once regarded as defeated (see Chapter 9, this volume). In many cases, the rise and spread of such disease has often been associated with migrants and there is no question that mobile groups may spread disease between populations. However, it is also the case that migrants are often "scapegoated" and there is growing evidence that the resources dedicated to the surveillance and control of migrant carriers may be better spent focused on improving the social conditions that migrants and other vulnerable groups inhabit.

As intimated elsewhere in this volume (Chapter 17), the mobile, migrant body has long been associated with disease. Indeed the spread of disease is perhaps the most obvious way in which migration and health have been linked, both in the public mind and in the academic literature. Numerous historical examples exist where the mobility of different groups brought people and diseases together with devastating impact. The decimation of the South American population following the Spanish conquest is one of the most extreme examples and, although the numbers involved are difficult to estimate, partly because the size of the native populations are unknown at the time of first contact, it is agreed that there were vast numbers of deaths across the region. What the link was between the migrant conquests and the startling deaths that followed remains debated though (Livi-Bacci 2006). Certainly, new diseases were introduced which the host "virgin soil" population had no immunity to and these included smallpox, measles, diphtheria, rubella, and mumps. However, even as early as 1858 Motolinia wrote of the "ten plagues" which contributed to the devastation of the Mexican population (Motolinía 1858). One of these referred to the spread of disease, but the others included the effects of the wars; the famine that followed because farming was abandoned during the wars; the exploitation of the host population, particularly through gold mining; and, the more general collapse of social and economic structures. What proportion of the deaths should be attributed to the spread of disease is difficult to determine. Certainly, these "crowd diseases" were more likely to be important in the more densely populated areas, but their impact would have been marginal in areas where the population was more scattered (Livi-Bacci 2006). Thus, while the devastating impact of the Spanish conquest is often assumed to be related to the introduction of disease, it is possible that this has been exaggerated in some accounts (e.g. Diamond 1997). As Livi-Bacci (2006: 226–7) points out:

> New diseases were certainly a very important factor – often the major factor – in the depopulation of America. But if we let history speak, we see that a rise of mortality due to human factors, a weakening of reproduction, and expulsion and forced migration of the indigenous people into hiding or into inhospitable areas were also powerful factors in the decline. Behind the demise of the Indians lay not only the blind determination of germs, but also no less deadly human factors.

From the late nineteenth century, public health interventions began to be introduced which were designed to protect societies from potentially diseased migrants. Classic images from Ellis Island encapsulate both the fear of the migrant families as they arrived in New York, but also represent the fear of the public health authorities charged with protecting the United States from the diseases that these migrants may have carried. Various health checks were conducted and although treatment was provided to those patients suffering from infectious diseases, it was rudimentary and quarantine was often the only solution (Figure 19.1).

A noteworthy example of how migration is associated with the spread of disease involves "Typhoid Mary," also around the beginning of the twentieth century (Leavitt 1992, 1997; Brooks 1996). Born in 1869 in County Tyrone, Ireland, Mary emigrated to the United States in 1884 and worked as a cook in various locations around New York. Mary became notorious because George Soper, from the New York Department of Health, identified her as the first healthy carrier of the disease in 1907 (Soper 1907, 1939). Asked to examine why an outbreak of the disease occurred in a household on Long Island in 1906, he focused his attention on the servants of this family and soon became suspicious that a cook may have been responsible. Tracing records of her movements using files kept by the New York domestic agency through which she had been hired, he soon found that most of the

Figure 19.1 Health checks and quarantine in Ellis Island, USA, around the beginning of the twentieth century. *Source*: Reproduced courtesy of the National Library of Medicine, National Institutes of Health, Bethesda, Maryland.

homes she had worked in had been struck down by the disease. Given that typhoid is spread through contaminated food or water, Mary's occupation made her a particularly effective carrier (Figure 19.2). However, it was not surprising that she resisted this label, as at this time few were aware that it was possible for apparently healthy people to carry and spread the disease (Wald 1997). Mary was adamant that she was not a carrier, particularly since tests conducted by a private laboratory found no evidence of the disease (she may have been in remission during the period of these tests).

Soper failed to persuade Mary that she was a threat to public health even though numerous members of the families she worked for had succumbed to the disease; indeed of the 47 people she was subsequently known to have infected, three died. After publishing a paper documenting Mary's condition (Soper 1907), he made a number of attempts to test Mary. On the day that he returned with a doctor to detain her she fled and it took three hours for her to be located. Had she agreed to undertake tests and to give up her job as a cook, or have her gall bladder removed, as this was believed to the site of infection, it seems quite likely that she would not

"TYPHOID MARY"

The Extraordinary Predicament of Mary Mallon, a Prisoner on New York's Quaran

By Dr. Wm. H. Park, New York Board of Health.

Figure 19.2 "Typhoid Mary," originally published in the *New York American*, June 20, 1909. *Source*: *New York American*, June 20, 1909.

have become so infamous, but she was unwilling and refused treatment. Mary was quarantined in a one-room bungalow in the Riverside Hospital for Communicable Diseases. She was released two years later, having agreed to give up working as a cook, but she failed to keep this promise, assumed the alias of Mrs Brown and disappeared, only to end up infecting a number of other households. She was publicly vilified as a menace and was detained once more, spending the rest of her life in detention – a total of 26 years of isolation (Brooks 1996). Mary's case was particularly tragic since during her detention more than 400 additional cases of healthy carriers were identified, although none were isolated. It was her determined resolve that she was not a carrier, and that her liberty should not be sacrificed for some "dubious" social good, that made her reputation; the term "Typhoid Mary" has since become synonymous with any carrier of disease who poses a threat to the public.

Of course, while this represents an interesting case study of how disease may be spread by a migrant it also raises broader questions about how society is controlled. There was a subtle shift in public health thinking around this time from the primacy of individual human rights to the notion of social beings who are expected to be responsible for their actions (Wald 1997). Indeed, militaristic metaphors, such as that of the "battle," became an increasingly common description of the fight between "man" and parasites (see Sontag 1978). Leavitt describes this as the language of a new science of bacteriology, in contrast to the language of individuals' rights and social justice which preceded it. For Leavitt, Mary Mallon's transformation in the media into "Typhoid Mary" represented the triumph of laboratory science over social rights (Leavitt 1997).[1] For Mary, it meant isolation without trial.

The role of migration and mobility is also critical in understanding society's more general response to this disease. Soper's insightful work on the spread of Typhoid was based on following the detailed movements of Mary between different, subsequently infected, households. This detective work was a good story that attracted considerable media attention. More generally, though, the disease represented the fear that many white Americans had of being overwhelmed by forces from outside:

> Typhoid made gruesomely literal the material relations of, and the intimate contact with strangers in, the industrial, immigrant city. The discovery of human vectors of disease fleshed out the contours of contact phobias, explaining the easy enlistment of typhoid in the discourse of "race suicide." Typhoid epidemics typically struck the affluent as often as the destitute. Thus they served as a convenient analogue for the extinction of the white race that was to attend the competition offered by the cheap labor of migrants and immigrants. Physically and economically, in other words, white middle-class America was apparently under siege. Epidemics, moreover, were the disruptive result of increased global commerce. (Wald 1997: 191)

The scapegoating of immigrant groups has been well documented by Craddock in her studies of the Chinese in San Francisco (Craddock 2002). These historical accounts demonstrate the ways in which public health officials constructed stigmatized Chinese immigrants, but also controlled their participation in American civil society through the creation of a pathological containment space for this diseased group in Chinatown. Even in more recent times, the fear of immigrants pervades attempts to control infectious disease. Certainly, there have been significant advances in public health, microbiology, vector control, immunology, and clinical medicine during the last century, which have reduced the threat of infectious diseases remarkably; the eradication of smallpox is the most oft-cited example of the success of human intervention. However, despite these advances, those charged with monitoring and controlling disease remain perplexed by the role of migrants. For example, a potentially influential policy document produced by the European Academies Science Advisory Council (EASAC 2007) outlines a series of challenges for EU health care systems which stress the importance of monitoring, screening and researching into potentially infectious migrant groups (Box 19.1).

It is perhaps ironic that some of the most serious public health problems which existed at the beginning of the twentieth century have come to the fore once again with the unanticipated resurgence of certain infectious diseases. It would be a great

Box 19.1 Key challenges for EU health care systems

- Improving evaluation and sharing of information on current screening practices across the EU.
- Facilitating health care access and improving health care follow-up of migrants after the initial contact, as part of a general need to enhance primary care services in some member states.
- Developing information and communication systems to improve awareness and support interaction between patients and the health care system.
- Coordinating strategies for screening and follow-up practices for high-risk groups across the EU.
- Developing consensus on those infectious diseases most relevant to migration.
- Progressing research to clarify issues where currently there is uncertainty. In particular, well-designed research studies are needed to determine: (1) burden of infectious disease in migrant groups; (2) nature of health inequalities – including vaccination status – between migrants and the rest of the population; (3) nature and degree of net public health risk attributable to migration; (4) efficacy of alternative screening approaches – it is essential to do better in assessing the benefits of screening and to include the evaluation of approaches based on surveillance and sentinel systems in the strategic analysis of the options for managing infectious disease-related migration problems.

Source: EASAC (2007), *Impact of Migration on Infectious Diseases in Europe*. EASAC, London.

surprise to health practitioners in the early twentieth century that the single infectious disease that takes the most lives today is tuberculosis (TB) – a disease which is treatable and preventable and one that has also been strongly associated with immigrants (see, for example, Bell et al. 2006). Thus, around 2 billion people are infected with the TB bacillus worldwide and an estimated 2–3 million die from TB each year.

In the United States, the introduction of sanatoria in the 1880s helped isolate patients who either died or became non-infectious. After curative drugs became available in the 1950s, and with the adoption of community outreach programs from 1959 funded by categorical federal project grants, there followed a sustained decline in the number of cases (Reichman 1996). However, what Reichman describes as a public health catastrophe followed as the categorical grants were replaced by block grants for public health expenditure in the early 1970s and funding became less targeted on TB. A resurgence of the disease occurred so that by the end of 1984 TB rates were rising, increasing 20 percent between 1985 and 1992 nationwide and by 30 percent in New York City between 1988 and 1992. In 1993 the World Health Organization declared TB to be a "global health emergency" – the first time any disease had been singled out in this way (Nakajima 1993).

Various factors are now responsible for the continued existence of the disease including the rise of the HIV virus, lack of adherence to multi-drug treatments, particularly among the homeless and those with more chaotic lifestyles. There is clear evidence that TB rates are considerably higher among immigrant groups in most advanced, industrial societies with more than half of all new TB cases occurring among immigrants in Western Europe, the United States, and Canada (Dasgupta & Menzies 2005). As much as 77 percent of the cases reported in the United States in 2000 were among non-Hispanic blacks, Hispanics, and Asian/Pacific islanders (Tiruviluamala & Reichman 2002) – and these types of statistics have led to various calls for improved surveillance measures to monitor incomers (Talbot et al. 2000; Farah et al. 2005).

However, these are relatively elaborate and highly expensive systems and some regard this response as disproportionate (Dasgupta & Menzies 2005; MacPherson & Gushulak 2006). Almost all high-income countries continue to use chest radiography screening to test for TB among applicants for permanent residence, but these programs are expensive and fail to pick up TB contracted by former immigrants who return home as screening is only conducted at the time of initial entry (Ormerod et al. 2001). One study of permanent-resident applications among those already living in Canada estimated that the 12,988 chest radiographs conducted in 1996–7 cost approximately $33,418 per active case detected and treated – this compares to only $11,090 for passive diagnosis and treatment (Dasgupta et al. 2000).

There is also some debate about the percentage of TB cases among the native born that involve transmission from immigrants, with some suggesting it is as much as 17 percent (Borgdorff et al. 1998) and others as little as 2 percent (CHIN et al. 1998). Even the higher rate recorded in the Netherlands still only represents a risk of less than 1 in 100,000 that Dutch born will develop TB following transmission from an immigrant and there is even some evidence that the foreign-born may be more likely to acquire the disease from the native born than vice versa (Jasmer et al. 1997). Certainly, the overall impact on public health is minimal and for some the response to the immigrant threat is exaggerated.

Many immigrants live in relatively deprived conditions after arrival in the host country (Ponticiello et al. 2005) and there is considerable evidence that the raised rates among ethnic minority groups can actually be explained by socio-economic status – once this is controlled for, the higher rates among ethnic groups are significantly reduced (Cantwell et al. 1998). Corroborating evidence is that immigrant groups have been shown to have higher rates of the disease for as long as 20 years beyond arrival. This suggests that living conditions within the United States are more likely to explain their higher risks than their immigrant status (Zuber et al. 1997). These results caution against a purely biomedical response to TB among immigrants (Ho 2004) and there have been calls for a broader public health approach which involves improving the living and working conditions of immigrants on arrival to the United States, as well as increasing the aid contribution towards helping to eradicate the disease worldwide (Enarson 2000; Schwartzman et al. 2005). Overall, this may be a more cost-effective public health strategy for dealing with TB than over-focusing on the role of immigrant carriers:

> The ideal long-term tuberculosis control strategy would be global investment to improve tuberculosis control in high incidence countries. If successful, this could result in a global reduction in tuberculosis incidence, which would reduce the risk of tuber-

> culosis among human migrants traveling from high tuberculosis-incidence to low tuberculosis-incidence regions. Such a strategy would be more humanitarian and may be more cost-effective than the current approaches to tuberculosis control among these migrants. (Dasgupta & Menzies 2005: 1114).

While migration is intimately linked to the spread of disease, it also has an impact on our understanding of the distribution of disease more generally. By moving, both internationally and sub-nationally migrants take with them their health characteristics (only some of which are infectious) and this mobility has implications for how we summarize health variations between population sub-groups and different geographical regions.

Health-selective Migration and Understanding Population Health

Migration is, of course, a selective process. Migrants are not a random selection from the population and as a consequence we would expect migrant characteristics to be different to those of non-migrants. This is true across a range of demographic, social, and economic characteristics (Bentham 1988; Boyle et al. 1998), but it is also true in relation to health outcomes. Thus, we would expect that migrants are generally healthier than average, except those who move in old age when health deterioration may become a more important motivating factor for moving. The distance of the move may also be influenced by health status, with shorter moves being more common among those of poorer health (Findley 1988; Boyle et al. 2002). If such selective movement occurs, it is quite possible that this will influence the apparent distribution of health. This could have an impact on the health profile of population classes, or of geographical origins and destinations. Indeed, while the health of individuals and communities may be influenced by migration it is also possible that the health of individuals and communities may stimulate migration (Jatrana et al. 2005). Certainly, such selective migration raises a number of important questions which rarely receive enough attention in the epidemiological literature – most studies simply ignore migration and its potential impact on health inequities (Prothero 1977; Boyle 2004).

Health-selective migration and widening health inequalities

The observation that health-selective migration may contribute to an increase or decrease in place-specific rates of illness is not new. Farr noted in 1864 that migrants from urban to rural areas differed in their health from migrants moving from rural to urban areas (Farr 1864). In 1872, Welton also pointed out that selective migration could have a profound effect on local mortality rates. Observing that older, less-healthy people were moving away from cities to distance themselves from health hazards, Welton (1872: 153) wrote that: “few would be surprised if it were found that places on the south coast, to which persons suffering from consumption and other ailments are apt to remove, exhibited heavy death rates.”

Even so, while numerous studies compare mortality or morbidity rates by local areas, very few consider the influence of mobility on these patterns. Thus, a strong

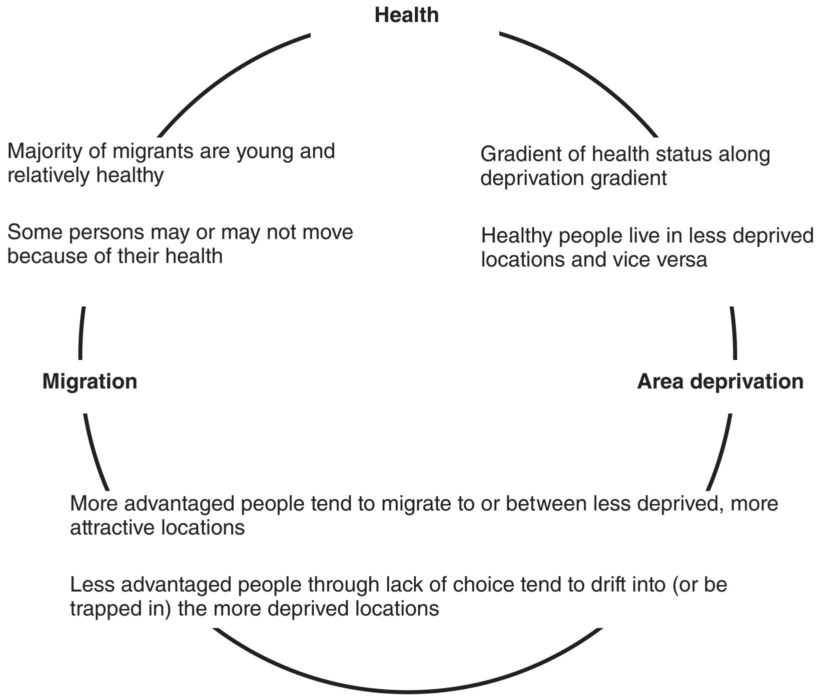

Figure 19.3 Interrelationships between health, migration, and deprivation.

relationship is regularly demonstrated between health and area-based measures of deprivation, such as the Carstairs index (Carstairs & Morris 1991). More deprived areas have consistently been found to have higher mortality rates (Eames et al. 1993; McLoone & Boddy 1994; Sloggett & Joshi 1994; Drever & Whitehead 1995), lower life expectancy (Raleigh & Kiri 1997), poorer self-reported health (Boyle et al. 1999), and worse outcomes across a range of different conditions (Crombie et al. 1989). The reasons for these health-deprivation relationships are complex but include that health and health-related behaviors tend to be poorer in more disadvantaged areas and that the range of resources and facilities which might promote health are less common in poorer areas (Macintyre et al. 2008). However, it is also possible that at least part of the explanation relates to selective migration and, if so, the relationship between deprivation and health may have been misrepresented (Figure 19.3).

Recently, a number of studies have explored this possibility in the United Kingdom (Boyle et al. 2002; O'Reilly & Stevenson 2003; Boyle & Duke-Williams 2004; Boyle et al. 2004; Norman et al. 2005; Connolly et al. 2007; Cox et al. 2007). In one such study, longitudinal data were used to examine both the effects of social class, or occupational, mobility and deprivation, or geographical mobility on self-reported limiting long-term illness (Boyle et al. 2009). The social class literature has suggested that movement between social classes actually reduces the health gap between the higher and lower social classes. Referred to as "gradient constraint" this has been assumed to be caused by the fact that movers into higher social classes tend to have poorer health than those they join, while movers into lower social classes tend to have better health than those they join (Bartley & Plewis 1997; Blane et al. 1999). This has led to the suggestion that increasing social mobility may be an effective policy to reduce health inequalities (Bartley & Plewis 2007).

Of course, "deprivation mobility" is different to social class mobility. The deprivation status of the place people live in may change between two time points as a result of them moving between two differently deprived places, or as a result of the place they live in itself changing status relative to other places (Norman et al. 2005). Either way, it is interesting to explore whether the changing deprivation status of the areas people live in is related to their health status. Is deprivation associated with poor health, or does health status influence the type of area a person lives in, much as Farr and Welton suggested in the nineteenth century? If so, is at least part of the health gap between rich and poor areas explained by such selective mobility, rather than deprivation-related factors?

A closed population sample of persons present at the 1971, 1981, and 1991 Censuses was extracted from the Office for National Statistics (ONS) Longitudinal Study (LS) (Hattersley & Creeser 1995). To control for initial poor health-selection effects those who reported being permanently sick or disabled in 1971 or 1981 were excluded from the sample. The aim was to determine whether over the 20-year period from 1971 to 1991 there had been any systematic sorting of healthy and unhealthy people across the deprivation gradient. As the sample was closed, the standardized health rates were simply compared (based on a self-reported limiting long-term illness question asked in the 1991 census) for five deprivation quintiles (calculated from variables for the electoral ward in which people were living) in 1971 and 1991.

Figure 19.4 compares the standardized illness ratios (SIRs) for the two time periods and shows that there was a steeper gradient in 1991 (solid bars) than for the same individuals in 1971 (striped bars). It does appear that those who were ill

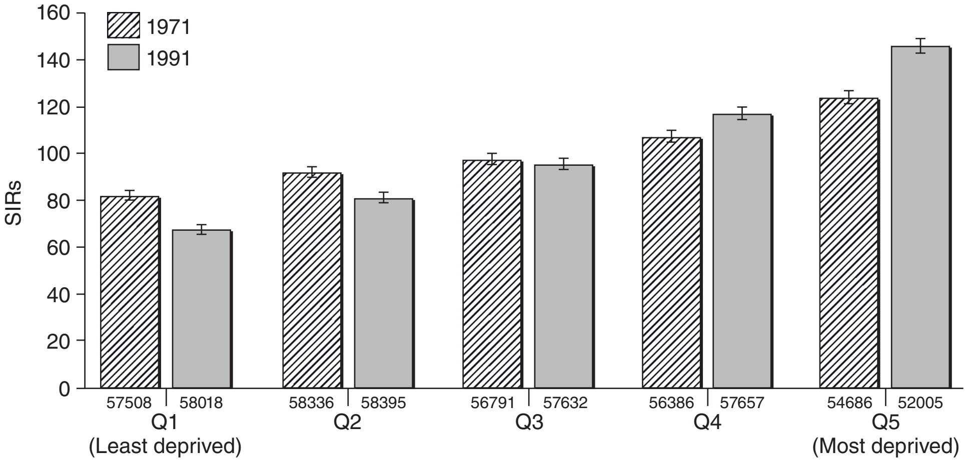

Figure 19.4 Standardized illness ratios in 1991 for Carstairs quintiles, 1971 and 1991. *Source*: ONS Longitudinal Study (http://www.ons.gov.uk/about/who-we-are/our-services/longitudinal-study/index.html).

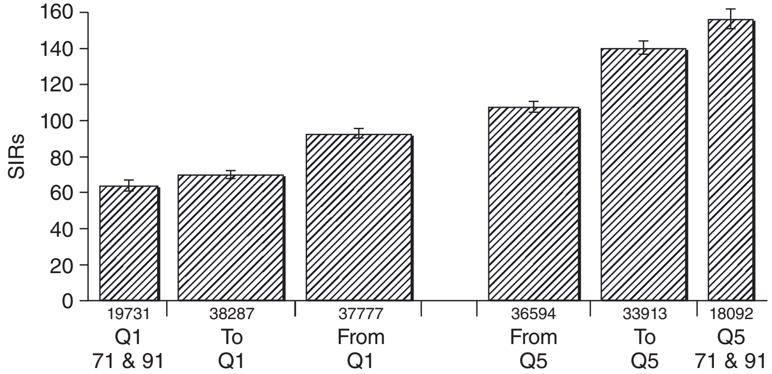

Figure 19.5 Transitions affecting changes in Carstairs deprivation quintiles 1 and 5, 1971 to 1991. *Source*: ONS Longitudinal Study (http://www.ons.gov.uk/about/who-we-are/our-services/longitudinal-study/index.html).

in 1991 were more likely to live in deprived areas in 1991 than they were in 1971 – selective mobility appears to have occurred over the 20 years, which will have contributed to the widening health gap that has occurred over this period.

Following the work in the social mobility and health literature, the health of those moving into different deprivation quintiles was compared with the health of those they were joining. Corresponding with the studies of social mobility, we also found that the health of those moving between deprivation quintiles consistently fell between that of their origin quintile in 1971 and their destination quintile in 1991. This raised something of a paradox. For selective moves to contribute to a widening health gap, as displayed in Figure 19.4, we would expect those moving into the most deprived areas to have worse health than those they joined and those moving into the least deprived areas to have better health than those they joined. Otherwise the selective moves would intuitively reduce the gap between these extremes when, in fact, the opposite effect occurred.

The reason for this result is displayed in Figure 19.5. It is true that those moving into the most deprived quintile had worse health than those they joined, but they had considerably better health than those who left quintile 5. And, because the absolute size of these in and out flows were relatively similar, the net effect is an increase in the relative poor health of those in quintile 5. The opposite effect occurs for quintile 1 – those arriving have worse health than those they join, but better health than those they replace. As argued above, the changing area deprivation circumstances of people may result from both migration and a change in the relative deprivation of an area itself, but it is clear that migrants play a substantial role in this redistribution. In fact, we find that for the most deprived areas, it is the out-migration of the healthy and the immobility of the less healthy (rather than the in-migration of unhealthy people) that largely account for the change in the health-deprivation relationship (Norman et al. 2005).

This example demonstrates the importance of mobility in our understanding of geographical health inequalities. At least part of the widening health gap between rich and poor areas will be accounted for by the movement of healthy and less healthy migrants into less and more deprived areas respectively. As a consequence, it is essential that the mobility component should be acknowledged when attempts are made to quantify health inequalities.

"Salmon bias" and the paradox of Hispanic mortality in the United States

Selective migration may also impact on apparent health inequities between different population sub-groups. A rather peculiar but important finding is that some immigrant groups have substantially lower mortality rates than those of the majority population in the destination societies. This has been observed in Europe (Razum et al. 1998; Kibele et al. 2008), but also in the United States where mortality rates among Hispanics are lower than those for the non-Hispanic white population (Markides & Eschbach 2005). This result has been demonstrated in surveys, studies using vital statistics data, and even in nationally linked mortality databases, such as the National Longitudinal Mortality Study (NLMS) (Singh & Siahpush 2001). It is particularly the case among older Hispanics and those born abroad rather than in the United States (Elo & Preston 1997). Hispanic men appear to have a 1.3 year advantage in life expectancy at age 65 and Hispanic women have a 0.9 year advantage at this age (Elo et al. 2004).

This finding is surprising because Hispanics have been shown to have poorer access to health care and, perhaps more importantly, the socio-economic circumstances of the Hispanic population are worse than for whites; there is even some evidence that the disparity between whites and Hispanics becomes even stronger when family income is controlled for (Sorlie et al. 1993). As virtually all studies in public health epidemiology demonstrate a mortality gradient, with those in poorer circumstances living shorter lives, these results for the Hispanic population are something of a paradox. Hence, this has received considerable attention from many researchers and a number of possible explanations have been suggested (Turra & Elo 2005).

First, it is possible that cultural factors influencing health behaviors, social support, and family relations may be different for this group (Abraido-Lanza et al. 1999; Singh & Siahpush 2001; Palloni & Arias 2004). We know, for example, that diet, smoking, and other health-related behaviors are influenced by cultural practices, as are the importance of social networking and support. It is possible therefore, that some blend of cultural practices may have a positive influence on Hispanic mortality, although to date the evidence for this is relatively weak (Palloni & Arias 2004).

Second, it is possible that data inadequacies may explain this surprising result (Weitoft et al. 1999; Razum et al. 2000). Problems might include inaccuracies in recording Hispanic origin, as ethnic identification is not entirely accurate on death certificates which usually provide information for the numerator in mortality rates calculations, nor even in censuses which are used to calculate the denominator. About 7 percent of Hispanic deaths are reportedly not recorded as Hispanic on death certificates (for example, Rosenberg et al. 1999). Age misreporting is another problem which has been identified as being more common among Hispanic populations in the United States than among the non-Hispanic whites (Dechter & Preston

1991). Thus, some Hispanic groups over-estimate their age, particularly as they grow older, and this would have a direct effect on the calculation of mortality rates if it was common. Finally, and more specifically, it has also been pointed out that matching files to subsequent death records (as may be the case in longitudinal datasets) may be less reliable for those from minority ethnic groups as their names may be more difficult to match and a migrant's other details such as social security numbers may be less reliable. In combination then, data issues could lead to an under-reporting of Hispanic deaths.

Third, and of particular interest here, are two migration-related processes. The "healthy-migrant" effect relates to the fact that migrants are generally healthier than those they leave behind and, in some cases, they may also be healthier than those they join in the place of destination (Marmot et al. 1984; Bentham 1988; Abraido-Lanza et al. 1999; Boyle 2004). This selective effect might explain why Hispanics in the United States have lower mortality risks than otherwise would be expected. It is also possible that selective migration in the other direction, or what has become known as the "salmon bias" hypothesis (Pablosmendez 1994), could also have an impact on Hispanic mortality. According to this line of reasoning, significant numbers of non-US-born Hispanics might be more likely to return home following spells of unemployment or illness and if these migrants die abroad they will not be counted among the deceased in the United States, even though they may have been counted as part of the denominator population (in the previous census, for example). Because older people are more likely to die, the salmon-bias hypothesis has greater salience at older ages, while the healthy-migrant hypothesis will have more impact on mortality among younger adults.

These three hypotheses have been examined by Palloni and Arias (2004) using data from the *National Health Interview Survey* (NHIS) and the Mexican Health and Aging Study (MHAS). They argue that the Hispanic mortality advantage can only be found among foreign-born Mexicans and Hispanics, rather than those born in Cuba and Puerto Rico, and that for the Mexicans the salmon-bias effect does indeed explain the lower than expected mortality rates. They were unable to account for the mortality advantage among the other foreign-born Hispanics. On the other hand, although a more recent study based on the analysis of social security data confirmed the existence of a salmon-bias effect, it was found to be too small to account for the significantly lower mortality of Hispanics. This is an important finding, as it relies on one of the few datasets that follow people who leave the United States – the Social Security Administration's Master Beneficiary Record (MBR). Emigrants are obliged to respond to annual questionnaires if they wish to continue receiving benefits and, at least among the group of social security beneficiaries captured in these data, the results support the concept of return migration of relatively unhealthy people, but do not suggest this explains all of the mortality advantage experienced by Hispanics compared to non-Hispanic whites in the United States (Turra et al. 2008). This is because the potential salmon-bias effect is influenced not only by the size of the mortality difference between emigrants and stayers, but also by the volume of such migration; a point we return to in the next section. Of course, as this study is only limited to primary social security beneficiaries, a good number of Hispanics currently in the United States and Hispanics who have returned home from the United States will not be included in the figures, leaving some possibility that the magnitude of the salmon-bias effect may be under-estimated in this analysis.

At the very least, these two examples make it clear that apparent differences in health status among different ethnic groups and between those living in differently deprived areas may be influenced by migration behavior. Because people with different health characteristics may have different propensities to move then we would expect this to have an impact on relative health inequalities. This is an important point which is often ignored in studies of health inequalities, suggesting that in many cases the extent of inequality may be exaggerated by migration.

Migration and Subsequent Health

While health-selective migration has been shown to have a potentially important impact on studies of health inequality, comparisons between the health of migrants and those in origin and destination societies is valuable for other reasons too. In particular, many studies have explored the longer-term impacts of migration to assess whether the health of migrants adjusts to that of the destination society over time (Prior et al. 1974; Marmot et al. 1975). These studies which aim to relate "assimilation" or "acculturation" to subsequent health outcomes highlight both the impact of destination environments on health, but also some of the problems that immigrants face when trying to adapt to new societies. Further, migrant studies can be used to test hypotheses about the potential causes of specific diseases, providing an insight into whether environmental or genetic factors underpin the health differences that exist among different national groups. If people's health circumstances change after living in a particular environment for a length of time, then the role of environment is supported in these quasi-experimental study designs.

Migration, disease, and "acculturation"

Numerous studies, particularly in the United States, have explored how the health of immigrant groups changes after arrival (Williams & Collins 1995; Lara et al. 2005; Argeseanu Cunningham et al. 2008). Some studies compare immigrants to native whites or second-generation ethnic groups, while some compare immigrant health to those they left behind in the country of origin. Underpinning most of these studies is the assumption that immigrants will gradually "assimilate" to the US way of life; something that was taken for granted in the early literature (Park & Burgess 1969). Part of this process involves "acculturation," or the acquisition of the cultural elements of the dominant society (Berry 1997). Of course, this rather linear model of immigrant groups inevitably changing their cultural affiliation over time was soon critiqued as others pointed to the different contexts in which some groups had arrived and the important distinction between child and parent acculturation (Portes & Rumbaut 2001). Bidimensional models of acculturation have also been proposed (Cabassa 2003), which question the linear process of assimilation and acknowledge that acquiring some characteristics of a new culture may be independent from rejection of the original culture. Thus, one common four-fold representation of different types of acculturation distinguishes "assimilation" (complete culture acquisition), "separation" (rejection of new culture), "integration" (embracing both cultures), and "marginalization" (exclusion by both cultures) (Berry 1997). Despite the theoretical developments in this field, however, proxy measures for acculturation continue to be relatively crude, often relying on the length of time of residence in the host country and the use of the dominant language (Himmelgreen et al. 2004; Lara et al. 2005).

From these studies, it generally appears that immigrant mortality rates are better than those of the native-born with immigrant life expectancies at birth being about 3.5 years longer overall. This difference is even greater when comparing immigrants with US-born members of the same ethnic group (Singh & Hiatt 2006). As noted above, this is somewhat paradoxical and has generated considerable research into possible selection mechanisms, including the fact that migrants tend to be healthier than those they leave behind and that some may return home when their health deteriorates. Recent immigrants also fare well in relation to a number of specific health outcomes and behaviors (for example, they have lower rates of heart disease, are less obese, have better mental health, and lower infant mortality rates), strengthening the evidence for a healthy immigrant effect (McDonald & Kennedy 2004). Various studies attribute such health advantages to better lifestyles (Kaplan et al. 2004), social support networks (Singh & Hiatt 2006), as well as the selection effects described above.

However, the picture is complex, making it difficult to draw broad conclusions (Lara et al. 2005; Zsembik & Fennell 2005). For some health-related outcomes immigrants fare worse on arrival. In these cases, contributory factors include the stress of the migration event itself (Vega et al. 1987), poor living and occupational environments (Holmes 2006), a lack of health insurance (Lucas et al. 2003), and poor take-up of health care services (Leclere et al. 1994). Also, the health and health related behaviors of immigrants have been shown to deteriorate over time (Frisbie et al. 2001). Perhaps most notably, diets become poorer and one consequence is a rise in obesity rates (Gordon-Larsen et al. 2003; Himmelgreen et al. 2004; Himmelgreen et al. 2005; Bowie et al. 2007; Ahn et al. 2008). Smoking, alcohol consumption, and substance abuse also rise (Vega et al. 1998; Gil et al. 2000; Abraído-Lanza et al. 2005; Koya & Egede 2007), as do rates of self-reported poor health (Cho et al. 2004), cancer (John et al. 2005), and heart disease (Mooteri et al. 2004; Moran et al. 2007). While migrants have better mental health on arrival (Dey & Lucas 2006), this also tends to deteriorate with time (Alderete 2000). Certainly, there is considerable evidence that second and third generation immigrants do not retain the healthy advantage that their immigrant forbears held (Guendelman & Abrams 1995; Popkin & Udry 1998). Overall, then, it does appear that the health of immigrants gradually becomes similar to that of the native born and this demonstrates the importance of destination environmental and other contextual factors on a range of health outcomes. This feature of migration is one reason why it is a valuable tool in helping identify the underlying causes of some diseases.

Migration as experiment: the case of multiple sclerosis

Multiple sclerosis is a chronic demyelinating inflammatory and degenerative disorder of the central nervous system and is the most common disease to disable the nervous system among young adults. Globally, around 30 people in every

100,000 have been diagnosed with MS with the rates for women about twice as high as those for men (WHO/MSIF 2008). The aetiology of MS is not known, although there is broad agreement that it is multifactorial with both genetics and environment playing a role (Ebers & Sadovnick 1994). The disease is particularly interesting geographically because of its remarkable correlation with latitude, which was identified in the early 1920s (Davenport 1922) and confirmed in the first study to compare MS mortality rates across a number of countries (Limberg 1950). This demonstrated that rates of MS were considerably higher in temperate zones than in the tropics or sub-tropics and that there was a clear north–south gradient within the United States. Numerous studies since this time confirm this spatial patterning (Acheson 1977; Hammond et al. 1987) and the most recent atlas of MS (Figure 19.6) also highlights the increased prevalence at greater distances from the equator (WHO/MSIF 2008). Sunlight may be implicated in the aetiology of the disease, therefore, although it is not the sole explanation as rates of the disease are relatively low in some northern areas. Some studies suggest there may be an interaction between sunlight and diet (Swank et al. 1952; Swank & Dugan 1990; Kampman et al. 2007), and this might explain the geographical variations in risk for French farmers which is not obviously related to sunlight, but may be related to the intake of oily fish as lower risk pervades in regions on the Atlantic coast (Vukusic et al. 2007).

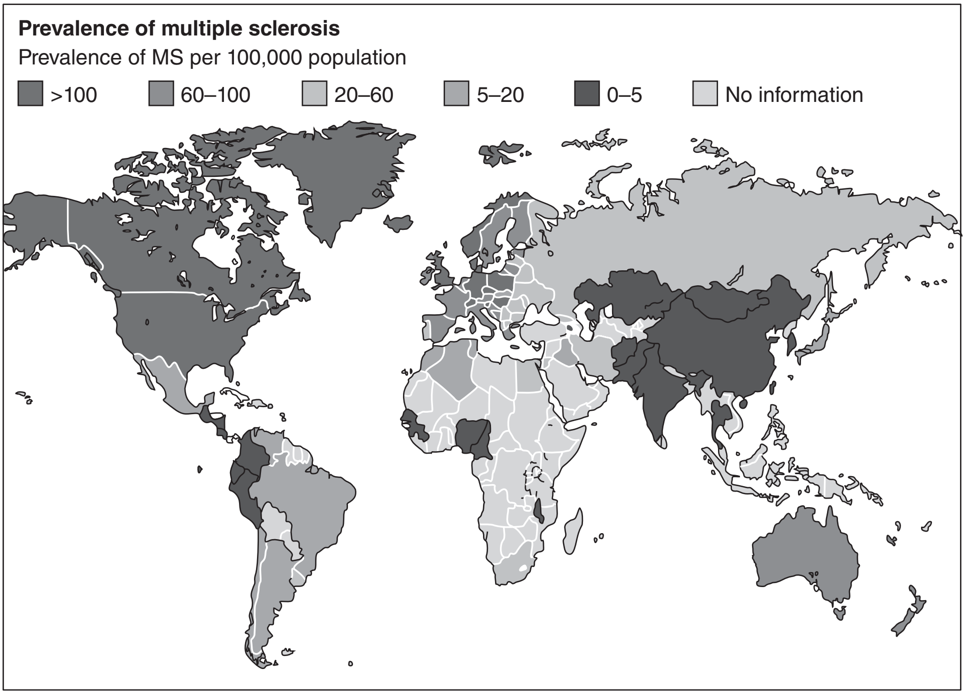

Figure 19.6 Worldwide distribution of multiple sclerosis. *Source*: WHO/MSIF (2008) *Atlas: Multiple Sclerosis Resources in the World 2008*. WHO, Geneva. Reproduced with permission from the World Health Organization and the Multiple Sclerosis International Federation.

Of course, the geographical distinctiveness of MS could be influenced by both nature and nurture. Consequently, a number of migration studies have been conducted in an attempt to examine whether the environment may indeed have a role (Dean & Kurtzke 1971; Elian et al. 1990). If the risk of MS changes among those who move between high and low risk environments, this would prove that the environment had a role to play in its aetiology.

The results do indeed suggest a role for the environment. For example, it has been shown that MS is uncommon among Indian and Pakistani immigrants to England but that rates are much higher among their children who are born there (Dean et al. 1976; Elian et al. 1990). A number of studies have found that the age of migration between high and low risk areas is crucial. For example, migrants from northern Europe where the rates of the disease are comparatively high to relatively low MS prevalence areas, such as South Africa or Israel, have a high prevalence of multiple sclerosis unless they migrate below the age of around 15 (Alter et al. 1966; Dean 1967; Dean & Kurtzke 1971; Dean & Elian 1997). Those who move before the age of 15 are more likely to acquire the risk of the destination society; migrants from relatively low risk countries such as India and Pakistan who move into the United Kingdom before the age of 15 have a higher risk of developing the disease than those who move after this age (Alter & Okihiro 1971; Dean & Elian 1997).

The importance of the age 15 cut-off has been debated (Detels et al. 1978), and a recent comprehensive migrant study in Australia also suggests that the age range of acquisition of MS may be considerably wider (Hammond et al. 2000). Even so, most studies support the idea that the most influential risk factor operates in early life, determining the geographical gradients in the disease which are apparent among ethnically homogenous populations. The combined results from these various studies raise the possibility that sunlight may have a role to play, perhaps in combination with some dietary effect, which would explain some geographical anomalies. There is also some support for the onset of MS being related to an infection, termed the primary MS affection (PMSA), which may be related in some complex way to MS (Sadovnick & Ebers1993). Kurtzke (1993) argued that this is likely to be a single infection, which is characterized by a need for prolonged exposure and has a limited age of susceptibility (MS does not seem to be contracted around the time of birth), and this hypothesis would correspond well with the findings from studies in the Faroe Islands which were occupied by the British in 1940 and which experienced successive epidemics of MS from 1943 (Kurtzke & Hyllested 1979; Kurtzke & Hyllested 1986; Kurtzke & Hyllested 1987; Kurtzke et al. 1988; Jersild et al. 1993; Kurtzke et al. 1993; Kurtzke et al. 1997; Kurtzke & Heltberg 2001). The influence of an infectious agent was also implicated in a recent study of MS clustering in Sardinia (Pugliatti et al. 2006), although the exact process of the interaction between MS susceptibles and the agent is debated (Poskanzer et al. 1966). Some form of gene–environment interaction is most likely and it may well be that more than one environmental factor is relevant (Ebers 2008).

The epidemiological study of MS is a classic example where the natural experiment of migration has been used to assess the role of genes and environment, as well as the period in the life course when risk factors are most likely to be influential. It demonstrates not only that migration is a valuable tool in the epidemiology armory, but also that cleverly designed migrant studies can provide new insights into the aetiology of hard to explain conditions.

Conclusion

This chapter has reviewed a few of the various and often complex links between migration and health which, we argue, are likely to grow in importance as society becomes increasingly mobile; indeed, for Urry, mobility has become a defining facet of twenty-first-century life. Certainly, the impacts of migration impinge on the health of the migrants themselves, but it can also have direct and indirect effects on the health of those in the origins and destinations that are involved and immigrants have attracted considerable attention because of the risk they pose to the spread of disease. Thus, the United States Institute of Medicine has recently commented that over the past two centuries the average distance and speed of human travel have increased a thousand-fold but incubation times for infectious diseases have remained the same (Knobler et al. 2006). Indeed, it is the relationship between immigration and public health where some of the most virulent anti-immigrant rhetoric has abounded.

However, as we argue above, rather than being viewed simply as vectors for the spread of disease, more attention needs to focus on immigrant living conditions and how included (or excluded) they are in host societies. More of a balance is required between policies that emphasize costly surveillance over those which take a longer-term more humanitarian approach to dealing with the plight of many immigrants. Hence the recent call for: more education of public health staff about acculturation effects among migrants; more targeting of specific immigrant groups in public health campaigns; a focus particularly on dietary changes among immigrant groups; better engagement between medical services and immigrant communities, particularly through the use of outreach programs (Lara et al. 2005).

More generally, while there is clearly a large and diverse literature on migration and health, we contend that migration has not received enough attention in epidemiological studies in the past. A major reason why migration must be considered is that it has a role in helping to explain the widening of geographical health inequalities which have been experienced in many developed countries. Ignoring the role of selective mobility will lead to inaccurate assessments of the impact of deprivation on health, and public health administrators need to be wary of ignoring such confounder variables.

Part of the reason why migration is often ignored in epidemiological studies is the lack of adequate data. While many will realize the importance of migrant selectivity in their work, it may not be simple to incorporate this because we rarely have detailed residential histories in routinely collected health datasets. Although not dwelt upon in this chapter, it is also evident that more subtle approaches to defining immigrant groups are required. Many studies conflate ethnicity and identity, sometimes relying simply on the country of birth to identify a particular group and it is clear that this will aggregate groups with quite different experiences and reasons for migrating. Improvements in data collection which recognize the diversity of migrant identities and experiences are therefore required. From a methodological viewpoint migrant studies are invaluable tools, but to take advantage of these types of quasi-experiment, we require more reliable, preferably prospective longitudinal data on migrant groups starting before they leave their origin societies. If combined with genetic material such studies could provide exciting opportunities to help us grapple with the gene–environment–cultural interactions which appear to underpin so many diseases (Manolio et al. 2005).

Note

1 While the case of Typhoid Mary would appear to represent a public health response from an earlier age, similar actions appear to have been taken in England even as late as the 1950s. A relatively recent report has uncovered the case of 43 women who were locked away for life in a mental hospital in Epsom, Surrey, following their diagnoses as carriers of typhoid. Even during the 1950s, when effective antibiotic treatments were available, as many as three women were detained per year, the repercussions of which are still ongoing as many of the women apparently had no mental health problems on arrival, although many were found to have serious psychological problems after years of incarceration (BBC, July 2008, http://news.bbc.co.uk/2/hi/uk_news/7528045.stm).

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Chapter 20

Social Perspectives on Health Inequalities

Vani S. Kulkarni and S. V. Subramanian

Introduction

The term "health disparities," or alternatively "health inequalities," came to occupy a central place in the larger health literature in just the first four years of the twenty-first century. For instance, a keyword search on the two terms in the 1980s and 1990s combined yielded a modest two dozen articles contrasted to more than 400 such articles between the period 2000 to 2004 (Adler 2006; Adler & Rekphof 2008). Development thinkers, health practitioners, health policy-makers, and academicians have engaged considerably with the issue of health inequality (Joseph & Philips 1984; Jones & Moon 1987; Liaw et al. 1989; Macintyre et al. 1993; Macintyre & Soomans 1995; Curtis & Jones 1998; Mitchell et al. 1998; Curtis 2004; Pearce et al. 2006, 2008). The aim of this chapter is to review the concept of health inequalities with a focus on the "social" aspect of health inequalities. The social aspect is captured by discussing issues related to the meaning of social inequalities in health, presenting evidence on social factors affecting health inequalities, an overview of the conceptual and empirical indices of the social, and by discussing policy implications of the social aspect of health inequalities. In conclusion, we argue that social factors influence health inequalities in relation to other factors that exist in the environment and not independently of them, and that social inequalities in health are not always those inequalities that are unfair and unjust. They are also those health inequalities that are *systemic* and simply a product of cultural ideologies.

These themes will be discussed in the following four sections. The first section reviews the use and interpretation of the concept of health inequalities historically and in current literature. The second section introduces the emergence of the role of social in research on health inequalities and reviews the existing distinction between health inequalities and social inequalities in health. This will be followed by an overview of conceptual and empirical indices of social inequalities in health. The fourth and final section proposes a re-conceptualization of the phenomenon of the social and what the social perspective on health inequalities should constitute, and discusses some policy implications of the proposed perspective.

Use and Interpretation of the Different Ways of Capturing Dispersion in Health

As we note, the subject of health inequalities has come to occupy a central position in health research. One noticeable consequence of this increasing interest is that its usage differs in different regions. For instance, the use of terms health inequality and health equity emerges in the health literature produced outside the United States, while health disparity is almost exclusively used within it (Carter-Pokras & Banquet 2002). Whereas health differences are those variations where chance and luck plays a role in determining health outcomes and variations that are genetically and constitutionally determined (for example, men get prostate cancer and women get cervical cancer) (Meyers 2007; Whitehead & Dahlgren 2007), health disparities and inequalities are those that are associated with a group's social advantage and disadvantage over the life course, and are unfair and unjust. (Braveman 2006; Meyers 2007; Whitehead & Dahlgren 2007). Health inequities refer to those inequalities in health that are deemed to be unfair, unacceptable, or stemming from some form of injustice, such as: (1) health-damaging behavior where the degree of choice of lifestyles is restricted; (2) exposure to unhealthy, stressful living and working conditions; (3) inadequate access to essential health and other public services; and (4) health-related social mobility involving the tendency for sick people to move down the social scale (Whitehead 1990).

The above definitions reveal that in the most recent public health literature health disparities and inequalities are used interchangeably and are distinguished from health differences on the one hand and health equity on the other (Braveman 2006; Whitehead 2007). It should also be noted that the former is regarded as a *value-neutral* concept and the latter a *value-loaded* phenomenon. There are some exceptions to this, however. Although "health disparities" as opposed to health equity has been defined in value-neutral terms – as a "chain of events" evidenced by a *difference* in the environment, access to utilization and quality of care, health status, or a particular health outcome that deserves scrutiny (Carter-Pokras & Banquet 2002) – in the recent public health literature the definition of health disparity focuses on not just differences but issues of health inequities. Thus, notions of health inequity and health disparity tend to convey a similar message, which is that the health differences become disparities and inequities if these differences are avoidable and if they are unfair. A quest for health equity is then a search for mechanisms to minimize such health disparities (Braveman 2006).

Health Inequality *versus* Social Inequalities in Health

The distinction between health versus social inequalities is based upon the criterion of presence and absence of social factors and conditions in describing and evaluating health differences and hence has the potential of invoking or avoiding the notions of fairness and justice. This criterion is important to understand because it represents an emergence and strong focus on the role of the social in capturing health inequalities.

Health inequalities in this context can be viewed as representing the broader *downstream* approach to health disparities. The downstream mechanisms refer to molecular events that are more proximal to occurrence of disease. Here, social experiences "get under the skin" and create disparities in physical and mental health (Taylor et al. 1997). Studies within this approach emphasize the role of individual health behaviors and their physiological correlates and the psychosocial factors, particularly stress and coping behavior. Although many of these studies acknowledge the origins of psychosocial factors in broad social structures, the psychosocial factors themselves are the focus of analysis, with little attention given to their structural origins or to the possibility that social structures may modify their effects on health (Schnittker & McLeod 2005).

An offshoot of the downstream approach to health inequalities are those studies that explore health inequalities through measuring and quantifying its distribution in population without much reference to its association with social groups and social conditions (Murray et al. 1999; used in the WHO's *World Health Report 2000* (WHO 2000)). Health inequalities according to this team of researchers refer to any avoidable differences in health among any individuals. Researchers argue that these individuals should not be grouped *a priori* according to social characteristics (except possibly geographic location) because it leads to the prejudging of causation and obscures intra-group differences. Health differences among ungrouped individuals are easier to measure, as there is no need for data disaggregated by social characteristics. By divorcing social characteristics from the individuals that are included, this approach removes ethical, social justice, and human rights considerations from the concept and measurement of health inequalities.

A social inequalities in health approach on the other hand, emphasizes the role of social factors in the understanding of diseases and disability and its distribution in a population. It represents the *upstream* explanations of health inequalities (McKinlay 1975). Health inequalities here are very closely associated with social groups and are defined as differences between the most advantaged group in a given category – e.g. the wealthiest, the most powerful racial/ethnic group and all others, and not only between the best- and worst-off groups. The role of a certain type of social condition, namely social hierarchy between social groups resulting from wealth, power, and prestige, is highlighted as an explanation for health inequalities (Braveman 2006). Specifically, the approach emphasizes the perspective of social inequalities in health to capture health inequalities in a given population by arguing that health inequalities need to be distinguished from social inequalities in health. The latter are really social disparities or inequities in health, meaning that they are unjust and unfair (Braveman et al. 2000).

Although health inequalities and social inequalities in health are two distinct approaches that encapsulate health inequalities, in recent research there has been an attempt to demonstrate a linkage between the two. The nature of causal linkage that is drawn shows how upstream factors cause downstream health inequalities. The linkage is vertically oriented: it starts at the top with race, poverty disruption, and neighborhood crime; moves to isolation, acquired vigilance, and depression; then to stress hormone dynamics; and finally, to cell survival and tumor development (Gehlert et al. 2008). The primacy of the upstream factors demonstrated here is a strong indication of the emphasis on social inequalities in health.

Outlining a Social Inequalities in Health Perspective

The focus on the role of social factors in the discussion of health inequalities behoves a comprehensive understanding of the concept of the social. In this section, which is divided into three parts, we first record research that defines social and social factors in health, we then move on to discuss the measurement of social factors, before analyzing the conceptual and empirical indices of social factors and categories in understanding health inequalities.

Definition of the "social" and "social factors" in health

The role of social factors in the health research literature has emerged as a response to the dominance and limitations of epidemiological, individual level explanations. The term social, according to the formal definition, connotes a system of common life. Its meaning becomes pronounced when contrasted with the term "*individual* and especially *individualistic* theories of society" (Williams 1983: 239, emphasis in the original). The social in context of health refers to the fundamental social causes of disease (House et al. 1990; Link & Phelan 1995) and to the various social processes that play a major role in distributing the determinants of health – knowledge and power resources – unequally (Graham 2004).

The social determinants of health usually refers to: (1) a society's past and present economic, political, and legal systems, its material and technological resources, and its adherence to norms and practices consistent with international human rights norms and standards; and (2) its external political and economic relationships to other countries, as implemented through interactions among governments, international political and economic organizations (for example, the United Nations, the World Bank, and the International Monetary Fund), and non-governmental organizations (Krieger 2001). It refers to the societal conditions that affect as well as can alter health outcomes by informed action (Marmot & Wilkinson 1999; Berkman & Kawachi 2000).

Historically, the spirit of social or upstream explanations can be traced as early as the middle of the nineteenth century in the writings of German doctor-anthropologist, Rudolf L.K. Virchow who wrote that "[m]edicine is a social science, and politics is nothing more than medicine in larger scale" (Virchow, cited in Waitzkin 2006). These ideas were articulated by proponents of social medicine in the later nineteenth century, who noted strong relationships between health and the dire housing circumstances, poor sanitation, inadequate nutrition, and horrendous work conditions that poor people encountered at that time (Link & Phelan 2005).

The emphasis on the role of social in relation to the "risk-factor epidemiology" approach that focused attention on individually based biological and behavioral risks for ill health was echoed at later times in history. In 1943, for instance, medical historian Henry Sigerist argued, "[the] task of medicine is to promote health, to prevent disease, to treat the sick when prevention is broken down and to rehabilitate the people after they have been cured. These are highly social functions and we must look at medicine as basically a social science" (Sigerist 1943: 241). Later McKeown noted that while biomedical research will continue to be significant "there is need for a shift in the balance of effort, from laboratory to epidemiology in recognition that improvement in health is likely to come in future, as in the past, from modification to the conditions which led to disease rather than from intervention in the mechanism of disease after it has occurred" (1976:179. See also Susser & Watson 1971; Morris 1975; Tuckett 1976).

Measuring the "social"

Measurement of the social depends upon how health inequalities are defined but it is also dependent upon other criteria such as, what groups are being compared to assess the inequalities (small populations within the country, between countries, or between socio-economic groups overtime), what type of inequality is being measured (relative or absolute and risk-based or outcome based), and what is the purpose of studying the inequalities (to evaluate or construct league tables)(Carr-Hill & Chalmers-Dixon 2005).

The focus here is on exploring the criteria of social groups in measuring health inequalities, which entails measuring the impact of different types of social categories and classifications. In some research, these categories include measures like social class, race, socio-economic status (SES: an individual-level construct of the social), and area deprivation (an area-level construct). There are, however, alternative social category groups and other ways in which to divide these categories, including: (1) demographic and social demographic characteristics (e.g. age, area of residence, sex, and ethnicity/race); (2) social and economic status (e.g. car ownership, employment, income, occupational social class, socio-economic groupings, and housing tenure status); and, (3) social environment (e.g. housing conditions, social networks and social support).

While social factors and categories have been accounted for in health inequalities research, it is important to note that measuring health inequalities through these categories is a challenging task for a few reasons. Firstly, social categories are hard to define because they consist of multiple dimensions. For instance, the category of social position includes education, income, wealth, occupation and so on. Secondly, the different dimensions are interrelated. For instance, an individual can simultaneously occupy various social roles and hold differing social status and thus belong to different social groups. Thirdly, these social categories serve as explanatory variables of both health and health inequalities, and to separate them is a difficult task. Related to the third reason is another factor, namely the characteristic of the social factors implicated in health inequalities. More specifically, while SES may have an impact on health inequalities it may not be determined as totally unfair and unjust unlike the social categories of race and gender where discrimination and stigma play a big role in producing health inequities. Thus social factors become hard to measure because they produce both health inequalities as well as health inequities.

Conceptual and empirical indices

Recent research on health inequalities emphasizes the role of social factors and conditions in health inequalities. Thus, a recent report on health inequalities contends that "whilst differences between individuals may well be interesting in themselves, they are only meaningful in terms of inequalities or inequities if those differences are linked to socio-economic status or some other dimension of differentiation (e.g. ethnicity or religion)" (Carr-Hill & Chalmers-Dixon 2005:156). Other influential work on health inequalities that focuses on social factors includes Whitehead's writing on health equity, which emphasizes the notion that inequality represents something that is not "variation" or "difference" *per se* but difference that is *systematic*, *socially produced,* and (therefore modifiable and) *unfair* (Whitehead 1990, 1992; Whitehead & Dahlgren 2007). Yet further definitions of health inequalities that include social factors include those that are expressed in terms of socio-economic status (Kunst & Mackenbach's 1994), social privileges and hierarchy (WHO-Braveman 1996, 1998), socially disadvantaged and disenfranchised groups (Braveman & Gruskin 2003), and systematic differences in the health of groups and communities occupying unequal positions in society (Graham 2004).

In some of the most recent research where an attempt is made to link the downstream and upstream factors of health inequalities, the causal linkage demonstrates how population-level social factors such as, race, poverty disruption, and neighborhood crime, mediated by isolation and depression, leads to genetic disparities in the onset of breast cancer (Gehlert et al. 2008). This research indicates not only the presence of social factors but also how social aspects of health disparities actually cause rather than just mediate the disease. In addition to such work that focuses on conceptual indices, there is an impressive body of empirical research that "captures" health inequalities with reference to social factors and categories (Marmot & Wilkinson 2005). This research recognizes that social factors exist in various countries, at both macro- and meso-levels, and have been explored in relation to: income inequality (Kaplan et al. 1996; Kennedy et al. 1996; Kawachi & Kennedy 1997a, 1999; Joe et al. 2008); social cohesion (Kawachi & Kennedy 1997b); social capital (Lynch et al. 2000), and ethnic and racial segregation (Williams & Collins 2001; Smedley et al. 2003; Williams et al. 2003; Kawachi et al. 2005; Williams & Jackson 2005). Researchers have also sought to assess multiple levels of social and economic influence, particularly the effects of neighborhood and community-level factors (Diez-Roux et al. 2000; Robert & Li 2001).

Research shows that such social inequalities in health exist in almost all countries. Numerous studies have provided evidence on the persistence of social variations in health in European countries (Drever & Whitehead 1997; Marmot & Bobak 2000; Mackenbach & Bakker 2002; Marmot & Wilkinson 2005). There have certainly been improvements in health and welfare policies evidenced in adoption of equity-oriented initiatives and methods such as UNICEF's triple-A approach (assessment-analysis-action), the UN's rights-based programming, the World Bank's results-based management (RBM), and, very recently, evidence-based tools to draw attention to inequities and to help redirect resources (Tugwell et al. 2006). However, social inequalities in health persist and such inequalities challenge, as well as negatively impact upon, the overall improvement in health especially improvements in life expectancy (Whitehead & Dahlgren 2007). Studies also point to the widening health divide across various countries indicated in the differences in life expectancies and mortality and morbidity rates between populations falling in different social groups. For example, research reveals that factors such as differences in neighborhood (Acheson 1998), levels of education (Valkonen et al. 1994; van de Water et al. 1996; Leinsalu et al. 2003), education and poor housing conditions (Marinacci et al. 2004), and differences in the nature of jobs (e.g. manual, skilled, and white-collar jobs) (Mesrine 1999; Jougla et al. 2000) are translated into differences in mortality and life expectancy levels of the population.

Social Factors in Health: The Evidence Base

Of the various social factors and categories that we describe above, we suggest here that the following have dominated the literature in the field of health inequalities: SES, ethnicity/race, and to a lesser extent gender. In addition to these categories, social factors have been included in an analysis of health inequalities in relation to psychological, or *psychosocial*, factors and have been most influential in outlining the concept of the *social gradient*. Therefore, in the sections that follow we summarize key empirical research on health inequalities with reference to each of these social factors and categories.

SES and patterns of health disparities

According to a traditional definition, SES is referred to as "the relative position of a family or individual on a hierarchical social structure, based on their access to or control over wealth, prestige and power" (Mueller & Parcel 1981). More recently, SES has been defined as "a broad concept that refers to the placement of persons, families, households and census tracts or other aggregates with respect to the capacity to create or consume goods that are valued in our society" (Miech & Hauser 2001). This broader definition is reflected in the literature, which includes exploration of the relationship between health and five different indicators of SES, including: (1) income and occupational skill level; (2) unemployment; (3) education; (4) occupational stress; and, (5) locus of control. To this list is added two more variables: self-employment in society (European Commission 2006) and what is broadly referred to as the "knowledge economy."

The central theme of the relationship between SES and health is that socioeconomic status is inversely associated with virtually all major indicators of health status, including functional impairments, self-rated health, disease-specific rates of illness, and mortality. Thus, the higher the educational, occupational, and income status of a person, the less likely it is for that individual to suffer from chronic illness, disability, accidents, suicide, homicide, or early death. Studies have brought to light the dramatic nature of this relationship by showing, for example, that persons near the top of the income distribution enjoy mortality risks approximately half of those near the bottom (Rogot 1992; Sorlie et al. 1995) or that, in some instances, the life expectancy gap between populations in different income categories is as high as seven years (House & Williams 2000) and differences in educational attainment (Ross & Wu 1995; Boutayeb 2006) and variations in occupational prestige (Marmot et al. 1984, 1991) can also result in alarming differences in health outcomes for populations located in different social gradients.

Race, ethnicity, and gender health inequalities

The existing research in this area has two primary characteristics: (1) research predominantly focuses on the relationship – differences and similarities in health status and behavior – between two "racial" categories ("blacks" and "whites"). For this reason, (2) most of the research on this subject has emerged in the US context. However, while the literature is dominated by research focused on investigating the black–white contrast, gradually, the notion of race has begun to incorporate a more complex awareness of the populations that constitute these two racial categories and also of the diverse ethnic categories used in non-US contexts. In this section, we will first summarize findings from research in the US context and then present research on this topic from elsewhere in the world.

The study of the relationship ranges from understanding only the differences in health behavior among racial groups and outcomes of these, to exploring disparities in overall health – whether it is increasing or decreasing – between blacks and whites, to highlighting problems that exist in assessing data on racial and ethnic health disparities (Baicker et al. 2004; Williams & Jackson 2005; Bilheimer & Sisk 2008). Research has also focused on disease-specific and chronic illness disparities including cancer, cardiovascular disease, HIV/AIDS, diabetes, and mental illness, between blacks and whites and among different racial and ethnic groups (Institute of Medicine 2003; Goldberg et al. 2004). Another area that has received a significant amount of much needed attention is related to the various factors that affect racial disparities in health. Here the focus is on factors such as communication, i.e. cultural or linguistic barriers, fragmentation of health care systems, incentives to physicians to limit services, and greater clinical uncertainty when interacting with minority patients.

Although racism affects health through multiple pathways – such as, economic and social deprivation, toxic exposures and other hazardous conditions, targeted marketing of commodities that harm health, and inadequate medical care – it is the factor of discrimination that is the most piercing one. As Ahmed et al. (2007) suggest there are three types of discrimination that are implicated in health inequalities. Firstly, *institutional discrimination* results in differential access to goods, services, and benefits in society. One of the most significant mechanisms of institutional discrimination in the United States is residential segregation, which has resulted in minority populations having fewer and lesser-quality opportunities for education, employment, recreation, and exposure to health-promoting environments. Further, discrimination in access to and quality of medical care has resulted in these populations being less likely to receive high-quality preventative and curative medical care, leading to poorer disease outcomes (Schulman et al. 1999; van Ryn & Burke 2000; Smedley et al. 2003; see also a recent report by the Institute of Medicine (IOM 2003)). *Internalized discrimination*, the second type of discrimination identified by Ahmed and colleagues, refers to the acceptance, by marginalized racial populations, of the negative societal beliefs and stereotypes about themselves. The beliefs by members of stigmatized groups of their own inferiority are associated with psychological distress and adoption of health-damaging behaviors. The final "type" of discrimination identified by Ahmed et al. is *perceived discrimination* and is related to the subjective experiences of discrimination, which, acting independently of the effects of institutional discrimination, is an acute and chronic stressor that leads to psychological distress and higher rates of disease (Williams & Williams-Morris 2000; Cain & Kington 2003; Ahmed et al. 2007).

While race as a social category has been predominantly associated with the US experience, health inequalities experienced by different ethnic groups has also been recorded in non-US contexts, such as Brazil (Barata et al. 2007), Colombia (Bernal & Cardenas 2005) and in Europe (Bhopal, 2007). Moreover, outside of the United States there are other equally indelible and enduring social categories associated with non-white ethnicity that are seen to shape health inequalities. These alternative ethnic categories are formed on the criterion of country of origin and other markers of ethnic identity, and combine with forms of racial discrimination to produce inequalities in health (Karlsen & Nazroo 2000; Nazroo & Karlsen 2001). Although literature on the relationship between ethnic category and health inequalities has identified some limitations, such as confusion over ethnic identities and lack of sufficient attention to social structure (i.e. SES and racism), there has been an impressive amount of research that reveals ethnicity to be an important social category in understanding health inequalities in different countries around the globe. Ethnic group affiliations strongly impacts health inequalities in for instance, Britain (Rudat 1994; Nazroo 1997; Nazroo & Karlsen 2001; Campbell & McLean 2002; Karlsen & Nazroo 2002; Nazroo 2003) and Norway (Syed et al. 2006). Close association between ethnicity and health inequalities, particularly between indigenous ethnic identities and mortality rates, is also documented in Australia (Holland 2005), Colombia (Bernal & Cardenas 2005), and New Zealand (Barnett et al. 2005; Blakely et al. 2005).

Inequalities in health based on the socially constructed category of gender are equally well documented. Women in most parts of the world experience higher life expectancy but lower levels of morbidity and quality of life in later years. Research indicates that women's longer life expectancy is less representative of healthy life and more of longer number of disability-lived years (Verbrugge & Wingard 1987; CDC 2000; Crimmins et al. 2002). In relation to men particularly, women's advantage in health is closely associated with biological and physiological systems while for men it is due to social conditions such as lower stress, reduced role (or status) conflict, and less societal demands (Bird & Rieker 1999). In certain parts of the world, such as sub-Saharan Africa and South Asia, this paradox is absent because women are a disadvantaged group in terms of both life expectancy and morbidity and quality of life (UN 2000, 2005). Health inequalities measured through these categories become social inequalities in health because they are mediated through discriminatory practices and hence unfair, and they are changeable through health policies and programs.

Psychosocial factors and the social gradient

Psychosocial factors refer broadly to social and psychological factors that have the potential to influence health and wellbeing. The social factors which interact with psychological factors are important indicators of social aspects of health inequalities. They include life stressors, the structure and content of interpersonal relationships, self and identity, personality traits, perceived discrimination, and emotions and affect. Put simply, psychosocial factors suggest that knowledge, power, and resources influence health not only through their direct effects on the material conditions of life but also in relation to the symbolic and meaningful social interactions that take place between individuals and groups. In these interactions, the symbolic effect is felt through behaviors such as social comparisons and notions of self identity (Schnittker & McLeod 2005). Studies provide evidence of association between psychosocial factors and health both cross-sectionally and prospectively. For instance, studies by Seeman et al. (1997, 2004) found that life events and other chronic stressors produced identifiable damage in physiological systems, which, in turn, increased the risk of disease. Marmot et al. (1998) also found that nine types of psychosocial factors (neighborhood poverty, childhood socio-economic environment, smoking, social relationships, social support, relationship strain, perceived inequalities, the psychosocial work environment, and perceived control) were distributed unequally across socioeconomic groups.

Although a distinct concept in its own right, the *social gradient*, which highlights *shortfalls* in health, identifies psychosocial factors as an important element in explanations of social inequalities in health. At a general level, it might be argued that the social gradient aptly describes the nature of social inequalities in health. What it means is that poor health is not simply confined to those at the bottom of a social hierarchy. Rather, there is a "social gradient" of mortality and morbidity that affects all members of society, meaning with each step one moves down the social ladder, the worse one's health becomes. In this sense, the social gradient might be regarded as a linear relationship between health and social position as it is a process whereby a stepwise, or linear, decrease in health is seen with decreasing social position (Marmot et al. 1994). While the study of British civil servants, known as the Whitehall studies, by Marmot and his colleagues (1984) was the first kind of study to show this gradient effect, evidence on the existence of social gradients in health now exists in most countries throughout the world (Evans et al. 2001).

The significance of the social aspect of health inequalities in the social gradient concept is that regardless of individuality, a given social position is associated with specific material, behavioral, and psychosocial resources and risk factors – a phenomenon which links social and health inequalities. Perhaps more importantly, the notion of the social gradient asserts that over and above material factors, a person's social position determines the amount of control they hold over many aspects of their life, as well as their opportunities for full social engagement and participation, all of which are considered to play a crucial role for health and wellbeing (Marmot et al. 2004). Consequently, the social gradient impacts on notions of social order and justice (Wilkinson 1996); as a study by Costa et al. (2002) reveals. In this study, which examined the populations of Florence, Leghorn, and Turin in Italy over a number of years, it was revealed that mortality increased linearly with the increasing degree of social disadvantage. This was so both when social disadvantage was measured by the characteristics of individuals, such as education, employment, or social class, and when it was measured by deprivation of the area in which people lived.

The impact of social gradient on health is manifested in the phenomenon referred to as the *shortfall* in health. Here, shortfall refers to the number of lives that would have been saved if all groups in society had the same high level of health as the most advantaged group. The nature and shape of social inequalities of health can hence be understood by measuring the shortfall. Acheson and colleague's (1998) study of mortality rates in England and Wales, for instance, showed that if all working men 20–64 years of age had the same mortality rates as men of the same age in professional and managerial positions, then over 17,000 fewer deaths would have occurred each year in the early 1990s. Other studies indicating the shortfall in health include Benach and Yasui's (1999) study of mortality in Spain where a shortfall of 35,000 deaths was indicated and Mackenbach's (1994) study in the Netherlands where it was found that the differential educational levels between men was making a difference of as much as 25–50 percent in the average morbidity and mortality in the Dutch population. Thus, if men with lower levels of education had a university education, the reduction in mortality and morbidity in the average Dutch population was calculated to be 25–50 percent.

Social Inequalities in Health: A Re-conceptualization

In this section we propose a framework for a social perspective on health inequalities that includes a re-conceptualization of the notion of the social at three levels: (1) the idea that the social refers to *relational interaction* among health and different structural conditions and processes and to the cultural ideological fabric of society; (2) that social factors affecting health inequalities are not always those health inequalities that are unfair and unjust; and, (3) that social factors in any discussion of health must be distinguished on the basis of what they influence: those that are determinants of health and those that are determinants of health inequalities. In the following sections, we elaborate these three levels and finish by suggesting some policy implications.

Relational interaction

The idea of relational (as opposed to substantive) interaction was first introduced by Bourdieu (1984) in his work *Distinction: A Social Critique of the Judgement of Taste* and refers to a phenomenon where different factors, conditions, and processes derive their social and cultural significance from the relations that *link* them rather than from intrinsic features of individual elements (Swartz 1997). Additionally, relational interactions are contrasted with substantive ones because social factors are seen to impact upon a phenomenon as independent factors. As we will argue, the distinction between relational factor and substantive factor is an important one and one which stands in marked contrast to current research which treats these relations as substantive ones.

Relational interaction, in the context of understanding social inequalities in health, can best be explained through reference to a number of illustrative examples. We begin by considering how this perspective might be employed in relation to (racial) discrimination. Here, what needs to be recognized are, firstly, the different social conditions and categories associated with racial discrimination that shape health disparities and the different pathways through which this process occurs and, secondly, the fact that "race" interacts with other social conditions, such as income and education and even values. In addition to these factors, it is vital that a *relational connection between health and race* is recognized to exist. That is, to acknowledge that, when considering a certain health status and/or behavior, relational interaction contributes to the identity or defining feature of a particular ethnic/racial group. Alternatively, and this has been investigated in the literature, that the ethnic/racial group affiliation becomes a strong predictor of a certain health condition. Here, health-related factors are both the right-hand and left-hand variables of the health equation; they represent a social condition and are represented by it.

The relational connection also exists between structural factors such as SES and values and ideology that come into effect with the practice of discrimination. For instance, the effect of factors such as income and educational level on health inequality is produced when they interact relationally with the value system and ideology of the society – values and ideologies can be sustained with the help of structural conditions, and the latter rely on such values to gain legitimacy. A relational perspective recognizes that these ideologies impact upon policy at a number of scales. In the US context, for example, neighborhood segregation or health insurance policies are a product of such an interaction between the structure and ideological fabric of the dominant social group. Similarly, social factors such as new knowledge and technology for improving health influence health conditions not by themselves but mostly in relation to other social factors that exist in the environment (e.g. social and familial networks and related patterns of influence).

This reconceptualization of the social in relational terms contributes to the understanding of health disparities in a few distinct ways. Firstly, health differences and disparities lie at different points on a continuum. Herbert et al. (2008) point out that the moment at which difference becomes disparity is a subjective matter but that it still can be identified by measuring the degree of control one has over the factors affecting a health condition. It has also been argued by Braveman (2006) that not all differences are disparities. The relational interaction approach, while retaining the existing elements of disparity – i.e. unfair and systematic – makes the inquiry into health disparities much more dynamic and central. Further, as health and social conditions are relationally connected, it leads to a situation where at a given time and place, differences can become disparities and at another time and place disparities can become differences (see Gehlert et al. 2008). For a group of illegal immigrants, for instance, differences in health are disparities because they have been systematic, socially determined, and unfair. However, if the conditions that make them illegal change and they become legal migrants, and begin to acquire health benefits (e.g. health insurance plans and so on), they move to another status. Consequently, for this group, disparities could potentially become differences. The relational aspect relates to how the characteristic or identity of illegal migrant groups is produced and retained structurally by health-related status and experience (for example, having or not having health insurance) and vice versa. It thus takes into account how health disparities affect larger social conditions as well.

Similarly, it has been emphasized that differences become social inequalities in health when the variations in health are systematic, socially determined, and are unfair. The relational perspective points to the fact that health differences become disparities not only because the health variations are unfair but also because health disparities create or perpetuate *social conditions* that are unfair. For instance, in the US context, health inequalities experienced by families reliant on welfare might be seen to perpetuate their dependence upon welfare. Moreover, in the broader context of advanced, industrialized society, health differentials among populations can affect the choice of occupation. So, for instance, certain populations with chronic health conditions are hindered from taking regular jobs and might opt for, or be forced into, becoming part of the “shadow” or “black” economy that perpetuates unfair employment conditions. Specifically, such activities are undertaken without the payment of government taxes, and associated benefits do not include unemployment insurance, disability insurance, pensions, or formal regulation through health and safety measures (Brenner 2006).

These examples reveal that health differences among populations can have negative effects by the worsening of certain structural or macro-social conditions. This leads us to argue that health disparities are not only those health variations that are systematic but also those that are *systemic* i.e. affecting the social conditions of a population or group at a more structural and institutional level. This does not mean that we need to discount those health differences as disparities – the black/white disparity in low birth weight that Braveman (2006) discusses – because it adversely affects an *a priori* disadvantaged social group, compounding its disadvantage. However, the social perspective of health inequality that we propose here calls for identifying those differences as disparities that also exist at the institutional level. In the case of low birth weight, for instance, the institutional effect will correspond to the creation or perpetuation of social conditions that lead to differential burdens of malnutrition and even infant mortality in society, of underperformance, and consequently of differences in SES. The institutional effect is represented also in the perpetuation of hegemonic racial biases that results in certain ethnic/racial groups being unhealthy due to their patterns of unhealthy behavior. These mechanisms produce a situation whereby health inequality provides a window into interactions and interrelationships among the various social processes and conditions of society. In this understanding, health inequality is not just shaped by dominant social conditions but actually represents and is *itself a social condition*. It is not only produced by social processes but perpetuates them.

Beyond unfair/unjust social inequalities in health

Although social inequalities in health have come to be understood in terms of the values of fairness and justness, not all social inequalities in health necessarily represent unfairness and unjustness. This is because social factors in relation to health connote cultural understandings and ideologies of what constitutes health. As a result, the role of the social factors in health inequalities is not only representative of unfairness, discrimination, and political manoeuvrings but simply of cultural differences in understandings of health. The effect of socio-cultural perceptions has been well recorded in the health literature (Kleinman 1980; Molzahn & Northcott 1989; Reiff et al. 1999; Torsch & Ma 2000; Garroutte et al.2005; Nichter 2008). Although it should be recognized that some cultural beliefs such as those that exist in rural India that doctors engaged in private practice make better doctors than those employed by the government may themselves be a product of illiteracy and poverty, making such disparities unfair, it is also apparent that literate and non-poor populations share similar cultural perceptions of health. In such cases, disparities in health are only partly explained in terms of unfairness and therefore should be understood largely as a product of differences in cultural perceptions.

Implications of social factors for health and health inequalities

The relational aspect of the social is significant in understanding the role of the social in health inequalities. There is an urgent need to understand the fact that social factors impact upon health as well as on health inequalities. Future research that includes the role of social factors in capturing inequalities in health needs to, therefore, distinguish between those factors that affect health and those that shape health inequalities. For instance, education as a social factor impacts health but it is the lack of access to it and associated illiteracy that leads to inequalities. Similarly, income levels and reduction in smoking patterns have affected health positively; however, these same social factors are not good explanations of health inequalities. These factors become explanations of health inequalities only when they interact with other factors, for instance, the system, or social policy, of distribution.

Furthermore, new knowledge and techniques for improving health may improve health but not necessarily reduce health inequalities. In this context, Link and Phelan (2005) point out that new knowledge and techniques benefit those with better resources, knowledge, influence, and social networks, and, as such, might actually add to the risk of more acute inequalities in health in a population in the short run. This means that social factors (knowledge and techniques) become explanations of health inequalities largely in relation to other social factors (i.e. influence and social networks). Additionally, psychosocial factors have a significant influence on health and wellbeing. However, psychosocial factors are also important indicators of social aspects of health inequalities in relation to other factors. For instance, Marmot et al.'s (1998) typology of psychosocial factors showed that these factors were distributed unequally across socio-economic groups, making them plausible *mediators* of the socio-economic position (SEP) (Schnittker & McLeod 2005). Thus, relational aspect of social factors is significant in the social perspective on health.

Finally, and similarly to the previous section, it should be recognized that not all psychosocial factors are significant indicators of inequalities in health in terms of the notions of unfairness and unjustness. Factors such as emotions, affect, structure and content of interpersonal relationships, while they may be distributed unequally among populations, they may not be a result of systematic and persistent inequities in distribution of resources in that population. Rather, they may be due to differences in personality and behavioral patterns. Indeed, as Schnittker & McLeod note in their review, "psychosocial factors *might not explain disparities* in the manner much psychosocial research would seem to suggest, psychosocial factors are important causes in their own right and, when considered in a more sophisticated social psychological light, may help to refine disparities theory and research" (2005: 75).

Conclusion

Research on health inequalities currently occupies a dominant place in health literature. In this context, social factors have been emphasized in the understanding of health disparities. In health geography, for instance, the study of health inequalities is referred to as social perspectives on health. The concept of the social, however, remains to be comprehensively analyzed in this literature. This chapter has attempted to fill this lacuna by offering a re-conceptualization of the phenomenon of the social at three levels: (1) emphasizing the relational aspect of the social; (2) de-emphasizing its relationship with notions of fairness and justness; and, (3) calling attention to the need to differentiate the types of social factors by identifying certain types as associated with health inequalities and others with health.

Future research on health inequalities aimed at understanding its distribution and consequences for social categories will only be robust if an understanding of the phenomenon of the social is sharpened in the directions suggested. Such an attempt will be particularly useful for a field such as health geography that aims to capture health inequalities spatially. By understanding the reciprocal effects of health and social conditions – health inequalities are as much a function of certain social conditions as social conditions are of health inequalities – geographical perspectives on health inequalities can bring to light the significance of understanding *both* the vulnerable groups of individuals as well as spaces and institutions that are identified as particular health risks. The geographical dimension of health inequalities can also be more comprehensive by distinguishing between places where health inequalities are unfair and where they are simply a product of deep-seated cultural perceptions. By emphasizing the difference between social factors aimed at improving health and aimed at reducing health inequalities, health geography can contribute to important policy decisions on health inequalities because it can provide answers to the puzzling question as to why some interventions help improve health among only certain social groups, populations, and neighborhoods at certain times in history while in other populations and neighborhoods, and at other times, these factors may actually be detrimental to the goal of promoting health equality.

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Chapter 21

Neighborhoods and Health

Anne Ellaway and Sally Macintyre

Background

Interest in the role of area of residence in influencing health has burgeoned since the early 1990s, with research showing that although "who you are" explains a lot of geographical variation in health outcomes, there is also an effect of "where you are" (Pickett & Pearl 2001; Riva et al. 2007). This has been found for total and coronary heart disease (CHD) mortality (DiezRoux et al. 1997; Waitzman & Smith 1998), CHD prevalence and risk factors (Davey Smith et al. 1998), morbidity (Jones & Duncan 1995), depression (Yen & Kaplan 1999), and diet, physical activity, smoking, and alcohol consumption (Karvonen & Rimpela 1996; Ellaway & Macintyre 1996; Ecob & Macintyre 2000). It has also been found that individual and area characteristics may interact (Shouls et al. 1996; Ellaway & Macintyre 2001); for example, in the west of Scotland "bad diet" was related to area deprivation, but only among more affluent households (Ecob & Macintyre 2000).

Interest in the magnitude of area effects on health has resulted in much work since the early 1990s (Duncan et al. 1996) using multilevel modeling analysis to try to ascertain the relative contributions of context (e.g. neighborhood characteristics) versus composition (e.g. population characteristics) (Diez-Roux 2000). However, it has been suggested that the difference between context and composition may be more apparent than real and that the precise mechanisms through which the local social and physical environment influences health and health behaviors are only beginning to be understood (Macintyre et al. 2002).

This chapter will provide an overview of the international literature on studies (of developed countries) which try to unpack potential mechanisms and pathways. We begin by describing our work on the socio-spatial distribution of general amenities and resources which might influence health and the ability to lead a healthy life. We then go on to explore some of these factors in more depth in relation to obesity, a health outcome of major public health concern. In response to concerns over increasing prevalence of obesity, there has been a significant increase in the number of studies which examine aspects of the local environment which might influence physical activity or obesity levels (e.g. the availability of local resources such as recreation facilities, green space, or food outlets). We also explore the interplay between access to local amenities and resources and the ways in which residents perceive and experience their local neighborhood.

Are Deprived Areas Worse off in General?

In work we've been conducting since 1987 involving two socially contrasting localities in Glasgow, Scotland, we have shown that many resources were more accessible and of better quality in the more socially advantaged area (Macintyre et al. 1993). We have been working with a framework which suggests that the following aspects of the local social and physical environment might be important for the generation of social inequalities in health:

1 physical features of the environment shared by all residents in a locality (for example, air and water quality);
2 availability of healthy environments at home, work, and play (for example, decent housing, safe play areas for children);
3 services provided to support people in their daily lives (for example, education and transport);
4 the socio-cultural features of a locality (for example the political, economic, ethnic, and religious history, the degree of community integration);
5 the reputation of an area (for example how the area is perceived by residents, service or amenity planners, and investors).

These categories may overlap and interact with each other, and their health effects may vary by people's personal resources. More broadly, we can think of features such as these as "opportunity structures," that is, socially constructed and socially patterned features of the physical and social environment which may promote or damage health either directly or indirectly through the possibilities they provide for people to live healthy lives.

To explore the role of place in influencing health we selected two socio-demographically contrasting localities in the city of Glasgow, a more affluent one in the north-west of the city and a more deprived one in the south-west. The north-west locality comprises prosperous neighborhoods built for the middle classes in Victorian times as well as high-status public housing estates built between the two world wars with high rents and purpose-built community facilities (e.g. shopping parades) aimed at attracting the more affluent working classes.

The south-west locality comprises small pockets of high-status inter-war development as well as large tracts of low-rent council flats more typical of Glasgow. Unlike many of their inter-war predecessors, these schemes lacked many basic local amenities (e.g., shops, schools, health centers, and social centers) for decades after their construction. Because of the post-war housing shortage, properties were built to standards previously thought to be unacceptably low.

These two localities differ in history, built environment, local amenities, and in socio-demographic characteristics. The north-west is the most socio-residentially advantaged and the south-west the most disadvantaged. Although these two localities, the south-west in particular, have undergone considerable housing and population changes since our study began, disadvantage remains higher in the south-west compared to the north-west. Health also differs between these neighborhoods, in the expected direction, with those living in the most affluent locality reporting better health, and having lower death rates than those living in the more deprived locality.

We have been collecting data both about the areas (either directly through collecting primary or secondary data about features of the environment or indirectly through the eyes of the residents), and about the residents, their everyday lives, and their health. Data about residents have been collected through the medium of face-to-face interviews and postal surveys. Our study began in 1987 and involves interviewing the same sample of residents who were aged 15, 35, or 55 at the start of the study. To date, we have interviewed our study respondents four times (fieldwork on the fifth and final sweep is nearing completion).

Differences in the social and physical environment

How residents themselves perceive their areas also varies between these two localities – residents in the more deprived area are significantly more likely than those in the more affluent area to report that "incivilities" such as vandalism, litter and rubbish, assaults and muggings, and disturbance by young people are a serious problem in their locality (see Table 21.1). In our study, we have found that perceptions of the neighborhood as being run down or threatening is associated with poorer mental health, independently of other factors associated with psychological wellbeing (Ellaway et al. 2001).

These perceptions appear also to be reflected in the willingness or otherwise of residents to walk around their area after dark – 23 percent of females and 6 percent of males in our more deprived study area report that they would *never* under any circumstances walk around their area after dark. This compares with 12 percent of females and 1 percent of males in our more affluent area. Such fears may deter people from moving around their local neighborhood in order to shop for essential provisions or to get exercise – residents in our more deprived area are less likely than residents of the more affluent study area to engage in physical activity, even after taking individual characteristics such as sex, age, and SES into account (Ellaway & Macintyre 1996). This is also reflected in obesity levels (Ellaway et al. 1997).

Table 21.1 Perceptions of local neighborhood problems

	More affluent area	*More deprived area*
Problem	*% reporting "serious" problem in their area*	*% reporting "serious" problem in their area*
Litter and rubbish	11.6	20.9
Vandalism	6.7	20.0
Disturbance by children or youngsters	4.7	14.4
Assaults or muggings	3.2	11.6

Table 21.2 Glasgow City Council leisure facilities in the two localities, 2000

	North west			*South west*		
	Locality	*Periphery*	*Total*	*Locality*	*Periphery*	*Total*
Swimming pools	0	1	1	1	0	1
Sports centres	1	2	3	0	0	0
Recreation centers	0	0	0	1	0	1
Golf courses	1	0	1	0	0	0
Tennis	3	2	5	0	0	0
Bowling	4	3	7	0	1	1
Football/pitches	3	4	7	2	1	3
Total	*12*	*12*	*24*	*4*	*2*	*6*

We think that these lower levels of activity might be related to the finding that there are comparatively fewer local recreational facilities in the more deprived locality (see Table 21.2). This reduces the choices available to residents and makes it harder to follow health promotion advice. It could of course be argued that people can take exercise elsewhere, that they can travel to facilities further afield. However, car ownership levels are lower in our more deprived locality compared to our more affluent study area and lower car access is not compensated for by public transport provision since that too is poorer.

Area deprivation and health promoting resources

Building on this work on two socially contrasting areas, we have investigated the location, by small area deprivation, of as wide a range of resources as possible across the whole city of Glasgow. The aim was to establish whether health promoting resources tended to be more available in richer areas and potentially health damaging resources more common in poorer areas; and if not, whether there was any discernible pattern to the location, according to deprivation of different types of resource.

Starting from our previous work in which we suggested using a framework of universal human needs which might be met by local opportunity structures (Macintyre et al. 1993; Macintyre et al. 2002), we first identified a number of high-level domains (e.g. education, transport, and health care) of services people need to live a healthy life. Within each of these domains we then searched for geocodable operationalizations (e.g. primary schools, secondary schools, bus stops, railway stations, general practices, and opticians). As we have previously noted (Cummins et al. 2005), there is often a mismatch between the items one would ideally like to be able to collect and geocode and those which are readily available in a reasonably reliable and up-to-date format. We examined the location of 42 resources in Glasgow City, Scotland, in 2005/6, by quintile of small area deprivation (we investigated their distribution within the city boundaries only, as many of the resources examined are subject to local City Council planning decisions).

Measures included number per thousand population, network distance in meters to nearest resource, and percentage of data zones containing at least one of each type of resource. Twelve resources had higher density in, and/or were closer to or more common in, more deprived neighborhoods: public nurseries, public primary schools, police stations, pharmacies, credit unions, post offices, bus stops, bingo halls, public swimming pools, public sports centers, outdoor play areas, and vacant and derelict land/buildings. Sixteen had higher density in, and/or were closer to, or more common in, more affluent neighborhoods: public secondary schools, private schools, banks, building societies, museums/art galleries, railway stations, subway stations, tennis courts, bowling greens, private health clubs, private swimming pools, colleges, accident and emergency hospitals, parks, waste disposal sites, and tourist attractions. Private nurseries, universities, fire stations, general, dental and ophthalmic practices, pawn brokers, automated teller machines, supermarkets, fast food chains, cafes, public libraries, golf courses, and cinemas showed no clear pattern by deprivation. Thus it appears that in the early twenty-first century access to resources does not always disadvantage poorer neighborhoods in the United Kingdom.

As part of this work, we have gone on to explore the socio-spatial distribution of alcohol outlets across Glasgow. Alcohol is a significant and growing problem in Scotland. Alcohol-related death rates in 2002–4 for males and females in Scotland were around double the rate for the United Kingdom as a whole (Office for National Statistics 2007). Cirrhosis mortality rates in Scotland are now one of the highest in western Europe (Leon & McCambridge 2006). At a local level, Glasgow City had the highest alcohol-related death rate among both men and women in the United Kingdom in 1998–2004 (Office for National Statistics 2007). Alcohol problems occur in all social groups but there is a marked socio-economic gradient in alcohol-related morbidity. People from the most deprived areas in Scotland are three times more likely to be admitted to hospital with an alcohol-related diagnosis than people from the most affluent areas, while men from the most deprived areas are six times more likely to die from an alcohol-related condition than men from the most affluent areas (Information Services Division 2007).

Elevated rates of excessive alcohol consumption and binge drinking have also been found among men in the west of Scotland area compared to the rest of Scotland, after adjustment for socio-economic factors (Gray 2007). Some studies, mainly North American ones, have suggested that the density of alcohol outlets may be higher in poorer neighborhoods (Gorman & Speer 1997; Duncan et al. 2002; Pollack et al. 2005; Romley et al. 2007). In Glasgow we found the socio-spatial distribution of alcohol outlets across Glasgow varied by deprivation but not systematically. Deprived areas such as the large post-war social housing schemes on the periphery of the city do not have many alcohol outlets, whereas in other equally deprived areas, such as the east end of the city, provision is higher e.g. one alcohol outlet for every 85 people (Ellaway and Macintyre 2009). It is therefore important to examine the local context of deprivation.

Obesity and the Local Environment

The prevalence of obesity is increasing in industrialized countries. Being overweight is linked with increased death rates and contributes to a wide range of conditions, including ischaemic heart disease, hypertension, stroke, diabetes, certain cancers, and diseases of the gall bladder (Must et al. 1999). Almost a quarter of adults in the United Kingdom are now classified as obese (Zaninotto et al. 2006) with higher rates among low-income groups (particularly women) (Department of Health Public Health Research Consortium et al. 2006). In the United States, 32 percent of adults are overweight or obese (Ogden et al. 2006). The principal cause of obesity is an imbalance between energy intake and energy expenditure. As obesity levels have risen, there is some evidence that there has been a simultaneous decline in levels of physical activity (Wareham 2006), and efforts to increase physical activity levels directed towards changing individuals' behavior have had limited success (Hillsdon et al. 2005). Although a range of factors may contribute to rising obesity levels (Keith et al. 2006), it has been suggested that more attention should be directed towards an ecological approach to the obesity epidemic and that "[u]nderstanding, measuring, and altering the "obesogenic" environment is critical to success" (Egger & Swinburn 1997). Obesogenic environments are those which promote excessive food intake and discourage physical activity.

A number of studies have shown that where people live is associated with obesity (Ellaway et al. 1997; Ross et al. 2007) and physical activity (Ellaway & Macintyre 1996; Cubbin et al. 2006); however, the precise mechanisms through which the environment may influence obesity and physical activity are not well understood (Jones et al. 2007). Since obesity and its adverse health consequences are more prevalent among lower income groups, furthering our understanding of the contribution of the local environment in creating and maintaining inequalities in obesity and health is vital. One potential contributory factor is the extent to which the availability of facilities for physical activity is distributed equitably across different neighborhoods. Lack of access to facilities may have greater impact upon the health of people in deprived areas as there may also be cost and mobility barriers to the use of private or more distant amenities (Talen 1998). A range of studies have explored the relationship between area deprivation and access to resources and there is an inconsistent pattern of results (Jones et al. 2007). Findings may vary by the resource and national context in question.

Play areas for children

Childhood obesity is rising and this rise has been linked to a decrease in physical activity. In developed countries the prevalence of overweight and obesity in children is associated with low income and increased area deprivation (James et al. 1997; Kinra et al. 2000; Jotangia et al. 2005). Access to appropriate facilities for physical activity is a key determinant of participation (National Institute for Clinical Excellence 2006). Some studies of children's outdoor playgrounds have found a higher prevalence of play areas in more deprived areas (Ellaway et al. 2007; Karsten 2001) whilst others have found play areas to be distributed equally across a city (Smoyer-Tomic et al. 2004). However, the quality of children's play areas may differ between areas. A study in Glasgow, for example, found that safety and aesthetics were poorer in deprived areas with more litter, broken glass, inadequate safety surfacing, and rusty or broken equipment compared to play areas in more affluent areas (Hughes et al. 2008). Across Scotland, 45 percent of people living in more deprived areas reported that a lack of safe play areas was a serious problem in their local area compared with 4 percent of those living in the most affluent areas (Curtice et al. 2005).

Some studies have explored whether proximity to recreational facilities such as parks and playgrounds is related to children's physical activity behavior. A recent review (Davison & Lawson 2006) found that some studies have found a significant positive association between the proximity of parks and playgrounds to the home and children's physical activity. For example, Sallis et al. (1993) found that parents' reports of the number of play areas within walking distance of the home were positively associated with observed levels of physical activity among preschool children. An Australian study found that children who reported a lack of parks or sports grounds near their home made fewer walking and cycling trips (Timperio et al. 2004). The relationship between proximity of parks and playgrounds and children's physical activity may vary by gender; one US study (Gomez et al. 2004) found that objectively measured distance to the nearest play area was inversely associated with adolescent boys', but not girls', self-reported physical activity.

Other studies looking at the distribution of resources, such as the number of facilities in an area, found that these are associated with physical activity among girls but not boys (Brodersen et al. 2005; Norman et al. 2006). In contrast to these studies, others have found no association between proximity of playgrounds and parks and children's objectively measured physical activity (Sallis et al. 2002; Adkins et al. 2004). In addition, no association was identified between spending on recreational infrastructure and children's self-reported physical activity (Brodersen et al. 2005). Findings thus appear inconsistent between settings and samples and more research is required to inform public health policy.

Young people

In their review of the relationship between recreation facilities and physical activity among young people, Davison and Lawson (2006) suggest that there are no clear differences across studies in the definition of recreational facilities (which usually included structures such as swimming pools, gyms, sporting arenas, and parks), the methods used to assess physical activity, or the demographic characteristics of the samples. Davison and Lawson suggest that the association between the availability of facilities and physical activity among youth is relatively small and therefore only measurable with a large sample. As a result, they suggest that, among young people, the association between recreational facilities and physical activity may be indirect.

More generally, resources for physical activity may show a more varied pattern, for example in Perth, Australia, lower socio-economic status (SES) areas had better access to sports/recreation centers, gyms, and swimming pools, while higher SES areas had better access to golf courses and the beach (Giles-Corti & Donovan 2002); in Melbourne there were no differences in the number or total area of free access, restricted access or sporting/recreation open spaces by neighborhood SES (Timperio et al. 2006); while the GLOBE study in the Netherlands found there was no significant differences by neighborhood socio-economic environment in proximity to sports facilities (van Lenthe et al. 2005). However, a national study in the United States found that higher SES areas were better served with physical fitness facilities, memberships sports and recreation clubs, dance facilities, and public golf courses; these facilities were least likely to be present in areas with higher proportions of African American, Hispanic, or other ethnic minority backgrounds (Powell et al. 2006). National studies are rare. The only study in the United Kingdom to date which has explored this issue found that the availability of physical activity facilities (such as gyms, swimming pools, and sports halls) declined with level of area deprivation across England (Hillsdon et al. 2007).

Physical (in)activity

To date, the observed patterns of association between objectively measured access to physical activity opportunities and physical activity behavior are inconsistent between studies (Sallis et al. 1990; Barling et al. 2002; Hillsdon et al. 2006; Nelson et al. 2006). A few studies have found associations between access to facilities and obesity (Mobley et al. 2006; Nelson et al. 2006). Studies of residents' perceptions of access to physical activity opportunities, have typically found modest associations with levels of physical activity and obesity. Moreover, relationships found between resident's perceptions of amenities and self-reported behaviors may be subject to reverse causality in that physically inactive or obese people may perceive their environment differently to the more active or non-obese (Jones et al. 2007).

Food retail outlets: proximity and food quality

A number of studies have examined whether there are differences between areas in the availability of food (Cummins & Macintyre 2006; Jones et al. 2007). In North America, for example, studies have generally found that there are between-neighborhood variations in the price and availability of food, with higher-quality foods being less available and more expensive in poorer communities (Chung & Myers 1999; Morland et al. 2002a). Residents of predominantly "black" areas are on average over a mile more distant from supermarkets compared to "white" neighborhoods (Zenk et al. 2005a; see Chapter 20, this volume for a discussion of the use of "black" and "white" in US context).

In contrast, other locations outside of North America find a less differentiated picture. In Brisbane, Australia, there were minimal or no socio-economic differences in food shopping infrastructure (Winkler et al. 2006). A study in New Zealand found deprived areas were closer to supermarkets (Pearce et al. 2006, 2007). In the south east of the Netherlands there was increased proximity to food shops with increasing socio-economic disadvantage (van Lenthe et al. 2005). Findings in the United Kingdom regarding social and environmental equalities in foodstuff provision are equivocal (Cummins & Macintyre 2006; Jones et al. 2007). Small-scale early studies found higher prices and less availability in socio-economically contrasting localities (Sooman et al. 1993). However, more recent and larger studies have failed to find an independent association between neighborhood retail food provision, individual diet, and fruit and vegetable intake (Cummins & Macintyre 2002).

The relationship between availability of supermarkets and a healthy diet has also been explored in recent research. For example, Moore et al. (2008) found that participants who had no supermarkets near their homes were 25–46 percent less likely than participants in the highest category of supermarket density to have a healthy diet. Similarly, participants living in neighborhoods with the worst-ranked healthy food availability (by their own reports or by their neighbors' reports) were 22–35 percent less likely to have a healthy diet than those living in the best-ranked neighborhoods. Several prior studies of the food environment and diet have used the presence of supermarkets as the key measure of local food environment. Greater proximity to supermarkets has been linked to better diets among pregnant women (Laraia et al. 2004) as well as to lower fat intakes (Morland et al. 2002b) and greater consumption of fresh produce (Morland et al. 2002b; Zenk et al. 2005b) in samples of adults.

In the United Kingdom, concerns in the early 1990s over a lack of food shopping opportunities became enshrined in government policy (White 2007). However, it has been argued that there may be less evidence for the existence of "food deserts" than is often supposed, although they may have existed in the 1980s (Cummins & Macintyre 2002). Other recent commentators have suggested that the factors affecting access to a healthy diet are multiple and extend well beyond spatial or geographical aspects and that a "typology of food deserts" may be more useful (Shaw 2006). Shaw proposes that the concept of "access" may be broken down into three contributory factors: "Ability problems" which are defined as anything which physically prevents access to food which a consumer otherwise has the financial resources to purchase and the mental desire to buy; "Asset problems" which are defined as the lack of financial and other means (including storage and cooking facilities) to consume food which the individual can otherwise physically access and has the desire to consume; and, "Attitude problems" which refers to any state of mind that prevents the consumer from accessing foods they can otherwise physically bring into their home and have the necessary assets to procure.

Proximity to fast food outlets

Some studies have explored whether fast food outlets are more likely to be located in more deprived areas. A UK study investigated associations between area deprivation and the location of the four largest fast food chains in Scotland and England (Macdonald et al. 2007). The study found that density of outlets increased from more affluent to more deprived areas for each individual fast food chain and all chains combined. These results provide support for a "concentration" effect whereby plausible health-damaging environmental risk factors for obesity appear to be "concentrated" in more deprived areas of England and Scotland. Only a few studies have examined whether proximity to fast food outlets is associated with higher levels of obesity in people living nearby. In the United States, a study of all counties found a higher prevalence of fast food outlets was associated with higher BMI (Mehta & Chang 2008). However, another study of one US city (Minnesota) found proximity of "fast food" restaurants to home or work was not associated with eating at "fast food" restaurants or with BMI (Jeffrey et al. 2006).

Does Where You Live Matter for Some Groups More Than Others?

The potential of the residential environment to influence health may vary for different groups, for example, some studies have found gender differences in the associations between health and the experience of place. Other studies, mainly in the United States, have noted that poorer, predominantly black, neighborhoods have poorer provision of the type of amenities and resources that might promote deter populations from leading a healthy life.

Gender

Although much research on area variations in health does not focus directly on gender differences, it has been observed that both socio-economic and area variations in health may be more marked for men than for women (Macintyre 1999). For example, there are stronger associations among men than among women between area-based deprivation and life expectancy in England (Raleigh & Kiri 1997) and area deprivation and mortality in Scotland (Macintyre 1999). This raises questions about potential differences between men and women in the social meanings of place, and in exposure or vulnerability to social and physical environments.

A substantial body of work shows that women tend to view the world as a more risky place than do men. Women tend to perceive greater risk from a wide range of events such as nuclear power, technological disasters, and airplane and car accidents (Karpowicz-Lazreg & Mullet 1993; Flynn et al. 1994) and risks in the domestic arena such as fire in the home (Savage 1993). In the employment sphere, women in the same position in the same organization as men are more likely to report a poorer physical working environment (Emslie et al. 1999), even after "actual" differences in physical conditions have been measured by outside observers (Sternberg & Wall 1995).

Various explanations have been proposed to account for the gender difference in risk perception. Candidate explanations include women feeling more personally threatened by environmental problems than men; women tending to be more involved in local activities than men and therefore more knowledgeable about environmental issues; and, women being more concerned than men with nurturing and maintaining life and less concerned than men with jobs and economic growth (Blocker & Eckberg 1989; Stern & Kalof 1993).

If there are gender differences in perceptions of the environment, how might these relate to health? We have previously reported that residents of socially contrasting neighborhoods in an urban area varied systematically in their perceptions of features of their local social and physical environment (such as area amenities, problems, crime, neighborliness, and area reputation and satisfaction) and that these varying perceptions were associated with self-reported health (Sooman & Macintyre 1995). A study of African–American mothers found that perceptions of features of their residential environment such as police protection, personal safety, cleanliness, and quietness were associated with very low birthweight in their infants after controlling for maternal health behaviors such as alcohol use and cigarette smoking (Collins et al., 1998).

Molinari et al. (1998) examined men and women's perceptions of the social and physical quality of their community and found that, for women, it was their perceptions of the *social* quality of their local community (including problems such as unemployment, access to health care, youth violence, and the quality of public education) that was associated with their self assessed health; whereas, for men, it was their perceptions of the *physical* quality of their local community (such as the quality of indoor and outdoor air, drinking water, and waste disposal) that was associated with their self-assessed health.

In our study in Scotland, we examined gender differences in people's perceptions of their neighborhood and in the links between these perceptions and health (Ellaway & Macintyre 2001). Depending on the particular domain of perception used, gender differences in perceptions of area may go undetected; for example, we found that there were no gender differences in perceived neighborhood cohesion, but women had significantly more negative assessments than men of problems in the local area. Gender differences seem to be related to domestic circumstances, the most negative perceptions being in women with children who were not employed outside the home. This lends some support to the idea that women at home with children may be more exposed, or more sensitive, to features of their local neighborhood than men or women in employment. Poor opinions of the neighborhood were more strongly associated with mental health among men, and more strongly associated with physical symptoms among women.

Other studies have explored the influence of social and material context, as measured by routine data sources. The socio-political and physical environment, amenities, and indicators of economic deprivation and affluence were measured in neighborhoods in the United Kingdom, and their relationship with self-rated health was investigated using multilevel regression models (Stafford et al. 2005). Each of these contextual domains was associated with self-rated health over and above individual socio-economic characteristics. The magnitude of the association was larger for women in each case. Statistically significant interactions between gender and residential environment were found for trust, integration into wider society, left-wing political climate, physical quality of the residential environment, and unemployment rate. These findings add to the literature indicating greater effects of non-work-based stressors for women and highlight the influence of the residential environment on women's health.

Gender differences in experience of the local neighborhood have also been noted in relation to smoking. In a Scottish study, we found that amongst men and women, perceived neighborhood problems were associated with the likelihood of smoking but mainly among those with the most negative view of the local neighborhood (Ellaway & Macintyre 2009). There were gender differences in particular aspects of these. For example, perceptions of the provision of neighborhood amenities seems to be more strongly associated with women's compared to men's smoking status, whereas the perceived quality of the local neighborhood appears to be a better predictor of men's smoking.

Ethnicity

Ethnicity is a consistent correlate of obesity. In the United Kingdom, black Caribbean, black African, and Pakistani women are more likely to be obese than women in the general population. Pakistani and Bangladeshi men and black Caribbean, black African, Pakistani, and Bangladeshi women have higher waist hip ratios than the general population, suggesting more abdominal adiposity (Department of Health

2006). In the US literature, there are many examples of the effect of segregated neighborhoods – for example, predominantly African neighborhoods have more fast food restaurants per square mile than predominantly white neighborhoods (Block et al. 2004); diabetic and low-fat foods are less available in these neighborhoods; black Americans consume one third more fruits and vegetables for every additional supermarket found in a census tract (Morland et al. 2002b). It has been suggested that food preferences are partly dictated by available selection in the neighborhoods linked to lower access to transportation in low income and African neighborhoods (Morland et al. 2002a). In the United Kingdom, less is known about whether access to food or physical activity opportunities varies by the degree of ethnic concentration in neighborhoods. It has been suggested, however, that areas in the United Kingdom with a high concentration of residents from ethnic minority groups also tend to be those that are more deprived according to environmental characteristics and service provision (Smaje 1995).

Measuring the neighborhood

Aspects of the neighborhood environment have been measured in different ways (e.g. subjective assessments by residents or objective data collected by outside observers) and studies that explore both subjective and objective ratings of the local social and physical environment are both very rare and tend to be geographically limited (Dunstan et al. 2005). Moreover, few, if any, examine their joint relationship with health or health behaviors, although there is recent interest in the physical activity literature (Troped et al. 2001).

The literature to date suggests mixed findings on this issue. Some studies have found a good match between residents' reports and those of outside observers on some aspects of the local area (Frohlich et al. 2007) while others do not (Kirkland et al. 2003; Hoehner et al. 2005). Few studies have examined this issue in the UK context and one that has found low agreement between measured and self-perceived proximity to a park (Macintyre et al. in press). Some studies have explored whether the association between individuals' health and wellbeing and objectively measured areas characterize degree of neighborhood affluence (as measured by census indicators such as household crowding, car ownership and number of residents in employment) is mediated by individuals' perceptions of their neighborhood.

A British study of older adults (Bowling & Stafford 2007) found that the degree of social functioning (an aspect of active and healthy aging and measured in their study by engagement in social activities such as taking part in groups and associations) was lower in more deprived neighborhoods, independently of individuals' demographic and socio-economic characteristics. Moreover, individuals' perceptions of the area as neighborly and having good facilities were also independently associated with higher levels of social activities. A weaker association was found for respondents' physical functioning. A study in Cook County, Illinois (Wen et al. 2006) found that the relationship between self-rated health and neighborhood socio-economic context was mediated by perceptions of neighborhood quality. In a nationally representative US study, it was also found that perceived neighborhood quality remained associated with self-rated health even after taking individual and neighborhood socio-economic factors into account (Weden et al. 2008).

Conclusion

Although there has been much recent interest in trying to unpack the ways in which aspects of the local social and physical environment might matter for health, there are still large gaps in knowledge. For example, most studies are cross -sectional and therefore unable to shed light on the plausible timing of exposures i.e. when area influences on health are likely to be discernible in health outcomes (Macintyre et al. 2002). Some aspects of the residential environment might have immediate impact upon health behaviors and outcomes (e.g. access to fruit and vegetables might influence diet) whilst others occur over time (e.g. weight gain arising from a poor diet over many years).

If one of the major challenges for public health policy is to determine the appropriate balance between targeting areas (e.g. by improving resources and facilities in neighborhoods) and targeting individuals (e.g. by improving health related behaviors or giving families more resources), then good quality evidence is required to inform those decisions. Policies which focus solely on changing individual health behavior have had limited impact, in some cases further widening the health gap between rich and poor (Whitehead 1995). Similarly, policies which focus solely on environmental improvements, such as housing, without a corresponding change to individual financial resources, educational, or employment opportunities also have limited impact (Social Exclusion Unit 1998). Producing the evidence to inform policy is likely to require a multidisciplinary approach and a commitment to funding the design and implementation of interventions and longitudinal surveys. It is here that health geography research can continue to make a contribution.

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Chapter 22

An Environmental Health Geography of Risk

Michael Jerrett with Sara Gale and Caitlin Kontgis

Introduction

This chapter is situated at the intersection of public health, environmental epidemiology, spatial analysis, and health geography. Specifically, we review recent trends in "environmental health geography" (EHG) and applications of spatial analysis in environmental epidemiology and public health research. Health geographers and others using geographic methods have made significant contributions to understanding potential exposure pathways in space and time, mechanisms that may influence effective biological dose, modeling of the social distributions of pollutants, and finally the assessment of health effects from environmental contaminants. There has also been considerable attention paid to the perceptions of environmental risk and how this may in turn condition biological responses to pollutants or lifestyle factors such as smoking, which may affect subsequent individual-level susceptibility.

The focus here is on the quantitative aspects of environment risks and how health geographers and others have approached the assessment of risks arising from environmental exposures. Our emphasis is on methods used to study environmental exposures, susceptibilities, ways of adapting, and ultimately the health risks of environmental exposures to human populations. Although we touch upon some of the historical aspects of EHG, we have drawn specifically on recent research published between 2005 and 2008 to emphasize innovations and emerging trends in the field. Interestingly, this review suggests extraordinarily rapid growth in the use of advanced geographic information science and spatial modeling for addressing questions of environmental risk. The growth in the field has meant that much of the environmental health geography practiced is conducted increasingly by people from disciplines beyond the field of geography.

To illustrate the utility of specific methods, we draw examples related to environmental justice, atmospheric pollution, and climate change. We aim the chapter at a broad audience who may be unfamiliar with epidemiology and spatial analysis;

therefore, some technical details are omitted. Numerous references are given on the statistical models for readers interested in operationalizing these methods.

An underlying premise of this chapter is that many environmental pollutants and risks have their origins in broader economic, social, and urban structures. This chapter begins by tracking the underlying changes in urban structures and economic systems that have contributed to increased emissions, changed exposure patterns, and have potentially large health effects. Understanding the environmental exposure faced by human populations within this increasingly complex landscape has prompted increasing use of geographic information science (GIS) and allied systems. Later parts of this chapter document and discuss the methodological challenges and promise of GIS and related technologies such as remote sensing.

Urban Change and Land Use as a Driving Force

Urban form and structure have changed dramatically over the past 150 years. The trend during this period toward increased automobile use as the primary means of travel has elevated the relative contribution of traffic to the urban pollution mixture. Compared to earlier settlements, where land use was characterized by small towns with mixed land use and high levels of walkability, modern cities have evolved into auto-dependent sprawling complexes. The reasons for, and implications of, this change in the structure of cities are multifaceted and interrelated. This section of the chapter examines some of the major trends that have led to automobile dependence and their implications for vehicle miles traveled per capita and environmental pollution.

As discussed earlier, in spite of technological innovation and regulatory control, emissions from traffic in many places have been growing, due largely to the heightened demand for travel, which is prompted partly by urban structures that promote private automobile use over walking, cycling, and public transit by rail or bus. In countries experiencing rapid economic development, such as China and India, greater wealth has also generated demand from automobile travel (Molina & Molina 2004). In the absence of effective planning, many cities in these and other similar regions are experiencing dramatic growth in private automobile ownership and associated environmental exposures across land, water, and air media.

Newman and Kenworthy (1996) identify three distinct phases of urban development, which have led to progressive automobile use in many urban areas. Earlier settlement patterns that prevailed for thousands of years until the industrial revolution in the 19th century consisted of smaller settlements that organically mixed different types of land use. Because walking was the predominant mode of transport, these settlements were generally smaller than 5 km in diameter, had most commercial destinations within a half-hour walk of many residences, and relied more directly on local resources than modern cities (Owen 1991).

The industrial revolution led to migration of populations from the countryside to the city, often resulting in overcrowding, poor sanitation, and high levels of pollution from industries in proximity to residential areas (Mumford 1975; Hall 2002). The response to the ills of the industrial city was an increasing dispersion of populations away from the central industrial core to suburban areas connected usually by rail (Howard 1946; Newman & Kenworthy 1996). This functional separation between industrial and residential uses allowed for reductions in pollution exposure and overcrowding that often led to poor sanitation and outbreaks of infectious disease. Paradoxically, this dispersion and functional separation of different land uses also laid the seeds of increasing auto-dependence and many of the environmental risks associated with sprawling land use.

Beginning in the 1930s and 1940s and accelerating until at least the 1990s, many cities experienced rapid population growth in suburban areas. The trend toward suburban development began in the 1930s, reached an apex in the 1950s to the 1970s, and still maintained a relative growth surfeit to the 1990s. Cities that developed during this period are characterized by urban sprawl, which has many negative environmental, economic, and social consequences, including elevated air pollution from traffic sources (Frumkin et al. 2004).

Urban sprawl is most pronounced in the North American city, but has become a global phenomenon that also characterizes land use development in rapidly growing economies, such as China and India. Sprawl has four important characteristics that contribute to a syndrome of environmental and health costs, including increased air pollution exposure: (1) deconcentration (i.e. lower population density than in earlier periods throughout much of the urban area); (2) decentralization with more new development occurring in suburban rather than central areas; (3) large-scale development of subdivisions, industrial parks, and commercial centers; and (4) related to (3) homogeneity in land use mix and segregation of land use types, creating a need for travel between, for example, residential and commercial uses. Taken together, these characteristics create demand for travel. Moreover, sprawl increases the probability that this demand will be met with automobiles because costs are too high to service low-density development with high-speed public transit. Transit supplied by buses without designated lanes is always slower than cars and, therefore, has low market penetration (Newman et al. 1992).

Because much more of the development and population growth is occurring in suburban areas, growth in vehicle miles traveled (VMT) has exceeded population growth by a large margin. Earlier studies of 58 cities from around the world (Kenworthy 2006) have demonstrated a strong inverse relationship between VMT per capita and simple measures such as urban density. The most energy intensive and auto-dependent cities are the sprawling areas of the American south-west (e.g. Houston and Phoenix), while dense cities in Asia have the lowest automobile dependency. Higher incomes in many areas of the newly industrialized world are contributing to more private auto use and as a result this picture may be changing, although empirical data are not available.

This demand for auto use leads to higher energy throughput in the regional environmental system and to numerous environmental problems (Hough 1995; Frumkin et al. 2004), with increased potential for air pollution emissions from mobile sources, increased emissions because of relatively inefficient use of energy in single-family dwellings, loss of farmland and natural habitat, increased storm water run-off due to impervious surfaces, decreased physical activity for adults who spend more time driving and children who are no longer safe to play outside, and potentially higher intake of many pollutants because the roadways are in proximity to so many residential dwellings.

Conceptual and Practical Aspects of Spatial Analysis in Environmental Health Geography

This section covers three questions related to geographies of risk. First, why is spatial analysis useful for understanding environmental health relationships? Second, what operational framework can be derived to understand the various underpinnings of environmental health geography? Third, what data are needed to support spatial analysis?

Rationale for spatial analysis

In a classic article, Mayer (1983) discusses two ways that spatial analysis can increase our understanding of disease pathogenesis. Firstly, geographical studies may suggest possible causal factors. Associations between disease and place imply that the population living there possesses inherent traits that make it more susceptible to disease. Secondly, the population may experience some increased level of exposure to a risk factor such as air pollution. Finally, spatial analysis can help identify how populations adapt and relate to their environment. Such adaptations may be beneficial and protective or maladaptive and detrimental to health. Adaptation to air pollution risk provides a good example. In areas that experience high pollution events, individuals may reduce their exposure on high pollution days by staying inside or avoiding strenuous exercise or they may underestimate the risk and proceed with their daily activities as though no excess risk is present. In the latter case, the maladaptive behavior may increase their risk of illness or death.

Heuristically Mayer's assertions may be valid but, in many cases, observed spatial association suffers from methodological and data problems including random clustering (Rothman 1990), differential diagnosis or chaptering, confounding by uncontrolled factors such as age, gender, or social status and, increasingly, data that are imprecisely georeferenced to the zip or postal code area instead of the land parcel (Dearwent et al. 2001; Burra et al. 2002). Using the example of cluster investigations, a disease cluster consists of three components: a common diagnosis, a known biological disease-causing mechanism or one that forms a plausible aetiological hypothesis, an unusual and statistically significant pattern of cases (Jacquez et al. 1996). Fewer than 5 percent of reported clusters turn out to be "true" in the sense that each condition is completely satisfied (CDC 1990). Thus, while Mayer's assertion is correct when these problems are not present, researchers must always question the validity of ostensible associations between place and disease.

An operational framework for environmental health geography

Here we translate Mayer's conceptualization into an operational framework that includes three underlying geographies: exposure, susceptibility, and adaptation. In many instances, health geographers have explored single domains, but in others they have sought to understand areas of maximal overlap. Areas where two or more of the circles in the Venn diagram (see Figure 22.1) overlap are termed "geographies of risk" (Jerrett & Finkelstein 2005). The analytic framework we use hinges on four related concepts: (1) the geography of susceptibility; (2) the geography of exposure;

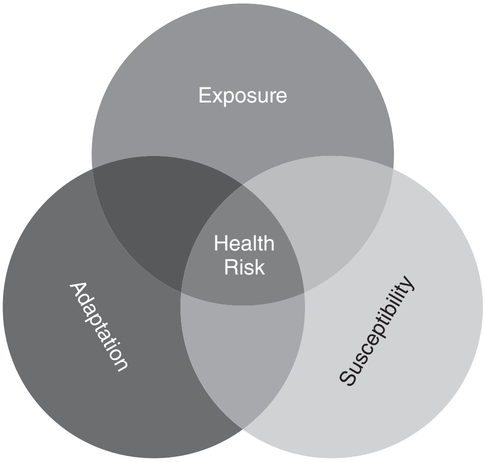

Figure 22.1 Extended conceptual framework for spatial analyis in epidemiology and public health. *Source*: Adapted from Jerrett, M. and Finkelstein, M. (2005) Geographies of risk in studies linking chronic air pollution exposure to health outcomes. *Journal of Toxicology and Environmental Health. Part A: Current Issues* 68, 1207–42.

(3) geography of adaptation; and, (4) points of intersection between these three, which we call the "geography of risk." We discuss how each concept encompasses many lower-level issues such as meteorological dispersion of pollutants, time–space activity patterns, behavioral changes in relation to perceived or real danger, and population distributions of susceptible individuals in time and space. Environmental health geography often focuses on understanding the overlap of two or more of these spheres of influence.

Data for spatial analysis

Data for spatial analysis must contain two classes of information. The first class includes attributes of spatial features measured in interval or ratio variables such as population size, mortality rates, pollution estimates or ordinal and nominal variables such as disease severity, name, or soil type. The second class involves the location of a spatial feature described by position on a map measured in one of many geographic coordinate or referencing systems (Goodchild 1986). In bringing these two classes of information together, spatial analysis seeks to assess non-independence or association in values of attributes at the same or nearby location or locations likely to experience spatial interaction (e.g. airports with connections to other distant airports). Haggett's (1994) discussion of the geographic factors leading to the global spread of infectious disease covers many of these long-range interactions (e.g. malaria cases appearing around airports in Switzerland as a result of flights from Africa). Explicit and systematic treatment of the locational aspects of attribute values separates spatial analysis from the standard statistical analysis employed in most environmental health research.

Because much of the available health and covariate data are collected for purposes other than spatial analysis, data integration and quality control are important precursors to the application of spatial-analytic techniques. A user-needs assessment survey of 30 health professionals in Canada revealed data availability, consistency, and cost as the main challenge to the expanded use of geographic information systems (GIS) and allied methods for health surveillance. Although over 80 percent of respondents said they planned to expand the use of spatial analysis in health research and policy, many expressed concern about the data needed to support such analyses (Bédard et al. 2000). In the United States and some European countries, the myriad of private medical care suppliers will probably make the task of developing national-level data capable of supporting spatial analysis even more difficult. Institutional structures for data collection, management, and dissemination lag the statistical techniques and technology available for spatial analysis.

Issues of privacy and confidentiality have also begun to collide with demands for higher accuracy and resolution in spatial health data. When privacy concerns are paramount, the data restrictions often force researchers to confront the question of whether available data are sufficient to support defensible health analyses. Fortunately, GIS offers powerful ways of integrating and cross-validating data (compare Jerrett et al. 1997 and Dearwent et al. 2001) and this gives researchers the capacity for deciding earlier on feasibility analyses. Recent research shows that investments in pre-analytic data preparation are essential because they can influence the outcome of subsequent spatial statistical tests even when errors in location affect less than 0.5 percent of the total data (Burra et al. 2002). Incorporating data of comparable spatio-temporal resolution and reasonable georeferencing accuracy remains the most time-consuming and expensive component of most spatial health analyses, but one that is an unavoidable first step toward analysis.

Environmental Justice, Spatial Risk Modeling, and Planning

In this section, we set out in detail the ways in which environmental health geography has developed in three discrete yet overlapping areas: (1) issues related to environmental justice or equity; (2) spatial risk modeling; and, (3) the utility of this understanding for the development of risk reduction policy and planning.

Social-spatial distributions of exposure: overlaps in susceptibility and exposure

Health geographers and others interested in health disparities have shown persistent interest in issues related to environmental "justice" or "equity"; a concept that evolved in the 1980s into an important aspect of environmental risk analysis. The field involves empirical analysis investigating whether socio-economic position (SEP), race/ethnicity, or the combination of both moderate exposure to environmental contaminants and other potential sources of health effects such as psycho-social stress. Environmental justice research takes on a political dimension because the concept infers that not only have the poor and racial/ethnic minorities been left behind in sharing the benefits of economic development, but they must also bear a disproportionate burden of the costs that arise from the production and consumption sectors (Buzzelli et al. 2003). Thus, the justice discourse also encompasses issues of fairness in regulatory, planning, and other environmental protection and economic decisions (Been 1993; O'Neill et al. 2003).

Research on environmental justice connects closely to the "geography of risk" framework presented earlier through what has been termed the "triple jeopardy hypothesis." This hypothesis posits that three linked conditions affect the air pollution–health relationship: (1) groups with lower SEP receive higher exposures to air pollution and other environmental hazards; (2) these groups already suffer the burden of reduced health from social factors such as poverty, psychosocial stress and lifestyle factors (some of which may be adaptive responses to the stress such as smoking); and, (3) the burden of poor health from social determinants will interact with air pollution to produce more serious health effects in the groups (Jerrett et al. 2001; Levy et al. 2002). In other words, the groups most likely to suffer ill effects from air pollution receive the highest exposure, and these susceptible low SEP groups will likely experience much of the health effect from environmental pollution. Some research supports the notion of larger health effects in lower SEP groups. For acute effects, neighborhood education and manufacturing employment have both been related positively with the size of air pollution health effects (Jerrett et al. 2004); in a chronic study, neighborhood income modified the health effects of air pollution (Finkelstein et al. 2003). Persons with both low income and high exposure were 2.5 times more likely to die during follow up than those with high income and low exposure and were also nearly twice as likely to die than those in the same exposure group with high income.

Importantly, environmental justice research takes on a political dimension because the concept infers that not only have the poor and minorities been left behind in sharing the benefits of economic development, but they must now bear a disproportionate burden of the external costs arising from the production and consumption sectors (Buzzelli et al. 2003). Thus, the environmental justice discourse also encompasses issues of fairness in regulatory, land use planning, and other environmental protection and economic decisions (O'Neill et al. 2003). Much of the earlier research focused on the distribution of toxic pollution from point sources (USGAO 1983; United Church of Christ 1987; Anderton et al. 1994; Jerrett et al. 1997). Early debates emphasized two major issues: (1) whether the methods used to assess spatial inequities were adequate due to data and statistical limitations (Bowen 2002); and, (2) whether the existence of unequal exposure by social or racial group was proof of intentional discrimination or a "natural" outcome of housing market processes that discount environmental externalities such that persons of lower income pay lower rents in areas of high pollution (Been 1993).

Methodological advances (i.e. better exposure characterization, a deprivation index representing multiple dimensions, and spatial autocorrelation analysis) have done much to increase confidence that environmental justice studies are not presenting spurious results due to poor methods. The question of whether deprived communities are specifically targeted for environmental externalities or whether this process is the outcome of a housing market that prices environmental exposures remains controversial. Some studies (Anderton et al. 1994; Boer et al. 1997) have emphasized the role of manufacturing employment as a contributor to exposure inequalities, which suggests an element of individual selection of residential location, albeit with a high probability of an income-constrained choice set. This question cannot be resolved through cross-sectional associative studies, but must be examined historically. In one of the better studies, Pastor et al. (2001) showed that over a 30-year period, hazardous waste facilities consistently went into minority neighborhoods rather than the minority groups moving in after the facility had depressed rents. Answering the question of intent will necessitate future studies that take a longitudinal perspective.

In a more recent study that epitomizes the state of the art for air toxics, Morello-Frosch and Jesdale (2006) implemented a GIS model across the United States to examine area-level factors, racial segregation, and estimated cancer risk associated with exposure to ambient air pollution. The study population consisted of 309 US metropolitan areas with populations >50,000 people. Then to capture any regional differences, the study population was further divided into the following six categories: western, southern, mountain and plains, border, midwestern, and northeastern states. To capture adequately the covariates, the researchers built several different GIS models. They assessed cancer risk for each area using the "hotspot" guidelines (a risk assessment procedure for air toxics and health data) from the Office of Environmental Health and Hazard Assessment (OEHHA). Then cancer potency data was linked to a hazardous air pollutants (HAPs) surface model. This air pollution model consists of state-wide grids that contain estimates of long-term HAP concentrations based on an Environmental Protection Agency (EPA) dispersion model.

When the researchers merged the cancer and air toxics data, they created inhalation unit risk (IUR) estimates to calculate the excess cancer risk due to chronic exposure to one unit of air pollution. Then they integrated the model with several other measures. To estimate segregation, they used tract level race/ethnicity data from the 1990 census to create a dissimilarity index (with a range from 0 to 1; 0 for no segregation and 1 for complete segregation). The dissimilarity scores were then designated as low/moderate (0.16–0.39), high (0.4–0.6), and extreme (>0.6) (Figure 22.2). They also thoughtfully built a surface layer from census block groups to calculate population density within census tracts. Area-level poverty and deprivation were measured with a composite of census variables and in terms of a version of the Townsend index, which uses the Z-scores from a different combination of census variables. Last, to capture civic engagement, the researchers measured voter turnout by county for the 1996 presidential election.

These socio-economic factors were then used to build a multivariate Poisson model to estimate the average change in the cancer incidence associated with segregation. While much of the cancer risk in the model is still due to mobile sources of pollution (mostly diesel particulates), the researchers found significant associations between cancer risk and racial segregation. When they adjusted for area-level SEP factors, the model showed a higher cancer risk associated with ambient air toxics for all racial groups. This finding was amplified by segregation index – the highly segregated areas with dissimilarity scores from 0.4–0.6 had a relative cancer risk (RCR) of 1.04 [95 percent CI 1.01–1.07] and the extremely segregated areas with dissimilarity scores >0.6 had a RCR of 1.32 [95 percent CI 1.28–1.36]. While racial disparities in cancer risk are affected by segregation, this relation is independent of area-level poverty. Across all racial groups, cancer risk increased with increasing segregation, especially for Hispanics.

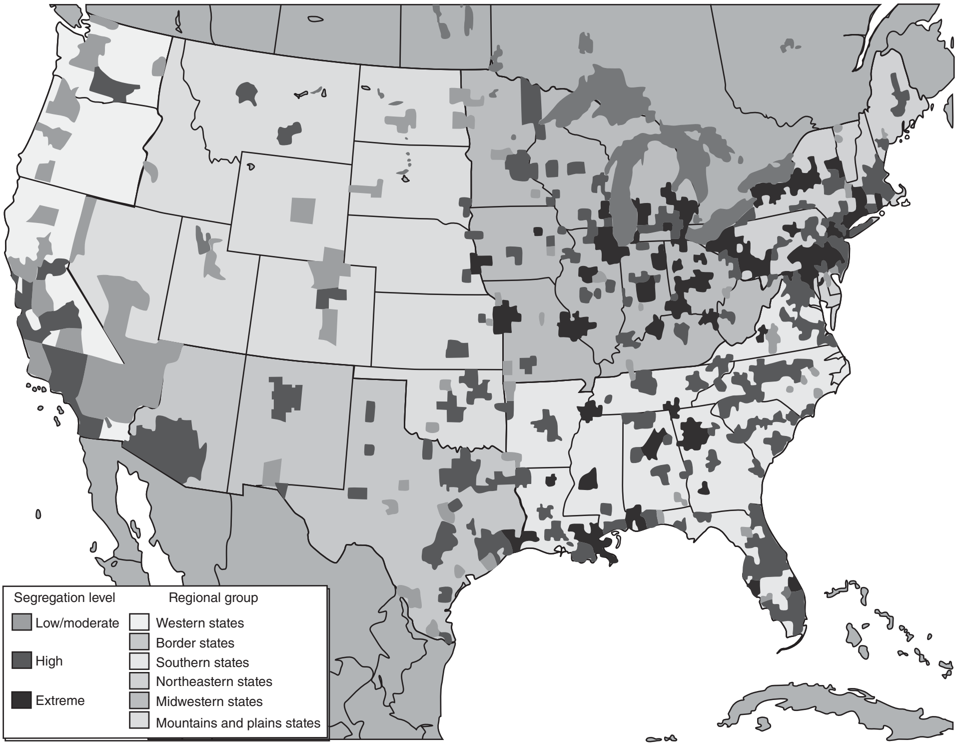

Figure 22.2 US map of segregation, by region. *Source*: Morello-Frosch, R. and Jesdale, B.M. (2006) Separate and unequal: residential segregation and estimated cancer risks associated with ambient air toxics in US metropolitan areas. *Environmental Health Perspectives* 114, 386–93.

This analysis has expanded the idea of segregation through the exploration of several different racial/ethnic groups and the thoughtful adjustment for factors confounding racial inequality. The policy implications from this work identify regional racial segregation as an important health issue with respect to risk and exposure to air toxics. Another interesting study uses cluster analyses, providing an example of the autocorrelation of related points that can display disease patterns as well as exposure patterns and facilitate identification of environmental justice sites. Fisher et al. (2006) examine the distribution of EPA designated toxic releases inventory (TRI) facilities in the San Francisco Bay Area. With three different spatial scales – regional, countywide, and citywide – the researchers evaluate the density of TRI sources and whether the clusters are statistically significant with a first-order intensity distribution and a second-order Ripley's K function. Ripley's K is a tool that compares a given distribution of points to a homogeneous Poisson distribution that is characterized by complete spatial randomness (CSR). Deviations from CSR can then be evaluated for significance. Ripley's K calculates the relative distance between points by forming circles around randomly chosen points, and estimates the average number of points per unit area. Then the function compares the observed estimate to an expected estimate that is based on CSR.

At the regional level, Fisher et al. found many clusters in the whole San Francisco Bay Area with two large, statistically significant peaks in the East Bay. Further, at the county level, there was statistically significant clustering along the western portion of Alameda County (Figure 22.3a). The researchers then use the city-wide data to identify West Oakland as a TRI source cluster and confirm their hypothesis that West Oakland is an environmental justice site because it has a statistically significant clustered distribution of TRI facilities. Figure 22.3b shows the location of the TRI clusters calculated with the intensity function, and Figure 22.3c illustrates that the city-wide cluster is outside of the random Poisson distribution or CSR envelope (represented by the upper and lower solid lines). The researchers go on to integrate social and economic characteristics from the census to explore other area-level demographics that make West Oakland an area for environmental justice concern.

Beyond studies such as these, researchers have shown heightened interest in examining the social distribution of traffic pollution. The body of traffic literature is quite small in comparison to the research on societal processes and on point sources. Apelberg et al. (2005) analyzed associations between the U.S. Environmental Protection Agencies National Air Toxics Assessment (NATA) models and census tract socioeconomic data in Maryland. Cancer risk for road-source emissions was higher in low-income and racial minority tracts. Green et al. (2004) investigated whether elementary schools in socially disadvantaged parts of California were more likely to be exposed to high levels of traffic. They reported the highest traffic counts on nearby roadways (within 150-meter radius buffer) in areas that had high proportions of economically disadvantaged and non-white groups. Other studies from southern California used emissions inventories and NATA to assess the health impacts of a range of sources, chaptering transportation sources as most important for lifetime cancer risk, particularly for racial minorities (Pastor et al. 2005).

In other countries, evidence of unequal distributions of traffic pollution by race/ethnicity and SEP has emerged, although the results are more mixed than in the United States. Pearce et al. (2006) used atmospheric dispersion modeling to detect a relationship between traffic pollution and disadvantaged social groups in New Zealand. Similar to the American studies, they reported evidence of unequal distributions of pollution, with higher levels in areas of relative deprivation. In England, Brainard et al. (2002) found that carbon monoxide and nitrogen dioxide, both markers of traffic pollution, related significantly to ethnic minority status and to social deprivation. Other factors that may influence near-source air pollution from dust re-suspension, such as street cleaning and maintenance, have also been shown to be related to SEP in the United Kingdom (Hastings 2007). In Sweden, Chaix et al. (2006) investigated the distribution of nitrogen dioxide in relation to young children. They reported higher levels of NO_2 for children living in poorer housing and neighborhoods. A Canadian study based on a land use regression prediction of NO_2 in Toronto reported that lower SEP was related to air pollution exposures, but there were exceptions that contrasted with the US literature (Buzzelli & Jerrett 2007). For example, racial minority groups tended to be less exposed in Toronto than other groups, probably due to the city's role as a gateway city for highly educated immigrants. Dwelling values also took an unexpected positive sign, which may have been partly explained by the dense urban structure of the downtown area

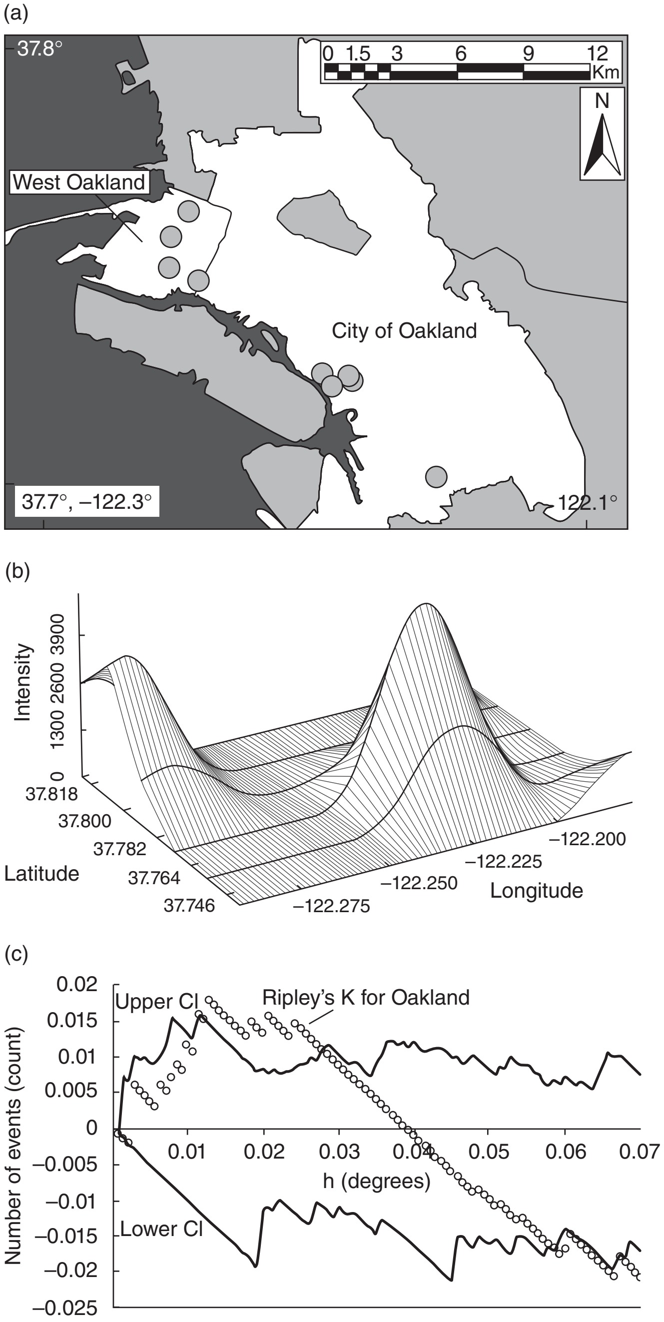

Figure 22.3 (a) TRI facilities in the city of Oakland, California; (b) intensity distribution of TRI facilities in the city of Oakland; (c) Ripley's K function for TRI facilities in the city of Oakland. *Source*: Reprinted from Fisher, J.B., Kelly, M., and Romm, J., Scales of environmental justice: combining GIS and spatial analysis for air toxics in West Oakland, California. *Health & Place*, 12, 701–14. Copyright (2006), with permission from Elsevier.

and the relatively high traffic and land rents in this district. These subtle differences highlight the need to examine the specific intricacies of place, but the minor differences in variables do not diminish the overall pattern of what has been observed in studies on point sources and other traffic environmental justice studies in the United States.

The spatiality and modeling of health risks

Since the 1990s, several trends have emerged in the spatial health risk assessment literature, some inspired by the environmental justice debate, some by literature on the geographies of health inequality, and others by methodological advances in multilevel modeling. On the substantive side, social health inequalities persist in many places and at many scales, and while the determinants remain only partially understood (CSDH 2008), environmental risks likely contribute to social health disparities (Finkelstein et al. 2005). Epidemiologists interested in explaining social disparities need to consider *prima facie* environmental exposures as an important confounder or effect modifier, something that is rarely seen in the social epidemiology literature. Second, because lower SEP groups often experience larger exposures, researchers interested in assessing the effects of environmental risk factors need to examine carefully the social distribution of the exposure to determine whether the observed health effects are larger in deprived groups than those in the general population. Third, there is the broader recognition that, in addition to individual risk factors such as smoking, contextual factors such as neighborhood deprivation may independently affect health. Given the high likelihood that environmental pollution exposures follow social gradients, attempts to examine the health effects of environmental pollution necessarily must control for a wide array of individual and contextual confounders.

Methodologically, the period since the 1990s has seen increasing use of random effects or multilevel modeling in public and environmental health research (Diez Roux 2002). Put simply, in the context of environmental health risk, multilevel modeling allows for simultaneous assessment of individual and contextual factors by explicitly accounting for likely non-independence by spatial location. In the most basic sense, this type of modeling promotes correct calculation of the variance by taking the non-independence in individual observations into the estimation of model parameters and coefficients.

The most basic form of health effects assessment in EHG derives from proximity to point sources of pollution. A few earlier studies investigated proximity to point sources, including coking operations and hazardous waste incinerators. For the most part, proximity to incinerators did not result in elevated rates of oral, pharyngeal, and lung cancers (Elliott et al. 1992), but subsequent sub-studies did chapter elevated cancer rates near one site, implicating putative air emissions as the likely source (Diggle et al. 1999). Although using proximity as a metric for exposure may appear straightforward, there are complex issues that may cloud the interpretation of results. As noted earlier in our review of environmental justice, point sources may depress rents and attract susceptible individuals into the polluted neighborhoods. The intermeshing over time and space of susceptible individuals in areas of high pollution suggests that observed health effects may be a function of exposure, susceptibility, or some interaction of both factors. Moreover, living in stigmatized communities may in turn create stresses that contribute to mal-adaptation. For example, people living in poor areas of Hamilton, Ontario, near a steel-making complex have a much higher prevalence of smoking than people living in neighborhoods away from the industrial zone.

There is also the complication of dispersion. Due to the potential long range transport from tall chimneys, only a small portion of the emitted pollutants may actually fall near the emission source, and the actual location of the pollution deposition may depend heavily on the prevailing winds. In addition, subjects working in point source facilities may live close by; thus, effects of occupational exposure cannot easily be distinguished from those due to ambient exposure. This makes assessment in local areas more difficult due to dispersion from the source to areas farther away. In response to these concerns, Reynolds et al. (2003) modeled point source hazardous air pollutant estimates at the census tract level to investigate associations with childhood leukemia in California. This method may have significant exposure measurement error due to the combination of inaccurate geo-codes for industrial facilities and the modeling process for prediction. In spite of this potential for error, they still chapter significantly elevated risks for people residing around point sources, such as industrial facilities, many of which would emit hazardous aerosols.

A study from the United Kingdom showed similar results (Knox 2005). It examined 14 years of fatal childhood cancers across the United Kingdom in relation to toxic hotspots, including PM_{10} emitters (i.e. emitters of particles of 10 micrometers or less in aerodynamic diameter), identified through a government atmospheric emissions inventory. Proximity of birth to hotspots related significantly to fatal childhood cancers. Many contaminants, including PM_{10}, showed significant associations. Of the various contaminants, the author concludes that the most significant risks appear related to some form of hazardous waste incineration or oil burning or evaporation, suggesting that putative emissions from industrial sources inhaled by the mother may cross the placenta to affect the fetus.

These and other similar studies around point sources have produced mixed results, possibly due to exposure measurement error, mobility in the populations, or the other complicating factors noted above. The Diggle study introduced an important advance with a "raised incidence" model that allows for the assessment of distance decay in point patterns of mortality or morbidity around a specific point source, while controlling for socio-economic confounders. But none of these models had data to support multilevel modeling, and specific examination of residual mortality was rarely included. Nonetheless in total this investigation of hotspots or point sources demonstrates the exploratory utility of employing the geographic approach to health analyses. Insights from these earlier studies have paved the way for multilevel models with more precise exposure measurement models.

In the more recent studies, the residual variation in a health outcome of interest has been mapped and analyzed to reveal whether important spatial patterns remain unexplained. Multilevel models are also being meshed with Bayesian statistical methods that make use of prior information on spatial processes and allow for assessment of how spatial measurement error may influence health risks assessment. Such examinations can be informative for understanding whether important spatial factors have been left from the model. Some of the more interesting examples are emerging with respect to air pollution risks.

For example, Molitor et al. (2006) examined lung function in a sample of about 220 children using advanced Bayesian multilevel modeling and proximity or dispersion exposure assessments. The study took place in southern California across 12 communities. It built on a longitudinal study of the relationship between lung growth and air pollution in children. Using this framework, Molitor et al. were able to show a positive significant association between lung function and air pollution from traffic. Interestingly, they also demonstrated that the more refined spatial exposure models decreased the uncertainty in the health effects estimates as might be expected by measurement error theory, and that the level of residual spatial variation in the health outcome had a spatial pattern. Some communities had much larger spatial errors than others suggesting possibly differential measurement error within each community.

In another recent study, Jerrett et al. (2005) investigated the effects of particulate air pollution on mortality in Los Angeles, CA. Health data were extracted from the American Cancer Society (ACS) Cancer Prevention Study II (CPS-II) for metropolitan Los Angeles (LA) at the zip code area (ZCA) scale (zip codes are used for US mail delivery; average population per zip code in LA is approximately 35,000, with an average area of approximately 22.5 km^2). Exposure was assigned to 267 ZCAs with a total of 22,905 subjects (5,856 deaths based on follow up to the year 2000). Some subjects reported only postal box addresses and were therefore excluded. A LUR prediction model was developed to predict fine particulate matter (PM) from 23 monitoring locations in the MSA of Los Angeles using GIS to integrate data from land use, transportation, and physical geography. The LUR method explained 69 percent of the variance in $PM_{2.5}$ with three predictors: (1) traffic density within 300 m; (2) industrial land area within 5000 m; and, (3) government land area within 5000 m of the monitoring site.

Ecologic variables for the ZCAs were used to control for "contextual" neighborhood confounding (see also national analysis, ecologic covariates). Some 44 individual confounders were identified in earlier ACS studies of air pollution health effects (Pope et al. 2002). These variables include lifestyle, dietary, demographic, occupational, and educational factors that may confound the air pollution – mortality association. Multilevel Cox proportional hazard models were used to model the association between mortality and air pollution, while controlling for other individual and contextual influences on health. Using this method, the researchers found larger significant associations between particulate air pollution and mortality, with especially elevated risks for ischaemic heart disease. Risks using this intra-urban exposure assessment were more than 2 times greater than shown in earlier studies that were based on central monitoring data and used exposure contrasts between cities rather than within them.

Importantly, the researchers were able to examine the residual mortality spatially through multilevel modeling. Figure 22.4 below shows the residual mortality pattern present when only the individual risks are included in the model with no pollution term, and when the effect of pollution is included shows the effect of including pollution (Figure 22.5). There is a substantial reduction in residual mortality when pollution is included in the model. Further analyses showed how inclusion of a term

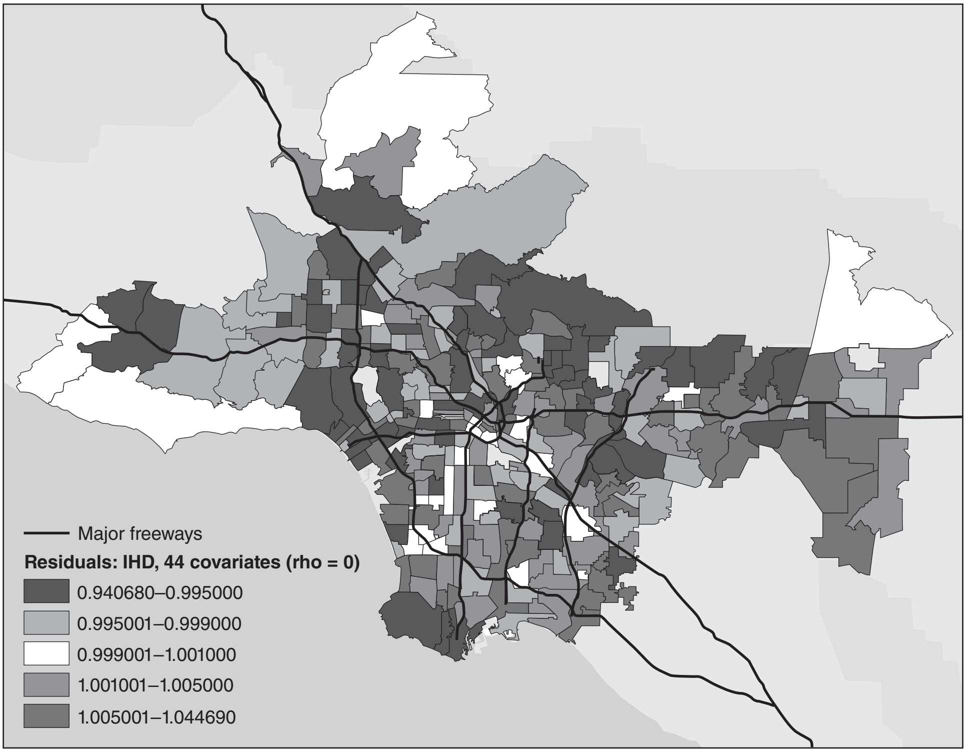

Figure 22.4 Residual mortality in zip code areas after controlling for 44 individual confounders and age, race, and sex. *Source*: Jerrett, M., Burnett, R.T., Ma, R.J., Pope III, C.A., and Krewski, D., et al. (2005) Spatial analysis of air pollution and mortality in Los Angeles. *Epidemiology* 16, 727–36.

measuring proximity to major freeways further reduced the residual mortality. Statistical tests confirmed that significant reductions in residual mortality were associated with pollution, suggesting convincingly that pollution was associated positively with mortality. Other tests using a spatial autocorrelation error term (rho) showed little residual autocorrelation was present when the effects of individual, contextual, and pollution terms were included simultaneously (results not shown).

These recent methodological advances, with the use of sophisticated Bayesian methods and with multilevel analyses, represent a major new direction in the field. In both instances, confidence in the observed health effects increased substantially with the examination of residual spatial patterns in the data. Removal of these patterns with inclusion of the environmental pollution variables provided stronger evidence that the associations did not occur by chance.

Spatial risk assessment in the context of planning for climate change adaptation in UK urban areas

Climate change represents perhaps the largest environmental risk humankind has faced. In reviewing the chapters from the Intergovernmental Panel on Climate

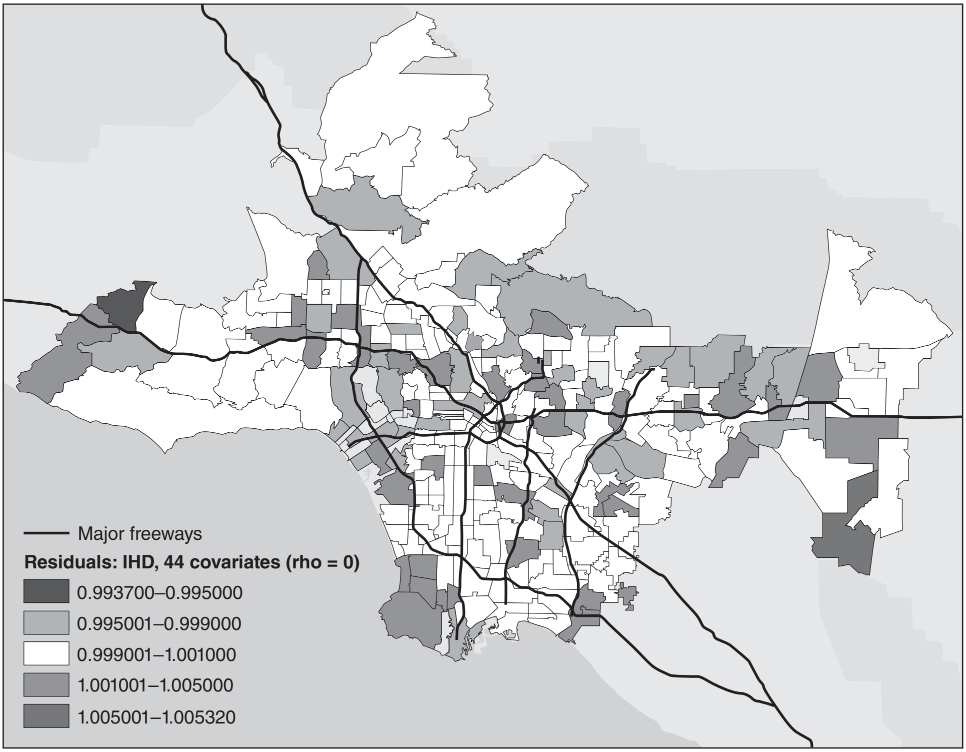

Figure 22.5 Residual mortality in zip code areas after controlling for 44 individual confounders and age, race, and sex with the PM2.5 pollution term included. *Source*: Jerrett, M., Burnett, R.T., Ma, R.J., Pope III, C.A., and Krewski, D., et al. (2005) Spatial analysis of air pollution and mortality in Los Angeles. *Epidemiology* 16, 727–36.

Change, there is a high degree of certainty that the global climate will warm, that human emissions of "greenhouse gases" such as carbon dioxide have contributed, and will contribute, for hundreds of years to this warming, and that major changes in the weather will create a cascade of effects likely to have health effects on humans (Confalonieri et al. 2007). Although mitigation remains a possibility, in this context adaptation appears essential, particularly for regional impacts where the uncertainty of timing and magnitude are much greater. In our review of ongoing spatial studies we found only one paper using GIS and health geography methods to assess adaptation to the risk of climate change. Lindley et al. (2007) applied conurbation-scale risk and adaptation assessment methods to study the response of the Greater Manchester urban area to climate change. This new, explicitly spatial method was developed through the Adaptation Strategies for Climate Change in the Urban Environment (ASCCUE) project, which was created by the Engineering and Physical Sciences Research Council (EPSRC) to address the lack of information needed to adapt to climate change. This study by Lindley et al. was done to assess the validity of this new method.

Conurbation-scale risk assessment was performed to evaluate an entire urban system as well as provide a basis for neighborhood-level analyses. Similar to the

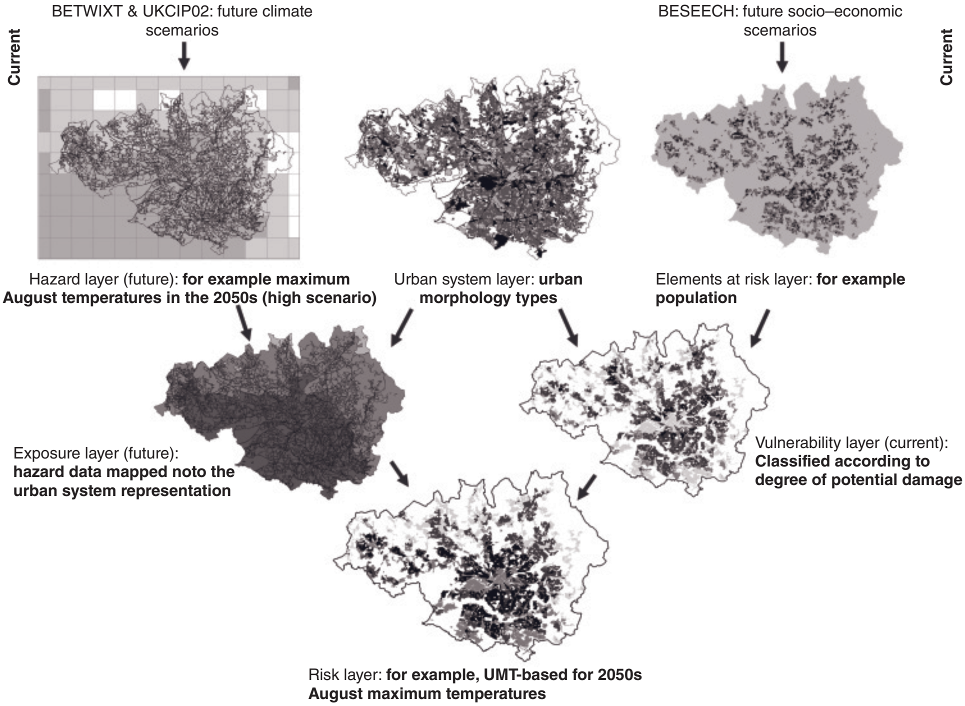

Figure 22.6 Application of conurbation-scale risk assessment. *Source*: Lindley, S.J., Handley, J.F., Theuray, N., Peet, E., and McEvoy, D. (2006) Adaptation strategies for climate change in the urban environment: assessing climate change related risk in UK urban areas. *Journal of Risk Research* 9, 543–68. Reprinted by permission of the publisher (Taylor & Francis Group, http://www.informaworld.com).

conceptual framework introduced earlier, the authors defined risk to be an interaction between hazard, exposure, and vulnerability. This methodology uses GIS to create separate maps of various risk elements (i.e. population), hazards (i.e. maximum August temperatures), and the urban-system (i.e. urban morphology types). A layer that maps the current vulnerability of the region is then created by merging the risk element layers to the urban-system layer, and a layer that projects future exposure is created by merging the hazard layer to the urban-system layer. Finally, the projected exposure layer and current vulnerability layer are merged to create a final risk layer (see Figure 22.6).

The authors reported this methodology to be valuable for several reasons. Firstly, since each risk element is represented as a separate layer, it is possible to modify each element individually to re-assess the final risk layer. This allows planners to easily evaluate different adaptation strategies in order to determine how to best mitigate the risk faced by urban areas due to climate change. Secondly, by developing this GIS method it is possible to not only identify current areas where adaptation is most necessary in order to deal with the risks posed by climate change, but it is also possible to identify areas that are most at risk in the future. By projecting these potential high-risk areas, it is possible to plan strategies to protect the areas that will become susceptible to the effects of climate change in the future, even if these areas are not currently at risk. Finally, to perform the conurbation-scale risk assessment, the authors used previously generated data in order to create the various GIS layers. By utilizing the best available data, it was possible to produce results rapidly, which will become increasingly necessary in order for urban areas to swiftly adapt to climate change.

Importantly, this study specifies the ways in which conurbation-scale risk assessment can be used to affect policy. Using "the ten principles for improved climate policy" outlined by Rayner and Malone (1998), the authors detail how this new method fulfils each of the principles. For example, in response to the principle stating that it is necessary to "realize that there are institutional as well as environmental limits to sustainability" (principle number 2), Lindley et al. point out that the conurbation-scale risk assessment allows for a wide array of information from various agencies to be taken into account. By satisfying these principles, conurbation-scale risk assessment proves to be a useful tool for planning adaptation strategies.

To demonstrate the method, the authors used conurbation-scale risk assessment to analyze how socio-economic change will affect the risk of heat stress (see Figure 22.7). Building Economic and Social information for Examining the Effects of

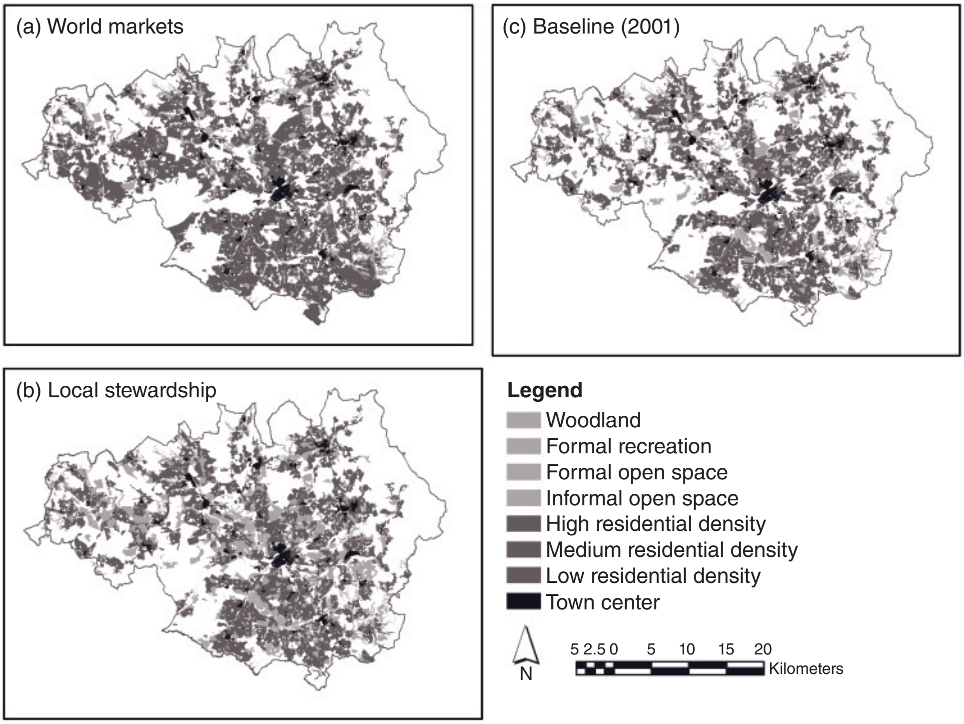

Figure 22.7 Using conurbation-scale risk assessment to analyze heat stress risk. *Source*: Lindley, S.J., Handley, J.F., McEvoy, D., Peet, E., and Theuray, N. (2007) The role of spatial risk assessment in the context of planning for adaptation in UK urban areas. *The Built Environment* 33, 46–69. Reprinted by permission of the Alexandrine Press.

Climate cHange (BESEECH) was created by the Building Knowledge for a Changing Climate (BKCC) project program to understand the ability of various socio-economic classes to adapt to climate change in an urban area. In doing so, BESEECH outlined four different socio-economic scenarios: world markets, global responsibility, national enterprise, and local stewardship. Using these scenarios, Lindley et al. showed that the local stewardship scenario reduces the community's vulnerability to heat stress, whereas the world markets scenario enhances the community's vulnerability.

This case study led the authors to make several policy suggestions that could help mitigate overall risk to heat stress in the Greater Manchester area, United Kingdom. To increase an individual's personal adaptive capacity, the authors propose longer working lives to provide health coverage and to create stronger social networks. Additionally, the authors recommend urban densification and an improved transport system so that the region can grow without increasing social deprivation. Finally, the authors encourage increased greenspace cover to reduce the heat hazard. Thus, by putting forth this application of conurbation-scale risk assessment, Lindley et al. have demonstrated the usefulness of visualization and cartographic overlay. This assessment is efficient and can be completed relatively quickly since it utilizes the best available spatial data rather than creating new data. It also allows researchers to easily compare various risk scenarios in order to discern what the proper adaptive approach to climate change should be put into effect.

Emerging Methods

It should be apparent from the previous discussion that developments in spatial analytical techniques have enabled the field of environmental health geography to make considerable advances in recent years. In this section, we review these developments and their utility for further refining research generated using these methods.

Mobility and exposure

Much of the current quantitative work in spatial analysis assigns estimates of exposure to the home address and occasionally to workplace or school location. Exposure surfaces can be assigned through raster grid cells or as points in a vector-based lattice. The result is a high-resolution estimate of potential ambient exposure across the entire urban area that can be assigned to the subjects' address through the geocoder file that converts alphanumeric street addresses to a longitude–latitude coordinate or equivalent projected coordinate system such as the Universal Transverse Mercator system.

Although it is useful to use home or work locations, most studies have not assigned exposures based on the "activity space" occupied by individuals. Studies conducted by Kwan (2004) indicate high variability in the likely distance away from home during the day. At this stage, much of the research has focused on residential address, but this will have differential levels of accuracy for commuters vs. non-commuters, for children being bussed or walking, and for retired vs. working individuals. Elgethun et al. (2007) compared parent diary chapters to differentially corrected GPS units worn my children 3–5 years old. There was 48 percent disagreement between the two instruments, with some areas of exposure being significantly underestimated (e.g. time in transit, time outdoors at home). Emerging technologies such as GPS and related activity measures such as accelerometers offer possibilities of reducing such errors in the exposure assignment of individuals in health studies concerned about environment risk.

Remote sensing

Remote sensing has emerged as an important innovation in the exposure sciences. Remote sensing can be defined as "the acquisition and measurement of data/information on some property(ies) of a phenomenon, object, or material by a recording device not in physical, intimate contact with the feature(s) under surveillance" (Short 2008). The field encompasses the capture, retrieval, analysis, and display of information on surface and atmospheric conductions that is collected using satellite, aircraft, or other technologies designed to sense energy, light, or optical properties at a distance. Here we review the potential uses of remote sensing for understanding the exposures from traffic pollution under three categories: (1) a means of estimating concentrations of pollutants, potentially generated by traffic, that may associate with health effects; (2) as a direct data input to models used to predict air pollution from land use, traffic, or other ground-level information; and, (3) as a means of cross-validation for land or atmospheric data capture by ground or traditional meteorological devices.

Remote sensing for predicting surface concentrations

Because routinely collected satellite data capable of measuring parameters that estimate ground level concentrations are generally of coarser resolution than the 500 m distance selected as a guide for traffic impacts in this chapter, we have few identified direct applications of remote sensing to estimating fine scale variations in traffic pollutants at resolutions relevant to health effects assessment. The moderate resolution imaging spectroradiometer, which operates from the Terra (EOS AM) and Aqua (EOS PM) satellites (National Aeronautics and Space Administration (NASA) 2009), currently has capacity to measure aerosol optical thickness (AOT), and when combined with appropriate processing and analysis, to predict particle concentrations in the troposphere. Some of the better retrievals and predictive models have been for relatively large areas on 1 × 1 degree grids, which translate into about 110 km resolution at the equator (see, e.g., Donkelaar et al. 2006). The minimum grid size available currently from MODIS is 10 × 10 km grids, with global coverage on a two day cycle. Liu et al. (2005) demonstrated a method for retrieving and reprocessing the MODIS images to a 1 km resolution. Based on a three-day comparison against 11–14 ground level measurements of PM_{10}, correlations ranged from 0.55–0.86. While the predicted values are for areas slightly larger than the 500 m influence zone of this chapter, further refinements to scales useful to assessing health the effects of traffic appear likely.

The multi-angle imaging spectroradiometer (MISR) is another space-based instrument capable of estimating AOT. This instrument has a minimum grid size of 17.6 × 17.6 km, and temporal coverage of the Earth every nine days (National

Aeronautics and Space Administration (NASA et al. 2009). Recent studies have utilized MISR to predict PM_{10} surface concentrations within Beijing, China (Jiang et al. 2006). The authors found moderately high correlations between measured concentrations and MISR predictions in the Fall, Winter and Spring (r ranging from 0.59 to 0.72), but a weaker correlation in summer ($r = 0.32$). Although the MISR predictions characterized the spatial pattern of AOT fairly well over the broad metropolitan area of Beijing, the authors noted that the minimum grid size of 17.6 km may be insufficient for assessing spatial variation in areas with high levels of heterogeneity in particle concentrations within the city.

Special studies using light detection and ranging (Lidar) have been used to augment other meteorological and ground-level data for understanding spatial and temporal dimensions of aerosols (Brook et al. 2004). In theory, Lidar may produce 1 m resolution images, but it has limitations in terms of oversensitivity to coarse particles (Brook, personal communication 2007) in estimating particle concentrations. Future studies using Lidar may allow for highly refined estimates of exposure from traffic pollution.

Remote sensing as data input

Increasingly, land cover information is derived partly or wholly from remotely sensed imagery. For example, as mentioned earlier, the US Multi-Resolution Land Characteristics Consortium of federal agencies has purchased and processed Landsat 7 images to classify land cover for the National Land Cover Database, which encompasses the entire United States (United States Department of the Interior & United States Geological Survey 2008). This database provides land use data in a raster grid cell format at 30 m resolution. Earlier versions of this land cover data were used to calibrate a land use regression model in New York City for predicting small area variations in $PM_{2.5}$ (Ross et al. 2007) and similar information is available at the national scale, which will enable large-area models of many cities to be calibrated where the pollution monitoring data exist or are collected for special studies.

Processed images may also supply useful information as input to exposure models. As an example, the normalized difference vegetation index (NDVI) can be used to derive estimates of vegetative cover (Defries & Townshend 1994). These have been used as predictors in land use regression models, and because the green cover supplies an alternate estimate of those areas likely to have fewer mobile sources, future applications of the NDVI and other processed images may serve as important data inputs to traffic exposure assessments.

Remote sensing for cross-validation

Many of the current exposure models used to predict pollutant concentrations at a fine scale utilize ground-based information on pollutant concentrations, land use, and traffic. In some instances, the geographic accuracy of these ground data may be of variable or questionable quality. Remotely sensed imaged of high resolution can be used as cross-validation against which to compare these ground data. Some examples include the location of pollution monitoring stations operated by government entities. Although increasingly these sites are marked with GPS coordinates, some error in the GPS coordinates can occur and those that rely on coordinates assigned by paper maps may have large errors. Digital orthophotos or high resolution images from IKONOS or QuickBird images, at 1–5 m resolution, can increase the spatial accuracy of the data used as input to land use regressions (e.g. Moore et al. 2007; Ross et al. 2007). Similar comparison can be done with land use classifications and with road networks. The advent of Google Earth and its extensions has made such cross-validation more accessible for many researchers, and reductions in spatial errors have probably increased prediction accuracy of ground level concentrations.

Conclusions

Through this review some central conceptual issues and trends have emerged. In examining the trends, there has been a remarkable growth in the use of advanced spatial modeling that appears to be accelerating not only in environmental health geography, but as an essential component of environmental epidemiology and public health. Use of GIS and spatial analysis is now commonplace in many research projects and health departments, oftentimes not involving traditional health geographers. The preponderance of this literature is on characterizing susceptibility to environmental exposures, with a secondary focus on health effects assessment. Only one study attempted to take a spatial approach to "adaptation" to risks.

Conceptually, the landscape and economic forces that underlie environmental risks have shifted in a way that has created finer-scale geographies of risk – largely due to traffic and its associated emissions or the infra-structure that may influence energy flow, resource use, the hydrological cycles, and waste emissions. The impacts generated in the variegated landscape of risk are not shared equally among all groups in society, but show a global trend toward increased burdens on the poor and on groups that are otherwise disadvantaged in society. These patterns of environmental injustice appear consistent across different spatial scales, different environmental risk factors, and over numerous study locales. Indeed, even when examining the emergent risks of GCC, these risks display a propensity toward affecting the least advantaged the most.

Turning to the assessment of health risks, the methodological advent of multilevel models and substantive idea of contextual influences on health have done much to increase the sophistication and insights into how environmental risks are both conditioned and confounded by numerous social and neighborhood factors. The use of multilevel models has elevated insights into health risks – in some of the more advanced models, the spatial approach has lead to much higher confidences in the empiric results and the demand for this kind of modeling in a field always at the interface between science and policy appears likely to grow. Bayesian approaches, although not widespread in the health effects modeling, have focused analysts to explicitly examine their assumptions about the processes under study and more critically have been able to decompose the various sources of errors in exposure measurements that often plague environmental health studies.

Regardless of methodological sophistication, controlling simultaneously for all known risk factors is problematic, and analysts may have to temper conclusions, even with multilevel approaches. Investigating the association between environmental and health factors through spatial analysis requires control for many potential risk factors (Krewski et al. 2005), and operationalizing such models without a high degree of collinearity (correlation among the variables) is a difficult if not impossible task (Jerrett et al. 1998). A thorough spatial analysis of the same relationships may still uncover useful information, including exposure mis-measurement within metropolitan areas, the effect of specific confounders, and the influence of chronic exposure. Yet, these advanced methods cannot overcome the reality that susceptibility, exposure, adaptation, and health risks are often intermeshed temporally through longer processes of land use and economic development, and epistemologically, these factors cannot be completely separated in a geographical analysis. More qualitative and historical approaches, essential elements of health and place investigations, are needed to re-assemble the likely causal pathway from exposure to disease. In the future, mixed methods, employing both multilevel approaches and more qualitative examples, appear likely to feature more prominently in EHG.

Other future trends are also apparent. GPS systems and activity monitors have given researchers capacity to move beyond relatively static geographies of risk, with exposures assigned largely to the home address, to characterize mobility and activity while in the exposure space or what Hägerstrand called the "hazard fields." Interesting and counter-intuitive findings are emerging from such studies. For example, Briggs et al. (2008) recently demonstrated that exposures to air pollution were higher for children who walked to school in London, England, than for children who were driven in automobiles. While the promise of capturing a time-geography of risk has not yet been fully realized, it is much closer to reality now than ever. Moreover, powerful Bayesian analytical techniques have been created recently to deal with complex spatiotemporal data (Christakos et al. 2001).

Although still in its infancy, remote sensing holds promise for studying environmental exposures and even for characterizing susceptibilities, particularly in poorer regions that may lack digitized mapping data. Remote sensing as presented through Google Earth has also awakened the geographic imagination in ways that go beyond the traditional academy and places where health geography is typically practiced. Numerous sites have now used Google Earth to map environmental exposures and risks. Combined with more systematic efforts of web-based mapping (e.g. Maclachlan et al. 2007), Google Earth and similar applications appear destined to have a major influence on the field of health geography and beyond to many other health sciences.

This chapter has reviewed major changes in land use that have in many ways worsened environmental risks faced by large populations. Many of these risks now follow a much finer spatial scale than in the past, although paradoxically, there are also emerging global risks such as climate change. Many of these risks are related to increased automobile use and associated sprawling landscapes that increase energy and resource use in regional ecosystems and concomitantly increase exposures in human populations. Following this historical review, the chapter then turned to elucidating the rationale for spatial analysis in health research, with an emphasis on earlier arguments by Mayer (1983) and on the data issues that often limit environmental health geography. From there the chapter developed a "geography of risk" framework emphasizing that risks to human health often result from the overlaps among individual susceptibility, exposure to environmental toxins and (mal)adaptation to those exposures of the stresses they cause.

The chapter then turned to an intensive examination of the social distribution of environmental contaminants, a major and ongoing concern of health geographers; the spatiality and modeling of health risks with an emphasis on air pollution; and, finally on cartographic approaches to characterize adaptive potential to possibly the biggest environmental risk to face humanity, global climate change. Through this review, progression toward more theoretically informed and methodologically sophisticated methods is evident. GIS and allied methods are now essential components in the larger fields of epidemiology and public health, and future trends indicate a high likelihood of further expansion beyond traditional EHG into the larger health debates related to geographies of risk.

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Chapter 23

Environment, Perception, and Resistance

Susan J. Elliott

Environment, Perception, Resistance

This chapter reflects the material presented in the previous chapter, focusing specifically on the psychosocial effects of potential and/or perceived environmental threats and responses to them. In so doing, the chapter follows a general outline of providing the history of the development of this research program within health geography, the evolution of theories of risk and response, and the emerging interest in issues of environmental justice. A series of case studies reflecting contamination of air, water, and soil – and community responses to these – are also presented.

Setting the scene

In 1976, in Seveso, Italy, there was a major explosion at a chemical factory. Workers at the plant as well as residents of the surrounding community were exposed to dioxin, a known carcinogen. Seveso became a natural laboratory for occupational epidemiologists working in that part of the world. They followed the workers and residents for some thirty years to discern whether or not there would appear a (statistically significantly) higher rate of cancer in the exposed versus not exposed populations. Indeed, one would have anticipated higher rates of cancer of the liver due to such an exposure. However, that is not what these researchers saw. Rather, they saw a five-fold increase in cardiovascular disease. This was a very unusual and unexpected finding, given that there is no biological or etiologic plausibility for a relationship between dioxin and cardiovascular disease. While the researchers did not collect any psychosocial or stress data, they speculated that exposed individuals were so concerned about the long-term implications of developing cancer, that they worried themselves into having heart disease (see Bertazzi et al. 1989 for more details); in short, they worried themselves sick.

Many people are worrying themselves sick today about the relationship between the environment and health, often fed by media reports of cancer hotspots, chemicals in food and other products, as well as their own personal experiences with friends and loved ones. When ruminating on the apparently high rates of breast cancer, colon cancer, any other type of cancer, people are pointing fingers at the environment.

The relationship between environment and health refers to those aspects of human health, broadly defined, influenced by the environments (physical, social, biological, economic, political, cultural) within which we live, work, and play. The disappearance of the fourth largest in-land body of water in the world (Aral Sea, Uzbekistan; Crighton et al. 2003), an inexplicable four-fold increase in asthma since the 1980s (Masoli et al. 2004), babies dying of contaminated water (Hrudey et al. 2003), the doubling of deadly peanut allergy (Al-Muhsen et al. 2003); these are all examples, all taken from research in the so-called developed world, of relationships between human health and the environment that are of paramount and increasing importance to researchers, policy-makers, and the general public. This situation has been punctuated by the occurrence of major environmental disasters such as Seveso (Italy), Love Canal (New York), Three Mile Island (Pennsylvania), Bhopal (India), and Chernobyl (former USSR). Ongoing concerns about creeping environmental disasters keep environment and health on the front page of the newspaper, and at the top of the research agenda. The primary challenge in addressing these relationships involves the complexity of designing investigative studies, measuring exposures and outcomes, and evaluating the evidence. Despite these difficulties, decisions must be made with respect to policy, regulations, and guidelines put in place to protect the health of the public who are, as indicated above, increasingly concerned about the impacts of the environment on their health and the health of their loved ones.

Clear articulation of what we mean by health is a useful point of departure for our understanding of the relationships between environment and health. Defining the environment is as complex. In the context of environment and human health, we often think of the physical environment (e.g. air quality) and its impacts on human health (e.g. asthma). But what of the social environment (e.g. social capital), the economic environment (e.g. unemployment rates), the cultural environment (e.g. role of women), or the political environment (e.g. access to opportunities and institutions)? These environments, too, have been shown to influence human health. This is why the World Health Organization, in a meeting in Sophia, Bulgaria, in 1993, crafted a very broad definition of environmental health that includes quality of life in the concept of health and refers to the influence of the physical, biological, chemical, social, and psychosocial environments on human health. This definition has a further, prescriptive component addressing the correction, control, and prevention of those factors in the environment that can (potentially) adversely affect the health of present and future generations.

The work of early geographers (Burton et al. 1978) on the human impacts of natural hazards (e.g. floods, earthquakes, volcanoes) forms the foundation for the modern study of geographies of environment and health. Human impacts of these hazards focused on the loss of life and property, loss of community and social functioning, loss of home, as well as perceptions of risk, the social amplification of risk, and the role of individual choice with respect to risk and coping with/adapting to risk. This large body of literature can be summarized in a very few points: natural hazards and natural events are two very different concepts; natural hazards and their impacts are unequally distributed across space; natural hazards and their impacts are increasing with time. With respect to the first point, there are catastrophic natural events that occur in our world on a regular basis: fires, floods, droughts, earthquakes, tornadoes. Indeed, some catastrophic natural events result in very positive benefits (e.g. a lightning strike that causes a forest fire can result in badly needed ecosystem regeneration). Natural events become natural hazards when they impact upon humans. Further, the extent of the impact on human populations is affected by actions taken by humans in the social, political, economic, and cultural realms. For example, the extent of the flood damage wrought by Hurricane Katrina in the US south in 2006 was exacerbated by the poor state of the levees originally constructed to protect residential areas from rising flood waters (Ringel et al. 2007). Another example is the Bangladesh Cyclone of November 1970, wherein one-third of the population of low lying coastal areas/re-claimed islands was killed. There were a number of factors that contributed to this death toll, some very simple (i.e. the cyclone occurred at 11.00 p.m.; the only radio and telegraph station in the area closed regularly at 11.00 p.m.) and some more complicated (i.e. the government reclaimed low lying coastal areas and islands through sophisticated engineering technology and encouraged agricultural settlement in these areas) (see Chowdhury et al. 2007).

It is clear from the two examples cited above that natural hazards and their impacts are unequally experienced across the globe. In the aftermath of Hurricane Katrina in the US south, for example, there have been heated debates about the response to the people of the area, claiming that the response was slow in coming and inadequate when it did arrive, primarily because the majority of those affected were poor people of African-American descent. The poor farmers of the low-lying coastal zones of Bangladesh may have felt the same way. Indeed, between 1947 and 1981, as a result of floods, earthquakes, and cyclones, approximately 85 percent of all lives lost were in Asia, 4 percent in the Caribbean and Central America, and 4 percent in South America. Only 2 percent of lives were lost in Europe and only 1 percent in North America.

Unfortunately, the toll (of human lives, of social functioning, of property damage) of natural hazards will increase over time, not decrease. There are essentially three reasons for this. The first is the growth and changes in distribution of human populations. That is, not only is the human population growing exponentially over the surface of the globe, its distribution is rapidly changing from one of a rural–urban mix to one that is primarily urban. These large concentrations of human populations create the opportunity for hefty tolls from natural disasters. The second reason is a simple one: we are getting better at recording the existence and parameters (i.e. magnitude, frequency, duration, spatial dispersion) of natural hazards, as well as their impacts (i.e. numbers of casualties, property damage, etc). Finally, modernization of some developing countries has actually made them more vulnerable to acute natural events. For example, much commercial development in Kingston and other parts of Jamaica is taking place on flood plains as well as alluvial and unconsolidated soils, making them even more susceptible to earthquakes as well as floods.

Much of what we study in the present day from an environment and health perspective deals primarily with technological, human made hazards, as opposed to the natural hazards discussed above. These hazards may be acute, such as an accident (e.g. the nuclear accident at Chernobyl) or they may be chronic (e.g. the contamination of the Great Lakes Basin, in North America). Hazards may be point source (e.g. the Sydney Tar Ponds in Sydney, Nova Scotia, Canada – the most contaminated industrial site in Canada) or ambient (e.g. air pollution across the European Union and much of the western industrialized world). They may be known, well understood and well documented, scientifically (e.g. the effects of lead exposure on the intellectual and physical development of children) but many, if not most, are suspected, not well understood, the subject of equivocal science, and hotly debated in the literature, the policy realm, the media, and among the general public. These include, for example, the relationship between low-level exposure to electromagnetic fields (EMFs) and brain cancer. EMFs come from a range of small appliances found in most homes in the world (i.e. refrigerators, hair dryers, clock radios, microwave ovens) but the major source of public concern, and focus of most research, is overhead power lines that carry electricity. While some studies have shown a relationship between exposure and outcome, others have not. These are studies done by credible scientists and published in respected, peer-reviewed journals. However, the science remains equivocal (see Neutra 2001 for a thorough review of the debate).

Other suspected hazards come into and out of fashion. For example, the potential for links between radon and lung cancer was of tremendous interest in North America and Europe in the 1970s and 1980s (Schoenberg et al. 1990; Pershagen et al. 1994; Lubin & Boice 1997). Radon is a by-product of the natural breakdown of uranium. As a result, it is naturally emitted from rocks, as well as in the uranium refining process. Given that it is naturally occurring, its distribution is unequal across the globe. There are some areas of the world where it is naturally occurring in high quantities (e.g. Pennsylvania in the United States). But it went out of fashion for a while; people forgot all about it as a potential risk for lung cancer. It has recently been making media headlines again, however, and home buyers are being encouraged to purchase radon detectors (at a cost of about $20 American dollars) to take into any new home they may be considering purchasing (Field 2001).

Other environment and health relationships are seemingly common knowledge. Included in this category would be the relationship between adverse air quality or air pollution and asthma. Again, however, a thorough search of the research literature finds only equivocal evidence for this relationship. Indeed, a study conducted in the late 1970s, early 1980s in Hamilton, Ontario (a city located on the western end of Lake Ontario that built its economy on steel production and other heavy industry), often held up as the gold standard for air quality and health research, firmly concluded that air pollution did not cause asthma; rather, air pollution could be responsible for exacerbating an already existing respiratory health problem in young children (Pengelly et al. 1984). Indeed, recent research about asthma from leading world investigators tells us two things: first, that we know very little about what causes asthma; second, if we had to choose a culprit in terms of causation, we should focus as much if not more on the indoor as opposed to the outdoor environment (Subbarao et al. in press). This is where difficult questions of policy arise: we still have to make decisions to set policy and guidelines, for example, around air quality in order to protect the health of the public. How do we do that based on such equivocal science? And more importantly, how do we reassure the public.

At this point, a key question arises: given the level of interest and activity around environment and health relationships, why is the science so equivocal? Essentially, this has a lot to do with the complexity of designing environment and health research, measuring exposures and outcomes, and evaluating the evidence. There are several different study designs to choose from in any health research endeavor. The strongest of these is the randomized controlled trial (RCT). Herein, the researcher has control over both the exposure of interest as well as the sample exposed. Typically, RCTs are undertaken to test a new treatment for a known illness, often a newly developed pharmaceutical. As such, the researcher would select a control group (who did not get the newly developed pharmaceutical or would receive a placebo) and an intervention group (who would receive the newly developed pharmaceutical) and assess the impacts, (ideally in a double blind manner). Widely heralded as the strongest study design, yielding the most credible results (Concato et al. 2000), it is impossible for use in an environment and health study. For many reasons, including ethical ones, it would be impossible to expose, say, a group of children to lead for a period of time and then assess the impacts compared to a control group not exposed. As an aside, we often have access to "natural laboratories" in environment and health research. For example, the 1976 explosion at a chemical factory in Seveso, Italy, allowed researchers to follow the workers and residents of the surrounding community for the next 30 years to assess the long-term health impacts. However, because this is not an RCT, the researchers cannot control for all of the potential confounding factors that may also be influencing the health outcomes of interest.

Since we cannot do RCTs, then, in environment and health research, we are limited to observational studies – essentially, observing what's already happened. One form of observational study is the case-control design. Herein, a number of cases are identified – for example, a cluster of leukemia cases – and these individuals are studied for their exposure histories. This was the study design used in the famous case of Woburn, Massachusetts (Costas et al. 2002). In this case, a seemingly inexplicable cluster of childhood leukemia cases occurred in a residential neighborhood in this small town. Area residents suspected the local water supply as the culprit. The water had not been right for some time – it smelled of chemicals and caused rashes and burning on human skin. These area residents worked long and hard to convince local authorities and physicians that there was indeed a link between the leukemias being experienced in the local community and the water supply. By 1986, 21 cases of childhood leukemia were identified in the community, compared to an expected rate of just over 5. These cases were matched with controls; that is, children of similar age, socio-economic status, background, etc. – essentially, matched on virtually every characteristic other than the health outcome of interest. A local industry was subsequently convicted of contaminating a city well, and the entire subject was made into a Hollywood movie, *A Civil Action*, starring John Travolta.

A second type of observational study is the cohort study. Herein, we sample on the basis of exposure, as opposed to outcome. Cohort studies can be one of two types: retrospective or prospective. In the context of the former, a cohort of individuals is identified who are thought to have experienced an exposure. The cohort is then studied to determine what, if any, adverse health effects they might have experienced in the past. This is the typical type of study done in environment and health research. Often, this is because a community realizes it may have been exposed to something (an air pollutant; a leaking landfill; a contaminated water supply) as a result of some ill-defined symptomatology or an inexplicably "large" number of cancer cases in a neighborhood. This self-identified cohort may then be studied to assess potential health effects experienced in the past during the exposure.

A prospective cohort study would also be characterized by sampling on the basis of exposure, but would follow the cohort forward in time to document any adverse health outcomes. An example of a prospective cohort study in environment and health would be the explosion at the chemical factory in Seveso, Italy, in 1976. Both workers and members of the local community were exposed to high levels of dioxin. A team of occupational epidemiologists followed this cohort forward for 30 years to assess whether or not adverse health outcomes occurred in the cohort at rates higher than would have been expected in an unexposed population. In addition, and from a humanistic perspective, we can conduct qualitative studies in environment and health (in-depth interviews; focus groups) in order to assess the impact on everyday lives of individuals and families of an environmental exposure.

Complicating things further are issues of measurement; that is, it is no easy task to measure exposures, outcomes, and ascertain the pathways through which individuals are exposed. When individuals report to their friends, family, physician, local public health official, and so on that they feel they have been exposed to some environmental hazard, it is very difficult to measure that exposure. First, the exposure has happened in the past and recall bias (do you remember how often you spent time in your basement in the last five years? How much time you spent in the shower or bath? How much tap water you consumed?) will impact on how accurately we are able to measure the exposure. Second, often the exposure comes from an illicit, undocumented source; e.g. chemical contamination by an industry to the public water supply in Woburn, Massachusetts. Third, we rarely know what the exposure contains. For example, when Lois Gibbs, a resident of the New York neighborhood, Love Canal, first discovered yellow ooze seeping into her basement, all she knew was it was yellow ooze. Toxicologists then had to deconstruct the ooze; not an easy thing to do. Fourth, we know very little about the synergies between chemical contaminants. That is, we may have some confidence of the relationship between trichloroethylene (a chemical primarily used in the process of dry cleaning) and bladder cancer, but what if the trichloroethylene is mixed with other chemical agents? Is there a synergistic effect that can actually cause more harm to human health than if one were exposed to these chemicals in isolation? This is why we often see the phrase "chemical soup" used when referring to the yellow ooze seeping out of Love Canal, or the waters of the Great Lakes Basin. Finally, all of this science is so very new to us. It is not that long ago (1950s, 1960s) that Dow Chemical spent much money and energy developing television advertisements about the wonders of chemicals and how they were going to change our lives. We still have much to learn. And sometimes our technology outstrips our knowledge – that is, we can now measure contaminants in such small amounts (from parts per million to parts per trillion) yet have very little if any knowledge of the impact of exposures at that level on human health.

Even if we can ascertain what an individual or a community has been exposed to, we must then determine what health outcomes we should be trying to measure. This is a very difficult task, for a number of reasons. First, we simply do not know how community-based (as opposed to occupational) exposures to these chemicals will impact on human health. Therefore, we don't know what to look for. In the incredibly comprehensive Upper Ottawa Street Landfill study undertaken in Hamilton, Ontario (Hertzman et al. 1987), researchers documented entire health histories of area residents who unknowingly had been exposed to (illegally dumped) liquid industrial waste for over 5 years. Every organ system was examined. This was extremely time consuming, and resource intensive. But not knowing what to look for, these researchers looked for everything. What did they discover? Not much – some red, itchy eyes, some psychosocial stress. Why? It could be that the dose that area residents were exposed to was not sufficient to have a health impact (it's the dose that makes the poison). It could also be that, as in many cases, the health impacts experienced are ill-defined symptoms that are difficult to trace to any specific exposure. For example, we often hear reports of headaches, rashes, stomach problems, sleeplessness, fatigue, psychosocial distress. These symptoms could be due to any number of factors; again, how do we control for all the confounding factors that exist in a community laboratory? The third reason why these researchers, despite their very thorough examination of the population, may have found very little in the way of health effects, relates to the issue of latency. That is, if we are concerned about cancers or some other type of chronic illness, it takes time (15 years? 20 years?) for such illnesses to develop. Following an exposed cohort forward for 20 years is very expensive research and fraught with difficulties (e.g. control for confounders, sample attrition) (see Hertzman et al. 1987).

In short, the measurement of health outcomes is no easy task. This is further complicated by the fact that we are often very interested in measuring not only the physiological health impacts of an exposure, but also the psycho-social health impacts. Psycho-social impacts can be defined as the combination of distress, dysfunction and disability manifested in a wide range of social, behavioral, and psychological impacts in individuals, groups, and communities as a consequence of actual or perceived environmental contamination. Psychosocial impacts are important to study for at least two reasons. First, they are a health impact in and of themselves (recall the definition of health cited above); one cannot have full health when one is anxious, worried, distressed. Indeed, despite whether the exposure is actual or perceived, these are real effects that have real consequences. As the sociologist W. I. Thomas expounded in the 1960s, if a situation is defined as real, it will be real in its consequences.

Measuring psychosocial impacts has typically occurred using standardized questionnaires or surveys; for example, the General Health Questionnaire, which comes in several versions (12 items; 20 items; 30 items), measures probable cases of emotional distress (Goldberg & Hillier 1979). The Symptom Check-List 90 measures somatic manifestations of emotional distress (e.g. headaches, stomach aches; see Derogatis & Cleary 1977). The CES-D scale is designed to measure depression in a general population (Radloff 1977). The SF-36 measures health outcomes related to a range of exposures (McHorney et al. 1994). It is important to remember that none of these were designed for use in an environmentally exposed population, but have all been successfully adapted for use in exposure-outcome situations of various types. Their continued use in the environmental area provides added validity to their use and interpretation.

The second reason why it is important to study psychosocial impacts of exposure is the relationship they have with physiological health. For example, when the chemical factory in Seveso, Italy blew up in 1976, workers and local residents received high doses of dioxin exposure; researchers who followed this cohort for over 30 years now expected to find elevated rates of cancers, particularly liver cancer. They did not. They found, however, a five-fold increase in cardiovascular disease. Why? These researchers did not really know. However, they speculate that the exposed cohort worried so much about whether or not they would develop cancer, that they worried themselves into cardiovascular disease.

And even if we knew what to measure, before we can claim a relationship exists, there has to be a clear pathway for the exposure (i.e. people either have to ingest something, inhale something, or have it absorbed through their skin somehow). Such pathways are clear in the case of Bhopal, where a train derailment led to the release of 40 tonnes of methyl isocyante into the air. Individuals could then breathe this in; this is a pathway for exposure.

Once we have measured exposure and outcome, it behoves us to evaluate the existence and strength of the relationship between them. We do this by calculating odds ratios; that is, the likelihood of an individual experiencing the health outcome of interest given the exposure of interest. For example, at Seveso, the researchers documented an odds ratio of 5 for cardiovascular disease, indicating that those exposed were 5 times more likely to develop cardiovascular disease than those not exposed. An odds ratio of 5 in environmental health research is very high; typically, we see odds ratios between 1.5 and 2. While these odds ratios may be statistically significant, they may or may not be clinically significant. For example, studies between air pollution and premature mortality in Montreal indicate an odds ratio of about 1.03 of dying prematurely on a bad air day. While this is borderline statistically significant, we might consider it to be clinically significant because we are applying that odds ratio to a large urban population (i.e. approximately 2 million people). Thus, this environmental exposure may not be a high risk but affects a lot of people. Perhaps then there should be a public health response.

And even if we have a relatively robust odds ratio, we still need to ascertain whether or not there is a causative relationship between *x* and *y*. In the 1970s, Sir Austin Bradford Hill gave an after-dinner speech to the Royal Association of Physicians wherein he outlined what are now euphemistically known as the Bradford-Hill criteria or the 9 diagnostic tests of causation. Briefly, he asserted that one could not claim causation unless most if not all of these criteria were met. They include:

- strength of association;
- consistency of association;
- specificity of association;

- temporality (i.e. that the cause comes before the effect in time);
- existence of a biological gradient or dose-response curve;
- biological plausibility of the association;
- coherence of the relationship with what we already know;
- experimental data;
- analogous evidence in the literature.

In short, it is not an easy task to "prove" a relationship between an environmental exposure and an outcome. And in the mean time, decisions have to be made, publics have to be responded to, actions have to be taken. And all the while, people worry themselves sick, as illustrated in the three examples below.

Air

The north-east end of the city of Hamilton, Ontario, is characterized by mixed land use – heavy industry mixed with residential and commercial – and a century-old legacy of poor air quality. The juxtaposition of heavy industry (primarily steel production) with single-family residential homes has resulted in a history of tension between the steel companies and residents. Concomitantly, there is a very strong attachment to place in this neighborhood, and always has been (Preston et al. 1983). The response to community concerns has been varied, but in the 1990s, a large multi-stakeholder initiative known as the Hamilton Air Quality Initiative (HAQI) emerged as a municipal and provincial response to the concerns of the community.

HAQI was a comprehensive effort on the part of policy- and decision-makers to respond to community concerns around the levels of pollutants they were being exposed to, the potential health effects of these (i.e. premature mortalities; increased rates of hospitalization), and potential policy responses (e.g. changing the technologies used at the local steel mills in order to reduce air emissions; strengthening air quality standards). A wide range of stakeholders was involved in the process, including representatives of local community groups. Substantial progress was being made on issues of concern to all.

But then there was a bump in the road; as is often the case in these situations, the questions of concern to some stakeholders (e.g. the community) were not those of central concern to others (e.g. municipal, industrial, and provincial decision-makers). In this case, local community residents were concerned about the black oily soot that often fell on their houses in large doses. This oily soot could not be cleaned off patio furniture, and often was seen to take the finish off cars. Area residents reported that these emissions were occurring more than once per week and that they were often constraining the outdoor activities of themselves and their children.

Concerned scientists linked to HAQI investigated samples and reassured area residents that the black oily soot falling on their homes, gardens, and cars posed little to no health hazard, as the particles that made up the soot were too large to respire into the lungs, where they could cause damage. Not surprisingly, the area residents were rather sceptical about this; if this black oily soot could eat the finish off their cars, it *must* have some deleterious health effect! So, they took their case to the medical officer of health, the chief public health official mandated by the Province to monitor the health of the local population, to make their case. The medical officer of health was swayed by the arguments of the scientists and reassured the local residents yet again that the black oily soot falling on their homes posed no danger to their health or the health of their children.

Again, the local residents were not placated. So they took action … with a home video camera, they videotaped children playing in a back yard, on their swings, a toddler going down her little slide on her belly, now black with soot – her hands black with soot, the area around her mouth all black with soot (because she was putting her fingers in her mouth, as toddlers do). The videotape was given to the local TV news show, and showed the next day on the evening news. It was at that point that the medical officer of health called for a health study, *not* of the physiological effects of exposure to the soot, but of the psychosocial impacts of the worry and concern and experiences of area residents. In so doing, 70 percent of study respondents reported being concerned about the black oily soot; 74 percent reported issues of lifestyle disruption related to the soot (e.g. not letting children play outside; not being able to hang washing outside; constantly having to clean outdoor materials such as patio furniture). Psychosocial effects (e.g. worry, stress, anxiety about health) were reported by over one-third of respondents (Elliott et al. 1999). The study concludes about the importance of community involvement in environment and health investigations, and ensuring that investigators listen to the concerns of the community, and ask the right questions.

Water

The Aral Sea was once the fourth largest body of water in the world; it is now – literally – a shadow of its former self. The Aral Sea is located in Karakalpakstan, a semi-autonomous Republic in Uzbekistan, part of the former Soviet Union. In the early years of the cold war, the Soviets converted large areas of the region into cotton fields in an attempt to maintain independence from the United States and China, the other major cotton producers. In order to irrigate the cotton crop in this largely desert region, substantial volumes of water were diverted from the two rivers feeding the sea – the Syr Darya and the Amu Darya. Several decades later, the sea has lost approximately two-thirds of its former volume, as well as virtually 100 percent of its fish stocks (a major food and economic staple in the region), leaving behind devastated fishing and fish processing industries.

Over-irrigation has left the soils of the region so salinized that the once lucrative cotton industry is now struggling, although they remain the fourth largest producer of cotton in the world. Decades of excessive use of pesticides and herbicides (including DDT), have left the soil and groundwater highly toxic to both humans and wildlife. These problems, combined with associated economic and social impacts, as well as the breakdown of health care infrastructure, have resulted in a wide range of physiological health problems for the area's population (e.g. anemia, cancers, drug resistant tuberculosis, kidney disease). Reflecting the severity of the situation, an early agenda-setting exercise by the international NGO Médecins Sans Frontières (MSF), suggested that the incidence of psychosocial impacts in this population were a major issue of concern (Upshur 1998). A comprehensive investigation was undertaken by a Canadian research team, designed to investigate local perceptions of the disaster as well as the prevalence of psychosocial impacts amongst local residents (Crighton et al. 2003).

An interview survey was carried out on a random sample of $n = 1118$ individuals in three communities chosen according to increasing distance from the sea, urban/rural characteristics and ethnic composition. The survey included questions about perceived health, emotional distress, somatic manifestations of emotional distress, perceptions of the environmental disaster, as well as socio-economic status and social support. The results of the study essentially indicate that the health status of the remaining population in the area (there was a great deal of out migration that had happened over the 10 years previous to the study) was significantly impacted by the levels of stress and anxiety experienced due to the disappearance of the sea. High levels of reported environmental concern, emotional distress, and levels of somatic symptoms of emotional distress were all related to perceptions of the disaster. As in other cases, people were worrying themselves sick.

Soil

The Sydney Tar Ponds in Sydney, Nova Scotia is known as the most heavily contaminated industrial site in Canada. This community witnessed approximately 100 years of coal smelting and steel production, characterized by inappropriate waste disposal practices. The site – a tidal estuary surrounded by over 300 hectares of contaminated soil – is now contaminated with 700,000 tonnes of known carcinogens. Area residents living within 5 kilometers from the site are very concerned about the impacts of the exposures on reproductive health outcomes. Anecdotal reports in the area reported higher than normal levels of miscarriages, stillbirths, infertility, and low birth-weight babies.

The contamination of this site was originally discovered in 1981, when levels of PCBs in lobsters in the area were seen to be 300 times safe levels. Several discussions were held about how to go about cleaning up the tar ponds but to no avail; the task just seemed overwhelming for decision- and policy-makers. The community grew angrier with time about the seeming reluctance of the government to undertake a clean-up initiative. There was a strong sense of injustice among the local community members. They felt that had they been located in an "important" part of the country – rather than a low income maritime province plagued by high rates of unemployment and other economic problems – the issue would have been addressed in a much more expeditious manner. As a result, in the early 1990s, the provincial government created JAG, or the joint action group, to work as a multi-stakeholder initiative (community representatives, the province, the municipality, the federal government) to address clean-up options and fund relevant research.

In the late 1990s, JAG funded a study of the reproductive health impacts of the tar ponds. A retrospective cohort study of the local residents documented the reproductive histories of 500 women living within 5 kilometers of the site in order to assess whether the adverse reproductive outcomes they experienced happened at levels higher than would have been expected in an unexposed population (Burra et al. 2006). The 500 women reported a total of 904 live births. Analyses of the birth data indicated that, with respect to low birth-weight, miscarriages, pre-term births, still births, and congenital anomalies, community exposure to environmental contaminants in the Sydney tar ponds had little impact on reported outcomes.

As in the case of the Hamilton oily soot example, however, the community was very distrustful of the results. Having lived with the legacy of the tar ponds for almost 20 years at this point, this is not surprising. A follow-up qualitative investigation of families living in the area indicated that they truly believed the tar ponds were impacting upon reproductive health in the area (Haalboom et al. 2006). This was further having an impact on people's reproductive decision-making; that is, couples were deciding to delay or forgo conception/childbirth, turn to adoption, or leave the area altogether. The situation for them was defined as real, and was therefore real in its consequences:

> I personally would not want to have a child in this area. Living here, I don't have children and part of the reason is because of the environment here. I don't think it's proper to raise a child in this environment.(Sydney resident)

And the stress and the worry have a lot to do with it:

> You see … living in an unhealthy environment leads to stress and it leads to a lot of physical illness. Stress and depression, it's all one.(Sydney resident)

Conclusion

Society finds itself in a rather untenable position. In the face of existing (air pollution, waste, contaminated water, nuclear waste), (re-)emerging (West Nile virus; influenza), and new (global climate change; avian flu) environmental risks, the public is demanding zero tolerance; indeed, in this postmodern society in which we live, the public feels an entitlement to an environment free of risk. There is a substantial literature on risk and risk perception; suffice it to say, the public is guided in its perception of risk by two factors: what is unknown and what is dreaded. Further, there is substantial difference between the factors that affect the risk perceptions of experts (probabilities of mortalities) and the lay public (the dreaded possibilities; the potential impacts for self and family). Regardless, the public is not just acquiescing anymore, particularly given the unequal nature of the distribution of risks and benefits in the context of environmental risk. The growing literature around environmental justice has documented the unequal treatment of some members of society with respect to those who are exposed and those who reap the benefits. And of course, as in all other inequities it is the marginalized (the poor, those of color, aboriginal persons, women, the disabled) that bear the brunt of the risk. While some have suggested that the risks we experience in our postmodern world have indeed become democratized, there are others who strongly disagree. While residents of the entire globe may now be at risk for the public health impacts of global climate change, it is those in the marginalized groups who are least able to cope with the impacts. Geographers have been doing a substantial amount of research on the health impacts of global climate change (see, for example, Bentham & Langford 2001; Lake et al. 2003; Gibbs et al. 2004; Dockerty et al. 2005; for a full review, see Gatrell & Elliott 2009, see especially chs 7, 8, and 9).

So, how do we move forward? Some would suggest that policy-makers take the best of what they can from the research and science available and follow the precautionary principle. That is, Article 15 of the 1992 Rio Summit on *Building a Sustainable Earth* essentially declares that we don't have to have all the science in place before we are compelled – morally and ethically – to make a reasonable decision in order to protect the health of the ecosystem, including human health. In 1964 the US Surgeon General declared that smoking cigarettes caused lung cancer. Over the next forty-plus years, we have expended much public health effort to get that message out. But it was not until 1994 that we finally understood the biological mechanisms involved. Should we have waited? Or should we just let everyone worry themselves sick?

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Chapter 24

Healthy Behavior

Liz Twigg and Lynda Cooper

Introduction: Definitions and Development

The focus of this chapter centers on "healthy behavior" and outlines the research contributions that geographers[1] have made to the understanding of patterns of such behavior amongst individuals and groups of individuals. Previous chapters have underscored the differences between the social and biomedical approaches to health and just as we can consider "health" from a narrow, biomedical, reductionist viewpoint, we could similarly assess healthy behavior in a mechanistic way which simply explores links to body biology and health outcome. However, the goal of this chapter is to consider healthy behavior through a much wider lens that takes into account the social and cultural context within which individual and group actions take place. The material, therefore, complements and touches upon agendas presented in other chapters of this book, notably those dealing with the geographies of public health, neighborhoods and health, health inequalities, and governing (un) healthy populations. Before looking at geographical contributions to the topic, we first need to provide some definitions of healthy behavior and discuss briefly how the topic has become a central focus in public health practice.

We can think of healthy behavior in very simple terms which refer to the actions that individuals and groups undertake (or avoid) to maintain a healthy body and mind. The most pertinent of these actions include smoking, diet, exercise, alcohol consumption, drug use, and safe sex. Others have extended the definition to go beyond these observables so that mental and emotional states are included and also personal traits which influence the more cognitive elements of our personality, all of which impact on health maintenance, health restoration and health improvement (Gochman 1997). Whilst the chapter touches on this wider definition, most geographical research has focused on the listed actions and the issues discussed here will relate largely to a subset of these observables.

Developments in public health and an understanding of population disease transitions are important in understanding why lifestyle and behavior are now important aspects of health policy and practice. These developments have been covered elsewhere in the book but the important issue for this chapter is that the major diseases of old age found in the developed world (i.e. the chronic and degenerative diseases) are often associated with particular ways of living in terms of diet, exercise, cigarette, and alcohol consumption (Doll & Hill 1954; Doll & Peto 1976), and individual life chances have become associated with individual lifestyle.

A major UK inquiry and subsequent, highly influential commentary on inequalities in health, known as the Black Report, acknowledged the importance of lifestyle in accounting for health inequalities but warned against a superficial, non-contextualized acceptance of a sometimes deeply flawed, unhelpful, victim, blaming philosophy (Townsend et al. 1992). Moreover, the authors of this report re-emphasized the prime importance of individual material circumstance as a major health determinant and argued that lifestyle is only one aspect of a complex picture of explanation. Importantly, the report stressed the need to contextualize the evidence of the links between lifestyle and health by highlighting the complexity of interactions between education, social class, material circumstance, life stage, and behavior.

Indeed, it is with this issue of context and healthy behavior that a sizeable group of health geographers, since around the time of the Black Report, have concerned themselves. Of course huge volumes of research and commentary have arisen from the discipline of public health and other related areas such as sociology and psychology. However, the specific and sometimes unique contribution made by geographers is to document the particular influence that place and space exerts over behavior and highlight the possible interactions between individual characteristics and those of the surrounding (geographical) context. The rest of this chapter outlines the nature and historical development of this work. Due to the public health significance and associated volume of work that centers on tobacco consumption, diet, and exercise, much of the commentary presented here will focus on these three aspects of health-related behavior.

Background: Health Related Behaviors in Context and the Development of Multilevel Modeling

Much of the early work undertaken by geographers on health-related behaviors such as smoking and alcohol consumption was inter-twined with theoretical and practical developments in the quantitative statistical modeling technique of multilevel modeling (Goldstein 1995; Kreft & de Leeuw 1998). Whilst focusing on the technique itself, the research also highlighted the substantive advantages that the approach could offer in unpacking the complexity surrounding individual and area influences on health related behaviors (e.g. Jones et al. 1991). Furthermore, and perhaps unusually so for findings based on quantitative technique, the narratives had much to say regarding the links to social theory, and embedded the work amongst ideas surrounding structuration theory (Giddens 1986) and critical realism (Sayer 2000), both of which attempt to capture the complexity of reality by highlighting the ongoing, recursive nature of people–place interaction.

It is not the remit of this chapter to discuss multilevel models in depth but it is useful to highlight how they can assist in understanding health behavior. Any behavior in question can be regarded as a function of individual predisposition as well as geographically based cultural or environmental influences (Duncan et al.

1993). The resultant geography can therefore be explained in terms of the *people* factors and *place* factors, now widely referred to as the *composition* and *context* distinction or interplay (Macintyre et al. 1993). This allows us to evaluate whether cultures of (say) smoking and drinking really exist. Traditional modeling approaches would assume that the people–place interaction is uniform across all places, whereas multilevel methods allow for different relationships to exist for different types of people in different types of places; an issue that is particularly important when studying (un)healthy behavior. Moreover, this transforms place from being the container within which to observe patterns and associations to a recognition that places can also influence such regularities (Jones & Moon 1993).

Smoking Behavior

Studies had found evidence for significant geographic variations in smoking prevalence at the regional and local level (e.g. Cummins et al. 1981; Balarajan & Yuen 1986; Blaxter 1990) but those which attempted to unpack the true impact of geographical context were relatively rare or comparatively simple in their approach (e.g. Diehr et al. 1993; Hart et al. 1997). In contrast, Duncan et al. (1993) used multilevel techniques to partition the spatial variation in smoking across individuals and areas across Britain using data from the 1984 Health and Lifestyle Survey (HALS) (Cox et al. 1987). They found that the lowest levels of smoking were found in the rural region of Devon and Cornwall where 76.2 percent of the survey respondents indicated that they were non-smokers. In contrast, the equivalent percentage for Inner London was 56.6 percent. However, initial results indicated that this regional variation was negligible compared to the variation occurring across individuals. The results suggested that the chances of smoking were increased if you were young, divorced, low social class, living in local authority rented accommodation, unemployed or male.

In the above study, there was evidence of a more localized geography and the next line of inquiry investigated whether neighborhood characteristics had an independent influence on smoking behavior over and above individual characteristics. Furthermore, if the relationship was strong, the question was asked whether small area characteristics, such as deprivation, could be used as surrogates for estimates of smoking (Kleinschmidt et al. 1995). This was seen as a particularly pertinent question for some nations because of the dearth of extensive routine health behavior data at the small area level (Twigg 1999). Exploring the issue further in Britain, Duncan et al. (1999) found that a composite index of ward level deprivation did have an independent impact on individual smoking status. Moreover, for those wards in the 95th percentile of the index (i.e. most deprived) the effect was similar to the more influential individual characteristics (i.e. being unemployed, divorced/separated or living in rented tenure) and raised the risk of smoking from about 32 percent to 44 percent in the stereotypical individual. The authors here drew parallels with the debates surrounding the effects of "*social miasma*" on health outcomes, sometimes referred to as "*deprivation amplification*," where the collective characteristics exert an influence over and above those of the individual (Sloggett & Joshi 1994; Macintyre et al. 2002; Macintyre 2007).

Multilevel approaches are now an accepted and standard way of assessing contextual influences on smoking (and other health related behaviors) both within and outside the academic discipline (Karvonen & Rimpelä 1996; Ross 2000; Frohlich et al. 2002; Diez-Roux et al. 2003) but the findings are often complex. Ecob and Macintyre (2000), for example, using data from the first, baseline wave of the West of Scotland Twenty-07 Study (see chapter 21) found that area deprivation was influential on current smoking status but not on tobacco consumption patterns. They also discovered that the effects varied by the age of smoker, being stronger in adult groups. Similarly, Reijnveld (2002), using survey information across seven large Dutch cities, acknowledged that smoking was higher in more disadvantaged neighborhoods but noted that the extent of the difference depended on ethnicity and age. Furthermore, the strength of the association varied according to city.

In essence, the multilevel work emphasized the importance of *types* of place rather than *specific* places in the explanation of smoking geography. However, as smoking became ever more prominent in public health work and more locally focused, small-area, place-specific detail on prevalences was urgently needed (Twigg & Moon 2002) and the multilevel approach was extended to provide a predictive framework for synthetic estimation at the small area level (Twigg et al. 2000b). The approach, which works on the basic principle of "modeling nationally" but "predicting locally," has proved to be an effective and well-received development in the provision of nation-wide estimates of smoking (Twigg & Moon 2002; Bajekal et al. 2004; Pickering et al. 2004). Using several runs of national routine datasets such as the Health Survey for England (National Centre for Social Research and University College London 2007), multilevel model equations which summarize the important place and people factors in the explanation of individual smoking are generated and then re-worked using small area level census data to provide predicted estimates of smoking prevalence, disaggregated by age and sex. Using the basic building-block of census output, these can then be aggregated to several other relevant geographies.

Figure 24.1, for example, shows the resultant map of smoking prevalence across the Primary Care Trusts (PCT) of England and clearly shows the large differentials in estimated prevalences between some of the more urban and rural areas. In the urban areas of Inner London, the North East, North West, West Midlands, and East Midlands where deprivation tends to be highest, prevalences are estimated at around 40 percent. In contrast, lowest rates (around 20 percent) are estimated for the more rural areas of Devon and Cornwall, East Anglia, the southern English Midlands, North Yorkshire, North Lancashire, and the southern Home Counties. The important point to make here is that until this technique was developed such a map did not exist; government surveys provided estimates for areas much larger than those shown and even then they did not necessarily represent a "gold standard."[2] Such data are not only used to help target intervention programs, they also play a part in estimating the impact of smoking on mortality by using the estimates within standard formulae, applied to small area counts of deaths from specific diseases attributable to smoking (Twigg et al. 2004).

Relative Deprivation, Neighborhood Stress, Social Capital, and Smoking

Debates surrounding individual-level psycho-social impacts of relative deprivation and the consequences that this has on neighborhood social cohesion and social capital have been prominent in the health inequalities arena for the last decade or

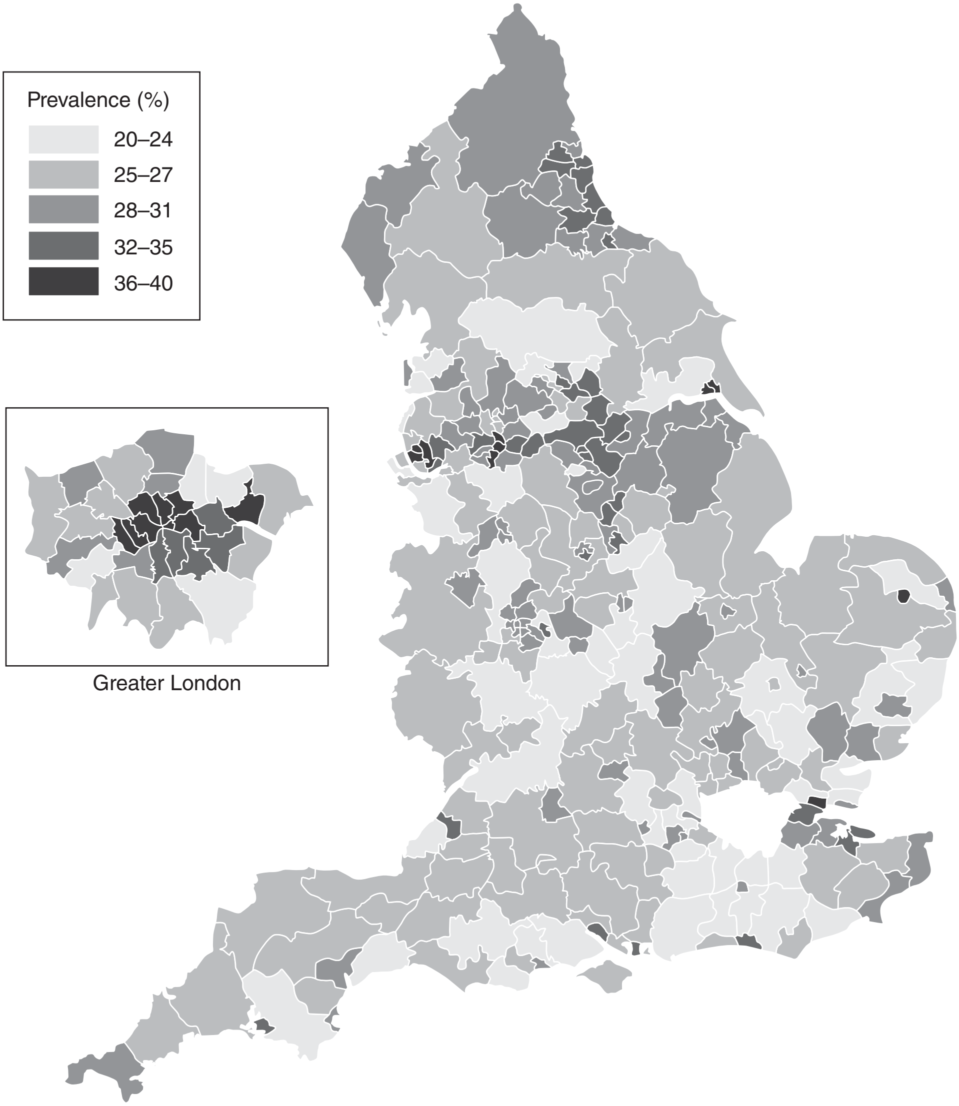

Figure 24.1 Estimated smoking prevalences across Primary Care Trusts, England. *Source*: Twigg, L., Moon, G., and Walker, S. (2004) *The Smoking Epidemic in England*. Health Development Agency, London. Reproduced with permission.

so. Furthermore, this work, which stems from Richard Wilkinson's income inequality thesis and Robert Putnam's ideas on social capital (Putnam 1995; Wilkinson 1996), has been extended to incorporate links with inequalities in health related behaviors.

For example, working on ethnic differences in smoking in New Zealand, Barnett et al. (2004) test the power of Wilkinson's inequality thesis (see also Kawachi et al. 1999) to explain the huge disparities in smoking prevalence between New Zealand Maori and Pakeha (i.e. people of a European descent) populations. According to

Table 24.1 Ethnic differences in smoking rates in New Zealand, 1996

	Male	*Female*	*Total*
Total Maori	45.8	55.9	51.2
15–24	43.3	54.4	49.4
25–34	47.7	63.2	55.9
35–54	52.5	60.4	56.7
55+	26.9	31.7	29.4
Total Pakeha	21.9	20.7	21.3
15–24	28.1	27.3	27.7
25–34	28.5	28.0	28.3
35–54	22.8	21.3	22.0
55+	12.3	12.7	12.5
Maori–Pakeha ration	2.1	2.7	2.4
15–24	1.5	2.0	1.8
25–34	1.7	2.3	2.0
35–54	2.3	2.8	2.6
55+	2.2	2.5	2.4

Source: Barnett, R., Moon, G., and Kearns, R. (2004), Social inequality and ethnic differences in smoking in New Zealand. *Social Science & Medicine* 59, 129–43.

the 1996 census results, Maori prevalences were 30 percent higher than Pakeha and for women, this differential rose to 35 percent (see Table 24.1). In this work, a refined Wilkinson thesis was explored which suggests that stressors resulting from the presence of income and social gradients may lead to more health damaging behaviors such as smoking and drinking (Wilkinson 2006). Barnett et al. explain that the Maori population tend to be a more deprived group than their Pakeha counterpart and argue that Maori women suffer the consequences of inequality more than Maori men as they are more directly exposed to the effects of psychosocial and material deprivation in large female-headed families. To investigate these issues, 1996 smoking rates for Maori and Pakeha were linked to eight indicators of absolute and relative deprivation. Using a partial correlation analysis, results indicated that both *absolute* and *relative* place deprivation were more strongly associated with Maori than Pakeha smoking. Stepwise regression illustrated that the absolute measures were better predictors than the relative measures. When results were stratified according to rural and urban areas, a small but significant effect for relative deprivation (which the authors term *ethnic inequality*) remains after controlling for absolute deprivation. In summary, the authors conclude that Maori are more influenced by inequality than Pakeha and they make reference to political processes which have widened the social and economic differentials between these two population groups (Barnett et al. 2005).

The impact of neighborhood economic stress, breakdown in social cohesion and depletion of social capital upon health behaviors is explored in a number of other studies. One of noteworthy inclusion here is that undertaken by Miles (2006) who uses a direct measure of neighborhood physical disorder to help explain smoking rates across several European cities. Physical disorder is measured directly by survey administrators who make note of the graffiti and litter in an area and the absence of plant decoration on the outside of buildings (e.g window and balcony boxes etc.). The presence of such decoration symbolizes neighborhood responsibility and pride, whereas high levels of litter and graffiti reflect the opposite. Lower levels of such neighborliness suggest lower levels of formal and informal control and reductions in social cohesion and social capital. This in turn inflates individual stress which may lead to more damaging health related behaviors. The findings suggest that smoking is significantly associated with physical disorder within the neighborhood. Furthermore, the direction and size is consistent across the European cities but there are differential effects across the genders. Women are far less influenced by physical disorder than men, suggesting that they are less influenced by neighborhood disadvantage than men, a finding that has been noted elsewhere (Ross 2000) but does not always appear consistent with others (e.g. Kleinschmidt et al. 1995).

Diet, Exercise, and Obesogenic Environments

The next section of this chapter considers the health behaviors of diet and exercise, both of which are implicated within the context of *obesogenic* environments (Eggar & Swinburn 2002; McPherson et al. 2007). In essence obesity and overweight occur because of the imbalance between calorific input (diet) and calorific output (physical exercise).[3] Our current way of western living promotes a more sedentary lifestyle that emphasizes this imbalance. For example, the infrastructure of cities and towns is largely designed to support motorized transport rather than promoting safe walking or cycling. Our homes are equipped with labor-saving devices and we are tempted by relatively inexpensive high energy, highly processed takeaway food which can be ordered online or via a telephone for home delivery. Like all other behaviors, social disparities exist in the way in which our day-to-day living environment is influential in promoting or constraining access to healthy, affordable diets, as well as impacting on the balance between calorific input and output.

Diet

The impact of neighborhood on diet (and exercise and obesity) is covered in depth elsewhere in this text but it is useful to use the example of diet here to illustrate how differences in macro-level retail policies (i.e. at a state or national level) can alter the map of healthy food availability at a neighborhood level in developed societies. “Food deserts,” for example (see Chapter 21, this volume and Cummins & Macintyre 1999: 546), were assumed to exist in the mid- to late 1990s in the United Kingdom (Lang & Caraher 1998; Whitehead 1998), largely as a result of changing food retail patterns. These changes involved the closure of many smaller, inner-city (independent) grocery stores in the 1980s due to competition from large multiple-owned superstores which became more numerous. These tended to be located on the edge of towns and cities, offering goods at much cheaper prices (Cole-Hamilton & Lang 1986; Wrigley 1996; Wrigley 1998ab). It was believed that these changes would impact most severely on disadvantaged groups such as the elderly, infirm, disabled, lone parents, unemployed, and those without access to a car (Westlake 1993). However, in 1993, new planning regulations were designed to counter this movement and provide a more sustainable approach which attempted to attract stores back into the city centers and regulated out of town developments. This resulted in a new wave of multiple, more compact stores being located in the center of urban areas alongside the newly introduced European, limited line discount stores which were highly competitive and attracted a different segment of the food retail market (Wrigley 1998b). In a study centered on the Greater Glasgow Health Board, Cummins and Macintyre (2002) showed that there was no real evidence for the existence of food deserts, even in the most disadvantaged communities. Furthermore, evidence from the United States indicates that the presence of supermarkets may lead to reductions in obesity (Morland et al. 2006). However, in contrast to the United Kingdom, Australia and the Netherlands (Turrell et al. 2004; van Lenthe et al. 2005; Winkler et al. 2006), supermarkets in the United States and Canada are not as common in deprived neighborhoods where small, independent retailers tend to be the norm, offering a more limited and expensive choice of foods (MacDonald & Nelson 1991; Chung & Myers 1999; Morland et al. 2002). Cummins and Macintyre (2006) provide a useful review of research on obesogenic food environments, paying particular attention to cross national variations and the particular problems experienced in the United States. There, as in many other western nations, fast foods are increasing in popularity (Lin et al. 1999; Nielsen et al. 2002; Department for Environment Food and Rural Affairs 2004) and an aggregate state-level study in the United States has estimated that 6 percent of the total variance in state obesity rates can be explained by measures summarizing fast food outlet density and the number of resident population per fast food restaurant (Maddock 2004).

Physical activity

As with all behaviors so far reviewed, both individual characteristics and neighborhood context are important for understanding patterns of physical activity and studies usually arrive at the common conclusion that levels of activity are lower amongst deprived people and within deprived places (Kinra et al. 2000; Owen et al. 2000; Kavanagh et al. 2005). The association between neighborhood disadvantage and lower levels of activity may be because there are fewer opportunities to engage in sport or physical exercise in disadvantaged areas, where an association has been identified between density of resources within an area and levels of reported physical activity (Diez-Roux et al. 2007). Hillsdon et al. (2007) map the variations in sports and recreation provision across England and find that there are far fewer facilities in deprived areas than in more affluent areas. However, regardless of the availability of recreational and sporting facilities, the usage of such resources may be attributed to more fundamental factors such as entry fees (Giles-Corti & Donovan 2002).

Very often studies focus on two other common possible mediators between area context and individual physical activity behavior. The first emphasis is placed upon the nature or design of the built environment and includes how neighborhoods or communities are arranged. The approach questions whether these designs promote activities such as walking or informal exercise (e.g. kicking a ball around a green space, jogging, or walking to work) or whether the environments constrain such behavior because urban design gives preference to (say) motorized transport. The second, but related, theme links in to the qualities of these environments and includes issues such as safety and fear of crime (see, for example Ellaway et al. 2007 and a more detailed discussion in Chapter 21 this volume). Similarly, Brown et al. (2007) suggest that the quality of designated pedestrian areas and the number of public spaces, such as shopping malls and parks, are associated with levels of walking, and that these are important factors in perceptions of space, in addition to the aesthetics and cleanliness of the built environment and any other natural features. Humpel et al. (2004) go further and distinguish the different contexts perceived to be conducive to different type of behavior. For example, "walking" can involve "walking for exercise," "walking for pleasure," as a form of "transport" or "general neighborhood walking," and they suggest that weather conditions and environmental aesthetics are most important for walking for exercise and general neighborhood walking, which is also influenced by location, whereas perceived safety and accessibility have the strongest associations with walking for pleasure, although there appear to be no significant determinants of walking as a mode of transport.

From these examples, we can see that the interplay between mediators in the pathway between context and behavior are often complex. Kamphuis et al. (2007) explore how different groups of people (based on SES) perceive the relationship between the environment and individual behavior and find that fear of crime creates barriers for outdoor activity amongst low SES groups, whereas easy access to sporting facilities and aesthetics are important for high SES groups. Similarly, Ross (2000) used multilevel methods to show that there was a higher fear of crime (i.e. being assaulted, injured, victimized, home burglary, and general fear of being on the street) in the more deprived areas and this deterred people from walking. However, the investigation also showed that people from poor neighborhoods were *more* likely to walk than those from more affluent areas. In other words, the results indicate that there would be even greater levels of walking amongst residents of poorer neighborhoods if fear of crime was reduced. Neighborhood context, however, had little influence on strenuous exercise and this may be due to the fact that such exercise is done outside of the area or indoors, in a gym and there is less possibility for fear of crime to impact on this aspect of exercise.

It is useful to note here the increasing use of geographical information systems (GIS) in the study of obesogenic and health promoting environments. We have shown how environmental context is multi-layered in terms of (say) access to supermarkets, fast food restaurants, green space, sports facilities, or pedestrian areas. All of these layers can be stored in digital form in a GIS, making it fairly easy to generate buffer zones of influence around features such as green areas, supermarkets or fast food outlets etc. Euclidean, travel, or walking distance can be derived automatically and a wealth of empirical data can easily be generated. Information on the built environment can also be linked to layers of information that capture the nature of the social context (e.g. population data and socio-economic data). For example, Pearce et al. (2007) use the technology to calculate access to various health promoting community resources across all neighborhoods in New Zealand, the results of which challenge the widely held assumption that access is worse in more disadvantaged neighborhoods. Likewise, Frank et al. (2004) looked at the relationship between obesity, community design, physical activity and time spent in cars in Atlanta, Georgia. Information collected via travel diaries was transferred to the GIS which also contained digital information on street networks and the nature of the built environment. Here they found that travel patterns and urban form were important predictors of obesity and called for strategies that take into account land-use mix which encourages walking and reduces car use. There are numerous other examples of the use of GIS technology in assessing the physical and social fabric of obesogenic environments and as their designs become more complex and the availability of relevant, high quality digital data increases, they have much to offer as a tool to aid in public health research (McLafferty 2003).

Discussion and Conclusions

In this chapter we have outlined the geography of several health-related behaviors. Due to space limitations we have neglected many other aspects of healthy behavior, notably safe sex (e.g. Teye 2005), drug use (e.g. Latkin et al. 2007), uptake of preventive medicine and health screening services (e.g. Jones et al. 1991; Schootman et al. 2006), alcohol consumption (e.g. Twigg et al. 2000a), and use of health promotion services (e.g. Poland et al. 2000). Furthermore, the content of this chapter is largely Euro- and North American-centric, and focuses solely on developed societies. This partly reflects the origins of much geographically focused healthy behavior research and our own research agendas. We acknowledge, however, that health behavior in relation to problems such as HIV/AIDS has had devastating impacts on both the developed and less-developed world.

A large proportion of the studies that we have reviewed employ extensive, survey-based and often quantitative research designs. They attempt to hypothesize *why* and *how* disadvantage leads to worse health-related behaviors but due to the nature of their research approach, they can only point to broad associations. Even in the more complex designs, they are unable to reveal and unpack truly causal associations or relationships. For example, in terms of smoking behavior, it is acknowledged that such approaches are limited in their ability to reveal detail regarding the processes surrounding tobacco initiation, addiction; (un)successful quitting or even the pleasures and positive aspects surrounding tobacco consumption.

In contrast, the renowned work undertaken and driven by Hilary Graham has employed much more intensive, qualitative research methods to unpack some of these "black box" issues at an individual level with regard to smoking behavior, particularly amongst women (Graham 1976, 1987, 1999; Graham et al. 2006) and similar attempts have been made by others to reveal the processes by which exposure to disadvantaged *geographical* contexts leads to more unhealthy behavior. For example, using qualitative focus groups with smokers and non-smokers in three deprived communities in Glasgow, Stead et al. (2001) derived common themes of potential pathways which linked area deprivation to smoking behavior. The participants described a stressful existence due to limited income, caring duties, high levels of drugs and crime, few opportunities to take time out and poor infrastructure to support day-to-day, affordable shopping and living. Tobacco consumption was a way of coping with these everyday anxieties and represented a means of temporary escape from the de-motivation associated with unemployment and poor financial incentives to re-train. Furthermore, in an environment where choice is limited and access to consumer goods limited, the authors note the ironical situation of easy access to a plentiful supply of often illegal and informally sourced tobacco. Of central importance in such communities however, is the acceptance of smoking as a behavioral norm, offering a way of strengthening neighborhood identities and sense of belonging. In this sense, the *contagion* perspective can be used to explain how context impacts on behavior. People are influenced by those around them and behaviors are replicated (see for example Ross 2000: 267; van Lenthe et al. 2005: 773). Whilst parents attempted to discourage their children from smoking, there was an acceptance that it was inevitable and was naturally seen as preferable to drug-taking.

It is now becoming evident that mainstream health promotion policy is by-passing "hard-to-reach" or "hard-to-engage" groups in terms of helping such people facilitate behavioral change. These groups are often marginalized or socially excluded and increasingly there are calls to understand the social context of their health behaviors. Whilst understanding such social context is often seen as crucial in appreciating behavior and ultimately leading to behavioral change, Poland et al. (2006) take a much more critical viewpoint and argue that its meaning is rarely fully understood (see also Eakin et al. 1996). If we take individuals who smoke as an example, they are often viewed by health professionals as "victims" within a lifestyle or addiction model – an assumption which has been challenged directly by Brown and Duncan (2000) in their research on cigar smoking and cigar bars in London. They question the common supposition that individual consumption is driven by a desire for health and describe how the popularity of cigarette and cigar shops and bars can be viewed as counter-culture against mainstream "healthist" rhetoric. Again, the role that smoking plays in people's everyday lives needs fuller recognition and understanding and, as Poland et al. (2006) note, a much deeper appreciation is required that considers power relations, pleasure, body image, patterns of collective consumption, and associated constructions of social identity. For example, there is a high rate of smoking initiation amongst teenage girls in the United Kingdom (ASH 2007) but there is much anecdotal evidence which suggests that inhaling tobacco smoke for the first time is not a pleasurable experience, so why does the act remain attractive? To answer this, we need to understand much more, for example, about cigarette smoking within the context of body sociology and body image and what is it about cigarette smoking that makes teenagers feel "cool" or positively "adorned" by cigarettes. Evidence also suggests that considering the behavior in isolation is also counter-productive as there are strong links between smoking, body image, and eating behavior, particularly for young women (Crisp et al. 1999). Poland et al. (2006) also argue that it is imperative to understand how these social processes are "*rooted in place*" (p. 61) and recognize that social patterning is tied in with social structure and societal organization. Fundamentally however, the whole relationship between "researcher" and "researched" must be re-evaluated and health professionals and academics must engage with individuals fully appreciate what the behavior means to them. Even if "hard-to-reach" groups can be identified, health promotion activities will fall short because they fail to understand the social meaning of potentially health damaging behaviors amongst such individuals.

The important generic message this chapter portrays is that understanding of patterns of health-related behavior is not simple. There is a complex recursive interplay between individual characteristics and contextual settings (Bernard et al. 2007; Cummins et al. 2007). Moreover, the factors that mediate between individual behavior and our social and physical environment are usually controlled or coordinated outside of the formal health care sector which has important implications for policy. Public health workers must seek out more productive partnerships with relevant organizations in trying to facilitate change (Srinivasan et al. 2003; Stafford et al. 2007). Of fundamental importance, however, is the need for health behavior research to be more critical and creative in order to fully understand and embrace the social context and meaning of health related behavior.

Notes

1 We use the term "geographer" in a broad sense and it includes individuals from the field of academic geography but we also refer to work undertaken by individuals from other disciplines such as sociology, population studies, or public health but whose work is clearly place and space related.

2 Although perhaps more fragile at the electoral ward level, the variation in estimates is shown to be much larger and ranges from 9 percent to 54 percent prevalence and again tends to be highly correlated with levels of deprivation, as revealed by the Index of Multiple Deprivation produced by the Department of Communities and Local Government (Noble et al. 2004). The electoral ward level estimates can be accessed via the Action for Smoking on Health (ASH) website (http://old.ash.org.uk/html/mappingproject/mappingproject.html). ASH have integrated the smoking estimates with the 2004 Index of Multiple Deprivation and both datasets can be viewed using an online mapping tool for any geographical area of England.

3 Overweight is defined as having a body mass index (BMI) between 25 and 29.9, whereas obese is a BMI above 30. BMI is derived by dividing weight in kg by the square of height in meters.

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Chapter 25

Governing Un/healthy Populations

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Introduction

In 2008 the US Association of Schools of Public Health (ASPH) launched a "what is public health" website as a means to draw attention to the field of public health and raise awareness of public health professionals. In a linked campaign, students of public health were encouraged to publically place stickers emblazoned with "this is public health" on "visual examples of public health in action" in their community. Around 30,000 stickers were distributed to more than 100 individuals and organizations in North America, and "Flikr" and "You Tube" websites were subsequently established with enthusiastic students contributing hundreds of photos and videos of the removable stickers in situ: on buildings, litter bins, bicycles, roads, taps, and even on people. So extensive were the students' sticker placements that an observer caught on video in New York remarked that "health appears to be everywhere" (for details see http://www.thisispublichealth.org/). The students' own explanations might give a similar impression. Where some pointed to activities such as water fluoridation, referred to as a "textbook example of public health in action," others addressed concerns where action in the name of public health is much less obvious: "Windows and buildings should allow for airflow from the outside to prevent mold and other respiratory threats."

The placement of stickers in the narrative above contains representations of two very different rationalities of public health. In the first, public health is a more or less contained field of endeavor engaging public health professionals in activities like water fluoridation – "textbook" because such activities have a longer history of acceptance as "public health" and involve familiar public health and biomedical specialities and public health policies. In the second narrative, public health appears to be "everywhere" within the physical and social structures of society – even in ways in which particular buildings designs might ensure an adequate airflow to prevent certain illnesses. In this mode of thinking, public health science involves attention to the social determinants of health and wellbeing, engaging a far broader range of government and non-government actors and focusing on creating the conditions for health (Hunter 2008). Actions to secure health may be seen in terms of healthy public policy, differentiated from public health policy, because the notion extends beyond the conventional biomedically oriented health care system (Bunton 2006). In this chapter we reflect on the new spatialities of public health and the value of critical geographic perspectives to the study of associated policy and practice.

The stickers narrative is a reminder and illustration of the complexity of *placing* "public health" when it is both a pervasive contemporary concern and focus for science and policy. That both commentators and students conflate issues of importance to the health of populations with "public health" exemplifies a sense of the "everywhere and nowhere-ness" of health in contemporary society (MacKian et al. 2003). Indeed, for Kickbusch (2006; 2007) *where* public health as a field directs its attention is increasingly challenged because for her we now inhabit an all encompassing "health society" (for an alternative perspective see Crawford 1980; Greco 1993; Conrad 1994). In this view, health and wellness now extend beyond what might be regarded as the traditional territory of medical and public health practice and are typified by the increased role of "the market" in health, a pervasive discourse about health across political and social life, and increased personal reflexivity about health. For Kickbusch, critiques, especially those that emphasize the dominance of biomedicine and the medicalization of everyday life (for example Crawford 1980; Foucault 1973), no longer make sense because actions to secure health and wellbeing are increasingly beyond the medical gaze. In short, she asks how do you critique and understand public health when "health has no boundaries"? (Kickbusch 2006).

This presents an interesting challenge to critical health geographers and one we wish to take up in this chapter. Our approach is by no means the only available – MacKian et al. (2003) explore similar questions through recourse to the notion of reflexive modernization, and Kickbusch (2006) is amongst those encouraging such an approach. However, we outline how "critical" Foucauldian approaches might still be employed to consider the governance of unhealthy/healthy populations, despite the seemingly amorphous territory of health and wellbeing that Kickbusch describes (cf. Parr 2004 on the meaning of "criticality" in health geography). A step was made in this direction by Brown and Duncan in their essay, "Placing geographies of public health" (2002; see also Fischer & Poland 1998; Brown 2000). In this essay, Brown and Duncan outline their understanding of the Foucauldian concept of governmentality, demonstrate its value to the sub-discipline through reference to studies in the field of critical public health, and present a possible research agenda for geographers.

As Kearns and Collins (Chapter 2, this volume) note, the terrain covered by "governmentality studies" continues to be of growing interest to geographers interested in public health issues. However, although we recognize that this is not the place to map out the entirety of this terrain – not least because others have already begun this task (see especially the edited volumes by Burchell et al. (1991) and Barry et al. (1996) and individual contributions by Dean (1999, 2007) and Rose (1999) – we believe that it is an ideal moment to reconsider the value of this concept to geographical studies of public health policy and practice. We make this observation because, notwithstanding the scholarship already mentioned, this interdisciplinary field of investigation has burgeoned in the past few years (Huxley 2007). Moreover, the recent publication of the complete set of lectures from which the concept was developed – "sécurité, territoire, population" delivered to students at the Collège de France, Paris in 1978 – initially in French and then subsequently in English translation (Foucault 2007), is likely to further stimulate interest in this concept (Elden 2007ab).

Health, Wellbeing, and Governmentality

Having introduced the general field of ideas that we are writing into, we will, in this section, explore the expanding territory of health by providing further clarification of our particular reading of two key terms: "health" and "wellbeing." These are terms that, quite obviously, carry special significance for health geographers and have been the focus of important intra-disciplinary debate; especially around Kearns' call for a more health-oriented perspective (see Kearns 1993, 1994; Mayer & Meade 1994). There have been, as one might expect, many subsequent additions to this debate; however, we wish to draw on one of the most recent of these: a paper published by Fleuret and Atkinson (2007). The authors of this paper set the scene for their contribution to this discussion through reference to the well-known and "famously broad" definition of health provided by the World Health Organization (WHO). As they note, this definition, which describes health as a "state of complete physical, mental and social *wellbeing* and not merely the absence of disease or infirmity" (WHO 1946: 100, emphasis added), is employed by WHO as a means to position this conceptualization beyond then dominant biomedical explanations.

Fleuret and Atkinson, following many others, go on to comment on the contribution that the WHO definition has made to the broadening of our understanding of health and (partially) releasing it from the grasp of the biomedical sciences. This is an achievement in itself and it is one that scholars from within and without this sub-discipline have contributed to. Despite this, the authors have reservations about the definition, especially its reference to "wellbeing." As they note, "[a] reorientation to viewing health through the lens of wellbeing brings challenges such as how to conceptualize wellbeing, how to measure or assess wellbeing, how to target wellbeing as the outcome of policy formulation" (2007: 110). This is a concern that is shared by others; for example, Hanlon and Carlisle (2007, 2008) argue that, if understood simply as individual happiness/pleasure (hedonic wellbeing) or virtue/human flourishing (eudaimonic wellbeing), the concept of wellbeing should not be the focus of public health intervention; both because public health is a "serious and practically oriented endeavour" and because it should be "wary of attempts to impose morally driven definitions of the good life on others" (2008: 265).

Though both sets of authors have slightly different reservations about the concept of wellbeing, they do share a belief that it holds some value as a target for future public health interventions. For Carlisle and Hanlon, this is especially the case when research in this area takes account of people's own understanding of wellbeing and where interventions operate at the population rather than the individual level (2007: 266–267). Moreover, they appear to suggest that wellbeing might act as a surrogate target in communities, particularly disadvantaged ones, that reveal high levels of "fatigue, scepticism and disenchantment" towards health initiatives. It is at this point that we wish to step back a little from this discussion of health and wellbeing. We do so because we believe that the desire to make wellbeing an acceptable target of public health investigation and intervention is not the only way in which we can engage with these concepts; and, more importantly, the governmental pursuit of them. In order to make our position clearer, let us now consider a rather different interpretation of the relationship between health, wellbeing, and policy.

Drawing on the French philosopher Canguilhem (1989), Osborne argues that the concept of health, and to this we add wellbeing, is not "absolute and determinate" rather it is "indeterminate, relative or elastic" (1997: 179). This particular interpretation has, more recently, been taken up by Monica Greco who notes that health, and again we would add wellbeing, cannot be guaranteed as a human right because only access to health *care*, health *protection*, or healthy *conditions* can be enshrined as such universal ideals. This is so, she argues, because the concept is considered "too vague, subjective or relative to become meaningful" (2004: 1). It follows from these two observations that in order to make such concepts knowable to policy-makers in the way that scholars like Fleuret and Atkinson, and for that matter Carlisle and Hanlon, suggest, we must make the indeterminate determinate. Indeed, this is exactly what is suggested when they encourage geographers to render this hard to measure concept measurable by mapping out those "spaces which may favour (or not) 'health as an important component of wellbeing' " (Fleuret & Atkinson 2007: 113).

As might be anticipated, given our introduction of differing, and perhaps more critical, perspectives on health and wellbeing, our approach is somewhat different. Though we accept the notion put forward by individuals such as Kickbusch, that we now live in a "health society," we are less certain about the "do-ability of health"; especially if it is, as she asserts, driven by the "promise that it can be created, managed, and produced" (2007: 90). Why should this desire concern us? Put simply, their remains in this approach what Petersen and Lupton refer to as an "unshakable faith in the narratives of post-Enlightenment humanism" (1996: 8), which suggests that as long as the determinants of health and wellbeing are made visible or knowable to us, we, either as individuals or as a society, can achieve the universal goal of good health set out in the WHO definition and in subsequent documents (e.g. the Alma Ata Declaration (WHO 1978), Health for All (WHO 1981), the Ottawa Charter (WHO 1986)). It is on the attainment of this laudable, and seemingly benign, goal that much of contemporary public health activity is focused and it is upon it that research agendas, such as the one proposed by Fleuret and Atkinson, are targeted.

However, we would argue that critically minded geographers should not only seek to examine how we make such concepts more amenable to policy; they should also examine the very ways in which this rendering process occurs. Though applying a governmentality approach to the field of public health does not necessarily involve questioning the value of policies and programs that are put in place, nor for that matter research endeavor that aims to support them, it does involve interrogating the ways in which un/healthy populations are rendered visible or knowable to policy-makers and the devices, mechanisms, practices, and strategies that are used to "encourage" individuals to make healthy choices. It is here that we argue that an approach which builds on Foucault's notion of governmentality is still relevant, and indeed crucial because is allows us to focus on these "diverse technologies of health; that is, all the means, projects and devices through which the impossible dream of a healthy *population* has been made an object of realization" (Osborne 1997: 181). In the remainder of this chapter we shall set out in more detail what governmentality entails and how it has been, and might be, employed by geographers interested in the expansive spaces of health and wellbeing.

Approaching Governmentality

It should be clear, then, that we place considerable value in engaging with this particular line of Foucauldian-inspired inquiry. In order to consider this further, we need first to set out our understanding of some of the principal elements of this concept. As Huxley notes, while we can locate a specific point of origin for the emergence of "governmentality" in Foucault's writing, many of the themes that it embraces were already well established in his work: whether relating to his general discussions of power, the emergence of the population as the object and subject of concern, or to different forms of governmental rule (2007: 186ff.). Though we do, of course, need to acknowledge this, it is widely recognized that the concept is characterized by two key elements: the "genealogy of the subject" and the "genealogy of the state" (Lemke 2001). In the former of these, Foucault deals explicitly with the government of the self or the "conduct of conducts" (Gordon 1991: 2). Here, he employed the term conduct in several ways: as a form of direction or guidance (to conduct others), in an ethical or moral sense (to conduct oneself), and as a term that refers to people's behavior or actions (conduct) (see Foucault 1982: 220–1; Dean 1999: 10).

Following this, it is possible to suggest that governmentality, as far as it relates to the "conduct of conducts," is concerned with "any attempt to shape with some degree of deliberation aspects of our behavior according to particular sets of norms and for a variety of ends" (Dean 1999: 10). If we consider this in relation to developing a program of research, analysis of the "government of the self" not only requires that we consider the aspect of the self being acted upon or governed, but also the techniques or practices of government employed, the "modes of subjectification" constituted, and the question of why govern or be governed (Dean 1999: 17). We will talk a little more about this in the following sections; however, for now we wish to move on to the second element of governmentality, the "genealogy of the state." As Lemke notes, by linking the words to govern (*gouverner*) and modes of thought (*mentalité*) together, Foucault was effectively indicating that it was not possible to study "technologies of power without an analysis of the rationality underpinning them" (2001: 191). Thereby suggesting that analysis of the practices and techniques of power also necessitates an awareness of the political domain within which they operate.

In his 1978 lectures, Foucault makes it quite apparent that governmentality refers to the operation of power: "by 'governmentality' I understand the ensemble formed by institutions, procedures, analyses and reflections, calculations, and tactics that allow the exercise of this very specific, albeit very complex, power […] that we can call 'government' " (2007: 108). So, by studying governmentality we are seeking to analyze the practices and techniques associated with a specific form of power, which in Foucault's own words had achieved "pre-eminence over all other types of power-sovereignty, discipline, and so on" (2007: 108; see also Dean 2007: 85). Yet, as noted above, we should also pay attention to the "mentalities and rationalities" that are intertwined in such "attempts to steer forms of conduct" (Huxley 2007: 187). Put differently, governmentality studies are concerned with revealing the interconnections that exist between various rationalities of rule (whether classical liberalism, Keynesianism, neo-liberalism etc.) and the technologies and assemblages of practices that are deployed to put these rationalities into effect (O'Malley et al. 1997: 502).

The importance of this is that according to Foucault these different rationalities of rule may also be associated with particular *spatial strategies*. That Foucault was concerned with space is already well known to geographers (see Philo 1992; Crampton & Elden 2007), with many pointing to his assertion that "[s]pace is fundamental in any form of communal life; space is fundamental in any exercise of power" (Foucault 1982: 252). Yet, as Huxley (2007) notes, geographers, especially historical geographers such as Driver (1993), Philo (1989), and Ogborn (1992), have also written extensively, though not always explicitly, on the role of space in governmental projects. Here, assemblages of disparate elements or *dispositifs*, whether of technologies (e.g. sanitation and inoculation), architecture (e.g. the clinic and the hospital), and methods of calculation and spatial representation (e.g. the population census and mapping), are seen to constitute arrangements that are "aimed at making up and governing particular kinds of individuals, populations, locations and territories" and are regarded as configurations that connect the "'thought' of government" to the problem of rule (Huxley 2007: 192). In order to fully appreciate the relevance of this to our argument, we move on in the next section to look much more closely at the utility of governmentality as a framework for investigating public health discourse and material practice.

Governing un/healthy populations

In the previous section we have presented a somewhat truncated introduction to the concept of governmentality; in particular, we have identified two of the key elements associated with it. Clearly, there is much more that could be said here and for those who wish to pursue this concept further we recommend a more in-depth reading of the scholarship that we cite. That said, we do not intend to end our engagement with the concept here. Rather, we wish to refocus our attention on some of the ways in which this particular form of analysis has been taken up in relation to contemporary public health discourse and practice. We begin this task by asking a seemingly straightforward question: what is it about the field of public health, however defined, that lends itself to interpretation using the analytical tools provided by governmentality studies? In reality, answering this question is rather tricky. However, two influential scholars in this area, Alan Petersen and Deborah Lupton, provide us with the beginnings of an answer when they state that: "the philosophies and forms of intervention of the *new public health* can be understood by reference to the political rationalities that characterize the societies in which the new public health knowledges and practices have emerged" (1996: 10, emphasis added).

We place emphasis on the phrase "new public health" because it has been interpreted in several ways. For Ashton and Seymour (1988), it refers to a multi-dimensional approach that recognizes the social, psychological, and physical determinants of health. Further, it is critical of the biomedical model, its focus is placed on at risk communities and populations and not risky individuals, and its goal is to promote a prevention-oriented approach to health care. Understood in this way, the "new public health" is closely aligned with the ambitions of the WHO and has been taken up by governments in advanced, industrial societies (and increasingly beyond). More recently, Kickbusch (2003) refers to the "new public health" in more r/evolutionary terms when she identifies nineteenth-century sanitary reform as the first phase of a public health revolution which also includes highlighting the interrelationship between individual behavior and non-communicable diseases and premature death (phase two) and promoting the idea that health should be understood as a key dimension of a person's quality of life (phase three).

The "new public health" is, then, more akin to a new social movement that brings together governmental agencies, non-governmental organizations, and many other actors (including individuals themselves) in the common pursuit of a single, universal goal: the promotion of human health and wellbeing for all. If we return to the quote taken from Petersen and Lupton, it should be apparent that they see the "new public health" in subtly different terms. They make this point more clearly a little further on in their influential text: "The new public health is, if nothing else, a set of discourses focusing on bodies, and on the regulation of the ways in which these bodies interact within particular arrangements of time and space … the discourses of the new public health also seek to transform the awareness of individuals in such a way that they become more self-regulating and productive" (1996: 12). When thought about in this way, the "new public health" is not so much about a network of relatively easily definable actors and agents but instead might be regarded as a set of health related imperatives that seek to engage individuals, or more appropriately groups of individuals, in a set of transformative practices: eat five a day, perform at least 30 minutes of physical activity, practice safe sex, regulate your alcohol intake, and so on.

It is upon these imperatives, and the places and spaces within and through which they operate, that much of the health geography literature on this topic has focused. For example, Brown (2000) employed a governmentality approach to consider the normalizing of particular kinds of sexual practice in the discourse surrounding AIDS/HIV in the 1990s. In more recent, and increasingly more sophisticated, research, the approach has been used to explore: the interrelationship between education, expertise, and public health knowledge (Williamson 2004); the interaction between power and technology in health care settings (Poland et al. 2005); the promotion of "safe-sun" practices in New Zealand schools (Collins et al. 2006); and the constitution of responsible subjectivity in relation to contemporary anti-smoking policy (Thompson et al. 2007). Though a seemingly disparate array of articles, what connects them is the recognition that the imperatives associated with contemporary public health discourse are carefully targeted at particular populations (rather than at individuals) and that they appear to operate within what Kickbusch (2003), amongst many others, refers to as "settings."

It is apparent, then, that health geographers are mindful of the emphasis that Foucault placed on population as the "object of government" (2007: 105). Moreover, there is a recognition that contemporary public health discourse seeks to foster healthy subjectivity through the normalization of health promoting practices in particular sites/settings: the home, the school, the workplace, the community, and so on (some interesting and relevant research by non-geographers includes Fullagar 2002, 2003, and Fusco 2006, 2007). Less apparent, however, is the relationship that exists between these strategies and techniques and the governmental rationalities that underpin them. For Petersen, as for other scholars writing in this field, an awareness of the influence of neo-liberalism is crucial. As he notes, neo-liberalism is a "form of rule which involves creating a sphere of freedom for subjects so that they are able to exercise regulated freedom" (1997: 194). Having made this observation, Petersen then moves on to establish a link between this understanding of neo-liberal rule as a form of regulated freedom, what Rose (1999) refers to as "government at a distance," and the "new public health," which he suggests requires that individuals enter into a process of self-governance that demands "endless self-examination, self-care and self-improvement."

Thus, as others have commented, under neo-liberalism, individuals are "encouraged," though they are on occasion coerced (cf. Dean 2007), into taking responsibility for their own self-care. However, this responsibility is not simply a question of choice and has increasingly become aligned with a moral imperative for the "prudent subjects of neo-liberalism … [to] practise and sustain their autonomy by assembling information, materials and practices together into a personalized strategy that identifies and minimizes their exposure to harm" (O'Malley 2000: 465; see also O'Malley 1996). Here, then, we see a connection between Foucault's dual concerns with "technologies of the self" and the "arts of government," because neo-liberal rule, through the emphasis that it places upon the notion of rational and responsible forms of citizenship, seeks to empower free and rational individuals to perform in ways that promote their own, as well as the state's, health and wellbeing. Moreover, it is possible to identify differing modes of subjectivity that are made possible under this form of rule; whether these be the "amoral" or "unethical" subjectivities of those who perhaps place the pursuit of pleasure, risk, or even danger over that of health or those of "moral" or "ethical" citizens who are happy to align their own personal desires with those of the State (see Coveney & Bunton 2003; Lupton & Tulloch 2002).

We will return to the ethics of responsibilizing subjects in the following section. However, as a way of bringing this particular aspect of our discussion to some sort of conclusion we wish to finish by referring, albeit quite briefly, to the question of "risk." Here, we do not employ risk as it is understood in the "risk society" thesis (on which see Giddens 1991; Beck 1992). Rather, we refer to risk as it was described by Castel: that is, as the "effect of a combination of abstract *factors* which render more or less probable the occurrence of undesirable" outcomes (Castel 1991: 287, emphasis in original). Castel's intervention on the subject of risk, and its emergence as a technique for governing the actions of individuals both in the present and the future, has proven crucial for those interested in offering a critical reading of contemporary public health discourse (see Petersen 1997; Brown & Duncan 2002). As Osborne suggests, neo-liberalism "abandons the quest for an absolute that would be health and opts for determinate strategies, targets and specifics instead" (1997: 185). A little further on in the text he qualifies this observation further, "[b]ecause health is not an absolute" neo-liberalism relies on a series of "surrogate values" against which health, and by association wellbeing, can be measured (1997: 186).

Though Osborne does not refer to risk explicitly, the point to observe here is that it is through the notion of risk, constituted as it is in this case by epidemiologists in collaboration with the biomedical sciences, that the indeterminate values of health and wellbeing are made calculable, knowable, and, in Kickbusch's terms, "do-able." Indeed, a similar point was made more recently by Dillon who noted that, in his 1978 lectures, Foucault observed an "increasing preoccupation with governing through contingency" (2007: 46). Moreover, he suggests that this problematization of contingency, which is regarded by Foucault as immanent feature of a population, was seen to initiate a "government of population (in its very contingency) by the burgeoning new sciences of contingency (statistics and probability) for the contingent (effects-based) promotion of life." This may appear quite abstract. However, if we consider that epidemiological notions of risk do not deal with actual but probable health-outcomes, it then becomes clear that public health discourse relies heavily on such contingency as a means of encouraging populations, rather than identifiable "at risk" individuals, to perform in ways that may, or may not, improve their health and wellbeing.

Extending the spaces of governmentality

We have outlined the terrain of governmentality studies and made an argument for its continued value to critical health geographies. In doing so, we are mindful of Dean's (1999) suggestion that an analytics of government can also make clear the disjunctions been the kinds of logic that inform practices and effects of governance. Indeed, it is precisely because neo-liberal forms of power are exercised at a distance, that the value of governmentality approaches may be, as Petersen suggests, their ability to "render visible the ethical content of the particular practices of self associated with contemporary forms of rule" (Petersen 2003: 188). Put differently, if the self-regulating subject is governed from a distance it may be difficult to associate, or see how practices of governance in public health impact on, activities of daily life, or to recognise the moralizing tendencies inherent in actions taken at a distance. As a way of considering this further, we now turn our attention to the discussion of a public health issue that has received much attention from (health) geographers: HIV/AIDS. Moreover, in drawing on research that employs a variety of geographic approaches, we will also consider how issues of contingency, and broadening definitions of health and wellbeing, are perhaps extending the spaces and places of governmentality.

As most of us are by now aware, HIV/AIDS emerged as a public health concern in 1981 following the identification of rare and aggressive cancers and infections in a small group of young gay men in New York and California. In the decades since then, it has been variously problematised as an ungovernable disease of "bad boyz," as a series of governable health risks, and, recently, as a global bio-security threat (Burges Watson & Stratford 2008; Campbell 2008). In this sense, HIV/AIDS might still be described as an "epidemic of signification" in which meaning is both multiple and contested (Treichler 1999). Moreover, as Schoepf (2004) has argued, the role of international biomedicine and epidemiology in the production of facts about HIV/AIDS and who it affects, still needs to be problematised. Geographers have played their part in this process. For example, Craddock (2004) points to the ways in which HIV/AIDS has been associated with a range of "at risk" populations, from military men, truck drivers, and prostitutes, in Africa, a continent that has also at times been represented as the "cradle of AIDS."

Such identification of particular publics as being "at risk" brings into focus questions of how such decentered subjects inhabiting multiple spaces, locations, and spheres may be governed from a distance, and to what effect. On one hand, the language of "at risk," and the focus on particular populations, carries with it the potential to stigmatise or isolate those same publics who are, both in representational and material forms, the *victims* of HIV/AIDS. Those most at risk may be "othered," as Tim Brown exemplified in his examination of how public health leaflets in the United Kingdom represented gay men (Brown 2000). Or as Michael Brown has revealed, particular behaviors may be problematically associated with particular identities or groups, such as the singling out of "good gays" versus "bad boyz" (Brown 2006). Moreover, by placing some populations under the risk spotlight it can defer the responsibilities of those who are not targeted. In this sense, men's responsibility in their sexual relationships may be deferred by contemporary classifications of women as most "at risk" (Burges Watson & Stratford 2008).

On the other hand, geographers have employed the notion of *sexual citizenship* to help explain how subjects may be "responsibilised" in the self-management of HIV/AIDS risk (Bell & Binnie 2006; Brown 2006; Cooper 2006). Earlier we suggested that focus on prevention extends the gaze of public health expertise to healthy populations, such that being "at risk" may be determined by more abstract behavioral factors identified as risky; for example, in relation to HIV/AIDS it might be "un-protected" sex. By coupling sexuality with citizenship, sex is amenable to technologies and practices that enable the "healthy" or "unhealthy" subject to self-govern. We might consider, for example, the strong focus in late 1980s and 1990s public health on "safe sex" and the promotion of condom use to reduce risk. In more contemporary settings, we might cite an example in which women have been responsib(ilised) as "rational" citizen-consumers of preventive health technologies through the efforts of international philanthropic organizations working to develop the first female-controlled microbicides (Burges Watson & Stratford 2008). In this latter illustration, we can employ a governmentality lens to examine how freedoms are granted but with sometimes unobtainable obligations. For example, Burges Watson and Stratford (2008) consider some of the moral questions raised by research in the development of prevention technologies designed for women in "developing" regions who were deemed particularly "at risk" of, or vulnerable to, HIV/AIDS; despite difficulties women may have in fulfilling obligations and the burdens such obligations impose because of their inequitable position in society.

If discourses of particular "at risk" populations were dominant in the 1980s and 1990s, the rationalities underlying approaches to HIV/AIDS appeared to be shifting to more encompassing concerns when seen through the rationality of *vulnerability* to HIV/AIDS (Kalipeni 2000; Oppong 1998). This discursive shift was made possible by the epidemiological country by country data collected under the auspice of

UNAIDS and alongside the recognition, and more complex mapping, of the social determinants of the illness. Geographers were amongst those to help in broadening the focus of biomedical inquiry by demonstrating health inequalities between places more or less affected by HIV/AIDS and examining the broader social determinants through which such inequalities could be explained (Gilbert & Walker 2002). Inequalities in the prevalence of HIV/AIDS were starkly represented and hard to ignore. For example in 2001, UN reports were showing that despite only containing 8 percent of the world's population, sub-Saharan Africa had two-thirds of the global AIDS population (Craddock 2004).

Such inequalities could not be explained simply in terms of the kinds of discourse of sexual orientations and behavior that characterised earlier representations (see Craddock and Brown, Chapter 17, this volume). But prevention in vulnerable populations does employ the same language of "at risk." The impact of HIV/AIDS on non-infected persons has been identified as a public health priority, especially in response to the growing number of "AIDS orphans"; that is, children who have lost one or both parents to AIDS or whose "survival, well-being or development is threatened or altered by HIV" (UNAIDS/UNICEF/USAID 2004). In 2003, UNAIDS and UNICEF issued a joint press release detailing the scale of the problem, namely the existence of 14 million children who had lost one or both parents to AIDS. The release suggested that "[r]isk factors such as missed opportunities for education, ill health and abuse and exploitation threaten their [children's] most fundamental rights and keep them enmeshed in poverty" (UNAIDS/UNICEF 2003). Moreover, the language deployed in this new target of public health attention has increasingly been couched in terms of the risks to the "health and well-being of children and 'families' " (Ferreira 2004).

In another example, it is apparent that since 2000 HIV/AIDS has been appropriated through the language of political "bio-security" and has become a problem of international institutions and requires actions even more remote from the subject. The associated "securitization" of HIV/AIDS has primarily been taken up within political geography, and is commonly linked to a watershed moment in January 2000 when the UN security council moved beyond its normal remit and concern with armed forces to declare HIV/AIDS a threat to international peace and security (Campbell 2008; Elbe 2005, 2006, 2008). Campbell (2008) argues the "securitization" of HIV/AIDS became possible because of the emergence of two interconnected discourses in the 1990s. The first was the supplementation of concern about the defense of the state and its territory with broader concerns about human security. The second concerned a new way of thinking about the relationship between security, disease, and commerce or what King (2002) has elsewhere called the "emerging diseases worldview." Combined, these discourses reflected a series of concerns: about the flow of goods and people through, for example, migration, urbanization, travel and commerce, and the potential human threats of transmission from places of unequal health status.

However, unlike international public health of the past, in which health concerns were addressed as internal to nations, the securitization of HIV/AIDS recast the problem in similar terms to global emergency or war and thus sanctioned and called upon the resources of national and international bodies to address these threats. Elbe highlights the prospective nature of these concerns, noting the first security council resolution to address HIV/AIDS contained the statement that HIV/AIDS "if unchecked, may pose a risk to stability and security" (Elbe 2005: 179). Further, Elbe (2005) raises concerns that actions against HIV/AIDS have produced openings for less than ethical processes of normalization and practices of racism that have not previously been possible. In spatial terms, the securitization of HIV/AIDS signalled an opening up of space to actions designed to address this problem as a global, rather than national, concern but also one that problematised the openness of borders to flows of certain, "undesirable," people.

We have not provided these examples of the shifting rationalities and approaches to HIV/AIDS as a complete account of the ways in which the pandemic has been addressed; it is not sufficient for that task. Rather the examples are provided to demonstrate the potency of ordering spaces for health. In each case, the identification and language of risk has been key to rendering HIV/AIDS visible, and therefore open, to particular forms of governmentality. In short, the rationalities and ensemble of technologies and assemblages of practices that we cite have been deployed in the neo-liberal governance of HIV/AIDS. They can be seen to have shifted in response to particular needs or as associated with a "dominant strategic function" (Foucault 1980). Yet they retain elements of the same underlying neo-liberal form, the same "new public health" approach. However, there is more going on here than just shifts of position and modifications of function. By changing the very institutions in which ideas of health circulate – notably in the case of HIV/AIDS to those related to political security – the apparatuses of governance for health have expanded. Indeed for Bashford, the effects of securitizing HIV/AIDS in this way have broader ramifications because health has become a "nascent and accumulating global problematization of sex, death and movement" (2006: 78).

Conclusion and Future Directions

The principal aim of this chapter was to consider the continued relevance of Foucault's notion of governmentality to health geographers; especially those interested in engaging critically with contemporary or "new" public health policy. To this end, we have sought to provide as comprehensive an account as possible of current understanding and we have done so by drawing on a wide range of literature from within and without the sub-discipline. Clearly, there is much more that could, and perhaps should, have been said; especially with regards to current geographical scholarship that employs this concept. Rather than dwell on the gaps, we shall instead highlight what we regard as the key points that we have made. We start by returning to our discussion of Fleuret and Atkinson's (2007) paper on health and wellbeing. We do so because we believe that it is important for geographers interested in health and wellbeing to, at times, cast a more critical eye over the discourses that they help to produce.

While there may be many reasons to celebrate health related research that seeks to make visible to policy-makers the spaces within and through which health and wellbeing might be produced, we believe that we have highlighted some issues that may arise in this rendering process. For example, as we have shown in the preceding section, there are tensions inherent in public health policy that are created by opening up spaces to secure health and wellbeing for all, and in the concomitant potential for enclosing spaces that can, paradoxically, repress freedoms, normalise particular behaviors, and exclude those who do not – because they are unable or unwilling – meet the dictates of ethical, and supposedly rational, subjectivity. We used the example of HIV/AIDS to illustrate this point. We might easily have turned to a host of other public health issues that have been problematised in the contemporary period; whether smoking, the excess consumption of alcohol, or concerns over overweight and obesity.

In so doing we do not question whether these practices are harmful to health and wellbeing. That is not our purpose. Rather, we argue that the notion of governmentality might be employed by critically minded (health) geographers to question the ways in which particular kinds of health related practice is constituted as un/healthy and to consider what this might mean in terms of the governance of populations (both by individuals themselves and by those who seek to govern at a distance). Further, we align ourselves with the belief that this form of governance is not necessarily oppressive – that is, a form of government that requires individuals to submit to power – but that it is productive in the sense that it produces particular kinds of healthy or unhealthy subjectivity. As Coveney argues in relation to public health, "[it is] a form of government which is *productive* in the sense that it *produces* modern subjects: it defines empirically what it *is* to be health (in ever expanding ways) and it 'supervises' the proper routes to health through a discipline which establishes for us a *rapport de soi*, or 'ethics'" (1998: 462, emphasis in the original).

One way forward for health geographers interested in exploring this productive form of power is to consider the spaces and places within which such ethical practice is performed. After all, the "new" public health is an inherently spatialised discourse (Petersen & Lupton 1996), which, through its "settings" agenda, seeks to make the everyday places within which we conduct ourselves spaces for health. Moreover, as Coveney goes on to argue, it is within such "settings" that we are encouraged to "assess our desires, attitudes and conducts in relation to those set out by expertise." As we suggest in this chapter, this "agenda" has already been followed by a number of (health) geographers and in a diverse range of papers. Though this is the case, the continued "territorialization" of people's everyday lives, and the spaces and places within which it is conducted, in the name of health and wellbeing implies that there will continue to be scope for research in this area. However, where a gap in this scholarship remains, is in research that extends this approach to those nations that exist beyond the advanced, industrial economies of the west. This is a considerable lacuna and one that has only relatively recently been identified by health geographers (see for example Brown & Bell 2007, 2008; Burges Watson & Stratford 2008). It is perhaps in this area in particular that the sub-discipline can continue to make a valuable contribution.

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Part V Health Care and Caring

Chapter 26

Providing Health Care

Ross Barnett and Alison Copeland

Introduction

Despite the emergence of national systems of health care provision, in recent years health systems around the world have come under increasing pressure due to the increased demands which have been placed upon them. These pressures arise from a wide range of changes in the physical and social environment and have resulted in the continual search for new organizational structures which it is hoped will be more effective in dealing with the problems which have arisen. The continually changing nature of modern health systems raises a number of important issues for geographers concerned with understanding both the nature of change and its impacts, but also how different health systems have responded to similar problems relating to the organization, funding and delivery of services.

In the light of such comments the focus of this chapter is twofold. First, we begin by providing a brief overview of health services research in geography focusing on early areas of concern together with new forms of inquiry that were developed in the 1980s and 1990s. In the second part of the chapter, and building on this background, we examine some of the key, but relatively unexplored, issues associated with health service restructuring and pay particular attention to some of the important debates relating to the provision of care. We have selectively grouped these under four headings: (1) tipping the balance?: an emergence of primary care led health systems?; (2) key issues associated with changes in secondary care; (3) social exclusion and disparities in the receipt of care and; (4) globalization and health workforce issues. Our concern is mainly directed at a limited number of developed countries, which reflects the state of the English-language literature. However, we acknowledge the wider implications of the trends that we discuss to other health system contexts, such as transition and developing economies where many of the concerns we raise are obviously also important.

To achieve these objectives the chapter is organized as follows: first, we briefly outline the core areas of concern of past geographical analyses of *formal* health services. Secondly, given this background, we focus on each of the four selected research themes paying particular attention to the key issues which we see as being important. In conducting our review we highlight areas of controversy and research areas which remain unexplored. Finally, we conclude by suggesting a need for a certain re-orientation of geographical health services research with a view to providing more policy relevant analyses. In particular, we see a need for the development of more comparative analyses of health sector restructuring at different geographical scales, a need for a return to more structural analyses of health system change and to develop a greater understanding of the power relationships which shape them, and for more evaluative research which emphasizes the policy relevance of our discipline.

Geography and Health Services Research

Geographical studies of health service delivery have had a long history, which along with the mapping and modeling of disease, represent one of the two traditions of medical geography (Rosenberg 1998). Once considered to be a minor and neglected part of human geography, recent years have seen a metamorphosis of medical geography into a more theoretically enriched geography of health (Kearns & Moon 2002). This has increasingly replaced space with place, raw empiricism with a greater attention to social theory, and, in contrast to much of contemporary human geography, has begun to grapple with important policy questions (Martin 2001).

Traditional studies of health service delivery were explicitly concerned with the role of space and how it affected the organization and distribution of health services and patterns of use. Generally four themes were emphasized: geographical bases of service organization, locational variations in the provision of health services, resource allocation in relation to need, and variations in service use. Much of this work reflected the importance of logical positivism in human geography as geographers searched for universal empirical regularities such as the "inverse care law," the presence of "supplier-induced demand" (Barnett 1993), or "distance-decay" patterns in the use of health services (Joseph & Phillips 1984). While there was some attention to theory it was strongly focused on patterns of individual behavior and much less on health institutions, or key public and private stakeholders and the role they played in determining access to health services. For example, much of the early welfarist work on the "inverse care law" focused on individual doctors and the locational decisions they made (Shannon & Dever 1974; Powell 1986) and, with few exceptions (e.g. DeVise 1969), said little about institutional policies of social exclusion and how they affected access to care. Similarly studies of hospital location also emphasized welfarist themes (e.g. Pyle & Lauer 1975) or empirical patterns of hospital use such as "Roemer's law" (Barnett et al. 1980) but, with few exceptions (e.g. Barnett 1984; Mohan 1984; McLafferty 1989), were largely silent about the wider organizational context affecting the structure of modern hospital systems. To a large extent this largely reflected the invisibility of Marxist theory in medical geography despite its importance in some other areas of human geography (Harvey 1973). Where structural analyses of health policy did take place this largely occurred on the part of other social scientists (e.g. Navarro 1976, 1978; Doyal 1995). However, by focusing mainly upon the effects of class and wealth, such analyses were highly functional in tone and neglected to consider the independent role of the medical profession in affecting the content and direction of health policy.

While health services have a distinctly spatial component, attention must also be focused on the role of place and how these may influence patterns of service delivery. Stimulated by the "cultural turn," health geographers, beginning with writers such as Gesler (1992) and Kearns and Gesler (1998), increasingly began to explore how aspects of place affected health, the delivery of health services, and health policy (Kearns & Moon 2002). In what has been termed the "new" geography of health, analyses of health care delivery have focused on the ways in which places of delivery of health services could be designed according to the principles of therapeutic landscapes. These were seen to encourage healing either by being places of refuge and relaxation (e.g. Conradson 2005) or because they de-medicalized hospital environments (Kearns & Barnett 1999). However, since much of this work was heavily influenced by cultural geography, it strongly focused on more micro-aspects of health service delivery and less on the wider socio-economic and political context which affected the funding, regulation, and delivery of health services. Studies which did so tended to be grounded in the specifics of particular localities and less interested in comparative research focusing on health system change. Nevertheless, as Mohan (1998) has suggested, such work was important in demonstrating and emphasizing the connections between changing patterns of health care delivery and contemporary socio-economic restructuring. By linking into more macro-theories of capitalism, such as regulation theory (Pinch 1997), it also began to think about the complex linkages between national-level political strategies and local-level service outcomes.

Unfortunately the research that evolved which examined differences from place to place in the structure of health systems tended to be conducted by non-geographers, with the result that "comparative" studies were largely silent about what aspects of place influenced the direction of health policy (Mackenbach 2003; Navarro et al. 2003; Chung & Muntaner 2006; Zambon et al. 2006). There are many different types of health care systems where states or provincial governments have a large impact on the structure and direction of health policy. To a large extent these variations reflect the importance of differences in levels of economic development between places but also the significance of different political cultures across countries at similar stages of development. These different cultures are characterized by different *governance* arrangements which determine where the key direction comes from within the system and where critical decisions are made, particularly the extent to which governments are involved in setting direction, funding or providing services or whether this is left to the private sector or the medical profession.

The lack of a global focus by geographers was also reflected in geographical studies of health sector restructuring. Health care systems are not constant entities but in reality are often in a state of constant change. Many health systems have gone through repeated restructurings over time but particularly in the 1970s onwards in Liberal countries. These changes have been likened to "revolving doors" (Gauld 2001) whereby governments in particular have sought to improve the performance of health services. Identifying, comparing, and understanding such changes within a political economy framework is a major challenge. Generally, most analyses of health sector restructuring have been country specific (e.g. Mohan 1998) and while they have provided much historical detail on the policy processes operating within different countries, they have largely lacked a comparative focus in which the different aspects of place are emphasized and how the political and social environment has shaped the evolution of health services. One of the few exceptions is Barnett and Newberry's (2001) analysis of how regional health authority managerial cultures shaped the direction of policies on deinstitutionalization within New Zealand. Similarly Moon and North's (2000) analysis of the evolution of primary care in the United Kingdom focuses not only upon the political developments which have altered the complexion of the NHS, but also have located such changes within a wider international context.

Health service restructuring is not an amorphous process and although it has been influenced by globalization and the diffusion of reform ideologies, it nevertheless has taken on different forms in different places. The explanations of these differences are complex but relate not only to differences in political ideology, but also to the influence of other factors such as structural economic change or the power of the medical profession in influencing the nature and outcomes of the restructuring process (Hafferty & McKinlay 1993). The latter trend suggests a need for a greater integration of broader macro-theories of the state (such as regulation theory) with more micro-theories of managerial or provider behavior such as agency theory or theories of proletarianization of the medical workforce (McKinlay & Stoeckle 1988). Quite clearly shifts in health policy need to be related to broader changes in the welfare state and the shifts to new modes of regulation as described by regulation theory (Pinch 1997). Health sector restructuring can be described as a new mode of regulation especially if key relationships change between the state, key providers and patients (see below).

With this in mind we turn to an analysis of recent changes in primary health care and some of the key issues associated with these new developments.

The Rise of "PHC-led" Systems

In recent years marked changes have occurred in the organization and funding of primary care. Since the 1990s some western countries have used the term "primary care-led" health system to describe new thinking about how health systems might be organized to give a more pivotal role to primary care. This involves a greater role for primary care in prevention and treatment, with the community as an increasingly important setting for care and, most important, primary care as the place where more financial and prioritization decisions are made, based on a knowledge of population health needs. One notable change has been the formation of group collectives which, some argue, have the potential to "tip the balance of the health care system towards primary care" (Boerma 2006: 17). Particularly important have been the emergence of primary care organizations (PCOs) which have sought to increase the influence of primary care professionals in health planning and resource allocation, and in the health system more generally (Smith & Mays 2007). However, this shift has been a contentious process involving conflicts between government and the medical profession or the latter with other key stakeholders. This has affected the pace of change, the nature of the new PHC models which have developed, and the extent to which they are likely to have positive impacts in terms of improved efficiency and access to care.

These developments raise a number of important issues which have only partly been explored by geographers. We selectively focus on three areas of concern:

- the pace and extent of PHC reform;
- barriers to reform and forces for change;
- geographical variations in the evolution of new models of PHC.

Pace and extent of reform

The first initiatives aimed at strengthening primary care were first clearly elaborated at the Alma Ata Conference on Primary Health Care, organized by WHO and UNICEF, and encapsulated in the Alma Ata Declaration (WHO 1978). The Declaration incorporated two key sets of ideas: the operational services that ensure high-quality care and the organizing principles of the system. The operational clauses reflect undisputed features of good primary care: point of first contact, family centered, continuity of care, preventive focus, and so on. The organizing principles were more contentious: population health approaches, democratization and decentralization of decision-making, and placing primary care in the center of the health system.

Green et al. (2007) note the strong influence of Alma Ata principles in poorer countries during the 1980s, with many committing to the implementation of national programs and important service innovations. However, during the 1990s the international policy agenda turned more towards economic and public sector restructuring, with many fledgling primary care systems experiencing increased privatization, with implications for access and equity. In western countries, the operational aspects of Alma Ata reflected emerging trends in good practice promoted by professional associations, but the organizational frameworks of community participation, population approaches or a central position in the health system were slow to be accepted either by policy-makers or practitioners.

The lack of responsiveness to Alma Ata principles seems surprising, considering the benefits anticipated from such changes. For example, increased emphasis on population health and prevention were expected to improve health status (Macinko et al. 2007), help negate the adverse effects of income inequality (Shi & Starfield 2000; Hefford et al. 2005) and reduce the pressure on (expensive) hospital services (Starfield et al. 2005). Community participation was also expected to make services more responsive to local communities, thereby improving access and reducing inequalities. Making primary care the “center” of the health system would ensure better resourcing and a greater decision-making role for providers. Despite these prospects, progress towards the development of “primary care-led” systems has been limited and, until recently, restricted to only a few western countries, and it is important to consider the reasons for this.

Barriers to primary care reform and forces for change

While the growth of PHC has generally been acknowledged, there has been less discussion of the barriers to reform and the forces promoting change. With respect to the first issue, there are four broad reasons why, internationally, there might be barriers to primary care reform: professional resistance, unhelpful health system arrangements, the market reform agenda of the 1990s, and existing power relationships. Firstly, although health professionals have shared values and work cooperatively in the interests of patients, the presence of strong, self-regulated professional associations promotes inward-looking approaches, presenting barriers to change in both process and structures. This is evident in practitioners' initial reluctance to adopt protocols and guidelines or to engage in new systems (Wilkin et al. 2001). Second, in terms of system arrangements, structural change requires a certain level of regulation. Markets do not encourage system-level change, although in the United States increased corporatization through managed care organizations has provided the framework for new patterns of care (Simonet 2005). On the other hand, highly regulated systems, as in former Soviet satellite countries, do not have the flexibility to arrange transitions to new structures. Third, the health reform agenda of the 1990s also created additional barriers to primary care reform, with its emphasis on markets and hospital efficiency. Even in the United Kingdom, where a "primary care-led health system" was proclaimed, the focus was on GP-fundholding, a mechanism designed to seek efficiencies in secondary care rather than primary care development or a population health focus (Green et al. 2007). Finally, traditional health system power relationships discouraged a greater role for primary care, with secondary care providers likely to express doubts over the capability of primary care and resistance from other stakeholders to competing claims for resources (O'Cathain et al. 1999).

Despite the barriers to change, an important countervailing force encouraging change in PHC internationally has been evident in more recent health services restructuring where governments and other purchasers have attempted to reorient health systems with the aim of achieving strategic goals. These goals have included: (1) achieving a collective approach to costs, equity, and quality issues, with the development of clinical governance and protocols marking a distinct change from the "cottage industry" of independent providers of the past; (2) achieving greater emphasis on preventive care and population health which can be linked to both fiscal and equity objectives; (3) achieving greater coordination between different parts of the health sector, one benefit of which is limiting unnecessary (avoidable) hospital admissions that have characterized many health systems; and (4) giving greater consideration to addressing health inequalities and inequities in access to care on the part of disadvantaged populations.

Any analysis of change must also take into account the sources of pressure for change and the aims of different stakeholder groups, including: (1) the rise of the "new public management" (Hood 1991) and the role of managerialism and state and corporate restructuring in restraining professional autonomy (McKinlay & Stoeckle 1988; Salmon 1995; Claxton et al. 1997; Barnett & Brown 2006); (2) changing professional relationships and the importance of clinical governance (Barnett 2001, 2003; Smith & Mays 2007); (3) the importance of deregulation of health care markets which has emphasized processes of "deskilling" (WHO 2000) and consumerism (Kearns & Barnett 1997); and, finally, (4) pressures from disadvantaged groups who have increasingly developed community forms of health delivery to provide alternatives to the more medicalized general practice model of primary care (Crampton et al. 2001).

New PHC models: for better or worse?

An important issue, and one intimately related to the political and social context and the power of the medical profession, has been the actual form of change. Different models of PHC have developed and these have quite different consequences for the populations they are supposed to serve. Three key models have evolved to varying degrees in different national contexts: professionally controlled collectives, corporately driven managed care, and social enterprise models or "third sector" care. While, the causes of these shifts vary from country to country, they share a common theme of improving health system performance via increasing efficiency and providing more integrated and, in some cases, more equitable care.

Professionally controlled collectives

Within many countries the 1990s saw the development of new PHC collectives such as independent practitioner associations (IPAs) in New Zealand or GP fundholding in the United Kingdom (Goodwin 1998). In both cases these were provider driven organizations which represented groups of formerly independent GP practices. In New Zealand, IPAs, modeled on entities in the United States where doctors began collective action against corporatization in the 1980s (McKinlay & Stoeckle 1988), were formed after 1991 by groups of GPs as a way of ensuring negotiating strength and managerial resources with regional funders who had been established as part of the newly established internal market (Barnett et al. 1998). IPAs, which eventually represented the vast majority of GPs, were owned and controlled by their members and although the latter became subject to internal group protocols, particularly with respect to laboratory and pharmaceutical expenditure (Malcolm 1997; Malcolm & Mays 1999), individual GP practices retained a high degree of autonomy.

Similarly in the United Kingdom, GP fundholding, introduced in 1991, also reflected the influence of trends in the United States and the desire of the Conservative government to encourage professional self-regulation, service integration, and increased efficiency. Unlike IPAs, however, fundholding was restricted to larger practices and also enabled GPs to purchase non-urgent hospital and community services on behalf of their patients. Despite perceptions that such contracts favored urban and more affluent areas, this generally was not the case (Baker & Hann 2001; Moon et al. 2002).

In both countries these models were soon superseded by larger collectives with expanded responsibilities, primary care groups (PCGs) in the United Kingdom and "third sector" primary health organizations (PHOs) in New Zealand (Barnett & Barnett 2004). These moves reflected changed political priorities and the desire of governments in both countries to strengthen primary care and widen its scope beyond that of general practice. As a consequence of accountabilities to public funders and the wider community, broadened responsibilities have affected the autonomy of GPs. The formation of group collectives has resulted in important efficiency gains even if these sometimes occurred at the expense of equity concerns. This was particularly the case in New Zealand where powerful provider organizations resisted government attempts to regulate the distribution of providers and fee levels (Barnett & Barnett 2008) and helped cause problems of access and wide dissatisfaction with doctors fees (Barnett et al. 2000; Barnett 2001).

Corporately driven managed care

While the formation of PCOs in New Zealand and the United Kingdom have been both a response to, and consequence of, government policy, this has been less true of managed care organizations in the United States, such as health maintenance orgainizations (HMOs). Although their formation was initially encouraged by Federal legislation in 1973, with most initially non-profit, managed care plans are now predominantly corporately owned. Managed care plans, have evolved as an important alternative to traditional FFS indemnity insurance and are now the main vehicle through which primary care provision occurs. Doctors may be salaried as part of a staff model HMO or may either be contracted to a health plan and paid primarily on a capitated basis as part of a group model or independent practice association or network HMO (Simonet 2005).

Most HMOs have used extensive clinical guidelines and because of their integrated approach and control over providers, especially in for-profit HMOs (Kletke et al. 1996), can ration access to both primary and secondary services. Although there is evidence that the growth of managed care was successful in slowing the growth in United States health expenditure in the early 1990s this appears not to have been sustained (Simonet 2005). Reasons for this have included: (1) difficulties of limiting hospital and physician costs; (2) the extension of such plans to cover more vulnerable Medicare and Medicaid patients; and, (3) the effects of a consumer backlash over poor quality of care (Blendon et al. 1998). Compared with FFS arrangements, managed care patients have suffered from more health problems, worse access to care, and have been less satisfied (Lillie-Blanton & Lyon 1998; Phillips et al. 2000; Safran et al. 2002). However, performance appears to vary according to alternative models of funding and ownership, with for-profit HMOs generally having poorer health outcomes than non-profit HMOs (Himmelstein et al. 1999). Despite the adverse publicity which surrounded managed care organizations in the early 1990s, more recent work suggests that access and utilization of Medicaid managed care programs were higher or similar to traditional FFS programs serving such patients (Simonet 2005). Nevertheless, while managed care plans may be more coordinated and comprehensive, research based upon patient responses reports higher satisfaction with FFS. This more favorable view is mirrored in a trend towards increased market share for FFS plans as patients seek more choice, despite higher costs (Draper et al. 2002).

Social enterprise models: “third sector” care

In contrast to the managed care model, which has traditionally ignored the uninsured and only recently enrolled lower-income federally insured Medicaid patients (Hellander 2006), social enterprise (SE) or community-oriented primary care models differ in that their focus has usually been upon more disadvantaged populations. Unlike IPAs or HMOs, they tend to be not-for-profit and exhibit strong community input at the governance level (Crampton et al. 2001).

While private ownership models can often be regulated to serve the interests of the community, there are some instances where private ownership will have a limited role. In areas where, for a variety of reasons (e.g. high needs populations or remoteness), there is little desire to practice, even if funding and incentives are provided, either public provision or community governance are essential to ensure access and supply. Examples here include Community Health Centers (CHCs) in the United States or the presence of community trusts, union health centers and indigenous (largely Maori) provider organizations in New Zealand.

These arrangements generally reflect a small proportion of all primary care in western countries (eg CHCs provide services to just under 5 percent of the US population (Rosenblatt et al. 2006)) but are becoming increasingly important especially in a number of middle income countries (Meads et al. 2006). This has been especially true in New Zealand where, due to government policy, "third sector" PHOs are now the dominant provider organizations. With a strong focus upon population health and issues of equity they stand in contrast to the doctor-controlled IPAs of the 1990s. Part of the interest by policy-makers in community governance lies in its ability to act as a countervailing force to the power of the medical profession and in some countries, including the United Kingdom, recent policy efforts to engage communities in primary care may have a similar subtext (Smith & Mays 2007). Perhaps more important is the greater potential of social enterprise models to deal with issues of health inequality by reducing co-payments and by emphasizing the integration of public health and primary care (Iliffe & Lenihan 2003). By focusing upon a population health approach the SE model helps practitioners identify patterns of disease and more innovative ways of addressing local health inequalities. Not surprisingly, such approaches often score highly on domains such as ongoing care, coordination of services, comprehensiveness and overall performance (Shi et al. 2003; Crampton et al. 2004; Gribben & Cumming 2007).

However, considerable challenges face new third sector groups. These include: questions of the size of the organizations relative to their tasks and their effectiveness in addressing health inequalities and building links with community, other government and voluntary agencies. In addition, further questions remain about maintaining provider enthusiasm in the face of increased bureaucratic control and performance requirements and their ability to bring about significant strategic change in secondary services through their commissioning role (Smith & Mays 2007). Perhaps the biggest challenge is the reduction in health inequalities, especially since this is often part of their political mandate.

Restructuring Hospital Systems

The increased emphasis on PHC in many health systems has generally occurred alongside and, in part, been a response to the ongoing high costs of providing hospital care. The emphasis on PHC and other forms of community care has been one response to reducing such costs, however, there have been marked changes within hospital systems themselves. These changes have taken on different forms in different countries, depending upon the political context and degree of state funding of hospital care, but generally there have been three main goals of restructuring: achieving greater equity of outputs, increased efficiency, and effectiveness. The first has focused upon allocating resources more equitably between regions, the second on reducing health care costs via service integration and improved provider accountability, and the third by improving the health impacts of service expenditure.

Attempts to achieve these goals have occurred through three main forms of restructuring which may loosely be described as involving redistributive, managerial, and market mechanisms. Redistributive forms of restructuring derive their origins from the ideas of Marx and Titmus and focus on targeting resources more effectively in response to population need. Managerial forms of restructuring effectively have focused on the transformation of public sector institutions and have been heavily influenced by the new public management focusing upon accountability and performance contracts to improve overall sector efficiency. Finally, health service restructuring has increasingly involved the use of market mechanisms both in terms of corporatizing the public sector and through increased privatization via the contracting out of services to both the private and voluntary sectors (Pinch 1997). This form of restructuring has been heavily influenced by public choice theory and the rise of neo-liberal political philosophies in most western countries. Competition and consumerism are its two keynotes.

Each form of restructuring has been accompanied by its own set of debates and controversies, but some common themes have generally pervaded each attempt at reform. We focus on three issues in particular:

- hospital privatization and its desirability;
- improving public sector performance – public hospital restructuring;
- the primary–secondary interface – reducing avoidable hospital admissions.

Hospital privatization

Geographical research examining hospital privatization and its implications has been limited. Indeed there has been a paucity of work since the edited volume on health services privatization by Scarpaci (1989). Surprisingly, this has been particularly evident in the United States where, despite the importance of privatization, little research has been conducted since the early work of Bohland and Knox (1989) and McLafferty (1989). For example, North American health geographers have added little to the debate over managed care, probably the most important form of health sector restructuring in the United States since the 1960s. Consequently, important geographical work has been done by other disciplines, most notably health economists, the work of Dranove et al. (1998) being a prime example. Elsewhere only Mohan (1984, 1988, 1991a, 1991b, 2002) and to some extent the present author have consistently examined privatization trends (Barnett & Barnett 1989; Kearns & Barnett 2003; Barnett & Brown 2006). As a consequence, there are numerous gaps in our geographical knowledge of recent trends in the structure of hospital systems and of developments in hospital policy and their implications.

Privatization, when viewed in terms of private expenditure as a proportion of total health expenditure, has proceeded furthest in countries such as the United States, Greece, Switzerland, and Australia. Efforts to privatize hospital systems perhaps reached their zenith in the 1980s and 1990s in countries, such as Britain and New Zealand, where untested neoliberal ideas from North American think tanks (Navarro 2007) were implemented in the development of internal markets in public hospital systems and via government encouragement of private sector providers (Mohan 2002; Barnett & Brown 2006). Privatization was also encouraged by the ready availability of investment capital (Bohland & Knox 1989) and by the desire of corporate providers to constrain clinical freedom as a way of containing health care costs (Salmon 1995; Hellander 2006).

Health services privatization was seen as a panacea for the ills of the Keynesian welfare state. Consequently governments were uncritical of simplistic ideas such as those of Donald McNaughton, former chairperson of the board of the Health Corporation of America, who once declared that "competition makes for better health care it's just that simple" (cited in: Barnett & Kearns 1996). Unfortunately, it was shown not to be that simple where, even in the United States, increased competition between (fee-for-service) hospitals for patients drove up hospital costs (White 1987), forced voluntary non-profit hospitals to become profit-oriented and turn away the uninsured (Salmon 1995; Kennedy & Morgan 2006), and resulted in increased numbers of hospital closures, the most significant of which were voluntary hospitals serving poorer neighborhoods (McLafferty 1989). Large numbers of hospital conversions also took place, particularly in sunbelt states (especially California, Florida, and Texas) as either voluntary and public hospitals were taken over or sold to corporate buyers (Needleman et al. 1997). However, despite growing numbers of conversions there is still debate as to their community effects especially in terms of how conversions affect the quality of services (Cutler 2000). Nevertheless, more recent evidence suggests that such conversions are detrimental both to hospital staff and patients. Picone et al. (2002), for example, found that hospitals converting to for-profit ownership were more likely to markedly increase their profitability, have staffing reductions and increased patient mortality. Similar trends were not observed in those hospitals which converted from for-profit to non-profit status. These trends resonate with similar experiences within the managed care sector where, despite some initial success in driving down hospital costs, this was only achieved at the expense of restricting access to care. The strategy of giving with one hand, of offering comprehensive benefits, but taking away with the other, via severely restricting access through utilization review, infuriated consumers and resulted in a managed care backlash and a reversion to fee-for-service payment, a trend which is still continuing (Blendon et al. 1998; Robinson 2001; Simonet 2005; Hellander 2006).

In other countries, such as New Zealand, the adverse affects of neoliberal strategies on the financing and provision of care were also evident. Public subsidies of private hospitals did not produce the desired efficiencies and, if anything, the growth of private hospitals had a detrimental affect upon the public sector as it drew away public surgeons and resulted in increased public waiting lists in areas where the private sector was strongest (Barnett 1988). Similar concerns have been voiced about co-location of public and private hospitals in Australia (White & Collyer 1998; Bloom 2000) and Ireland. In Australia, as in the case of the UK private finance initiative (PFI), the contracting of the private sector to build, own and operate (BOO) public hospitals has been controversial. Critics have argued that PFI developments have resulted in significant increases in capital costs, loss of bed capacity, and reductions in staffing (Gaffney et al. 1999; Mohan 2002). The high costs of private capital have been politically justified due to the fact that the private sector is now bearing most of the risk in the construction and subsequent management of hospitals, yet many would argue that the large risks said to be transferred are not justified (Pollock et al. 2002). This has been particularly the case in circumstances where there have been design flaws in newly constructed public hospitals or where governments have had to financially rescue failed PFI developments, as in the case of LaTrobe Hospital in Victoria, Australia. Nevertheless, public-private partnerships like PFI or BOO have proved attractive to governments since they provide a short-term solution to providing hospital facilities even if public procurement may be less costly in the long term. However, these and other developments such as foundation hospitals in the United Kingdom, while they may promote increased competition and patient choice between public hospitals, are likely to widen, rather than reduce, disparities between places in access to health care (Mohan 2003).

Public hospital restructuring

The backlash against the social and economic costs that have accompanied past attempts to privatize hospital systems has also applied to similar attempts to introduce internal market reforms into public hospital systems. The introduction of internal markets in hospital services in countries such as the United Kingdom or New Zealand in the 1990s replaced earlier attempts at managerial reforms which still remained typical of other countries like Canada (Hanlon & Rosenberg 1998) or Australia (Bloom 2000). While internal markets had a number of potential advantages, such as integrated budgets, integrated planning, less cost shifting and a greater potential for service innovation, they suffered from a number of disadvantages. Provider competition was not possible in small hospital "markets," efficiency gains were often less than expected, competition, where it did take place created a climate of distrust between different providers, and the clash of managerial and professional cultures resulted in workforce unrest (Hornblow & Barnett 2000). Also, devolution of service purchasing increased regional inequalities in service provision and inevitably resulted in service rationalization as providers sought to cope with fiscal deficits (Barnett 1999). It was also a means by which central governments could avoid blame for local difficulties.

The local consequences of such processes were numerous. Faced with serious financial deficits and possible closure, many public institutions were forced to market themselves to attract paying patients as a way of generating additional income, while others attempted to generate additional revenue by opening fast-food franchises (Kearns & Barnett 2000). Such "place-marketing" reflected the new commercial ethos of these public institutions but was at odds with their health goals. However, service rationalization involving closure or attempted closure of many local hospitals was often the main outcome (Mullner et al. 1988; James 1999; Barnett 2000; Hanlon 2001; Wilson & Rosenberg 2002). Such trends gave rise to *geographies of resistance* whereby communities and other affected groups fought such changes (Moon & Brown 2001; Barnett & Barnett 2003).

However, the political backlash against privatization also occurred with the result that the market reforms soon yielded to a softer "third way" approach to social policy (Powell 1999). This was evident in the development of a more pluralistic welfare state with more non-state actors being involved in the delivery of health services (Milligan & Conradson 2006). Yet, many of these issues remain relatively unexplored within the geography of hospital provision and this has been particularly true with respect to the links between primary and secondary care. Given that one of the goals of PHC policy in many countries is to lessen dependence upon expensive hospital services it is to an examination of the primary-secondary care interface that we will now turn.

The primary–secondary interface

With PHC gaining a more pivotal role in the provision of health care, there has been increasing pressure to improve efficiency and effectiveness of the care provided. PHC has in most countries become the gateway to secondary care with general practitioners becoming the first point of contact. However, where providers failed to manage or diagnose early conditions, unnecessary and expensive hospital care (Sheerin et al. 2006) was often the result, particularly in countries which had significant cost barriers preventing the use of PHC (Barnett & Lauer 2003). In the 1970s the term ambulatory sensitive hospitalizations (ASH) or "potentially avoidable" admissions emerged as a result of the US Institute of Medicine's attempts to identify admissions due to specific medically diagnosed conditions that may serve as an early identifier of problems within primary care (Ricketts et al. 2001).

Effective health care delivery at primary care level may result in considerable cost savings (Sheerin et al. 2006). In the United Kingdom, for example, Wanless (2002) estimated that if the worst 25 per cent of health authorities were to increase their performance to the level of the next 25 per cent of health authorities, then within 5 years there could be a reduction of 120,000 potentially avoidable admissions, saving an estimated £220 million at 2001 prices. However, identifying such conditions has greater implications than costs of hospitalization in that the personal cost of disparities in health care can lead to significant morbidity, disability, and lost productivity at the individual level.

Despite the identification of "potentially avoidable" conditions in the late 1960s, there has been little interest by geographers in the primary-secondary interface. Consequently a number of important questions remain. First, there has been little debate regarding the effects of PHC upon ASH hospitalizations. Ricketts et al. (2001), for example found, in North Carolina, that while ASH rates were related to income, employment, and ethnicity, a trend found in other studies (Reid et al. 1999; Roos et al. 2005; Saxena et al. 2006), there was no strong relationship with the level of primary care resources. Second, others have also suggested that ASH admission rates may also depend, at least in part, on hospital admission policies, and are also affected by variations in the choice of ASH indicators, which is critical when such indicators are intended as a measure of performance of PHC (Caminal & Starfield et al. 2004; Ansari et al. 2006). Third, despite the restructuring of PHC and a greater emphasis on early intervention/diagnosis and population health approaches in many countries (Barnett & Barnett 2008), it is unclear how such changes have affected the rate and geography of ASH admissions. In New Zealand, for instance, there is some evidence that these have continued to grow (Copeland 2010 forthcoming). Moreover, while GP practice variations in European ASH admission rates are largely explained by variations in the composition of the practice population, this is not the case with the indigenous Maori population (Barnett & Malcolm 2008). This suggests that the effects of compositional and context variables upon admission patterns is complex and involves interactions between different types of patients and their PHC service providers.

Future Directions and Conclusion

In order to bring this chapter to a conclusion, we identify in this section a number of areas, in addition to those already mentioned, where we believe health geography research might make a contribution to knowledge. As we note above, an important consideration in discussions of health service restructuring has been the effects of restructuring on access to health services and health outcomes. While geographic studies of utilization have examined inequalities in access to health care on the part of different groups, less attention has been devoted to the *quality* of health services received. This is an important omission, especially given early calls to investigate both the quantity and quality of services delivered to different groups of patients (Powell 1986) and also because of the need to evaluate the effectiveness of health expenditure in terms of improving population health.

There is a growing body of evidence which suggests that, while lower-income groups may be heavier users of services, higher-income patients are more likely to receive more comprehensive care from their doctors. In the case of primary care researchers, in a variety of different contexts, have found that time spent with the doctor, or the likelihood of the request or access to diagnostic tests, including follow-ups, varies inversely with socio-economic status (Wyke et al. 1992; Scott et al. 1996; Krupat et al. 1999; Furler et al. 2002; Williams et al. 2004). Similar trends have been observed in the hospital system with lower income groups having shorter lengths of stay (Barnett & Lauer 2003) and in some cases certain minorities have been reported as less likely to be referred for surgery than other groups with comparable needs (Gatrell et al. 2002).

The fact that there are both socio-economic and ethnic biases in the way such patients are treated suggests ingrained forms of exclusion within different health systems. Whether such findings reflect communication barriers or the existence of active discrimination by health professionals is unknown, but the fact that such biases arise in a number of different areas of treatment (e.g. general practice, mental health care and cardiac surgery) in different health care systems indicates that they are pervasive. These trends suggest a number of important issues which require further investigation, including:

- determining the extent of such forms of exclusion and their prevalence in different areas of health care across different types of health systems;
- determining the extent to which the background and clinical behavior of health care providers leads to such forms of exclusion;
- assessing the extent to which structural factors (e.g. segregation and scarcity of health resources, both fiscal and human etc.) which are likely to influence the rationing of health services;
- determining the extent to which social exclusion in terms of quality of services received adversely affects health outcomes.

A second area that might benefit from the potential insights offered by health geographers relates to issues affecting the performance of national health systems and especially the availability of skilled health workers. Shortages of skilled health workers have affected the ability of both the primary and hospital sectors to carry out their tasks with the result that richer countries have been active in recruiting health workers from around the world. Migration patterns generally follow a hierarchy of wealth, from poorer to wealthier countries or from middle-income to richer countries, where terms and conditions are better. The out migration of nurses from New Zealand to Britain or British nurses to the United States is a case in point. Skilled migrants from developing countries often form part of a visible "ethnic minority" in richer countries. Frequently the reliance on overseas labor has been to fill less desirable posts which have been avoided by locally trained medical graduates (Iredale 2001).

Major political shifts and historical ties have shaped the territoriality of medical labor markets. In the United Kingdom, for example, traditionally doctors entering general practice and hospital medicine have come from India and Pakistan, but the redrawing of the map of the European Union and the attendant creation of a single labor market has resulted in increasing numbers of migrants from Central and Eastern Europe. However, the presence of more restrictive immigration and registration policies means that the changing geography of migration needs to be viewed through the development of regional or traditional rather than global labor markets. International medical graduates (IMGs) entering New Zealand, for example, are largely drawn from (European) Commonwealth countries, to the exclusion of countries elsewhere.

The impact of such trends on both richer and poorer countries is now attracting increased attention in the literature. However, unfortunately, despite the importance of globalization, geographical research on the medical migration has been limited to exploring the impact of IMGs on the availability and, to a lesser extent, the quality of care particularly in the United States (e.g. Mick & Comfort 1997; Baer 2003). Despite this early work, significant gaps remain in our understanding of globalization and the migration of health professionals. The following areas, in particular, would seem to be worthy of increased research:

- patterns of global (and regional) migration and how these have been affected by social and health policies in richer and poorer countries;
- the impact of the global brain drain upon the performance of health systems and the structure of the health workforce in poorer countries;
- the impact of IMGs upon patterns of care by specialty and location in receiving countries;
- retention issues – what aspects of place are important in influencing retention rates of IMGs and their relations with patients and the communities in which they practice;
- processes of social exclusion which may affect the career and locational choices of different groups of IMGs.

In conclusion, it is important to note that the provision of health services in a cost effective and equitable fashion is one of the most significant functions of the contemporary welfare state. Yet it remains one of the most difficult, mainly due to the competing demands for increasingly scarce resources as populations age and as medical technologies become more complex. Also, its pluralistic character means that governments face the difficult task of funding and regulating a diverse array of health care providers as they attempt to improve levels of service efficiency and to ensure an equitable provision of care. Unfortunately, achieving these two goals has often proved illusory as costs have continued to rise and because of professional resistance to any loss of professional autonomy.

The challenge for health geography is to gain a better understanding of such trends both in terms of their causes and how they vary from place to place but also how local political cultures have affected the nature of power relationships and the health care policies which result. We see this as being important for a number of reasons. First, it is important to develop more comparative research which emphasizes the importance of political culture as a factor in the development of health policy and how it has changed. Second, processes of health sector restructuring need to be placed in the context of wider changes which have affected the structure of the welfare state, such as globalization and neo-liberalism. There has been a dearth of research which has attempted to integrate macro- and micro-theories of restructuring (e.g. regulation theory and proletarianization) as a way of gaining a greater understanding of restructuring processes and their social and spatial impacts. Third, we think it is important that geographies of health services pay greater attention to more macro-processes since these affect the micro-contexts which we have been so concerned about in recent years.

This is not to downplay the significance of cultural concerns in health service delivery but simply to re-emphasize the significance of the bigger picture. The recent resurgence of interest in landscapes of voluntarism (Milligan & Conradson 2006) provides a model of integrating macro and micro concerns. Similarly, while there has been much interest in place effects upon health (Macintyre et al. 2002), geographers have paid less attention to contextual determinants which have shaped health service change at both the national and local scales. This is an important oversight and one that needs to be rectified if we are to better understand processes of health restructuring and the wider implications of such changes for tackling inequalities in health and health care. Finally, such an approach may also help give our research a more important policy focus and lay to rest Martin's (2001) criticisms of the "policy turn that never happened," well at least for health geography.

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Chapter 27

Accessing Health Care

Thomas C. Ricketts

Introduction

Access is a concept that has practical and physical characteristics as well as serving as a symbol for arguments for justice and equity. In geography, there is a formal recognition that the relationship of people to their lived spaces affects their health. There are two major ways to consider how space affects health and they are as an ecological determinant and as a matrix of structures and processes that can be manipulated to allow for use (or non-use) of health care and health promoting activities. In the health services research literature, access has been considered in the context of an interaction between a person as patient and a healer, usually a professional. This dyadic form of access can be examined in a framework where appropriate use of services can be seen as a desirable policy outcome as well as contributing to an individual's health (Aday et al. 2004).

There is as well a population-level consideration that assumes a relationship between access and population health outcomes (Shi 1992; Starfield & Shi 2002). Population level comparisons contribute to our assessment of inequity in access and many studies have documented systematic differences in access to services that can be linked to unfavorable health outcomes (Goddard & Smith 2001). The weight of the evidence of the relationship between access to care and health status led to the promulgation of the "Declaration of Alma-Ata" from the WHO International Conference on Primary Care in 1978, which stated that primary care should be brought "as close as possible to where people live and work, and constitutes the first element of a continuing health care process" (International Conference on Primary Health Care 1978).

Plans that considered aggregate geographic accessibility have a long history in the organization and planning of health systems. In the United Kingdom, the so-called "Dawson Report" promoted a regionalized system of accessible health care units distributed according to population need (Dawson & Bond 1920). That was an early expression of a policy to promote equity of access. In the United States, the Committee on the Costs of Medical Care used the Dawson Report as a stimulus for their own plan for regionalized services to promote equity of access (Committee on the Costs of Medical Care 1933). Neither of these plans was implemented. The failure of systems and governments to provide adequate access to health care services was observed by Tudor Hart who coined the "inverse care law," which theorizes that the availability of health care services varies inversely to need (Hart 1971). In response to these repeated observations, access to health care became a political symbol (Stone 1997) of a desired policy goal for health systems of many nations. When politicians propose a system that assures access to health care, they then invite the measurement of its achievement. It has been the promise of these policies that promote equality of access that has driven much of the investigation into what does guaranteed access imply and how can it be measured.

Geographic texts that deal with access to health care have relied, in the main, on frameworks from outside the discipline of geography. Powell complained in the inaugural issue of *Health & Place* that geography, especially medical geography, had been subordinated to medical sociology and the policy sciences in the study of health care, especially in terms of access (Powell 1995). That trend has been countered by a robust application of spatial analysis and GIS method to problems of measuring access to services (Higgs 2005). These analyses depend on access being defined in terms of use.

Geographers tackled the problem of spatial accessibility well before the development of formal theories and frameworks for access (Shannon et al. 1969, 1975). These earlier discussions of access drew on concepts that were familiar to business and marketing as well as health services. Two examples of definitions within geography show how the concept spans disciplines. Henri Picheral in his *Dictionniare Raisonné de Géographie de la Santé* uses the French term *accesibilité* and cites the qualities of distance and time as well as proximity as characteristics of access. But he adds that it is a "social indicator" that measures inequality and can be seen as a "determinant of health" as well as a risk factor (Picheral 2001). The *Dictionary of Human Geography* sees accessibility as ranging from the simple measure of the "ease with which one place can be reached by another" to a more complex set of measures that apply to populations and to factors that are cultural and institutional (Johnston et al. 2000).

In a geographic context, access is more often described in terms of distance to care. Distance is considered a component of access and is sometimes abstracted into the concept of availability – the measure of the physical proximity of services measured by distance or time. That element has been examined by some geographers as an essentially spatial problem (Joseph & Phillips 1984) and that interpretation has been carried forward in studies of how disadvantaged groups are spatially segregated from services. The idea of access as a physical characteristic of use of services is certainly appropriate when medical care is considered a service either offered in a market or as a benefit or even a right under a body politic. However, access can be viewed in other ways conceptually and even the idea of access as a function of the physical availability of a service might be modified to reflect how people experience space and actually use or view health care practitioners.

The geographic perception of access extends beyond concerns with distance to care. The overall structure of the health care delivery system is viewed as, itself, the product of larger forces that have shaped how we view health in society and how we organize space (Knox et al. 1983). There are even broader conceptualizations of access; for example, Pirie (1979) described accessibility as a "vacancy in an activity routine" and that it be measured by describing the "disruption" that was required to create the access. Further, access as a standard of justice may be considered a contested symbol. On the one hand, access would be interpreted as a standard of "realized" access or appropriate utilization of a formal service when needed. On the other hand, it could be an argument for "opportunity" where the individual is more or less free to choose to use health care, but whose beliefs and the intervening social environment may condition that pattern of use.

There is, then, no consensus on what the concept does represent and it is used interchangeably as a goal construct and as a rubric for specific measurement. Moreover, access may not be as important in some places, especially rural places (Arcury et al. 2005; Pierce 2007), as it is in others. This is a function of both the way in which space is perceived but also in the way in which a community sees itself in relation to the health services system (Acevedo-Garcia et al. 2008). The qualitative elements that go into perceptions of spatial access are not well understood but there have been conceptual descriptions of health behavior that explicitly consider how people perceive their local community and its services and how they view other places (Moos 1979).

Key Theories and Concepts

In the sections that follow, the main theories of access are described, as are some of the key issues (e.g. how to measure access) that have emerged. In addition, some attention is given to the ways in which geographers amongst others have engaged with and adapted these ideas.

Access as use

There is one dominant and several lesser-known theories of access as appropriate utilization of services, and all of these include an element of spatial proximity in their make-up. The most important and most often cited is the "behavioral model of health services use" developed by Ronald Andersen and subsequently published with John F. Newman as a study of the societal and individual determinants of medical care utilization in the United States (Andersen & Newman 1973). This was expanded upon by Aday (Aday & Andersen 1974: 208), who called access "more of a political than an operational idea" but that it had "for some time been an expressed or at least implicit goal of health policy." That description of the place of access in policy continues to hold and, given the general acceptance of the Andersen, Aday, Newman framework for access, the concept has taken hold in research as an organizing framework which is often used to influence policy-making.

The key thing that Andersen and his colleagues noted was that earlier concepts of use of health care focused on two major alternative dimensions: the characteristics of the population versus the characteristics of the delivery system. They also noted that it was the use of service and outcomes of the use process that could be used to measure access. They expanded this structure to identify five components: health policy; characteristics of the health delivery system; characteristics of the population at risk; utilization of health services; and, consumer satisfaction as representative of a "framework" for the study of access. These components were labeled either “predisposing” – generally characteristics of individuals, or “enabling” – system or structural characteristics. The biological imbalance of individuals was termed “need” and also considered an important component of the core conceptualization. The overall framework included causal links and paths between and among the elements that led to an outcome of “appropriate utilization.”

In an explicitly geographic context, Guagliardo (2004) interprets these two dimensions as “potential” and “realized” access and contrasts the spatial from the aspatial. The spatial-potential studies, in his determination, focused on “distance and availability” but excluded utilization. Again, there are many examples of this approach and they are more often found in the geography literature. The realized-spatial studies included some aspect of utilization, these are often found in general health services research, but the spatial component may be very indirect (the relative supply of practitioners in a relatively large zone, a county, for example). Guagliardo sees “affordability and culture” as aspatial, this may exclude a point of view that is actually more often taken in geographic studies of place and space and use of health services.

The early users of this access concept attempted to create global indicators of access that focused on both process and outcomes. The process indicators were what have become the “usual” measures of having a “regular source of care”; the travel time to care; ability to get an appointment in a reasonable time; and, in-office waiting time. These have persisted as access measures and are regularly included in national surveys fielded by the Centers for Disease Control and Prevention (CDC) in their *Behavioral Risk Factor Surveillance Survey* (BRFSS) (MMWR 1998; Mokdad et al. 2003); by the Agency for Healthcare Research and Quality’s (AHRQ) *Medical Expenditure Panel Survey* (MEPS) (Berk & Schur, 1998a); and, the Center for Studying Health System Change and their *Community Tracking Survey* (CTS) (Cunningham 1999; Cunningham & Whitmore 1998) (see Table 27.1).

Another theory of access developed by Khan and Bhardwaj (1994) posits a spatial model of use that highlights the characteristics of the person, the proximal health care delivery system, and factors that either facilitate or thwart interactions between the two. The latter incorporates cultural and behavioral aspects of the individuals and communities. That model was adapted by Mobley, Root et al. (2006) in an analysis of access to primary care services and its relationship to “preventable hospitalizations.” The Khan and Bhardwaj framework can be considered as a more ecological conceptualization. Other work on access to health services may take a primarily empirical approach (Haynes 2003). Again, the core elements of the spatial component remain a function of time. The framework does imply that perception of time is an important factor in how people trade off their choices of how to spend their time in care seeking or other activities. The value of time in the decision of access health care is a focus of economists (Sloan 1977) but their measurement of access has been similar to that in other fields, as a direct measure of journey time or the overall time required to use health services.

Measuring access

Two useful texts in medical geography offer introductions to how access has been analyzed by geographers. Meade and Earickson’s *Medical Geography* devotes a

Table 27.1 Access indicators used in population surveys in the American context

Topic	*Indicators*	*Geographic implications*
Usual source of care	• Has usual source of care • Type of usual care • Reasons for lack of usual source of care • Usual course of care has changed • Reason for change of usual source of care	"Usual" may reflect influence of travel patterns for work or shopping.
Delays in obtaining care	• Not able to get needed care • Unattended medical problems • Specific service not covered by insurance • Consequence of not getting care • Care is getting (easier/harder) to obtain	Transportation opportunities may present significant barriers resulting in delays (see below)
Barriers to care	• Have trouble paying bills • Health plan refused care • Ease of getting care • Waiting times • Transportation options • "other" barriers (discrimination, language)	The friction of distance and transport opportunities are embedded in barriers and may interact with the economic and social spatial structure of a community.
Physician and hospital use	• Length of time since last visit • Number of physician contacts • Hospital stays • Reason for hospital stay	Hospital location may be distant or present special challenges if separate from the referring clinician.
Preventive health services	• Preventive behaviors are encouraged by professionals • Received well – child care • Received immunizations • Received mammogram, pap smear	Preventive services are often separate from curative services.
Satisfaction with care	• Attitude toward usual source of care • Quality of overall medical care • Availability of medical care • Ease of getting to physician • Costs of medical care	Time to care, transport opportunities, and options and interface with transport may present real challenges.
Satisfaction with health plan (coverage)	• Plan strongly influences physician decisions • Overall satisfaction with plan • Choice of providers • Referrals for specialists • Required to change primary provider	Programs and places may not be place related, and may offer different geographies of care by restricting options.

Source: Adapted from Eden, J. (1998), Measuring access to care through population-based surveys: where are we now? *Health Services Research* 33, 685–708.

chapter to accessibility, but many parts of the text are relevant (Meade & Earickson 2000). Cromley and McLafferty review methods for measuring access in their book, *GIS and Public Health*, and make an important distinction between formal and informal health care (Cromley & McLafferty 2002). They focus on access to formal health care in their useful guide to the fundamentals of the analysis of access. The key ideas of distance decay and the basics of measurement challenges in computing distance, interactions among optional opportunities, and the use of activity space concepts are covered in their text.

The spatial element in access has been measured in two principal ways: as the relationship between service supply in population groups (a physician to population ratio in a county) as well as a determination of "distance to care" measured for a population or for individuals. The use of ratios to indicate access to care is an established approach, while the use of distance and time to care has expanded rapidly with the advent of GIS systems that can quickly and accurately calculate distances (Ricketts 2003). Guagliardo (2004), citing a general taxonomy developed by Gesler (1986), describes four types of accessibility measures in geography: provider to population ratio, average distance to a set of providers, gravitational models of provider influence, and distance to nearest influence. The first three of the four of these measures depend on zonal data; that is, data aggregated to some geographic boundary. In epidemiological terms, this is the denominator. Kwan and Weber (2003) suggest that zonal data may lead to misleading results because of discontinuities in perceptions of individuals within the areas, systematic group differences (e.g. gender, race and so on), and the modifiable areal unit problem (MAUP).

The problems of perception are only now being explored with vigor and the MAUP is being examined more closely (Mobley et al. 2008). The MAUP problem in measures of service availability has been addressed to some degree by the GIS-based technique of creating "floating catchment areas" (Luo & Wang 2003; Luo 2004). That technique, which allows multiple areas to contribute to a locality's measure of accessibility based upon a fixed distance radius assigns values to all small areas, including those without any of the specific resources; in this case, primary care providers. This technique has been applied in multiple analyses of aggregate access. In New Zealand the FCA is used to create a local accessibility index for care services (Bagheri et al. 2006). A study of the accessibility of GPs in Wales combining road network and rasterized characteristics of the built environment made use of the FCA as an initial step (Langford & Higgs 2006). In specialty services, FCA was used to create accessibility indices for a population surrounding dialysis facilities (Yang et al. 2006).

In health services, there are many studies of spatial access to care documenting the distance from population centers or locations to specific services, but, as Guagliardo wrote in 2004, "despite decades of attention, we have surprisingly little quantitative information about the effect of spatial accessibility of care on population health, particularly regarding the effect of primary care" (Guagliardo 2004: 3). One difficulty in relating access measures to outcomes has been the aggregation of rates of mortality and morbidity to specific areas or zones. The construction of epidemiological denominators shares the same boundary problems as does the study of resources. In the case of outcomes, the use of geographically weighted regression techniques has overcome some of the problems of assignment of effect. A recent study that combines the use of floating catchment areas with geographically smoothed rates for outcomes, in this case, diagnosis of late-stage breast cancer, has shown the utility of the combination of approaches (Wang et al. 2008). An analysis on a national scale of the effects of access to primary care physicians and mortality using geographically weighted regression reveals the regional complexity of the relationship (Ricketts & Holmes 2007). Similarly, there are mediating transportation opportunities that facilitate access to services (Lovett et al. 2002) and the consideration of these needs to be reflected in any index that tries to capture the distance and transportation barriers to accessing care.

The development of GIS-supported analysis has made the study of access much more tractable but the rise of the information technology that supports analysis of spatial phenomena also has changed the way in which people use space. This has affected how we can understand access. Kwan and Weber sees an information-mediated urban landscape that is much more complex in terms of how it affects use of services and access to health care (Kwan & Weber 2003).

Consumption landscapes and health care access

The degree to which use of health services follows patterns of general consumption has been examined in a cultural sense by Gesler and Kearns, geographers who have noted the recent introduction of consumerist values into health care (Gesler & Kearns 2002). It would be more accurate to speak of the re-introduction of consumer emphasis because medicine, especially in the United States prior to the early twentieth century, was a largely entrepreneurial enterprise characterized by extravagant claims and a very business minded orientation (Starr 1982). Gesler and Kearns included a brief section entitled the “malling of medicine” which recounted efforts by the government of New Zealand to promote “shopping around” for health care (Gesler & Kearns 2002). What they did not anticipate was the actual inclusion of medical care services into shopping malls and so-called “big-box” stores such as Wal-Mart where new “minute clinics” were being opened at a very fast pace in the United States (Malvey & Fottler 2006). These retail clinics, which are now to be found in other national contexts, are described as meeting the needs for “convenience” for patients and provide a form of access that combines general commercial activity with health care seeking. There has been a similar growth in the opening of worksite clinics with 44 percent of those that opened since 2000 listing “improve access to care” as one reason for their establishment (Dolan 2008).

A somewhat parallel development is the expansion of the “HealthStore Foundation, Child and Family Wellness” shops program currently in Kenya but being expanded into other African nations (Bhandari et al. 2008). These are small businesses, called “micro-franchises,” often run by nurses, that function in communities where a public clinic may also operate. The “health stores” can be considered extended pharmacies and are owned and staffed by professionals who offer basic medical advice.

Focus on inequality

The Andersen framework (see Figure 27.1) was used primarily to demonstrate that there were persistent and predictable inequities in “realized access” or use of services and the framework itself put forward as a way to structure the evaluation of the degree of inequity as well as explore policy solutions (Aday et al. 2004). Aday also came back to the 1968 Andersen model to describe the structure of health services research as a mechanism for assessing the efficiency, effectiveness, and equity of health care (see also Aday et al. 1998). The framework was used to describe the

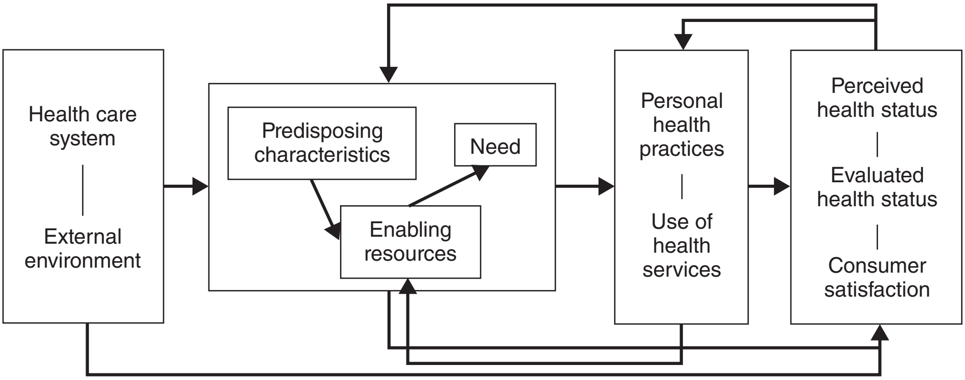

Figure 27.1 The Andersen model of access. *Source*: Adapted from Andersen, R. (1968) *A Behavioral Model of Families' Use of Health Services. Center for Health Administration Studies*. Research Series, no. 25. Center for Health Administration Studies, Chicago.

process as one way to evaluate equity in the provision of health services and included a general outcome measure of "health" status for individuals and communities. In the 2004 edition, health status was viewed more as a central characteristic of populations that depended on a web of influences. The value of using health status as an outcome was reiterated in an empirical study of safety-net ambulatory care services on a low-income, urban population (Brown et al. 2004). The use of the Andersen framework in that study was supported by a commentary that emphasized how it could be used to structure an assessment of "contextual" factors (Davidson et al. 2004, Andersen et al. 2002). This extended related work that focused on community characteristics as an important element in assuring access and which supported the need to measure policy effects at the community level in order to understand how well systems can support or ensure.

Alternative Theories: Access as "Fit" in Theory and Practice

Having discussed some of the key theories of access, the following section outlines an alternative approach, "access as fit." In addition to reviewing the main features of this approach, the following section provides examples of the ways in which it has been applied in practice. However, as noted below, despite the value of this alternative approach, it is the Andersen-inspired framework that has historically been used in research and evaluation studies.

Access as "fit"

Roy Penchansky proposed an alternative approach to understanding access that focused on the interaction of key elements that determined use of services (Penchansky 1977; Penchansky & Thomas 1981). Penchansky suggested the concept of "fit" between the patient's needs and the system's ability to meet those needs He suggested that this fit could be measured across five dimensions: *availability* which is the volume of physician and other health care services; *accessibility*, the spatial or geographic relationship between the providers of health care and the users of care; *accommodation* describes the organization and content of the health care system as it relates to the ease with which people can use care (clinic hours, waiting time, and length of waiting time for an appointment); *affordability* is the financial ability of the population to use the care provided by the system and the perception of value on the part of patients; and *acceptability*, which represents the attitudes of the users of health care toward the providers, and *vice versa*. Penchansky and colleagues subsequently used this concept in empirical studies (Thomas & Penchansky 1984). The relative emphasis on location and transport resources reflects a qualitative difference from the Andersen model which tends to treat spatial relationships as a covariate rather than as an essential component of access.

Applying the "fit" concept

A practical application of the "fit" concept was proposed by Taylor to underpin the development of indices of under-service (Taylor & Ricketts 1994). This combined metric has been used in the development of proposals to modify the federal health professional shortage area (HPSA) and the medically underserved area (MUA) designations that are used by the US federal government to allocate resources for safety-net care (Ricketts 2002; Ricketts et al. 2007). The "fit" concept essentially suggests that there are recursive interrelationships between resources, needs, and demands that can be measured. This structure is illustrated in Figure 27.2.

Julio Frenk extended the work of Penchansky and Thomas crediting Donabedian for the idea, to suggest that "fit" was a process of adjustment between the population and the health care delivery system (Frenk 1992). Frenk also noted the internal problem of using terms which have not been clearly defined but are used interchangeably (e.g. access, accessibility, and availability) and he emphasized the interpretations that might be considered more spatial or those that have been considered more often in geography. Frenk sketched a narrow, intermediate, and broad domain for the consideration of the accessibility concept, shown in Figure 27.2. To Frenk, then, access is the ability of a person to utilize health care given a need and/or desire to obtain it, while accessibility is really the degree to which a person needing and seeking care actually receives care.

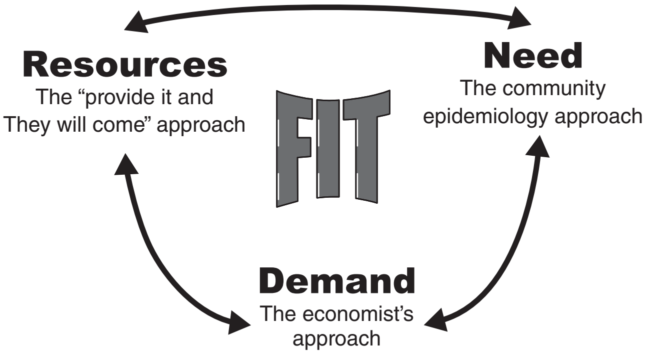

Figure 27.2 Access as "fit" among resources, need, and demand.

Another typology has been offered by Hall and colleagues to distinguish "geographic accessibility" from other aspects of "contact" and "appointment" accessibility (Hall et al. 2008). This partitioning of access into elements of the experience follows the lead of Frenk and illustrates the importance of feedbacks within system of care. Those elements can affect the effects of distance and the way people negotiate spatial elements of a health care system (see Figure 27.3). The Institute of Medicine (IOM) published a study of access to health care in the United States with a focus on indicators to track changes in access over time (Millman 1993). The IOM carefully defined access as "the timely use of personal health services to achieve the best possible outcome." This definition repeats the emphasis on utilization but focuses on the individual patient and rates developed from individual encounters in the medical care system. The tight link drawn by the IOM between system characteristics and appropriate use reflect the interactive and cyclical processes described in the "fit" concept than the more linear Andersen framework.

Dominance of the Andersen framework

However, it is the Andersen-inspired models and frameworks that historically have been more often used to guide research and evaluation studies on access than the "fit" approaches of Penchansky, Frenk, and others. Eden described how access measures are operationalized in commonly used survey data in the United States (Eden 1998) and that review serves as a useful listing of studies of access motivated by the Andersen framework. A summary of those indicators is included in Table 27.2. More recently, the Penchansky model has been more often invoked in analyses of access that are discussed in the geographic domain. The Khan and Bhardwaj framework emphasizes Penchansky more than Andersen (Khan & Bhardwaj 1994).

The various outcome measures or indicators of access have not been subjected to a careful study of their interaction. Although most large-scale studies include nearly all elements of access described in the Table 27.2 they are often reported in the scientific literature with a focus on a single aspect such as "usual source of care" (Lambrew et al. 1996), or which focus on a general assessment of access in relation to costs (Fisher et al. 2003) or to system structure (Reschovsky 1999). There is

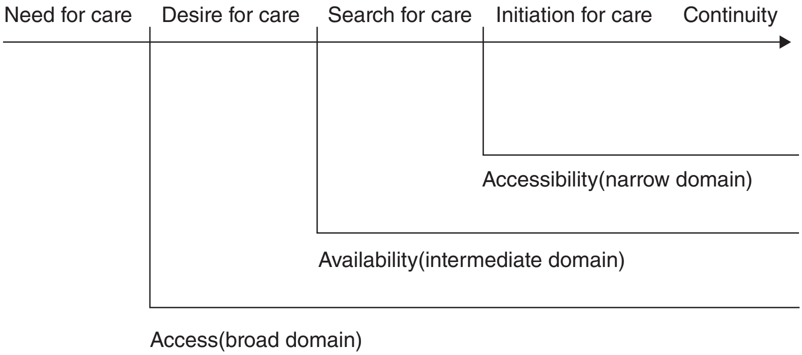

Figure 27.3 Frenk's domains of access, availability, and accessibility.

Table 27.2 Ethical and empirical foundations of the goal of equity of access to medical care

Goal of equity of access to medical care	Criteria of equity	Dimensions of access	Indicators of equity of access
Freedom	Freedom of choice	Availability in system due to: organization financing	Distribution of providers; types of facilities; source of payment
Equality of opportunity	Similar treatment for similar disease	Population characteristics predisposing (age, gender, race, education, religion); enabling (income, usual source, insurance); need (perceived, evaluated)	Regular source of care, insurance coverage
Adequate medical care	Decent basic minimum	Type, purpose of use of services	Use of selected services
Effective medical care	Cost effectiveness		Use of selected service relative to need
Overall		Satisfaction	Opinion of patients, public

Source: Adapted from Gold, M. (1998), Beyond coverage and supply: measuring access to healthcare in today's market. *Health Services Research* 33, 625–52.

evidence that certain aspects of any of the proposed access frameworks or models have much less influence on outcomes. For example, local supply of practitioners does not correlate highly with use of services or satisfaction with care (Berk et al. 1983; Grumbach et al. 1997); and role of "usual source of care" is not significant in affecting use of services (Smith & Bartell 2004). What has been shown to be more important is insurance coverage, race and ethnicity, and income (Berk & Schur 1998b; Schur & Berk 1998). Spatial considerations, such as transportation difficulties and time to get to a clinic, are asked in some surveys, especially those that focus on access in rural areas (Pathman et al. 2006).

In the United Kingdom the *National Surveys of General Practice* focus on waiting times, satisfaction, and perception of treatment and staff courtesy. No questions are asked about ease of journey to seek care or any other spatial measures. The same applies to the 2006 *Survey of Local Health Services*; geographical or spatial access may not be considered an issue in the NHS based on its absence from assessment tools.

Questioning Access Theories

In the following section, it is argued that current analyses of access have a tendency to overlook the complex reality of people's lives and the ways in which this complexity impacts upon their access or otherwise to health-care services. In this section, the importance of this complexity to theories of access is discussed.

The dimensions of time, anticipation, and experience

In general, it is possible to say that much of the analysis of access has been done using cross-sectional analysis and the models that have been used to guide that study are relatively static. They tend to relate to discrete events where a person is in need of services, seeks them out and receives some form of care, advice or therapy, and the outcome is measured. At the population level, it is relatively fixed variables that are considered such as overall insurance coverage, ratio of practitioners to population, and organizational characteristics such as staffing, hours, or physical amenities. In reality, people have many opportunities to react to needs or perceived needs and their reaction depends largely on how they anticipate the system will react to them, how much they trust the system, and how much benefit they feel they will derive from using health care (Mechanic 1998). This process depends a great deal on how people perceive the health care system and health care itself. Studies of attitudes toward health care systems and their effects on use have not been numerous although this is seen as an important factor in the process of care.

Understanding how and when a person seeks to use health care services and when that process starts and ends can shed some light on how well access models and frameworks can be applied in real-world policy-making or management. There are three types of events that can activate the access process: seeking screening, becoming ill and aware of the illness, or becoming injured or suffering an illness that others can detect. Blanchard and Lurie demonstrated that persons who were shown disrespect were more likely to avoid subsequent necessary care seeking (Blanchard & Lurie 2004).

Attitude toward the caregiver or care system by the patient is also important in the choice to access or use health care (Fiscella et al. 1998, 1999). Analysis of the NMES data in the studies by Fiscella and colleagues found that, after controlling for socio-demographic traits, persons with higher levels of scepticism were less likely to use appropriate services and scepticism was associated with higher mortality. A study of the interaction of patients with primary care physicians found that the development of trust had important effects on continuity of care (Lings et al. 2003). Another study found that trust was a key predictor in whether a patient would choose to leave a primary care practice in a managed care system (Safran et al. 2001)

The process of care seeking and resolution of needs involves interactions with practitioners and institutions that may or may not persist. Practitioners often move or change the content of their practice and institutions and organizations constantly change their scope and their locations; the places where people go to seek and receive care regularly appear and disappear, especially in fast growing or contracting communities. There is little known about this structural transition in the system. There are few studies of transitions and their effects on how and whether people receive appropriate care. An analysis of the Community Tracking Household Survey data found that change in "usual source of care" was associated with greater unmet needs and lower satisfaction with care but those reporting a change were more likely to report a physician visit that those without a change (Smith & Bartell 2004).

The role of agents in this process, whether they be physicians, nurses, family members, or others, is not all that well understood in a framework of access. For example, in mammography screening, there is some research that looks at the simultaneous input of physicians and patients to whether or not to get screened (Hawley et al. 2000) and the role of the physician appears more crucial than others in the process. Andersen initially focused on families and their lifecycles as the context in which to examine access to and use of health care services (Andersen 1968); this inclusion of a potential agency structure does not appear to have been pursued in subsequent research using the framework.

This more dynamic picture of the system of access or utilization was considered in Andersen's original work, where he focused more on the behavioral aspects of the process and how behavior was affected by learning: "Theoretically, use of health services can be viewed simply as another form of human behavior" (Andersen 1968). He later re-emphasized the importance of learning in the framework of access, where the "outcome, in turn, affects subsequent predisposing factors and perceived need for services as well as health behavior" (Andersen 1995). This would imply that much more attention needs to be paid to use of care over time.

The research that has been done that formally considers the temporal aspects of access has generally fallen under the rubric of "continuity of care." Continuity in primary care is usually described as repeat visits to the same practitioner or practice or some formal attempt to follow up on care (Starfield et al. 1976; Steinwachs 1979). Rarely, however, are there studies of how people change as a result of their use of services (a temporal, experiential process) and how different components or elements of that system differentially affect use and satisfaction (a process that speaks to the transition of patients through the system from one element to the next). The changes that people undergo as a result of using health services or seeking to use them should be an important, if not central aspect of an access theory.

The importance of the feedback of experience and its effects on outcomes have been emphasized as a weak point in systems of care (Coleman & Berenson 2004). This is seen by the nursing profession as the challenge to managing the "critical pathway" for patients (Furaker et al. 2004). This notion of a critical pathway does suggest that there are models for attending to important processes within frameworks that describe the access process. Guidance for the management of chronic care has suggested that coordination of services may help with temporal changes in patient needs (Wagner et al. 1996) but there is no apparent structure to guide the development of attitude and trust among patients. It might be said that efforts to build "patient literacy" and competency as activated consumers of health care may be useful points of view in developing a comprehensive theory or framework for access that considers patient learning as a key element (Lee et al. 2004).

The problem of non-use

Evaluating the performance of any health care delivery system intended to increase or guarantee access should include a measure of non-use as much as actual utilization. In surveys of populations, people are often asked whether they have delayed or simply not gotten care due to some barrier factor such as inability to pay or distance to a provider. These measures of non-use are assigned to the population rather than to a particular system or location of care, rarely are they correlated and if there is some connection drawn, it is usually to identify problems in the community rather than to assess the performance of a safety net organization.

Non-use is generally not well understood. Delay in care may be due to myriad short-term conditions and decisions that are a function of how an individual interacts with their environment. Likewise, there are processes internal to the individual that might cause a person to deny pain or ignore symptoms. Care seeking also involves a wide range of agents and intermediaries whose jobs may be to fiscally "gate-keep" and control utilization. There is also the process of eligibility determination which poses a barrier for use to many people in itself and often results in a patient being denied care or the patient being frustrated and abandoning their search for care. There is evidence that there are active attempts to deter patients from seeking care by arbitrary denial of benefits or referrals or denial of care or deflection of the patient as a part of risk avoidance or de-marketing (Greenberg et al. 2004).

Conclusion: Reconciling Frameworks and Building a Unified Field

In conceptualizations of access, the "dynamic axes" of learning and adaptation may be present but, if they are considered, they are seldom considered to be important or dominant characteristics of the process. We continue to hear how the health care system suffers from a lack of coordination. The near universal agreement that this is the case can be seen as abundant evidence that we do not know how to integrate parts of the system that change over time or across space. Achieving a policy goal of equal, equitable, or effective access will require that we give primary consideration to these dynamic parts of the process and pay less attention to the more static elements of resources and structure. This proposal is, in one sense, an application of "systems" thinking, where the consequences of decisions concerning structure and process are recognized, measured against standards, then changes are made and their effects are anticipated (Feussner & Demakis 2000).

For access frameworks to be useful for stimulating change, they must relate to a functioning system that is capable of learning. Research that identifies predisposing factors as the most important determinants of appropriate use of care – realized access – must recognize that those factors are the hardest to change but that the delivery system must be changed to accommodate them. The same holds for enabling factors; insurance status and income cannot easily be modified. However, there are instances where processes that determine eligibility can change the apparent insurance status of individuals based on their predisposing characteristics. This usually occurs when a person presents in the system and the transition is motivated after the care-giving process has already begun. An access framework should be able to identify the intersections of predisposing and enabling components where the transformation from potential to realized access occurs. At these points it may be possible to estimate the effects of changes on access.

We have recognized that failures in quality are often due to systemic failures, especially in communications between elements of the health care delivery system. These failures can be seen as failures of access; taking the argument in the other direction, access can be seen as an essential component of high-quality health care.

By solving problems of access, which means ensuring effective access, we are bolstering one part of the metric of quality.

Access can be a learned behavior. This is because individuals have "careers" in their interaction with the health care system; they move from neophytes to adepts as they become patients or seek care and advice. Some may never make the transition to a skilled user of the system and suffer the consequences of reduced access. In a similar sense communities and populations exhibit patterns of learning and adaptation. There is an ecology of access where the desirable competencies that promote effective use of services compete with competencies to avoid interactions that negatively affect people's self-worth, sense of trust and community. In practical policies, we should also accept that individuals who use the health care system seek value for the effort and money they put in to care seeking. They function as patients and consumers who learn from their experience and choose to reject or accept the care they are provided to the extent they have a choice.

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Chapter 28

Location-allocation Planning

Frank Tanser, Peter Gething, and Peter Atkinson

Introduction

Access to health care varies across geographical space because of non-uniformity in the distribution of health service providers and the populations who make use of their services. Geographical information systems (GIS) and related spatial analysis methods provide a set of tools for describing and understanding the changing spatial organisation of health care, for examining its relationship to health outcomes and access, and for exploring how the delivery of health care can be improved (McLafferty 2003). Applications of these methods are becoming more common not only in communities of industrialized countries, but in economically marginalized communities of developing countries as well (Tanser & Le Sueur 2002). Quantitative geographical methodologies are increasingly being used in "location-allocation" problems in the field of health care planning to inform the optimal allocation of finite resources. Health planners can identify potential locations for new health care facilities and evaluate the benefits of each location in terms of increasing access to care.

Physical access to health care has been shown to affect utilization across many settings (Stock 1983; Joseph & Phillips 1984; Müller et al. 1998; Baume et al. 2000; Tanser et al. 2001; Buor 2003; Gething et al. 2004; Tsoka & le Sueur 2004; Arcury et al. 2005a) and impacts directly on a large number of health outcomes. For example, distance to health care facility has been associated with increasing maternal and infant mortality (Thaddeus & Maine 1994; Frankenberg 1995; Reyes et al. 1998; van den Broek et al. 2003), decreased vaccination coverage (Jamil et al. 1999; Acharya & Cleland 2000), increased adverse pregnancy outcomes (van den Broek et al. 2003), and decreased contraceptive use (Debpuur et al. 2002; Seiber & Bertrand 2002; Arcury et al. 2005b) and is likely to be a factor in adherence to demanding treatment regimens such as tuberculosis treatment (Wilkinson & Tanser 1999). Improving geographical access to health care can therefore have a direct bearing on improving adverse health outcomes (Perry & Gesler 2000). In the developing world, improved access to primary health care is required for the successful attainment of at least three of the United Nation's Millennium Development Goals (reduce child mortality; improve maternal health; and combat HIV/AIDS, malaria, and other diseases) (UNDP 2005).

Physical access to health services is determined by the geographical location of patient locations in relation to available facilities, by physical and topographical barriers and by patient mobility including the modes of transport that are available to reach these destinations. Measures of geographical accessibility concentrate on the physical separation that impedes contact (Haynes 2003). Impedance (the "friction of distance") can be represented by Euclidean distance, distance along a road network, travel time, or travel cost. Accessibility to health care differs markedly by setting and population. In developed countries patients typically have much greater choice and mobility and distance constitutes less of a barrier in accessing care. By contrast, in many developing-country settings patients will attend the nearest facility, irrespective of discrepancies in standard of delivery of care, because patients are less mobile and unable to afford the additional expense of traveling to facilities that are further away. This makes the choice of location of facilities (such that they are physically accessible to the vast majority of the population) in these settings vital. Meaningfully measuring geographical access remains difficult in such settings where patients commonly use walking as their primary mode of transport and public transport is unregulated and its temporal and spatial coverage sporadic. As a result of these difficulties, Euclidean distance is often used as a proxy measure of accessibility in many developing country contexts (Stock 1983; Kohli et al. 1995; Müller et al. 1998; Tanser et al. 2001; Buor 2003; Noor et al. 2003).

Location-allocation (L-A) planning seeks to find optimal sites for facility locations. In this chapter, we provide an overview of quantitative approaches to measuring physical access and review the use of location-allocation methodologies to inform the optimal allocation of scarce health care resources. To illustrate the concepts discussed in the chapter we use as a case study work that has been done in a rural health district of South Africa. Because decisions on how to allocate primary health care resources are often based on many epidemiological, sociogeographical, and ethical criteria, the methodologies discussed in this chapter provide an empirical basis for optimizing location of new facilities that can form but *one* important component of the decision-making hierarchy.

A History of Location-allocation Planning in Health Geography

Much of the theoretical foundation for modern location-allocation planning was laid in the 1960s and early 1970s (Engelhart 1960; Cooper 1963; Church & ReVelle 1976). In this period the fundamental categories of location-allocation problem were recognized and formalized: the p-median problem (Jarvinen et al. 1972) (determining the locations of a number of facilities to minimize the total population-to-facility distance); the location set covering problem (Toregas & ReVelle 1973) (determining and locating the minimum number of facilities to service all populations within a stated distance threshold); and the maximal covering location problem (Church & ReVelle 1974) (determining the configuration of a set number of facilities that maximizes the proportion of the population serviced within a specified distance threshold). The theoretical background to these formalized problems is discussed in more detail later.

One of the earliest examples of a health study implementing what would now be considered a "location-allocation" approach is that by Gould and Leinbach (1966) who implemented an algorithm to locate a series of hospitals in Guatemala and determine their optimal capacity in order to best serve the local population given the existing road network. Throughout the early 1980s the increasing availability and processing power of computational resources led to an expansion in the operational application of location-allocation algorithms to health care problems. In a 1981 study, Bennett investigated spatial patterns of under-provision of primary care in Michigan, United States, and used a location-allocation approach to identify the optimum location of a set of proposed new facilities. Using this approach the study demonstrated that, if located optimally, fewer facilities were required to provide adequate and equitable health care coverage than was proposed in the original plan. In a 1982 study Curtis investigated location-allocation approaches for the spatial planning of general-practice services in south-east England, including a consideration of travel cost as a suitable metric of access. A year later, Mohan (1983) incorporated location-allocation analysis into a study that sought to provide model-based input into a dispute on spatial aspects of hospital provision strategy in northern England.

Evidence from the literature of this period points to a prevailing view that developments in location-allocation modeling were not well suited to developing-world settings (Rushton 1984) due to the complexities involved, the substantial computational requirements, and the need for comprehensive and reliable data on existing populations, health systems, and transportation networks. Despite this, numerous examples of location-allocation studies in developing settings can be found from this period: for example, Kusumadewa et al. (1977) derived theoretical optimum locations for specialist hospitals in Bali, Indonesia, and compared these locations to the actual configuration, concluding patients had to travel 17 percent farther than under an optimal configuration. Bennett et al. (1981) optimized the choice of nodes to locate mobile health workers to access rural communities in Columbia and were able to improve substantially on an original allocation strategy devised manually by local health planners. Ayeni et al. (1987) used an location-allocation model to assess the spatial efficiency of health care provision in rural Nigeria and compare the existing configuration with a modeled optimum.

Much of the early theoretical underpinning of location-allocation tools was developed under the banner of operational research, regional science, mathematics, or computer science. However, a complementary strand of research was being led by geographers that considered in more detail some of the explicitly geographical concepts that underpinned location-allocation approaches. Interest in the concepts of accessibility to, and utilization of, health care and the fundamental role of space and physical accessibility in determining access grew rapidly amongst health geographers throughout the 1970s and 1980s (Sohler 1970; Gish 1973; Shannon et al. 1975; Joseph & Phillips 1984). A number of bodies of work during this period were particularly influential. Knox (1978) investigated links between accessibility to primary care and social deprivation, and considered the evolution of spatial aspects of the provision of primary care with respect to urbanization in both Britain (Knox

1979) and the United States (Knox et al. 1983). Other work focused on the quantitative representation and modeling of the flows of patients between centers of population and nodes of health service provision. Early work, including that by Mayhew and colleagues (Mayhew 1981; Mayhew & Leonardi 1982; Hyman & Mayhew 1983; Mayhew et al. 1986; Wilson et al. 1990), laid the foundation for the development of a wide range of modeling approaches for predicting and explaining spatial patterns of utilization, and for improving spatial planning of resource allocation (Bikker & Devos 1992; Royston et al. 1992; Pooler 1994; Lowe & Sen 1996; Fotheringham et al. 2001; Oliveira 2004).

The 1990s and 2000s have seen a dramatic increase in the application of location-allocation concepts and spatial accessibility and utilization models, driven in part by the widespread availability of sophisticated yet relatively user-friendly geographic information system software. In the following sections of this chapter we review the fundamental theoretical and conceptual issues in location-allocation planning before providing a detailed case study that exemplifies contemporary approaches to location-allocation problems and spatial accessibility and utilization research.

Theory and Concepts

Health care planners seek to manage health systems to optimize service delivery across a wide range of different criteria. Often these criteria have an explicitly spatial component that needs to be addressed in key management decisions. Consider a health agency that is seeking to improve service provision within a region by constructing an additional health facility. The new facility can be located at any one of a set of candidate sites and the population to be served by this new facility, and by each of the existing facilities in the region, can be allocated in any number of different ways. Other factors being equal, a reasonable objective might be to identify the site that minimizes the average time taken by the population in need to access a facility within the region. Location-allocation modeling is the name given to a diverse set of modeling techniques that aim to provide solutions to this type of spatial problem (Cromley & McLafferty 2002). In general terms, a location-allocation model seeks to identify the location of services and the flow of people (customers, patients, employees etc) to those services that maximize or minimize a given objective function. In the current example, the objective function would represent mean patient travel time to each patient's nearest facility. Location-allocation models require at least three major components to be characterized:

1 geography of service provision;
2 geography of population in need;
3 geographical accessibility of services to the population.

The appropriate representation of these components is a pre-requisite for effective location-allocation modeling, but also allows a wider range of spatial analyses to be carried out that can address a diverse set of health care management questions. In essence, if these three geographical components can be modeled effectively then the potential effects of changes in both the provision of, and demand for, services on levels of service delivery can be quantified.

Characterizing geographies of service provision

A fundamental requirement for constructing a location-allocation model for health system planning is to know where different elements of that system are located. More formally, the spatial characteristics of the system as a whole, or certain services within it, must be known. Many health services are provided from facilities with an explicit spatial location such as hospitals, clinics, or general practice surgeries. In these cases, there is little conceptual difficulty in defining the location at which the service operates, although it is important to note the distinction between the location of health facilities and the location of health services. Assessing the former requires information only on the physical location of facilities, whilst the latter requires also information on the type and capacity of services offered by each facility. Some health services operate in such a way that their spatial location is difficult to define precisely. Community-based services where health workers visit patients in their own homes are an obvious example (Krout 1994). Although these services have an inherent geographical location, it is less straightforward to define, and therefore collect data on, than services based at fixed locations. Mobile health services also have a potentially complex geography (Alexy & Elnitsky 1996), with detailed data on their movements and schedule required to define fully their location. Whilst conceptually straightforward, obtaining reliable data on both fixed and mobile service locations can be extremely challenging, particularly in developing-world settings (Noor et al. 2004).

Characterizing geographies of population in need

A second fundamental requirement is to define the spatial characteristics of the population for which a health service is to be provided. This in turn requires the definition of: (1) the spatial distribution of the population as a whole; and (2) the subset of that population that requires a given health service. The distinction between these two components increases with the level of specialization of different health services. The process of characterizing the spatial distribution of a regional population is inevitably data driven. Nearly all countries worldwide operate some form of national census system which increasingly generate GIS-ready digital maps detailing population characteristics within administrative boundaries. The availability, reliability, and frequency of such outputs is, however, extremely variable (UN 2007). Other derived data products are available that represent populations as a pseudo-continuous field in a raster format, such as those provided by the Gridded Population of the World (GPW 2005) and Global Rural-Urban Mapping projects (GRUMP 2004). Depending on the scale of the modeling exercise, it may be necessary or desirable to georeference the population more precisely than can be achieved with census or global population data. Although expensive, in such instances a complete enumeration can be achieved by defining geographical coordinates of individual dwellings via a ground survey using a global positioning system (Tanser 2002).

Many health services are provided to meet the needs of specific subsets of populations. If the spatial distribution of a given subset is to be characterized independently from that of the general population, then members of that subset and their spatial locations must be identified. Some services target certain age groups or genders, such as those for cervical screening services for example (NHSCSP 2007). In such cases, the population subsets of interest may be identified using age and sex data collected routinely as part of national censuses. Other services are targeted at population subsets who suffer from specific conditions. A service offering different forms of renal replacement therapy, for example, might be established to provide community-based, outpatient, and inpatient care for patients with end stage renal failure (Martin et al. 1998). In such cases, identification of the relevant population subset requires that those suffering from the condition are diagnosed and enumerated via formal health system records. In regions with more advanced health information systems, members of the population suffering from serious acute or chronic illnesses with high diagnosis rates are likely to be well enumerated via routine health records. As such, characterizing their spatial distribution is likely to be relatively straightforward, accepting constraints imposed by the need to retain patient confidentiality. Conditions that are diagnosed less consistently, such as many types of mental illness (Basco et al. 2000) are likely to be enumerated less comprehensively since a substantial proportion of sufferers may be unknown to the formal health service. In developing-world settings, under-resourced health information systems mean that data on even the most prominent public health problems are sparse or unreliable (WHO 2000; Gething et al. 2006). Where comprehensive data on population morbidity or vulnerability for specific conditions are unavailable, it may be possible to estimate the spatial distribution of population subsets of interest using statistical modeling (Lawson 2001). Survey data on the prevalence of a given condition can be linked to demographic or environmental covariates to predict prevalence rates across a region. This is an increasingly widespread approach in the estimation of populations at risk from, for example, malaria and other vector borne diseases (Rogers 1991; Snow et al. 1999; Diggle et al. 2002; Snow et al. 2005; Clements et al. 2006a; Clements et al. 2006b; Diggle et al. 2007).

Characterizing geographical accessibility

If the spatial characteristics of both service provision and the population in need can be represented appropriately, the final pre-requisite for location-allocation modeling is to characterize geographical access between the population and the services in question. In a health care context, the term *accessibility* incorporates a range of spatial and non-spatial criteria including the availability, affordability, and acceptability of services to the population (Penchansky & Thomas 1981). Geographical accessibility is one component of overall accessibility and refers specifically to the costs involved for different patients in traveling between their origin (normally their home) and their health service destination (such as a clinic or hospital). These travel costs might be measured in terms of distance, time, or financial expense. Geographical access can be represented most simply using straight-line (Euclidean) distances between patient origins and service locations. However, this simplistic approach falls far short of capturing the complexities involved in the way patients access services (Noor et al. 2006). Before formal models can be designed, it is imperative to understand how journeys made by patients to access services might be made in a given region. Common modes of transport include walking, travel by private car, and travel by scheduled public transport. The relative importance of each of these in accessing health services will vary within countries and between different regions of the world. It is essential to realize however that, within any population, different modes of transport will be used by different individuals, making the characterization of patient travel a complex task.

A simple GIS model for patients' journey time to a health facility on foot can be constructed using a Euclidean distance function. Such functions calculate the straight-line distance from each pixel in a digital surface to a specified point (such as the location of a health facility), which can then be multiplied by an average walking speed to produce an estimate of journey time. Such a model assumes patients can traverse the landscape in any direction at a constant speed. A more realistic approach is to incorporate landscape features that determine journey time such as gradient, barriers, and the footpath network by defining an impedance or cost surface (Noor et al. 2006; Tanser et al. 2006). This is a raster grid that represents the journey time or cost associated with traversing each cell across a modeled landscape. Rather than every cell having a uniform walking speed associated with it, individual cells are assigned different values of impedance based on their gradient or land cover. Cells that form part of a footpath or road network can be assigned low impedances, whilst cells away from paths or on steep terrain can be assigned very high impedances. Cells representing a complete barrier such as a river can be masked out, completely blocking travel across them. This cost surface can then input into a shortest-path algorithm within a GIS. These algorithms determine the shortest route between each cell and the point (e.g. health facility) of interest. By knowing which cells a patient must travel through, and the impedances associated with each, the algorithm can calculate the journey time from each cell to the health facility.

Journey times by private car will be determined by a very different set of criteria than journeys made on foot. Pedestrian models often use raster surfaces to allow journeys to be modeled across the land surface as a whole. In contrast, we know that journeys made by car are likely to be restricted to the road network. This important difference means that car journeys are generally modeled using a vector network representation (where points in space are joined by a network of digital lines) in a GIS rather than a raster surface (where space is represented using a digital grid of pixels) (Gendreau & Marcotte 2002). Journey time by car is affected by factors such as the speed limits of different sections of road and infrastructure such as traffic lights and roundabouts. The amount of traffic on the road at a given time will also be important and this adds a temporal dimension to the issue, with traffic density varying over diurnal, weekly, and seasonal cycles (Ghosh et al. 2007). In a network representation, each vector segment of road can be assigned an average speed, and the time required to travel along each segment is calculated. Journey time between two points can then be estimated using network analysis functions that find the shortest or fastest route between the two points in question across the network, and calculate the time required to travel along that route.

Modeling travel times for journeys made using scheduled public transport requires a further set of factors to be considered. Public transport journeys are constrained not only to a given road or rail network, but also by a set of pre-defined journey schedules between specified destinations, as defined by the service timetable. Such journeys may involve multiple legs by bus, train, tram, ferry, or other means. Each leg will have a journey time associated with it, as well as a waiting time while individuals await arrival of the transport or queue for a ticket. Journeys by public transport often involve distances that are walked on foot at the beginning and end, or in between different legs of the journey. Further complexities are added by issues of service unreliability or unavailability due to overcrowding. If timetables of public transport services are known and can be queried within a GIS, then the expected journey time between public transport hubs (bus stops, train stations etc.) can be determined. Journeys made using multiple transport services can be modeled by cross-referencing between different timetables (Martin et al. 2002), and legs of the journey made on foot can be modeled using a pedestrian journey time model.

Location-allocation Modeling

So far, this chapter has introduced the problems of location-allocation planning of health facilities, particularly in resource-poor countries, and framed those problems through discussion of the various properties that might influence development of a solution (e.g., distributions of disease, human population and facilities). In particular, geographical information systems (GIS) have been discussed as a tool of great utility for capturing, storing and organizing the requisite spatial data (Walsh et al. 1997; McLafferty 2003). We now consider the class of models known as location-allocation models that can be used to provide a solution to the problem of locating facilities. An early review of operational research techniques, including location-allocation modeling, applied to developing countries was provided by Datta (1993).

Definitions and terms

A location-allocation model is a tool for finding optimal sites for facility locations (Rahman & Smith 1996). The present interest is in determining the sites of new health facilities in developing countries. In this context, the facilities to be sited may be considered as "central" (Hodgart 1978) and thus, the objective is usually to locate facilities as close as possible to demand centers.

It is implicit that the space of interest is a geographical space and that, therefore, the sites must be located spatially. There are three common representations of geographical space to which location-allocation models are applied; network, plane, and raster, with networks being the most common. In a network, the space of interest is a restricted space where facilities can be located at pre-selected points on a network (e.g., vertices). In the plane, equivalent to the vector data model in a GIS, the space is unrestricted and facilities can be located anywhere on the plane (Dokmeci 1979). In the raster data model, the space of interest is restricted only by the spatial resolution of the representation. In the following discussion, we assume the most common case of optimization on a network.

Generally, location-allocation models are applied to existing scenarios within which some operational facilities are already located such as to determine the optimal location of new facilities yet to be added to the system. However, Rahman and Smith (2000) consider three further cases: (1) where sites are to be determined in a completely new area (e.g., a new city); (2) application to a historical arrangement of facilities to determine its efficiency *post-hoc*; and, (3) to improve existing systems. Each of these additional scenarios is of debatable value: (1) is a rare occurrence and so will not be considered further here; (2) is problematic because it has little operational value – it does not lead to any operational improvement (Rahman & Smith 1996); and, (3) while potentially useful, may not lead to implementation because of the huge costs involved in changing expensive and entrenched health care systems. For the reasons associated with (1) and (2), discussion is restricted to the case of adding facilities to existing systems.

The most important parameter in setting up a location-allocation model is the criterion or objective function. For private enterprises such as retail centers the criterion is often to minimize cost. However, for public facilities such as health care facilities, the criterion of interest may be difficult to define because it involves consideration of public welfare goals such as equity and efficiency. For example, in locating dispensaries in Kenya, should the criterion be to minimize the mean distance (or time) to travel to the facility? An alternative would be to minimize the maximum distance (or time) that anyone needs to travel to the facility. These different interpretations of the goal of maximizing public welfare lead to several location-allocation problems (Rahman & Smith 2000). The three location-allocation modeling approaches discussed in this chapter are:

1 *p*-median problem;
2 location set covering problem (LSCP);
3 maximal covering location problem (MCLP).

The objective of the *p*-median problem is quite simply stated to determine the locations of a number of facilities such that the total travel distance (or time) from demand points to facilities is minimized. It is assumed, of course, that users travel to their closest facility. An issue with this objective function is that while an acceptable solution is achieved on average, there is no guarantee that all users will be within a tolerable distance. In practice, this often means that users located in rural areas will not be serviced adequately. Improved geographical accessibility to basic services for rural populations is a goal of most governments in developing countries (Rushton 1984). The LSCP is a response to this issue with the *p*-median problem. The objective of the LSCP is to locate a minimum number of facilities such that every demand point falls within some acceptable tolerance distance or time from at least one facility (Toregas et al. 1971; Toregas & ReVelle 1972).

Where resources are severely limited, as in resource poor contexts, the solution provided by this LSCP model (i.e., the number of facilities required) may be unobtainable (i.e., too expensive). In these circumstances, the objective can be changed to the following; to locate a fixed number of facilities such that the minimum number of demand points lies outside the desired tolerance band. This is the MCLP (Church & ReVelle 1974; Bennett et al. 1982). Oppong (1996) provides a comparison of the *p*-median and MCLP objectives to determine health care facility locations in Suhum District, Ghana.

Many variants on these basic approaches have been developed such as to allow for multiple or sequential objectives (Rahman & Smith 2000). Further, both stochastic (in which parameter uncertainty is handled) and dynamic (in which solutions must be robust to changing circumstances through time) formulations have also been developed (Owen & Daskin 1998; Harper et al. 2005). Optimization algorithms that can be applied to solve these problems include linear programming and simulated annealing (Murray & Church 1996).

Within the set of three models defined above, it is possible to distinguish further between single-level location-allocation models (SLAMs) and hierarchical location-allocation models (HLAMs). In SLAMs, the analysis is restricted to the simpler case of one type of facility only. However, in resource-poor settings the health care delivery system is often hierarchical, with the first point of contact (e.g., a dispensary in Kenya) leading to a referral, where necessary, to a larger facility with specialist infrastructure (e.g., a hospital in Kenya). location-allocation models that include more than one type of facility are referred to as HLAMs (Banerji & Fisher 1974; Tien et al. 1983; Hodgson 1988; Rahman & Smith 2000). When optimizing HLAMs it is often necessary to determine the way in which different types of facilities will be embedded within each other. One common choice is to determine the location of the larger facilities first and then successively smaller facilities in rank order in the hierarchy; a top-down approach. Bottom-up approaches have also been implemented.

One issue with the models described above is that they are generally fitted in an uncapacitated form. This means that there is no limit, in the model, on the capacity of facilities to deal with patients. The focus is generally on travel distance (or time) to facilities. It is clear that the capacity of facilities may be an issue both (1) globally (where total demand outstrips the total capacity), but also (2) locally even where condition (1) is not met. While it is possible to allocate resources and personnel to facilities based on local demand after site selection has been determined, this issue has also led to the development of the capacitated *p*-median problem (Heller et al. 1989).

Location-allocation modeling: a decision-support tool

The place of such optimization models in the actual siting of health facilities in practice deserves some consideration. In developing countries, new health facilities are located most commonly by local government or elected leaders, basing their decisions on a wide range of socio-economic and political factors. In this context, location-allocation modeling may achieve its stated objective well, but may turn out to be of limited use in practice for a range of reasons including: (1) the utility of the modeling approach is not well understood (e.g., through lack of engagement with decision-making bodies); (2) the results fail to serve pragmatic or political ends; and, (3) the results are difficult to implement in practice (e.g., for economic reasons).

Location-allocation modeling can be seen by many governments or government agencies as too sophisticated. It is certainly true that location-allocation models are applied to well-posed problems in well-defined sample spaces. The complex reality can be very different, including many factors and forces, such as the political will of various leaders, which are not considered by the model. Further, in practice, the solutions arrived at by government leaders are often sub-optimal (Rahman & Smith 1996). It is, therefore, important that location-allocation modeling is framed clearly as a decision-support tool, where decision-support means the use of computers to analyze data such as to provide information to identify, and solve, problems and aid decision-making. It also follows that sufficient effort should be made throughout any project to engage deeply with decision-making bodies and to explain to those bodies as far as possible the usefulness of the location-allocation modeling approach. Without such engagement, there is a real danger that the final implementation step of the location-allocation process will not occur.

Growth in data availability

Recent advances in data acquisition and processing methods such as remote sensing and spatial statistics have led to the availability of a wide range of data previously not possible. In this section, we consider the utility of some of these data sources because the additional detail and dimensionality provided has great potential within location-allocation modeling.

Many datasets exist with no locational information provided. A good example is the health management information system (HMIS) in Kenya for which facilities at three levels (dispensary, health center, and hospital) were recorded, but for which the locations of those facilities were unknown. A global positioning system survey was undertaken by the Kenyan Medical Research Institute (KEMRI) to ascertain the locations of the vast majority of facilities listed (Noor et al. 2004). Great value is added to the HMIS dataset through such *post hoc* survey as it allows application of spatial statistics for various purposes and, importantly, the application of the kinds of location-allocation model discussed here. Such rich spatial datasets are becoming increasingly common, but it is vital that the experience of Kenya is promulgated throughout Africa and other resource poor settings such that the power of spatial statistical modeling can be brought to bear.

A second rich source of spatial information is remote sensing. Optical and microwave sensors can be used to provide a variety of covariates for use in location-allocation modeling. One obvious variable of interest is the settlement distribution. Many location-allocation models rely on population census data distributed within areal census units to define the demand points. Such areal units are hazardous for the purpose for a variety of reasons (Goodchild 1979). Remotely sensed settlement distribution can provide a more precise representation of the actual locations of individuals on the ground. Recent work on defining settlement distributions in Kenya has suggested the use of Landsat Thematic Mapper sensor imagery with a spatial resolution of 30 m, a much finer spatial resolution than is provided through census data (Tatem et al. 2004).

Another important variable that can be provided by remote sensing is the current road network. This is particularly important where the data used in the model are otherwise provided by an archive cartographic map that may be out-of-date or lack the required spatial detail. Similarly, a further linear object of interest that can be remotely sensed is the river network, which can provide a physical barrier to access where walking is of interest as a means of transport. A further property to consider is relief which may provide an impediment to the speed of walking within the context of utilization and access modeling (Noor et al. 2006). Elevation models (and, thus, information on relief) can be provided by remote sensing indirectly through techniques such as photogrammetry or directly through sensing systems such as LiDAR.

Finally, remote sensing can provide a series of covariates that may be related to the distribution of tropical infectious diseases, such as found in sub-Saharan Africa, most often indirectly through the vectors that transmit the disease. For example, the normalized difference vegetation index (NDVI) that is readily estimated from optical remotely sensed imagery in the red and near-infrared wavebands has been found, when lagged temporally by one month, to be correlated with mosquito distribution (Hay et al. 1998, 2000). Knowledge of such vectors is important in defining the spatial distribution of disease. Coupled with a regression-type model (Noor et al. 2006), it is possible to predict the spatial distribution of vectors or disease and this information can provide a further important constraint on the optimal location of facilities; effectively allowing a more precise finessing of the spatial distribution of demand for health services than provided by data on the spatial distribution of the entire population.

Case Study: Planning and Evaluation of Access to Primary Health Care in a Rural South African Population

To illustrate some of the concepts discussed in the chapter we review work that has been done in the planning and evaluation of primary health care access in the Hlabisa sub-district of South Africa (Tanser 2006b). In Hlabisa (as in many parts of the developing world) meaningfully measuring physical access to primary health care is problematic because patients use walking as their primary mode of transport but public transport still plays an important role for a significant proportion of the population in accessing health care. Baseline data was collected on the clinic usage patterns of 23,000 homesteads in the Hlabisa sub-district and data on methods of accessing health care at the nearest clinic. This information was used to inform the production of a hybrid accessibility model (incorporating both a walking time and travel time using public transport) and the expected catchments (derived from the model) were compared against the observed clinic usage patterns of all homesteads in the district. The resulting model was used to investigate differences in rural, urban and peri-urban usage patterns of clinics in the study area, to quantify the effect of physical access to clinic on usage and to optimally site a new clinic in the sub-district.

Study area

Hlabisa health sub-district is located within the rural district of Umkhanyakude in northern KwaZulu-Natal and is 1,430-km^2 in size. The sub-district is about 250 km north of the city of Durban (the third largest city in South Africa). The population consists of approximately 200,000 Zulu-speaking people, of which 3 percent are located in a formally designated urban township (KwaMsane), 20 percent live in peri-urban areas (informal settlements with a population density of more than 400 people per km^2), and the remaining 77 percent live in rural areas. The rural population live in scattered homesteads that are not concentrated in villages or compounds, as is the case in many other parts of Africa. The population distribution exhibits extreme heterogeneity – density ranges by two orders of magnitude (20–2,500 people per km^2). The community, like many others in the province of KwaZulu-Natal, is in the throes of an unprecedented health crisis, with population-based HIV surveys measuring a prevalence of >50 percent in some age groups (Welz et al. 2007).

This sub-district's health infrastructure is typical of many similar rural health systems in South Africa and functions as a semiautonomous unit at the third tier of the national health system. A central community hospital and 13 fixed clinics provide the bulk of the primary health care in Hlabisa. The hospital has an adjacent clinic that dispenses primary health care to patients in the surrounding area. In addition, 30 mobile clinic points are visited twice monthly (Tanser et al. 2001). To access primary health care, two-thirds of the population reported walking to clinics, while the remaining one-third use public transport. The mean reported travel time to clinic was 73.6 minutes (Tanser et al. 2006). The reported times included walking time, time spent waiting for public transportation, and time spent on public transportation.

GIS data used

The analysis draws from GIS data maintained by the Africa Center for Health and Population Studies (Tanser et al. 2008) comprising a series of geographical layers of the Hlabisa subdistrict – including magisterial and nature-reserve boundaries, roads, and rivers – and covers about 500 facilities (e.g. clinics, schools, shops) and 24,000 homesteads. All homesteads in the study area were positioned by 12 field-workers carrying hand-held GPS units that recorded to an accuracy of less than two meters. During this GPS survey, a key informant in each homestead was interviewed regarding usage of the health care clinics. Reported travel times to clinic were collected from residents for a random sample of 250 homesteads (Tanser et al. 2001).

Measuring access to and coverage of health services

To estimate physical access to primary care in the Hlabisa sub-district a cost analysis was used to estimate travel times to the nearest clinic and to derive clinic catchment boundaries (Tanser et al. 2006). In the cost analysis, friction values are assigned to each level of road and areas in between roads to compute the least cost (in terms of travel time) to get to the most accessible target clinic. Large perennial rivers, dams, and nature reserves were designated as absolute barriers to travel in the model. To account for the differing means of traveling to clinic a "walking model" (Figure 28.1a) and a "public transport" model (Figure 28.1b) were produced. In the public transport model individuals are assumed to walk to the nearest road at a speed of $4\,km\,h^{-1}$, thereafter they travel at the varying speeds in public transport according to the level of road. In the walking model, the roads and tracks are assumed to be only marginally faster to walk along than areas between roads. Differing lines of accessibility are produced according to the type of model. The walking model to some extent resembles a model based on Euclidean distance whereas the

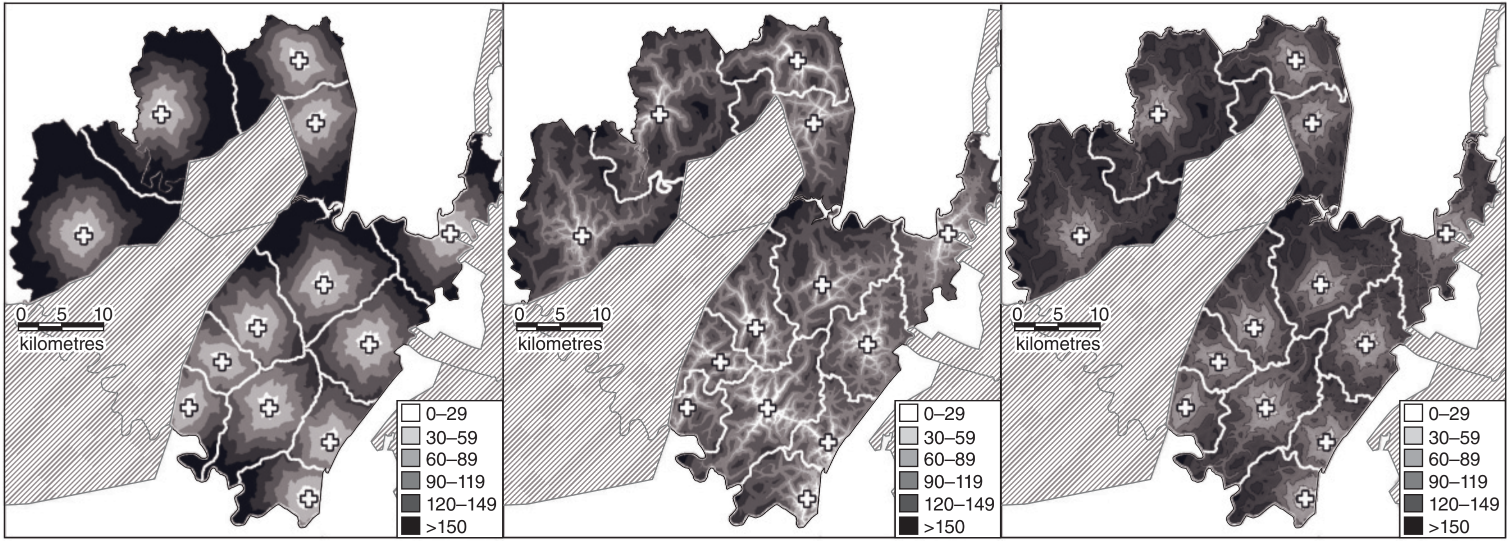

Figure 28.1 Derivation of the hybrid travel time (minutes) to clinic model (striped areas indicate nature reserves). (a) estimated walking time to clinic (walking model) and resulting catchments; (b) estimated travel time to clinic (public transport model) and resulting catchments; and (c) average travel time to clinic (hybrid model) and resulting catchments.

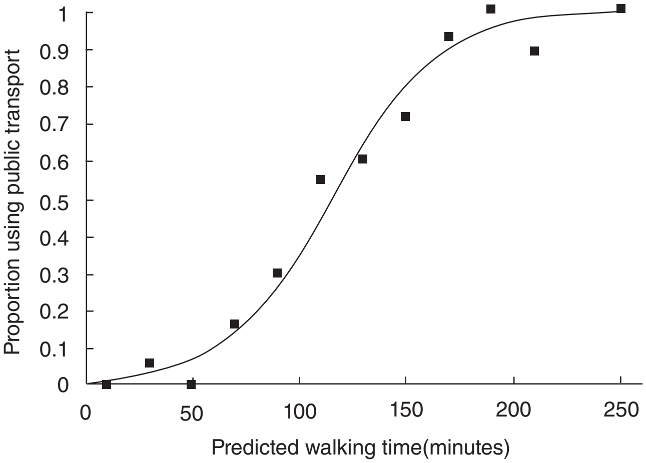

Figure 28.2 The relationship between the population of homesteads who reported using public transport to travel to clinic and predicted walking time (obtained from the cost analyis) to clinic ($p < 0.0001$). *Source*: Reprinted from Tanser, F., Gijsbertsen, B., and Herbst, K., Modeling and understanding primary health care accessibility and utilization in rural South Africa: an exploration using a geographical information system. *Social Science & Medicine* 63, 691–705. Copyright (2006), with permission from Elsevier.

public-transport model concentrates lines of accessibility along the road network. The resulting theoretical travel times were then adjusted using reported travel times from a random sample of 250 homesteads.

Our analysis (Figure 28.2) showed that as estimated walking time to clinic increased so did the proportion of the population who reported using public transport to access primary health care ($p < 0.0001$). We used the weights in this relationship to combine our walking and public transport model into a single hybrid model (Figure 28.1c). As the distance to the nearest clinic increases, therefore, roads play more of a role in determining accessibility because an increasing proportion of people make use of public transportation (Tanser et al. 2001). The resulting travel times thus take into account the quality and distribution of the road network, natural barriers such as perennial rivers, and the proportion of the population likely to be using public transportation (as a function of walking time). The associated catchment boundaries constitute a line of equal travel time between neighboring clinics. The model estimated the average travel time to the nearest clinic to be 77 minutes, and 65 percent of the population travel 1 or more hours to attend a clinic. The results show for example that people in rural homesteads travel four times longer to access care than do their more affluent urban counterparts.

Understanding the usage patterns of the health services

The deviations between observed and expected clinic usage were analyzed by comparing homesteads' reported usage with the predicted catchments (Tanser et al. 2006). Over 91 percent of homesteads reported using the most accessible clinic

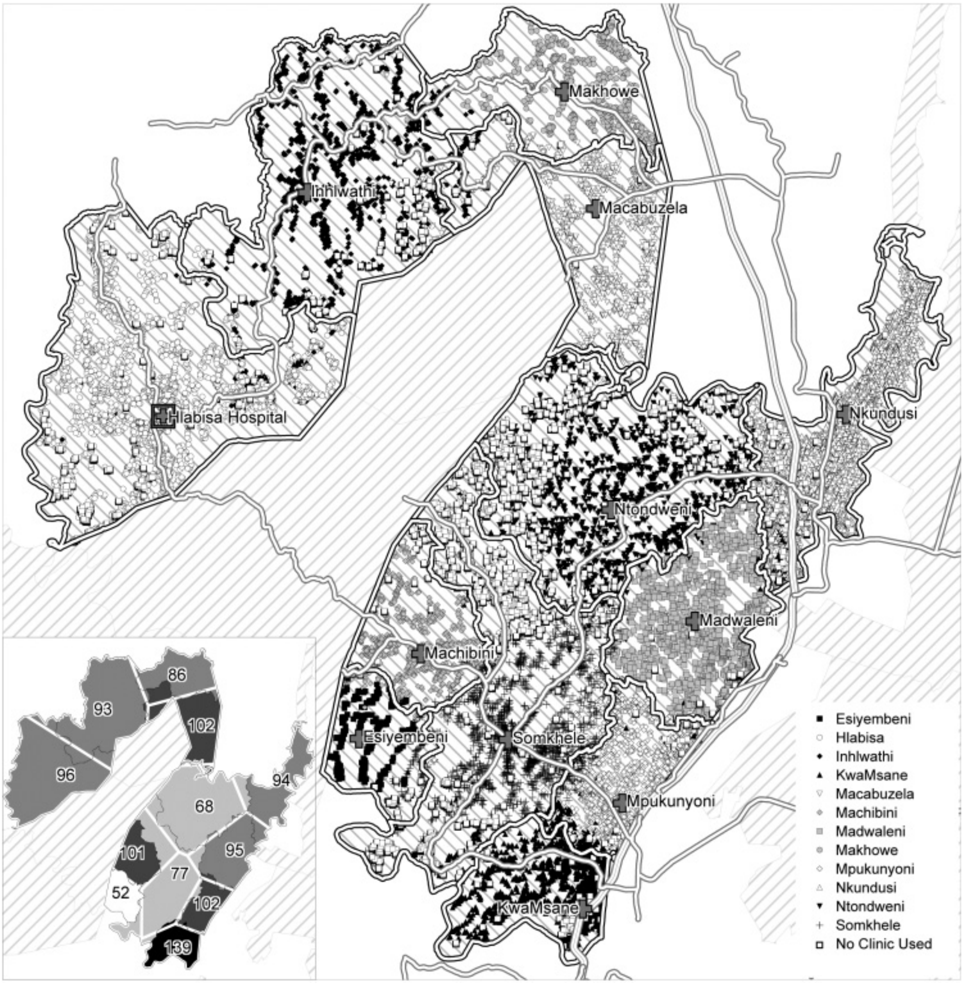

Figure 28.3 Comparison between reported clinic usage and predicted travel time catchments in Hlabisa health sub-district. *Source*: Reprinted from Tanser, F., Gijsbertsen, B., and Herbst, K., Modeling and understanding primary health care accessibility and utilization in rural South Africa: an exploration using a geographical information system. *Social Science & Medicine* 63, 691–705. Copyright (2006), with permission from Elsevier.

(Figure 28.3). The differences between observed and expected usage was used to compute a distance usage index (DUI) for each clinic (Tanser et al. 2001). The DUI is a ratio of the sum of all travel times by individuals to a reported clinic divided by the expected total time traveled to that clinic, expressed as a percent. Expected total times traveled to clinics were calculated using all homesteads that fell within a clinic's predicted catchment. The index is an overall measure of inclusion, exclusion, and the strength of a patient's attraction to the clinic (using time traveled to attend clinic). Thus, a clinic that attracts a large number of patients from outside its predicted catchment and receives good attendance within its catchment will have

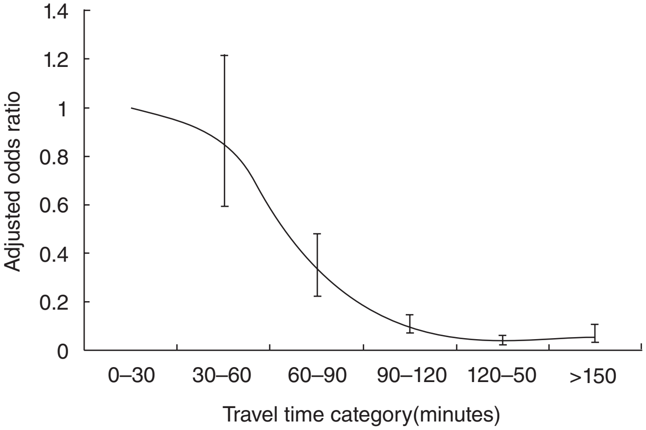

Figure 28.4 Results of the logistics regression showing the adjusted odds ratio (95% confidence intervals) of homesteads using clinics (reference category = 0–30 minutes) with increasing travel time to nearest clinic. *Source*: Reprinted from Tanser, F., Gijsbertsen, B., and Herbst, K., Modeling and understanding primary health care accessibility and utilization in rural South Africa: an exploration using a geographical information system. *Social Science & Medicine* 63, 691–705. Copyright (2006), with permission from Elsevier.

a DUI of > 100 percent. Conversely, a clinic that only attracts patients from short distances and has poor attendance within its predicted catchment will have a DUI value of <100 percent.

The analysis (Figure 28.3) reveals that one of the rural clinics exhibits substantially less attraction and utilization than expected (DUI = 52 percent), while the only urban clinic exhibits substantially more attraction and utilization than expected (DUI = 139 percent). The urban clinic is the only one of the 13 clinics to be designated a Community Health Center, offering a broader range of services than the other clinics and 24-hour service and attracts a significant proportion of patients from outside its own expected catchment. A logistic regression was used to analyze differences in utilization after adjusting for systematic differences in clinic access (Tanser et al. 2006). The adjusted odds of clinic usage by homesteads in peri-urban areas (after adjusting for differences in physical access) were nearly 30 times those of their urban counterparts (OR = 28.2; 95 percent CI 19.2–41.3). The corresponding odds ratio for rural populations was 18 (OR = 18.0; 95 percent CI 12.5–26.0). There was a significant decline in homesteads reporting usage of any clinic with increasing travel time ($p < 0.0001$). For example, the adjusted odds of clinic usage by a homestead within 30 minutes of a clinic were 10 times (adjusted OR = 10; 95 CI 6.9–14.4) those of a homestead in the 90–120 minute zone (Figure 28.4).

Planning of health services locations

A recent paper used a quantitative methodology to optimally site a new primary health care facility in the Hlabisa health sub-district (Tanser 2006a). The methodology uses the population distribution as well as accessibility to care to achieve maximum population-level increase in accessibility to care. The methodology is well suited to rural environments where patient choice regarding health care is limited and defines accessibility with respect to the nearest clinic and not on hypothetical interactions with all clinics within a reasonable distance. The methodology uses empirical data on distance-decay derived from the analysis of the clinic usage patterns of 23,000 homesteads to estimate impedance to care (Tanser et al. 2006). The result is a methodology that achieves a large population impact on health care accessibility by selecting the most efficient location for the new facility.

Previous work in the area had shown a logistic relationship between decay in attendance of a specific clinic and travel time to that clinic (Tanser et al. 2006). The reverse of this curve (1-usage) was used to estimate impedance to care. The logistic relationship means that individuals encounter little impedance in accessing care if they live fewer than 50 minutes from a clinic, but thereafter impedance increases rapidly. The product of the impedance value and the number of residents in each homestead were superimposed onto a 30-m raster grid. A 3 km × 3 km Gaussian kernal was then used to calculate person-impedance per km^2. The kernel is systematically moved across each cell on the grid and calculates the weighted (according to a standard normal distribution) person-impedance per km^2 for each cell's unique 3 km × 3 km neighborhood. The greater the distance from the central cell, the less that area contributes to the person-impedance per km^2 estimate. The subsequent person-impedance map (Figure 28.5) delineates the areas where high levels of impedance to care correspond with high population concentrations, and where the placement of a clinic could greatly reduce the population's impedance (and therefore increase accessibility) to care. The potential site for the test clinic is shown on the map as "Test Clinic," with the resulting catchment superimposed. The test clinic would reduce person-impedance by 3.6 times the reduction achieved by the construction of the newest clinic in the sub-district. The corresponding ratio for increasing clinic coverage (percent of the population within 60 minutes of care) would be 4.7 (Tanser 2006a).

Conclusion and Future Directions

The availability of geographic tools (embedded within geographical information systems) to plan and evaluate access to health care services has increased exponentially since the 1990s. These advances have greatly improved our understanding of the role played by geographic distribution of health services in public health. Advances in computer power, declining hardware and software prices, and increased data availability have all contributed to this trend. New methods have been found to measure accessibility across continuous geographical space and identify vulnerable populations without proper access to care, allocate interventions and objectively locate services with maximum benefits in terms of increasing access to care. Recent advances in data acquisition and processing methods such as remote sensing and spatial statistics have led to the availability of a wide range of data previously not possible. The wider incorporation of these data into predictions of physical accessibility will allow the creation of more sophisticated models. This in turn will increase our understanding of the impact of physical access on health outcomes and facilitate the more objective allocation of scarce resources.

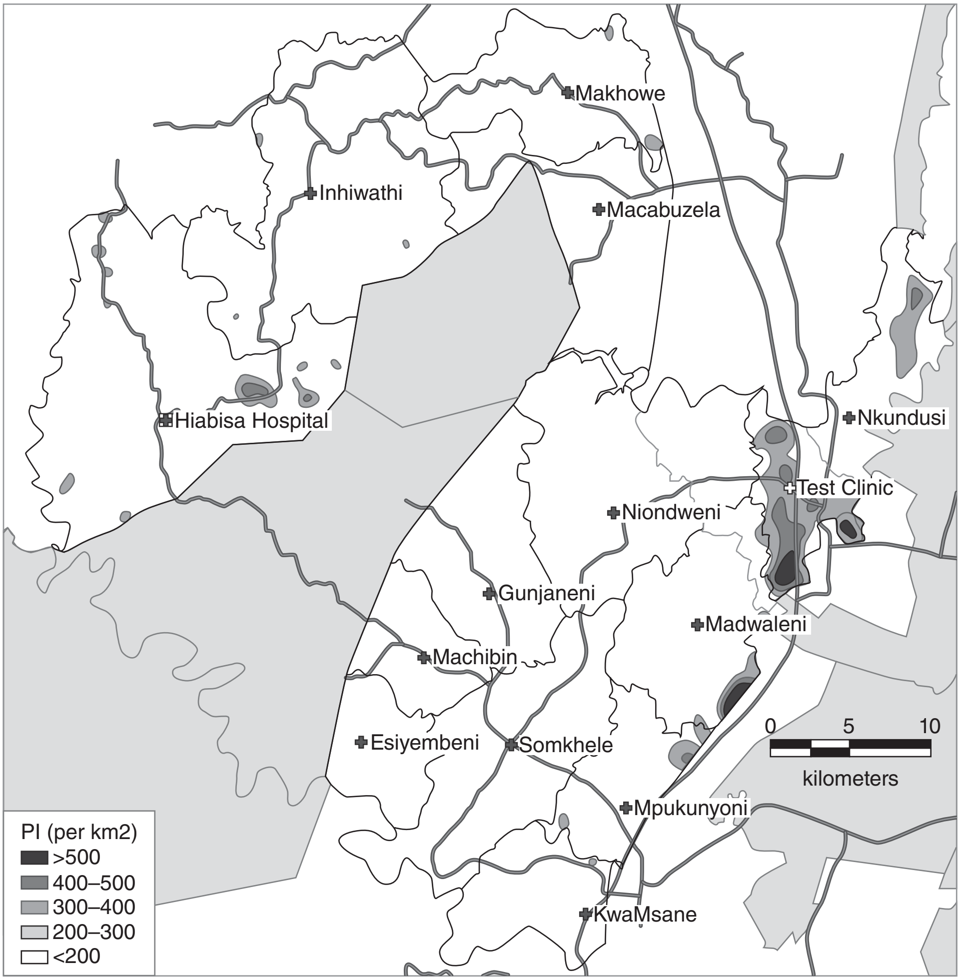

Figure 28.5 Person-impedance (PI) to clinic per km^2.

As discussed elsewhere in this book, another factor to be considered in the spatial organization of health care systems is the trade-off between *equity* (defined as achieving equal distribution of access to care among population sub-groups) and *efficiency* (defined as achieving the maximum population-level access to care) (Gilson 1998). The geographical dispersion of the population makes inequalities in access to health care inevitable. Efforts to increase equity will often lead to a reduction in efficiency. An efficient health service might provide the greatest aggregate ease of access for a given level of resources, but will not always be an equitable one because access may not be distributed fairly between groups (Williams 1997). A single-minded pursuit of efficiency in the spatial allocation of health care resources in societies "can serve to intensify general disparities in the quality of life" (Knox 1982). In some instances it might be considered important to make the health services more equitable by reaching small numbers of vulnerable populations living in remote areas, but this may not always be financially viable. With very few notable exceptions, location-allocation models focus on increasing the efficiency of spatial organization of the health care services.

A more challenging objective is to develop methods that focus on increasing equity or that maximize the trade-off between efficiency and equity. In an African context, an especially important issue is the take up of and adherence to anti-retro viral therapy (ART) for HIV treatment (Stevens 2004), for which physical access is likely to be a crucial determinant. Widely regarded as the largest public health intervention ever undertaken on the continent, demand for ARTs will exceed supply and thus, difficult decisions will have to be made regarding the rollout. Considerable attention is now being focused on the allocation strategies and how to maximize equity without unduly compromising efficiency using different allocation strategies (Wilson & Blower 2005; Wilson et al. 2006). The topic is an interesting one in that ART is likely to profoundly influence the course of the HIV epidemic (Baggaley et al. 2005) but there is widespread disagreement about the direction of that change. Different allocation strategies could also have a marked impact on the future course of the epidemic. For example, the results of a mathematical modeling exercise undertaken for the province of KwaZulu-Natal, South Africa show that the deployment of ART exclusively in the big cities would prevent the greatest number of primary infections, avert the greatest number of AIDS deaths, and ensure that levels of transmitted resistance to treatment would also be kept to a minimum level (Wilson et al. 2006). Clearly, this would result in unacceptable disparities in health care between urban and rural areas but does serve to illustrate many of the complexities involved in the allocation of scarce health care resources.

One methodological advance which has not been applied extensively in the field is that of multi-level statistical modeling. Multi-level approaches allow the robust estimation of contextual effects (such as physical access to health care) on individual and community level health outcomes. Multi-level analysis can be used to draw inferences regarding the relationship of group (often referred to community or neighborhood effects) and individual level variables to individual level outcomes, but inferences can also be made regarding intergroup variation, whether such variation exists in the data and to what extent it is accounted for by group and individual-level characteristics (Diez Roux & Aiello 2005). By bringing together group and individual-level variables and examining variability both within and between groups, multi-level analysis avoids the inferential fallacies that may occur when a relevant level is ignored (Diez-Roux 1998). Key challenges that remain in the use of multi-level analysis are identifying the levels that are relevant to the research question of interest, specifying the relevant constructs or variables at each level, operationalizing the relevant groups, and measuring the relevant group level variables. As one author has stated, “[i]ndeed, identifying “true” neighborhood differences also requires identifying true neighborhoods, an aspect on which much of the applied work remains largely silent” (Kawachi & Subramanian 2007). Despite these challenges, however, multi-level analysis has the potential to offer unique insights into the cascades of causation associated with health care utilization and health seeking behaviors.

The establishment of sentinel geo-referenced demographic and health surveillance systems (such as the Africa Center demographic information (Tanser et al. 2008) system described previously in the chapter) that are able to link patients from their place of residence to the health services are critical. This is especially true for developing country settings where the national and provincial datasets (both geographic and otherwise) are of a low quality. These surveillance sites follow up a designated population intensively over time collecting highly accurate vital event (e.g. births, deaths, migrations), socio-economic, behavioral, and health-seeking behavior data on a routine basis. Many studies that focus on the impact of access to health care are conducted in a cross-sectional manner and are thus limited in their ability to disentangle cause and effect relationships inherent in such associations. The longitudinality of the data collected by demographic surveillance sites allows the true multi-level causal relationships between access to health care and health outcomes to be quantified and the resulting relationships used to allocate resources in other settings where limited data are available.

Another new development in the field is the deployment of web based geospatial applications through the internet which is likely to profoundly change our thinking about the allocation of resources (Croner 2003). With increased access to many forms of geocoded public health information, such systems could in the future allow the near real-time allocation of resources where the need is greatest. However, concerns about patient confidentiality and privacy often mitigate against the collection and use of detailed georeferenced health data at a fine spatial resolution (Croner 2003). Another important advance is the development of spatial decision support systems that integrate GIS with an array of analytic methods such as location-allocation models to support health care planning and assessment (Rushton 2001). "Designed for addressing ill-structured problems, the systems allow decision-makers to pose questions, explore alternatives and identify potential solutions in an interactive, computer-based environment" (McLafferty 2003).

The spatio-temporal nature of population movement (and related patterns seeking of health care) can be complex. For example, a person may be a member of more than one household (living in one household during the week to be near work or school and returning another on weekends or public holidays) or may chose to preferentially seek health care in an area that is closer to work or day-care facilities rather than place of residence (Cromley & McLafferty 2002). To improve our understanding of the impact of physical access to health care on health outcomes in a population, methods are needed that account for the high population mobility in many settings and that for example, incorporate into measures of accessibility the amount of person-time spent in various localities.

As described in this chapter multiple factors such as the community and individual levels of poverty, and disease profile will profoundly impact on access to and allocation of health care resources and therefore on the types of methodologies that can be applied to measuring and understanding access to care. The rapid growth of managed care, ambulatory services, telemedicine, and provider networks in the developed world for example, is fundamentally altering health care delivery and traditional methods of measuring accessibility and spatial organization of health care delivery are likely to have to be significantly changed (McLafferty 2003). In the developing world research should focus on the generation of more locally relevant and precise estimates of geographical access and their relationship to health outcomes.

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Chapter 29

The Changing Geography of Care

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Introduction

Within human geography we have seen the emergence of a wide-ranging debate around care in recent years. One significant strand of this debate has focused on care as an ethical concern – one that incorporates such issues as difference, beneficence, citizenship, rights, and responsibilities. Here, the ethics of care has been considered across a range of spatial scales that stretch from the global to the highly place-specific. Though these are highly important and topical issues, we should not forget that the discourse of care also holds considerable meaning for those working within geographies of health and social care. Here, care is largely interpreted within a relational framework that examines the linkages between health and care-giving, the places in which it occurs, and those charged with its delivery. This is of particular importance in many advanced capitalist countries, where health and social care policies have focused increasingly on the development of services designed to support care-giving in community and home-based settings rather than the large institutional settings that predominated in the past. Such shifts in *where* care takes place have implications for *who* is responsible for the delivery of that care. The turn to neoliberalism and third way approaches to health and welfare, in countries such as the United Kingdom, North America, and New Zealand, for example, has placed increasing emphasis on informal care-giving through the family and the voluntary sector. In this chapter we, thus, focus on the new spaces of care identified within contemporary geographical research and in particular we examine the increasing role played by the voluntary and informal sectors in the delivery of health care provision.

To address these issues, we have organized the chapter around four main sections. Firstly, we consider who cares and for whom. Here, we focus on the shift from care delivered by health professionals to social care, the voluntary sector, and the family. Such a shift also has implications for gender and culture that warrant consideration. We also examine debates around the nature of that care in relation to older people and disability. Secondly, we focus on the changing place of care, from an early focus on the institution to community and home-based care in the late twentieth and twenty-first centuries. We consider how the increased emphasis on family and voluntary sector care, together with newly emerging forms of care (such as new care technologies), impacts on who cares and where. Our third section draws on case material from the United Kingdom, New Zealand, and North America as a means of examining how changes in care are being experienced by those involved in the delivery and receipt of care in different places. Drawing particularly on work with disabled and older people, we focus on how shifts in where care takes place can impact not only on people's physical and emotional experiences of care, but can also transform the place in which care-giving occurs. Finally, we consider some future directions that geographical work around care might take, with specific reference to the interrelationship between statutory, voluntary, and family care provision.

Who Cares?

Care and shifting welfare regimes

Who cares is affected by differing political and socio-cultural constructions of care and how this is interpreted within a framework of rights and responsibilities. In many non-western societies, traditional family-based systems of care-giving remain the norm. Informal care is viewed as an extension of everyday familial responsibilities and can thus be characterized as an exclusively private activity embedded within notions of familial obligation. At the other end of this ideological framework, socialist and welfare regimes view care as a collective responsibility, organized primarily by the state, and often (but not exclusively) situated within institutional settings. Attempts to resolve growing post-war welfare crises in many advanced capitalist countries, together with an ideological shift away from institutional to community-based care since the mid-twentieth century, has led governments to seek ways in which to reduce their responsibility for care. This "public service restructuring" was manifest in an orchestrated set of policies, measures, and institutional actions aimed at reducing state involvement in welfare provision through the development of a mixed economy of care (Lewis & Moran 1998). For many neo-liberal governments this has also included the adoption of so-called "third-way" approaches (Giddens 1998) – a central precept of which, is the belief that while the state and markets still play an important role in the provision of care, the voluntary and informal sectors should also be recognized and encouraged as key players (Milligan & Conradson 2006). Such approaches have, thus, effected a change in both the institutions and actors charged with the planning and delivery of that care. Responsibility for care is shifting from the state to communities, households, and individuals – most significantly, family members.

The precise forms of neo-liberalism that states have adopted are historically and geographically specific (for further discussion see Esping-Anderson 1996; Peck 2001). This has prompted a number of studies that have examined the nature and implications of these shifts for various populations involved in the provision of care and those supported by it (Glendinning & Kemp 2006; Ungerson & Yeandle 2006).

The complexity of understanding who cares for whom, however, is obscured by the ways in which informal carers[1] have become the subjects of health and social care policy in recent years. Twigg and Atkin (1994), for example, noted how informal carers could (and were) being regarded variously as service-users, resources, and co-workers. The intricacy of policy intersections between informal (family) carers and other groups, further illustrates the complexity of this area of study. For example, policies around the rights of care-recipients can have a substantial impact on both formal and informal carers and vice versa. Notable areas of work have therefore focused on the implications for who cares (Twigg & Atkin 1994); multiple definitions of care (Morris 1993; Watson et al. 2004); charitable versus rights based notions of care (Barnes 1997); and good care versus bad care (Campbell et al. 2000). At the local level, unpacking who cares is further complicated where informal carers contribute both their time and energy to grassroots voluntary groups, for example, through carers' and parents' support groups, local disability organizations, and day centers.

Continuing debate about state versus individual responsibilities to care is apparent in the ways in which various governments have grappled with defining social rights for carers. The realm of social rights has been one of the greatest sources of uncertainty in discourses about the role of the state, particularly in relation to care. This has been of particular significance for women. Because women's care work has historically been seen as the regular maintenance of the home and family, governments often struggle with the idea of according extra symbolic or cultural status to the role of caregiving.Critically, then, the reframing of responsibilities for care and the emergence of new approaches to welfare during the latter half of the twentieth century onwards, can be read through a shifting landscape of care and care providers – an issue we address in more detail in subsequent sections of this chapter.

Good care versus bad care

Unpacking who cares also requires us to think about what constitutes good and bad care. Good care can, perhaps, best be defined as the provision of the "appropriate" physical, social, and emotional supports to meet the [self-defined] needs of the person requiring help in order to maintain as much independence as possible in their everyday lives. Good care should be delivered within an environment that is most suitable to the care-recipient's specific needs, but should also take account of the impact on care-givers. It also needs to be delivered within a wider context of a caring and care-ful society free from gender, age, cultural, or other forms of discrimination. Nolan et al. (2001) suggest that the perceptual and subjective dimensions of "good care" can also be captured in a framework that incorporates six "senses," including a sense of security, continuity, belonging, purpose, fulfilment, and significance.

Work on what constitutes "bad care" has a long and extensive history in the social sciences – particularly within disability studies (Morris 1993; Oliver & Barnes 1998). This arose in response to the medicalization and bio-reductionism of individuals thought to be in need of care and assumptions that this care could best be delivered within an institutional environment. Such thinking led medical and social care professionals to assume paternalistic positions of power and control over the lives of disabled people, thus undermining or negating their capacity for autonomy and self-determination (Thomas 2007). This view continues to inform debates on care and independence. Hence, despite the shift to community-based care, the term "care" is one that remains synonymous with dependency in disability studies – so central to the process of disablism. Here, disablism refers to the social beliefs and actions that oppress, exclude, and disadvantage people with impairments (Abberley 1987). According to some disability scholars, contemporary community care still creates dependency – it has simply been repackaged within a new frame of practice (Oliver 1996; Oliver & Barnes 1998). Indeed, Twigg and Atkin (1994) go so far as to suggest that while informal (family) carers are by and large seen as part of the solution, they may also be part of the problem.

It is not only family carers who are seen to be part of the dependency problem. The disability movement has also sought to actively disengage from any association with voluntary care provision through religious or secular charities. These organizations, they argue, too often construct care as a charitable act of benevolence towards dependent and needy subjects (Oliver & Barnes 1998). Such resistance has led to intense debates about whether individuals should be constructed as requiring care or personal support (see, for example, Thomas 2007).

Finally, in recognizing that "bad care" has the potential to undermine or negate the capacity of the care-recipient for autonomy and self-determination, it is also important to note that changing the place of care is not necessarily the panacea for alleviating the potential for bad care in the form of abuse. We have seen a number of high profile cases of abuse in institutional settings in the United Kingdom and elsewhere (for UK examples, see BBC News 2001; Newell 2007), hence as Clough (1996) and others note, community care can simply shift the potential for bad care into the private space of the home, making it even more difficult to monitor and address.

What do we mean by care?

It is clear from the above discussion that "care" is subject to differing social, political, ethical, and cultural interpretations. Much emphasis is also placed on ensuring care is defined in terms of the needs of the care-recipient. Increasingly, however, we have seen the emergence of debate around how the notion of care is perceived among those who are the recipients of caregiving. There can be significant variation not only in the duties and tasks that an informal carer carries out for people experiencing different forms and levels of illness or disability, but also in how that care is conceived in each case. As noted above, the notion of "caring" for a disabled person is the source of significant debate.

Rather than care, those working within the disability movement argue that a more empowering and liberating strategy is one of personal assistance (Thomas 2007). Here, personal assistants (PAs) have a task-centered role that involves response to instruction. In this model, disabled people become recipients of assistance – in much the same way as a business person relies on a PA for appropriate help and support. Furthermore, the concept of assistance cuts through the emotional symbolism that is sustained by the binary distinction between carer and care recipient, returning power in that relationship to the disabled person (Watson et al. 2004).

The implementation of direct payments policies in the United Kingdom, in particular, has brought this debate to the fore as it involves making monies available to disabled and older people to enable them to employ their own PAs (Glendinning & Kemp 2006). Whilst this approach has the potential to reduce dependency models of care, as Shakespeare (2000) notes, independent living (IL) models may not appeal to all. In part, this is because for some, such as those experiencing terminal illness, extreme old age, or severe intellectual impairment, taking on the responsibility of an employer when experiencing ill-health disability is too daunting. For them and others, voluntary support and traditional family care arrangements are often viewed as preferable to support based around models of independent living (Shakespeare 2000). This may be because the contractual non-personal form of assistance advocated by the IL model fails to capture the combination of emotional and practical care (Watson et al. 2004). Indeed, Wiles (2003) has argued that the emotional nature of care-work is just as important, if not more so, than the physical issues of care-giving and the body. Downplaying the importance of emotional work also fails to recognize the ultimately gendered nature of care and care work (Watson et al. 2004). Feminists (e.g. Finch & Groves 1983) have argued that as long as women continue to be the primary carers in the home and in related areas of employment, the emotional component of care, and care work more generally, will remain undervalued.

The above issues all have implications for who carries out care and expectations of care. Care continues to be undertaken overwhelmingly by women (as informal carers) and increasingly by the voluntary sector (as formal care-workers). The disability movement, however, has attempted to develop a more instrumental view of the processes that constitute the caring relationship. Clearly then, the women's and disabled people's movements hold very different, if not contradictory, positions and priorities with respect to care.

The Changing Place of Care

In the previous section, we considered contemporary shifts in who cares – and where the rights and responsibilities for care-giving now lie. Any change in the balance of responsibility has inevitable implications for where that care takes place and vice versa. In this section, then, we turn our attention to these interrelationships to consider how, over time, newly emerging forms of care have resulted in the creation of new landscapes of care. More specifically, we consider how the shift from institutional to community-based care, together with policies aimed at supporting care recipients to remain in their own homes, has affected a shift in the balance of care from the formal to the informal sectors.

From institutional to community-based care

One strand of work around care has focused on the shift from institutional to community and home-based care. Geographers writing around people with mental ill-health, disabled people, and frail older people have drawn attention to the ways in which the distinctly nineteenth- and early twentieth-century solutions to "care" were bound up with issues of order, control, discipline, and medicalized treatment within large-scale institutional settings (see for example, Philo 1987, 2000; Cornish 1997; Park & Radford 1997). Park and Radford point out that such work focused largely around three core themes: first, a concern with exclusion and how care delivered within large-scale institutions effected a spatial segregation of frail and impaired people from the wider community – either for the purpose of therapeutic intervention or for the purposes of social control. Second, researchers have been concerned to explore the relationship between access and utilization of institutional care services. Finally, there has been a concern to demonstrate how the classification and labeling of those in receipt of institutional care enabled "an ever more specialized allocation of space within and between institutions" (Park & Radford 1997: 71).

Around the mid-twentieth century, however, we began to see the emergence of a growing body of evidence that highlighted the often parlous state of care provided within these institutional environments and the adverse impact this was having on the health and wellbeing of care-recipients (e.g. Goffman 1961; Townsend 1962). Stories of abuse, mistreatment, and the institutionalization of both staff and patients within often aging and crumbling institutions were emerging, making it clear that there was a need for a radical rethink about how we should care for what are some of the most vulnerable groups in our societies. This, together with an ideological shift in thinking about the form this care should take, gave rise to a process of deinstitutionalization and the replacement of institutional care by community and home-based systems of care (Dear & Wolch 1987; Milligan 2000a, 2001; Metzel 2005).

It is not the purpose of this chapter to consider the impact of deinstitutionalization and geographers' contributions to these debates – this is dealt with elsewhere in this book. Rather we wish to draw attention to how deinstitutionalization acted to shift the landscape of care away from large-scale institutional settings dominated by medical models of care, to community and domestic settings in which social models of care have come to play a far more dominant role than had previously been the case. For frail and impaired people, this shift not only promoted the development of new forms of care and care provision but also drew new actors into the caring network.

Landscapes of care and the voluntary sector

Critically, the shift to community-based care placed significant emphasis on the need for social and medical care services to work together in ways that, in some countries, had not previously been the norm. In the United Kingdom, for example, where health and social care had long operated as discreet services, there was significant evidence of "turf protection" as health and social care professionals sought to protect the boundaries between what they saw as their distinctive roles. This can be seen most clearly in debates around the "health or social bath" for older and disabled people (Twigg 1997) but has also involved medication and other activities formerly seen as the preserve of health professionals. In many neo-liberal states this has been compounded by the adoption of "third way" approaches to care that have sought to separate out purchaser and provider roles, opening up care provision to a wider range of voluntary and private sector care providers through competitive contracting (Milligan 2001; Power 2005; Owen & Kearns 2006; Cloutier-Fisher & Skinner 2006). A common outcome of the shift to community-care, therefore, has been to draw the voluntary and private sectors into much closer working relationships with the state, increasing interdependence in the planning and provision of care services, particularly at the local level. Debate about what this means for the voluntary sector continues (see for example, Wolch 1999; Salamon 1999; Milligan & Fyfe 2006). Most notably Jennifer Wolch (1990, 2006) argued that what we are seeing is the emergence of a "shadow state apparatus" that involves a "deepening instrumentality of non-profit organizations within emerging state formations" (2006: xv).

The appeal of an enhanced role for voluntary organizations in the provision of care is seen to lie not only in their not-for-profit status, but also in their ability to respond quickly and flexibly to new care needs and demands in innovative ways that public services, bound up in state bureaucracy, are often unable to achieve (Milligan 2001). Combined with a shift from grant-aid to competitive contracting, this enhanced role for voluntary organizations has brought both opportunities and constraints. On the one hand, contracting has opened up opportunities to deliver more services to more of the target group the organization was set up to serve. On the other, state contracting for specific services, delivered to specific people, in specific places, has resulted in greater state control over the form and kinds of services voluntary organizations can deliver, increased monitoring and bureaucracy. For voluntary organizations this has often meant making tough decisions about whether they are willing to: (1) compromise their mission statement in order to attract contracted funding; and (2) lose some flexibility, as the contracted service they can offer and the place in which they can deliver it, is both proscribed by the contract and monitored by the state (Brown 1997). In addition, the time and expertise required to negotiate contracts and to adhere to monitoring procedures has led some to argue that this works in favor of larger over smaller organizations and has lead to: (1) an increased professionalization of the sector; and (2) increased competition between organizations as they compete for the same funding (Bondi 2004; Barnett & Barnett 2006). In the United Kingdom this has been further complicated by the development of new governance structures manifest as formal partnership bodies that operate between the state and civil society. Made up of representatives of the statutory, private and voluntary and community sectors, these bodies are charged with the strategic development of care services but in ways that are outside traditional democratic control (Fyfe & Milligan 2003).

Geographers have been particularly keen to examine how these developments impact on the spatial equity of care. While some voluntary care provision is institutional in nature – through for example, the development of voluntary care homes and hospitals (see Valins 2006), in the main voluntary care services focus on the provision of domiciliary and community-based care. How and where voluntary organizations develop, however, often relies on local champions, the availability of funding, the skill of those working within the voluntary organization in competing for scarce resources, and the extent to which the organization's focus is seen as serving a current political priority. As work in the United Kingdom, North America, and New Zealand has highlighted, dependence on such factors can contribute to an uneven distribution of voluntary care services that shifts and changes over time and which, at a local level, can result in complex layers of inclusion and exclusion (see for example, Milligan & Fyfe 2004; Skinner & Rosenberg 2006; Barnett & Barnett 2006).

More broadly, it should be noted that while the voluntary sector is playing an increasingly important role in the delivery of care across many advanced capitalist countries, how this is manifest and experienced varies not just within countries but also between them. Bacon (2006), for example, points out that in Northern Ireland the majority of voluntary welfare development is faith-based. Given the historical context of Northern Ireland's troubles and religious division, it is inevitable that this has influenced how and where voluntary welfare organizations have developed, and in particular, their relationship to the state. This intricate interplay of historical, social, cultural, and political factors means that any attempt to "read" the landscape of voluntary care cannot be undertaken without an understanding of the particular context within which it is situated. While there are some commonalities in how voluntary care has developed across neo-liberal economies, how it is manifest in the United Kingdom, for example is rather different to that of North America and New Zealand.

Care and home

The shift from institution to community places care for frail elderly and disabled people more firmly within the private space of the home. Care policies designed to support individuals to remain at home rely heavily on family, friends and neighbors to provide much of the care-recipient's everyday support needs This includes such tasks as dressing, bathing, toileting, medicating, feeding, cleaning, and shopping – as well as the provision of important social and emotional support. In the United Kingdom, a recent report from one carers' organization noted that the economic value of this informal care amounted to some £87 billion per annum (Yeandle & Buckner 2007: 30). Informal care-work is thus the "given" against which other forms of home-based care are developed and provided. Informal care work is also highly gendered. Though some men do undertake tasks of informal care-giving, research indicates that women carers still predominate. The form of care given by men is also argued to be qualitatively different, tending toward practical care tasks such as financial management, shopping, and home maintenance rather than the more personalized care offered by women (Miller & Cafasso 1992; Bywaters & Harris 1998; Neno 2004). Policies designed to support care in the home, thus impact disproportionately on women.

Geographical work on care-giving and the home has highlighted how this change in the place of care not only shifts the meanings and practices associated with home, but also blurs the boundary between public and private space (Dyck 1998; Twigg 2000). The traditionally private space of the home becomes both a place of care work and a place of care consumption (Wiles 2005). As Twigg (2000) and others have pointed out, this also creates shifting power relationships within the home – between service recipients, health professionals, and family carers. To receive care, recipients must grant access to some of their most private spaces to a range of voluntary, statutory and/or private care providers. This opening up of the home to formal and informal care providers can change the meaning of the home not just for the care-recipient but also the primary care-giver. We explore these issues in more depth in the following section. But as Milligan (2000b) notes, with increased frailty and mobility, care-recipients can find themselves confined to a single room with few opportunities to move outside. Depending of the extent of support required then, the spatial re-ordering of care can, for some carers and care-recipients, be akin to an institutionalization of the home.

As suggested above, how care is manifest and who delivers that care can change over time and place. Recent advances in new care technologies provide a good example of how new forms of care can impact on who cares and where that care takes place. Smart homes and domotic (home automation) technologies such as electronic pill dispensers, smart plugs, and environmental control systems are designed to enhance the independence of frail older or disabled people within the home, reducing the extent to which they need to rely on care support (whether formal or informal) (Curry et al. 2002). Care technologies such as telecare, webcams, smart clothing, and other home-based monitoring devices, however, are bringing new care providers and care workers into the caring network. As Mort & Finch (2005) also point out, many of these technologies involve understanding people's "normal" routines, using alarms to monitor any deviation from this routine. While proponents of these systems argue that such developments enhance the ability of frail and chronically ill people to remain longer in their own home, we cannot accept these developments uncritically. Information gathered about the daily activities of older people is aggregated and stored, raising not only ethical, legal and governance questions about consent and ownership of the data, but also about how these monitoring technologies change older people's experiences of privacy at home. This then points to the emergence of new actors in caring networks, as well as new forms of care and the emergence of new places in which care occurs (Milligan et al. 2006).

Experiencing the Changing Geographies of Care

In this section we draw on material from the United Kingdom, New Zealand and North America to examine in more depth, just how the informal sector is experiencing these changes in the landscape of care.

Experiences of the voluntary sector

Arguably, for voluntary organizations, two of the most significant and inter-related impacts arising from changes in the topography of care are increased pressure to professionalize and increased competition for scarce resources (Owen & Kearns 2006). For some, professionalization exemplifies a global shift in which local geographical and cultural knowledge is eschewed in favor of a technical managerial approach implemented by "experts" (Fyfe 2005). Such a shift is not without casualties, as many (particularly smaller) voluntary organizations have found it difficult to adapt to the new managerial demands. Jenkins (2005) and others further point out that the incorporation of voluntary organizations into the neoliberal project as service providers, effectively neutralizes their flexibility and dynamism. While these impacts have been experienced to varying degrees across all neo-liberal countries, how the sector has been mobilized and shaped varies both within and across these countries.

In the United Kingdom, sectoral shifts have been significantly shaped by New Labour's approach to the "third way." This relationship has been formalized through the implementation of compacts between government and the voluntary sector, designed to enhance their relationship through a set of agreed statements on their respective roles (Plowden 2003). Clear evidence of increasing professionalization is manifest in the ways in which many voluntary organizations have significantly restructured in order to meet: (1) the challenges of new partnership and local governance structures; and, (2) the monitoring and accountability measures required by government as part of their new contractual relationship with the state.

The shift from grant aid to competitive contractualism in the United Kingdom not only underpins much of the drive towards professionalization, it has also generated increased competition between organizations for what has become scarcer and more directed funding. As Milligan and Fyfe (2006) note, much of this funding has been directed at specific geographical or thematic areas of need whose boundaries shift over time according to changes in government priorities and programs. This, in turn, directs other funders towards these priority areas resulting in a skewing of financial resources away from poorer and more marginal areas (Turok & Hopkins 1998). In their bid to attract funding, voluntary organizations have been shown to target these priority areas in what has been described as a "feeding frenzy" for resources (Milligan & Fyfe 2006: 42). This, in turn, acts to create a geographically uneven landscape of welfare voluntarism that can prove particularly detrimental to marginal areas.

In the United States, important social, cultural, and political distinctions have acted to shape the voluntary sector in rather different ways. While, historically, the US voluntary sector has played an important role in welfare provision (Tocqueville 1969), by the early part of the twentieth century it was generally accepted that it was inadequate to address major welfare problems. An insurance-based system, with limited state provision, thus replaced charity to become the main form of welfare (Van Til 2001). The neo-liberal turn from latter part of the twentieth century has, however, once again placed the voluntary (non-profit) sector center stage as the US government seeks to retrench its state welfare responsibilities. This is not without its critics, O'Connell (1996), for example, warns that the shift toward transferring welfare responsibilities from the state to the voluntary sector not only lacks a real understanding of the roles and capacity of voluntary organizations to fill the gaps left by state withdrawal, but also raises important questions about whose responsibility it is for co-ordinating what is a highly dispersed system. Pointing to significant disparities across the United States in how this process is being managed, he cautions that care should be taken such that "in the greater drive for pluralism and decentralization we do not compound the already frightening breakdown in the management of our existing scatterization" (1996: 224). Hence, as Salamon and Anheier (1994: 2) comment, any refocusing on voluntary provision "raises important questions about the relation between the presence of a nonprofit sector and the operation of an effective caring tradition."

While the United States has developed a complex entrepreneurial voluntary sector, there is also a close-knit relationship between religion and voluntary care activity. The church plays a significant role in mobilizing localized advocacy and welfare support. Indeed, in looking at factors influencing the growth of the voluntary welfare sector, Corbin (1999) points to a positive correlation in the United States between the congregation size, the number of churches in proximity to each other and the number of voluntary welfare organizations. Unsurprisingly, the US administration has been concerned to recognize and encourage the role of faith-based organizations in the provision of social care services, opening up opportunities for faith-based and community organizations to compete for federal funding. A recent initiative, "Charitable Choice," for example, has enabled state governments to contract with religious organizations, thus eliminating former barriers to their inclusion in the provision of social services (Bacon 2006).

Those working around issues of informal and voluntary sector care in both Canada and New Zealand have pointed to similar developments in state–voluntary care provision (see for example, Skinner & Rosenberg 2005, 2006; Cloutier-Fisher & Skinner 2006; Kearns & Joseph 2000; Barnett & Barnett 2006; Owen & Kearns 2006). In each of these countries welfare restructuring, competitive contracting, professionalization, and new governance structures are creating a radical transformation within the voluntary sector and bringing it into new relationships with the state. Wolch (2006: xiii) goes so far as to argue that "restructuring has catalysed the pursuit of the voluntary sector "fix" that protects state legitimacy yet maintains [state] flexibility and control." As we have sought to demonstrate, however, how this is mobilized is subject to differing social, cultural, and political histories that are played out in different ways in different places.

In New Zealand, for example, the Treaty of Waitangi, between Maoris and non-Maori, means cultural considerations are at the heart all care planning and provision. In Canada, the presence of provincial and three territorial systems over a single national health care system means that while each adheres to core principles set out by federal government, each can play out in different ways (Skinner & Rosenberg 2006). The vast geographical divisions between rural/urban and North/South in Canada also mean where Canadians live, rather than what they need, can underpin whether, and what kind, of services they receive (Shapiro 2002). The harsh weather conditions of northern Canada, for example, make service provision particularly difficult, leading to an exacerbation of inequities in access and provision (Williams 1996). Differences amongst the for-profit and non-profit providers can thus be transcended by a collective sense of struggle to cope with the broader inequities that exist within the care system (Skinner & Rosenberg 2006).

Socio-spatial experiences of family caring

Despite similar trends, there are also substantial variations between countries in the extent to which they have explicitly attempted to strengthen the responsibilities of families or expanded public services to relieve families of some of their caregiving responsibilities (Leitner 2003).While the above cultural and place-specific factors have also had profound effects on informal carers, the most clear distinction between nations has been the extent to which public policy assumes that households or the State carry principal responsibility for their members' welfare (Glendinning & Kemp 2006).

Despite a long history of state familialism in the United Kingdom, since the last 1980s there has been growth of carer-focused policies that recognize the separate needs of informal carers from those of the care recipient (e.g. carer allowances and carer assessment). While this is a positive move for carers, commentators maintain that such policies do not go far enough, in that carer services are still limited and rationed (Klein et al. 1996; Arksey 2002) creating an implementation gap between policy and provision. Nevertheless, these developments still highlight a commitment by the state to recognizing and supporting carers. This is in contrast to countries with mixed or privatized health care, such as the United States and Canada, where there is still significant debate about whether or not carers should be recognized as a separate client group. In the United States, the issue of who cares is grounded in a care system underpinned by values of independence and competition (Brockley 2004). This has been further underscored by the success of the US disability movement in creating a social discourse based on independence and empowerment as opposed to charity. Hence, the United States has followed a very particular model of carer policy where federal and state legislation is based on a rights-based model – but one that largely supports the rights of the care recipient (Polivka 2001). This is exacerbated by the federal structure of the United States. So while the federal "National Family Caregiver Support Program" (NFCSP) offers some minimal support to moderate-income families, in reality, authority for most service provision rests with state and local governments. Several states, for example, California, Pennsylvania, and Washington, fund care-giver support programs from their state general revenues (Fox-Grage et al. 2001), however, a report by Smith et al. (2000) found that in half the states, the share of Medicaid long-term care resources spent on home and community services was less than 8 percent (though New York varied at 50 percent). There is thus significant variation between states, with many placing tremendous responsibility on informal carers – including the negotiation of complex service environments with different eligibility requirements and coping with the financial impacts of this, which drive many to state-poverty levels (Levine 2007). Hence, despite a discourse of empowerment and independence, support for informal care is patchy and largely remains a family responsibility.

Similarly, in Canada, as late as 2000, recognizing care-givers as a separate client still remained a particularly contentious issue for federal and provincial governments that saw this as opening the floodgates to an entirely new constituency who would demand services (Chappell et al. 2001). Carers thus fit rather awkwardly between disability and health care policy. As a result, the social side of support in these countries – home support services in particular – have been cut and access to these services have become more restrictive through changing eligibility criteria (Anderson et al. 2002). As with the United States, differences in home care policies among the provinces are substantial enough to make where Canadians live, rather than what they need, the basis for determining whether they gain services (Woodward et al. 2004). There are significant differences between English-speaking Canada and Quebec, for instance, with the latter having a much larger provincial government role in health and social services, as a result of enshrining a continental model of collective responsibility (Skinner & Rosenberg 2006).

It is clear that both voluntary organizations and families have been significantly affected by neo-liberal health and social care policies. At the same time, each country exhibits cultural, political, and place-specific differences that affect how the informal sector (including both voluntary and family care providers) is conceptualized and incorporated within the care sector. In countries with longer histories of contractual funding for the voluntary sector, such as the United States and the United Kingdom, organizations have learned to adapt to greater competition. Interestingly, based on evidence from the United States, Johnson et al. (1998) maintain that over time, competitive contracting actually reduces competition as bias toward incumbent providers creep in and monopolies develop. However, the importance of faith-based voluntarism should not be underestimated as a mobilizing force for the sector. In addition, place-based differences, such as urban/rural location, remain an important factor in how voluntary organizations are affected by neo-liberal policy.

The construction of social "norms" in relation to the role of family and disability has led to very distinct local practices for carers informal. Although there has been a common objective in all countries to maintain the dignity and independence of care recipients in their own homes, discourse around the responsibility of "family" differs significantly. Despite the broader neo-liberal trend, there is still a belief in the United Kingdom in the ability of the welfare state to ameliorate the problems for carers and care recipients, albeit through an increasingly elaborate mix of community care providers. In the United States, values of independence come into conflict with a strong measure of state familialism, which relies heavily on the family. It is thus clear from looking across nations, that what care *is* is shaped by differing emphases on ensuring whether care is defined in terms of the needs of the care-recipient or the carer.

Moving Forward: Future Directions for a Geography of Care

In this final section we consider some of the specific contributions that geographers are making to debates around care as well as drawing out some of the gaps and newly emerging themes. In particular, we aim to identify some of the ways in which geographers might extend existing work through a consideration of how place shapes, and is actively shaped by, changing forms of care, shifting relationships between different "care" groups and those charged with the responsibility to care.

Within this chapter we have addressed a number of recurring themes: first, we have drawn on debates about who cares, and how the roles and responsibilities to care change over time and place. Differing welfare regimes and shifting political responses to the so-called welfare crisis, particularly neo-liberal responses, have effected a shift away from a state-centered responsibility to care toward a [re] emphasis on individual responsibility. The widespread adoption of the "third-way" in many neo-liberal states has also elevated the role of new actors in the care network. Most specifically this is manifest in a new landscape of voluntary care provision – one that Wolch (1990) and others have long argued has implications not only for the spatial equity of care, but also for traditional democratic control over these caring services. As the form, performance, and place of care have shifted, it has become increasingly difficult to disentangle who cares. The boundaries between statutory, voluntary, and informal care provision are becoming increasing porous as informal carers and voluntary care-workers take on tasks previously the remit of the statutory services. But this is not the whole story; recent work in the

United Kingdom, Canada, and New Zealand has begun to unpack some of the complex interrelationships between voluntary groups and informal carers (e.g. Skinner & Rosenberg 2006) and between voluntary and statutory organizations (Milligan et al. 2008). But shifts in the actors involved in care and where that care takes place are also acting to reinforce the gendering of care. Not only do women undertake the bulk of informal care in the home, but care-work undertaken by voluntary organizations also falls disproportionately on women. New care technologies may be reinforcing the gendering of place and care. Interestingly, how the spatial restructuring of care may be reinforcing traditional gender roles has been little explored by geographers, to date. There is even less work on male care-giving.

Shifting the focus to the global scale, with the exception of work on child carers by Elspeth Robson (2000) health geography has had a very limited engagement with informal care outside of advanced industrial nations. A further significant gap exists around the role of voluntary health non-governmental organizations (NGOs) and civil society organizations (CSOs) in so-called "developing" countries. International NGOS such as Médicin sans Frontières, Oxfam, Save the Children, and the International Red Cross, to name but a few, play an important role in disaster relief and emergency medical care in the aftermath of war and natural disaster. But voluntary aid through NGOs, though important, cannot be accepted uncritically and geographers can play an important role in these debates.

More generally, the focus on care *within* state boundaries illustrates the various scales at which normative understandings of care generally operate, i.e. those of the national, regional, and local scales. At a broader level, however, geographical understandings of the site of care often ignore the concept of care *across* nations. Rights and responsibilities to care is a contentious issue even within countries. This has been exacerbated by increased global mobility. For example, the widening of EU membership and increasing movement of populations across member states, has exacerbated long-running debates in the United Kingdom over whether its National Health Service should support non-British (EU/non-EU) citizens (BBC News 2007). Differing cultural conceptions of care, government concerns over the rights of migrants and asylums seekers to care, combined with the difficulties these migrants can face in obtaining appropriate care in their host country highlight just some of the issues that warrant further investigation. Geographers are, thus, in a unique position to consider how the landscape of care is being shaped beyond the national scale.

This focus on care and how it operates in relation to scale leads us to a second theme of what constitutes good and bad care. At a global scale, bad care might be seen to be that delivered by NGOs in ways that act to reinforce traditional colonialist patterns of power. At the level of the local and individual bad care may be characterized as that which reinforces traditional structures of patriarchy and discrimination; and that which fails to empower and protect the care-recipient from mental or physical abuse. The shift from large institutional spaces of care to more fractured and disparate spaces such as the home and community-based facilities increases the potential for bad care to remain hidden from the public gaze. Further, Wolch & Philo (2000) and Moon (2000) have further pointed to the ways in which jails have increasingly become the "new institution" of [bad] care for those with mental ill-health. Hence debate about what constitutes "good care," the form that care should take and where continues.

But should we even be talking about care? Though there is some sectoral differentiation between geographical work in this field, there is still a tendency to think about "care" for disabled or frail older people in a way that makes the impairment – and issues specific raised by the form of impairment – less visible than it perhaps should be. For example, those working within the disability movement make clear that, in their view, we should not even be talking about care in relation to disabled people. Rather, we should be focusing on personal support. Such a view can be equally applied to any individual requiring support with his/her daily life. Importantly, however, we should acknowledge that at some point frailty can increase such that personal support must give way to care. Hence care and support, we would maintain, represent differing ends of a spectrum that stretches from independence and personal support within home and community settings to care and dependence within domestic or institutional ones. This spectrum entails different spatialities of care for different people with different impairments.

Our third theme draws more specifically on the shifting landscapes of care and the need for a spatial theorization of care that goes beyond earlier work on the homespace as exemplified by Twigg (2000) and Milligan (2000a, 2003). Traditionally, there has been a focus on conceptualizing the meaning of home, either for the carer or for the care recipient or a concern with the impacts of deinstitutionalization. Debates around institutionalization and deinstitutionalization, however, are now giving way to new debates around reinstitutionalization and the meaning of asylum, particularly for people experiencing chronic mental ill-health. Others are seeking to conceptualize community and homecare within ideas around extitution (Domenech & Tirado 1997), whilst care transitions are being considered in relation to the meaning of home (Milligan 2004, 2006). The increasing porosity of the boundaries between who cares and where, thus calls for a more dynamic theorization of how different individuals are enmeshed in the care/home landscape.

Note

1 Here *informal* carers are defined as those, generally family members, relatives, or close friends, who look after frail elderly or disabled relatives in the home. They may, or may not, receive some form of state benefit but are paid no formal wage for the care-work they undertake. Conversely, *formal* carers are individuals who may be employed by statutory, voluntary, or private sector organizations but who receive a wage for the care-work they undertake.

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Chapter 30

Complementary and Alternative Medicine (CAM): Production, Consumption, Research

Gavin J. Andrews, Jon Adams, and Jeremy Segrott

Overview

This chapter has two sections. Drawing on a wide-range of social scientific research, the first provides an introduction to, and overview of, complementary and alternative medicine (CAM). It discusses a wide range of baseline issues that will be informative to those unfamiliar with CAM and CAM research, including: definitions, the rise in its provision and use, and the nature of production and consumption. Whilst spatial features are emphasised in the first section, the second section is more squarely geographical in its orientation and engages directly with geographical issues and research. It considers geographies of CAM at the macro-scale of countries and regions and moves on to consider geographies of CAM that exist at the micro-scale. It explores the roles of space and place in CAM materials and practices and also examines the many non-physical spaces that exist in CAM including websites and other cyberspaces, and imagined and visualised spaces in treatments. Throughout the chapter, attention is paid to the nature of "progress" in the geographical study of CAM. The chapter closes with some thoughts on possible avenues for future research inquiry.

An Introduction to CAM

What and where is CAM?

Complementary and alternative medicine is a catch-all term now widely used to refer to a vast range of health and health care products, therapies, technologies and practices that are available largely beyond state-funded conventional health care systems and are not commonly taught as core topics in the health sciences and undergraduate medical curriculum (Adams 2007). Often included in definitions of CAM are such therapies and medicines as acupuncture, aromatherapy, chiropractic, homeopathy, reflexology, traditional Chinese medicine, naturopathy, massage therapy, as well as a range of herbal remedies, vitamins, and health supplements. CAM was not always the most common term used in research. Prior to CAM becoming generally accepted, "alternative medicine" was most often used, which signified the use of such therapies and medicines *instead* of conventional health care. Later, as commentators gradually realized that these therapies and medicines were often used *at the same time as* conventional health care, the term "complementary medicine" became more popular. CAM, then, is simply the latest guise which accounts for different kinds of relationships.

Unfortunately, any attempt to define and classify these medicines and therapies does face a number of significant challenges. These are not difficulties to be glossed over but important markers illustrating the political and cultural nature of health care practices, provision, territory, and identity (Adams 2004). A major hurdle to producing a meaningful definition or classification has been created by the sheer breadth of potential health and health care therapies, practice, and products available, a breadth that can often result in the grouping of medicines and therapies that appear to have little in common (Tovey et al. 2004). Moreover, to define CAM primarily as distinguishable from the biomedical model of conventional medicine and the practices of the conventional medical community might be regarded as a negative starting point. While insightful from a social science perspective, it also houses two problems. First, recent integration, whereby CAM and conventional medicine are provided together, is blurring some of the more traditional distinctions between the two medicines.

Second, this definition fails to positively define the character of CAM. In response, some researchers have attempted to classify CAM via a number of positive and distinctive crosscutting features. For example, Coulter (2004) outlines a number of broad metaphysical positions that lie behind the philosophical principles common to CAM; suggesting that it is, to varying degrees, based upon a number of principles including vitalism (the healing power of nature), holism (the whole is greater than the sum of the parts), naturalism (acceptance of things natural), humanism (dignity of patient is considered central to therapy), and therapeutic conservatism (least care is best care). Based on these kinds of ideas, "holistic medicine" has become popular as an alternative title to CAM with some commentators and lays emphasis on the way in which these medicines and therapies simultaneously examine the client's mind, body, and broader social life.

No dominant medical system has ever practiced an absolute monopoly over health care in any one country or globally. Indeed CAM, like all health practices and technologies, is both spatially and temporally variable. For example, homeopathy is a popular CAM in Germany and other parts of Europe but has relatively little presence in Australian culture. Similarly, chiropractic is a popular CAM therapy in Australia but is often considered mainstream medicine by many in the United States. In this sense, it is advantageous to perceive CAM not as a static entity but as a fluid process influenced by cultural, social, and political change. As we will see, such cultural and geographical variations must be considered when interpreting CAM in any given context.

The prevalence and profile of users

The popularity of CAM has grown exponentially over recent years and CAM is now positioned as a major health care resource in most advanced industrial societies for both the treatment of illness and maintaining wellbeing (Tovey et al. 2004). Empirical work has identified the use of CAM by a substantial proportion of the general population in a number of countries including the United States (Kessler et al. 2001; Barnes et al. 2004), United Kingdom (Thomas et al. 2001), Canada (Millar 1997), Australia (Adams 2004b; MacLennan et al. 2006), Italy (Menniti-Ippolito et al. 2002), Norway (Hanssen et al. 2005; Steinsbekk et al. 2007), Denmark (Hanssen et al. 2005), and Sweden (Al-Windi 2004). Analysis suggests that consumers contribute far more financially from their own pocket for CAM than for conventional medicines (MacLennan et al. 2006).

While these and other surveys provide prevalence estimates ranging between 30–75 percent, accurate interpretations and comparisons across surveys are difficult due to variations in CAM definition, question formulation, and design rigor (Harris & Rees 2000). For example, some surveys have reported CAM use over 12-month periods (Adams 2004b; Steinsbekk et al. 2007), others lifetime CAM use (Kessler et al. 2001), yet others have begun to produce longitudinal analysis of CAM use over set periods of time (Bair et al. 2002; Sibbritt et al. 2004). Similarly, where some research has reported prevalence rates for consultations with CAM practitioners (Wolsko et al. 2002; Adams 2004b) other studies have included prevalence of such consultations alongside self-prescribed CAM not requiring a practitioner (MacLennan et al. 2006). Geographical variations in CAM definition, as outlined earlier, should also be considered when interpreting such findings (Adams et al. 2004). In addition to prevalence amongst the general public, work has identified relatively high levels of CAM use amongst specific patient populations. For example, studies have reported high levels of CAM use amongst cancer patients (Molassiotis et al. 2005), patients with diabetes (Edege et al. 2002; Yeh et al. 2002) and patients with rheumatology (Rao et al. 1999).

Despite obvious difficulties in comparing prevalence rates across places, populations, and cultures, it does appear from the expanding literature that CAM is no longer confined to specific subsections and minorities of society but is a popular treatment choice across society. Nevertheless, much research shows that CAM users are more likely to be female, mid-aged (30–50 years old), have a higher income, have a higher level of education, be in full time employment and have a poorer health status than non-CAM users. Some work also suggests that CAM users are more likely to reside in non-urban areas than non-CAM users (Adams 2004b). This has prompted some commentators to suggest an urban–rural divide in CAM use. However, further research is required here and at present the use of CAM and its relationship to rural/urban health remains open to conjecture (Adams 2004b).

Research conducted largely in the United States has examined racial/ethnic differences in CAM use with some revealing a higher level of CAM consumption among non-Hispanic whites relative to minorities (Barnes et al. 2004; Graham et al. 2005; Hsiao et al. 2006). Meanwhile, other work suggests CAM use is equally prevalent among different racial/ethnic groups (Mackenzie et al. 2003), with different ethnic groups utilising different CAM modalities (in some cases aligned to cultural traditions) (Najm et al. 2003). As suggested above, the vast majority of CAM consumption data also illustrates that CAM users tend to employ these medicines in conjunction with, and not as a substitute for, conventional health services (Adams 2004b). This finding suggests that consumers do not perceive CAM as being in direct opposition to conventional services but are instead employing different types of medicines on a more pragmatic basis (Andrews 2002). Nevertheless, this does not mean necessarily that consumers fail to perceive differences between the two types of medicines and it may well be that certain features of CAM (not necessarily predominant in conventional medical care) help understand and explain the increasing popularity of CAM with health care consumers.

Why do people use CAM?

Many studies have investigated the reasons why people use CAM. Although not always stated in this way, these reasons can be grouped under push factors (from conventional medicine) and pull factors (from CAM). In terms of the former, it is thought that users are effectively pushed towards CAM because they have become dissatisfied with conventional medicine. Various reasons have been given for this including a lack of confidence in conventional medicine's ability to effectively treat a range of prevalent chronic conditions (Furnham & Forey 1994; Furnham et al. 1995; Furnham & Kirkcaldy 1996; McGregor & Peay 1996), the perceived negative side-effects of drugs and their over-prescribing (Verhoef et al. 1998) and a failure to meet the emotional needs of patients through comfort and support (Peters 1997).

In terms of the latter, it is thought that users are pulled towards CAM by a range of factors including the holistic and personalised nature of many treatments, the greater time spent in consultations, the spiritual dimension to care (Vincent & Furnham 1996), because CAM is more consistent with many peoples' personal values and philosophical orientations towards health (Astin 1998; Siahpush 1999a, 1999b), because it forms part of a wider identification with an alternative ideology or sub-culture (Pawluch et al. 1994; Fulder 1996; Kelner & Wellman 1997a) and ultimately because it works where conventional medicine does not.

Of course, push and pull factors are highly interrelated. For example, a desire for more personal control over treatment is based in a feeling that conventional medicine disempowers patients whereas CAM empowers them. A desire to engage in a more personalized service in CAM, incorporating a closer and more open form of practitioner–patient relationship, contrasts with a perception that conventional medicine is impersonal and remote. A perceived need to seek "natural" solutions to health and illness contrasts with a perception that conventional treatments are invasive and involve an unnecessary iatrogenic toll. Also, a need to find responses in CAM for the increasing range of chronic conditions that afflict contemporary populations relates directly to the perception that such conditions are not adequately addressed by the conventional curative model (Millar 1997; Siahpush 1998; Bausell et al. 2001; Menniti-Ippolito et al. 2002).

More generally, an added influence, or pathway, to CAM use may also originate in wider societal change. Kelner and Wellman (1997b) argue that the increasing use of CAM reflects a greater number of "smart consumers" in western society: more people who are well informed about health related issues and who prefer to use their own personal informed judgements regarding their health and health care. This, the authors argue, reflects a wider consumer interest in health and body matters in western society and a pervasive moral duty to act and be well (Greco 1993; Conrad 1994). It is also argued that the media has a part to play in promoting this consumerist health culture and sustaining the demand for CAM by providing a wealth of information published in popular magazines and newspapers on diseases and available treatments (Doel & Segrott 2003a).

Some empirical work has helped explore these issues and has begun to test such hypotheses. However, recent research and commentary suggests CAM users need to be investigated in a more sophisticated way that is sensitive to variations in the type of modality used, the nature of use (whether prolonged or intermittent etc.) and the type of user (for example, across racial/ethnic, gendered or geographical lines) (Andrews 2002; Sirois & Gick 2002; Adams et al. 2004; Chao et al. 2006; Shmueli & Shuval 2006). Further empirical research is needed to better understand different CAM patient journeys through time and space and the motivations of the increasing number of heterogeneous CAM users.

Who provides CAM?

The ranks of non-medically trained CAM therapists, often consulting in private solo or group practice, have swelled alongside the rising popularity of CAM use, constituting tens of thousand of practitioners in most western countries. This group unsurprisingly constitute the vast bulk of the sector. Andrews and Phillips (2005) conceptualize and characterize this as a "Petit Bourgeois business model," which includes the selling of low order goods with considerable market viability, financial insecurity (or at least modest profit potential), businesses of modest size, small amounts of employment generation and owners being "hands-on" workers.

Other research has studied specific features of the private sector. Andrews (2003a) and Andrews and Hammond (2004) consider pathways to private practice, the previous employment of private therapists, their reasons for practicing, the range of modalities practiced and the positives they gain from this form of caring and business ownership. The findings suggest that although some younger therapists had moved straight from their education into CAM, the most common scenario was for therapists to be middle-aged people who entered the sector directly from skilled professional jobs and thus to have radically changed their careers. Indeed, many were formerly employed in caring-related professions such as nursing, social work, and teaching. Often therapists had been disillusioned with particular aspects of their former jobs. However, more frequently they were simply attracted by the therapies themselves, the conceptual paradigms which underpin them and to the different experiences of business ownership and caring practices.

In another paper, Andrews (2004) considered varied attitudes towards greater integration into conventional health care systems. This research revealed that the majority of therapists claimed not to have existing business connections with conventional medicine, though many stated that they had established some form of informal arrangements. In general, therapists were happy that they had experienced increasingly positive reactions from conventional clinicians towards their therapies. The overwhelming majority of therapists were positive about the proposition of working with conventional medicine but did state certain reservations and requirements. Although Andrews' research provides some baseline evidence, in comparison to research on the consumption of CAM, very little inquiry has been focused on production by the large private sector.

As suggested above, it is increasingly common for private CAM therapists to work alongside conventional practitioners often in primary health care settings. Although benefits occur for both parties, most therapists who operate in this way still remain financially independent (Andrews 2004). Perhaps more significant still, has been the increasing interest, referral and, in some cases, personal practice of a range of CAM by conventional health professions and in specialties such as general practice (Pirotta et al. 2000; Adams 2003), nursing (Adams 2006), midwifery (Adams & Tovey 2007), and oncology (Samano et al. 2005). It would appear that the somewhat informal or weak model of consumer integration – whereby CAM users have begun to mix and match differing treatments often without the knowledge or consent of their primary conventional physician – has led to an acknowledgement of, and engagement with, CAM from within conventional medical ranks. Indeed, such interest and use has reached levels whereby the appropriate representative bodies and associations have themselves taken an active interest or have at least had to engage with CAM in position and policy statements. Regardless of whether increased interest in CAM amongst conventional practitioners is based upon patient demand, professional self-interest, or financial necessity, it is now the case that those organizing and financing health care systems around the world are increasingly turning to CAM as one possible form of provision amongst a range of medical styles (Baer 2007).

Geographical Issues and Literature

Geographies of CAM

Prior to the emergence of CAM in many advanced industrial societies during the 1980s, geographers focused their research efforts on its "predecessor," "traditional medicine." Typically referring to treatments associated with ancient societies, "traditional medicine" denotes the methods, beliefs, and approaches that people employed to restore health before the arrival of western biomedicine. Geographer's early engagements with this area, examples of which include Pinyin (China), bone setters (worldwide), Ayurvedic medicine (India), and Kampoh medicinal preparation (China), were very much influenced by Charles Good's seminal paper published in 1977. In this paper, Good pointed out the need to investigate how integration between "traditional" and "orthodox" medicine related to national and regional health goals and health planning, particularly in Africa, Asia and Latin America.

Mirroring the perspectives and concerns of the medical geography at the time, Good's research agenda focused on the accessibility and utilization of services including: investigating the spatial arrangements of traditional medicine in urban and rural areas, the factors involved in the seeking of traditional medicine and various obstacles related to distance-decay. Although geographical research on traditional medicine has continued it has in recent years taken on a more critical and contextual approach. For example, Barrett (2000) examined the geographical concepts at the heart of Chinese and Indian medicine and Del Casino (2004) has studied the revitalization of "traditional" medicine in Thailand. In this latter example, the research highlighted the ways in which traditional medicine "(re)placed," or at least was partially integrated within, the state public health system as a means to address the care needs of people living with HIV/AIDS. Similarly, Wilson and Rosenberg (2002) examine how certain activities of first nation populations in Canada – such as hunting and fishing – might be accounted for in public health debates and as determinants of health-related calculations.

The need for geographers to research CAM, rather than traditional medicine, was first highlighted by Anyinam (1990). His argument was for wide ranging quantitative inquiry including attention to local, regional, and national distributions of therapists, their relationships to biomedical services, their referral networks, and practice catchment areas. Since 1990 only a modest number of studies answered this call and the ones that did mainly considered spatial trends in CAM at the regional level. Notably, Verheij and colleagues (1999) considered distributive trends in CAM provision in Holland, and Williams (2000) considered distributive trends in CAM provision in two Canadian provinces. In retrospect, given the vast range of CAM provided in so many places, responding effectively in this way was always going to be a very difficult for a small sub-discipline which was increasingly adopting qualitative methodologies.

The emergence of the "geography of health" as a distinct area of investigation (Kearns 1993) has involved a far more comprehensive engagement with CAM by geographers. This is perhaps because the increased interest in good health, wellness, and wellbeing has led geographers to consider the ways in which therapies are performed and consumed within particular spaces and places and how CAM is itself shaped by these spaces and places. Therefore in the remainder of this section we will consider three key sub-themes that have emerged within this literature: place and healing; imagined and physical places; and the diffusion of places.

Place and healing

Some geographers have sought to investigate the construction and meaning of the spaces and places in which CAM therapies are performed. A key focus of this work, which is informed by humanistic geography (Williams 1998), is to think through how the characteristics of places "such as the therapist's clinic" might have therapeutic qualities, promote the healing process and help constitute the performance of CAM therapies. Williams (1998) and Andrews (2003b, 2004), for instance, have applied Gesler's concept of therapeutic landscapes to CAM to explore how the places where CAM is practiced may produce feelings of health and wellbeing or promote healing. Reflecting Gesler's proposition that therapeutic landscapes work on multiple levels (e.g. physical, psychological, and so on), Williams suggests that practitioners create therapeutic landscapes, both because of the physical attributes of the spaces in which they deliver care and due to the strong interpersonal relationships which are built within them: "landscapes are understood herein as not only healing places, but those landscapes associated with the maintenance of health and wellbeing" (Williams 1998: 1195). In this sense, through the work that they do, CAM practitioners can create "authentic" or "caring" environments that promote the healing process and CAM clients may come to attach particular meanings to the clinics where they receive treatment, and a sense of place can develop (Gesler 1992; Williams 1998; Andrews 2003b).

Another development in this area is work by Conradson (2007) that builds on theoretical discussions on the relationships between nature, the body and time (see Thrift 2000) to explore the notion of stillness. For Conradson, stillness is a psychosocial state of calm whereby individuals are more aware of their embodied state and place in the world. Stillness is only felt when individuals disconnect themselves from the background noise of their lives including obligations to their work, family, and friends and the constant connections they have to them through telephones, email, and other forms of communication. Stillness has a spatial element as individuals also have to physically remove themselves from such distractions in order to experience this feeling and re-locate – either momentarily or for extended periods – in other places. Although Conradson's research is focused on retreat centers as such places (i.e. non-health care venues) many connections can potentially be made to CAM and its holistic and spiritual qualities.

Imagined and physic places

With specific reference to CAM, work by Andrews (2004) and Williams (1998) has taken the concept of therapeutic landscapes in new directions by considering how such landscapes might not only comprise physical settings, but also include places and spaces in the imagination. As Andrews (2004: 309) states: "therapeutic places may not necessarily exist in "real" (linear) time and in physical space. Rather, they could exist as spaces and places created by, and located in, the mind". Andrews and Williams explore the ways in which many CAM therapists purposefully use imagination and visualisation in their work, asking clients to visualize their own bodies, as well as imagine distant spaces as part of the healing process.

Geographical studies have also examined the spaces in which CAM is performed, and how such spaces are produced, arranged, and contested, though many questions remain to be addressed in what is still a fledging research area. One key focus of such work is the space of the clinic, in which encounters between practitioners and clients take place. Doel and Segrott (2004: 728), for example, explore the materialization of CAM and the importance of materials within therapeutic practice. Using a posts-tructuralist approach they view CAM less in terms of unified therapies and more in terms unique events in which practice depends upon the articulation of bodies and materials: "What takes place is always unexpected. It is always an event: a singular articulation of heterogeneous materials and practices with a unique consistency that is specific to each encounter."

The authors describe three kinds of materials within the practice of CAM: "signature materials" which "exemplify the specificity of each therapy," such as aromatherapy's essential oils; "supplementary materials" which enable practice to "take place," and include the spatial setting itself and equipment such as the treatment couch and the "marginalia" of waiting room furnishing, patient records and name plates. Each enactment of CAM requires a unique articulation of such materials, particularly given the ways in which the selection of aromatherapy oils (for instance) will be tailored to the individual client. Doel and Segrott also highlight a tension between the ongoing professionalisation and regulation of CAM modalities that seeks to achieve greater standardisation and accountability among practitioners and the will of many CAM practitioners to retain their clinical autonomy and the individualised nature of their practice.

Drawing on the work of Fournier (1999) they suggest that the clinical autonomy of CAM is being governed "at a distance" through the creation of generalizable "work identities" and ways of being professional. This generalisable professionalism focuses on the margins of practice, such as the importance of note taking, the ethics and aesthetics of advertising, and the creation of a professional image. Such an image is to be achieved in large part through attending to space – to the ambience of the clinic (clean towels, good quality couches) and the furnishing of the waiting room (comfortable seating and the presentation of a diverse set of objects, from framed qualification certificates to potted plants). As Doel and Segrott suggest therefore, professionalization takes place through the regulation of micro-geographies and the ways in which previously functional and neglected marginal materials are arranged in such spaces. In Foucauldian terms, this might indeed be considered a form of non-biomedical governmentality.

At another level, Andrews (2004) focuses on design features to explore the ways in which therapists seek to create a particular "ambience" or "feel" in their clinics. Noting Kingsbury's (2003) discussion of the link between "material and mental spaces," Andrews describes how clinics were designed and decorated to exert a subtle calming effect. The use of plush furniture, pastel colors, natural light, indoor foliage, water fountains, scents, and "new age" posters gave them a distinct "spiritual" feel. In contrast, in their study of the collaboration between CAM practitioners and biomedical professionals in a hospital setting, Mizrachi and colleagues (2004) suggest that spatial arrangements of this kind can reflect broader structures and inter-professional relationships: "alternative practitioners copy the structure and symbols of the dominant [biomedical] professional group in the hospital" as a way of gaining legitimacy and recognition. They argue that such isomorphism is not only "present in the dress code of alternative practitioners, which resemble that of physicians or nurses" and the "furnishings and decor of their clinical settings, which are generally similar to those of their biomedical colleagues" but also in the professional conduct of some CAM practitioners who even refer to their clients as " 'cases' " (2004: 37).

The spatial diffusion of places

Whilst the delivery of therapies by professional practitioners in private clinics remains important and commonplace, recent years have seen the diffusion of CAM into a range of new spaces, particularly through the increased consumption of self-treatment remedies and materials. Homeopathic preparations, aromatherapy oils, acupuncture pens, crystals and a bewildering array of manuals, self-helps books, CDs, and other sources of information are all now freely available (though only to those with the financial means). Wiles and Rosenberg (2001: 221) suggest that the growth in the use of CAM is linked to the rise the growing importance of health and the body in western society and to the "constant (re)formulation and negotiation of situated identities." They suggest that CAM consumption takes place within a range of everyday geographies and that the study of CAM should be situated within the "geographies of consumption." The newly dispersed geography of CAM therefore takes place in domestic space, workspace, retail space, and the mass media (including magazines and the internet) alongside the therapist's clinic.

Exploring one such space, Doel and Segrott explore the mass mediation of CAM by health and lifestyle magazines and its displacement into consumer culture. As they note, "the media … situate and enact CAM in terms of particular performances in specific settings, often in relation to everyday spaces such as the home and the workplace rather than medicalized spaces such as hospitals and clinics" (2003a: 742). CAM is frequently presented as a "de-differentiated" form of consumption, which extends beyond the treatment of discrete illness. The mass mediation of CAM presents it variously as a means of dealing with the diffuse disease of everyday life or as a pleasurable and sensuous form of consumption in which experiencing CAM may be an end in itself. In this sense, CAM comprises a diverse collection of materials and practices which readers can utilize to deal with almost every aspect of daily life (energy imbalances, stress, pollution in the environment, and so on). Further, Doel and Segrott argue that "what CAM demonstrates above all else is not only the drawing of such things as experience, place and health into the orbit of the medical, but the dispersal of the medical itself" (2003a: 744). Geographically, what this means is that CAM potentially enters every kind of conceivable space.

Building upon this work, Doel and Segrott (2003b) investigate how the editors of such magazines construct CAM and communicate it to their readership. They suggest that the magazines create three spatialized discourses of CAM. Firstly, some of the editors are concerned primarily with the medical efficacy of CAM for the treatment of discrete illnesses and locate therapies in relation to the diseased body. A second discourse positions CAM as a way of addressing a much broader state of healthy living and draws a range of activities and everyday spaces into the realm of health: "CAM offers a way of coping with everyday urban life. Indeed, almost every aspect of one's daily practice is drawn into the project of health management. Personal relationships, home decorating, holidays, financial strategies, work-related stress, and time management all have the potential to help or hinder the individual achieve their optimum state of health" (Doel & Segrott 2003b: 135). In this discourse the pursuit of personal wellbeing is, then, located in a range of everyday spaces such as the home or workplace rather than the hospital or clinic.

A third discourse locates CAM as part of a natural or alternative lifestyle. Such a lifestyle is primarily about a particular set of constructions of the self and "bodily conduct," rather than a narrow concern for the treatment of illness or the achievement of good health. It links CAM consumption to ideas of self-empowerment (making active decisions), ethical consumption, and environmental politics. And these links might be seen as primarily philosophical, or ethical rather than medical. An important aspect of all three discourses is the way in which they construct complex connections between health and gendered femininity, presenting CAM to a largely female audience and focusing on female health. The construction of health as a mainly female issue sits alongside the magazines' calls for women to become self-empowered and "take control of their lives."

Future Inquiry

Arguably, the emergence of CAM has been one of the most important trends in health and health care during the past century. Although geographers have now started to take an interest in CAM as a research subject, there remains much more to be discovered. In this final section, we reiterate an agenda for future research first outlined by Andrews and colleagues in 2004 (an agenda conceived largely by co-author Janine Wiles) and provide some further elaboration.

As we have indicated in this chapter, CAM is not only about health and health care: it is a much wider social and cultural phenomenon and has a central place in many people's everyday lives. With regard to social issues, there is a need for geographical research to examine the consumption of CAM in different social groups, their circumstances, experiences, and outcomes. These groups could be demographically defined and involve age, income or ethnicity, for example. Otherwise they could relate to lifestyle or social situation and, for example, include sexuality or disability. In terms of production, there is also a need to consider the social character of providers, businesses, and sectors.

With regard to cultural issues, research needs to examine the many identities associated with CAM production and consumption. These include spiritual and "alternative" lifestyle cultures and consumer cultures ranging from individuals and groups desperately seeking solutions to pressing health problems to those for which CAM is a status leisure activity. Future research also needs to locate CAM in local and regional cultures and specific versions of contemporary urbanism and rurality (Andrews et al. 2004). For example, certain forms of CAM may be associated with spiritual or idyllic landscapes whilst others may be associated with city living. Similarly, a historical perspective is required and investigation into to how CAM might contribute to the gradual "becoming" and "making" of places and exist as a source of historical contestation and struggle. Here, one potentially important area for research is the transportation of traditional medicine to places in the developed world. Post-colonial theory, with its sensitivity to diversity and critical understanding of the power relations and processes involved in the creation and oppression of the "other", needs to be used in understanding of how traditional medicines might be morphed into CAM in western cultural contexts (Andrews et al. 2004).

Many political, policy, and economic considerations also arise with CAM which have spatial dimensions. With regard to policy, still to be explored geographically is the regulation and training of CAM providers in places, the legal status of various modalities in places, the extent to which care is publicly provided or market driven and a range of geographically defined policies with respect to CAM. With regard to economic issues, a number of fields of research can be identified. Traditional spatial analysis might map the flows of private and public finance associated with CAM and the factors which effect these flows. A closely aligned strand of research would model and map the macro-scale distributive features of labor markets from the international to the local level. Meanwhile, a more critical line of research, again focused on work, could investigate workplaces and their performative labor relations (Andrews & Evans 2008). Indeed, therapist's workplaces may be complex constructions involving spatial routines, practices, and power relationships. With regard to consumption, research questions might focus, for example, on the consumption experience of the "clinic" and the situated experiences and negotiation of care.

Throughout the above research there is a need to acknowledge that CAM is female dominated in its production (Andrews & Hammond 2004) and in some forms of consumption (Andrews 2002b). Hence, future research needs also to account for the ways in which gender interacts with specific places of CAM. One might, for example, focus on the extent or aetiology of gendered divisions among CAM professionals. Another area of research might focus on how the gendered constitution of conventional medicine interacts with the gendered constitution of CAM in spaces and places where they are integrated (Doel & Segrott 2003a). More generally, researching CAM in the above ways might contribute towards the development of health geography. At one level it has the potential to further expand the sub-discipline's growing understanding of health, especially with regard to notions of wellness, wellbeing, and happiness. At another level, understanding geographies in the production of CAM might help the sub-discipline engage far more deeply and critically with health care including the nature of health work, workplaces, work practices and concepts in care (Andrews & Evans 2008).

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