ADVANCES IN MEDICAL SOCIOLOGY

VOLUME 8

SOCIAL NETWORKS AND HEALTH

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Editors

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ADVANCES IN MEDICAL SOCIOLOGY VOLUME 8

SOCIAL NETWORKS AND HEALTH

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CONTENTS

PART I: SOCIAL NETWORKS AND HEALTH: AN OVERVIEW

PART II: LINKING SOCIAL NETWORK THEORY TO DISEASE PREVENTION

PART III: METHODOLOGICAL ISSUES IN NETWORK RECALL AND AGREEMENT

PART IV: RISK EXPOSURE AND SOCIAL TIES

PART V: NETWORK TIES AND DISEASE PREVENTION

PART VI: SOCIAL SUPPORT AND HEALTH

THE ROLE OF SOCIAL NETWORKS IN HEALTH, ILLNESS, DISEASE AND HEALING: THE ACCEPTING PRESENT, THE FORGOTTEN PAST, AND THE DANGEROUS POTENTIAL FOR A COMPLACENT FUTURE

Bernice A. Pescosolido and Judith A. Levy

ABSTRACT

Since the 1970s, the role of social networks in tracing the underlying epidemiology of illness, distress, disease and disability; and, in understanding how people identify and respond to these crises, has become a mainstay of social and behavioral science research. In this piece, we introduce the papers in this volume in three ways. First, we summarize basic tenants of a social network approach, laying out what research has been able to support to date. Second, to avoid the danger of continuing to do more and more network studies that merely replicate what we already know rather than opening up new areas of understanding, we return to the earliest roots of the social network perspective. Third, we use this review in tandem with the volume's papers to mark the cutting-edge boundaries of current research and to identify the issues and questions that remain.

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INTRODUCTION

Social networks matter. The role of personal and organizational connections form a solid place in our understanding of how the social world affects and is effected by health and medical phenomena across a wide range of contemporary socio-medical research focusing on the epidemiology of health problems, the organization and use of formal medical care services, and the diffusion of medical technology. The social network perspective offers a dynamic approach, rooted in the community and its institutions, to understanding the lives of persons; their risk of illness, disease or disability; and their experiences and outcomes confronting these problems. As an explanatory framework, contemporary network theory incorporates ideas from other existing perspectives. Yet, it also insists that we understand what happens to people, in both the short and long run, through the interactions that we have with one another, even within large and sometimes daunting social institutions like the medical care system. Rather than one more "contingency" or "utility", a network perspective sees interaction in networks as the underlying *mechanism,* thereby contextualizing the response to health and health problems in everyday life.

As described elsewhere (Pescosolido, 2000), there are basic tenants of network theory. Some are based on prior research and, because of this, some agreement appears to exist. Other ideas subsist more at the level of aspiration or theorizing and pave the way for future investigations. We begin here with those that seem firm, leaving the remainder to a discussion of what social network research should consider next. In between the two, we take a step backward to the origins of theories about the role of social relationships and social networks, seeing where they have gotten us and what questions they continue to raise.

THE ACCEPTED PRESENT: NETWORK FOUNDATIONS

Network theory aims to understand human behavior through social relationships or ties. The basic premise of network theory is that individuals and organizations shape everyday lives and experiences through consultation, resource sharing, suggestion, support, and nagging. Thus, social network theory and research offer a way to think about abstract influences such as "society", the "community", and the "system" by looking to the set of social interactions that occur within them. Networks set a context within groups, formal organizations and institutions for those who work in, or are served by them, which, in turn, affect what people, do, how they feel, and what happens to them (Wright, 1997). Similarly, networks map relationships among groups, organizations and institutions allowing examination of phenomena such as "diffusion of innovation" and "cracks" in service systems (e.g. Coleman et al., 1966; McKinney et al., 1993; Morrissey et al., 1994). Importantly, then, for issues of health and health care, social networks exist not only in the "lay" community, as is most commonly conceived, but also in the formal health care system since all health care is provided through human communication, with or without human touch, aided or devoid of human compassion, and in concert or opposition to community cultures (Hohmann, 1999; Pescosolido, Wright & Sullivan, 1995).

Social networks have been demonstrated to be vectors of the incidence and prevalence of infectious disease, dramatically in cases like HIV infection (see Bearman, 1992 for a good summary), but equally relevant to chronic problems like heart disease (Berkman & Syme, 1979). Further, social networks have been implicated not only in the cause of illness and disease but also in their consequences including the recognition of problems as physical or mental health issues, help-seeking (e.g. knowledge, advice, access, system barriers), involuntary treatment (e.g. coercion), care-giving, adherence and outcomes (see Pescosolido, 2000 for a review). In sum, the social network perspective has put a human face on issues of the causes of, experiences with, and consequences from health problems by conceptualizing the actions of real people.

At this point in time, we know much more about the empirical finding that having social networks matter than how or why they operate, where they come from, how they are activated or how they are meshed with psychological, biological or clinical factors. Calling this research agenda a success is appropriate for its early stages, in part, because methodological and analytic problems halted earlier pursuits of social network investigations (particularly those in the 1930s that relied on the use of graphic depictions to trace social networks; see Scott, 1988 for a brief but broad historical survey). In addition, cutting-edge research, like the papers we collected for this volume, provides evidence that questions of how and why networks operate *can* be pursued and pursued with reasonable scientific integrity. However, even these papers suggest additional questions and leave others unanswered. In the next section, we review the basic theories and ideas from which much thinking about networks came, hoping that such a review will place what we know in perspective, serve to show where the contributions in this volume move the agenda forward, and illustrate how they continue to raise important issues for consideration in future research.

THE OFTEN FORGOTTEN PAST: THE ROOTS OF THE SOCIAL NETWORK PERSPECTIVE AND THE CURRENT STATE OF AFFAIRS

Back to Basics: Sociology, Durkheim, Simmel and the Power of Social Networks.

Social relationships have always been at the heart of sociological understandings of the world; and, despite the many varieties of "sociology" in contemporary theory, the role of social interactions may be the single agreed upon commonality (Pescosolido, 1992). Sociological studies of health, illness and healing are no exception. In fact, in attempting to convince scholars of the importance of a sociological perspective a century ago, Emile Durkheim (1951) focused on a dramatic example of mortality – the case of suicide. The large-scale theory that Durkheim laid out focused on the intersection of two features of social relationships. First, Durkheim discussed the role that *integration* played in preventing suicide – that is, whether people feel that they belong, that they are cared for and loved or even that they "matter." Second, he added to this insight the dimension of *regulation* or whether individuals are monitored, guided and even prohibited from considering different options (such as suicide) in response to life problems.

Even with this critical role of social relationships, Durkheim focused on the social group and institutions as wholes – the family, the church, the workplace and even the political structure. Perhaps it was this approach that led early social support researchers (e.g. Myers, Lindenthal & Pepper, 1975) to do the same, asking simply whether friends or family provide care and concern but without asking in detail about the social ties that form those social groups. And this approach continues to this day, with contemporary researchers reviving the emphasis on identifying and assessing "groups" in health behavioral research (Rapkin & Dumont, 2000).

Hurlbert et al. (in this volume) take on the issue of the difference between social network and social support approaches to understanding the role of social interactions. While social network researchers ask about specific people, eliciting specific names, those in the social support tradition ask about generic categories of people. Both approaches are lodged in a Durkheimian perspective but, as Hurlbert and her co-authors point out, represent different strategies and often produce different results. Their review and synthesis squarely takes on this bifurcation in approaches that have focused differentially on the structure (social network approach) or content (social support approach) of human connections. By so doing, they provide a first step in integrating and enriching both by retheorizing and reconsidering measurement and analytic strategies.

The paper by Faber and Wasserman in this volume also pursues this line. Seeing social network analysis as a framework for understanding social support, they examine the connection between social support as a theoretical construct and social network methodology. They conceive of social support as something that might occur in a network (through a tie), and, using techniques appropriate to the lack of independence among ties, they show that a substantial amount of variance in personal support can be explained by network and personality characteristics.

At the same time that Durkheim wrote, Georg Simmel (1955) was the first to suggest that it is the nature of *ties* themselves, rather than the social group per se that constitutes the heart of many human behaviors. Simmel's play with the geometry of social circles began an agenda on social networks consistent with Durkheim's approach but one that was, at best, implicit in his theory of suicide. Yet, bringing together these two early approaches provides a mechanism to assess what has been done with social networks as well as what remains to be explored (Pescosolido, 1994). Most importantly, it illuminates some of the inherent tensions in pursuing a network approach.

Figure 1 provides a graphic depiction of Durkehim's theory rethought under a network perspective. In essence, this visual aid offers a number of issues for consideration. First, as noted earlier, social networks may bring care and concern (integration) but they may also bring oversight (regulation). That means that social interactions can be positive or negative, or helpful or harmful. They can integrate individuals into a community and, just as powerfully, place stringent isolating regulations on behavior. Second, the influence of social network ties may not be as straightforward as some have expected since having too many ties may be as damaging as too few. Traditionally, social network researchers have tended to think in linear terms, assuming that more is better. But as Fig. 1 shows, the place where the "social safety net" has the most "bounce" or "give" to protect individuals from problems is in the center of the net – where social networks are moderately integrated and regulated.

As Durkheim conceived of society's protection, four places exist where social relationships are problematic. Where individuals have social networks absent of care and concern, he described a state of egoism (the left hand side of Fig. 1's safety net); where there is no regulation, individuals left to their own standards face a situation he labeled anomie (front of the safety net in Fig. 1). In both cases, the ties or ropes of the social safety net are too far apart to provide support and protection. Individuals who face crises have nothing to grasp on to and they fall through the net – they get sick, they fail to get care informally or formally, they die. However, where they are over-regulated

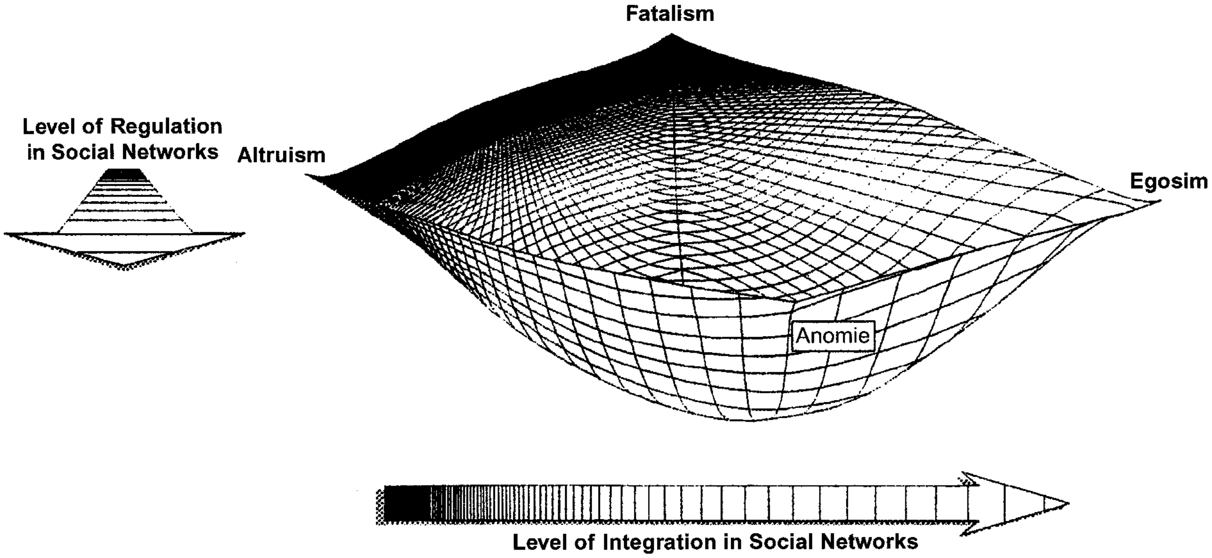

Fig. 1. Graphical Depiction of Durkheim's Theory of Suicide Using a Social Network Perspective.

(a state of fatalism, back side of the net in Fig. 1) or over-integrated (a state of altruism, left hand side of the net in Fig. 1), the social safety net closes up. Individuals lose their ability to make choices on their own. When faced with crises, they hit a "wall" of rigid rules, obligations, and expectations that shatter rather than support.

In general, social network researchers have tended to focus on the positive aspects of social networks, most often asking only about positive ties of emotional or instrumental support. The little research that has explored negative ties in people's lives has found them to have powerful effects on health (e.g. Pagel, Erdly & Becker, 1987; Berkman, 1987). In this volume, Schensul et al. explore the influence of negative vs. positive ties by examining to what extent the personal networks and macro-networks within which older Latinos and African Americans use illicit drugs play a role in HIV risk exposure and prevention. Among their findings, they discover that older African American drug users are more centrally located in larger dispersed networks than their older Puerto Rican counterparts. Such positioning tends to increase exposure to HIV among those drug users who are older African Americans while decreasing it among their older Latino peers. The combination of peripheral placement in large social networks combined with association with network members who practice safer needle hygiene and a reduced number of sexual partners appears to exert a somewhat protective influence on the likelihood of infection among older Latino users. In contrast, older African American drug-users' centrality and embeddedness within network cultures of riskier practices places them at potentially greater risk of becoming infected or infecting others.

McLaughlin et al. (in this volume) pursue the issue of what kinds of social relationships matter to different groups of people. Specifically, they show that the effects of positive and negative networks are not zero sums. Problematic social relationships result in more involuntary entrance to care while supportive ones bring individuals voluntarily into the mental health system. Having problems in partner relationships has a greater effect on involuntary entry to care for those who are married, but, interestingly, not for those who are cohabiting. Not surprisingly, friends are more influential for young adults and for those who are single or divorced than for others.

Social network researchers have also tended to focus on data at one point in time and one place. But as Roy (2001) suggests, networks and the larger "societies" they form are dynamic structures and processes located in both time and space. Durkheim noted and took this into account in two ways. He focused heavily on cross-national differences, theorizing how cultural contexts shaped societies with differences in integration and regulation (e.g. how French departments and German cantons differed in religious profiles). He also described historical changes over time that moved social groups and individuals from one segment of the social safety net to another (examining, for example, how shifts in economic prosperity as well as economic crises in Prussia pushed suicide rates higher, Ch. 5, 1951).

As Agadjanian in this volume similarly describes, social network influence is not a process of even intensity; rather networks are situation, issue, and context driven. This paper focuses on the importance of informal social networks considering differences across settings and time and in response to different illness threats. In societies where formal channels of health information and practices are underdeveloped or distrusted, Agadjanian identified informal social networks that facilitate the flow of information and convey it differently – in comprehensible language and in culturally appropriate ways. The downside of such translation is that social networks can misreport and misinterpret. Networks also respond to different threats in different ways and to different ends. With HIV's prolonged latency and unclear symptoms, social network ties form a means to screen acceptable partners. Facing cholera's short incubation period, swift course, and violent and unambiguous symptoms, social network ties help to delineate the front of the epidemic, update people about recent cases, and serve to apply and enforce official measures.

Durkheim's theory, translated through Simmel's network lens, provides a rich and sophisticated view of how social networks create structures that push or pull individuals toward different solutions to life crises. Social and behavioral scientists have used it as a springboard for entire agendas. Having served as an initial inspiration to social support and social network literatures, some of its original insights have become part of the public domain of ideas. As a result, parts have been lost. The review above suggests places in the intersection of sociology and health, illness and healing where Durkheim's original insights have been fruitfully adapted as well as places where they could be pursued with greater intensity. The beauty and deceptive simplicity of this theory and its graphical depiction, however, mask three critical questions that beg attention: (1) Where do social networks come from? (2) How are they activated? and (3) Can they be measured with reasonable scientific accuracy or precision? We turn below to insights and partial answers to these questions.

THE NON-COMPLACENT FUTURE: CONFRONTING FOUNDATIONAL ISSUES IN THE SOCIAL NETWORK PERSPECTIVE

The three questions above form the basis of a series of investigations that would greatly expand our knowledge of "how" and "why" networks operate to facilitate or hinder health, illness and healing. Each represents a line of research to which the authors of the papers in this volume begin to bring some empirical evidence and suggest additional issues.

Where Do Social Networks Come From?

Historically, in social science, various trends culminated in post World War II America that pointed researchers to a reliance on standardized socio-demographic characteristics rather than any factors, which required tailoring by locality (Coleman, 1986). White, Boorman and Breiger (1976) argued over a quarter of a century ago that this focus on social categories was not so problematic in the past where these group designations demarcated important social limitations on interaction. Originally, external networks or "community" ties were circumscribed by the place people lived and were constrained by customs that prohibited relationships across gender, class, or even age lines (Fischer, 1982; Pescosolido & Rubin, 2000; Simmel, 1955; Wellman, 1982). Patterns of ties have been changed by larger historical forces (e.g. changes in women's access to labor outside the home, changes in technology). And while we continue to see gross differences in, for example, the number of network ties by simple social categories (e.g. gender), we also see the frustration in the lack of consistent socio-demographic correlates in areas where great care has been given to standardizing measures and approaches (e.g. see Pescosolido & Boyer, 2000 for a review of correlates affecting utilization of mental health care). Thus, while socio-demographic characteristics may have some potential to shape the boundaries of social networks, they increasingly seem to be poor measures of social interaction. The lack of consistent socio-demographic correlates, then, may suggest a misplaced focus on these static characteristics which mask social interactions only indirectly, providing poor proxies for the real underlying social forces at work – the content, structure and function of social interactions.

So, how should we consider the relationship between socio-demographic categories and social network variables? Often seen as vying for the same explanatory space, sociologists have argued for a focus on networks *instead of* a focus on static social categories. Rather than positioning them as competing approaches, researchers need to ask about the underlying processes that create social network ties, reify social functions by static categories and, therefore, influence outcomes. The Suitor and Pillemer paper, in this volume does just that. They explore the often documented relationship between gender and caregiving. Traditionally, women report more social support networks and are listed more frequently in the support networks of others. Examining over four thousand ties for over 400 caregivers, Suitor and Pillemer explore why this is the case. Because women have more often taken on the role of caregiver, their experience provides them with greater support resources to offer others also facing the stress of caregiving. Not only do those women who provide support under these circumstances draw from their experiences, but also those who receive support often mention the value of these experientially-based insights in and suggestions from those who have been in similar situations. We need more research that explores where social networks come from and how they are forged or limited by social categories, expectations and experiences.

In this regard, Akiyama and Antonucci (in this volume) advocate the use of a life span perspective that includes attention to the primacy and contributions of social networks across the life course. Focusing on the considerable body of research documenting women's higher rates of depressive symptomotology than men, they use a life span perspective to revisit the long-standing debate over the contributions of accumulated role strain vs. gender-conditioned vulnerability in explaining these differences. To explore these competing arguments, they turn to data drawn from a regional stratified probability sample of 1,702 people ranging in age from 8 to 93. Findings show that among the youngest people, depression is significantly associated more with gender than life strains or social relationships. By middle age, however, gender becomes much less important in predicting depressive symptomatology once the life strains and social network relations as experienced at this life stage are considered. Meanwhile, gender alone does not predict levels of depressive symptoms at the later stages of the life span. Based on their findings, Akiyama and Antonucci speculate that feminine socialization with a social network relational orientation may help to close the gender gap in depressive symptoms in old age, given that social networks in later life increasingly tend to consist primarily of individuals selected for maximizing positive affect.

How and Why are Social Networks Activated?

A review of the social network literature reveals that researchers ask about two very different kinds of networks – latent and activated ties (Knoke, 1990). The former represent the number, structure and resources of those ties that individuals expect to rely on a regular basis. For example, these can be elicited by standard questions such as the "important matters" battery (Marsden, 1990). Individuals are asked questions such as " From time to time, most people discuss important matters with other people. Looking back over the last six months – who are the people with whom you discussed matters important to you?" (from the General Social Survey). In contrast, activated ties represent a list of those persons, organizations, etc. that individuals actually contacted in the face of a specific problem (e.g. Who did you consult? Have sexual relations with? Borrow money from? Set up a contractual agreement with?). Again, these two lines of research have often been pursued separately from one another. Doing so, however, eliminates the possibility of marking how individuals choose from potential lists of "others." The interesting questions that arise from this difference in existing research target when and under what conditions do people activate social ties. And, of those that they could have or did have contact with in the past, what makes that tie important enough to activate in the present? This can be extremely important in the case of illness and disease.

The paper by Regen et al., in this volume, explores the role of activated network ties in illicit drug users' recognition, attribution, and management of illness as well as the influence of these ties on formal care seeking and its timing. Fearing punishment and other adverse consequences should health providers learn of their drug dependency, the data show that illicit drug-users turn to their peers to diagnose episodes of illness and treatment. Here they stand to gain both an insider's informed knowledge of common drug-related illnesses plus the empathy of "fellow-feeling" based on shared experience. Such advice could prove particularly useful for users in distinguishing between being "dope-sick" due to physical withdrawal or other complications of drug use and experiencing the symptoms of an illness such as flu or fever unrelated to the use of drugs. Should an illness persist or be of sufficient magnitude to require formal treatment, these same network peers served as coaches in accessing the treatment system and circumventing the negative sanctions that might arise through its use.

Can we Capture Social Networks?

Given the dynamic nature of social networks and concerns that some may be fleeting or based only on weak bonds of affiliation (Granovetter, 1973), a major concern in pursuing the network research agenda has been whether or not reports of social network ties are accurate and can be measured with reasonable scientific precision. Three papers in this volume provide an interesting and complex picture of our ability to measure social ties.

Wright and Pescosolido in this volume present the most optimistic evidence. Using data reported by individuals who may have been seen as too impaired by some to provide accurate information (i.e. persons with serious mental health problems), they show that concerns about social network recall are minimal. Specifically, in directly asking individuals in a second wave interview why individuals on the network tie list in the first wave interview did not appear again, the results indicate that most were *meaningful* exclusions. That is, most people were excluded because they were no longer, in the eyes of the respondent, in the social network. Only 5% of the changes in network lists were due to respondents "forgetting" a person from the first wave who they thought, upon being reminded, should again appear on the network roster. Further, the recall problems were most likely to exist only for the small group of individuals with psychotic symptoms.

While also showing a concordance of information from former and current drug users and their partners, Latkin et al. in this volume also report that other factors are correlated with accuracy in reporting. If individuals are similar in HIV status, age or sexual relationship, the concordance between the reports of network ties appear to be high. But there is only moderate concordance of information from current drug users, injection drug users, and those who had dissimilar employment status. In a similar vein, the Brewer et al. paper in this volume examines factors that affect recall of sexual and drug injecting partners. Here the news is much more discouraging. Over time, persons with multiple partners in either area forgot a large proportion of their sexual and drug injecting contacts. Social "similarities", whether in role relationships, location, or temporal order, increased accuracy in reporting. The good news from this report is that these factors can be used to structure both interview instruments and interventions to increase the accuracy of information collected and effectiveness of targeted program intervention, respectively.

In sum, the papers in this section indicate that researchers are pursuing foundational issues in social networks and doing so with promising results. We turn now to a series of issues that may present more daunting problems.

THE NON-COMPLACENT FUTURE: SQUARELY FACING THE INHERENT TENSIONS IN A SOCIAL NETWORK PERSPECTIVE

While the information in the previous sections documents what we have done and what we can and should continue to do well, both early theories and current research bring to the fore additional issues that cannot be ignored. It may be that our progress to date allows us to reconsider problems pushed aside earlier. Or, it may be the case that our progress to date brings up tensions that confront any perspective as it matures. Or, there may be inevitable tensions within the social network perspective itself which may or may not be eliminated by innovations in theory and method. In this final section, we take a non-exhaustive look at some nagging questions in social network research. We offer insights from papers in this volume that explore the current boundaries of social network research. By doing both, we hope to spark the imagination and efforts of researchers to continue to develop new theoretical ideas, methods and studies that bring the insights of the social network perspective to basic and applied research questions.

Eliminating Artificial Biology vs. Society Arguments

The issue of how biology and society work together was a question that Durkheim did not ignore but dismissed outright. However, there is little question that a social network approach, as currently conceived, requires that we reject this original and narrow approach. Networks are not the only or perhaps even the most important factor, but they do provide a reasonable and possible way to synthesize disciplinary insights. For example, psychological profiles of both the client and provider shape the possible bonds that can form and influence outcomes (Orlinsky & Howard, 1987; Leventhal, Leventhal & Contrada, 1997; Rosenfeld & Wenzel, 1997). Social psychological characteristics (e.g. self-reliance) may also influence the degree of influence of network ties. Networks may affect biology (e.g. plasma fibrinogen levels, Helminen et al., 1997) or be affected by biological states (e.g. negative psychotic symptoms and the ability to maintain social ties, O'Donnell et al., 1992). To begin to capture these complexities requires the combined expertise of clinical and social and behavioral scientists who develop new approaches to conceptualizing theoretical models, designing studies, and analyzing data.

To this end, the Klovdahl et al. paper in this volume is ingenious. Examining TB transmission, a disease process that requires close contact in confined spaces, they employ the fingerprint method to which TB cases are related. The conclusion that place-based contacts matter shows that people with contacts, even if not in formal social network relationships that individuals would list on a network roster, are important. This method also offers one way to get around the perpetual problem of the strength of weak ties. Contacts are not always based on "important matters" but are nonetheless important to understanding social phenomena (e.g. job acquisition, Granovetter (1973) or in this case, TB "outbreak networks)". We have only seen the first step, however, in bringing together body, mind, space/place and social life.

Eliminating the False Qualitative-Quantitative Debate

A network perspective calls for multi-method approaches. No standard way exists to chart network relationships – they may be derived from a list on a survey where an individual is asked to name those persons whom they trust, admire, dislike, and share information with. Alternatively, the information may come from observing the behavior of individuals (e.g. who they talk to in their work group) or by documenting the behavior of organizations (e.g. checking which organizations in the health care system have referral agreements). Deciding which kinds of social networks are of interest, how to elicit the ties, and how to track their dynamics, especially under stress, remain critical issues (Berkman, 1986; House et al., 1982; Leik & Chalkley, 1996; O'Reilly 1988; Suitor et al., 1996; Wellman et al., 1996).

Jinnett and Coulter, in this volume, take on this issue of method through the important substantive case of networks internal to formal systems of care. They take an exploratory look at the promise of qualitative and quantitative approaches to social network influence. They conclude that quantitative research can powerfully document the effects of social networks, but only when accompanied by qualitative research do we discover why they operate and even why social network structures look the way that they do. There is little question that research that draws from the strength of both methodological approaches will be most likely to answer three primary research questions: Do social networks influence health, illness and healing? How do they do so? Why do these ties exist and operate the way that they do? An integrated methodological approach, rarely used to date in its fullest capacity, opens up greater potential for changing interventions and policy.

Facing the Reality of Dynamic Social Relationships

As noted above, the ability to form and maintain social ties may be the result of health, illness, and disability problems, not simply factors implicated in their cause (Berkman, 1986). For example, if individuals seek out or are forced into care, what happens in these sites can alter their health outcomes as well as their life course. It is a mistake, however, to see "treatment" as a single, standardized or medically sterile "event" (see Pescosolido & Boyer, 1999 on necessary revision in the Network-Episode Model). Social networks that exist inside of treatment programs influence how health care services are provided; the quality of service delivery of services; whether they are accepted or rejected by individuals and the community; and, ultimately, affect their impact on the health of those who work or are cared for in the treatment systems (see Coser, 1961, Wright, 1997).

Holschuh's paper, in this volume, addresses one issue of change as a result of treatment context. Indeed, she documents that social characteristics were not key to understanding what kinds of networks individuals with chronic and serious problems had in the long run; rather the kind of treatment facility was important for understanding whether individuals affected by serious mental illness developed relationships that had more than one basis or function. Using the longitudinal approach, Holschuh documents that those individuals who were treated in environments that were rated high on "practical orientation" or included long term institutionalization reported more "multiplex" ties while those who reported residential care episodes did not.

So these "internal networks" (Pescosolido, 2000) must be taken into account in understanding the later phases of the illness career. Not only do these networks affect what happens within the walls of clinics, hospitals and even community-based programs, they set a climate of conflict or co-operation with the "external" networks in the community. To date, we have few longitudinal or even cross-section studies that target these complex interactions (see Pescosolido, Wright & Sullivan, 1995, for a potentially useable theoretical framework).

In sum, the focus on how treatment affects social networks represents only one small segment of trying to understand how, how often and why social networks change. Considering the degree of change inherent in social networks requires that we consider the ebb and flow across time, and over the illness career, attempting to capture both their initial state at the time a health crisis (whether individual or societal) appears, making how changes in response to the early stages of the crisis, and tracing their contours as persons enter and leave treatment or seek other alternatives. As Castells (2000, p. 297) suggests, social structure is composed of networks in interaction that are constantly on the move, akin not to early body or later machine metaphors but, drawing from molecular biology, the image of a self-generating process. This task, while seemingly immense, represents one of the most critical to address in future research.

Reconciling the "Whole" vs. "Parts" Approach to Social Networks

As Fig. 1 showed, Durkheim's two dimensions (as well as others that might be included) are considered together because, in total, they form a safety net that social support researchers like Pearlin and Aneshensel (1986) theorize protect individuals from having life events happen as well as buffer their impact on health, illness and disease. The more recent tendency in social network research, however, has been to break social networks down into increasingly finer descriptors, asking *what is it* about social networks (e.g. the number, their multiplexity, their strength) that is the "critical ingredient" affecting health outcomes.

In his early work in New York City on social networks that facilitate or hinder care, Suchman (1966) did not talk about a characteristic of a tie; rather, he talked about a constellation of characteristics that, when considered as a whole, represented *cosmopolitan* or *parochial* networks. These networks structures led individuals toward (cosmopolitan) or away from (parochial) the formal medical care system. Similarly, Freidson (1970) realized that similar network structures could lead individuals toward different options, depending on the beliefs, attitudes and opinions of the people who constituted the network. For example, when the push is great (i.e. in extended social networks) and beliefs held are in concert with modern, scientific medical methods, the "lay referral system", as he called it, pushes individuals into care. A similar network structure with beliefs in opposition to modern medical care would exert the same amount of influence but would likely do so in the opposite direction.

This contrast in earlier vs. later approaches raises the question of the degree to which we exploit both the dimensions of social networks and their constitution in structures and cultures with diverse characters. We can consider, at minimum, three overall characteristics of social networks as central to mapping the nature of relationships – structure, content, and function. Structure targets, for example, the overall size of the network, the different types of relationships that people can have (e.g. kin, confidant, member of the same church), and whether social ties have more than one basis of connection (i.e. in multiplexity, a person who is a spouse and co-worker), and how tightly knit the network is (i.e. how well the people know one another or "density)". Content taps the quality and substance of social networks – the kinds of things that flow from or to each individual or organizational actor (e.g. "social support" captures whether or not network ties provide care, nurturing, or assistance). Finally, networks can serve a variety of functions including emotional support (e.g. concern), instrumental aid (e.g. lending money, providing transportation, babysitting), appraisal (e.g. evaluating a problem or a source of aid), and monitoring (Pearlin & Aneshensel, 1986).

The effect of the structure, content, and functions of social networks need to be considered separately because it may be how they come together that is important. For example, having numerous network ties that offer care and support will have a different impact on individuals' lives – whether as patients or providers – than many network ties that are hostile. In the end, however, it may be this total "feel" or "look" of social relationships that matter, and this possibility seems more consistent with earlier work rather than current conceptualizations and directions. This insight does not require a choice between conceptualizing facets of social networks and theorizing typologies; rather, it calls for a dialogue between the two. This suggestion, perhaps, is the most provocative and unexplored avenue in contemporary social network research.

Eliminating the Micro-Macro Bifurcation

The social network perspective suggests that what links the lives of individuals to their and to the times and place in which they live is their interactions in social networks (Pescosolido, 1994). These interactions, however, can exist at many levels – individuals interacting with other individuals; individuals interacting within large social groups or organizations; and individuals interacting in larger climates or contexts that may differentially impact outcomes. Durkheim jumped throughout his treatise from a consideration of personal events that solidify or break social ties (e.g. divorce) to membership in organization or groups that facilitate or hinder interaction (e.g. churches) to societal level events that alter potential interactions (e.g. economic recession, war, political structures).

Durkheim simply marshaled empirical available at whatever level existed at the turn of the last century, sometimes switching quickly from administrative level data collected at very different levels or across time periods (e.g. counties/cantons/departments; regions; countries). To avoid the interpretive dangers inherent in equating or mixing individual, group and area level phenomena, more recent research has focused on one level or another. But Durkheim's switching is problematic not only because of concerns about the ecological fallacy but because this all too often requires that we make assumptions about what is happening at other levels. Even where linking data may be available (e.g. system change and individual outcomes), we are forced to make assumptions about the mechanism by which change did nor did not happen (see Pescosolido, 1996, p. 191ff. on this issue),

Rather than jump from one level to another with data and explanation, the diagram in Fig. 2 suggests three separate foci that produce three questions simultaneously. First, we can focus on the micro level: How do specific network ties that individuals have affect health, illness and healing? For example, do Catholics have lower suicide rates (i.e. the micro network question)? Here we theorize that the absence of social ties of support in the face of crisis or the breaking of social ties impact health outcomes. Second, we can focus on the macro level: How do larger social network climates (now often referred to as "social capital)" influence health outcomes? Do areas with lots of Catholics have lower suicide rates (i.e. the macro question answered empirically above by Durkheim; see Pescosolido and Georgianna (1989) and Pescosolido (1990) for

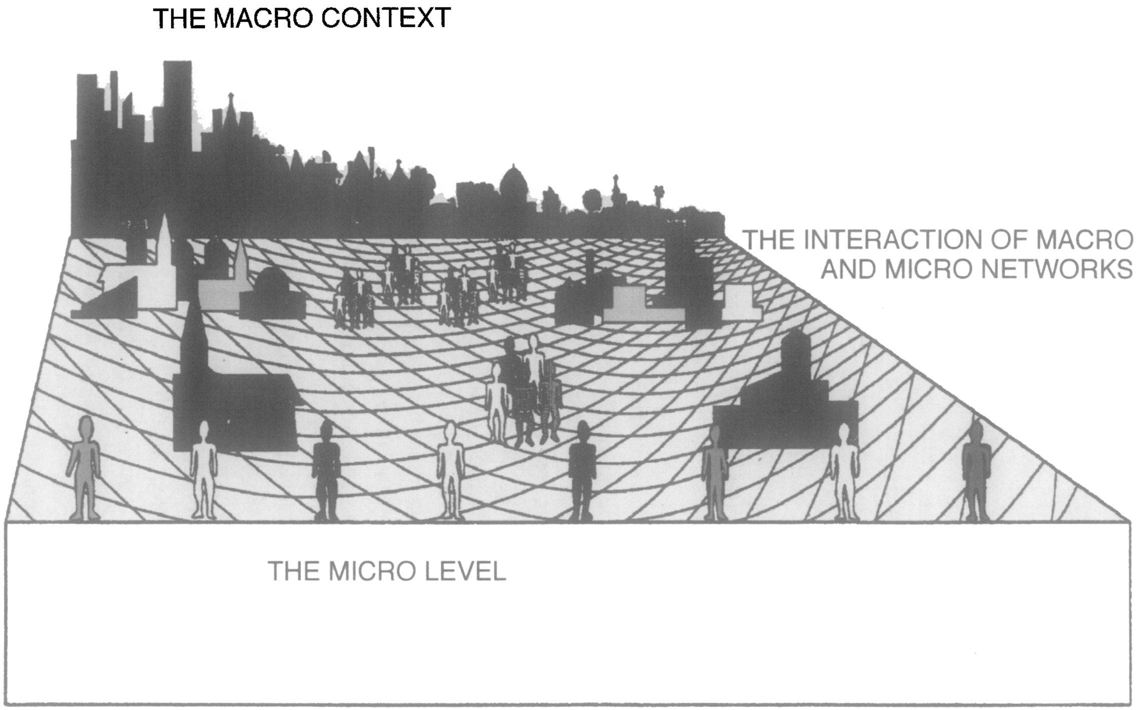

Fig. 2. The Macro-Micro Linkage, Social Networks and Health, Illness and Healing.

a network translation). Here the focus is on the larger social context shaping a milieu in which people live, regardless of their own individual set of ties. Third, we can focus on the interaction or conditioning between the micro and macro levels. Here we ask whether and how the two other levels of social networks interact to influence health, illness and healing. For example, is it the Catholics in the Catholic areas that have lower suicide rates or might it be the case that the larger context exerts a protective influence across the board? Do Protestants in Catholic areas have higher suicide rates (the interaction of micro and macro social network effects)? Are the Protestants in Protestant countries committing suicide or might it be the Catholics who lie outside the culturally dominant religious networks? Positing that larger macro network contexts condition the impact of the more individual level effects, this question pushes for a consideration of the influence of individual social network ties depending on the larger climate. This third question is the one that has been least pursued although recent interest in "contexts," in hierarchical analytic methods, and in contextual data now available from GPS (Global Positioning Systems) may make inroads likely in the near future.

Confronting Ethical Issues in Studying Networks

As Woodhouse et al. (1995, p. 151) point out, when the social network perspective's foci "are people and the connections are intimate activities, ethical questions are inevitable." While we have neither the time nor the space to give adequate attention to ethical issues in studying social networks, we did not want our review to pass without some note of the considerations inherent in this line of research. Further, we suggest that we cannot ignore the need for empirically-based research, whether quantitative or qualitative, that posits, explores and bring data to critical ethical questions in the study of social networks and health, illness and healing.

These are not the regular and important issues of being pristine about the protection of human subjects where choices regarding harm and benefit, or rights of the individual and the rights of society are somewhat clear. Avins and Lo (1989) among others concludes that in cases like HIV, available options on issues such as informed consent can only result from weighing which principles (e.g. confidentiality or harm to others) matter more. We know so little about how research participants evaluate these issues that there is little we can say than to call for serious study of the effects and complications of issues such as mandatory notification, competence, coercion, "duty to warn" and disclosure (Woodhouse et al., 1995).

CONCLUDING THOUGHTS

As Simmel (1955) originally noted and Castells (2000) recently reminded us, social networks are a very old form of social organization. Both classic and contemporary theory also suggest that changes in the origins, forms and functions of social networks may be what produces societies of such different shapes and consequences that those living in them fail to recognize the world in which they lives (Pescosolido & Rubin, 2000). Castells (2000, p. 693) notes that the present time is caught up in a whirlwind of change which calls for social scientists to study society and produce knowledge " to know which kind of society we are in, what kind of social processes are emerging, what is structural and what can be changed by purposive action." Characterizing contemporary social life as shaped by globalization, infrastructure technology and the demise of the nation-state boundaries and shared cultures, he calls the "new" society the "Network Society." For those who have drawn from and developed the social network perspective over the last hundred years of sociology, this may seem either as a welcome "rediscovery" of the central salience of a social network perspective or a situation which downplays the fundamental nature of and historical pervasiveness of the importance of social networks as a way to conceptualizing all social forms. In any case, renewed attention to social networks by researchers in others areas is encouraging because it can shed new light on theory and research derived from examining substantive areas outside of our own. The work done to date does mark substantial road of progress in understanding how social ties affect health, illness and healing. Yet, our review also suggests that we have at least as many miles to travel ahead.

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SOCIAL SUPPORT AND SOCIAL NETWORKS: SYNTHESIS AND REVIEW

Ashley D. Faber and Stanley Wasserman

ABSTRACT

Social network analysis is a collection of methodological tools that provide a variety of measures and models for describing relationships among social actors embedded in networks of social support. Although methodologists have made great advancements in the area of statistical models for networks, little social support research has moved beyond descriptive measurements of network data. Here we review selected social support literature that has begun to utilize a greater variety of network analyses. We describe and synthesize this literature, then discuss other quantitative tools of use in describing and studying support networks. We also review recent developments in theoretical and applied social support research including research on the role of support networks for persons with HIV/AIDS and older adults. We conclude by discussing the most recently developed statistical models for networks, highlighting their use in a variety of contexts.

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INTRODUCTION

Social support has become an important area of research in several fields including clinical and community psychology, gerontology, and the medical sciences. Social support is a complex, multidimensional construct that researchers define in several ways. Early research defined social support as the resources available from the friends, family, and acquaintances that 'surround' individuals (Barrera, 1986). Social support has been defined as 'explicit' resources such as those listed above, plus 'implicit' resources – resources that people perceive as being available (Heller, Swindle & Dusenbury, 1986). In the 1980s, research turned to modeling social support using social networks. Wellman (1981) proposed investigating social support in the context of networks and quantified using social network analysis. The network approach allows "focused attention on how the composition, content, and configuration of ties affected the flow of resources to the focal individual" (Wellman, 1981, p. 176). It also permits researchers to see social support as a property not existing between two people, but among several, interconnected individuals.

Much of the literature on social support uses the phrase "social support network", without defining it. There is a need to unify the social support construct and social network analysis to better understand how network analyses and measures can be incorporated into social support theory. The *Sourcebook of Social Support and Personality* (Pierce, Lakey, Sarason & Sarason, 1997, p. ix) states that the two critical needs in social support theory development are:

(1) recognition of the fact that the construct of social support is multifaceted and complex; and
(2) theories that "embed the construct in broader theoretical frameworks that incorporate observations established by researchers in other domains."

Social network analysis provides a framework to explain the components of social support. It can provide researchers with a variety of measures and statistical models to quantify and describe support networks. It also allows researchers to determine how individual attribute variables and structural properties of social support networks explain relational support ties. Great advances can be made in social support research, both theoretical and applied, by utilizing social network methodology and models.

In this review paper, we begin by considering the connection between social support as a theoretical construct and social network methodology. This will include definitions and descriptions of network terminology, sample measures, examples of analyses, and an explanation of how such procedures can be used in support research. Next, we discuss how social network analyses and related quantitative methods have been incorporated into the recent literature on social support and related areas. We review a wide range of literature – including research on networks existing among members of large communities, older adults, and individuals with HIV/AIDS. This section will give a general overview to how researchers examine networks in different contexts.

Next, we review recent developments in social support theory and discuss the empirical findings that support these theoretical advancements. Our discussion reviews recent literature on perceived social support and the relationship between support and psychological adjustment. We also review recent applied research that examines the importance and role of social support to two key populations – people infected with HIV/AIDS and older adults. The analysis focuses on these two populations because as the number of persons in these groups increases dramatically, there is a growing need to address if and how social support can affect the important health and social issues that impact them. We conclude our review by discussing why social support researchers should incorporate statistical network models such as p^* into their research. To this end, we provide a brief history on the development of p^*, and discuss a variety of special cases of the p^* family (by focusing on model parameters) of particular use to social support researchers.

This paper is meant to be a review of social support research and social network analysis and their interconnections. While we present a large body of research, we cannot discuss all recent literature on social support networks and social network analysis. Rather, we provide readers with a sampling of several important and recent studies that reveal the importance and promise of social network analysis to research on social support. The goal is to give researchers insight into how network analyses can be used to understand social support processes better.

APPLYING SOCIAL NETWORK ANALYSIS TO SOCIAL SUPPORT NETWORKS

What is Social Network Analysis?

Much of the current literature on social support refers to the existence or workings of social support networks without explicitly defining the notion of a "network." House, Umberson and Landis (1988) proposed one of the few definitions of social support that explicitly includes the concept of a network. They suggest that social networks, defined as structures that characterize a set of relationships, are but one component of social support. While an improvement over merely ignoring the concept, their definition appears rather vague.

Clues as to the association between the support that is provided and the structural relationships in which that support is given and received can be found by examining social network analysis itself.

Social network analysis is a branch of social and behavioral science methodology that explicitly defines networks and their characteristics. Social network analysis "re-frames" interpersonal and interorganizational phenomena in terms of the relationships among social entities. These entities might be people, businesses, cities, or countries, and the relationships might be defined by friendship, giving advice, control, or economic support, just to name a few possibilities. Wasserman and Faust (1994, p. 4) proposed four defining concepts in social network analysis:

(1) Actors and their actions are viewed as interdependent;
(2) Relational ties between actors are channels for transfer of resources;
(3) Network models focusing on individuals view the network structural environment as providing opportunities for or constraints on individual action; and
(4) Network models conceptualize structure as lasting patterns of relations among actors.

Thus, social network analysis moves the focus from the level of a single actor (the "common" view in standard social and behavioral science) to collections of actors who are "tied" together by relationships through which resources may flow.

Social network analysis involves a wide variety of methods, but often uses sets of measures to describe and quantify the ties that exist within a network. Such ties are usually dichotomous and can be either nondirectional, in which a tie does or does not exist between two actors, or directional, when ties are directed towards or away from an actor.

The network statistics that summarize these dichotomous relational ties quantify structural characteristics at several levels within the network. The *individual level* focuses on features of each actor within the network. For example, it might focus on the extent to which a person chooses others (*outdegree*) or is chosen by others (*indegree*) for a particular relation. The *dyadic level* of analysis describes relational ties between two actors. Measures at the dyadic level include *mutuality* indices that quantify how much two actors 'extend' a certain type of relation to one another simultaneously. The *triadic level* considers relationships among three network actors and includes the measures of *structural balance*, *transitivity*, and *cyclicity*. These measures describe how resources are shared among three actors and can characterize the hierarchical relationships or 'tightness' of relationships that exists within a network.

Subgroup analyses, in general, focus on the existence of cohesive collections of actors who have many relational ties to one another. *Cliques* are one example of cohesive subgroups, but many others exist. At the 'highest' level of analysis, *global measures* describe characteristics of the entire network. For example, network *centralization* reflects the overall variability or heterogeneity of actors' relational ties.

Defining Support Networks: Theory and Methods

Social support is one possible type of relational variable that can be measured for actors in a social network. The associations between support relation and other measured relations and the differences among the actors in the network are all interesting aspects of the complete network system. The study of social support can benefit from network methodology by using it to explain how individual *and* structural characteristics influence supportive experiences.

Barry Wellman (see Wellman, 1981) was one of the first researchers to discuss using network analysis to study social support networks. He defined a social support network as a set of actors connected by ties that represent how resources 'flow' from one person to another. He observed that a network approach can be used to consider:

(1) Supportive ties anywhere in a network;
(2) The content, strength, and symmetry of the ties within the network;
(3) The structure of support networks; and
(4) Characteristics of either an entire network or components of a network.

Most importantly, the network approach permits exploring the transfer of resources between two individuals and also among several people simultaneously.

Wellman (1981) notes several ways in which network measures can reveal information about support. A measure of the strength of ties can be used to quantify the strength of support. Reciprocity among ties (that is, tendencies toward mutuality) also can measure degrees of 'shared' support between two individuals, while transitivity indicates how resources are shared among three people. Wellman also suggested measuring and then examining different types of support ties and the structural characteristics of such ties. For example, this process might be used to determine if financial ties are less reciprocal than emotional ties. Finally, Wellman proposed that a measure of density could indicate how the number of ties in a network helps or hinders the transfer of resources throughout the network.

Positional analyses also can be utilized in social support research. Roles and positions are based on the "actors' structural similarities and patterns of relations in multirelational networks" (Wasserman & Faust, 1994). Classifying actors into roles and positions simplifies the broader, complex patterns existing within a network. A social position is defined as "a collection of individuals who are similarly embedded in networks of relations" (Wasserman & Faust, 1994). For example, consider the support network that might exist in a nursing home for older adults. One position in this network might consist of all the nurses and aides-these people would all have similar ties to and from others in the network. Social roles refer to "patterns of relations which obtain between actors or between positions" (Wasserman & Faust, 1994) and thus quantify how relations are linked within the network. A blockmodel accurately models these roles and positions, and consists of a mathematical representation of the:

(1) Actors who make up certain positions; as well as
(2) The absence or presence of a tie between those positions.

Within social support networks, blockmodels indicate the ties that exist between certain supportive positions. For our nursing home example, a blockmodel could show the ties that connect positions such as nurses, doctors, patients, and visitors.

More recently, Walker, Wasserman and Wellman (1993) confirmed the benefits of social network analyses for research on social support. Walker and his colleagues discussed the importance of measures such as network size, density, centrality and prestige, role structures, and reciprocity. They also reiterated the importance of future work on social support network models – namely, those predicting which ties are associated with a wide variety of network and individual based predictor variables. As Wellman (1981) previously asserted concerning the benefits of such models (p. 180):

> By treating support as a variable that *may* occur, and not as a given, we gain more analytic power. We can analyze the circumstances under which a tie will or will not provide support: for example, how the transmission of support is related to the characteristics of individuals, the ties that link them, and the networks that contain these ties. We keep social support as the object of study, but use social networks as the subject of study.

Recent research on stochastic models has given us the tools to address Wellman's concern. The new p^* class of models, fitted approximately using logistic regression, allows for complicated dependencies among the relational ties (Strauss & Ikeda, 1990; Wasserman & Pattison, 1996; Robins, 1998). The p^* model is expressed in terms of logits, the log odds of the probability that a tie is present, and uses linear combinations of network characteristics as predictors in the model. One of the strengths of p^* is that it allows for a broad range of structural and individual based predictive variables. Very recent work has extended p^* to multivariate relations (Pattison & Wasserman, 1999), valued relations (so that one can predict the presence of a tie of a certain strength; Robins, Pattison & Wasserman, 1999), and multiple groups of actors (Anderson, Wasserman & Crouch, 1999).

Despite advancements in these methods, researchers have yet to examine how these models might encompass new theory and research in the area of social support. There is a need for collaboration among network analysis and social support researchers to assess the connections between the methodology of network analysis and the substantive issues of social support research. Utilizing the most recent developments in social network analysis will provide support researchers with the analytic power Wellman suggested was necessary to more fully understand supportive ties. If network models and social network analysis as a whole can incorporate the most recent advancements in social support research, the models may result in better predictions about social support networks and their characteristics.

NETWORK ANALYSIS IN THE SOCIAL SUPPORT LITERATURE

In this section, we review a sampling of recent literature using social network analysis to study social support and related concepts. Rather than focusing on substantive findings, we will explore the specific network analyses and quantitative approaches researchers have used in recent literature. While Wellman (1981) proposed using social network analysis in social support research nearly two decades ago, recent work has once again stressed the need for this methodology. Beggs, Haines and Hurlbert (1996) pinpoint Wellman's 1980s research on community ties to be the beginning of the social support strand of network analysis. They maintain that an "aspaital conception of community" is important to understanding the underlying forces of social support-in other words, the structural characteristics of networks are exactly the features that will help researchers understand supportive experiences.

Before discussing recent literature incorporating network analyses, we need to distinguish between *egocentered* and *full relational networks*. An egocentered, or local, social network consists of "a focal actor, termed ego, a set of alters who have ties to ego, and measurements on the ties among the alters" (Wasserman & Faust, 1994). These types of networks also have been called personal networks. Much of the measurements on social support networks are based on egocentered networks, although researchers do not always define them as such. The use of egos as the primary respondent implies that support is conceptualized as a property of one individual and the ties that individual has to others. Most of our attention here is focused on egocentered networks. Remembering that support networks do not necessarily have to be egocentered networks is important, however. Support networks can exist among several individuals who constitute a complete network. A set of actors and relational ties that exist among the actors is referred to as a complete network (in contrast to a local network) or a full relational network. Full relational network data is more costly and difficult to collect than egocentered data. Perhaps these considerations explain the widespread use of egocentered networks in the study of support. Yet, remembering that support measured via egocentered networks can be measured more completely using full relational networks (subject to available time and money) is important.

Social Support Networks at the Community Level

Using egocentered network data gathered on the members of a small Canadian community, Wellman and Wortley (1990) examined six proposed explanations for supportive relations within the context of community ties: strength of ties, access to others, structural characteristics of networks, kinship roles, positional resources, and similarity and dissimilarity of individuals. Many of the six proposed explanations drew upon structural characteristics of the network rather than actor-level characteristics. Analyses of the data involved measuring the density of particular networks and using multiple logistic regression to predict support within the network. The logistic regression analyses utilized a stochastic model to understand which variables best predicted the presence of a supportive relationship. The authors also used factor analysis to identify components of strong ties and hierarchical cluster analysis to obtain a kinship structure. Contingency tables allowed cross-classification of such characteristics as strong ties and the types of support they provided.

Besides using specific measures, Wellman and Wortley (1990) also employed more traditional techniques such as multivariate analyses to clarify the structural characteristics of the networks. Two structural characteristics in particular-strong ties and parent-child ties-were found to affect support. Thus, incorporation of important network characteristics and measures helped to confirm that structure does indeed influence support. However, the techniques used by these researchers made assumptions that may not have been justified-in particular, the assumption of independence among the relational ties is unlikely to be valid. A more 'suitable' approach would be to utilize a model that allows a dependence structure among the relational ties. Such models serve as a more realistic representation of a network.

In a more recent study on supportive relationships within communities, Schweizer, Schnegg and Berzborn (1998) examined the social support networks of residents living in Costa Mesa, California. The authors used a random-walk sampling design to gather information on network members. This method involves randomly selecting an initial actor, gathering information about the actors to whom the initial actor is connected (ego's *alters*, or the *first zone*), then randomly selecting an actor from this first zone and gathering information about the actors to whom that actor is connected. This process can be repeated for several zones. To describe the resulting networks, the authors reported the number of ties within networks, the types of relations that defined the ties (partner, child, friend, etc.), a geographical description of the ties (were the ties within the city, county, state?), and a racial description of the ties. The authors also considered the correlation between gender of roles and types of support. Finally, correspondence analysis was used to model the relationship between kinship roles and types of social support. Correspondence analysis provides a unique way to visually display data to show the relationship between roles and social support (see Faust & Wasserman, 1993; Wasserman & Faust, 1989; Wasserman, Faust & Galaskiewicz, 1990).

While Wellman and Wortley (1990) and Schweizer, Schnegg and Berzborn (1998) examined supportive ties within larger communities, much support research examines ties within smaller networks. Many of these studies describe the characteristics of supportive relationships in a wide variety of contexts using network measures. For example, measures of network size have been used to understand social support in the context of separated women (Nelson, 1995), the elderly (Bowling, Grundy & Farquhar, 1995; Adams & Torr, 1998), and college students (Pretorius, 1994). Such analyses draw upon a literature associating network size with support satisfaction (Sarason, Pierce & Sarason, 1991; Sarason, Shearin, Pierce & Sarason, 1987) and also the perceived availability of support (Connell & D'Augelli, 1990; Cutrona, 1986). While many researchers use size to describe networks, researchers increasingly are considering a wider range of measures to describe supportive networks.

Social Support Networks of the Older Adults

Research on older adults recently has begun to utilize a variety of network measures. In a study of older persons living in London, Bowling, Grundy and Farquhar (1995) studied the size and density of elderly person's networks and classified ties according to type (friends, confidants, relatives, etc). Chi square tests were used to examine how network ties changed over time. Multiple regression revealed how changes in the numbers of friends, relatives, etc. in the network contributed to the change in the size of a network. Meanwhile, Adams and Torr (1998) study of friendship networks of the elderly considered four key network measures: size, homogeneity, internal hierarchy, and solidarity. Homogeneity was measured as the proportion of close friends with the same characteristics as the subject (e.g. age, gender, and religion). Solidarity was measured using a weighted version of density defined by Kapferer (see Adams & Torr, 1988, p. 55). Lastly, internal hierarchy was based upon questions asking subjects about a friend's influence on decisions (a measure of power) and how much respect was reciprocated between them (a measure of status).

In a more recent study on the networks of older adults, Campbell, Connidis, and Davies (1999) used social network analysis to examine sibling ties within the support networks of 678 adults (55 years and older). Logistic regression was used to model the probable presence of a specific type of tie in a network. The authors specifically chose to use logistic regression to move beyond descriptive characteristics of the network and to determine the likelihood of certain relationships occurring. The dependent variable was one of five dichotomous variables that indicated whether a support tie existed between the focal, elderly individual and a spouse, child, sibling, other relative, or friend. The five logistic regression models were applied to each of four relations: confidant, companion, emotional support, and instrumental support networks. Independent variables in the regression models included gender, age, number of siblings and children, proximity of children and siblings, and marital status. Here the proximity variable is similar to a network measure although the authors measured the variable as geographic rather than network distance, which is defined as the minimum number of ties between two actors. Although attempting to use a comprehensive network approach, the authors limited the analyses to measures of distance.

Most literature on elderly networks only considers egocentered networks. Hirdes and Scott (1998) however, studied both full relational and egocentered networks in their research on elderly patients in a chronic care hospital, their families, and the employees of the hospital. The network measures, including mean indegree and outdegree, *betweenness centrality*, counts of dyads, and density were used to describe the networks of the three groups. They found that patients had the highest mean in-degree (meaning most of the ties were directed towards the patients), while employees had the highest mean outdegree (meaning they sent most of their ties to others). Betweenness centrality measures the extent to which certain nodes 'link' other nodes together. In this context, employees had the highest mean betweenness centrality, implying that employees most commonly link together other, unlinked nodes. Such analyses are easily performed using network analysis software such as UCINET V (Borgatti, Everett & Freeman, 1998), which provides an encompassing way to view all the components of the network at a variety of levels.

Social Support Networks in Research on HIV/AIDS Populations

Concurrent with the increased visibility of social network analysis in the literature on social support, studies of AIDS and HIV-infected populations also offer suggestions for better use of social network methodology. Trotter, Rothenberg, and Coyle (1995, p. 29) stress the need for network data and new methodology in research on HIV and AIDS "to move both the theoretical understanding of HIV intervention efforts and empirical studies of risk taking behavior to a more complex and contextualized level of analysis." Trotter et al. (as well as Laumann, Gagnon, Michael & Michaels, 1994) propose several network methods and measures of benefit to research on the spread of HIV/AIDS. The authors suggest using network analytic techniques largely ignored to date in social support research (such as the multiway contact matrix) and offer ways for researchers to think about epidemiological data in terms of networks. These authors argue that social support researchers might benefit from drawing upon the extensive body of AIDS literature that examines the connection between network methodology and HIV/AIDS. This literature might trigger ideas about using network measures to study social support in general and social support for HIV/AIDS patients in particular.

Importance of Relational Ties

Laumann, Gagnon, Michael and Michaels (1994) have considered the role of sexual networks in the field of AIDS/HIV research. They state that "sexual networks form the pathways across which these infections are transmitted from one person to another" (p. 269). Laumann et al. suggest that studying the ties within a network is vital to understanding the network. They observe that the characteristics of sexual ties strongly influence the spread of sexually transmitted diseases such as HIV/AIDS. For example, the sexual orientation of the actors (heterosexual vs. homosexual) and the type of sexual interactions in which they engage help determine their risk. Social support research also recognizes the importance of characterizing supportive ties. Much of the research we have already discussed describe ties in terms of the characteristics of the person providing the support (are they a friend, partner, sibling, parent, etc.?), the age, race, and educational status of that person, as well as the "location" of that individual. Researchers must consider how these characteristics impact the actual presence of a certain support network and its structural characteristics if they are to better understand the role that unique supportive ties play for individuals.

Laumann et al. also discuss the importance of the connectivity of a network. Connectivity measures how much actors are tied together within a network. For example, actors are unlikely to contract HIV via sexual intercourse if they are not tied to others (i.e. they are isolates). These isolates can, in fact, help to deter the spread of the disease. Conversely, networks with greater connectivity are more likely to include actors who will contract the disease due to more prevalent sexual interactions. Connectivity is also important to support networks because it determines how much support can be 'transmitted' throughout a network. Lack of connectivity (i.e. isolation) can harm individuals, as we discussed in the context of social support in the lives of the elderly. Although connectivity in general is a very important consideration, Laumann et al. also point out that connectivity is dependent on time. In other words, relationships are continually beginning and ending, in a persistent state of flux. Such continual change influences the spread of a disease in a sexual network and the transmission of support in a supportive network.

Centrality is another important network measurement for disease transmission. Trotter, Rothenberg and Coyle (1995) suggest considering the centrality of network members to determine the "gatekeepers" of the network-those who function as important links within the network, linking together otherwise unconnected nodes (Freeman, 1980). Laumann et al. define these central members as the 'core group' of a network. The number of core members within a network can substantially affect the spread of a STD throughout a sexual network. A simple measure of actor degree (the number actors adjacent to the focal actor) can determine which actors serve as core members. For example, Johnson, Schade and Weller (1995) calculated degree centrality to determine which individuals were most active in sexual and friendship networks. Curtis, Friedman, Neaigus, Jose, Goldstein and Ildefonso (1995) used observational and survey data to determine which actors were members of the core, inner periphery, and outer periphery of a drug user network. The types of connections among actors characterized these groups. In contrast to core members who frequently shared drugs with many others, members in the inner periphery used drugs occasionally and had limited contact with a core member. Members of the outer periphery were more private in their drug use and had no contact with core members. Meanwhile, Curtis et al. found that membership positioning within these groups was related to HIV risk. Members of the core network were more likely than their less central peers to have shared used syringes and rinsewater. Thus, structural characteristics, and more specifically, network connectivity, influence the risk of the contraction of HIV/AIDS. In studies on social support, degree centrality and prestige indices would aid in finding individuals who 'determine' the sending and receiving of support. They also can help 'locate' important subgroups such as core and periphery networks, which have important consequences for individuals in these subgroups. For example, core members in a social support network may have better psychological adjustment then those in the outer periphery.

Trotter, Rothenberg, et al. (1995) and Laumann et al. (1994) also discuss the importance of bridges to the connectivity of a network. A *bridge* is an individual (or group of individuals) that spans two disconnected subgroups. Laumann et al. (1994) suggest that bisexual bridge groups in sexual networks are important, for example, because they help transmit the disease from heterosexual to homosexual groups. Elwood (1995) examined how bridge groups aided in the transmission of HIV between disconnected subgroups including gay HIV-positive male drug users, heterosexual men and women, other gay men outside a core network, incarcerated individuals, and particular racial groups. While Elwood used qualitative data to identify members of the bridge group, Johnson, Schade and Weller (1995) calculated the betweeness measures to determine bridges among 19 members of an informal gay college organization. Such network measures can help to identify those people who are crucial to the connectedness of a support network (usually referred to as *cutpoints*, see Wasserman & Faust, 1994, Ch. 4). For example, actor betweenness centrality indices could help to identify those network members who link actors to some type of supportive sub-network. In this situation, the bridge member functions to 'monitor' the flow of support within the network.

RECENT DEVELOPMENTS IN RESEARCH ON SOCIAL SUPPORT

Perceived Social Support

Perceived support constitutes an important area within current research in social support. This construct refers to "the extent to which an individual believes that his/her needs for support, information, and feedback are fulfilled" (Procidano & Heller, 1983, p. 2). Procidano and Heller (1983) also point out that perceived support and the support provided by support networks are not the same. Rather, 'enacted support' measures the social resources that actually have been provided, and is independent of one's perception of receiving the resource (Pierce, Sarason & Sarason, 1992).

Perceived social support is more strongly related to 'outcome' variables than are measures of 'enacted' support or network characteristics (Vaux, 1988). Leppin and Schwarzer (1990), for example, found that although the correlation between network characteristics and health was only –0.07, the correlation between perceived support and health outcomes was –0.25. Another investigation found a negative relationship between depression and perceived informational and emotional support, while received support had a positive relationship with depression (Komproe, Rijken, Ros, Winnubst & 'tHart, 1997). Both studies suggest that the distinction between received and perceived social support has important consequences for an individual's mental health and well-being.

Factors Influencing Perceived Support

Given that perceived support affects outcome, researchers have worked to understand the factors that influence perceived social support. Pierce, Sarason and Sarason (1990) develop a model where general support expectations, relationship-specific support expectations, and situational stress all contribute to perceived support. This model emphasizes person and environment variables that lead to perceptions of support. Current theories of perceived social support continue to examine whether perceived social support is a characteristic of the individual or the environment (Pierce, Lakey, Sarason, Sarason & Joseph, 1997).

A study by Pierce, Sarason, and Sarason (1992) found that both person and environmental factors influenced perceived support. They considered how 54 adult children perceived the support of their mothers during a stressful situation. They hypothesized that the children expecting a high level of support from their mothers *and* from others would perceive their mothers as being supportive. Results show that the support expected from their mothers and the stressfulness of a given situation influenced perceived support the most. Furthermore, the investigators found that support was perceived differently depending on when it was provided (before or after the stressful situation). They conclude that situation × situation interactions best explain perceived social support.

A more recent study by Lakey, McCabe, Fisicar and Drew (1996) found further support for environmental influences on perceived support. Lakey et al. studied how supporters, perceivers, and the interaction of these two influenced perceived support. Their study included three experiments where: (1) graduate students rated the supportiveness of professors; (2) sorority members rated the supportiveness of fellow house members; and (3) undergraduates rated the supportiveness of a listener helping another person with their problems. Results across studies showed that 41% of the variance in support judgements was accounted for by the perceivers × supporters interaction. The contribution of the 'supporters' variable, however, varied across the three studies. While the variable accounted for 38% of the variance in the third scenario, it accounted for only 2% in the second scenario. Thus, the authors concluded that both person × situation and perceiver × supporter interactions influenced the results.

Explaining Perceived Support: Two Theories

Procidano and Smith (1997) propose two theories to explain the development of perceived support: cognitive and attachment theories. According to their cognitive theory, individuals develop support schemas early in life that influence how they generally perceive the supportive environment around them. This influence on the perception of support causes individuals to seek environments that confirm their support schemas. Because these schemas are based on years of experiences, they represent an 'aggregate' form of support – one that encompasses many supportive and non-supportive encounters. Perhaps this aggregation explains why perceived rather than specific support strongly affects well-being. Several specific, supportive acts may form support schemas that influence the perception of a future supportive act.

Procidano and Smith (1997) also propose an attachment theory to explain the processes underlying perceived support. This theory suggests that the emotional bonds that form early in life subsequently affect development of support schemas. Results of a study by Ognibene and Collins (1998) that examines how adult attachment styles (secure, preoccupied, dismissive, and fearful) relate to perceptions of social support and coping style support this theory. Their findings show that attachment style was associated with perceived support, secure adults perceiving more support from friends and family, and fearful adults perceiving less support from friends. These findings suggest that the attachment styles developed early in life influence perception of support as an adult.

Procidano and Smith (1997) also propose methods for effectively studying perceived support. Procidano and Smith first suggest that questions about perceived support be embedded in a larger framework based on five contexts: (1) culture; (2) development; (3) personality; (4) social settings; and (5) life tasks. Many researchers (as we discuss later in this paper) have begun to incorporate these constructs into research on social support. Procidano and Smith also review the different types of perceived support measures. They distinguish between measures that assess overall, global support and those measuring support at a relationship level. Such support might be measured across an entire network or at the level of each tie. Measures also can differ by the responses elicited. For example, some measures ask subjects about support from individuals identified by the researcher, while other measures permit subjects to identify support providers themselves.

The Role of Perceived Support and Personality in Support Networks

More recent research on social support combines perceived social support and environment (i.e. network features) with an additional important construct, personality. A study by Russell, Booth, Reed and Laughlin (1997) examined how personality, network characteristics, and perceived social support affect the support networks of 294 recovering alcoholics. Russell et al. propose a model where personality directly influences both network characteristics and perceived social support, while network characteristics directly influence perceived social support. More specifically, they propose that extraversion influences network characteristics, while neuroticism directly affects perceived support but not network characteristics.

The results of structural equation modeling revealed that extraversion was significantly related to network characteristics (size, amount of contact, and proportion of confidants) and also perceived social support. On the other hand, neuroticism was negatively associated with perceived social support. Furthermore, all of the network characteristics (network size, average frequency of contact, number of bad relationships with network members, number of good relationships with network members, number of confidants within network, number of multiplex relationships) influenced perceived social support. Personality and network characteristics together explained 44% of the variance in support. This study shows that both personality and network characteristics (which might represent aspects of the situation or environment) can enhance greater understanding of perceived social support.

This study represents the future direction for research on social support in that it examines support in the 'social environment' where it exists. It constitutes one of the few recent studies that examines social support theory (namely, theory on perceived support) while including the component of network characteristics. Researchers must continue to study individuals as embedded within a supportive network, while incorporating important factors such as personality and perceived and received support. The study by Russell et al. showed that support, especially perceived social support, results from both individual and personality characteristics teamed with the effects of their social environment (i.e. the characteristics of their support network).

Social Support and Psychological Adjustment

The study of the relationship between support and psychological adjustment is another important area within social support research. Research in the 1970s and 80s suggested that interpersonal relationships and the support they provide might protect individuals from stressors. Two models explained this relationship.

The direct-effect model (Broadhead, Kaplan, James, Wagner, Schoenbach, Grimson, Heyden, Tibblin & Gehlback, 1983) suggested that social support could directly benefit psychological adjustment and health independent of stress. On the other hand, the stress-buffering model suggested that social support could have a protective effect on an individual's health, *in the presence of stress* (Cobb, 1976; Cohen & Wills, 1985). According to this latter model, the 'buffering' effects of social support occur in two ways: (1) by preventing appraisal of stressors before they have occurred; or (2) by reducing a response to a stressor once it has occurred.

Direct Effect and Stress-Buffering Models

Research within the past decade has continued to examine how supportive ties aid adjustment to stress in a variety of contexts. Much of this literature examines the role that social support networks play in direct effect and stress-buffering models for individuals suffering from various physical and mental health conditions. Low levels of social support were found to be associated with physical ailments such as cluster headaches (Blomkvist, Hannerz, Orth-Gomer & Theorell, 1997) and asymptomatic gastric disease (Fukunishi, Hosaka & Rahe, 1996). Meanwhile, positive relationships between support and health have also been found. For example, Stewart, Hirth, Lkassen, Makrides and Wolf (1997) found that individuals who were readmitted for ischaemic heart disease were more likely than those not readmitted to seek social support as a way of coping with the disease. Several studies also demonstrate a positive relationship between social support and adjustment for cancer patients. Baron, Cutrona, Hichklin, Russell and Lubaroff (1990) found a positive relationship between support and the proliferation of T-cells for individuals with renal, bladder, prostate, or testicular cancer. However, Ma (1998) found that cancer patients had better overall levels of adjustment during the post-treatment phase than during earlier phases, when they were able to best utilize the support they received.

Other studies specifically examine the influence of direct vs. buffer effects on individuals suffering from various illnesses. Penninx, van Tilburt, Boeke, Deeg, Kriegsman and van Eijk (1998) found support for both the direct effect and stress-buffering effect models. For example, having a partner and many close relationships negatively affected depressive symptoms for healthy and sick participants. This represents a direct effect, because the presence of a stressor (i.e. a disease) did not influence the impact of supportive ties. More extensive support networks, as characterized by strong ties, also appeared particularly beneficial. Research by Unger, Kipke, Simon, Johnson, Montgomery and Iverson (1998) has also suggested the benefits of the direct effect model for a group of homeless adolescents, aged 13–23. Their results showed that, regardless of the level of stress experienced by the adolescents, higher levels of emotional and instrumental social support reduced risk for depression and poor health. Penninx et al. (1998) also found that emotional support and diffuse relationships only negatively affected depressive symptoms for subjects with diabetes, lung disease, arthritis, and cancer. This finding is evidence for the buffer effect model because subjects experiencing significant stressors were aided by the presence of supportive ties. Results in a similar study found that this buffer effect was most significant for patients with the most severe arthritis symptoms (Penninx, Van Tilburg, Deeg, Kriegsman, Boeke & Van Eijk, 1997). This suggests that even under the greatest levels of stress, supportive ties appear especially beneficial.

When viewed as a whole, these studies suggest that support networks do benefit psychological and physical health. Furthermore, the sources of those supportive ties and the type of support they provide are important for understanding the impact of support on health. Thus, it is critical that researchers consider network characteristics such as connectivity, density, and the strength of ties, all of which can affect the health of network members.

The Role of Coping

A significant portion of the literature that examines the relationship between health/adjustment and social support also considers the role of coping in this relationship. Coping helps to 'stabilize' an individual during a stressful situation and involves both cognitive-emotional and behavioral components (Lazarus & Folkman, 1984). The literature typically considers "problem-focused coping", in which individuals perceive a problem to be solved, and "emotion focused coping", in which individuals try to control the negative feelings associated with a stressful situation. Problem-focused coping leads to more positively affect adjustment than does emotion-focused coping or denial (Billings & Moos, 1984; Blaney, Goodkin, Feaster, Morgan, Millon, Szapocznik & Eisdorfer, 1997; Folkman & Lazarus, 1988; Folkman, Lazarus, Gruen & DeLongix, 1986).

Thoitus (1986) distinguishes between coping and support by arguing that "coping" refers to actions that one takes to meet the demands of a situation, while "support" is what others do to help the person cope. Heller, Swindle and Dusenbury (1986) proposed that the perception of support mediates the influences of support on coping. How supportive actions are perceived influence whether or not those actions help the coping process. Thus, perceived support ultimately influences health and well-being via the coping process.

Several studies find evidence for the effects of coping on psychological adjustment. Among homeless adolescents for example, higher levels of instrumental and emotional support correlate with use of problem-focused coping (Unger, Kipke, Simon, Johnson, Montgomery & Iverson, 1998). Furthermore, using problem-focused coping is associated with positive perceptions of health. Adolescents who use emotion-focused coping, however, are more likely to experience higher levels of stress, social isolation, depression and poor subjective health status. Penninx, Tilburg, Boeke, Deeg, Kriegsman and van Eijk (1998) also found that personal coping resources (high self-esteem, high sense of mastery, and high self-efficacy) positively affect depressive symptoms. Coping appears important to both psychological adjustment and health.

Holahan, Moos and Bonin (1997) propose a resource model of coping that incorporates support, coping, and psychological adjustment as both direct effect and stress-buffering approaches. Along with stressors and initial adjustment, they include two types of resources in their model: (1) personal resources, consisting of personality strengths; and (2) social resources, consisting of emotional support and guidance from one's social network. According to the model, coping mediates the influence of support (resources) on adjustment under stressful situations. Under lower levels of stress, however, the personal and social resources directly affect adjustment. Holahan et al. (1997) tested this model using structural equation modeling and found that personality characteristics such as self-confidence, an easy going disposition, and family support lead to lower levels of depression after four years. In addition, under high stress, resources (i.e. social support) affected adjustment indirectly, while social support directly influenced adjustment in lower stress situations. These results reinforce the importance of both the direct effect and stress-buffering models as well as the association between personality and social support.

Several studies empirically support this model. Coping mediates the effect of support on depression for both individuals dealing with the death of a loved one (Nolen-Hoeksema, Parker & Larson, 1994) and women recently diagnosed with breast cancer (Komproe, Rijken, Ros, Winnubst & 'tHart, 1997). Terry, Rawle and Callan (1995) also found that coping mediated the relationship between support and adjustment for groups of working women and expectant mothers. Among working women, higher levels of support from work colleagues led to greater use of problem-focused coping and less emotion-focused coping. Moreover, these two types of coping predicted adjustment with problem-focused coping resulting in better adjustment. Likewise, among expectant mothers, support from partners was mediated by coping responses – partner support was associated with less emotion-focused coping and better adjustment.

A relationship between social support, coping, and personality characteristics appears to exist. Ognibene and Collins (1998) found that different attachment styles, as determined by different personality characteristics, are associated with different coping styles. For example, secure adults are more likely to use social support in the context of social and achievement stressors, whereas dismissing adults are more likely to use escape-avoidance coping strategies. Moreover, evidence suggests that anger in coping – which is characterized by anger suppression – is associated with a perceived lack of tangible, self-esteem, and belongingness support (Palfai & Hart, 1997). Perhaps escape-avoidance and anger-in coping mediate the effects of social support, leading to poor adjustment. These findings suggest further support for a relationship between several constructs, including personality, social support, coping, and psychological adjustment.

RESEARCH IN APPLIED SOCIAL SUPPORT

Current applied research in social support is investigating how social support is utilized within two important populations – namely, the HIV/AIDS infected population and the elderly population. The research in these areas also is beginning to utilize network analyses. This methodology will bring new insight about the function of social support for persons in these populations. We will review some of the current work in these areas and how network analyses have been an important part of some of this research.

Social Support in the HIV/AIDS Population

The HIV/AIDS transmission has become a worldwide epidemic. As of December, 1996, the Center for Disease Control reported nearly 581,429 cases of AIDS in the United States. Although new drug combinations known as 'cocktails' are helping to extend the life expectancy of AIDS patients within the United States, mortality due to this disease continues. While medicine continues to search for a cure or vaccine for AIDS, social scientists are concerned with how social support might help individuals to avoid contracting the virus or to live with the disease. Researchers are also interested in examining how HIV/AIDS impacts a social support network, and how particular structural characteristics of support networks help or hinder supportive experiences.

Characteristics Influencing Support Research

Several characteristics of AIDS as a disease process provide a unique context for studying social support. Gradual progression of the disease is one characteristic. AIDS is preceded by HIV infection, which reduces the functioning of the immune system and its ability to fight off opportunistic diseases. During the early stages of the disease, physical symptoms remain primarily asymptomatic and a person infected with the virus may be unaware of infection. Over time the disease can progress to full-blown AIDS as defined by several physical complications including shingles, diarrhea, fever, dry cough, sore throat, skin rash, fatigue, persistent headaches, and numbness or tingling (Hays, Turner & Coates, 1992). Progression of the disease, including an increase in the number of symptoms, often results in depression (Crystal & Kersting, 1998; Hays, Turner & Coates, 1992). Given the timeline of the disease, social support can play a vital but differing role for persons with HIV/AIDS. For example, a supportive network might serve different purposes for asymptomatic individuals newly diagnosed with HIV as compared to people with full-blown AIDS who exhibit numerous symptoms.

Another unique characteristic of the disease that offers potential insight into network analysis lies in the populations it affects. Of the 581,429 cases of AIDS reported in 1996, approximately 50% of the infected individuals were gay men and about 25% were intravenous drug users (Center for Disease Control, 1996). Given the differences in life circumstances, social support may take different forms or address different needs for these two populations. For example, the homosexual population typically has a stigma attached to it. Social support within the networks of homosexual individuals will inevitably be influenced by the extent to which their family supports them and extent to which they are embedded in a supportive homosexual community. Research is just beginning to investigate what particular types of support are especially helpful to homosexuals who are suffering from AIDS. Furthermore, the social support networks of drug users are likely to influence the extent to which one's drug use continues. This support may therefore increase or decrease the risk of a drug user contracting the HIV virus.

The Role of Supportive Ties

Several studies investigate which types of supportive ties persons with HIV/AIDS perceive as most beneficial. As discussed earlier, Laumann et al. suggest that the types of ties within a sexual network are important for understanding the spread of HIV/AIDS. Studying the types of ties is also important for understanding how support yields better psychological and physical health for people with HIV/AIDS. Several studies show that informational, emotional, and tangible support are perceived as most beneficial (Friedland, Renwick & McColl, 1996; Hays, Chauncey & Tobey, 1990; Hays, Turner & Coates, 1992; Schwarzer, Dunkel-Schetter & Kemeny, 1994). Furthermore, the satisfaction with provided support can positively affect depression (Hays, Turner & Coates, 1992) and lead to greater use of healthy coping strategies such as a having a fighting spirit and personal growth (Lesserman, Perkins & Evans, 1992). Moreover, support networks for persons with HIV/AIDS appear oftentimes 'multirelational' – i.e. they are composed of several types of supportive relationships. These complexities speak for the importance of investigating how structural components differ across types of support and also differentially affect well-being.

The benefits of support for persons with HIV/AIDS depends, in part, on who provides that support. Research suggests that persons with HIV/AIDS do not differentiate support according to type of support – rather, the *source* of support is more salient to the individual (Schwarzer, Dunkel-Schetter & Kemeny, 1994). Support from friends/peers and partners appears particularly important to persons with HIV/AIDS (Catania, Turner, Choi & Coates, 1992; Crystal & Kersting, 1998; Hays, Chauncy & Tobey, 1990; Schwarzer, Dunkel-Schetter & Kemeny, 1994). Meanwhile, evidence examining the effects of family support is mixed. While persons with HIV/AIDS typically do not receive much support from family members during periods of non-crisis, some studies have found that support increases during periods of increased stress (Crystal & Kersting, 1998) or with extreme illness (Catania, Turner, Choi & Coates, 1992).

Not all types of support are helpful (Barbee, Derlega, Sherburne & Grimshaw, 1998; Hays, Magee & Chauncey, 1994). Barbee et al. examined the types of social support, and the providers of support that were beneficial and harmful to HIV-positive individuals. Results showed that most supportive acts from friends were helpful, particularly those providing solace to the individual. Meanwhile, 70% of the unhelpful acts were of an avoidant type in which the provider either: (1) discouraged the individual from expressing negative emotion; or (2) tried to minimize a problem. Interestingly, nearly half of the supportive acts of lovers and 62% of the acts provided by family members were regarded as negative. Barbee et al. (1998) concluded that the negative effects of support from family members might have been tied to the family's attempt to come to terms with the effects of the disease. A review by Kadushin (1996) of the literature on gay men's social support networks also suggests that social stigmas, lack of communication, guilt, feelings of responsibility for a child's sexual orientation, and the lack of acceptance of homosexuality can also limit the support families provide. Thus, both the types of supportive ties and the provider of that support influence the helpfulness of support.

How Does HIV/AIDS Impact Support Networks?

Given the importance of a supportive network for persons with HIV/AIDS, more recent research has begun to investigate how the unique characteristics of the HIV/AIDS epidemic influence these ties. Hays, Turner and Coates (1992) studied how progression of the disease produces depression among gay men. They found that the number of HIV symptoms was positively related to depression, while emotional, informational, and practical support exerted a protective influence. Thus, while progression of the disease to the symptomatic stage appears to significantly affect the well-being of persons with AIDS, supportive ties buffer against the deteriorating effects of the disease. Longitudinal analyses revealed that support variables significantly explained the variance in depression one year later, even after controlling for depression at time one. A significant interaction between informational support (receiving advice or information regarding a variety of issues) and HIV symptoms also appears to exist. Hays and his colleagues concluded that those experiencing numerous symptoms may benefit from support in the form of concrete information because it leads to a sense of control and predictability.

While Hays et al. (1992) considered the influence of supportive ties on depression, other studies have examined an 'opposite' process. Kaplan, Patterson, Kerner and Grant (1997) hypothesized that health status may influence social support. Evidence from previous research shows a positive relationship between progression of AIDS and social support (Pakenham, Dadds & Terry, 1994; Zich & Temoshok, 1987). Such studies suggest that the effects of social support on health may vary as the stages of the disease vary. Thus, physical symptoms of AIDS may well predict levels of social support or vice versa.

To test this hypothesis, Kaplan et al. (1997) studied the support networks of 397 HIV-positive heterosexual and gay men. They defined "social support" as the amount of support (emotional and informational) provided and network size. Using cross-lagged correlation models, they found that baseline symptoms significantly predicted network size although the reverse situation did not hold. During the progression from HIV to AIDS, subjects' network size decreased. In fact, Hayes et al. found that patients with the most rapidly declining immune systems had the largest decline in network size. Therefore, the cross-lagged correlation model seemed to indicate that the disease was predicting social support network size as well as the amount of support available. Thus, illness seemed to transform the social environment of AIDS patients, resulting in smaller networks. One caveat should be considered, however. The authors defined social support as the support network's size. Yet, network size is not solely indicative of social support. As discussed above, types of support, and satisfaction with that support constitute components of the supportive process.

The Role of Support Networks for Drug Users

The previous studies investigated the social support of men already HIV positive. Other recent literature considers how the relationships and structural characteristics of drug users' networks put them at risk for contracting HIV (Latkin, Mandell, Oziemkowska, Celentano, Vlahov, Ensminger & Knowlton, 1995). Latkin et al. propose using network analyses to determine which members of a drug user's network positively and negatively influenced their drug use. Although family members made up 27% of the networks, there was no relationship between having family members in one's network and frequency of injecting. Density and the size of the *drug subnetwork*, however, were significantly related to frequency of injecting. Furthermore, a significant relationship existed between frequency of injecting and reporting a partner within the network – 53% of the participants who injected less than once a day also reported having a partner in their network.

Latkin and his colleagues (1995) suggest that examining the network where drug users are embedded can yield a better understanding of the behaviors and interactions that lead to HIV infection. Little research, however, investigates how social support impacts drug users. Marginalization of this population can limit the social support they receive, placing them at greater risk for contracting HIV. Some research suggests that supportive ties may be helpful to drug users. Data on HIV negative drug users reveals positive relationships between different types of social support from family and friends and coping (Brook, Brook, Wynn, Whiteman, Masci, De Catalogne, Roberto & Amundsen, 1994). This same study also found that only the emotional support from siblings and friends was associated with greater coping ability for HIV positive drug users. This study suggests that different types of support serve different purposes in the lives of HIV positive/negative drug users. Perhaps support helps prevent infections among HIV negative drug users while assisting HIV positive drug users to cope with the disease. Future research might yield a greater understanding of how support from important individuals, such as partners, drug network members, friends, and family impact risk-taking. Such information can lead to more beneficial intervention methods, because the intervention can be enacted within a drug user's own social context-their social support network.

The Role of Social Support for Caregivers

More recent work in AIDS related support has considered the caregivers of AIDS patients. Just as there are unique characteristics of the AIDS disease itself, unique characteristics also exist among caregivers of persons with AIDS. For example, caregivers often become stigmatized through dealing with AIDS (Jankowski, Videka-Sherman & Laquidara-Dickinson, 1996; Turner et al., 1998). They also differ from typical caregivers-they are more likely to be young male friends or partners of the AIDS patient (Turner, Catania & Gagnon, 1994; Turner & Catania, 1997). Given these characteristics, the caregivers may find themselves isolated, making it difficult to find support.

Jankowski, Videka-Sherman and Laquidara-Dickinson (1996) used qualitative methods to learn about the experiences of caring for persons with AIDS. They found that most caregivers experienced feelings of anger, loneliness, isolation, guilt, and depression due to their role. Their networks also were affected by their role which entailed a struggle to keep their friend's AIDS diagnosis a secret. Moreover, the stigmatizing effects of being associated with the disease often led to the loss of weak support ties. As a result, the caregivers depended more on strong ties. Rarely were the ties between the caregiver and the person with AIDS mutual. This study paints the picture of caregivers as isolated, emotionally strained individuals needing support of others as much as those with AIDS. These findings also suggest that the disease can harm both the peripheral actors within the support network and the person with AIDS.

In a more quantitative approach to studying caregivers, Turner, Pearlin and Mullan (1998) considered how the caregivers themselves obtain support. Turner et al. studied the support networks of 642 caregivers of persons with AIDS living in San Francisco and Los Angeles. Turner et al. considered the characteristics of caregivers' networks as predictors of support. Results showed that the HIV status of the caregiver was significantly related to emotional support received by the caregiver. They also found that conflict between the caregiver and patient and also conflict within the caregiver's own network led to less support for the caregiver. The more contact the caregiver had with friends and family and the gay community the more emotional support they received.

These two studies show that the social environment in which the caregiver functions affects the social support that they receive and points to a profitable future direction for research on the social support networks of AIDS patients. Turner et al. successfully 'extend' the view of the networks of persons with AIDS by including both their caregivers and the caregivers' networks. This structural or network approach yields a more accurate understanding of the lives of several people within a network, allowing us to see where in the network persons with AIDS and caregivers need support. Furthermore, it leads insight into how network members inevitably influence the support that people with AIDS receive.

Social Support in the Elderly Population

Factors Influencing Support Networks

Given the growing population of the elderly, identifying factors that can aid in the aging process is increasingly important. Research has shown that lack of social interaction leads to disabilities, depression, and even death for the elderly

(Murphy, 1982; Thompson & Heller, 1990; Simonsick, 1993; Vaillant, Meyer, Mukamal & Soldz, 1998). As a result of such findings, considerable research now considers how social support aids older persons in their life changes. As in any population, social support for the elderly intertwines with several other constructs including personal relations, family and friendship, caregiving, community and neighborhood environments, gender, ethnicity, health, class and income, and employment status, to name a few (Rubenstein, Lubber & Mintzer, 1994). Current research on the social support networks of older persons investigates how these constructs influence the support they receive.

Research on the impact of social support for elderly individuals has begun to make greater use of network concepts and methodologies. We previously mentioned how more explicit network methodology and analyses have informed research related to aging. In this section, we focus explicitly on social support research within the elderly population. Network analysis has been used to examine networks within other areas of family research such as divorce and separation, parenting, and adolescent peer networks (see Acock & Hurlbert, 1990 for a review). Given that network analyses have been applied to other family processes, using such analyses to understand the support networks of the elderly also appears fruitful. A network analysis approach allows researchers to understand how the elderly actively form their networks, and how those networks also influence them. As Acock and Hurlbert propose, such analysis leads to a greater understanding of how "network characteristics provide resources which may affect well-being, or aid in the attainment of desirable outcomes" (p. 246).

Recent research examining the characteristics of support networks of older adults has begun to incorporate structural characteristics along with many of the constructs mentioned by Rubenstein, Lubben and Mintzer (1994). Barker, Morrow, and Mitteness (1998) investigated the support networks of elderly urban African Americans. Their results showed that when compared to men, women had larger networks, consisting primarily of friends and children. Male networks, on the other hand, consisted primarily of spouses, kin, and friends. Married men were more likely to have their children and other kin in their networks, resulting in more stable networks. Nonetheless, men who re-married had little contact with their children, resulting in smaller networks. A study by Tsai and Lopez (1997) investigated how ethnicity influenced social support. In their study of elderly Chinese immigrants, Tsai and Lopez found that children and children-in-law primarily provided support followed by friends and neighbors. Both of these studies show gender, ethnicity, family relationships, and marital status significantly impact ties and the types of ties that exist within the supportive networks of the elderly.

Types of Support Networks

A recent study by Litwin (1999) incorporated network features by classifying support networks according to the characteristics of ties. Litwin investigated how network type related to giving and receiving support. He classified 2,646 elderly Jewish participants into six types of networks: diversified, friend and neighbor, narrow family focused, attenuated, religious family focused, and traditional extended family networks. These networks were defined by the types of contact among network members, the marital status of the focal member, and number of children within the network. For example, the religious family focused network was characterized as one where the primary sources of contact for the elderly person were children and the synagogue. Elders in this network category had less sibling contact and lower frequency of contact with neighbors and children. Results showed that types of helping differed across network types. Older persons in a religious family-focused network, for example, received significantly more informal help from adult children than members of diversified networks (a network where the focal member is married, a high rate of contact with siblings and friends exists, and the focal member exhibits moderate social club attendance). In addition, members of diversified networks received significantly less formal paid domestic assistance than religious family-focused network members. Campbell, Connidis and Davies (1999) also found that different types of ties lead to different types of support for older adults. They found sibling ties to be highly associated with emotional, instrumental, and confiding support. This adds to the evidence that types of ties in a network influence the overall supportive experience of the elderly person.

Impact of Support Networks on Health

Besides characterizing support networks and the ties within those networks, researchers are also examining how support networks benefit physical health and functioning in old age. This line of research presumes that social support buffers stressors such as illness. Choi and Wodarski (1996) studied informal support systems (consisting of spouses, adult children, and other relatives) for 695 white, elderly men and women to determine the 'flexibility' of the informal support systems (i.e. how support responded to needs), and also how emotional and instrumental support slow deterioration of the person's health. SEM results showed that problems in functional health (determined by functional limitations, difficulties with activities of daily living, or instrumental activities of daily living) led to increased support at time one. Living arrangements and frequency of face-to-face contact with children and spouses, however, better predicted instrumental support than actual health status. Thus, *size* of the support network, rather than health status, appeared to affect the amount of support provided (i.e. the flexibility of the network). High levels of unpaid support at time one also led to less functional and physical deterioration at time 2.

The study by Choi and Wodarski (1996) has two important implications. First, it shows that the larger the network, the more likely an elderly person is to receive support regardless of physical or functional health status. Second, the study shows that support, particularly unpaid instrumental support, helps deter deterioration of an elderly person's health. Additional research by Barker, Morrow and Mitteness (1998) shows that although an elderly person's network fluctuates with changes in health, support networks mobilize in times of stress. The findings by Choi and Wodarski and Barker et al. imply that considering how extensively an elderly person has a supportive network already in place is important. Nonetheless, while this research suggests positive benefits from supportive networks, research by Vaillant, Meyer, Mukamal and Soldz (1998) indicates that other physical and psychological factors can mediate the benefits of support. Vaillant et al. found that after controlling for alcoholism, smoking, exercise, and pre-morbid psychopathology, social support no longer significantly related to level of physical activity or mortality. This finding suggests that future investigation of elderly person's support networks should examine structural characteristics of the networks only after controlling for variables such as smoking and alcoholism.

Influence of Isolation on Support Networks

While intervention methods/procedures for the AIDS population are only recently becoming widespread, intervention methods for the elderly are long-standing. For example, intervention methods such as senior centers, counseling, informal neighborhood groups for seniors, respite care, retirement groupings, and buddy systems exist across the country. Rubenstein et al. (1994) emphasize that considering how isolation can affect the elderly remains important despite the prevalence of these programs. Windriver (1993) defined two types of isolation that affect the elderly: (1) social loneliness, resulting from not feeling one "belongs" to a group; and (2) emotional loneliness due to lack of a close, intimate relationship. Rubenstein et al. (1994) also suggest that economic changes, the suburban environment, living alone, and intergenerational relations might influence the extent to which the elderly are isolated.

More current research examines how social and emotional isolation affect the lives of the elderly. Such isolation may result from the death of loved ones or illness that leads to loneliness and decreased social contact (Dugan & Kivett, 1994; Simonseck, Kasper & Phillips, 1998). Elderly African Americans appear particularly affected by social isolation and spend little time outside of their homes (Simonsidk et al., 1998). African American elderly women (ages 55–96), for example, appeared extremely isolated (i.e. live alone without much contact with family or friends) and were three times more likely than non-isolated women to die within five years of the initiation of the study (LaVeist, Sellers, Brown & Nickerson, 1997). This occurred irregardless of women's use of community-based senior service centers. These studies suggest that as people age, they face new challenges such as the death of friends and family, illness, and loneliness, that can lead to isolation. Little research examines how social support might alleviate such social isolation. Future research in this area might help to identify the types of supportive ties needed to limit the detrimental effects of social isolation.

Social network analysis is one tool beneficial to understanding the impact of isolation on the elderly. Thompson and Heller (1990) used a network approach to quantitatively define isolation among elderly women. They defined isolation as network embeddedness determined by network size and frequency of interaction. Regardless of the amount of perceived support they found that women who were isolated (i.e. had the lowest level of embeddedness in family and friend networks) also had poorer psychological well-being. Meanwhile, women who were *qualitatively isolated* (i.e. had low levels of perceived support from family and friends) did not exhibit poorer psychological well-being when compared to those less isolated. Other research, however, indicates a negative relationship between perceived support from friends/family and loneliness (Dykstra, 1993). Dykstra also found that the support perceived as available from core network members (the 'most important' network members) is negatively association with loneliness. These studies suggest that investigating structural ties and the connectivity with networks and the strength of those ties can promote a better understanding of isolation and its effects on well-being.

While the research above suggests an important connection between isolation and health, Revenson (1986) warns against jumping to the conclusion that old age is related to loneliness. He observes that such assumptions coincide with America's ageist stereotypes about the elderly. Revenson's review of the literature on the elderly and loneliness shows that the elderly often are less lonely than younger and middle-aged individuals. Thus, isolation should not always be associated with negative outcomes as some aspects of isolation may actually benefit older persons by serving new needs as the person ages. Social network analysis can once again help researchers to determine the components of such networks that aid older persons in unique ways.

The study of social support has been an important research area within psychology for the past three decades. The domains of developmental, personality, and clinical psychology help to explain social support as does research methodology. Social network methodology helps to advance work in social support research while also incorporating well-established theories of social support. It also helps to extend current research in the field on perceived support and coping and support. More importantly, social network analyses yield a better understanding of how social support impacts the lives of populations including AIDS patients and the elderly. Network analyses strengthen social support theory by including more detailed structural characteristics of a person's network and permits better understanding of how, in addition to dyadic relationships, specific ties and *entire* networks, powerfully impact social support.

FUTURE DIRECTIONS: SOCIAL SUPPORT AND NETWORK ANALYSIS

Earlier in this paper, we asserted that social network analysis greatly benefits social support research. We also reviewed recent literature that incorporates network measures. Many of these measures are descriptive. While descriptive measures certainly yield a "nuts and bolts" understanding of a network, they do not have statistical importance. They lack a stronger, more confirmatory means of statistically investigating a social support network and comparing the characteristics of two or more networks. A model incorporating network measures that exist at the individual, dyadic, triadic, and global levels is required. For example, we might be interested in the effects of gender, age, reciprocity, and transitivity on the presence or absence of supportive ties within a network. Simultaneously evaluating the effects of measures from such levels would be beneficial. Finally, we need statistical tests of full and reduced models (i.e. conditional tests) to determine if predictors, such as transitivity, are statistically important. Such confirmatory tests would permit researchers to determine if particular structural characteristics affect the supportive experiences of individuals.

The p^* model permits us to consider all of the above issues. The following discussion presents an explanation of why and how to use p^* in research on social support. We will discuss why researchers *need* to use p^* in order to more thoroughly understand supportive networks. Our goal is to convince social support researchers that p^* should become a routine analysis in support network studies.

p_1 *Models*

The p^* model was certainly not the first statistical model developed for hypothesis testing within the social network analysis framework. The model, developed by Holland and Leinhardt (1977, 1981), proceeded p^*. The model predicts the state of a dyad within a network. Specifically:

Null Dyad: $\log [\Pr(X_{ij} = X_{ij} = 0)] = \lambda_{ij}$

Asymmetric Dyads: $\log [\Pr(X_{ij} = 1,\ X_{ji} = 0)] = \lambda_{ij} + \theta + \alpha_i + \beta_j$
$\log [\Pr(X_{ij} = 0,\ X_{ji} = 1)] = \lambda_{ij} + \theta + \alpha_j + \beta_i$

Mutual Dyad: $\log [\Pr(X_{ij} = X_{ji} = 1)] = \lambda_{ij} + 2\theta + \alpha_i + \alpha_j + \beta_j + \beta_i + \alpha\beta$

These probabilities are log linear, in that the logarithms of probabilities are an additive or linear function of parameters. Thus, each dyadic state is modeled as a linear combination of a number of parameters. Descriptions of the parameters can be found in Chap. 15 of Wasserman and Faust (1994). Clearly, p_1 considers the log probability of a dyadic state, modeled as the sum of choice, expansiveness, attractiveness, and in certain cases, mutuality parameters.

The parameters in the p_1 model can be estimated using maximum likelihood estimation performed using network software packages or standard software for loglinear models (Wasserman & Faust 1994). In the p_1 model, if the estimate of a parameter is positive, it generates an increase in the log probability, or odds ratio, that a tie will be present from i to j. The model can also be used to test hypotheses by comparing particular test statistics for full and reduced models. The test statistic used is the standard conditional likelihood-ratio statistic, ΔG^2, which is a function of the observed data and the values predicted by the model. This statistic, which is the difference between the likelihood ratio statistics for two nested models, is approximately distributed (asymptotically) as a chi-squared random variable. Thus, one can fit two nested models, compute the ΔG^2 statistic, and compare it to the appropriate chi-squared distribution. If the statistic is "large" compared to the upper α^{th} percentile of this distribution, then the 'additional' parameters in the full model are statistically and possibly substantively important.

Although p_1 can be fit easily to a network, the model poses several drawbacks. One is that the p_1 model assumes that dyads are independent of one another. Relationships between two individuals, however, are not necessarily independent of the relational ties in other dyads throughout the network. Furthermore, assumptions of dyadic independence does not permit incorporation of higher-level network effects such as transitivity. As a result, modeling higher levels of interest is impossible. Second, the p_1 model does not allow for considering dyadic level measures *along with* triadic and global level measures. Instead, it permits examining measures such as attractiveness, expansiveness, and mutuality. This results in attractiveness and expansiveness parameters that, although great in number, only describe one actor at a time. Although the mutuality parameter describes the entire network of ties, it is limited to describing dyadic interactions, thus restricting the conclusions that can be drawn about the network of interest.

*Logit p**

The assumption of dyadic independence has led to an extensive discussion in the literature about finding a 'better' model for network analyses – one that can still be used in hypothesis testing but does not assume dyadic independence. Recent work by Frank and Strauss (1986) and Wasserman and Pattison (1996) has led to the development of p^*. The p^* model provides many solutions to the problems inherent with p_1. One of the important ideas behind p^* is that it models the probability of a realization of a network for a fixed number of actors. In other words, one has to imagine that the particular network under study is a realization of all the possible networks that could have occurred for the given number of actors.

In a manner similar to standard regression, p^* yields the explanatory variables that 'drive' the existence of the particular network being studied. Regression searches for the explanatory or predictor variables that best predict the value of an outcome variable. P^* searches for the explanatory variables, which can include a variety of measures, that significantly impact the probability of the network data collected.

An important difference between p^* and p_1 is that the p^* model does not assume independence among the dyads. Frank and Strauss (1986) presented a special case of p^* with a Markov dependence structure that permitted dependencies among ties that share a node. Dependence graphs could be used to specify all possible dependencies. The probability of the graph can then be shown to be a function of the cliques of the dependence graph. Based on this research, Strauss and Ikeda (1990) developed a pseudo-likelihood estimation procedure for model parameters using an approximation of the likelihood function that does not require an assumption of dyadic independence. Thus, p^* is capable of estimating parameters for individual actors similar to p_1 and also parameters that exist across all possible levels of analysis. No longer restricted to modeling dyadic states, p^* can include individual attribute variables such as age, gender, and HIV-status, dyadic level variables such as reciprocity, triadic level attributes such as transitivity, and global level characteristics such as network centralization.

The p^* model is a log linear model that represents the probability of a particular network realization, **X**, as

$$\Pr(\mathbf{X} = x) = \frac{\exp\{\theta_1 z_1(x) + \ldots + \theta_r z_r(x)\}}{k(\theta)},$$

where θ_1 is a model parameter, $z_1(x)$ is an explanatory variable, and $k(\theta)$ is the normalizing constant that is a function of the model parameters, $\theta_1 \ldots \theta_r$.

It is typically very difficult to specify the normalizing constant; however, by expressing p^* in terms of logits, p^* can be rewritten without the normalizing constant. Logits are the log odds of the probability that a tie is present, and are linear functions of several predictor variables:

$$\log \left\{ \frac{\Pr(X_{ij} = 1 | X_{ij}^{C})}{\Pr(X_{ij} = 0 | X_{ij}^{C})} \right\} = \theta' \delta \, (x_{ij})$$

where θ is a vector of model parameters to be estimated, and $\delta \, (x_{ij})$ is a vector of explanatory variables. The probabilities are conditional on the entire graph, exclusive of the tie from i to j (X_{ij}^{C}).

This logit form of p^* can be fit approximately using standard logistic regression procedures available in many statistical software packages. Its use only requires formatting the data to produce structural explanatory variables that can be used in the logistic regression procedure. The output from such procedures estimates the parameters. A large positive estimate for a given parameter indicates that the explanatory variable is important to the probability of the network under consideration. If the estimate is positive, there is a greater probability that the tie exists due to that particular explanatory variable, conditional on *all other effects* stated in the model. On the other hand, parameters with a negative estimate suggest a decrease in the probability that a tie is present from i to j due to that explanatory variable. A non-significant parameter means that the realization of the network does not depend (statistically) on that explanatory variable. Similar to p_1, performing statistical tests using p^* by comparing the difference of pseudo-likelihood ratio statistics is possible.

That it can investigate either a single network or multiple networks is another strength of p^* (Anderson, Wasserman & Crouch, 1999). This allows the researcher to consider the characteristics by which networks differ, a particularly useful method for social support research. In the theoretical context, for example, comparing perceived and received supportive networks might be desirable. In a more applied situation, one might want study the differences between supportive networks for two different populations, or the differences between support networks at two time points. The p^* model can be used in these situations to determine the parameters that are statistically important in two or more different networks.

Selecting p^* Parameters

Once the researcher determines the number of networks to consider, determining the parameters of interest for the given network or research question comes next. An important advantage of p^* is its ability to incorporate individual attribute variables along with network parameters that exist at any level of interest (i.e. dyadic, triadic, global). A listing of parameters for both directed and undirected relations can be found in Wasserman and Pattison (1996). Since we are considering social support networks, however, we will discuss parameters that might be of interest in research on social support. As with regression, theory and the research question should always drive the parameters chosen to include in p^*. For example, if a researcher were interested in the effects of isolation on the elderly in a nursing home support network, including each actor's indegree and outdegree in the model would be wise. Once the parameters have been chosen, a full model with all parameters can be fit, followed by fitting several reduced models to identify a good fitting and parsimonious model that accurately describes a network.

Attribute Variables

A variety of parameters exist that one might want to consider for p^*. Similar to regression models, a number of attribute variables, including gender, age, or education level, can be included. Such parameters help clarify how individual actor differences influence the presence of supportive ties. For example, a positive estimate for gender might reveal that supportive ties within the network often occur between or among actors of the same gender. Actor-level attribute parameters would benefit much of the research discussed earlier in this paper. For example, actor-level attributes could incorporate the cultural and personality contexts that Procidano and Smith (1997) suggest are important to understanding perceived support. Within research on AIDS, HIV status might be incorporated. Large estimates for any of these parameters would indicate that the particular attribute influences the structure of the given support network.

Actor-Level Parameters

In addition to attribute parameters, p^* can include actor-level network measures such as actor centrality. Centrality indices are important for understanding the relative 'prominence' or importance of an actor within a network. Such measures can be used to study theories that link personality traits and perceived social support (Russell, Booth, Reed & Laughlin, 1997). In this context, measures of centrality and prestige might represent important aspects of a person's personality that influence how many ties compose a network, further supporting findings showing that personality can influences network characteristics (Russell et al., 1997). One type of centrality, betweenness centrality, quantifies the links between individuals in a network. Betweenness centrality assumes that actors are central in a network if they "lie" on paths between many other actors. A betweenness centrality parameter can identify how bridge groups, such as those discussed by Elwood (1995), tie actors together within social support networks.

Density, or the average standardized degree (Wasserman & Faust, 1994), is another important actor-level parameter. Although density 'characterizes' the entire network, it is a homogeneous actor-level parameter because it is determined by effects at the level of individual actors rather than dyads, triads, or higher. The focus in social support literature on network size and density would lead one to include this parameter in a p^* model. However, p^* allows the researcher to statistically test the extent to which density is truly important to the presence of ties within networks. Such an examination can add to the general literature on social support that links network size to greater support. Furthermore, p^* models allow considering how density differs across various support networks.

When drawing conclusions about the 'meaning' of an actor-level parameter, remembering that p^* models the log odds that a tie is present in the network is important. Results showing that certain actor-level statistics are large and positive indicate that the particular parameter contributes to the presence of ties within the network. In other words, if a certain actor's level of centrality is statistically important in a model, it increases the log odds of a tie if that actor's centrality increases. In addition to measures of actor's centrality, parameters for expansiveness and attractiveness that are found in p_1 could be included. These parameters measure the tendency for particular individuals to either provide support to (expansiveness) or receive support from (attractiveness) others. Recall however, that these parameters exist for each actor and could result in over parameterization of the model. Hypothesis testing can test for the overall effects of expansiveness and attractiveness.

Dyadic, Triadic, and Higher-Level Parameters

At the dyadic level, parameters of interest usually quantify tendencies toward or away from mutuality or reciprocity. Several recent studies have examined the importance of reciprocity to supportive relationships (Van Tilburg, Van Sonderen & Ormel, 1991; Williams, 1995). Social support often is conceptualized in terms of social exchange theory which states that individuals attempt to maintain a certain level of equity in the giving and taking involved in relationships (Blau, 1964). The inclusion of a reciprocity effect in p^* allows one to model how well this important aspect of social exchange theory holds for a particular support network. Reciprocity would also be important in understanding the theory of perceived support advocated by Lakey, McCabe, Fisicar and Drew (1996). Lakey et al. suggested that an appropriate 'match' between the perceiver and supporter was important in understanding the influence of environment on support. Such a 'match' could be measured with reciprocity parameters. In applied research, reciprocity parameters would help to show the extent to which HIV patients reciprocate the support provided to them by caregivers, or the extent to which older adults reciprocate support to their adult children. Studying reciprocity parameters might also extend research on exchange theory, which states that the ties between individuals are based on the exchange of a valued item. Research on support and reciprocity could reveal the extent to which support is shared as a valuable commodity. In any of the above cases, a large, positive reciprocity parameter would indicate a network relation where ties likely occur due to reciprocated support.

Triadic measures move beyond merely considering dyads. Although the logit p^* is written in terms of dyadic ties, testing the statistical importance of triadic parameters to determine how triadic interactions influence ties within the network remains possible. Little research however, considers how the interactions of three actors within a network influence supportive relationships. Two important triadic level effects for use in p^* models include parameters for transitivity and cyclicity.

A triad is transitive if when i is tied to j, and j is tied to k, i is also tied to k. Transitivity often represents how much actors in a network are hierarchical (Wasserman & Faust, 1994). Cyclicity represents the situation where i is tied to j, j is tied to k, and k is also tied to i. Cyclicity among network triads can show which triads are 'tightly' bound. Triadic states are important components of balance theory which states that a triad is balanced when signs of the ties existing among the actors have a positive product (i.e. they are all positive, or two are negative and one positive). Balance theory has been important to understanding positive and negative affect relations. For example, balance theory proposes that two friends (people with positive ties to each other) feel similarly towards another person.

Using triadic parameters in p^* models permits assessing which supportive interactions among three people influence the overall structure of the network. None of the literature we have reviewed appears to consider the effects of triadic interactions on supportive experiences. Seeing how particular triadic interactions affect psychological adjustment and well-being would be interesting and balance theory might be applicable here. Similar interest lies in determining how a positive and a negative ('conflictive') tie to a third individual influences that person's adjustment. For example, when two people have positive ('supportive') ties with a third person, the latter may have better adjustment.

Triadic level parameters also reveal information about network hierarchies. Statistically large transitivity parameters in p^* models indicate a 'hierarchical' support network. This means that some people might "lead" or "instigate" supportive relationships, while others tend to receive support. On the other hand, significant cyclicity parameters might indicate the opposite state – that relationships are 'anti-hierarchical'. In this case, support within triads tends to 'bind' the actors closer together. For research on well-being and social support, such results would reflect the extent to which hierarchy within supportive relationships helps or harms the ties.

The 2-star triads are another class of triadic parameters. Examples of 2-star parameters include the 2-in-star ($j \rightarrow k$ and $i \rightarrow k$), the 2-out-star ($i \rightarrow j$ and $i \rightarrow k$), and the 2-mixed-star ($i \rightarrow j$ and $j \rightarrow k$) (see Robins, Pattison & Wasserman, 1999, for a figure and discussion of these effects). These parameters summarize types of choices occurring among triples of actors. Transitivity and cyclicity arise as a result of a combination of 2-in, 2-out, and 2-mixed-stars. In the context of support networks, the 2-in-stars indicate triads where two actors send support towards a focal individual, whereas 2-out-stars indicate triads where a key actor sends out support to two other actors. The 2-mixed-stars represent triads in which support is passed along from person to person. These parameters describe and quantify how structure within triads influences the presence of supportive ties within networks.

Finally, p^* models can include global level parameters such as network centralization. Network centralization parameters describe relations in detail by examining how support tends to 'focus' around key individuals within a network. Large centralization parameters indicate a network with one actor considerably more central than others. If network centralization is a statistically large parameter within a model, subsequent examination of the attractiveness parameters might reveal which particular actors are most central. Such models would prove particularly useful in applied research that examines if support is provided equally by all members or one member in particular.

Partitioning Actors

Depending on the network being investigated, partitioning actors by important exogenous attribute variables may prove beneficial. Partitioning allows incorporating group level effects into p^* based on variables such as age, gender, education level, race, HIV status, or type of support provided (e.g. financial, emotional, instrumental, etc.). It permits examining how structural parameters differ between groups of interest. The resulting p^* model would include estimates for *differential* reciprocity, transitivity, cyclicity, or density, for example. Partitioning also would be helpful when considering contexts that influence perceived support, such as personality type or cultural group (Procidano & Smith, 1997). Within the stress-buffering model of support, partitioning actors with different stress levels helps explain how stress differentially affects network structure and in turn, influences well-being. In an applied context, research on AIDS and support might include a p^* model where individuals are partitioned according to the number of HIV symptoms present (similar to the approach by Hays, Turner and Coates, 1992). This method reveals how health status influences the characteristics of networks such as network size (Kaplan, Patterson, Kerner & Grant, 1997). Research on the support networks of the elderly could benefit from partitioning actors according to gender, ethnicity, family relationships, and marital status – variables shown to be important to the support networks of older persons (Barker, Morrow & Mitteness, 1998; Tsai & Lopez, 1997).

Using the p^* model in the context of social support networks allows considering parameters from several levels of analysis simultaneously. Wasserman and Pattison (1996) have shown that p^* models can be fit approximately using logistic regression procedures that are familiar to behavioral scientists. While we have discussed a variety of parameters which might be of interest to the support researcher, p^* models can incorporate numerous other parameters including connectivity, geodesic lengths (the length of the shortest path between two actors), and betweeness centralization. The key is to include any number of parameters, of both the relational and attribute type, of importance to a particular research question. Furthermore, these parameters can represent individuals, dyads, triads, entire networks, or subgroups of actors who share common characteristics. Unique to this class of models, one can *statistically test* the statistical significance of these parameters via the fitting of full and reduced plausible models of social structure.

CONCLUSION

The literature reviewed throughout this paper shows that a network approach to social support research is vital to understanding both theoretical aspects of social support and its application in various practical contexts. We conclude by arguing for the use of p^* models to examine social support in terms of networks. Earlier in this paper, we noted that one of the important issues in current social support research examines how much social support results from the environment or the person. After reviewing an extensive body of literature we conclude that the relationships that one participates in are an important part of one's surroundings or environment. The class of p^* models will help researchers relate the person and their local and/or global structural environment, thus allowing the researcher to simultaneously consider the effects of attribute *and* relational data on support relationships.

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INFECTIOUS DISEASE CONTROL: COMBINING MOLECULAR BIOLOGICAL AND NETWORK METHODS

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ABSTRACT

As the magnitude of the HIV/AIDS pandemic became apparent, attention was directed once again at the control of infectious diseases. Tuberculosis (TB), the focus here, was once thought 'conquered' but again has become a matter of concern. Historically, TB control has concentrated on contacts between infectious cases and susceptible persons in their immediate social (often household) environments. The development of DNA strain typing of the bacterium M. tuberculosis, however, provided important new tools from molecular biology. Subsequent work has indicated that transmission could occur more readily than previously believed, i.e. in community settings. Limitations of conventional TB control programs thus were revealed. Here, tools from molecular biology, epidemiology and network analysis are integrated to suggest a new approach to infectious disease control.

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INTRODUCTION

Societies are structured by interactions among and between members of populations. These structural patterns influence the direction and degree that pathogens spread. Hence, more knowledge about social structures can help to improve disease control.

The role of patterns of human interaction in the spread of pathogens was made clear by the 'Patient Zero' cluster of patients diagnosed with the AIDS in the early 1980s. Patient Zero – a male flight attendant – was believed to be the source of widely disseminated HIV infection. As the patients involved were connected to each other through direct sexual contact or indirectly through intermediaries, this cluster provided the first scientific evidence that an infectious agent was implicated (Auerbach et al., 1984). Further, conceptualizing these inter-connected patients as a social network helped to demonstrate the usefulness of network methods for studying the spread of human pathogens (Klovdahl, 1985).

Subsequent work using network concepts and methods concentrated on diseases transmitted during sexual contact including HIV/AIDS, gonorrhea and syphilis (Ghani et al., 1996; Gupta et al., 1989; Haraldsdottir et al., 1992; Klovdahl et al., 1994; Morris, 1993; Parker et al., 1998; Rothenberg et al., 1998b; Wylie & Jolly, 2001). In addition, social network techniques have proven effective in studying other (horizontal) modes of HIV transmission such as spread resulting from needle-sharing among illicit drug users (Curtis et al., 1995; Friedman et al., 1999; Latkin & Knowlton 2000; Latkin et al., 1995; Miller & Neaigus, 2001; Neaigus et al., 1994; Rothenberg et al., 1998a).

The relevance of network methods to research on HIV and other STDs raises an enticing question: Can network concepts and methods – the network paradigm – be usefully applied to the study of other pathogens? Here, this question is addressed in relation to tuberculosis (TB), transmitted by the airborne route. As airborne transmission evokes images of anonymous strangers spreading infection by coughing or sneezing in public, TB provides a challenging opportunity to begin to evaluate the wider relevance of the network paradigm.

TUBERCULOSIS

In the 1980s concern about tuberculosis increased in industrial societies as decades of downward trend in morbidity and mortality ended and case rates rose (Bloom & Murray, 1992; Raviglione et al., 1993). For the United States (U.S.) between 1985 and 1992, the Centers for Disease Control and Prevention (CDC) calculated that 52,000 excess (of trend) cases occurred (Cantwell et al., 1994). By 1993 the figure was 64,000 excess cases (CDC, 1994). Some regions were affected more than others; for example, in New York City between 1979 and 1993 almost 20,000 excess cases were reported (Haggerty, 1994). One contributing factor was HIV/AIDS (Narain et al., 1992; Onorato et al., 1992) and TB soon was made a criterion for AIDS (CDC, 1992).

TUBERCULOSIS INFECTION/TUBERCULOSIS DISEASE

Some relevant background information merits review at this point. TB typically is caused by *Mycobacterium tuberculosis* (*M. tuberculosis*, or *Mtb*), a bacterium and member of a large family (*Mycobacteria*). This family includes *M. bovis* (the cause of bovine TB and sometimes – more so before milk pasteurization – TB in humans), *M. avium* (a cause of opportunistic infections in AIDS patients), and *M. leprae* (the cause of leprosy) (Benenson, 1995).

When a healthy person is infected with *M. tuberculosis*, his or her immune system deals effectively with it in most instances. The infection often remains dormant thereafter and causes no further problems. These persons are neither diseased nor infectious (Comstock & O'Brien, 1991). Latent tuberculosis infection restrained by on-going immune system response, in fact, appears to confer some protective immunity against reinfection (Chan & Kaufmann, 1994). In addition, a reaction by cell-mediated immune system defenses (e.g. CD4 T cells) to Purified Protein Derivative, tuberculin (PPD-S), injected into a person's skin (e.g. a positive Mantoux skin test) indicates Mycobacterial infection (Snider Jr., 1982). Tuberculin skin tests have been very useful in public health: A positive result following a negative test (i.e. a 'conversion') has long been used to indicate transmission between an infectious and a susceptible person in the absence of disease in the latter (Comstock & O'Brien, 1991; Herrick & Davison, 1993).

A small proportion of (healthy) adults who are infected (an estimated 5%–10%) develop active TB disease, sometimes long after initial infection ('endogenous reactivation') (Comstock & O'Brien, 1991). Usually only TB affecting the respiratory tract (e.g. lungs) may become infectious. Coughing and sneezing are examples of mechanisms that can expel aerosolized bacterial secretions from respiratory passages into the surrounding air as droplets (Mims et al., 1995). After evaporation these become 'droplet nuclei', able to circulate in enclosed places (Wells, 1934; Wells & Stone, 1934). Inhalation of droplet nuclei containing viable tubercle bacilli by susceptible persons is the principal cause of new infections ('exogenous infection') (Riley et al., 1962).

Vaccination against TB has been possible with the Bacille Calmette-Guerin (BCG) vaccine. Although widely used around the world, questions remain about its effectiveness (Murray, 1994). In consequence, important in TB control programs have been locating persons with active disease (case-finding), separating infectious from susceptible persons (isolation), and treatment with antibiotics (chemoprophylaxis/chemotherapy) (ATS, 1992).

Historically, after antibiotics effective against *M. tuberculosis* became available – from the 1950s – infectious persons could be rendered non-infectious, initially, often within two weeks (Johnston & Wildrick, 1974; Rouillon et al., 1976). Isolation as a control strategy then became less important. Indeed, one study carried out after the introduction of antibiotic treatment found that during a five-year period, 39% of contacts of home-treated patients subsequently converted (indicating recent infection) compared to 45% of sanatorium contacts (Kamat et al., 1966). Not surprisingly, the sanatoria common earlier in the century soon disappeared, replaced by home confinements.

TUBERCULOSIS TRANSMISSION

Much of the work in the 20th century fostered the belief that TB was not highly contagious. As one author summarized:

> . . . tuberculosis is not a highly infectious disease and is generally not acquired easily by casual contact with a potential transmitter of infection. Rather, intimate and prolonged sharing of environmental air is required before infection is acquired by a susceptible host (Locks, 1981, p. 675).

In other words, the evidence suggested that for transmission to occur close contact with an infectious person over an extended time in a confined space was normally necessary (Loudon et al., 1958). As a result, contact tracing has been an important means of finding new cases (Etkind, 1993; Rieder, 1993). In low prevalence countries, the common approach has been to rank contacts of (infectious) cases by their likely degree of exposure to infectious patients and to target those believed most at risk. Ideally, treatment follows for newly identified cases. In recent times, antibiotics increasingly have been given as directly observed therapy (DOT) to ensure adherence (and reduce risks of emerging drug resistance) (Bayer & Wilkinson, 1995; Sumartojo, 1993).

Earlier research, to reiterate, supported the view that *Mtb* transmission required close contact for extended periods. This meant that identifiable social relationships often existed between infectious persons and those believed to be infected by them, including household members, visiting kin, close friends, neighbors, and co-workers. Hence, the personal interactions long associated with tuberculosis transmission are precisely the kinds studied in social network research. However, before 'jumping in' to apply social network methods, implications of recent work in molecular biology must be considered.

SOME CONTRIBUTIONS OF MOLECULAR BIOLOGY

The declining incidence of TB in developed countries meant fewer infectious cases to which susceptible persons might be exposed. In the U.S., the case rate dropped from 53.0/100,000 to 14.2/100,000 between 1953 and 1974 (CDC, 2000). Estimates suggested that about 8% of the new cases notified in 1971 (≈ 35,000) resulted from recent (exogenous) infection and 92% resulted from (endogenous) reactivation of infections acquired earlier. Thus, when case numbers increased in the 1980s, the most plausible explanation seemed obvious: Increasing reactivation of previously dormant infections. Among HIV/AIDS patients, initially it was assumed that latent (earlier) infections reactivated and progressed to disease as a consequence of damage to cell-mediated immune defenses (CDC, 1987).

Work at the frontiers of molecular biology, however, led to a reconsideration of the conventional wisdom. Research on the *M. tuberculosis* genome found DNA probes (e.g. IS*6110*, pTBN12) that made it possible to differentiate between strains (Dwyer et al., 1993; Eisenach et al., 1988; Thierry et al., 1990; Zainuddin & Dale, 1989).

An example of DNA 'fingerprints' (or profiles, banding patterns or simply 'prints') is shown in schematic form in Fig. 1. Twelve prints of *M. tuberculosis* isolates are shown, with lanes one and 12 from controls. The other lanes show identical (six band) patterns from 10 patients with TB.

These new methods allowed much stronger inferences about likely disease origin: Endogenous reactivation or exogenous infection. Given a series of cases, if patients had strains of *Mtb* with identical or closely similar prints, a plausible explanation was recent transmission, with the possible exception of an initial source case whose disease may have resulted from reactivation. Provided minimal strain-typing criteria were met, if disease resulted from endogenous reactivation it was much more likely that the banding patterns would not be similar, with dissimilarities resulting from earlier infection by different strains at different times or in different places (van Embden et al., 1993; Yeh et al., 1998). These methods have been supported by studies of strains cultured in vitro over time (van Soolingen et al., 1991), of animals (Hermans et al., 1990), of epidemiologically linked patients (Mazurek et al., 1991), of patients in geographically separated populations (Hermans et al., 1995), and of patients followed over time (Otal et al., 1991). And, they have been subject to much critical scrutiny (Burman et al., 1997; Godfrey-Faussett et al., 1992; Kremer et al., 1999; Yang et al., 1996) . . . their strengths and weaknesses increasingly well understood.

In addition, there have been supporting studies of TB outbreaks using strain typing along with conventional epidemiology (Barnes et al., 1997; Beck-Sagué

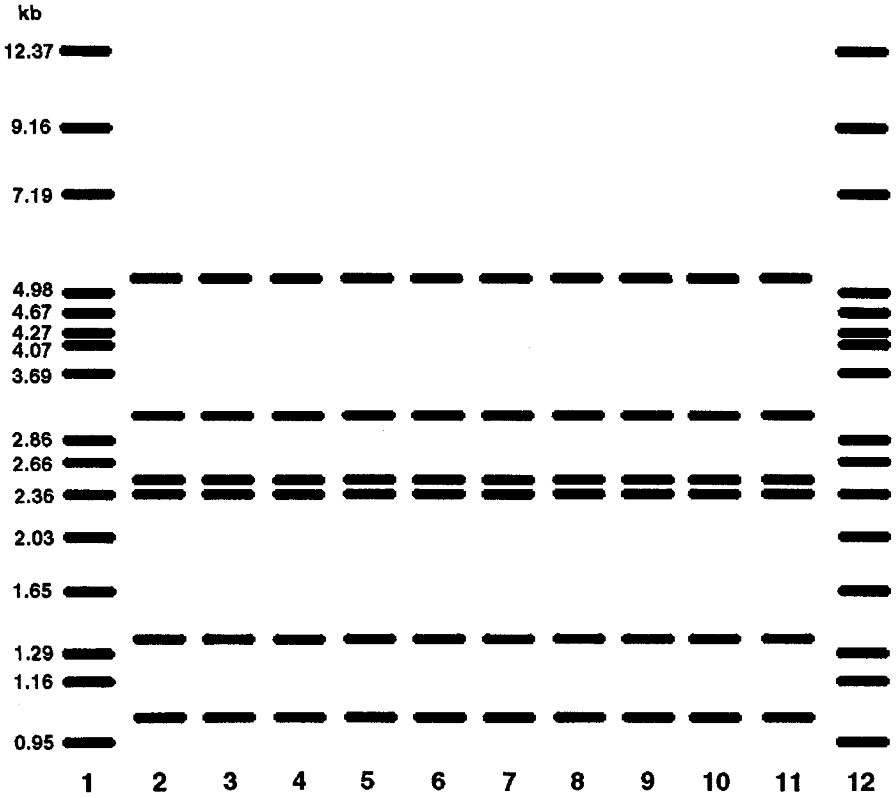

Fig. 1. A Schematic Diagram of a DNA Profile (IS*6110*). The Different Columns (lanes) Represent the 'Prints' from Specimens Cultured from Different Patients. The First and Last Lanes are Controls.

et al., 1992; Bifani et al., 1996; Daley et al., 1992; Genewein et al., 1993; Small et al., 1994). These studies represented a major step forward and brought to light serious shortcomings in TB control programs. That is, traditional programs usually did well in locating individual patients (and small clusters) but were less successful in recognizing the larger outbreaks of which individual cases were part.

In essence, the new work suggested that *Mtb* transmission was more complicated than previously believed. Many outbreaks were linked to places rather than to close, identifiable, contacts. This led to a reconsideration of earlier work, and a greater recognition of the potential importance of physical locations in outbreaks (Barnes et al., 1997; Classen et al., 1999).

Re-examining earlier literature, however, indicates that places have long been implicated in TB transmission. For example, place-focussed outbreaks have been reported in nursing homes (Stead, 1981), in hospitals (Beck-Sagué et al., 1992; Edlin et al., 1992) and in schools (Hoge et al., 1994; Reves et al., 1981). They have occurred aboard a U.S. naval vessel (Houk et al., 1968) and in a shipyard (Allos et al., 1996). They have also been observed in a crack house (Leonhardt et al., 1994) and in prisons (Bergmire-Sweat et al., 1996). In some of these place-associated outbreaks those infected had a personal relationships with the likely source of their infection but this has not always been so (e.g.) (Barnes et al., 1997; Kenyon et al., 1996; Sepkowitz, 1996; Valway et al., 1998).

It follows that even if there was perfect reporting of close contacts by TB cases, persons involved in an outbreak might not always be linked together to form a social network. Paradoxically, research using DNA methods established a need for new approaches to TB control and stimulated the work outlined here. Yet, evidence for *Mtb* transmission among persons for whom no personal links could be found or were likely to have existed – i.e. among persons not connected to form a social network – cannot be ignored. Hence, one implication is clear: It is not always possible to simply pull network methods out of the toolbox, so to speak, for use in infectious disease epidemiology. For some tasks, new tools must be developed.

BEYOND SOCIAL NETWORKS

A network consists of nodes connected by links of one kind or another. A social network typically is defined as a set of persons connected – directly or indirectly – by social relationships (Mitchell, 1969). The ties of interest may be friendships, links to kin, neighbors, work associates, sexual or drug injecting partners, and so on. Social researchers most often conceptualize networks as graphs or digraphs. A mathematical graph is a set of points (vertices) connected by lines (edges). The lines in a graph are undirected ($l_{ij} = l_{ji}$) (Wilson & Watkins 1990). A digraph (i.e. a *di*rected *graph*) is a set of points connected by directed lines. In a digraph, if a line l_{ij} is present ($l_{ij} = 1$), a line l_{ji} may ($l_{ji} = 1$) or may not ($l_{ji} = 0$) be present (Harary et al., 1965). In terms of their characteristics, the points in graphs/digraphs are not normally distinguishable from each other.

As TB outbreaks can involve both persons and places, using network methods is not straightforward. Although 'two-mode' network methods may seem appropriate at first glance (Wasserman & Faust, 1994), the usefulness of these (as developed to date) is limited when dealing with disease outbreaks. Thus, there is a need for new concepts to use network analysis to study a broader range of human pathogens.

THE CONCEPT OF AN OUTBREAK NETWORK

An 'outbreak network' is a set of actors and the links that connect them in a disease outbreak. The actors may be persons, places, and other 'objects' (animate or inanimate) 'playing a role' in the transmission of an infectious agent. The links are epidemiologically-relevant interactions among persons, places and any other actors (e.g. fomites) implicated. In outbreaks involving only persons, an outbreak network reduces to a social network consisting of epidemiologically relevant links among persons, represented as points in the relevant graph or digraph. In a tuberculosis outbreak network, however, the points can be persons and places.

There are a number of ways of viewing this multi-actor complexity. For example, a place could be a proxy for personal interaction. At its best, recall and reporting of personal relationships (e.g. close contacts) is seldom perfect (Brewer, 1999). Hence, a place may be a good proxy for interaction between particular persons.

For *M. tuberculosis* (and some other pathogens, e.g. *Staphylococcus aureus*, *Bacillus anthracis*), moreover, considering a place as well as a person as potentially 'infectious', with varying levels and lengths of infectivity is not unreasonable. A place may be infectious because persons who are infectious congregate there and remain so during their presence. Or, a place may be infectious irrespective of the presence of particular persons, for example, as with places contaminated by anthrax spores (Brachman, 1980). Thus, places may be infected or infectious, and in different ways.

For simplicity, persons and places are viewed as 'equivalent' here. That is, the graph/digraph for the outbreak network considered here consists of equivalent 'points', persons and places, infectious or capable of being infected.

A place is assumed infectious when frequented by persons with infectious TB. This is a simplification but provides a useful beginning.

QUANTITATIVE IMPORTANCE IN OUTBREAK NETWORKS

Tuberculosis infection can progress to infectious disease before detection. Public health departments often face outbreaks underway when the first cases are observed. Their task is to find the key actors (e.g. infectious persons) in an outbreak and to implement effective control measures ... both as quickly as possible to minimize spread. Quantitative measures of the importance of actors – and classes of actors – in outbreak networks can help to accomplish this.

The concept of network 'centrality' is a logical starting point as much attention has been devoted to its measurement (Wasserman & Faust, 1994). This work originally focused on communication networks (Bavelas, 1948). The importance of centrality has been expressed as follows:

> ... when a person is strategically located on the communication paths linking pairs of others, that person is central. A person in such a position can influence the group by withholding or distorting information in transmission." And, "... a point that falls on the communications paths between other points exhibits a potential for control of their communication (Freeman, 1979, p. 221).

Location in a communication network affects flows of information and influence. The flow of pathogens is also affected by network location (Klovdahl, 1985). All else constant, centrally located persons in a network have a higher probability of being infected during an outbreak and – if infected – of infecting others (Klovdahl et al., 1994; Rothenberg et al., 1995).

Many measures of centrality exist. Some were developed to address social science problems (Bonacich, 1987; Freeman, 1979; Nieminen, 1974). Others were developed to learn more about the spread of pathogens in networks (Altmann, 1993; Bell et al., 1999; Stephenson & Zelen, 1989). An illustration helps to clarify network centrality in relation to infectious diseases.

Figure 2 depicts a network of 20 nodes (here, all persons) and connecting links (personal relationships). These links are assumed to permit transmission of a human pathogen, for example, involving epidemiologically-relevant close contact. In digraph terms, node #1 is a 'source' – it is the origin of a number of links but destination for none. In contrast, node #5 is a 'sink', as is node #7, #11, #13 and nodes 16 through 20: These nodes are destinations only. Some nodes, for example nodes #2 and #3, are on shortest paths (geodesics) between other nodes (e.g. #2 between #1 and #5).

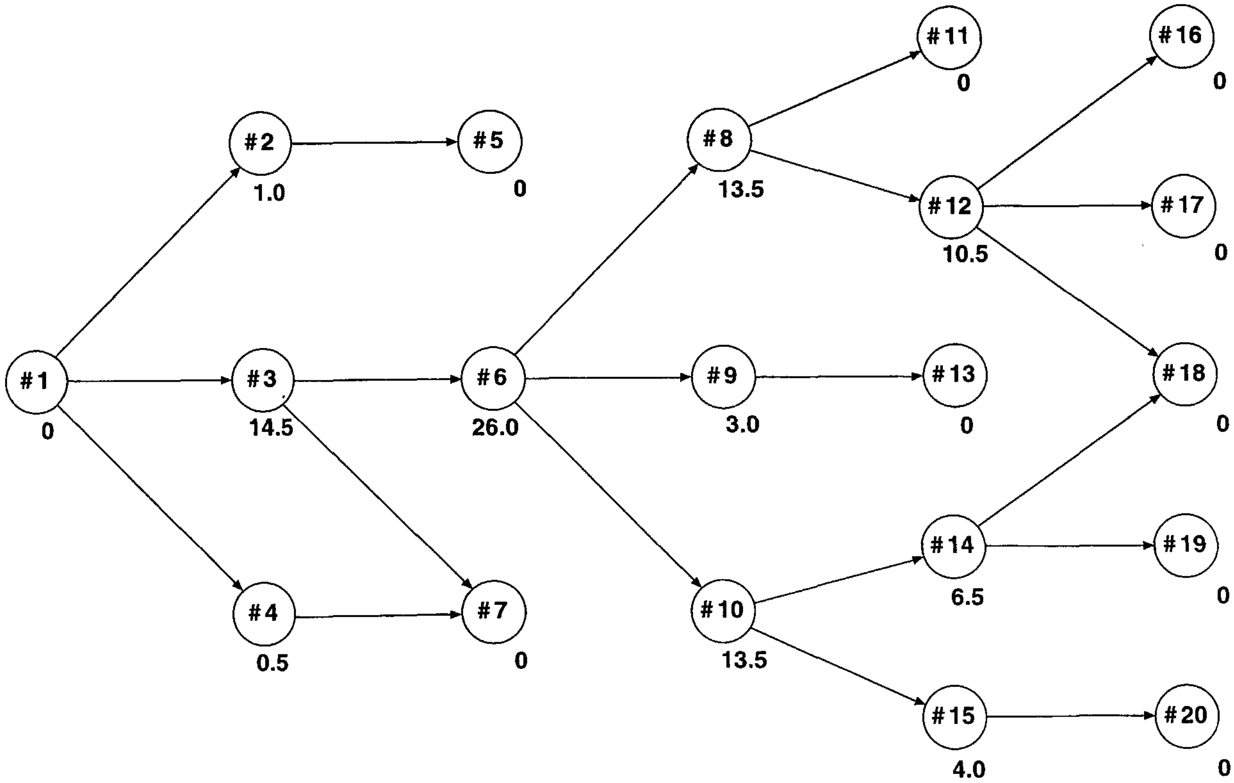

Fig. 2. An Illustration of Network (betweenness) Centrality. Centrality Scores in this (Hypothetical) Outbreak Network are Given for Each Node (person). It was Created with Macromedia Freehand (8.0).

Using the classic 'betweenness' measure of centrality in its directed graph (digraph) form (Gould 1987), centrality scores for nodes in this (hypothetical) outbreak network can be calculated. These are shown in Fig. 2.

Sources (node #1) and sinks (e.g. #5, #7, #13) have zero betweenness centrality: They are not on any shortest paths between other nodes. Node #2 has a centrality score of 1.0 – it is on one shortest path (between #1 and #5). Node #4 is also on one shortest path, between #1 and #7, but there is another between #1 and #7 (i.e. #1 → #3 → #7). Accordingly, the betweenness centrality score for #4 is calculated as $1/g_{ij}$, where g_{ij} is the number of geodesics between the relevant nodes (#1 and #7). Hence, the centrality score for node #4 is $1/2 = 0.5$. Simultaneously, 0.5 (1/2) is added to the overall centrality score for node #3 as it is on the other (of the two) shortest paths between #1 and #7.

Expressed formally, the (partial) betweenness centrality score $b_{ij}(p_k)$ for a point (node) in a digraph is:

$$b_{ij}(p_k) = g_{ij}(p_k)/g_{ij}$$

where i is an origin point, j is a destination point, k is a point for which a centrality score is being calculated ($i \neq j \neq k$). Also, $g_{ij}(p_k)$ is the number of geodesics (shortest paths) between point i and point j containing point k, and g_{ij} is the total number of geodesics between point i and point j. As a point k may appear on shortest paths between more than one pair of points, often more useful is an overall measure of betweenness centrality for each point:

$$C_B(p_k) = \Sigma\, b_{ij}(p_k)$$

which sums – for each point (p_k) that appears on any shortest path(s) – the betweenness scores (b_{ij}) for all pairs of points (i and j) (Wasserman & Faust, 1994).

Centrality scores provide epidemiologically useful, quantitative information about the importance of different actors (e.g. infectious persons) in an outbreak network. Some of this reinforces existing knowledge; other information can provide new insights. For example, in the population shown in Fig. 2 a correlation exists between network centrality scores of individuals and the number of infections that would be prevented if infection was stopped at a particular individual (i.e. excluding the source case, the product-moment correlation $r = 0.88$). Ignoring the time dimension (to further simplify), person #6 and person #12 have the same number of contacts (three) but #6 has more than twice the centrality score and, therefore, is a more important actor in this outbreak. Stopping infection at a person such as #6 would prevent 13 infections while stopping it at someone such as person #12 would prevent only two subsequent infections. In a sense this is analogous to assigning highest priority to finding and treating the most (biologically) infectious patients, i.e. those capable of producing the most secondary infections (Shaw & Wynn-Williams, 1954).

AN UNDETECTED TUBERCULOSIS OUTBREAK

A collaboration in Houston, Texas (the Houston Tuberculosis Initiative) involving researchers at the Texas Medical Center and disease control experts in the City of Houston Health and Human Services Tuberculosis Control Division identified one puzzling outbreak of tuberculosis using DNA strain typing methods. A number of patients with active tuberculosis disease were found to have a common (IS*6110*, six band) profile, designated the 'Print 4' strain. The prints for 10 of these patients were shown in Fig. 1. This analysis focuses on 37 of these patients diagnosed between 1993 and 1996 with tuberculosis disease (Klovdahl et al., 2001; Yaganehdoost et al., 1999).

Available data on personal relationships (close contacts) obtained using conventional public health procedures indicated very few links among these patients although over 600 [(n(n – 1)/2 = 37(36)/2 = 666] links were theoretically possible. Interviews were not possible with all patients but data available included information supplied by proxy persons for deceased or otherwise unavailable patients, for example about their known contacts. In Fig. 3 patients infected with the Print 4 strain and the links between them are shown. The visual representation was created with Graphviz (Koutsofios & North, 1993).

The Print 4 outbreak represented a pattern common in recent years: Strain typing methods provided evidence linking a number of cases but health departments have not had the tools to determine how outbreaks were actually occurring. In consequence, timely and cost-effective outbreak control often has been difficult if not impossible.

The Print 4 outbreak was made the focus of a field investigation. Some additional case-case links were found (included in Fig. 3) but places were discovered to be the missing links. That is, 33 of 34 patients interviewed reported having frequented bars, taverns, restaurants or similar establishments, and 32 of the 37 patients (86%) could be linked to one or more specifically named places of this kind. Most of these places were located in an identifiable geographical area. Overall, the fieldwork uncovered over 40 bars and similar places visited during the period considered by patients diagnosed with Print 4 *Mtb*. Further, about 80% of the patients interviewed (27 of 34) were gay or bisexual, and many of the places implicated were described as 'gay bars' (Yaganehdoost et al., 1999).

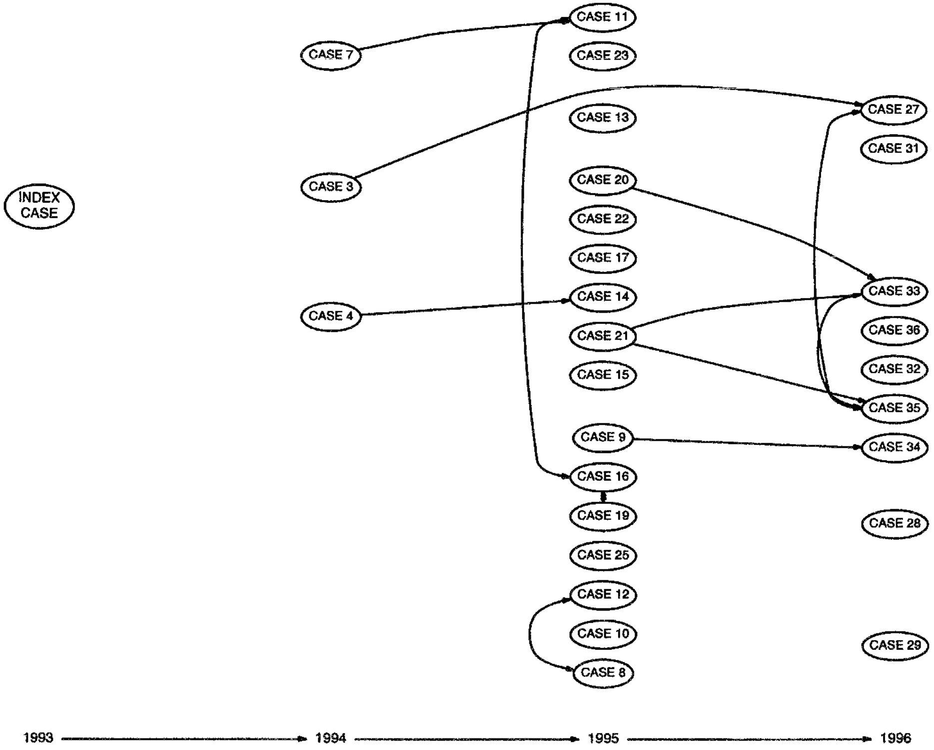

Fig. 3. Personal Relationships (close contacts) among Patients in the 'Print 4' Tuberculosis Outbreak in Houston Texas. All Observed Case-Case Links are shown; 29 of the 37 Cases are shown.

This Figure was Created with Graphviz (Koutsofios & North, 1993).

Eight of these patients could not be linked to another patient or to a place frequented by other patients. About 80% (29/37) of them were part of the outbreak network: All were connected, directly or indirectly, though other patients or places to each other (Klovdahl et al., 2001). Figure 4 represents the Print 4 outbreak network as a mathematical digraph.

A basic understanding of the biology and epidemiology of the infection/disease being considered is essential for reconstructing an outbreak network. The link shown between Patient #20 and Patient #33 in Fig. 3 is illustrative. Patient 20 and Patient 33 both had active tuberculosis disease caused by the Print 4 strain and were close contacts. From a social science perspective a connection between Patient #20 and Patient #33 would seem non-problematical. The clinical data, however, indicated that Patient #20 did not have a form of disease that produced infectious droplet nuclei (e.g. pulmonary disease); therefore, it was extremely unlikely that he could have transmitted infection. If this link had been retained for the outbreak network analysis the importance of Patient #20 (and some other patients) would have been overestimated. Hence, links not supported by both network and clinical data were excluded.

After reconstructing the outbreak network, centrality scores ('betweenness') were computed. For simplicity here, morbidity dates (dates of diagnosis with tuberculosis disease) were used as proxies for periods of infectivity.

In the digraph representation (Fig. 4) it will be noted that Place 30 is represented twice, as 'Place 30 (1)' and as 'Place 30 (2)'. This illustrates another challenge in reconstructing an outbreak network. That is, in this outbreak the index case was diagnosed with TB in 1993 and Case 36 in 1996. Both were linked to Place 30. However, as Case 36 was HIV positive it is plausible to hypothesize that his (relevant) contact with Place 30 was closer to 1996 than 1993 as HIV/AIDS patients tend to progress to tuberculosis disease more quickly. For simplicity, however, here each place was included once in the centrality calculations.

The spread of human pathogens is a directed process – from an infectious person (or other source) to a susceptible person. Nevertheless, treating links as undirected – representing an outbreak network as a mathematical graph – can be useful. This is equivalent to saying that the evidence considered might not be strong enough to determine direction of transmission. Thus, the Print 4 outbreak network was also represented as a graph (Fig. 5) and the relevant (graph) centrality scores calculated.

Table 1 shows the centrality scores for this outbreak network, which were calculated with UCINET 5 (Borgatti et al., 1999). In the directed (digraph) and in the undirected (graph) realizations of the Print 4 outbreak network both patients and places ranked in the top 10 in importance.

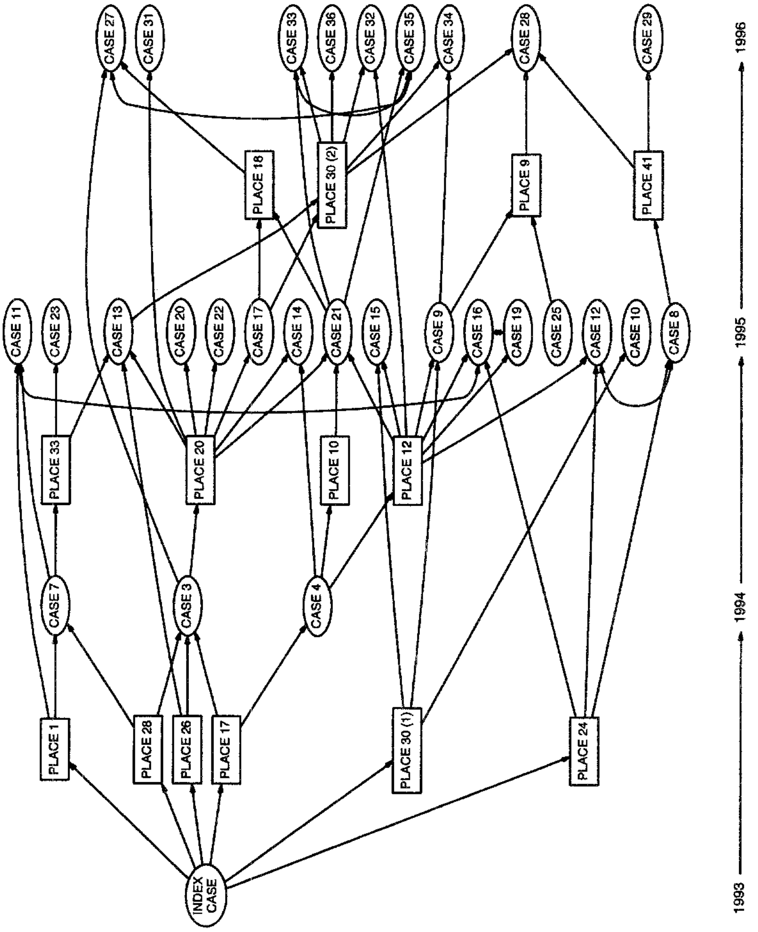

Fig. 4. An Outbreak Network for the Print 4 strain, Reconstructed from the Data Obtained from the Actors (Persons and Places) Identified and Represented as a Mathematical Digraph. Cases/Places that could not be Linked are not shown.

This Figure was created with Graphviz (Koutsofios & North 1993).

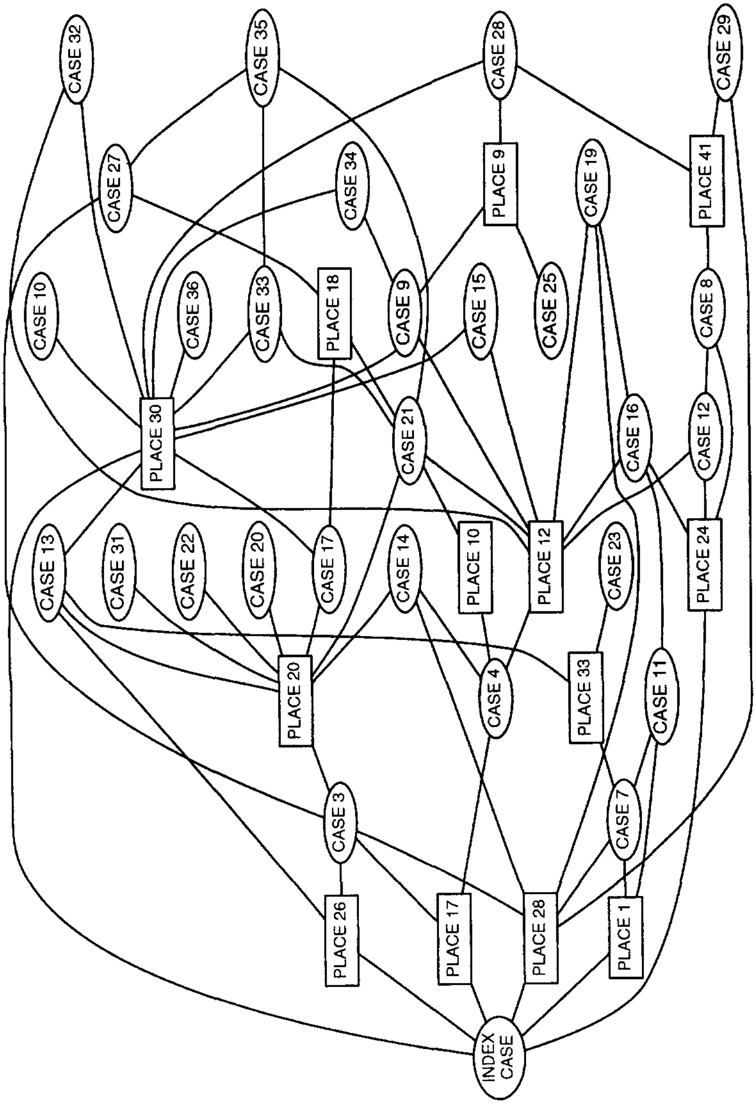

Fig. 5. The Print 4 Outbreak Network Represented as a Mathematical Graph.

This Figure was created with Graphviz (Koutsofios & North 1993).

Table 1. Rank Order in Importance (Betweenness Centrality) of Persons/Places in the Print 4 Outbreak.

Rank Order	Case/Place (Digraph)	Case/Place (Graph)
1	Place 20	Place 30
2	Place 33	Place 20
3	Case 3	Place 12
4	Place 12	Place 24
5	Case 7	Place 26
6	Case 8	Case 14
7	Case 4	Case 28
8	Case 17	Case 21
9	Case 21	Place 33
10	Place 18	Case 17
Cases:	6	4
Places:	4	6

Note: Calculations were based on all relevant data: Patients, 37; places, 13; links, 112. Not all are shown in the figures. The highest centrality scores were ranked 1, and so on.

Briefly, three places (#20, #33, and #12) were in the top 10 when the links in the outbreak were considered directed (Fig. 4) or undirected (Fig. 5). All were bars; all served food and drink. Thirteen patients were linked to Place 20, a gay bar and a popular place for socializing, seven to Place 33, a gay 'leather' bar, and 12 to Place 12, also a gay bar. Place 30, which scored highest when the outbreak network was represented as a graph, was a nightclub and known as a 'pickup joint'. Persons in search of causal sex frequented it. Thirteen patients were linked to Place 30 and the same number to Place 24, which also was important. Place 24 was mainly seen as a gay bar but (as with some other 'gay bars' uncovered during the fieldwork) it was not frequented exclusively by persons known to be gay or lesbian. Some bars could be described as 'gay/public' bars (Yaganehdoost et al., 1999).

Eight persons were in the top 10 in importance in this outbreak when directed (digraph) and undirected (graph) representations were examined. All were male; six were white, one black and one hispanic. Five were between 25 and 34 years old, two between 35 and 44, and one between 55 to 64. Seven had never been married; one was separated. One had not completed high school; seven were high school (but not college) graduates. All were gay. Seven of the eight were known to be HIV positive.

Regarding other relevant aspects of their lifestyles, four of these men reported three or more (alcoholic) drinks daily; three, 12 or more. Seven used (illegal) drugs at some stage; three within the previous six months. Three had experience with intravenous drug use; each of these had shared needles.

All were linked to bars in the Print 4 outbreak. Importantly, seven of these eight had paid employment in places associated with the outbreak, or had significant unpaid involvement (e.g. 'drag queen contestant'). By comparison, less than 40% of the patients in the outbreak as a whole were known to have had similar levels of contact with these places.

As *Mtb* is spread by the airborne route, and as the period from infection to disease can be variable, transmission may not have occurred within the places 'implicated'. Patients in this (very sociable) group may have recalled places visited more easily than persons with whom they had contact. Thus, the Print 4 outbreak is best described as *place-associated.*

Ascertaining loci of transmission with greater certainty would be useful. Nevertheless, identifying a small number of places (here, seven from a list of over 40) as more strongly linked to an outbreak (or type of outbreak) can facilitate disease control. For example, quantitative information about actor importance in network terms, i.e. not only in biological terms, can assist health departments in rationally allocating limited resources to social 'hot spots' – places significantly more associated with transmission – in their disease control and prevention programs.

CONCLUSIONS AND IMPLICATIONS

Tuberculosis has re-emerged in the developed world after a long period of decline. Concern about drug-resistant tuberculosis has increased. After thousands of years of host-parasite accommodation allowing the mutual survival of host and parasite populations, strains of *M. tuberculosis* for which society has no 'magic bullets' have emerged.

Over the past century, as TB declined in industrialized nations, transmission has appeared most common within households of infectious patients. Consequently, case-finding shifted from mass screening (e.g. chest radiography) to household members and other close contacts of newly diagnosed cases.

Studies using DNA strain typing methods, however, have shown that significant extra-household transmission can occur. The full extent of this community transmission is likely to be more accurately determined as more studies using these new methods are carried out.

Although case-finding has become more sophisticated, systematic approaches to *place-finding* remain to be developed and tested. And, new ways to quantify the importance of actors (persons, places, and others) in outbreaks are required for more effective disease control.

From a public health perspective, drawing up a 'wish list' of tools from laboratory science to improve tuberculosis control is not difficult. For example, useful would be ways of detecting infection more quickly after exposure, faster identification of drug resistant strains, more effective drugs with fewer side effects, including drugs that eliminated 'persistors' (latent infection). Indeed, at or near the top of any wish list would be a vaccine against tuberculosis, with greater protective efficacy across varied strains and diverse human populations.

In thinking about new approaches, however, a sense of perspective is needed. As McKinney, Jacobs and Bloom observed:

> If there is an overarching lesson to be gleaned from the rich history of tuberculosis research, it is the need for humility by the scientific community. The discovery of the tubercle bacillus by Koch in 1882 was truly one of the great triumphs of scientific rigor and personal courage. But let us not forget that in 1890 Koch proclaimed *the* cure for tuberculosis, that in 1921 Calmette and Guerin introduced *the* vaccine against tuberculosis, that in 1946 Schatz and Waksman isolated *the* antibiotic that killed the tubercle bacillus – yet, tuberculosis remains today the leading cause of death in the world from a single infectious disease (McKinney et al., 1998, p. 128).

Work on the tuberculosis genome has made possible a number of advances in the past decade. Strain typing methods such as used here represent one advance. Another was the discovery that different *M. tuberculosis* genomic Groups have been associated with disease outbreak of varying magnitudes. This has implications for public health, i.e. for making possible more effectively targeted control efforts (Sreevatsan et al., 1997). And, the recent mapping of the entire *M. tuberculosis* genome (Strain H37Rv) with over four million base pairs suggests that significant contributions to tuberculosis control wish lists may be forthcoming in the near future (Cole, 1998).

Yet, equally clear is that tuberculosis control is more likely to improve if new developments from laboratories (e.g. new treatments) are combined with innovative disease control programs (Murray & Salomon, 1998). Here, network analysis can help. On the one hand, data obtained in outbreak investigations carried out using conventional approaches often can be analyzed using network methods; on the other, network research can provide a basis for developing new tools for outbreak investigation and for suggesting new strategies for disease prevention/control.

At the same time, humility outside the laboratory is no less necessary. The focus of the work reported here has been on an outbreak occurring in a society (the U.S.) that can allocate substantial resources to disease control. In fact, resources for control were augmented after the increase in case numbers in the mid-1980s with considerable success. Other wealthy, low prevalence societies similarly have resources needed for enhanced disease control when required.

The situation in wealthier nations, however, pales into insignificance when contrasted to that in poorer nations. TB is a major public health problem on a world scale (Barnes & Barrows, 1993; Kochi, 1991; Raviglione et al., 1995; Snider Jr., 1994). At least 1.7 billion people are infected – about one-third of the world population. There are about eight million new cases each year and roughly three million people have been dying each year of tuberculosis, disproportionately in poorer nations. Many if not most of these cases may have been cured if prompt and adequate treatment had been available.

Even where the TB control programs currently recommended by the World Health Organization have been implemented in countries with high TB prevalence, their limitations suggest a need for more active (rather than passive) case-finding (Godfrey-Faussett et al., 2000). In this regard, developing effective place-finding methods may help to provide cost-effective new approaches to better case-finding.

Mycobacterium tuberculosis poses many challenges, from the molecular level to the societal level. A trans-disciplinary approach – not without its own challenges – is essential if there is to be any possibility that the global tuberculosis problem can be brought under control. Here it has been suggested that combining molecular biological and network methods with tools from epidemiology can contribute to more effective disease control and prevention.

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CASES, CONTEXTS AND CARE: THE NEED FOR GROUNDED NETWORK ANALYSIS

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ABSTRACT

This paper argues that case-centered network analysis requires the integration of both quantitative and qualitative analysis. First, we discuss the importance of linkages or connections between individual clients, providers and agencies in forming networks of care. Next, we explore the linkage between the public mental health and HIV treatment systems. A discussion of the potential influence of cases on networks and network change follows. Finally, we argue the value of incorporating a qualitative analytic approach to understanding inter-organizational linkages.

INTRODUCTION

In the process of receiving and delivering health care services, individual clients and care providers are embedded in social structures, for example, clinics. These clinics operate within larger structures, for example, the public mental health system or the public physical health care system. These systems interact in tightly and loosely coupled ways with each other and with other entities in the community such as independent task forces and non-profit advocacy groups. This paper sets out to describe the value of using qualitative data in concert

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with more quantitative social network data in order to understand the context, process and structure of health care treatment. Within sociology, network analysis has been used both at the level of individuals (micro analysis) and social structure (macro analysis). Such network analysis can be combined with case analysis in the area of health studies. This paper argues that case-centered network analysis requires the integration of both quantitative and qualitative analysis. We proceed as follows. First, we discuss the importance of linkages or connections between individual clients, providers and agencies in forming networks of care. Next, we explore the linkage between the public mental health and HIV treatment systems. We follow with a discussion of the potential influence of cases on networks and network change. Finally, we argue the value of incorporating a qualitative analytic approach to understanding inter-organizational linkages.

THE CONTEXT OF HEALTH CARE TREATMENT: LINKAGES AND NETWORKS OF CARE

The issue of linkages and connections between social actors is a primary concern of social network analysts. Social network analysis can be applied at various levels to describe linkages among clients and family members or between treating organizations. Our particular interest is in the use of social network analysis for describing organizational networks of care. Others have used the approach extensively in understanding mental health and physical health care systems from an organizational perspective (Morrissey, Tausig & Lindsey, 1985; Morrissey, Johnsen & Calloway, 1997; Wright & Shuff, 1995).

We draw heavily on the work of Caronna et al. (1997) in describing cases, contexts and their interrelationships. Contexts (e.g. formal and informal networks of care) can constrain and enable cases by limiting or supporting individual behavior. For example, the funding environment can influence whether new resources are introduced into a system thereby changing organizational activities and the relationship of cases to each other. Cases (e.g. individuals, organizations) reproduce and modify contexts by supporting the status quo or altering structure through changed behavior. For example, an influential clinician can initiate new referral practices which become adopted by their peers and develop into altered referral patterns over time.

The totality or "network" of service providers represents part of the context of care in which staff, clients and organizations operate. Linkage or coupling can occur at all levels: clients, staff, clinics, agencies, service systems. Coupling refers to the degree of responsiveness (how responsive one case, for example, is to changes in another case) and distinctiveness (how distinctive operations/activities of one case are compared to another case) between cases and contexts (Orton & Weick, 1990). For example, a clinic that relies heavily on Medicaid funding for its operation will be tightly coupled in its responsiveness to Medicaid policy changes and to federal and local agencies that administer such changes. On the other hand, a clinic that receives relatively little funding from Medicaid will likely be only loosely coupled to these same federal and local agencies.

Caronna et al. (1997) discuss "embedded" case study design as a qualitative method for carefully analyzing linkages among and between cases and contexts. By embedded, they refer to the multilevel nature of social systems, individuals, organizations and environments. In our case, we have health care providers and clients working in or attending clinics and these clinics have linkages with other organizations either by referral or funding or some other mechanism. These inter-relationships create an overall system or "network" of care.

LINKAGE BETWEEN THE PUBLIC MENTAL HEALTH AND HIV TREATMENT SYSTEMS

Our discussion examines the way cases and contexts may influence each other using HIV treatment for the seriously mentally ill as a case in point. High quality care requires access to both physical and mental health services for the person with serious mental illness and HIV. Individuals with serious mental illness may require intensive assistance in recognizing their physical health needs and getting to necessary treatment. Additionally, the treatment prognosis of a person with HIV, for example, will be severely impaired if they are seriously mentally ill and are not actively engaged in treatment for the mental illness or are not taking their psychotropic medications as prescribed. Furthermore, psychotropic medications can interfere with the effectiveness of some of the HIV treatment drugs thereby comprising the quality of both the mental and physical health treatment. Better linkage between the two treatment systems may facilitate improved access to care.

We are currently conducting research that uses an organizational case study approach to describe systems of care for persons with serious mental illness and chronic physical illnesses, with a focus on HIV treatment in particular. The study targets direct service providers (e.g. case workers, nurses, psychiatrists) and administrators at public mental health clinics and physical health treatment organizations. Using HIV treatment as the specific example, we ask about: (1) the nature of structural relationships between the mental health system and providers of HIV service; (2) usual practice with respect to persons with SMI and HIV; (3) provider, organizational and financial constraints that might impede the delivery of high quality care; and (4) characteristics of persons with SMI that interfere with high quality care for HIV. It is important to gather a variety of perspectives since individuals working in the same clinic or health sector often have conflicting views of policy and procedures (Yin, 1994). Accordingly, we obtain qualitative data from key informant interviews including multiple perspectives both within and outside organizations.

These qualitative data are used to make sense of the structural (formal) organizational features seen in our quantitative network analysis. While the latter can identify the way the system is organized structurally, how the clinics are related to one another and the system as a whole, it cannot capture what motivates these structural relationships. Furthermore, in situations where stated policy would imply that no formal system exists, as might be in the case where no contract exists between clinics that treat physical illness such as HIV and those that treat only mental illness, it may be that individuals have negotiated informal systems that are involved in securing care for their clients. For example, in one case, an experienced counselor in HIV treatment was able to provide HIV education to the staff in neighboring mental health clinics by offering workshops to assist them with substance abuse among their clients, a problem of much more perceived immediacy. The mental health program directors were being evaluated partly on the basis of their interventions with the substance abuse problem. The numbers of mentally ill with a dual substance abuse diagnosis was quite large in comparison to the numbers with HIV. HIV prevention and treatment, therefore, was not on their radar screen as a significant problem. Through negotiation this counselor was able to create a network not identified anywhere in the formal structures of either organization. It also implies that the counselor now has somewhere to refer an HIV+ patient who is also seriously mentally ill for mental health treatment since the receiving clinic understands more about the nature of HIV care and the potential complications of HIV treatment drugs with psychotropic medications.

Relationships between and among case members or between cases and contexts can be loosely or tightly coupled. Little is known about the level of integration between mental health care providers and HIV treatment providers specifically, but most evidence suggests that there is loose coupling and a low degree of connectedness between the mental and physical health care treatment systems more generally (Goldman et al., 1990; Ridgely & Jerrell, 1996; Bickman, 1997). Change in one system only indirectly, and remotely, affects change in the other system. There is also loose coupling within organizational cases. Often, there are disparities and disagreements in terms of policy and treatment goals among staff of the same clinic. These conflicting views can lead to either system change or maintenance of the status quo.

Specifically, it may be that specialized funding (a contextual influence) creates or influences cases that may then be able to act as catalysts for change in their own community. Such a catalyst might be a specialized committee, for example, a Ryan White committee, or a specialized HIV treatment center. Certainly, key players also have the potential to be change agents when bolstered by the appropriate resources, particularly when they are embedded in organizations that can support their activities or that can influence positions of power such as funding decisions. Most often there is loose coupling between activities in the physical and mental health care sectors. Some evidence of loose coupling include conflicting interests (this can occur within a case, for example, a clinic, as well as between cases and contexts), fragmented structure, and multiple, diverse field-level actors. In particular, the mental health service sector's primary function does not overlap with the HIV treatment system's primary function and this can contribute to conflicting interests among mental health agencies seeking to treat mental illness and HIV treatment providers seeking to manage symptoms of HIV. Because of multiple funding sources targeted at diverse special population groups or service areas, a fragmented service system results. Furthermore, the diverse set of occupational members (e.g. physicians, social workers, nurses) working in the health care field have their own set of expectations about treatment and appropriate provider roles which can add to the conflict and fragmentation already present.

TOWARD A BETTER UNDERSTANDING OF CASE INFLUENCE AND NETWORK CHANGE

If we think of HIV among the SMI as a steadily-rising problem, a continuous event, rather than a discontinuous one, then we can think of how cases or contexts might respond to this epidemic. Think of the players involved – clients (those with SMI), mental health care workers (variety of professional and non-professional workers), physical health care workers and specialized HIV treatment providers, funding organizations, public vs. non-profit sector and so on. How do these players (or cases) respond to the epidemic? What does each see as their role? How does this opinion of their role influence their intended actions? Are their intentions constrained by lack of resources, bureaucratic policy or other factors? Cases create and recreate ways of dealing with the epidemic. There are a variety of alternatives which may be engaged singularly or in combination. For example, providers in one sector may defer to the other sector (whether it be mental health or physical health); they may ignore the problem, which results in the individual client seeking care pretty late in the game; they may work together in a concerted fashion to address problems but still operate as separate entities, thus duplicating efforts; they may merge functions under one roof both in terms of a single organization and a single location; or they may create multi-role teams to address complex issues across agencies.

These are just some possibilities and each suggests different degrees of coupling and responsiveness between sectors, which help us understand the reasons why a resulting structure of care might look the way it does.

Barley (1986) refers to "slippages" that occur when trying to integrate new technology into role relationships among radiology technicians and physicians. In our example, we can think of "slippages" such as new HIV treatment drugs that interfere with psychotropic medication. Each has severe consequences for the treatment prescribed by the psychiatrist and the physical health care provider as well as severe potential consequences for the client. The evolved tension between the mental health and physical health care field may promote a situation with poor cross-communication. Physical health care is focused on product-based technology such as drugs or medical equipment. Mental health care is focused on people-based technology such as therapy or rehabilitation and social skills training, along with psychotropic medication. The bridge between physical and mental health care is often medication management. Persons with SMI require psychotropic medication and these medications may interact with, and potentially compromise, treatment for physical health conditions. The unintended consequences of developing new effective ways of treating HIV has important implications for the medication management of the person with serious mental illness.

Qualitative methods help us understand more about the barriers to information sharing based on different treatment goals and the implications of these barriers on care delivery. The nature of mental health treatment is people-intensive. Coordination involves multiple providers (case manager, nurse, psychiatrist, psychologist, social worker) sharing information and ideas about patient treatment, usually in a treatment team planning context. The focus of treatment is on stabilizing the client and restoring functionality while recognizing the chronic nature of serious mental illness. Treatment is most often targeted at the functional status or quality of life of the individual client, not discrete events. The exception is crisis intervention, in which a client's most immediate needs are stabilization of symptoms, often in an inpatient setting. However, good discharge planning most often involves some transition planning into the community. In contrast, the nature of physical health treatment is technology-intensive. Coordination involves multiple measures (lab results, diagnostic reviews, staged treatment, medication management). The focus of treatment is on resolving a current crisis, looking for a ballpark measure, reducing and maintaining t-cell counts at a certain level, and preventing the onset of opportunistic infections. Treatment can be targeted at discrete potential events. Although HIV is now viewed as a chronic disease (Coulter et al., 1997) by many clinicians, it is still treated in an acute fashion primarily because many individuals do not present for HIV treatment until multiple acute symptoms are present. For the client with serious mental illness and chronic physical illnesses, particularly HIV, the degree of coordination required on the part of mental and physical health care providers is monumental.

Professional norms and conflicts contribute to the loose coupling or coordination between the mental health and physical health care sectors. Between sectors, HIV is most probably identified as a physical disease and thus more the purview of the physical health care treatment system than the mental health sector. How a case or client is treated depends on the context in which the treatment occurs. The client with HIV is more likely to have their HIV treatment needs met through the physical health treatment sector because such care is aligned with the treatment norms of the physical sector. Even within sectors, social workers, psychiatrists, and other professionals are trained in distinctly different ways and embrace different orientations toward effective treatment. Cases can have differing reactions to similar events (Meyer, 1982; Barley, 1986). Among providers in the mental health service sector, for example, the *non-profit* community mental health centers may react differently to HIV among SMI than the *public* mental health system. It may be that the distinctive status as "public mental health provider" constrains the ability of the public mental health system to influence the overall treatment context. In contrast, non-profit mental health organizations may be able to draw on a wider variety of funding sources and have greater and more flexible control over the content of the services they provide, relative to the more legislated public mental health agencies.

Loose coupling can contribute to the adoption of non-traditional forms of treatment and interaction. For example, a "model" program that is unique is often seen as a valued resource in the community. It is a place where traditional norms and values are challenged and care is provided differently, but is not a threat to the established order of the system because of the loosely coupled nature of services. In other words, introduction of the model program has very little effect on more established players in the near term because of the "looseness" in the system. However, these distinctive cases in a loosely-coupled system can influence the context through diffusion, although their impact is very difficult to discern through quantitative methods. Thus, we may be able to understand change over time in a network more concretely, if we know something about the individual cases in the system and whether the cases themselves are coupled tightly or more loosely with other cases and with their context. As Caronna et al. (1997) acknowledge, a distinctive case must have some power and/or legitimacy in order to influence context. Emergent inter-relationships develop over time and stimulate reciprocal effects of context and cases. In attempting to determine the relationship between the cases and the context in which the cases are embedded, it is important to acknowledge the notion of a negotiated order (Strauss et al., 1963, 1964) as a way of avoiding a crude structural determinist bias. Such a bias exaggerates the impact of the structural context on the embedded cases and does not allow for the impact of the cases on the context itself. We must allow for reciprocal influence of cases on contexts and contexts on cases. Causality is not uni-directional (Giddens, 1984; Barley, 1986). With a negotiated order framework the researcher can proceed without assuming a priori that the relationship is either reciprocal or symmetrical. In this way network analysis can also be usefully wedded to the notion of a grounded research methodology.

A QUALITATIVE APPROACH IN UNDERSTANDING INTER-ORGANIZATIONAL LINKAGES

With social network analysis, we are particularly interested in *what* exists in terms of inter-organizational linkages. We are concerned about the number of ties, the centrality of organizations and the symmetry or asymmetry of these relationships. With a qualitative approach we are additionally interested in *why* these relationships do or do not exist and in understanding their nature from the perspective of the social actors, that is, grounded. Are there funding limitations, location issues, differences in philosophy or turf battles, for example, that might affect linkages? Does the mental health sector consider HIV treatment to be outside their realm of responsibility and does this translate into a referral pattern rather than a mutual exchange or sharing of clients? We contend that one must know *why* linkages do or do not exist in order to think about change in more concrete terms.

If we only rely on macro-level data or structural features of networks we limit our understanding of the ways cases react to, reinforce and try to modify context (Caronna et al., 1997). For example, Eisenberg and Swanson (1996) showed the value of both formal network analysis and in-depth qualitative interviews. They used network analysis to understand referral patterns, cooperation in planning, sharing of resources, coordination of services and sharing of information among Healthy Start programs. Further, they used qualitative data to interpret the network analytic findings and gain a better understanding of the interaction between cases and contexts. There were eight "sink" programs identified in the study and four of these were WIC programs. In network analytic terms, "sink" programs have an unusually high amount of in-referrals compared to out-referrals. The qualitative data revealed that the WIC program will not accept clients without a positive pregnancy test conducted by a medical facility. Therefore, pregnant women must see another provider before seeking WIC services, contributing to the WIC programs higher-than-average referral or "sink" status. Understanding why this sink status exists may help us think about potential solutions that may improve care quality, for example, by offering pregnancy tests on-site at WIC offices.

CONCLUSION

The emphasis of grounded network analysis is on *why* the structure looks the way it does and understanding how actors both affect and are affected by this structure. Qualitative methods help to understand *why* certain effects occur and the nature of the influence that cases have on contexts and vice versa. Investigating the mutual effects of cases and contexts on each other adds a dynamic quality to network analysis that is not currently present in the method. These mutual effects, described above, can be understood in terms of the degree of coupling between and within levels of analysis. Finally, in order to accurately study causality and coupling between and among cases, researchers should collect data at each level of analysis from independent sources. This presents a cost-intensive, but necessary challenge. Obtaining true independence between levels of data is not possible because of the mutual inter-relationships between cases and contexts. But, aggregating data obtained at the micro-level to the macro-level or vice versa results in either micro-defined views of contexts or macro-defined views of cases (Caronna et al., 1997). Challenges for future research include the identification of appropriate data sources at multiple levels of analysis as well as developing and refining methods for combining quantitative and qualitative data. The combination of qualitative and quantitative data or triangulation of said data is a formidable challenge and is particularly problematic when it involves multiple levels of analysis (Jick, 1979). Where possible it should involve combining data at each level of analysis and not combining qualitative data at one level with quantitative data at another level. By using data at various levels of analysis and incorporating qualitative methods, we believe grounded social network analysis will offer a more dynamic understanding of network effects and network change.

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"SORRY, I FORGOT": THE ROLE OF RECALL ERROR IN LONGITUDINAL PERSONAL NETWORK STUDIES

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ABSTRACT

Network researchers have been concerned with evaluating the accuracy of individuals' descriptions of their personal networks for many years. This paper examines the problem of "forgetfulness" and the extent to which it influences the measurement of ego-centric or personal social networks over time. The data come from the Indianapolis Network Mental Health Study (INMHS), a longitudinal study of the social networks of a cohort of individuals newly diagnosed with mental health problems. We focus on 114 people who completed two or more waves of the INMHS and explore the frequency that names mentioned in prior waves were forgotten. The results indicate that the membership of the respondents' networks changed significantly over the three waves; however, less than 5% of the observed change was due to respondents forgetting ties mentioned in prior waves. The vast majority of changes observed in their networks reflected "true" change in the composition of the respondents' social networks. Overall, the results suggest that people with mental health problems can provide descriptions of the changes in their social networks that are reliable and relatively free of recall bias. The implications of these findings for measuring personal networks over time are discussed.

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INTRODUCTION

Social network researchers have long expressed concern about the reliability of personal network data (Suitor et al., 1997). Because interpersonal relationships are dynamic and change frequently, often in very short periods of time, traditional methodological conceptualizations of reliability and validity have been difficult to apply (Scott, 1991; Wasserman & Faust, 1994; Wellman et al., 1997). Network researchers, in particular, have struggled with trying to disentangle whether instability in the composition or structure of people's networks over time reflect important network changes or measurement error (Marsden, 1990; Wasserman & Faust, 1994; Morgan et al., 1997).

This paper examines the reliability of respondents' descriptions of their personal support networks at three points in time over a two-year period. While several studies have examined longitudinal patterns of stability and change in networks (Wellman et al., 1997; Suitor & Keeton, 1997), network researchers typically have assumed that most of the observed changes reflect "real" structural changes in respondents' personal networks. While we use a similar approach to assessing network change over time as those used in past studies, we pay special attention to the reasons respondents' failed to mention network ties named in prior waves. In an effort to separate significant network changes from respondent recall-related measurement error, the analyses presented in this paper focus on frequency that respondents reported that they forgot network ties when asked about the absence of previously mentioned ties in subsequent interviews. The data were collected as part of the Indianapolis Network Mental Health Study (Pescosolido et al., 1998).

DISENTANGLING MISREPORTING FROM "REAL" NETWORK CHANGE

In longitudinal network studies, disentangling network change from problems with informant accuracy remains a central methodological concern (Killworth & Bernard, 1976; Marsden, 1990; Morgan et al., 1997; Leik & Chalkley, 1997).[1] In traditional survey research, a measure or measurement technique is considered reliable when it yields the same result when applied repeatedly (Babbie, 1995). Most often, reliability is assessed quantitatively using a test-retest method or by establishing the overall consistency in the pattern of responses across multiple items (Babbie, 1995; Schutt, 1998). While these methods have proven especially valuable in assessing the reliability of relatively stable social attitudes or beliefs, these methods are more difficult to apply in studies of more dynamic behavioral or social phenomena, such as interpersonal relationships and/or social networks where change is expected (Marsden, 1990; Morgan et al., 1997; Leik & Chalkley, 1997). Indeed, network research is founded on the assumption that social networks are dynamic and constantly changing (Wellman, 1982; Wellman et al., 1997). As Peter Marsden (1990, p. 449) notes:

> There is an inherent problem in interpreting the results of over-time studies of network measures, since it is not presumed that properties of networks are unchanging traits. Unreliability is thus mixed together with genuine turnover.

At the same time, network researchers have also recognized that network measures are not perfect and informants may not always be able or willing to describe their network accurately (Marsden, 1990). In a comprehensive review of cross-sectional studies designed to elicit personal or social network data, Brewer (2000, p. 40) found that "across a variety of relations, people forget a substantial proportion of their social contacts when asked to recall them." Network researchers are concerned about the accuracy of respondents' network recall because they often are associated with problems in "the measurement of various structural properties of personal and social networks" (Brewer & Webster, 1999; Brewer, 2000, p. 41).

The problem of recall error in longitudinal network studies raises additional validity and reliability concerns. Indeed, a long-standing methodological concern among longitudinal personal network researchers has been to try and distinguish over time variation in network properties that reflect genuine change from variation that results from unreliable network instrumentation or respondent error. In an effort to disentangle these issues, researchers have given special consideration in recent years to analyzing the patterns of stability and instability in longitudinal personal network measures (Gurvitch, 1961; Pool & Kochen, 1978; Freeman & Romney, 1987; Leik & Chalkley, 1997; Morgan et al., 1997). Three general approaches have been used: (1) evaluating the test-retest reliability of network measures; (2) examining the relationship between active and inactive ties; and (3) estimating network growth curves.

Drawing on the traditional methodological logic of test-retest reliability, researchers have examined instability in networks over short periods of time as evidence of measurement error or poor "informant accuracy" (Marsden, 1990; Broese van Groenou et al., 1990). These studies typically evaluate the amount of overlap, usually expressed as a percentage, in the particular ties named in two or more interviews conducted over a short period of time. Broese van Groenou et al. (1990), for example, compared the network descriptions of individuals, using several different types of network elicitation methods, and found that respondents offered relatively consistent descriptions of their networks over a four-week period. The percentage of ties which overlapped in the two interviews served as the reliability measure and ranged from a low of 74% to a high of 88% (Broese van Groenou et al., 1990, p. 126). Others have conducted similar test-retest reliability analyses with similar results (Barrera, 1980, 1981; Knoke, 1982; Tracy et al., 1990). Within this test-retest logic framework, the number and relative proportion of non-overlapping ties represents an estimate of the measurement error in a study's network measures. While this strategy is intriguing, it is not possible to determine whether the estimated error is due to the inherently "mushy" nature of most network measure name generators or problems with respondent recall (i.e. failure to remember salient social ties). Yet, many network researchers take comfort in these figures because the consistency in respondents' network descriptions are equal to or exceed standard social science expectations regarding measurement reliability when compared to other survey research methods (Tracy et al., 1990).

A second approach focuses on who is mentioned as being "in" or "out" of a person's network at any particular time. Bernard, Killworth and colleagues, for example, have conducted a number of studies which document that people's lives are populated by many, less salient network ties and that these ties are often not remembered or even reported in personal network studies (Killworth & Bernard, 1976; Bernard & Killworth, 1977; Bernard et al., 1981, 1982, 1987, 1990; Killworth et al., 1990). These and other studies indicate that individuals' descriptions of their networks tend to emphasize "the routine, typical structure" (Hammer, 1980, 1984; Romney & Weller, 1984; Freeman & Romney, 1987; Freeman et al., 1987; Marsden, 1990, p. 447; Brewer & Webster, 1999; Brewer, 2000). That is, respondents generally neglect to mention those individuals with whom they interact less frequently or who are more structurally peripheral to the subjects' networks. Within this framework, instability is viewed primarily as a problem of respondents underestimating their "true" network at a particular point in time by including only the most active network members and excluding those who are less salient or have not been contacted recently.

A third approach to understanding network variation over time builds on the insights regarding the active/inactive network using network growth models to estimate change resulting from random measurement error and underlying change-related dynamics (Gurvitch, 1961; Pool & Kochen, 1978; Morgan et al., 1997). Pool and Kochen (1978), for example, used diary network data to capture the less active or latent ties over a year long study period. Their method allowed them to develop more comprehensive network lists and to study the amount of instability within the active network at multiple time points. Morgan et al.

(1997) extended this logic by computing network growth curves using cross-sectional network data gathered in interviews conducted at two-month intervals with a sample of widows over a twelve-month period. While this line of research documented a strong tendency towards stability in aggregate network properties (e.g. total network size), there was significant turnover in the particular individuals included in the network at any point or, what they refer to as "instability in network membership." Morgan et al. (1997, p. 22) conclude that "the instability of individual ties is not a case of random noise but instead reflects a distinction between a core set of ties that are present at nearly every elicitation vs. a more peripheral set of ties who were only important once or twice throughout the year."

While these studies help to understand some of the variation in network structure and composition over time, they do not address directly the related, fundamental problem of "network recall" in longitudinal network studies (Hammer, 1980; Marsden, 1990). That is, to what extent are changes observed over time in aggregate network characteristics or individual network membership a result of the respondents' simply forgetting to mention key network ties? This study builds on the above efforts to understand the sources of instability in personal networks by examining respondent error in network reporting in a cross-sectional, personal network survey conducted at three points in time over a two year period. Using a methodological check similar to that used by Morgan et al. (1997), respondents were asked to enumerate their personal networks using a standardized series of name generators at each wave. At each follow-up contact, after the respondent provided an initial listing of names, interviewers were instructed to probe discrepancies between the current and past network descriptions and to record the respondents' explanations of changes in network membership. This paper describes and analyzes the frequency that respondents "forgot" network ties mentioned in prior waves and estimates the relative amount of network instability attributable to problems in respondent recall. We further examine whether particular types of respondents or particular types of ties influence the likelihood that respondents forgot to mention a previously mentioned network tie. In particular, we focus on the respondents' characteristics which have been found or argued to be associated with network change, including gender, age, race, education, and mental health status (Hammer, 1985; Marsden, 1990; Suitor & Keeton, 1997; Morgan et al., 1997). Further, because of the importance of the quality of relationship, we also examine the relative importance of key relational characteristics on the likelihood a tie was forgotten, including the frequency of contact and emotional closeness (Morgan et al., 1997; Wellman et al., 1997).

DATA AND METHODS

The Sample. The data for this study come from the Indianapolis Network Mental Health Study (INMHS), a longitudinal study of the social networks of a cohort of individuals making their first major contact with the mental health system at the largest public and private hospitals in Indianapolis (Pescosolido et al., 1998). The main focus of this study was on documenting network stability and change early in the individuals' illness careers. Baseline interviews were conducted within the first three months following the individuals' initial contact with the treatment facility. Each respondent was invited to be re-interviewed at three additional points following their initial interview: wave 2 = 8 months, wave 3 = 24 months, and wave 4 = 48 months. Because wave 4 is still in the field, only the wave 2 and 3 follow-up data are analyzed here.

This analysis focuses on the 114 respondents who completed a baseline interview and a wave 2 and/or a wave 3 follow-up interview (or 65.9% of the 173 individuals recruited for the study). Of these, 80 respondents (70.1%) completed both the wave 2 and wave 3 follow-up interviews. Of those who completed only one follow-up interview, 18 (15.8%) completed a t2 interview and 16 (14.0%) completed a t3 interview. Table 1 presents the characteristics of the full sample and the sub-sample of individuals who completed one or more of the first two follow-up interviews. Overall, the two samples are similar; there were no statistically significant differences on any of the demographic or clinical characteristics included in the study.

Network Measures. At each wave, respondents were queried extensively about their social network ties. The instrument (available upon request) was designed to provide a comprehensive assessment of the respondent's social ties within thirteen social domains (e.g. household, family, work, school). In addition, content-specific name generators were included to identify individuals of specific theoretical interest to the study. Specifically, each respondent was asked to name the people they talked with about "important matters" paralleling the questions used in the 1985 General Social Survey (Burt, 1984; Marsden, 1987). Because initial pre-testing indicated that respondents often did not think about "health and mental health problems" as "important matters," a follow-up question was asked to identify ties with whom the respondent spoke about "health and mental health" related matters. In addition, we also asked each respondent to report the names of ties who were a burden either because the network tie was "always talking about" the respondent's important or health matters and/or because the network tie was always talking to the respondent about the tie's important matters or health problems. Once the respondent had named their network ties, a series of descriptive questions were asked about

Table 1. Demographic and Clinical Characteristics of the Focal Respondent Sample and the Analysis Sub-Sample, Indianapolis Network Mental Health Study.

	Full Sample (*N* = 173)		Sub-Sample who Completed a Wave 2 and/or Wave 3 Interview (*N* = 114)	
	N	%	*N*	%
Gender				
Male	62	35.8	34	29.8
Female	111	64.2	80	70.2
Race				
White	127	73.4	86	75.4
African American	46	26.6	28	24.6
Married	52	30.1	39	34.2
Site				
Private Hospital	42	24.3	30	26.3
Public Hospital	131	75.7	84	73.7
Diagnosis[a]				
Psychotic Disorder	39	22.5	21	18.4
Major Depression	85	49.1	59	51.8
Other Diagnosis	49	28.3	34	29.8
Problem Started More Than One Year Ago (Yes)	23	13.3	18	15.8
Mean ± SD				
Age	30.61 ± 10.13		30.93 ± 10.11	
Education (Years)	11.59 ± 2.00		11.84 ± 1.89	
Annual Income	$11,495 ± $11,284		$11,801 ± $11,767	
Number of Children[b]	1.58 ± 1.52		1.50 ± 1.48	

[a] Diagnosis was coded as a series of three categorical dummy variables. Individuals with disorders which involved psychotic symptoms (e.g. schizophrenia, bipolar disorder, psychosis not-otherwise-specified) were coded as "psychotic." Persons who met the diagnostic criteria for major depression were coded as "major depression." All other types of mental health problems (e.g. mild depression, adjustment disorder, post-traumatic stress disorder) were classified as "other diagnosis."

[b] Individuals with no children were coded as "0" prior to computing the mean (SD) number of children.

each tie, including the ties' gender and age as well as the type of relationship, frequency of contact, and the amount of affection and social support the respondent gets from the tie. The analyses for this paper target the "core support network," defined as the unique set of individuals nominated as "important matters" and/or "health matters" discussion partners. Three network size measures were computed and analyzed separately for each wave: (1) the number of important matters discussion partners; (2) the number of health matters discussion partners; and (3) the number of "core supporters," i.e. the number of *unique* ties named in response to the important and health matters questions.

Methodological Check on Network Change. To identify the reasons for network change, a special methodological check was developed and used in all follow-up interviews. For each follow-up interview, interviewers were given a list of the names of network ties mentioned by the respondent in the prior wave's interview. Interviewers were trained to administer the same network enumeration batteries used in the baseline interview. After the respondent had enumerated their network for the current wave, the interviewer was instructed to compare the current nominations against the names mentioned during the prior wave interview.[2] When a previously mentioned tie was not repeated in the current interview, the protocol called for the interviewer to probe for an explanation by asking: "I see you didn't mention (NAME). Can you tell why you didn't mention them this time?" Respondents' explanations ranged from simple explanations (e.g. "S/he died"; "We got divorced") to extended descriptions about the changes in the relationship. Each explanation was coded and included, along with data on the overall pattern of mentions across the waves, in the data record for each network tie. When the respondent indicated that they had simply "forgotten" to name the tie and that he/she should actually be on their current list, the interviewer was instructed to add the person to the appropriate list(s) and code the tie as having been forgotten from the prior wave. Using the interview history and the explanation codes, two special summary network measures were constructed for each respondent. The *number of ties not mentioned* describes the number of ties in wave 2 or 3 that were mentioned in a previous wave but were not mentioned in the initial list of names given by the respondent. In addition, *the number of ties forgotten* was counted to distinguish ties that were excluded due to relationship changes from those excluded because of respondent recall error. These measures were also used to compute the *proportion of all ties not mentioned that were forgotten* (number of ties forgotten/number of ties not mentioned).

Analysis. The analysis examines the frequency and patterns of respondent recall error. Simple frequency distributions and descriptive statistics for the number of ties not mentioned and forgotten are presented to describe the extent that recall error is present in these respondents' network reports. Because interviewers were instructed to add individuals identified as "forgotten" to the network lists, it was further possible to compute an estimate of the potential bias in the network data that would have been present in the network size variables without the methodological check. This *forgetfulness bias coefficient* was computed by dividing the number of ties flagged as initially forgotten by the total number of ties included on the list (after adding the "forgotten" ties to the current list). In order to explore the patterns of respondent network recall bias further, logistic regression analysis is used to test whether or not respondent characteristics are associated with forgetting network ties separately at waves two and three.[3] The respondent characteristics included in these models were: gender (female = 1), race (African American = 1), age (in years), education (in years), diagnosis (coded as a series of three dummy variables for psychosis, depression, and other diagnoses; other diagnoses is the reference category), and a dummy variable indicating if the respondent had been struggling with their mental health problems for longer than a year (see Table 1 for basic descriptive statistics).

RESULTS

Table 2 presents the frequency distribution of the number of important matters, health matters, and core support ties mentioned by the respondents (for the respondents completing each wave). On average, they mentioned approximately 4 individuals as important matters discussions partners at each wave, ranging from a high of 4.28 (SD = 2.11) in wave 3 to a low of 3.96 (SD = 2.19) at wave 2. This figure is slightly higher than the average of 3.01 reported by for the U.S. general population (Marsden, 1987). A similarly stable pattern in network size is found in the data for the health discussion partners, with the average ranging from 4.18 (waves 1 and 3) to 4.34 (wave 2). A count of the unique number of ties mentioned across these two lists suggests that these respondents have between 5.34 (SD = 2.89) and 5.60 (SD = 3.03) unique core supporters. *T*-tests for differences across the waves within each list failed to identify any significant variation.

Table 2. Network Size by Wave and Type of Tie, Indianapolis Network Mental Health Study.

		Wave 1 ($N = 114$)	Wave 2 ($N = 98$)	Wave 3 ($N = 96$)
IMPORTANT MATTERS TIES				
	Mean	4.08	3.96	4.28
	SD	2.34	2.11	2.19
HEALTH MATTERS TIES				
	Mean	4.18	4.34	4.18
	SD	2.66	2.73	2.73
CORE SUPPORT TIES				
	Mean	5.34	5.60	5.55
	SD	2.89	3.03	3.01

Table 3 reports the frequency distribution and descriptive statistics for the number of important matters and health matters ties that were not repeated from the prior wave (left hand panel) and the subset of not mentioned ties who were "forgotten" (right hand panel). An average of two network ties mentioned were not repeated by the respondent in both follow-up interviews (average number of not mentioned ties ranged from 1.71 [SD = 1.65] to 2.17 [SD = 1.99]). This pattern is consistent both for the important matters and health matters list (because of the significant overlap, the corresponding values for the core support network are not reported in Table 3).

With regard to the frequency that prior ties were forgotten, the data suggest that forgetting a tie was a relatively rare occurrence. Indeed, between 85.4% and 94.8% of the respondents surveyed failed to forget any network ties. Forgetting important prior ties appears to be a slightly greater problem at both waves two and three for the important matters ties (10.2% [wave 2] and 14.6% [wave 3] forgot a previously mentioned tie) than for the health discussion partners (9.2% [wave 2] and 5.2% [wave 3]). Nevertheless, on both lists, the mean number of ties forgotten ranged from a high of 0.19 (SD = 0.66) to a low of 0.09 (SD = 0.44).

The mean and standard deviations of the proportion of the forgotten ties and the estimated measurement bias attributable to problems in respondent recall for each follow-up wave are presented in Table 4. The proportion of previously mentioned ties that were forgotten is quite small. On average, the average amount of network instability attributable to respondent recall problems ranged between 3% and 7% of the total amount of network instability observed in the study. When considered in terms of the respondents' current network description, it is possible to estimate how much measurement error would have been present without the extra methodological check by dividing the number of ties forgotten by the total current network size. These results are presented in the right hand columns of Table 4. These figures suggest that, if the methodological check had *not* been used, the network measures would have underestimated the current network by between 1% and 5%, depending on the particular measure.

In order to understand better whether there is systematic variation in who has a tendency to forget, a series of logistic regression analyses were computed using a binary variable indicating whether or not a respondent forgot one or more ties.[4] Table 5 presents separate logistic regression models of whether or not a respondent forgot an important matters tie, health matters tie, or combined core support tie. The models test whether or not gender, race, age, education, diagnosis, and when the respondent's psychiatric problems began influenced the likelihood of their forgetting a previously mentioned tie at wave 2 or 3. In general, few respondent-related characteristics were associated with network

Table 3. Number of Previously Mentioned Core Support Ties Who Were Not Mentioned and Who Were Forgotten by Type of Tie and Wave, Indianapolis Network Mental Health Study.

	Number of Previously Mentioned Ties Not Mentioned at Follow Up								Number of Previously Mentioned Ties Who Were "Forgotten" at Follow Up							
	Important Matters Ties				Health Matters Ties				Important Matters Ties				Health Matters Ties			
	Wave 2		Wave 3		Wave 2		Wave 3		Wave 2		Wave 3		Wave 2		Wave 3	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
0	26	26.5	29	30.2	24	24.5	27	28.1	88	89.8	82	85.4	89	90.8	91	94.8
1	21	21.4	24	25.0	27	27.6	18	18.8	5	5.1	11	11.5	5	5.1	2	2.1
2	25	25.5	15	15.6	19	19.4	10	10.4	2	2.0	2	2.1	4	4.1	2	2.1
3	11	11.2	10	10.4	10	10.2	18	18.8	2	2.0	1	1.0			1	1.0
4	5	5.1	12	12.5	9	9.2	9	9.4	1	1.0						
5	5	5.1	5	5.2	6	6.1	6	6.3								
6	3	3.1	0	0.0	2	2.0	6	6.3								
7 or more	2		1	1.0	1	1.0	2	2.1								
Mean	1.88		1.71		1.84		2.17		0.19		0.19		0.13		0.09	
SD	1.86		1.65		1.69		1.99		0.66		0.51		0.45		0.44	

Table 4. Proportion of Prior Ties Not Mentioned Who Were Forgotten and Estimated Bias Attributable to Forgetting in Each Follow-Up Wave, Indianapolis Network Mental Health Study.

	Proportion of Previously Mentioned Ties Who Were Forgotten		Estimated Bias in Total Network Size Attributable to Forgetfulness	
	Mean	SD	Mean	SD
Important Matters Network Ties				
Wave 2	0.06	0.20	0.03	0.10
Wave 3	0.07	0.20	0.05	0.16
Health Matters Network Ties				
Wave 2	0.05	0.18	0.01	0.05
Wave 3	0.03	0.14	0.02	0.07

recall. Age, however, was associated with a slight increased in the odds of forgetting someone at wave 2 in the models for the important matters, health matters, and core support networks (odds ratios were 1.08, 1.28, and 1.10 respectively). However, age had no effects on any of the network measures for wave 3. Neither the respondent's diagnosis or his/her history of mental health problems had a systematic impact on their likelihood of forgetting a network tie. Having a psychotic disorder, however, was significantly associated with forgetfulness in the important matters list at wave 3. That is, individuals who had been diagnosed with a psychotic disorder were significantly more likely to forget a tie than those who had other disorders (odds ratio = 12.43).[5]

DISCUSSION

The analyses presented above highlight that the amount of error attributable to respondent forgetfulness in longitudinal personal network studies is relatively small. The estimated amount of potential bias resulting from respondents forgetting previously mentioned ties was estimated to be less than 5% of the current ties named, with somewhat less error being associated with more specific name generating items like "health discussion partners" than more general ones like "important matters" networks. More important, the absence of any systematic predictors – either with regard to the respondent's characteristics or with regard to network tie or relational characteristics – suggest that this particular type of network measurement error is largely random.

Table 5. Logistic Regression Analysis of Respondent Characteristics on the Likelihood that One or More Network Ties Were Forgotten by Type of Tie and Wave, Indianapolis Network Mental Health Study.

	Important Matters		Health Matters		Combined Core Support Network	
	Wave 2	Wave 3	Wave 2	Wave 3	Wave 2	Wave 3
Gender (Female)	0.87	0.54	0.07	0.10	0.51	0.41
Race (African American)	2.30	0.35	0.11	0.00	1.62	0.32
Age (in years)	1.08*	0.96	1.24**	1.13	1.10**	1.01
Education	1.39	1.37$^+$	2.28*	1.48	1.31	1.32
Diagnosis						
Psychosis	3.88	12.43*	0.00	2.74	5.98	6.57
Depression	1.99	5.66	8.99	3.81	5.38	3.48
Problem Began ≥1 Year Ago	0.00	1.86	3.40	2.53	1.10	1.40
−2 Log Likelihood of Model	50.63	64.26	27.61	28.80	66.13	73.39
χ^2	13.96*	15.19*	32.52***	10.38	17.76*	12.75
Nagelkerke R^2	0.275	0.261	0.616	0.306	0.288	0.211

$^+p \le 0.10$, $*p \le 0.05$, $**p \le 0.01$, $***p \le 0.001$.

More generally, these results lend further support to network researchers' claims that personal network data are reliable and that much of the instability in network measures over time reflect the dynamic nature of interpersonal relationships. Even over a relatively short, two-year period, the amount of turnover in the network membership of the core personal network of the respondents included in this study was significant. Over the course of the two-year study period, the overall size of the respondents' core personal networks remained relatively stable; however, as many as two of the four core supporters from prior waves did not continue to be identified as core network members. When viewed as a proportion of the network turnover, the amount of recall bias due to forgetfulness represents only a small fraction of the instability observed in the network, typically between 1 and 5%. In short, this study suggests that the majority of change observed in personal network data is likely related to important interpersonal dynamics rather than problems in respondents' abilities to remember ties named in prior interviews.

However, even with these findings, we issue a caution. Poor memory is only one potential source of measurement error in network studies. As noted above, Bernard et al. (1981, 1982) and others have documented that a significant number of people's weaker social ties are often not remembered and/or not reported in standard personal network surveys (Hammer, 1985; Romney & Weller, 1984; Freeman & Romney, 1987). The tendency to leave out less active ties represents a significant source of informant inaccuracy which is not assessed or addressed directly in the analyses presented here.

The fact that this pattern of effects was observed among individuals with serious mental illness is all the more significant. It is often assumed that persons with serious mental illness are unreliable respondents because of the potential influence their mental condition may have on their ability to provide reliable and valid data (Dworkin, 1992). These concerns have been especially pronounced in network studies, in part, because of the frequent turnover in network membership and because of wide-spread perceptions that the quality of their relationships is "less" than or different from those who do not suffer from a psychiatric disorder (Hammer, 1980; 1985). Nevertheless, the analyses presented here suggest that persons with mental disorders can provide detailed descriptions of their personal networks that are reliable and relatively free of problems in recall bias.

CONCLUSION

This study examined the frequency and patterns of forgetfulness in providing personal network descriptions in a longitudinal study conducted over a two-year period focusing on persons with mental health problems. The results indicate that problems in recalling salient network members mentioned in prior waves is not a significant concern, even in this sample of people facing serious personal difficulties. Most of the changes in the personal networks studied occurred at the network membership level rather than in the overall size of the network. Moreover, in the vast majority of cases, respondents were able to offer clear and definitive explanations of why particular ties were no longer key players in their core social support network. Less than 5% of the previously named ties were not repeated in subsequent waves due to respondent recall error. While the results of this study provide evidence that respondents, even persons with serious mental health problems, can reliably describe their networks over extended periods of time, the study is limited to an examination of problems in name recall. The examination of other potential threats to the reliability and validity of network data remain and more research is needed to help network researchers distinguish more carefully between network measurement error from important changes in individuals' personal networks over time and under changing social circumstances.

NOTES

1. The problem of reliability in longitudinal network studies is a special case of more general concerns regarding informant accuracy in cross-sectional personal network studies. For a review of these issues, see Marsden (1990) and Wasserman and Faust (1994).

2. Interviewers were instructed to make the comparison with the last completed interview. In 16 cases at t3, the comparisons were made with t1 rather than t2.

3. Parallel models, using ordinary least squares regression analysis, were computed to analyze the forgetfulness bias estimate; however, the heavily skewed distributions made these analyses unreliable.

4. Ordinary least squares regression analysis was also used to examine the number of ties that respondents forgot; however, because of the heavily skewed distribution in the number of ties forgotten (see Table 3), the estimates could not be considered reliable. Consequently, the logit analyses focus on whether or not a respondent forgot one or more ties.

5. Because of the small sample size, the wide variation in the magnitude of the odds ratios and Nagerkerke R^2 must be interpreted with caution (Long, 1997). Cell sizes for some variable combinations may be very small or zero. Consequently, we emphasize the significance levels of overall patterns of effects.

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PATTERNS IN THE RECALL OF SEXUAL AND DRUG INJECTION PARTNERS

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ABSTRACT

Persons with multiple sexual partners forget a significant proportion of their sexual partners when asked to recall them (Brewer, Garrett & Kulasingam, 1999). Similarly, drug injectors forget a large proportion of the persons with whom they inject drugs. Forgetting of sexual and drug injection partners in contact interviews for partner notification and social network research hinders efforts to understand and control the spread of infectious diseases such as HIV. We address this problem by describing the cognitive structures people use to organize their partners in memory and developing interviewing techniques that exploit these structures to enhance recall of partners. One hundred fifty-six persons presumed to be at high risk for HIV freely recalled their sexual and injection partners. These subjects tended to cluster, or mention successively, partners who interacted with each other, partners with whom they had the same kind of role relationship, and partners with whom they interacted in the same type of location. The pauses between adjacently recalled pairs of partners typically correlated moderately negatively with pairs' perceived level of interaction. Subjects tended to list partners with whom they had more

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frequent sexual or injection contact earlier in recall than those with whom they had less frequent contact, and they also tended to recall partners in rough forward or reverse chronological order. The four supplementary interviewing techniques we developed for enhancing recall of partners involve cues that correspond to the organizing factors of partner memory we identified (network ties, role relationships, locations, and chronology).

INTRODUCTION

Research shows that when people try to recall all those with whom they have a particular relation (such as friendship or working together), they tend to forget a substantial proportion of persons (Brewer, 2000). In particular, sexually active persons with multiple sexual partners forget a significant proportion of their sexual partners, and drug injectors forget a large proportion of the persons with whom they inject drugs (Brewer, Garrett & Kulasingam, 1999).

Forgetting of sexual and drug injection partners presents a practical problem for controlling infectious diseases and collecting social network data on the transmission of such diseases. Partner notification, or contact tracing, is a primary method for controlling and preventing the spread of sexually and parenterally transmitted infections such as chlamydia, gonorrhea, syphilis, HIV, and hepatitis (e.g. Benenson, 1995; Levy & Fox, 1998; Rothenberg & Potterat, 1999; Toomey & Cates, 1989). As part of this process, public health workers interview infected individuals to elicit their sexual and/or injection partners for periods ranging from the past few weeks to the past several years, depending on the infection. The public health workers then seek to locate these partners, notify them of their exposure to an infection, counsel them about preventive measures, and test them for infection. Infected partners may then be treated, discouraging further transmission. Social network studies of the transmission of these infections also involve eliciting individuals' partners and tracing them to be included in the research (e.g. Friedman, Neaigus, Jose et al., 1997; Klovdahl, Potterat, Woodhouse, Muth, Muth & Darrow, 1994). These studies describe the structure of the social networks that channel infections, and the resulting information can be used to predict the course of epidemics, examine social influences on risk behavior, and target preventive interventions. To the degree that reported sexual and injection contact information is incomplete, the ascertainment of network structure and the effectiveness of partner notification will suffer. In these contexts, forgotten partners hamper efforts to prevent and understand the transmission of infectious disease.

We seek to address this problem of forgetting by developing and testing interviewing techniques to enhance recall of sexual and injection partners. We believe that the key to enhancing recall in some domain is to discover the cognitive structures people use to organize items in the domain in memory and then design interviewing techniques that exploit these structures to elicit additional items. In another paper (Brewer, Garrett & Rinaldi, 2002), we reported how we elicited additional items in a semantic domain, such as types of fruit, after subjects had free listed exhaustively from the domain. In that study, we increased subjects' recall by administering cues that capitalized on the underlying semantic structure of the domain.

In this study, we examined associative and serial order patterns in recall (cf. Brewer, 1995b; Puff, 1979) to discover the cognitive structures individuals use to organize their partners in memory. Associative patterns refer to the connections or relationships between adjacently recalled items (in this case, partners). By noticing how an individual associates from one partner to the next during recall, one can describe that individual's cognitive structure of those partners. Associative patterns may be identified by measuring clustering and investigating the pauses between adjacently recalled pairs of partners. Clustering of partners by a particular factor occurs when successively recalled partners are more likely to share some characteristic or have some relationship than partners not recalled successively. The pauses between adjacently recalled pairs of partners, or inter-response times (IRTs), reflect how closely linked particular partners are in memory. The features of adjacent pairs that correspond most closely to the IRTs point to factors likely underlying individuals' associative recall processes.

Serial order patterns refer to the types of partners which are remembered earlier or later in recall. Partners' output serial positions in recall index their salience (with partners recalled earlier considered more salient) and may reveal an individual's orientation towards or strategy for searching for partners in his or her memory. In addition, we also studied individuals' comments about how they recalled their partners to gain further insight on their retrieval processes.

The next section of the paper describes the methods of our study, followed by a description of our results. In the final section, we discuss the supplemental interviewing techniques to enhance recall of partners that we derived from our results.

METHOD

Subjects

We used data from our study of memory for sexual and injection partners (Brewer, Garrett & Kulasingam, 1999). We recruited persons presumed to be at high risk for HIV from the largest HIV testing clinic in Seattle, a large epidemiological study of drug injectors, and an outreach services project for gay/bisexual methamphetamine injectors. Staff at these organizations referred to our study all persons they served during the recruitment period. No data are available on the number of eligible persons who were referred but declined to participate in the study.

We enrolled 156 subjects. As noted by Brewer et al. (1999), subjects were behaviorally and demographically representative of persons served by these organizations. Overall, 78% of the sample were men and subjects' mean age was 38. Seventy-four percent were white, and the remaining 26% were African-American, Hispanic, Native American, or of mixed ethnic background. Twenty-three percent of subjects considered themselves homeless. Of the sexually active subjects, 41% were gay or bisexual. Among the drug injectors, the primary drugs injected were heroin, cocaine, and/or methamphetamine. Each subject received a $20 gift certificate good at one of several stores for participating in an interview.

Procedure

Subjects recalled partners for one of two recall periods according to a research design that allowed examination of other aspects of memory for partners. Forty-five percent of subjects recalled partners from the last year, while the other 55% recalled partners from the last two years. For the present analyses, we did not differentiate subjects by recall period. The elicitation question for sexual partners defined sexual partners as all those with whom the subject had genital or anal contact (i.e. all anal, manual, oral, and/or vaginal sex partners). The elicitation question for injection partners defined injection partners as all persons with whom the subject injected drugs (i.e. persons with whom a subject may have had risky injection contact). We asked subjects to list all partners in the recall period, take as much time to recall as necessary, and refer to partners by first names, nicknames, initials, or brief descriptions. For the present analyses, we included all partners recalled by a subject before the interviewer read back the list of partners to check that they were accurately recorded (approximately 5% of all partners elicited were mentioned at later points in the interview, on average). Nearly every subject consented to our audiotaping the partner elicitation portion of the interview. The overall study involved two interviews per subject. The results we describe here are based on the first interview because the data from both interviews show similar patterns.

After eliciting their partners, we asked subjects to report how they recalled their partners with respect to order of output and strategies for remembering all the partners they could. Then we asked a series of questions about each of their partners, up to the first 12 they recalled. We randomly assigned subjects to one of four separate but partially overlapping subsets of questions about partners (we used subsets of questions to shorten the interview). Most questions involved free responses (partner's role relationship to subject, time since subject last met partner [coded in weeks], time since subject's first/last sexual/injection contact with partner [coded in weeks], frequency of sexual/injection contact with partner [number of times], location where subject interacted with partner, city where subject interacted with partner, partner's race/ethnicity). Other questions involved fixed response options (relationship closeness [9 point Likert scale], sex of partner; feelings toward partner [mostly good/neither good nor bad/mostly bad], whether subject shared injection paraphernalia with partner). Another set of questions asked about the social proximity between each pair of partners as indicated by their frequency of interaction (never/a little/sometimes/a lot). For the specific wordings of all questions, consult the interview instrument at http://faculty.washington.edu/ddbrewer/trqst.html.

RESULTS

One hundred and forty-one sexually active subjects recalled a mean of 6.8 sexual partners (median = 4, s.d. = 11.3, range = 1 to 98). Ninety drug injectors recalled a mean of 10.5 injection partners (median = 8, s.d. = 9.9, range = 1 to 52). Seventy-nine subjects recalled both types of partners.

Associative Patterns

For analyses of associative patterns, we included only those subjects who listed four or more partners because subjects with fewer partners lack enough of a recall sequence with which to detect associative patterns.

Clustering in Recall

Clustering by a categorical partner variable, such as role relationship, is present in a subject's recall when adjacently listed pairs of partners are more likely to be in the same category (e.g. have the same kind of role relationship with the subject) than non-adjacently listed pairs of partners. Clustering by a non-categorical variable – in this case, social proximity – is present in a subject's recall when adjacently listed pairs of partners are more likely to interact with each other (as perceived by the subject) than non-adjacent pairs.

To measure clustering, we computed the Adjusted Ratio of Clustering (ARC) (Roenker, Thompson & Brown, 1971) using the procedures described by Brewer, Garrett and Rinaldi (2002). The ARC equals $(o - e)/(m - e)$, where o

is the observed clustering score, e is the expected (by chance) clustering score, and m is the maximum possible clustering score for a given subject. The ARC takes a value of 1 when clustering is maximal, a value of 0 when clustering is at the level expected by chance, and negative values when clustering is less than expected.

To measure clustering by a particular variable, partners must vary on that variable. Also, to measure clustering by a categorical variable, at least two partners must belong to the same category of that variable. When clustering by a particular variable cannot be measured for these reasons, it means that the variable by definition plays *no* role in a subject's associative recall process. For the clustering analyses, we coded the social proximity data for each subject in binary form to indicate whether a pair of partners had interacted at least a little. The ARC cannot be applied appropriately to ordinal scale data (as in the 4 point scale for social proximity). Furthermore, in coding subjects' open-ended responses for categorical partner variables we did not infer the similarity of different responses, but treated different responses as different categories except for obvious synonyms (e.g. "former girlfriend" and "ex-girlfriend"). In addition, we coded "don't know" responses for the social proximity between a pair of partners as "never interacted" because the subject did not perceive the pair to be tied by interaction (Brewer (1997) used the same coding rule).

Table 1 presents the ARCs for several variables. Although there is large variation in subjects' ARCs for particular variables, some variables describe subjects' associative patterns better than others. Subjects tended to cluster sexual partners and injection partners in recall by the same set of variables. For both partner types, social proximity, role, and location are the strongest associative factors. Partners varied on these variables for more than two-thirds of the subjects and the mean ARCs for these variables were all greater than 0.25. This means that the typical subject tended to list adjacently partners who interacted with each other, partners with whom he or she had the same role relationship, and partners with whom he or she had interacted at the same type of location. For all other variables, few subjects had partners who varied on the variables (indicating that these factors cannot broadly account for subjects' associative patterns) and/or the distributions of ARCs indicate weak or negligible clustering.

Incidentally, these subjects referred to most of their partners by name rather than with some type of description. The mean proportion of sexual partners a subject referred to by a name is 0.78 (median = 0.83) and the mean proportion of injection partners a subject referred to by a name is 0.91 (median = 1.00). In addition, the moderate clustering of sexual partners by first letter of name is due to the moderate clustering by name. After collapsing same name

Table 1. Adjusted Ratios of Clustering.

Variable	Proportion of subjects whose partners vary	Mean	Median	S.D.	Range	Prop. positive
Sexual partners						
social proximity	0.73 (24/33)	0.27	0.17	0.56	−0.50 − 1.0	0.67
role	0.77 (10/13)	0.59	0.76	0.47	−0.08 − 1.0	0.90
location	0.77 (10/13)	0.44	0.38	0.54	−0.40 − 1.0	0.80
city	0.62 (8/13)	0.03	0.01	0.63	−0.67 − 1.0	0.50
race	0.55 (11/20)	0.12	0.00	0.62	−0.56 − 1.0	0.46
sex	0.20 (4/20)	0.63	0.88	0.60	−0.25 − 1.0	0.75
name	0.29 (22/75)	0.32	0.26	0.49	−0.50 − 1.0	0.64
first letter of name	0.52 (39/75)	0.20	0.29	0.63	−1.0 − 1.0	0.69
first letter excluding same name clusters	0.45 (34/75)	0.05	0.10	0.63	−1.0 − 1.0	0.53
Injection partners						
social proximity	0.89 (33/37)	0.27	0.44	0.68	−1.5 − 1.0	0.76
role	0.78 (14/18)	0.44	0.67	0.71	−1.0 − 1.0	0.79
location	0.89 (16/18)	0.44	0.54	0.64	−1.0 − 1.0	0.88
city	0.56 (10/18)	0.31	0.41	0.78	−1.0 − 1.0	0.80
race	0.72 (13/18)	0.17	0.20	0.60	−1.0 − 1.0	0.62
sex	0.83 (15/18)	0.03	−0.03	0.59	−1.0 − 1.0	0.47
name	0.34 (25/73)	0.46	0.46	0.47	−0.25 − 1.0	0.72
first letter of name	0.77 (56/73)	0.08	0.05	0.55	−1.0 − 1.0	0.55

clusters (which include partners that all have the same first letter), clustering by first letter decreases to almost chance levels (see Table 1).

From these ARCs alone we cannot determine whether social proximity, role, or location is the most influential in subjects' associative processes because these variables overlap to some extent. Further analysis of clustering by one variable within clusters defined by another variable (Brewer & Yang, 1994; Brewer, Rinaldi, Mogoutov & Valente, in press) would help to identify the variable(s) that provides the most general and detailed description of associative patterns. Unfortunately, such control analyses are not possible here because the role and location clusters tend to be quite small (2–3 partners).

Figure 1 shows the lists of partners, in order of recall, for four subjects who are representative in terms of the level of clustering by location and role. The lists are expressed in terms of the locations in which a subject interacted with particular partners and the role relationships particular partners have with a subject. The moderate levels of clustering by location and role can be seen clearly in these lists.

Locations

Sexual partners
Subject A:
1. downtown
2. downtown
3. beach
4. beach
5. bar
6. downtown
ARC = 0.40

Injection partners
Subject B:
1. bar
2. shooting gallery
3. partner #3's house
4. motel
5. motel
6. partner #6's house
7. partner #3's house
8. partner #3's house
9. hotel
10. partner #10's apartment
ARC = 0.55

Role relationships

Sexual partners
Subject C:
1. friend
2. ex-boyfriend
3. ex-boyfriend
4. one night stand
5. one night stand
6. one night stand
7. one night stand
8. one night stand
9. weekend stand
10. one night stand
11. one night stand
12. friend
ARC = 0.52

Injection partners
Subject D:
1. old friend
2. old friend
3. friend
4. partner #2's ex-girlfriend
5. friend
6. friend
7. friend
8. acquaintance
9. acquaintance
10. friend
11. friend
12. friend (and dealer)
ARC = 0.44

Fig. 1. Recall Lists of Partners Expressed in Terms of Partners' Locations and Roles for Four Representative Subjects.

Figure 2 displays the perceived interaction network for the first 12 injection partners recalled by another representative subject, with the numbers indicating the order in which the partners were recalled. To produce this figure, we first submitted the ordinal valued social proximity matrix for this subject to multidimensional scaling (Kruskal & Wish, 1978). The stress of the two-dimensional representation is 0.06. We then used NetImage (Freeman, 1998) to combine the scaling of the partners with information on the dichotomized ties between partners (whether a pair interacted with each other at least a little) in the picture. Partners close together in the figure were perceived by the subject

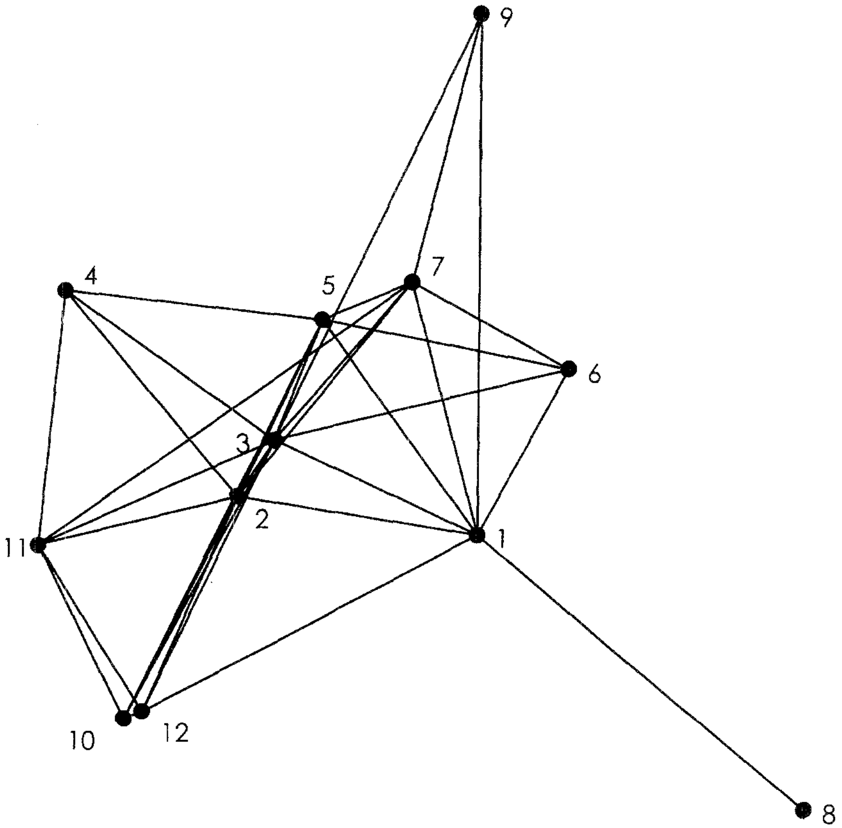

Fig. 2.

to interact together "a lot" or "sometimes", while partners farther apart were perceived by the subject to interact together only "a little" or not at all. Lines connect partners whom the subject perceived to interact at least "a little" with each other. By tracing this subject's recall in the figure, one sees that this subject tended to recall successively persons linked by moderate to high levels of social interaction, and that all pairs of adjacently listed partners are perceived to interact at least a little except adjacent pairs 7–8, 8–9, and 9–10. The social proximity ARC for this subject is 0.44.

Inter-Response Times

Short pauses between adjacently listed pairs of partners indicate close connections between those partners in memory, while long pauses indicate more distant connections. We measured IRTs for each subject's recall by replaying the audiotape for a subject's interview and pressing a button on a microcomputer keyboard at the instant the subject mentioned each partner's name or description. A computer program computed the IRTs, precise to one hundredth of a second, based on the time elapsed between these keystrokes. Two of us measured IRTs independently for a 50% systematic sample of the subjects whose interviewers were audiotaped. The mean interrater reliability coefficient (Pearson's r) for the IRTs was greater than 0.99 for both types of partners (median rs = 1.00, minimum $r = 0.99$ for sexual partners and 0.94 for injection partners).

For every subject, we calculated a Pearson correlation between the natural logarithm (ln) of the IRTs and each of several variables representing the relationships between adjacently listed pairs of partners. These latter variables correspond to the three primary associative factors identified from the clustering analyses. For the role and location variables, we coded adjacent pairs of partners with the same role/location as 2 and pairs with different roles/locations as 1. For the social proximity variable, we used the 4 point ordinal scale ratings of the level of interaction between a pair of partners. As in previous research (Brewer & Yang, 1994; Brewer, 1995a), we used the natural logarithms of the IRTs because they tend to produce better fitting correlations with these other variables than do the raw IRTs.

Table 2 shows the summary statistics for these correlations by partner type and variable. The means in the table represent unweighted mean correlations computed with Fisher's z-transformations (Rosenthal, 1991). The sample sizes are smaller than those in Table 1 due to missing data on IRTs for some subjects (also, the adjacently listed pairs of partners did not vary in social proximity for a few other subjects). For both types of partners, IRT correlates more strongly with social proximity than with role or location concordance. In other words, adjacently recalled pairs of partners tended to be listed more rapidly in succession if the subject perceived them to interact a lot with each other than if the subject perceived them to interact little or not at all with each other. The moderate correlations between social proximity and IRT are not a consequence of the general slowing of IRTs over the course of recall. The mean partial correlations between social proximity and IRT controlling for output serial position of the adjacently recalled pairs are –0.35 for sex partners and –0.31 for injection partners.

Figure 3 presents a scatterplot between social proximity and IRT (untransformed) for one representative subject. The points plotted represent the first 11 adjacently recalled *pairs* of injection partners for this subject. The ordinal social proximity values indicate the perceived level of interaction for a pair of partners, where 1 refers to "never," 2 refers to "a little," 3 refers to "sometimes,"

Table 2. Pearson Correlations Between Inter-Response Times (ln IRT) and Selected Variables.

Variable	*n* subjects	Mean *r*	Median *r*	S.D. *r*	Range *r*	Prop. neg. *r*
Sexual partners						
social proximity	18	−0.35	−0.37	0.38	−0.79 – 0.90	0.89
same role	9	0.15	−0.07	0.55	−0.80 – 0.84	0.56
same location	9	−0.06	−0.27	0.49	−0.80 – 0.80	0.56
concurrency	16	−0.16	−0.22	0.41	−0.70 – 0.73	0.75
Injection partners						
social proximity	33	−0.52	−0.51	0.39	−0.97 – 0.40	0.82
same role	11	−0.12	−0.05	0.49	−1.0 −0.89	0.55
same location	12	−0.25	−0.19	0.42	−0.80 – 0.38	0.58
concurrency	15	−0.38	−0.45	0.54	−0.96 – 0.91	0.73

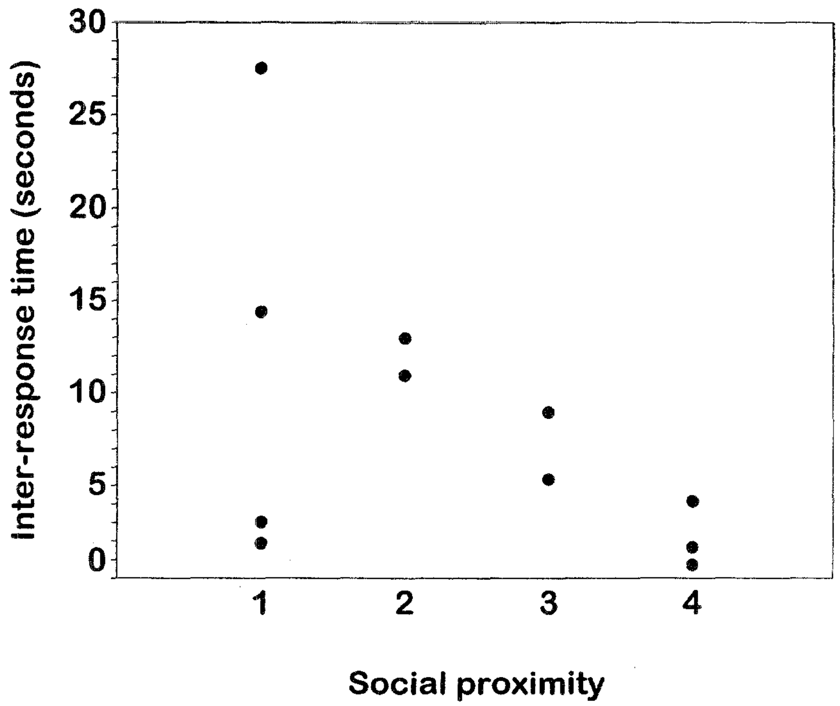

Fig. 3.

and 4 refers to "a lot." The figure demonstrates that the subject recalled rapidly in succession those pairs of partners who interacted intensely, and that the pauses between adjacent pairs tend to be longer for progressively lower levels of social proximity. The Pearson correlation between social proximity and ln IRT for this subject is −0.52.

Serial Order Patterns

We measured serial order patterns for each subject by computing Pearson correlations between partners' output serial positions (e.g. 1st, 2nd, 3rd, etc.) and their values on particular variables. For these analyses, we included subjects who listed three or more partners. Table 3 shows a summary of these correlations. Most subjects recalled partners who varied on the characteristics in Table 3. Particular variables differ substantially in how well they describe partners' output serial order. For both partner types, frequency of contact is the most strongly related to output serial position. This means that subjects tended to list partners with whom they had multiple or many sexual/injection contacts earlier in recall than those with whom they had relatively little sexual/injection contact.

The three chronological variables referring to time since last met partner, last sexual/injection contact with partner, and first sexual/injection contact with partner show lower correlations with output serial position, on average. These lower averages are due primarily to the high variance and tendency toward bimodality in the distributions of these correlations. For these variables, a number of subjects had fairly strong negative correlations while other subjects had moderately strong positive correlations, suggesting forward and reverse chronological retrieval strategies, respectively. Relationship closeness and subject feelings about a partner are only modestly related to serial order patterns in recalling sexual partners. That is, subjects tended to list sexual partners with whom they had relatively close relationships and about whom they felt positively earlier in recall than those with whom they had more distant relationships and those about whom they felt more negatively. Relationship closeness and subject feelings about a partner are not related to serial order patterns in recalling injection partners. However, subjects did tend to list injection partners with whom they had shared injection paraphernalia somewhat earlier in recall than those with whom they had not shared such equipment. We obtained similar results as those in Table 3 when we computed ordinal measures of association for serial order patterns.

The IRTs also suggest that there may have been a chronological component to subjects' recall processes. The row labeled "concurrency" in Table 2 shows the summary of correlations between IRT and whether the subject's partnerships with each partner of an adjacently recalled pair overlapped in time (i.e. were concurrent). These correlations tend to be moderately negative, although not quite as strong as those for social proximity. (The adjacent pairs of sexual partners did not

Table 3. Summary of Pearson Correlations for Serial Order Patterns.

Variable	Proportion of subjects whose partners vary	Mean *r*	Median *r*	S.D. *r*	Range *r*	Proportion negative *r*
Sexual partners						
rel. closeness	0.96 (22/23)	−0.24	−0.34	0.46	−0.85 – 0.77	0.64
feelings re part.	0.95 (42/44)	−0.22	−0.18	0.40	−0.89 – 0.65	0.70
last met	1.0 (23/23)	0.22	0.16	0.50	−0.85 – 0.80	0.35
last sex. contact	1.0 (23/23)	0.15	0.33	0.62	−0.92 – 0.90	0.39
first sex. contact	0.96 (22/23)	−0.36	−0.31	0.50	−0.99 – 0.79	0.64
frequency of sex	0.84 (38/45)	−0.48	−0.49	0.44	−0.98 – 0.58	0.82
Injection partners						
rel. closeness	1.0 (23/23)	−0.18	−0.02	0.52	−0.98 – 0.87	0.52
feelings re part.	0.88 (38/43)	0.00	0.05	0.54	−0.94 – 0.89	0.45
last met	1.0 (23/23)	0.12	0.04	0.53	−0.85 – 0.96	0.48
last inj. contact	1.0 (23/23)	−0.02	−0.13	0.54	−0.83 – 0.87	0.56
first inj. contact	1.0 (23/23)	−0.20	−0.29	0.49	−0.97 – 0.94	0.61
freq. of injection	0.84 (32/38)	−0.45	−0.46	0.43	−0.89 – 0.50	0.75
sharing inj. para.	0.87 (13/15)	−0.30	−0.29	0.47	−0.87 – 0.60	0.77

vary for 7 subjects, and the adjacent pairs of injection partners did not vary for 8 subjects). The negative correlations mean that the pauses between adjacently recalled pairs of partners tended to be shorter when the subject's partnerships with both partners in the pair overlapped in time than when they did not.

Subjects' Accounts of Their Recall Processes

To complement our analysis of subjects' objective recall patterns, we summarized subjects' accounts of how they recalled their partners. Our summary is based on subjects' responses to the questions about their recall processes as well as their spontaneous comments during recall. Table 4 presents the proportions of subjects who mentioned different types of recall strategies. The table includes only those strategies reported by 5% or more of the subjects for one or both types of partners. Subjects' reports of their recall strategies are consistent with the associative and serial order patterns we observed. Subjects' accounts highlight associative strategies based on social proximity and location (and to a much lesser extent, role) and serial order strategies based on chronology of partnerships, frequency of sexual/injection contact, and relationship closeness. In the table, "reinstating the context" refers to focusing on a single location and remembering all the persons who were there (cf. Fisher & Geiselman, 1992).

Table 4. Proportion of Subjects who Reported Using Particular Recall Strategies.

Strategy	Sexual Partners	Injection Partners
Associative		
location	0.19	0.24
social proximity	0.07	0.19
parties	0.05	0.06
reinstating context	0.01	0.08
role	0.01	0.05
Serial order		
forward chronological	0.16	0.08
reverse chronological	0.14	0.07
unspecified chronological	0.06	0.02
relationship closeness	0.08	0.10
frequency of sex/inj. contact	0.09	0.07
feelings toward partner	0.05	0.00

DISCUSSION

Summary of Main Results

Subjects tended to cluster their partners in recall by social proximity, role relationship, and location in which they interacted with them. Inter-response times for adjacently recalled pairs of partners typically correlated moderately negatively with pairs' social proximity. Subjects tended to list partners with whom they had more frequent sexual or injection contact earlier in recall than those with whom they had less frequent contact, and they also tended to recall partners in rough forward or reverse chronological order. Subjects' accounts of how they recalled their partners parallel these results. Overall, our findings on the recall of sexual and injection partners indicate similar associative and serial order patterns as those in the recall of acquaintances, friends, and coworkers (Brewer, 1995b; Brewer et al., in press).

Supplementary Interviewing Techniques to Enhance Recall

From these results, we developed supplementary interviewing techniques for enhancing the recall of partners. Each of these techniques involves a set of cues that correspond to one of the organizing factors of partner memory we identified (social proximity, role, location, and chronology). These techniques are intended to stimulate and exploit the associative and serial order retrieval processes that the organizing factors presumably represent. We designed the techniques to be administered *after* an interviewee has freely listed as many of his or her partners as possible.

Recalled Partners as Network Cues

Following Brewer, Garrett and Rinaldi's (2002) general approach, we use the partners that an interviewee freely lists as social proximity cues. For this technique, the interviewer reads back to the interviewee the names or descriptions of the partners the subject recalled. For each partner, the interviewer asks the interviewee to think of other persons who know, hang out, or interact with that partner and list any of these other persons if she or he had sex/injected drugs with them during the recall period but forgot to mention them before. This approach is similar to a personal network elicitation strategy used by Fraser and Hawkins (1984).

This technique of using previously listed partners as network cues may be less effective for eliciting additional sexual partners than for eliciting additional injection partners. Although our subjects clustered sexual partners moderately by social proximity and their IRTs correlated most strongly with social proximity, the network density (i.e. the proportion of pairs of partners who had interacted together at least "a little") for sexual partners (mean = 0.14, $n = 33$) is much less than that for injection partners (mean = 0.42, $n = 37$). Low density sexual partner networks mean that using freely recalled sexual partners as network cues may not trigger or bring to mind many other persons who are sexual partners.

Location and Role Cues

To assemble the list of location and role cues, we first noted all the responses our subjects gave to the questions about locations in which they had interacted with their partners and role relationships they had with their partners. Then we compiled a list of all the locations and roles mentioned by two or more subjects to ensure that the locations and roles were not idiosyncratic (see Fig. 4 for the location and role cues). In compiling this list, we lumped together locations and roles that we believed were similar and thus unlikely to be sufficiently unique or distinct from each other as cues. To administer these cues, the interviewer says each location or role (in an individually randomized order) and asks the interviewee to think of all the persons with whom she or he has interacted/had sex/injected drugs in that location or who play that role in his or her life. The interviewer then asks the interviewee to list any of these other persons if she or he had sex/injected drugs with them during the recall period but forgot to mention them before. Klovdahl, Dhofier, Oddy, O'Hara, Stoutjesdijk and Whish (1977) and Liebow (1989) used a similar supplementary technique, based on role cues, in eliciting personal networks.

Role cues: acquaintances, associates[i], boyfriends/girlfriends, current or past coworkers/bosses/employees, dealers/connections[i], ex-boyfriends/ex-girlfriends, ex-wife/ex-husband/ex-partner/ex-mate, family/relatives/kin[i], friends/good friends/old friends/best friends/close friends, friends/ relatives of dealers[i], friends/relatives of friends, friends/relatives of people you've injected drugs/had sex with, mother/father of your child[s], neighbors, one night stands/flings/pickups[s], roommates/people you life with[i], people you dated[s], people you had sex with for money or drugs (date/trick/john/client), prostitutes, strangers/anonymous people, wife/husband/partner/mate.

Location cues: another city or town, bar/tavern/club, bathhouse[s], beach[s], Capitol Hill[i], car/van/truck, computer bulletin board/chat room/online[s], downtown[i], drug treatment[i], gym[s], jail[i], motel/hotel, on the streets, park, parties/social gatherings, rest stop/truck stop[s], shelter/mission[i], shooting gallery[i], someone else's house/apartment, under the viaduct or bridge[i], work[i], your current or past house/apartment/place.

Note: [i] refers to cues for injection partners only and [s] refers to cues for sexual partners only.

Fig. 4. Location and Role Cues.

Chronological Strategies and Cues

We developed two types of techniques based on partners' chronology. The first technique is the method for eliciting sexual partners recommended by the U.S. Centers for Disease Control and Prevention (CDC, 1973, 1998; Steiger & Taylor, 1947). For this method, the interviewer simply asks the interviewee at the outset to recall his or her partners in reverse chronological order. Our related but somewhat more involved technique is to sketch out a timeline of prominent events in interviewee's life during the recall period and then work through the timeline to cue his or her memory for additional partners (for related but less comprehensive timeline techniques, see Belli, 1998; Berney & Blane, 1997; Denver STD/HIV Prevention Training Center, 1999; Laumann, Gagnon, Michael & Michaels, 1994; Means & Loftus, 1991; Pomeroy, Flax & Wheeler, 1982; Sobell & Sobell, 1992). For this technique, the interviewer records information on a calendar that shows the months and major holidays for the recall period. Specifically, the interviewer notes the interviewee's current and past residences (including time spent in hospitals, jails, and treatment facilities, as well as vacations and business trips), important events that happened to the interviewee's family and friends (including the interviewee's own marriages/steady relationships and others' marriages/divorces/births/deaths), daily activities (employment/training, school/college, changes to daily routine), and, for drug injectors, events related to their drug use (periods of abstinence, periods of especially heavy use, overdoses, changes in drugs used or sources of drugs). Once this timeline is established, the interviewer begins at the start of the recall period and progresses forward through time. The interviewer identifies relevant points and periods in time defined by the events on the calendar and asks the interviewee to think of other persons with whom she or he had sex/injected drugs around that time.

We hypothesize that chronological strategies and cues may be more effective for eliciting additional sexual partners than eliciting additional injection partners because our subjects had contact with sexual partners in a more serial, or less concurrent, fashion than they did with injection partners. The proportion of all pairs of a subject's partnerships that overlapped in time (i.e. the first sexual/injection contact with one partner was in-between the first and last contact with another) indicates the extent of concurrency. In our sample, the mean proportion is 0.49 for sexual partners ($n = 22$ subjects, median = 0.40), which is appreciably less than that for injection partners ($n = 23$ subjects, mean/median = 0.71). The lower rate of concurrency for sexual partners may make it easier for individuals to organize their sexual partners in chronological fashion. Nonetheless, these results indicate that our subjects tended not to practice serial monogamy to a very high degree.

Applying and Evaluating the Techniques

Because there are no robust demographic or behavioral correlates of forgetting partners (except for number of very recent partners) (Brewer et al., 1999), we expect that if any of these techniques are effective in eliciting additional partners, they should be effective for most kinds of individuals with multiple sexual and/or injection partners. Also, because recalled and forgotten partners do not differ substantially on many partner and partnership variables (Brewer et al., 1999), we speculate that any additional partners elicited by these techniques should be similar to freely recalled partners.

The location and role cues should be modified before being applied in different local populations. It would be necessary first to gather data in a particular community on the locations in which individuals interact with their partners and the role relationships they have with them to ensure that the cues are relevant and likely to elicit additional partners.

We are in the process of evaluating these techniques in a randomized controlled trial. This experimental evaluation will provide a systematic assessment of the techniques' effectiveness and time efficiency in eliciting additional partners.

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CONCORDANCE BETWEEN DRUG USERS' AND THEIR NETWORK MEMBERS' REPORTED DRUG USE AND HIV STATUS: IMPLICATIONS TO HIV PREVENTION

Carl A. Latkin, Valerie Forman and Amy Knowlton

ABSTRACT

This chapter examines accuracy of data on characteristics and behaviors of network ties by assessing concordance between 327 indexes' reports on their 411 network members and the network members' self-reports. Participants were recruited for an HIV prevention intervention. Almost all (99%) participants had a history of drug use. Concordance rates varied by the type of information reported and raters' characteristics and behaviors. Overall, substantial concordance (kappa = 0.68) was found for reports of network member's HIV status, with sex partners having greater concordance (kappa = 0.80) compared to HIV seronegative and current drug using indexes (kappas ranged 0.55–0.61). Yet, participants generally, and HIV seronegatives especially, tended to underestimate HIV infection of their network members. Reports of network members' current drug use (kappa = 0.45), current injection drug use (kappa = 0.58), and employment (kappa = 0.52) showed moderate concordance, and age showed near

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perfect concordance (kappa = 0.90). Results suggest that former and current drug users can provide reasonably accurate data about the HIV status and drug use of their network members. Implications to HIV prevention are discussed.

INTRODUCTION

Social network studies ask individuals to identify network members and provide information about the members' attributes, such as demographic characteristics and relationship qualities. While comparing self-reports and proxy reports is important for methodological verification (Cole et al., 1996), few studies have examined the accuracy, or concordance, of network attribute data. Assessing the validity of indexes' reports on their network members may be helpful for making population estimates, and understanding social influence processes, of risk behaviors. Furthermore, use of validated proxy-derived data offers potential for more rapid and less costly assessments (Menon, Bickart, Sudman & Blair, 1995). The present study examined concordance levels between indexes' reports of network members' characteristics and behaviors and the network members' self-reports, and compared concordance rates by factors hypothesized to affect concordance.

Concordance Rates

Prior research on concordance rates appears in public health studies that use proxy data. Researchers have documented high to moderate concordance levels for reported demographics and health-related behaviors. In an English study, a high level of agreement was found between mothers and their male partners on paternal smoking (kappa = 0.90) and alcohol use (kappa = 0.74) (Passaro, Noss, Savitz & Little, 1997). A Japanese study of steel workers and their spouses also found moderate to high levels of agreement on reported smoking habits (kappa = 0.86) (Okamoto, Ohno, Horisawa, Wakai et al., 1999). Another study documented high concordance for proxy-derived data on demographics and cigarette smoking (range 0.86–0.94), and moderate to high concordance on medications taken (range 0.55–0.88) and alcohol use (range 0.52–0.82) (Nelson et al., 1994). Findings from these studies suggest that individuals can accurately report network members' substance use behaviors. Given the potential implications to HIV prevention research, the present study assessed the validity of illicit drug users' proxy reports of network members' substance use and sexual behaviors.

Sex and Drug Behaviors

A review of U.S. and international studies of reproductive behavior indicated that sex partners had a median agreement of 76% among countries assessed (Becker, 1996). Comparable concordance has been found for sex partners' reports of sexual behaviors. For example, a study of concordance in 155 gay partners' reports of ever engaging in four types of sexual behaviors showed high concordance, with kappas ranging from 0.76 to 0.88 (Seage et al., 1992). Similarly, good concordance was found for reports of a variety of sexual behaviors in a study of heterosexual couples (Ochs & Binik, 1999). Concordance was 80% or greater for two-thirds of reported sexual behaviors.

Not all studies of sex partners find high levels of agreement. While one study revealed substantial concordance (kappa = 0.68) for use of any birth control, concordance of reported use of particular methods ranged from kappa = 0.03 to kappa = 0.69 (Coughlin et al., 1998). In a related study of 119 college student couples, only 50% of females and 31% of males correctly reported their partner's ever having a sexually transmitted infection (Seal, 1997).

Correlates of Concordance Rates

Research suggests that numerous factors may affect accuracy of self-report data in general and proxy-report data in particular. Cognitive factors such as errors in recall can affect the accuracy of self-report data. Most studies find better reliability in reports about the presence, compared to amount or duration, of an assessed behavior. Embarrassment in reporting intimate or socially proscribed behaviors also may affect the accuracy of self reports (Stone et al., 1999). Socially desirable response biases may be the result of purposeful impression-management, self-deception, or some unaware cognitive biases to bolster self-image (Meston et al., 1998; Paulhus, 1984). Such biases may produce systematic under- or over-reporting by a particular population.

A variety of factors in addition to self-report biases may affect the validity of proxy reports. Research suggests that concordance rates may vary according to how much a proxy can observe or is familiar with the individual's inquired attribute. In an experimental study of accuracy of partners' attitudes, Menon and colleagues (1995) found that joint participation and open communication about a surveyed behavior yield higher levels of concordance. Proxies' own attributes or behaviors also may affect concordance in reports. For instance, the false consensus phenomenon refers to the tendency of respondents to believe that others have the same characteristics or attitudes as themselves (Marks & Miller, 1987). Such misconceptions may lead individuals to believe that sex or drug partners have the same negative HIV status and, therefore, HIV protective behaviors are unnecessary. Similarly, lower agreement on reported sexual behaviors among gay male sex partners was found among couples of whom at least one member was a heavy substance user and also among sex partners who did not know each other's HIV status (Seage et al, 1992). Yet in most prior studies, HIV status has not been found to affect concordance rates. In a study of sex partners in Thailand (de Boer, Celentano, Tovanabutra, Rugpao et al., 1998), concordance levels were high for sexual behaviors and contraceptive practices, and concordance rates between members of HIV serodiscordant couples did not differ from those where both partners were HIV positive. A study of HIV serodiscordant male couples in New York found substantial agreement of reported sexual behaviors (kappas ranged 0.51–0.77) (Carballo-Dieguez et al., 1999).

Perceived and Actual Network Behaviors

Attribute data of network members may be an important potential source of information for estimating the risk behaviors and HIV status of high risk, hard-to-reach populations. Network attribute data also may elucidate potential microsocial influences on HIV risk behaviors. In a multi-country study, drug users' risk reduction was strongly and consistently associated with reports of peers' risk reduction (Des Jarlais et al., 1995). Other studies have found that risk behaviors are more strongly associated with perceptions of peers' risk behaviors than are peers' actual behaviors (Prentice & Miller, 1993). In the present study we examined the agreement between indexes' and network members' self-reports of network members' attributes. Specifically, we explored agreement between index participants' reports of network members' attributes and behaviors and the network members' self-reports of age, employment status, current drug use, injection drug use, and HIV status. We hypothesized that relative observability or sensitivity of information collected and raters' own behaviors and characteristics would affect concordance rates.

METHODS

The data were collected prior to random assignment as part of the baseline interview for the SHIELD (Self-Help in Eliminating Life Threatening Diseases) study, an experimental HIV prevention intervention. Participants were recruited through targeted outreach in areas of high drug activity in Baltimore as assessed through ethnographic observations, focus groups, and geocoding of drug-related arrests in the city over a three-year period. Potential index participants were provided a written description of the study and a toll-free telephone number to call. A brief screening was administered by phone upon contact to the study. Potentially eligible individuals were then asked to provide informed consent, approved by the Johns Hopkins School of Public Health's IRB, and administered a face-to-face interview. SHIELD study inclusion criteria consisted of: (1) being at least 18 years old; (2) having daily or weekly contact with drug users; (3) being willing to conduct AIDS outreach education; and (4) being willing to bring into the clinic two network members. Interviews elicited information on index participants' background, HIV-related behaviors, drug use, and social networks. After the initial assessment, index participants were asked to bring two high-risk members of their networks to the clinic for similar assessment. The study targeted network members who were drug network members, sex partners, and peers at high risk for HIV through sexual transmission. All participants were paid $15 for completion of the interview.

Measures

The personal network inventory included 17 name-generating questions concerning their support network, interaction network, and sex network members. Specific items elicited perceived sources of social support in the domains of emotional support, information support, material support, physical assistance, and social participation. Next, questions generated names of individuals with whom the participant shared meals and living space. Lastly, questions elicited the names of the participants' sexual partners in the prior 6 months. Index participants were then asked a series of relational and attribute questions, including their network members' age, employment status, drug use, HIV/AIDS status, and their role relation. Sexual partners were defined by sexual activity or role relation, e.g. spouse, girl/boyfriend, as reported by either the index or network member. HIV/AIDS was assessed by asking indexes, "Does anyone who you have listed have HIV or AIDS?"

Analytical Plan

Agreement between the reports by the index individual and his/her network member was assessed with a Pearson product moment correlation or a Spearman rho correlation in the instance of skewed data if the outcome was continuous. Cohen kappa statistic (1960) was used with dichotomous outcomes. Kappa takes into account the observed agreement versus expected agreement (that due to chance alone) and, therefore, is influenced by the base prevalence of the condition or behavior of interest. While a weighted kappa statistic has been used in the literature for ordinal response data, the present study did not due to concerns documented by Graham and Jackson (1993). The data were then stratified by factors hypothesized to be associated with validity of reports. A kappa of 0.81 to 1.00 represents almost perfect agreement, 0.61 to 0.80 substantial agreement, 0.41 to 0.60 moderate agreement, 0.21–0.40 fair agreement, and less than 0.20 slight or poor agreement (Landis & Koch, 1977).

RESULTS

Data presented are from the first 411 network members (of a total of 567 network members interviewed) who completed the personal network inventory and have been linked to their nominating index ($n = 327$). Some indexes ($n = 84$) had more than one network member interviewed. Preliminary analysis was conducted on a random selection of one network member per index ($n = 327$ dyads) to discern if differences in the number of partners interviewed per respondent affected the study findings. The outcome was compared with analysis using the full sample ($n = 411$ dyads). Findings indicated that using the full sample of network members did not appreciably alter the results. Therefore, analyses of the full sample are presented.

The majority of the index members were male (63%), African-American (95%), unemployed (80%), had less than a high school education (58%), and almost a quarter (24%) had been homeless in the prior six months (Table 1). Though few (9%) were married, nearly two-thirds (65%) reported currently having a main partner. Almost all (99%) had a history of drug use, 71% had been in drug treatment or a detoxification program, 66% reported any current drug use, and 40% reported current injection drug use.

The sample of network members appeared similar to the sample of index participants. The majority of network members were male (52%), African American (93%), and unemployed (78%); 49% had less than a high school education and 17% reported homelessness in the prior six months (Table 1). Few (6%) were married, though two-thirds (66%) had a main sex partner. Almost all (97%) had used drugs, 64% had been in drug treatment, 70% were currently using drugs, and 60% were currently injecting drugs. Almost one-fifth (19%) of network members reported having HIV/AIDS. Of the 207 indexes who reported having a main partner, 115 (56%) had a sex partner interviewed. Sex partnerships were primarily identified by indexes' reports of recent sex (n=109), although eight were identified by role relation or recent sex as reported by the network member.

Table 1. Demographic Characteristics of Indexes and Network Members in the SHIELD Study, Baltimore, Maryland, 1997–1999.

Characteristics	Index Members $N = 320$ %	Network Members $N = 411$ %
Gender: Male	62.8	52.3
Ethnicity: African-American	94.7	93.2
Education: < 12th grade	41.9	48.7
Marital status: Married	9.1	5.8
Have a main partner	65.1	68.0
Employed	19.7	22.1
Homelessness, prior 6 months	23.8	16.6
HIV seropositive	18.5	18.8
Drug use, ever	99.1	97.3
Drug use, currently	65.8	69.6
Inject drugs, currently	39.7	46.2
Drug treatment, ever	71.2	64.1
Cohabitation	30.9	
Time known each other, years (median)	6.0	
Frequency of contact, daily	56.3	

Concordance on Relationship Characteristics and Network Member's Demographics

Near perfect concordance was found for reports of network members' age (Table 2). The Spearman rho correlation for age was 0.90, with the mean age self-reported by the network member 39.5 years vs. 39.0 self-reported by network members, with little variability by index characteristics or behaviors (kappas ranged 0.88–0.90). Moderate concordance (kappa = 0.52) was found in reports of network member's current employment, with 83% agreement, and showed no variation by sex partnership or index HIV status (kappas ranged 0.51–0.52) (Table 3). Indexes who currently used drugs, however, had higher concordance rates (kappa = 0.58) than indexes who were not currently using drugs (kappa = 0.40) in reports of network member's employment.

Concordance On Network Member's Current Drug Use

Overall, reports of network member's current drug use showed moderate levels of agreement (kappa = 0.45) (Table 4). Index members had 83% (316 of 380) agreement in reporting network member's current drug use. Non-sex partners

Table 2. Correlations Between Index's Proxy Report and Network Members' Self-report of the Network Member's Age (Spearman's Rho Statistic).

Group	*n*	Age Correlation
Full sample	410	0.90
Index & sex partner	117	0.90
Index & non-sex partner	293	0.89
Index HIV+	78	0.88
Index HIV-	330	0.90
Index current drug user	271	0.90
Index no current drug use	134	0.90

Table 3. Agreement Between Index's Proxy Report and Network Member's Self-report of the Network Member's Current Employment Status ($n = 409$).

		Network member's self-report of employment	
		No	Yes
Index's report of network member's employment	No	68.0%	7.6%
	Yes	9.8%	14.6%

Group	*n*	Kappa
Full sample	409	0.52
Index & sex partner	117	0.52
Index & non-sex partner	292	0.51
Index HIV+	78	0.51
Index HIV−	329	0.52
Index current drug use	271	0.58
Index no current drug use	133	0.40

had higher concordance (kappa = 0.45) than sex partners (kappa = 0.40). Unexpectedly, the indexes who were currently using drugs had lower concordance (kappa = 0.26) compared to the indexes who were not currently using drugs (kappa = 0.48) in reports of network member's drug use. For reports of network member's current injection drug use, the kappa was moderate (0.58) but higher than for current use of any drugs (0.45), though the agreement was lower (79%) than for current drug use status (83%) (Table 5). Reports of current injection drug use showed comparable concordance by sex partnership and index HIV status (kappas ranged 0.56–0.58). The indexes who reported current drug use, however, had higher concordance (kappa = 0.64) than indexes who reported no current drug use (kappa = 0.41).

Concordance on network member's HIV/AIDS status

Overall, substantial concordance was found for reports of network member's HIV status (kappa = 0.68), with 91% agreement (Table 6), however, concordance

Table 4. Agreement Between Index's Proxy Report and Network Member's Self-report of the Network Member's Current Drug Use ($n = 380$).

		Network member's report of currently using drugs	
		No	Yes
Index's report of network member currently using drugs	No	13.2%	3.7%
	Yes	16.3%	66.8%

Group	*n*	Kappa
Full sample	380	0.45
Index & sex partner	102	0.40
Index & non-sex partner	278	0.45
Index HIV+	73	0.58
Index HIV–	306	0.39
Index current drug use	253	0.26
Index no current drug use	124	0.48

Table 5. Agreement Between Index's Proxy Report and Network Member's Self-report of the Network Member's Current Injection Drug Use ($n = 398$).

		Network member's report of currently injecting drugs	
		No	Yes
Index's report of network member currently injecting drugs	No	44.7%	12.1%
	Yes	9.0%	34.2%

Group	*n*	Kappa
Full sample	398	0.57
Index & sex partner	108	0.56
Index & non-sex partner	290	0.57
Index HIV+	77	0.58
Index HIV–	319	0.57
Index current drug use	263	0.64
Index no current drug use	130	0.41

showed wide variation by role relation and index characteristics. Concordance was highest for sex partners (kappa = 0.80), and considerably lower for indexes who reported HIV seronegative status (kappa = 0.55) or current drug use (kappa = 0.61). Of the network members who self-reported having HIV/AIDS, more than a third (27 of 74; 36%) of their index members were unaware of their HIV seropositive status. Of the network members who reported being HIV seronegative, the indexes reported that 3% (8 of 319) of them had HIV/AIDS.

DISCUSSION

The results from this study suggest that current or former drug users' reports of risk network member's risk behaviors and HIV status show acceptable rates of agreement. While variability exists in the concordance rates among the reports assessed, most measures of concordance were in the substantial to moderate range. HIV status and age had high levels of agreement, while employment status, current drug use, and current injection drug use had moderate levels.

Table 6. Agreement Between Index's Proxy Report and Network Member's Self-report of the Network Member's HIV Serostatus ($n = 393$).

		Network member's report of HIV/AIDS	
		No	Yes
Index's report of network member HIV/AIDS	No	79.1%	6.9%
	Yes	2.0%	12.0%

Group	n	Kappa
Full sample	393	0.68
Index & sex partner	114	0.80
Index & non-sex partner	279	0.63
Index HIV+	76	0.71
Index HIV–	316	0.55
Index current drug use	261	0.61
Index no current drug use	127	0.74

These levels of agreement are comparable to those reported previously for reproductive information (Becker, 1996; Coughlin, 1998) but not as high as several studies have found on proxies' reports of substance use, e.g. cigarettes and alcohol (Passaro, Noss, Savitz & Little, 1997).

Concordance In Reports Of HIV Status

We found high concordance in reports of network member's HIV status. Nonetheless, the results also suggest that inner city current and former drug users tend to underestimate the prevalence of HIV among their network members. This finding is disturbing if the partners are unknowingly HIV serodiscordance and engaging in unprotected sex or sharing of injection equipment. Consequently, HIV prevention efforts should emphasize in the absence of definitive information the prudence of HIV seronegative individuals assuming that sex and drug partners are seropositive, and, therefore, the practicing of HIV protective behaviors.

Given that HIV serostatus is not verifiable by observation, it appears that many HIV seropositive individuals disclose their HIV serostatus to their network members. Such disclosures appear highest among sex partners as they had higher concordance rates for HIV infection than did non-sex partners. Previous literature suggests that greater agreement between sex partners' reports may be due, in part, to more frequent contact that offers more opportunities to observe the behavior, greater likelihood of shared behavior, emotional closeness, and communication (Menon et al., 1995). Sex partners in the present study were more likely to live together, have longer-term ties, and more frequent contact (60% of sex partners vs. 19% of non-sex partners cohabitated, $p < 0.001$; 59% of sex partners vs. 46% of non-sex partners knew each other over the median time of six years, $p < 0.05$; and 77% of sex partners vs. 48% of non-sex partners reported daily contact, $p < 0.001$). Research is needed to examine the extent to which these or other factors may explain the high concordance rates for reports of HIV infection among sex partners in drug using populations.

Drug Use

Reports of network members' current employment and injecting drugs showed similar proportions of indexes over- and under-reporting the characteristics. The concordance rates for injection drug use had a higher kappa than the rates for any drug use. The relatively low kappa coefficient for current employment may be due to the low rate of employment (22.2%) reported by the network members, or, alternatively, to the ambiguity of formal versus informal sector employment for this population.

Some evidence exists of false consensus in the reports of drug use (Marks & Miller, 1987). Indexes who self-reported current drug use were more than three times as likely to report their network member was using drugs when the network member did not, as compared to indexes who reported that the network member did not use drugs when the network member did. We speculated that a proportion of this misclassification of network members was due to lack of current information about the network members' drug use. We further analyzed the data by recoding the current drug use variable for the network members to reflect any use in the prior 6 months to determine if accounting for network members' recent stopping of drug use would affect the concordance rate. The agreement was greater for indexes who reported that the network member was currently using drugs, but the agreement for indexes who reported that their network member was not currently using was lower (data not shown).

For some behaviors, beliefs or perception of network members may be more important than the actual behaviors of the network members. Previous research suggests that some behaviors, such as alcohol consumption, are more influenced by individuals' perceptions of their peers' behaviors than by peers' actual behaviors (Prentice & Miller, 1993). The relative influence of perceived vs. actual behaviors of network members likely depends on the type of behavior, observability to the rater, and other factors such as the base-rate of the behavior in the population. Factors that may be associated with the accuracy of assessment of the network members may include the distinctiveness of the behavior, whether it is conducted with the index, social desirability for self and for network members of reporting the behavior, and saliency of the behavior. Accurately assessing episodic and infrequent behaviors compared to routine events may be more difficult.

In summary, results from the present study suggest that current and former drug users are able to report on their network members' attributes and behaviors, and that substantial to moderate agreement exists between these reports and the network members' self-reports. Network inventories can produce a wealth of data about the social environment of hard-to-reach populations. Results from the present study suggests that the accuracy of this information is bounded by a range of cognitive and relationship factors. We found variability of concordance by type of data, role relation, and rater behavior. These differences suggest the importance in choosing proxies to consider not only role relationship but also the proxies' own behavior and opportunity to observe or infer the network member's behavior or characteristic of interest.

For estimating characteristics of hidden populations, examining concordance rates between proxies' and network members' reports and then adjusting proxy reports by the concordance rates may be possible (Killworth et al., 1998). In the present study, if indexes' proxy reports were used to estimate the prevalence of HIV infection among network members, the estimated prevalence would be 14%, compared to 19% of self-reported HIV infection among network members. Estimation approaches are likely to be much more efficient than surveying all the network members.

Study Limitations

One limitation of the study was the lack of a gold standard to verify either the indexes' or network members' reports. Hence, we could only examine agreement among them. Possibly, a social desirability bias existed in reports of behavior. Yet, since the behaviors assessed did not include HIV risk behaviors, such as needle sharing, that tend to be associated with social desirability responses in this population, the likelihood of this bias is minimal. Also, network members who came to the clinic for interviewing differed from those network members listed by the index who did not. Thus, a recruitment bias limits the generalizability of the findings. Moreover, individuals with larger networks may have enrolled, thus producing a selection bias. The possibility of a selection bias also may be due to the study's emphasis on recruiting members of the risk network that, in turn, influenced the types of network members the indexes were able to recruit. Network members who were not interviewed also were likely to represent weaker ties, and hence the concordance levels reported here only apply to strong affiliations. Caution should be used, therefore, in generalizing these results to network members who have less frequent contact and shorter relationship duration. Still, less than a third of the network members lived with the indexes, yet the level of agreement among the indexes and network members was moderate to good. This finding suggests that it is unnecessary for individuals to live together to accurately report a network member's behaviors. There are limitations in using the kappa coefficient to assess levels of agreement. Since the kappa statistic compares expected probability of a phenomenon with the observed probability, the calculation depends on the marginal frequencies, and is therefore sensitive to the frequency of the phenomenon. Behaviors of low prevalence, such as employment, therefore, may have low kappas even when inter-subject agreement is high.

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ETHNICITY, SOCIAL NETWORKS AND HIV RISK IN OLDER DRUG USERS

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ABSTRACT

This paper compares older drug users' exposure to HIV infection or to infecting others with the HIV virus to that of their younger counterparts and addresses the extent to which their personal networks, and the macro-networks within which they use drugs, play a role in risk exposure or prevention. We first consider the changing epidemiology of HIV with respect to older adults. Next we utilize two separate but related sets of data to determine if older drug users are at greater risk than their younger counterparts for drug and sex related HIV risk and also whether or not their knowledge base is sufficiently adequate to enable them to make appropriate decisions about HIV related risk avoidance. We then examine the role of social networks in enhancing or reducing risk of HIV infection in older and younger drug users. Finally we consider the position of both sero-positive and sero-negative older drug users in macro-networks of drug users and whether or not their positions increase or reduce their risk of exposure.

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INTRODUCTION

> Even though we're junkies you know, I like to really educate myself very well, and I am always reading books and reading material . . . right now I got a big habit, I use, shoot like a bundle a day, nine ten bags a day but then I do that and I get off it, I wait till the next day . . . some people need to give 24 hours a day to dope . . . I don't steal see, I run. I overcharge people . . . they trust me with their money. I would never take a penny of anyone and I'm very famous for that. I'm the only junkie that doesn't rob you . . .
>
> I'm tired of livin' that type of life. I'm gonna get it together. I'm too old for this! I wasn't brought up this way. I don't like this type of livin'!
>
> *Older drug users in Hartford, CT.*

Two decades of attention to younger drug users has produced a gap in our understanding of the drug use patterns and lifestyle adaptations of older adults who continue to use illicit street drugs and in doing so, may themselves be at risk for exposure to STDs and HIV infection. Many studies have demonstrated the risks associated with injected cocaine and heroin including acute and chronic infections and sexually transmitted diseases including AIDS (Magura et al., 1989; Southeran et al., 1989). Recruitment through street outreach has limited the number of older participants in these studies since many older drug users choose to hide their drug use (Atkinson & Lial, 1982; Boyd, 1991; Courtwright, et al., 1989; Gordon & Thompson, 1995; Horton & Fogelman, 1991) or to seek and use drugs in more private, protected places. Nevertheless, drug users who manage to survive beyond fifty are joining other aging cohorts, and national epidemiologic data are beginning to point to increases in HIV infection in older users (CDC, 1996, 1998; Adler & Nagel, 1994; Hinkle, 1991; Nokes, 1996; Riley, 1989; Ship et al., 1991; State of Connecticut Health Department, 1996).

Most older drug injection users are not new recruits to injected heroin or cocaine; they have been purchasing and using drugs for long periods of time. At the same time they have confronted violence, disease, personal losses, homelessness, drug-related sickness and a host of other challenges. As "old-timers", they are known on the street or in drug using networks and, because of their longevity, they may be centrally situated in these networks. In AIDS endemic areas such as some neighborhoods of the large cities of the northeast, survival coupled with centrality has meant a longer period of time in which to become exposed to HIV infection. Survivors may have become infected with AIDS or hepatitis without their knowledge. Further, many researchers have argued that factors associated with aging such as drying and tearing of the vaginal wall may increase the potential for infection among sexually active older women (Catania et al., 1989; Center for Women Policy Studies, 1994; Scura & Whipple, 1990; Woolery, 1997) while problems in maintaining an erection may reduce older men's use of condoms. Some researchers have argued that older drug users may know less about AIDS than their younger counterparts because they are less public about their drug use and less connected to current sources of information about AIDS and protection from risk (McCaig et al., 1991).

Biologically, older adults are more succeptible to HIV infection (Skiest et al., 1996; Wallace et al., 1993; Woolery, 1997, among others). Whether the infection actually takes place, however, depends on several critical contextual factors. These include the amount of HIV in the population, the number of people with whom the individual interacts who are HIV infected, the likelihood of exposure to risky situations which enhance the potential for encountering risk behavior, whether or not and with what frequency the individual engages in risk behavior which transmits the virus and where the person is situated in the larger network of drug users. Numerous studies of network influence on the diffusion of HIV and related risk behaviors in drug user populations have shown that even if the virus is widespread in the general population, the personal networks and behaviors of the individual can work to reduce exposure to infection (Neaigus et al., 1995; Friedman et al., 1994; Woodhouse et al., 1994; Rothenberg et al., 1995).

On the one hand, these factors suggest that older drug users are an under-researched population likely to be at high risk of becoming infected with HIV, unknowingly infecting their partners and succumbing more rapidly to the disease (Adler & Nagel, 1994; Blaxhult et al., 1990; Carre et al., 1994; Ferro & Salit 1990; Phillips et al., 1991; Moss & Miles, 1987; Ship et al., 1991; Skiest et al., 1996; Sutin et al., 1993; Wallace et al., 1993). On the other hand, a growing body of literature on older drug users is suggesting that older users are reducing their risk in a variety of ways in order to protect themselves, to avoid exposure to violence, and to live longer. For example, some researchers have reported that older drug users moderate their heroin and cocaine consumption by alternating with marijuana, alcohol and other drugs or by substituting non-injecting for injecting drug use (Agar, 1973; Levy, 1998, Radda et al., 1997). There is some evidence that they take greater precautions to avoid transferring syringes and sharing works (Radda, 1998). In general, frequency of sexual intercourse declines with age and there is some evidence to suggest that older adults reduce their number of sex partners (Levy, 1994).

This paper will compare older drug users' exposure to HIV infection or to infecting others with the HIV virus to that of their younger counterparts, and address the extent to which their personal networks and the macro-networks within which they use drugs, play a role in risk exposure or prevention. We first consider the changing epidemiology of HIV with respect to older adults.

Next we utilize two separate related sets of data to determine whether older drug users are at greater risk than their younger counterparts for drug and sex related HIV risk, and whether their knowledge base is adequate to enable them to make appropriate decisions about HIV related risk avoidance. We then examine the role of social networks in enhancing or reducing risk of HIV infection in older and younger drug users. Finally we consider the position of older drug users, both sero-positive and sero-negative, in macro-networks of drug users, and whether or not their positions increase or reduce their risk of exposure.

FACTORS ASSOCIATED WITH RATES OF HIV IN OLDER ADULTS

The Changing Epidemiology of AIDS in Older Adults

National, state and local date on rates of reported AIDS cases and sources of infection in adults 50 and over point to a noticeable shift from transmission through male-to-male sexual exchanges and blood transfusions to infection via injection drug use and heterosexual contact. The 1996 data from the Centers for Disease Control and Prevention shows that among adults ages 50 and over, injection drug use accounted for 19.2% (1430) of reported AIDS cases, and 21.4% with the addition of men having sex with men who also engage in injection drug use (CDC, 1996). Nationally, since 1993, new cases of HIV have been highest among African Americans and Latinos, women, and persons in the northeast and south, with 36% of cases among African Americans and 19% among Latinos (CDC, 1995, 1996, 1998).

The trend toward increasing proportions of HIV infection in older adults of African American and Latino backgrounds through injection drug use and heterosexual transmission is likely to continue since a disproportionate number of new cases of HIV nationally are occurring in these populations. Many questions remain, however, with respect to the reasons for the rising rate of infection among drug users, which older adults are actually at risk, and what approaches may be taken to address their needs for information, protection and health care. Since the primary routes of infection for drug users involve interpersonal exchanges (unprotected sex and shared use of uncleaned needles and other drug use paraphernalia) researchers have turned away from individually oriented counseling and educational models of HIV prevention, to social influence models and studies of the socio-cultural context of risk behavior as a means of understanding risk exposure and the context for interventions making use of social marketing and social influence theories and methods.

Social Influences, Norms, Settings and Networks in HIV Prevention

Social influence responses to the HIV epidemic have emphasized the study of social norms formation and the development of interventions that emphasize the creation of preventive behavioral norms, (Friedman et al., 1992, 1987; Moore & Wenger, 1995), AIDS prevention self-help groups (Friedman et al., 1991; Friedman & Casriel, 1988; Carlson & Needle, 1993; French, et al., 1993), and peer organizations of drug users (Cross & Herkt, 1995; Trautmann, 1995; Levy et al., 1995, Watters et al., 1990). Associations between drug-related and sexual HIV risks among peers (Magura et al., 1989; Southeran et al., 1989) suggest that social influences, peer norms, and peer pressure are key factors in behavioral decision making and behavior change (Friedman et al., 1992; Latkin, 1995; Longshore, 1995; Zapka et al., 1993). Among the most significant current findings in AIDS prevention studies with IDUs are indication that **peer norms**, when compared to self-efficacy and intentions to change, have the greatest effect on risk and protective practices of African Americans and Latinos ((Longshore, 1995). Peer norms are constructed and conveyed through social networks.

Since the mid-1980s, a growing number of researchers have incorporated social network concepts and analyses into the study of alcohol/drug use and disease transmission among drug users (Freeman, 1979; Frank, 1981; Klovdahl, 1985). Higher than expected seroprevalence in certain subgroups has been explained in terms of network transmission of HIV (DesJarlais, 1990). Neaigus and colleagues (1995) have demonstrated the convergence of risk behavior and network membership. In a study of an HIV high prevalence area (New York City), HIV-positive persons were frequently found to be in the core network component rather than in peripheral components (Friedman et al., 1994, 1997). By contrast, in Colorado Springs, Colorado, where HIV-positive persons were found overwhelmingly to be isolated in the smaller subcomponents of the network and those HIV-positive individuals located in the central component occupied non-central network roles, a low level of endogenous HIV transmission was found (Woodhouse et al., 1994; Rothenberg et al., 1995). These findings suggest underlying network characteristics that shape the pattern and rate of diffusion of HIV in diverse local contexts (Trotter, 1995; Price et al., 1995). Conversely, social networks can serve as conveyors of benefit (e.g. HIV prevention knowledge, materials, etc.) Friedman (1995) argues that studying social networks and high-risk settings *in tandem* is a critical arena for AIDS prevention research.

Understanding and addressing the many **contexts** or high risk settings in which HIV risk behavior occurs, and the variety of interacting and sometimes contradictory forces that influence the beliefs, norms and behaviors of individuals in these social situations, is critical to furthering our understanding of HIV transmission and to developing more effective AIDS prevention programs for both injection and non-injection drug users and their sex partners. Since the 1960s and 1970s, anthropologists and sociologists have conducted street ethnography in shooting galleries, crackhouses and other drug use settings (Fiddle, 1967; Hanson et al., 1985; Preble & Casey, 1969; Agar, 1973). Zinberg's seminal study of drug use among returning Vietnam veterans, illustrated the central importance of set and setting in influencing type, location, rituals, and quantity of drug use (Zinberg, 1984). These studies have been followed by formative ethnographic research in these settings (CDC, 1989; DesJarlais et al., 1985; Ginzberg et al., 1985; McCoy & Khoury, 1990; DesJarlais et al., 1986; Feldman & Biernacki, 1988) in which HIV related sexual and drug risk behavior take place and multilevel intervention studies among gay men (Minkler, 1990) and drug users in New York City (Friedman & Casriel, 1988), San Francisco (Moore & Wenger, 1995), Chicago (Levy et al., 1995) and Miami (Page et al., 1991). Researchers are now beginning to consider targeted models for HIV prevention in locations where drug related risk behavior occurs, and to advocate for public health collaboration with housemen and other key actors in the drug scene. (DesJarlais & Friedman, 1990; Power et al., 1996; Oullet et al., 1991; Celentano et al., 1991). In this paper, we hypothesize that older adult drug users are changing the composition of their social network, their drug use and sex norms, and the locations in which they use drugs in order to reduce their HIV exposure and transmission risk. In the sections to follow, we will consider the relationship of social norms, social networks and drug use sites to protective and risk behaviors of older drug users and their networks in Hartford, Connecticut.

STUDY SITE, SAMPLING AND DATA COLLECTION

The Study Site

Hartford, Connecticut, serves as the location in which data have been collected on older drug users and their networks. Among mid-sized cities in the United States, Hartford ranks as one of the oldest and poorest. Once an industrial, and later an insurance and banking center, the city has become increasingly impoverished over the past 40 years and the gap in per capita income between the wealthy suburban municipalities and the city has grown dramatically. Economic growth has concentrated downtown, along the river front and in areas close to downtown in which insurance companies, universities and health care institutions have vested economic interests, leaving the primarily African American and Latino residents of other neighborhoods socially marginalized and without employment, quality education or adequate housing. Despite recent modest improvements in the distribution of wealth and economic development, this pattern of inequity has resulted in a steadily growing informal drug economy and a large cocaine and heroin-using population of men and women of all ages and ethnic groups. In 1994, the Hartford Health Department estimated the presence of approximately 12,000 adult cocaine and heroin users in the city. To date, there is no evidence to suggest a decline in adult drug users, or HIV infection rate.

Research on HIV infection among heroin, cocaine and crack users has been conducted in Hartford through a number of federally funded studies since 1989. In three of these studies with relatively large targeted sample sizes – Project COPE ($N = 934$), Project COPE II ($N = 1299$) and the Hartford SEP Evaluation Study ($N = 1165$) 8%–14% of all participants were aged 46 and over. More African American than Puerto Rican or Caucasian users are in this group and between 75 and 80% of each study sample was male. Combining study data, approximately 75% of all older participants were current (30 day) alcohol users, approximately 35% were current marijuana users (women are twice as likely to use marijuana as men), 60% were heroin users (women more than men) and more than half were cocaine users (no gender differences). In Project COPE II, the study with the largest sample of street drug users, at least half of the older male drug users and two thirds of sexually active women reported NEVER using condoms while engaging in penetrative sex. Data from Project COPE II showed that HIV prevalence increased significantly with age ($p < 0.01$), with 34% of those less than 46 years old and 44% of those over 45 HIV-infected. These data from our research over the past decade correspond with national concern over HIV exposure and risk behavior in older drug users.

Data Sources, Research Methods and Instruments

Data for this paper were obtained through two ongoing studies of drug use and HIV exposure in high risk sites. The first study is examining the interaction of personal and macro-networks with the locations and situations in which injected drugs and crack are used. To do so it integrates ethnographic, epidemiologic and social network research with targeted sampling through street outreach. Ethnographers and outreach interviewers identified and conducted observations of drug use and needle risk behavior and contextual factors influencing risk in approximately 60 inside and outside sites including apartments, abandoned buildings, alleyways, hallways of residential buildings, cemeteries and other isolated park-like areas, abandoned cars and protected sites under stairways and bridges.[1] These data contributed to the formulation of a panel survey examining the association among risk behaviors, network characteristics of respondents, and types of locations in which individuals reported using drugs. The survey was administered at two time points 12 months apart, to a sample of approximately 293 adult heroin, cocaine and crack users recruited through street outreach and enrollment of members of drug networks of index recruits. The network survey included sociodemographic, health status, peer norms and other predictors of risk behaviors, drug and AIDS risk behaviors, and past and current use of high-risk drug use settings. These domains were measured with the ARA, a modified and shortened version of the AIDS Initial Assessment (AIA) developed for the NADR projects and the Risk Behavior Assessment (RBA) used in NIDA Cooperative Agreement projects (Joe et al., 1990; Joe & Simpson, 1991). Participants' involvement in high risk drug use settings is measured with the High Risk Sites Instrument. Risk, support and network characteristics of personal networks, is measured with the HIV Risk Network Questionnaire based on an instrument created by the research team of the Flagstaff NIDA Cooperative Agreement project (Cochran et al., 1990; Maguire, 1983; Granovetter, 1973; Trotter et al., 1995). Respondents in the network survey were asked to identify members of their personal networks with the following question: "Now I want you to think about people you have contact with, people who have been involved in your life in an important way at any time during the past six months. Start with current people and work your way back. Some of these people may hassle you or argue with you, making your life difficult at times. But if they are important in your life, then you should include them in your list". Respondents were then questioned about their relationships, their drug use, their sexual activity and other behaviors in relation to each member of their network.

This paper draws on baseline data collected from the first 230 participants in this study. For purposes of analysis in this study, the sample was divided into four age cohorts: 20–29 ($N = 51$), 30–39 ($N = 85$), 40–49 ($N = 72$) and 50 and over ($N = 22$). The oldest cohort consisted of 20 males and 2 females, and included 16 heroin injectors, most of whom also reported injecting speedball. Comparative analyses were conducted across all ***four age cohorts***.[2] For additional analyses, four new ***age-ethnic cohorts*** were generated by collapsing age and ethnic groups into younger (20–39) African American and Puerto Rican and older (40 and over) African American and Puerto Rican groups.

The second source of data for the paper is a set of indepth semi-structured interviews with older drug users conducted during the formative stage of development of an NIA funded study of exposure to HIV risk in older adults residing in senior public and private housing facilities. The two-hour interviews included thirty open ended questions with probes. Twenty eight drug users forty-five years of age and older were identified from concurrent field studies with IDUs and interviewed on their history of drug use, their current drug use, how they obtained drugs, where they use them, their concerns about health, changes they had made in their drug use and general lifestyle over the past decade, and their personal relationships with their families, friends, sex partners, and drug partners. Respondents were paid $20.00 for their time, and the same interviewer, who knew many of the respondents from previous studies, conducted all the interviews.[3] Respondents ranged from 50–70 years of age, and included 24 males and four females, approximately evenly distributed among Puerto Ricans and African Americans. All but two were injecting heroin or using crack at the time of the interview. The interviews were transcribed coded by theme and used to explain or illustrate the results of the survey data.

With these data we explored hypotheses with respect to risk behavior, protective behavior and network characteristics associated with age, ethnicity and age-ethnic cohorts. The primary hypothesis guiding this paper is that older drug users are reducing their drug related risk behaviors by using drugs by themselves, using clean needles, expanding their drug repertoires to include more non-inection drug use, entering short term treatment (detoxification) and reducing their connections with drug using members of their personal networks. We also hypothesized that older drug users would seek more protective social and health options such as drug treatment and more interaction with non-drug users and that, in response to increasing health and social isolation, they would seek re-engagement with family members. Third, we anticipated variations in these expected patterns by ethnicity. In our analyses, we first considered age differences and then examined the interaction of ethnicity and age in relation to risk and protective behaviors and characteristics of personal networks.

DIFFERENCES BETWEEN OLDER AND YOUNGER USERS IN DRUG USE BEHAVIORS

Drugs Used, Age of First Use and Frequency of Drug Use

We assumed that participants in our survey sample were polydrug users. Thus we first examined the number of drugs used by cohort, to determine whether age was associated with number of drugs consumed. We created an index of all current (past thirty day) drug use with a range of 0–8. There are differences across age cohorts in number of drugs used [f. 2.825, df.3, Sig. 0.039], with a significant drop in drug use appearing in the oldest cohort. When we consider the interaction of age and ethnicity (younger vs. older Puerto Ricans and African Americans) with drug use, the significant overall differences by age disappear. Figure 1 shows an interaction between amount of drug use and age between the two ethnic groups with increases over time among African Americans and decreases over time among Puerto Ricans.

The mean age of initiation of most drugs was later for older than younger users. However, on average, older Puerto Ricans reported initiating cocaine and heroin use (sniffed or injected) injected speedball (a mixture of cocaine and heroin) and use of another opiate (percodan or codine) significantly later than younger Puerto Ricans or African Americans in both age groups (see Table 1).

There were few significant differences across age groupings in 30 day and 24 hour use of drugs although older users tended to inject more. However, a comparison of means across age/ethnic groupings (older and younger Puerto Ricans and African Americans) shows a more complicated pattern for 30 day use of drugs. African Americans reported using alcohol significantly more often

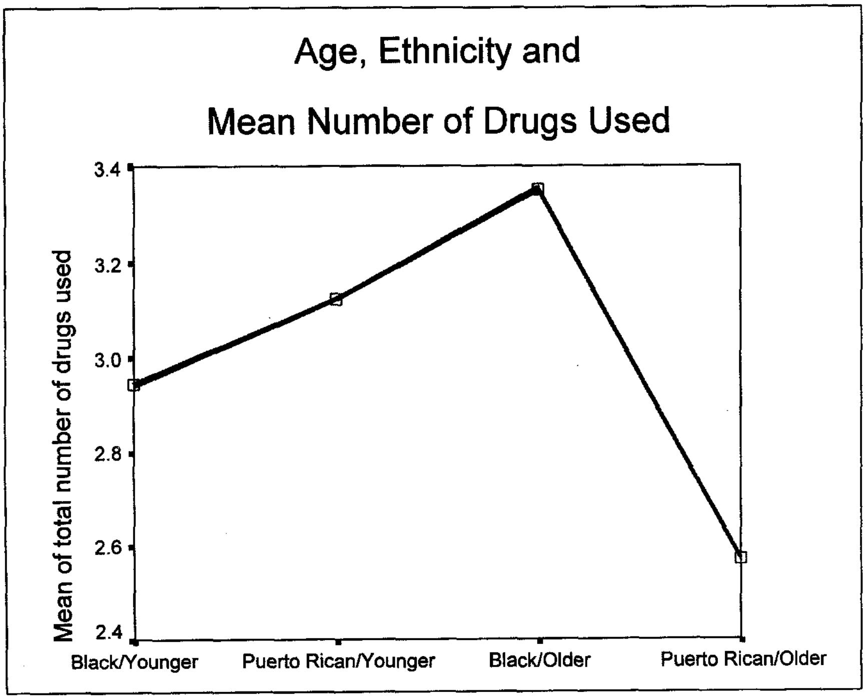

Fig. 1. The Interaction of Age, Ethnicity and Mean Number of Drugs Used.

Table 1. Means for Age of Drug Initiation Across Age/Ethnic Groups.

Variable	Younger African Americans	Younger Puerto Ricans	Older African Americans	Older Puerto Ricans	Significance
Alcohol	13	15	14	16	f. = 3.564, Sig. = 0.015
Marijuana	13.8	14.8	15.5	17.5	f. = 5.335, Sig. = 0.001
Crack	23.5	23.3	33.7	33.6	f. = 23.473, Sig. > 0.001
Sniffed Cocaine	20.2	18.6	21.6	23	f. = 5.432, Sig. = 0.001
Sniffed Heroin	21.8	20.8	21.7	26.6	f. = 5.766, Sig. = 0.001
Injected Heroin	20.7	22.2	19.5	25	f. = 3.468, Sig. = 0.018

than Puerto Ricans, regardless of age. Younger African Americans use alcohol more often than anyone else, though alcohol decreased somewhat with age in this group. Younger African Americans and Puerto Ricans reported using marijuana more often than their older counterparts. African Americans use crack twice as often as Puerto Ricans but older African Americans are reducing the frequency of their crack use by half whereas older Puerto Ricans continue to use crack at the same rate. Puerto Ricans of all ages inject heroin at about the same rate and at higher levels than African Americans. Among African Americans, despite lower overall use, frequency and amount of use increases with age. Finally, older African Americans inject speedball three times more often than anyone else (See Table 2). In sum, younger users inject drugs more frequently than older users but African American injectors actually show an increase in overall frequency of injection use with age (see Fig. 2).

These data suggest that while risk of HIV exposure through frequency of injected drug use seems to be stable across age cohorts for Puerto Ricans, among African Americans it increases. At the same time African American older drug users have a broader repertoire of drugs than older Puerto Ricans and thus are in a better position to diversify their drug use and reduce their risk exposure.

In-depth interview data tends to corroborate these findings. Many of those interviewed say they have reduced their drug use either because it has become increasingly difficult to obtain drugs, or because they fear being assaulted or jailed. As Sam, an African American 50 year old, noted, "like I said, most of

Table 2. Mean 30-Day Consumption of Drugs by Age/Ethnic Cohorts.

Variable	Younger African Americans	Younger Puerto Ricans	Older African Americans	Older Puerto Ricans	Significance
Alcohol	15.52	8.33	13	9.04	f. = 4.789, Sig. = 0.03
Marijuana	3.94	4.35	1.17	1.22	f. = 3.072, Sig. = 0.031
Crack	20.3	8.66	11.33	9.21	f. = 23.473, Sig. > 0.001
Sniffed Heroin	4.55	10.34	2.93	9.08	f. = 4.539, Sig. = 0.004
Injected Heroin	14.95	24.83	19.07	23.27	f. = 5.386, Sig. = 0.001
Injected Speedball	5.79	5.85	16.79	7.88	f. = 11.520, Sig. > 0.001

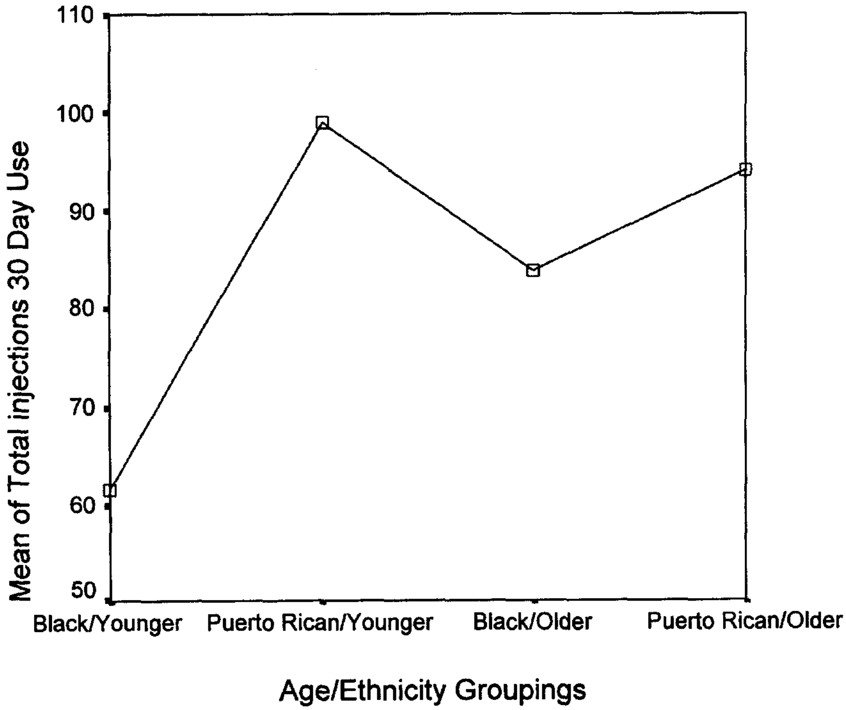

Fig. 2. Mean Number of Injections Compared Across Age/Ethnic Groupings.

those people I know that are around my age, they start a bag early .... you know, between nine and two, nine in the morning till two in the afternoon, and they'll call it a day, you know." George, another African American older heroin user, when asked how he has been able to control how much he uses, said "Well I try to control it. I don't want to get strung out. I try not to get strung out. Sometimes I get down two or three days, then I go in the house stay two or three days .... I try to stay busy, go to see my sister, I go to the library and read ... you have to budget yourself". He drinks alcohol to prolong the high. He adds that he knows quite a few people of his age who are still using drugs, paying for them with their limited incomes "and they budget it, you know. They might do one or two bags ... and some of them deals."

Selecting Less Risky Sites in Which to Use Drugs

The locations in which people choose to use drugs play a role in exposing them to HIV as well as other risks such as violence, abuse, or imprisonment. Older drug users have physical and psychological limitations that promote a search for safer locations where violence directed toward them by other drug users or the police is less likely. Respondents were asked to estimate how frequently they used drugs alone. More older African Americans reported using drugs alone than expected, in contrast to Puerto Ricans and younger African Americans (Eta approximate T –2.118; Sig. 0.036). They were then asked to identify their first and second preferences for drug use sites. Choices included using drugs alone, with others in private apartments, hotel rooms or cars, using drugs in enclosed public places (mainly abandoned buildings) or in exposed public places (stairways in occupied buildings, public bathrooms or parks, cemetaries and vacant lots). Older African Americans favored using drugs in enclosed spaces, either their own or someone else's house/apartment. Both younger and older Puerto Ricans reported using enclosed outside spaces or an abandoned building where it is possible to enter and leave quickly, to inject or smoke alone, and to watch for the police. With age, older users avoid exposed outside locations as too risky.[4]

When asked where he uses drugs, Roberto describes bathrooms, restaurants, abandoned or burnt out buildings.

> You can go down on Smith street, and you usually go into the bathrooms and use. You can go to a restaurant. You can go in an abandoned building. You can use a lot of places. I like to go to a special place, like a lot of guys go to XXX hospital or restaurant you know. . . I don't like to go there because you have a big chance of getting caught. I go sometimes to the abandoned building, you carry your own water, your own cooker, you go to your friend's house, a lot of people go in a burnt house or to an abandoned building, or in the car, sometimes we go near the river, park the car and we do it there.

In in-depth interviews, older respondents expressed concern about their safety as well as the desire to hide their drug use from family and friends. An older Puerto Rican woman for example, reports that she sniffs heroin in the bathroom and in a nearby abandoned building to keep her drug use from her family. Drug users readily differentiate their efforts to protect themselves now from their drug use behavior in the past. George says: "the police are harder now. . . they be on the corner every day. They're always around the place. It's hard out there and I can't stand no bust. And money's scarce now – winter time. Don't nobody got no money. I don't like to hang out with them you know. I just do my thing, go on home, I want to read. I reads a lot." Roberto, an older Puerto Rican heroin user says that life has changed with age.

> When you're younger you can jump a fence..you're faster . . . when you're older you can't fight, if you're sick you can't fight. If you're sick all the way you're going to lose. You got a 99% or 100% chance that you're going to get hurt . . . it's tough when you get older, you don't know too many people and anybody can come and give you a holdup, get your dope.

"Tired" is a term that many respondents use to describe their feelings about their lifestyle. Enrique, a Puerto Rican former drug user in his fifties, now on methadone says:

> The drug using changed me a lot. I'm tired, I'm so tired. And as I get older, I'm tired, I'm trying to hang up my glove, you know. I'm so tired. I cannot hustle the way I used to hustle. I'm a lot slower. And age, when you see, when you first start getting ready to quit drugs, it's when you hit bottom . . .

Obtaining Needles

Source of syringe can be viewed as contributing more or less to HIV risk exposure. For example, using a needle exchange program or the pharmacy to obtain needles is less risky because procurers are likely to know about and use their clean needles only once, to avoid transferring them to someone else and to refrain from using syringes previously used by another individual. Obtaining needles on the street, receiving a used needle, or borrowing or renting a needle are examples of behaviors that expose individuals to risk of HIV infection. A Chi Square test was conducted to examine the relationship between age cohort and source of syringes. Source of needles was recoded into three categories with respect to safety: Needle exchange program, pharmacies or from a diabetic, and other sources on the street (for example loan, rental, theft or found). Age alone is unrelated to source of syringes. When asked where they obtained syringes during the past 30 days, respondents reported equal likelihood of using the Needle Exchange Program across age and ethnicity groupings but younger

Puerto Ricans were more likely to obtain their syringes on the street (X^2, 23.732, Sig. < 0.001) or by borrowing them from someone else (X^2 9.056, Sig. = 0.02), than older African Americans. Respondents were asked to indicate where they obtained most of their needles in the past 30 days. Blacks were more likely to use a pharmacy while younger Puerto Ricans are more likely to use riskier methods of getting needles. ($X^2 = 23.522$, df. 2, sig. = 0.005). This is supported by qualitative interviews with older users who say that they are taking care to avoid sharing needles or using potentially infected needles. There was no significant difference across age groups in the number of times users injected with used needles nor any difference in the estimated number of times the respondent injected alone. However there are differences by age (but not by ethnicity) in the number of times respondents injected with others, with mean rates lower in older users. Further there is a significantly greater probability that an African American drug user will have used a needle formerly used by an HIV-infected person (chi square 37.939, df. 9. sig. > 0.001).

Indepth interviews reveal that older drug users recognize the dangers associated with transferring needles. Most heroin and speedball users said that they took care of their own needs and, even if they used drugs with one or two other people, did not share their needles. When asked where he obtained his needles, Enrique said "my needles, I go to the drug store and exchange them. I'd buy them." Another Puerto Rican drug user gets his needles "on the wagon on the street. The van comes in the morning Monday through Friday. "Sometimes," he says, "you buy them in the drugstore, sometimes you buy them from somebody on the street, people that use insulin, they sell it for you or they give it to you free." Typical of other older users, this gentleman said that in the past like everyone else, he used other people's needles:

> Before, a long time ago everybody do the same thing. Sometimes you need a needle and you don't got it, or the one you got is stuck, you use somebody else's. You clean it and you use it. You clean it with water a couple of times and then you use it." He gives his needles to other people, telling them to clean well. But, he says, "you tell them clean it, you know the people sometimes are in a hurry, that's the mistake they make when they are in a hurry, they don't clean it too good and that's how you can get infected . . .

When asked how he obtained his needles, another African American user mentioned a drug store, pharmacy, off the street, and the trucks that pass them out. Responding to whether he ever uses needles that have been used before, he said emphatically:

> no, no, no, no. I have done it years ago, once or twice, but as a rule I keep my own because of the disease. I ain't tryin' to leave, I try and give myself all the opportunities possible to stay alive.

To prevent infecting others, Carlos, an older heroin user who is seropositive makes a point of saying that he does not share his own used needles or works with anyone. He does, however, use needles that others give him. He says "Yeah, yeah, yeah, yeah. I still do it. I still do it. I use other people's. (But) I wouldn't give mine to nobody." After he uses his needles he says, "I throw it away, I broke 'em or I save 'em for next time. But I ain't givin' no cookers to nobody. I don't give my needles to nobody. I tell 'em what I got. If you wanna use it" you know, that's his business. I tell him. Look here, I got HIV". Carlos tells people that he is HIV infected and the choice to use his syringes and works is up to them.

Accessing and Using Drug Treatment

Drug treatment is an option for all drug users. Since there are few long-term facilities, most drug users are compelled to use short-term treatment and detoxification programs. They use these programs to reduce their drug intake and to assist them to modulate their drug use or even to try to stop using drugs on their own. The difficulties of finding and paying for street drugs on a regular basis induces older drug users into treatment twice as often as younger users – 63% of oldest users (aged 50 and over) reported that they sought treatment in the thirty days prior to their interview, vs. 38% across the other cohorts. There were no inter-ethnic differences. George, an older African American heroin user describes why he enters treatment:

> 'Cause I didn't have anything come to and I got tired of doin' heroin. And then I was doin' a little boostin', goin' to the store and stuff and I got busted. I'm tired of that. Now I can't stand no more busts. I know that it's wrong. I just got tired. I'm tired of it all. I'm too old for this, you know what I'm sayin'. I'm tired.

Another older African American man combines methadone treatment with alcohol and the intermittent use of other drugs which he obtains through a variety of means including selling, brokering drugs, and charging for the use of his apartment. A Puerto Rican gentleman on methadone for six years entered his program because he "hit bottom" when his wife, tired of his drug use, threatened to leave him.

DIFFERENCES IN SEX RISK BEHAVIOR BETWEEN OLDER AND YOUNGER USERS

Survey data from our study of drug use in high risk sites suggests that older drug users of both ethnic groups are less at risk for HIV infection through unprotected sex than other cohorts. First, the percentage of respondents reporting no penetrative anal, oral or vaginal sexual activity in the last 30 days in the oldest cohort was double that in other cohorts (60% for those over 50 vs. 30–35% in all other age groups). Older users also reported having sex with fewer people and less often than those in other groups. For example, the mean number of people with whom older drug users had sex of any kind was 1.2; for other groups it ranged from 1.5–1.8. The mean number of times in the past 30 days that older users had sex was three times less (7.3) than that of the youngest group (20.5). At the same time, while older users had less sex, the number of times they had sex without a condom in the previous 30 days was higher (mean of 2.2 for older users, vs. 1.5 for all other users), suggesting that they had more confidence in their long-term partners, knew less about the potential for HIV infection through unprotected penetrative sex, or possibly had difficulty maintaining an erection while using a condom. Nevertheless, the mean number of times in the past 30 days that the youngest drug users had had sex without protection was twice as high as that of the oldest group.

Older users do use condoms, however. One older African American uses condoms consistently with his girlfriend of three years, despite her reluctance to do so.

> Otherwise ain't nothin' happenin'. She don't like it. She didn't like the way it feels. Ain't about feelin'. It's about staying alive. I'm not gamblin' I don't care. You think you know (he says about her HIV status). I am not gamblin' so you gonna do it my way or we ain't doin' it at all." He sees condom use as a sign of responsibility and respectability in the context of his drug use "I don't be feenin'. Take it or leave it".

Ethnicity does make a difference in terms of frequency of unprotected sex in risky places. Overall, mean frequency of unprotected sex drops with age for African Americans but increases for Puerto Ricans (see Table 3). Older African American respondents reported more sexual partners, and more unprotected sex with non-regular partners in comparison to older Puerto Ricans. Mean rates of unprotected sex in a drug use site, while smoking crack were higher among African American than Puerto Rican respondents and did not drop with age. Mean rates of exchanging sex for drugs or money were higher among African Americans than Puerto Ricans, but dropped with age for African Americans and increased for Puerto Rican respondents. Ethnicity, not age, was the best predictor of using a needle obtained from someone infected with HIV, of HIV status, or of having ever been treated for an STD.

When interviewed in greater depth about their sex partners and their sexual activity, older drug users describe having fewer partners, and less sexual activity. Perhaps one reason why older users are taking more precautions is because they indicate knowing over twice as many people who have been infected with HIV or have died of AIDS – a mean of approximately 10 for younger and 19 for older Puerto Rican and African American respondents. Furthermore, they record

Table 3. Sex Behaviors Leading to HIV Risk – 30-Day Means.

Variable	African American Younger	Puerto Rican Younger	African American Older	Puerto Rican Older	Significance
No. of sex partners, past 30 days	3.49	1.16	2.09	0.54	f. 4.384, df. 3, Sig. = 0.005
No. of different sex partners without latex protection	2.81	0.80	1.45	2.71	f. 2.558, df. 3, Sig. = 0.05
Mean unprotected sex – regular partner	12.77	11.41	9.22	11.08	f = 2.467, df. 3, Sig. = 0.067
Mean unprotected sex – irregular partner	6.86	0.95	2.96	0.17	f = 3.794, df. 3, Sig. = 0.013
Mean unprotected sex – crack smoker	4.09	0.70	4.15	0.33	f = 3.278, df. 3, Sig. = 0.024
Mean use of High Risk Drug Site	4.82	0.58	4.37	0.67	f = 2.473, df. 3, Sig. = 0.066
Mean days trading sex for drugs/money	7.50	0.55	2.22	1.7	f = 5.449, df. 3, Sig. = 0.002
Diagnosed with STD	higher than expected	lower than expected	higher than expected	lower than expected	X = 35.057, df. 3, Sig. > 0.001
Diagnosed with HIV	higher than expected	lower than expected	higher than expected	lower than expected	X = 10.444, df. 3, Sig. = 0.01
Used needle of someone with HIV	higher than expected	lower than expected	higher than expected	lower than expected	X = 18.502, df. 3, Sig. > 0.001

that they have lost many of their drug using partners to prison or death. As one older Puerto Rican man said:

> "I've been using drugs 'um, gettin' close to 30. 30, 31 years, somewhere around there. I hooked up with my cousin Anthony who's dead today. Everyone that I know is dead. They all died from that same thing (HIV) .... The crowd that I hung out with in New York .... They're all dead ... Yeah, all shooters. Yeah, I guess that's why they're all dead. They were nice people. They weren't your. . .that. . .that image that's created that all junkies are evil individuals ..." A second, African American man lost fifteen friends to AIDS and drug use and was worried about his own survival. R: "I'm tryin'. And I'm gonna do, I'm gonna make it better. I know ________ you know what I'm sayin'. I know right from wrong. I know this one way thing is death. Drugs are death. One way situation, you know? You know? A lotta my friends and stuff, they gone. They're on drugs, you know what I'm sayin'? Dead end street ... [I lost] 15 maybe from drugs and the virus .... A lotta my friends. Close friends from all over, you know, Connecticut. I lived near Stamford 7, 8 years. Bridgeport. Norwalk. New Haven. You know what I'm sayin'?"

DIFFERENCES IN NETWORK CHARACTERISTICS BETWEEN OLDER AND YOUNGER USERS

The most interesting implications of these data lie with differences in personal and macro-network characteristics across age cohorts. In the next section of the paper, we consider differences among age cohorts in their relationships with drug using and kin networks. First, we consider age differences in personal or 'ego-centered' networks, with respect to closeness, intensity of interaction and patterns of drug use.

Characteristics of Personal Networks

We first considered differences by age cohort. In our analysis, we differentiated between drug using and non-drug using network members, and kin and non-kin network members. This allowed us to generate a matrix of network members by type of relationship and drug use (kin drug and non-drug users, and non-kin drug and non-drug users). We found few significant differences across age cohorts in overall network size, mean number of kin and non-kin network members, or drug network size. Drug users in the two older cohorts (40 and over) knew their network members approximately twice as long as those in the two younger cohorts (18–39). There was no difference across age cohorts in frequency of interaction with network members, including drug using members of networks, in the previous 30 days although younger respondents reported somewhat more interaction with drug using network members than older drug users. There was no difference across age cohorts in in mean number of injectors in personal networks.

Table 4. Age Cohorts and Means: Network Characteristics.

Variable	Age Group 18–29	Age Group 30–39	Age Group 40–49	Age Group 50 +
Overall Mean Network Size	5.5	5.4	6.5	6.3
Mean Number of Kin in Network	1.1	0.89	0.82	0.80
Mean Number of Drug Users in Network	4.5	4.4	5.2	4.8
Mean Time **All** Network Members Know Each Other	5.6	9.2	13.4	12.3
Mean Frequency of interaction of last 30 days	21.3	19.5	18.1	16.9
Mean Time **Drug** Network Members Know Each Other	4.4	8.4	12.1	12.9
Mean Frequency of Interaction Drug Network Members, Last 30 days	21.8	20.9	18	18
Mean No. of Drug Using Kin in Networks	0.6	0.5	0.1	0.3
Mean Network Strength	2.1	2.1	1.9	2.2
Mean Drug Network Strength	1.9	2.0	1.8	2.1
Mean No. of Injectors	3.2	2.8	3.90	3.0

Disaggregating the Effects of Age and Ethnicity

Our ethnically mixed survey sample included relatively larger numbers of Puerto Ricans in the two younger cohorts, and more African Americans in the two older cohorts. To explore the interaction of ethnicity and age, we constructed a variable with four categories: younger (20–39) and older (40 and over) Puerto Ricans and African Americans.

Inter-ethnic but not inter-age differences were significant in almost all cases. African Americans have larger networks, more network members, and have

Table 5. Age/Ethnicity Cohorts and Means: Network Characteristics.

Variable	African American Younger	Puerto Rican Younger	African American Older	Puerto Rican Older	Significance
Overall Network Size	7.8	4.5	7.3	4.4	F. = 21.761, P. > 0.001
Mean Number of Kin in Network	1.8	1.3	0.76	0.69	P. 0.639
Mean Number of Drug Users in Network	6.2	3.7	5.8	3.6	F. = 15.989, P. > 0.001
Mean Time **All** Network Members Know Each Other	11.3	6.9	16.5	9.0	F. = 15.866, P. > 0.001
Mean Frequency of Interaction **All** Members last 30 days	14.2	22.5	16.1	22.4	F. = 14.389, P. > 0.001
Mean Time **Drug** Network Members Know Each Other	11.0	5.7	16.2	6.0	F. = 20.730, P. > 0.001
Frequency of Interaction Drug Network, Last 30 days	14.7	23.1	16.6	21.8	F. = 13.741, P. > 0.001
Mean No. of Drug Using Kin in Networks	0.74	0.53	0.21	0.19	F. = 4.318, P. = 0.006
Network Strength	1.9	2.2	1.9	2.3	F. = 2.363, P. = 0.073
Drug Network Strength	1.8	2.1	1.8	2.2	F. = 1.788, P. = 0.151
Mean No. of Injectors	3.1	2.9	3.1	2.7	P. = 0.896

known their network members longer including members of their networks who use drugs. But they have somewhat weaker connections with their networks. Younger African Americans have more drug using members and more drug using relatives in their networks than older African Americans. Puerto Ricans regardless of age have smaller and newer networks, and fewer drug users in their networks. But they report somewhat stronger connections with network members and interact with them more often. Mean number of drug using relatives in participants' networks drops with age, leaving older drug users from both groups with fewer family members upon whom to rely in case of need or crisis. These data suggest that with the exception of relationships with relatives, ethnicity and socio-cultural factors rather than age are associated with differences in personal network characteristics of drug users and network associations established in early adulthood continue through middle and later years.

There are differences by ethnicity as well as age in the percentages of network members engaging in risky behavior. More network members of older in comparison to younger drug users reported obtaining needles from the NEP (36% vs. 26%). The mean percentage of network members who are reported to use ego's used needles is highest among younger Puerto Ricans (12%), drops for older users and is lowest (9%) for older Puerto Ricans. The mean percentage of network members who share cookers with the index person is stable across all groupings (5%) except for younger Puerto Ricans for whom the mean is slightly lower (3%). These differences suggest trends but are not significant.

OLDER DRUG USERS IN RELATION TO MACRO-NETWORKS

Next we consider the location of older adults in ethnically differentiated macro-networks. These macro-networks were constructed manually, by connecting index participants and their named personal networks. Macro networks were constructed for each of the two primary ethnic groups in the study. In each instance, one large and a number of much smaller networks were generated. The predominantly African American networks were located in the northern part of the city, and the predominantly Puerto Rican networks in the southern part of the city. The largest African American network included approximately 65% of African American drug users in the study; the largest Puerto Rican network included almost 80% of all Puerto Ricans in the study sample. Neither African American nor Puerto Rican respondents, regardless of age, mention many members of other ethnic groups in their personal networks. Thus, in general, there appears to be little ethnic cross-over among network members although the Puerto Rican network includes several white and African American drug users. This is not surprising given the political geography and the economy of the city, divided by a non-residential downtown economic center, and an historical plan to segregate Puerto Ricans in the central and southern part of the city, and African Americans in the northern neighborhoods. The data indicate that older African American drug users (both seropositive and seronegative) are more centrally located in a larger dispersed network (Diagram 1); older Puerto Ricans regardless of serostatus, are marginal to theirs (Diagram 2).

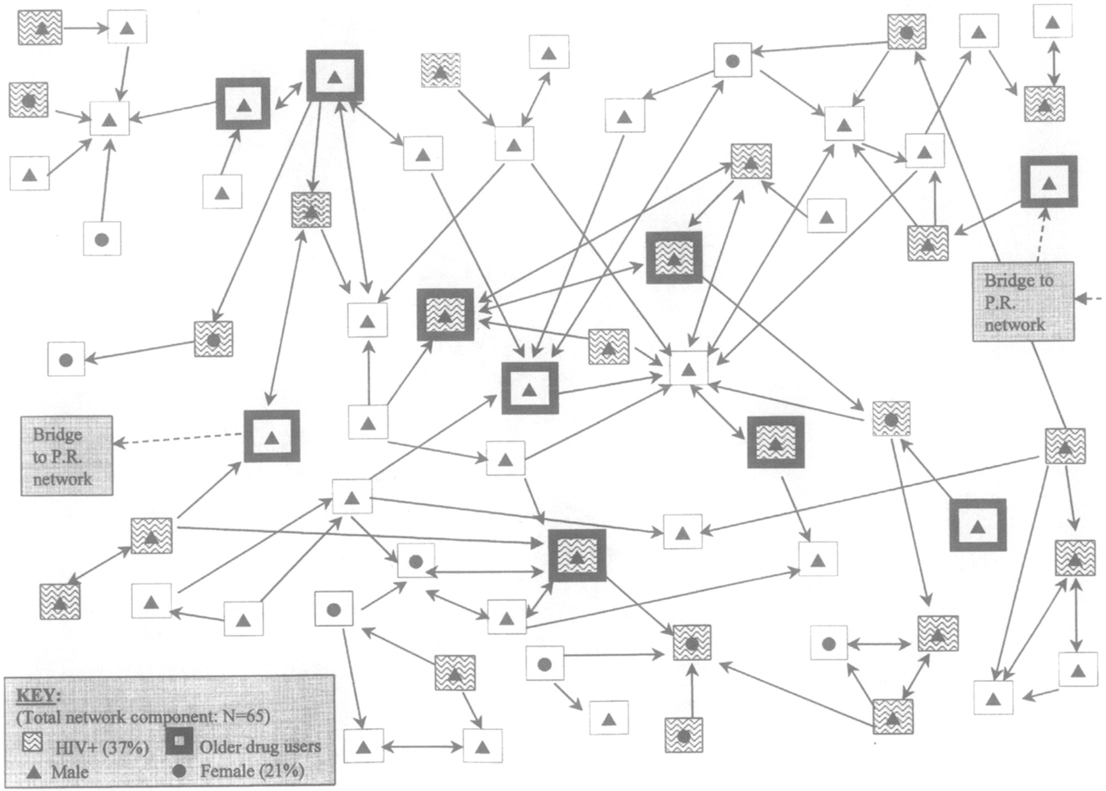

Diagram 1. African American Drug Network: Older Users in Largest Connected Component.

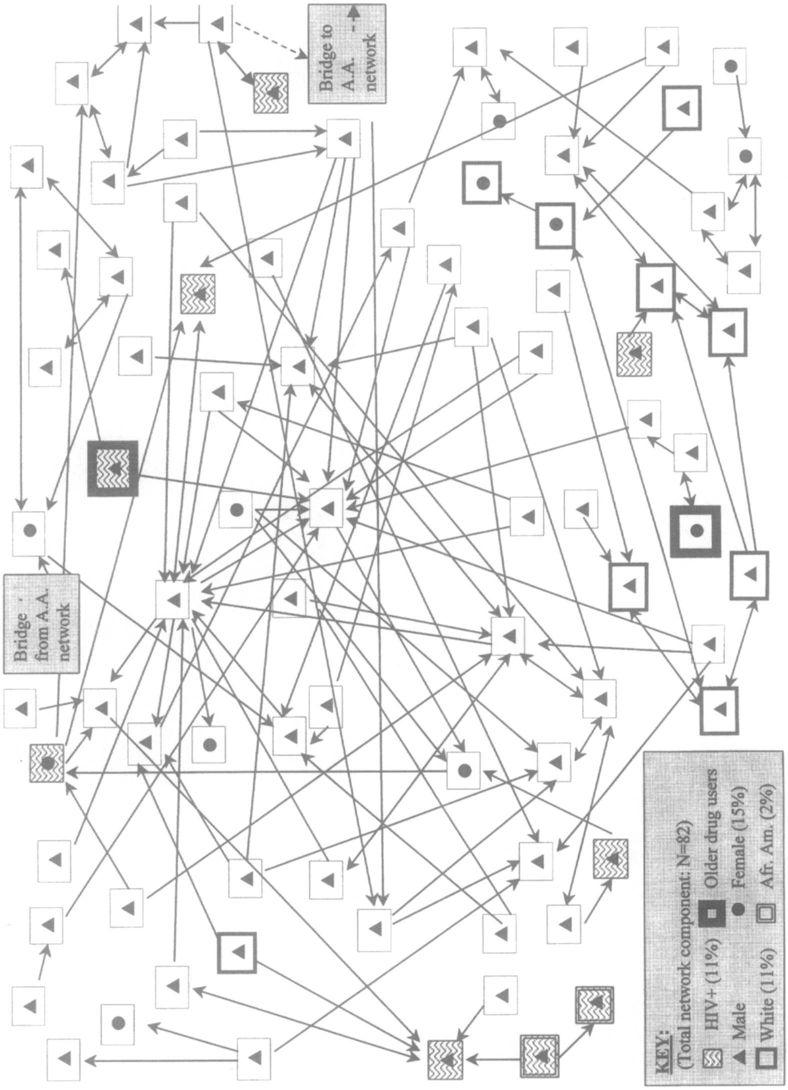

Diagram 2. Puerto Rican/White Drug Network: Older Users in Largest Connected Component.

DISCUSSION AND CONCLUSIONS

We hypothesized, earlier in this paper, that older drug users would reduce their drug and sex risk behaviors, and that their social networks would reflect these reductions. What we have discovered is a more complex picture. With respect to some behaviors, patterns of use and social relations established in earlier years persist into older adulthood. In others, there are age or ethnic differences and in still others the interaction of age and ethnicity produce important differences.

Both groups are maintaining patterns of social relations established earlier, which serve in the case of African Americans to increase exposure to HIV and in the case of Puerto Ricans, to decrease exposure. Furthermore, unlike older Puerto Ricans who tend to reduce overall drug use as well as injection drug use, older African Americans increase their drug use repertoire, and their injecting drug use rises rather than declines over time, especially with respect to speedball. In addition, noticeably absent in most indepth interviews with older African Americans is reference to family (with the exception of mothers), non-drug using friends, children or other associates. Drug and life history accounts of Puerto Rican older adults, on the contrary, often mention wives or life partners, children, siblings, parents, non-drug using friends and other members of a much larger personal network on which they can depend for assistance, companionship and other resources as well as assistance in leaving addiction behind. Older Puerto Ricans also mention methadone programs, church affiliations, spiritual resources, and histories of employment including working in family businesses.

African Americans migrated in large numbers to Hartford and other cities of the north during and after World War II. Like Puerto Ricans, they became integrated into the northern economy as industrial workers and tobacco pickers. The communities they established in the 1940s and 1950s took root throughout the city. In the early 1960s the fragile African American business economy was undermined, first by urban developers' interests, then by the disintegration of the industrial economy, and later, investments, banking and real estate. More recently, as the insurance capital of the Northeastern United States has shifted to other locations, most notably Philadelphia, the role of the insurance industry in employment and urban development has also declined. Urban segregation (Puerto Ricans in the central and southern part of the city and African Americans in the northern neighborhoods) has been coupled with the consolidation of economic interests in the hands of an alliance of city politicians and developers. This socio-political and economic process continues to the present, first undermining the economic role of adult males, later of adult women and, with the decline of the public school system, the income generating potential of children and youth. At the same time, however, African Americans have been long-term residents of the city. Families know each other, children attend school together, and long-term relationships are forged which come into play as people enter and move away from drug use. African American drug users have friends, family members, acquaintances and connections, many of whom have been drawn into and deeply harmed by drug use and the drug trade.

The boundaries between "respectable behavior" and drug use are clearcut in the African American community. Youth draw marked social distinctions between alcohol and marijuana and cocaine and heroin, fearing transition to the life of the "dope fiend" and begin hard drug use later than Puerto Ricans. African American drug users who have shifted to sniffing or injecting cocaine, heroin or speedball tend to develop large, quasi-intimate networks of other drug users whose resources they can draw upon intermittently when they need new sources of drugs, "running buddies", money or a place to stay. They know enough people so that they can usually find an apartment, house or safe indoor location in which to inject, generally with one or two other people. In interviewes with African American older drug users, family members other than mothers are rarely mentioned and close friends tend to be those drug users who have survived violence, overdoses and HIV/AIDS infection. Despite these experiences, they continue to inject drugs, transfer needles, and share cookers.

Puerto Rican adults – even older male adults – have lived in the city for much less time than African Americans. They tend to have a history of employment, often with family members or family friends, remain connected to spouses or former girlfriends, and maintain more contact with children and grandchildren. Like African American users, they seem troubled and embarrassed by their drug use, and have found many ways to reduce or even to eliminate it, including detoxification and methadone treatment. Drug use is viewed as inappropriate for older adults who should be acting as role models for their families. The combination of peripheral placement in large social networks, care with needle use, association with network members who clean and exchange needles and reduced number of sexual partners suggests that older Puerto Rican drug users are significantly less likely than their African American counterparts to become infected or to infect others with the HIV virus.

By virtue of their central position in their networks, African American older adults are potentially at greater risk of both infecting and becoming infected by others. African American older drug users are taking some steps to reduce exposing themselves or others to HIV by diversifying their drug use, using needles that they have obtained from safer places even when using drugs inside with people they know, reducing their number of sex partners, and reducing the frequency of unprotected sexual encounters in a variety of different circumstances. Unfortunately, however, without additional intervention targeted specifically to older users, these efforts are not likely to be sufficient to moderate the spread of the infection in this group. Recent reports on increases in HIV risk in target populations suggest that, at least in Connecticut, women and Puerto Rican men are at highest risk. These data point to the need to continue HIV risk prevention with an overlooked population of older African American men who are well informed about risk, but find it difficult to translate their knowledge into practice because they are embedded in social networks and influenced by social contexts that make it difficult for them to make further changes in their lives without additional resources.

NOTES

1. NIMH Grant Number: P01 MH/DA56826, Project # 3 PI, Margaret Weeks, Ph.D., Co-PI, Merrill Singer, Ph.D., Jean Schensul, Ph.D. entitled "Study of High Risk Drug Use Settings for HIV Prevention," This grant, based at the Institute for Community Research in Hartford, is affiliated with the Yale Center for Interdisciplinary Research on AIDS (CIRA).

2. It was not possible to use other data sets for analysis for this paper because they were not network studies, and thus did not include quantitative data on egocentered or macronetworks.

3. NIA Grant #R01 AG16564, "AIDS Risk in Residents of Senior Housing," PI, Jean J. Schensul, Ph.D., Co-PI, Margaret Weeks, Ph.D.

4. Differences between actual and expected use of site choices by age/ethnic grouping are significant at the 0.001 level (Site type 1: Pearson $X^2 = 28.713$, df. 9, Sig. 0.001; Site type 2: Pearson $X^2 = 41.826$, df. 9, Sig. > 0.001).

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INFORMAL SOCIAL NETWORKS AND EPIDEMIC PREVENTION IN A THIRD WORLD CONTEXT: CHOLERA AND HIV/AIDS COMPARED

Victor Agadjanian

ABSTRACT

In societies where formal channels of diffusion of health risk and prevention-related information and practices are inadequate, informal social networks offer a powerful alternative. This study compares how social networks deal with two types of public health concerns – the prevention of cholera and HIV/AIDS. It is based on data from in-depth interviews and focus groups conducted in Maputo, Mozambique, in June-August of 1998 – in the aftermath of a major cholera epidemic and in the midst of an unraveling catastrophe of HIV/AIDS. For both diseases interaction through social networks compensates for the insufficient and inadequate information distributed through official channels. However, the differences in the latency period, course, and clinical manifestations of the two diseases affect the nature, mechanisms, and forms of social interaction. Because HIV/AIDS remains largely an abstract threat not

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supported by practical knowledge and everyday experience, HIV/AIDS-related social interaction transmits mainly rumors and unconfirmed suspicions. In addition, this interaction is constrained by traditional social barriers and distances, such as the ones based on gender and age, which may retard the rise of HIV/AIDS awareness in the community. In contrast, the symptoms of cholera are easily identified and understood, and the generalized threat of the epidemic spawns intensive and widespread interaction both within and across conventional social boundaries. This interaction mobilizes the community against the epidemic and helps individuals to improve the prevention of infection.

INTRODUCTION

In societies where formal channels of diffusion of health risk and prevention-related information and practices are underdeveloped and/or distrusted, informal social networks may offer a powerful complement and, often, even an alternative. Through their interaction with relatives, friends, neighbors, and coworkers people share information and opinions on the etiology, nature, symptoms, and consequences of health risks and diseases. Informal social networks not only facilitate the flow of this information, but also convey it differently from the formal channels. Information is transmitted in a comprehensible language and is tailored and interpreted in accordance with the network participants' cultural beliefs, social norms, and shared notions of health and illness. At the same time and for the same reason, social networks may misrepresent and misinterpret the real biological and physiological dimensions of a disease thereby increasing individuals' susceptibility. Importantly, social networks are not just vessels in which the information on health risks and diseases circulates and the notion and image of disease are constructed; they themselves may be transformed in this process – social distances and hierarchies rearranged and personal loyalties and trust reconsidered.

These processes, however, are contingent on the type of health risks in question. The degree of the social network mobilization and the intensity of social communication vary from one type of risk to another. With some health risks the distortion of the real causes, characteristics, and consequences of the disease can be greater and therefore the effectiveness of preventive and curative measures lower than with others.

In this study I focus on the informational aspect of informal social networks and analyze how such networks deal with two different types of public health concerns – the prevention of cholera and of HIV/AIDS – in a third world setting. The analysis is based primarily on data from in-depth individual interviews and focus groups discussions conducted in Maputo, Mozambique, in 1998 – in the aftermath of a major cholera epidemic and in the midst of an unraveling catastrophe of HIV/AIDS.

The growing body of research on social networks and health has predominantly focused on how social networks influence health status or help ill people and their families to cope with their ailments (e.g. Auslander, 1998; Becker et al., 1997; Castro et al., 1997; Pescosolido, 1991, 1992; Pescosolido et al., 1998; Wellman, 1998). Numerous studies have examined the spread of HIV through social networks (e.g. Anderson, 1992; Barcellos & Bastos, 1996; Caldwell et al., 1989, 1999; Konings & Caraël, 1997; Morris, 1993). Relatively little, however, is known about how social networking can help to prevent HIV infection and other infectious diseases, but existing studies suggest that it may play a significant positive role (e.g. Goldman et al., 1998; Heckathorn, 1999; Helitzer-Allen, 1994; Kawewe, 1996).

The role of social networks in health-related decisions and practices is further underscored by the importance of self-care in developing settings. Because of financial, logistical, and cultural barriers, individuals' access to the western health system is often limited, and individuals tend to rely on self-treatment and other alternative forms of care (Crandon, 1983; Delgado et al., 1994). Social networks serve to identify and legitimize such alternative forms and sources of care (Crandon, 1983). Even with respect to the more formalized western health care system, however, social communication in peer networks helps people to rationalize and accept the procedures or treatments. This particularly holds for relatively new medical technologies and procedures, as has been shown by research on contraceptive acceptance (Agadjanian, 2001; Bongaarts & Watkins, 1997; Kincaid, 2000; Kohler, 1997; Montgomery & Casterline, 1996; Montgomery & Chung, 1999; Rutenberg & Watkins, 1997; Valente et al., 1997).

HISTORICAL AND EPIDEMIOLOGICAL SETTING

Maputo, the setting of this study, is a rapidly and chaotically growing metropolis. The 1997 National Census counted just under one million residents in Maputo (Census, 1998), but this figure could well underestimate the city's actual population size. Since colonial times, Maputo has been informally divided into two main sections: the so-called "cement city" – the city core with high-rise commercial and residential buildings and other typical elements of urban infrastructure, built mainly during the late colonial period, and the sprawling "reed city" – an endless sea of primitive and often precarious constructions, built with little planning and largely without electricity and running water – surrounding the city's cement core. After Mozambique's independence from Portugal in 1975 many of the cement city's white inhabitants, frightened by the specter of racial revenge and by a wide-range nationalization carried out by the socialist FRELIMO government, left for Portugal or South Africa. Thousands of Africans, many of them recent migrants, moved into the city's vacated apartments and houses. The migration flow into the city increased considerably during the civil war that battered Mozambique's countryside from the late 1970s until 1992. The economic devastation caused by the war and aggravated by mismanagement led to a rapid decline of the urban infrastructure and services. The city that was built to house some three or four hundred thousand people has seen its population swell to three times that number (Ibraimu, 1994). Although the end of the war and the onset of nationwide economic restructuring since the late 1990s have returned some orderliness to the city's growth, its numerous economic and infrastructural inadequacies have shown few signs of abatement.

Cholera

Abject poverty, urban mismanagement, and rapid population growth have strained the city's health care system and made its population extremely vulnerable to epidemiological hazards. As in other similar settings, cholera had visited Maputo on several occasions (Aragon et al., 1994), but the time elapsed from the previous and relatively mild outbreak in 1992 was sufficient for society's memories of the scourge to fade. Thus, the 1997 epidemic caught this urban society unprepared both psychologically and epidemiologically. This time it was not just another episode of an almost forgotten plague; the epidemic struck with unprecedented force and swiftness, initially paralyzing the city health care system and spreading panic among the million plus city denizens. To aggravate the situation, the strain of cholera, believed to have been brought to southern Mozambique by refugees from Africa's Great Lakes region, was resistant to common antibiotics available in the city health institutions, and the treatment had to rely on the scarce equipment and dwindling supply of serum for rehydration therapy.

The city government and its health sector failed to adequately confront the cholera epidemic in its early phase. As the epidemic worsened, the government and health officials continued making meaningless statements about the situation being "under control" and "improving" or clumsily cracking down on street vendors of prepared food. The health authorities' inept and misguided response in the beginning of the epidemic only magnified the generalized public bewilderment and outrage (Africa News Service, 1998; Panafrican News

Agency, 1997; WHO, 1997). Several months passed and hundreds of people died in the city and in other parts of the country before emergency supplies of necessary medical material were received, large-scale and effective preventive and curative measures were deployed and the epidemic gradually subsided (Panafrican News Agency, 1998). Although outbreaks of cholera have been reported in various parts of Mozambique in years to follow, none of them has come close to the magnitude of the 1997 epidemic.

HIV/AIDS

Although the HIV/AIDS pandemic has been present in the central and southern parts of sub-Saharan Africa for many years and has already left devastating scars on the population of several countries, relatively little systematic information is available on HIV/AIDS in Mozambique, and in its capital city in particular. According to the Ministry of Health estimates, around 13% of adult Mozambicans (age 15–49) were infected by the turn of the century, with the estimated seroprevalence level in Maputo being close to the national average (Ministry of Health, 2001). The levels of seroprevalence in neighboring countries and the voluminous and highly intensive labor migration between southern Mozambique, where Maputo is situated, and South Africa, as well as my private conversations with local physicians and health workers all suggest that even that figure may be an underestimation, and the epidemic may be already reaching catastrophic, even if yet hidden, proportions.

The relative dearth of reliable official statistics on HIV/AIDS in Mozambique does not mean that the populace, especially in urban areas, is unaware of the disease and its devastating consequences. In fact, the AIDS problematique has firmly established itself as a prominent part of the public health discourse, and references to it are regularly made in the mass media. What is remarkable, however, is the contrast between the general awareness and the specific knowledge of the disease's presence and toll in the community. Official information on the latter aspect has been patchy, reflecting primarily the lack of adequate research on and reliable assessment of the HIV/AIDS prevalence and infection rates in the nation and in the capital city. Despite the ominous estimations, the Ministry of Health and the Mozambican National Council on HIV/AIDS, that is supposed to coordinate awareness-building and prevention measures and the national level and city health authorities have not been very active, generally limiting their interventions to periodic distributions of condoms in poor neighborhoods and a spiritless HIV/AIDS awareness campaign in the media. Thus, the society under study presents a combination of a rapidly spreading epidemic, a high level of *general* awareness of its potential threat, and a lack of *specific* understanding and knowledge of the disease's clinical manifestations, and therefore of any identified practical encounters with it.

The sluggish and ineffective response of the city's medical authorities to the spread of cholera, especially in the early weeks, left the community struggling with the disease largely on its own. Likewise, the insufficiency and inadequacy of the official information on HIV/AIDS coupled with the looming, even though poorly understood, threat of the epidemic, shift the burden of identifying the infection risks and copying with the consequences of the disease to the community and individuals. As I will illustrate below, in both cases social networks play an important role in articulating the community's reaction to the epidemics.

DATA AND METHODS

The data I use in this analysis come from a larger project that our research team carried out in several *bairros* (administrative subdivisions) of Maputo's reed city in June–August of 1998. The fieldwork included focus group discussions, conducted separately with women and men, and individual in-depth interviews with individuals of both sexes. In all, 16 focus groups (eight with each sex) and 97 individual in-depth interviews (53 with women and 44 with men) contained questions dealing with the cholera and HIV/AIDS epidemics. In addition, I conducted ethnographic observations in these communities and interviews and conversations with community leaders and health officials.

The interviewees and the focus group participants were asked, among other questions, about their perceptions of and attitudes toward cholera and HIV/AIDS, the sources and types of information they receive about the two diseases and epidemics, the forms of their prevention available in the community and practiced by the interviewees and others, and about the social channels through which such information usually circulates and individual knowledge and experiences are exchanged. Although the questions on the two epidemics and the social reaction to them constituted two separate thematic foci of the fieldwork, the interviews were designed so that the informants' social networks would be first identified and delineated, and then the specific information on cholera or HIV/AIDS would be situated within the context of these social networks. This strategy allowed us to weave the specific issues of cholera and HIV/AIDS into the general fabric of social interaction. In the following text, I first briefly present the general characteristics and mechanisms of communication through social networks in this community, and then explore how these networks have functioned in the face of the two epidemics.

GENERAL CHARACTERISTICS OF INFORMAL SOCIAL NETWORKS

The general contours of informal social networks that emerged from the data are in many respects universal. The discussions and interviews demonstrated that social networking is not a process of even intensity. Although the exchanges within social networks never stop, they tend to be most intensive when they are most needed. Unusual material hardships, social tensions, health crises, and psychological stress are among the factors that compel people to seek more information, sympathy, and support from others. As the criticality subsides, so does the intensity of exchanges in social networks.

Social networking is issue- and situation-driven. Specific issues and problems that individuals and households face shape their networking choices and strategies. At the same time, individuals constantly relate – explicitly or implicitly – their interaction and exchanges to the informational impulses they receive from outside of their informal social networks – particularly, from more formalized circuits of information.

Social networking can both reinforce and redefine social distances. In a society where extended family ties are traditionally strong, social networks tend to be anchored in relatives and affines. However, as this urban society rapidly westernizes, connections and exchanges with non-kin become more common, and social networking increasingly expands beyond the extended family. And although the reliance on the family persists and may even increase under extremely critical circumstances, in some cases, when the input of relatives is deemed inappropriate or even undesirable, individuals are more likely to turn to non-kin, whom they may perceive as more reliable and effective sources of information and support than relatives.

Social networking is also governed by other social boundaries and hierarchies, especially those related to gender. In a society stratified and segregated along gender lines, men's and women's social networks are usually gender-specific and seldom intersect: men and women who are not related by blood or marriage or affinity rarely interact in any consistent and prolonged way, and those who are – do so in accordance with strict norms that define and enforce gender distances. However, under extreme circumstances, such as those of a generalized social (including epidemiological) crisis, the gender barriers become porous as individuals try to maximize the utility of social interaction in coping with the crisis.

HIV/AIDS AND CHOLERA IN SOCIAL NETWORKS

Undoubtedly, the differences in epidemiological characteristics of HIV/AIDS and cholera are of crucial importance to how both were interpreted and reacted to in social networks. The prolonged latency and unclear symptoms of AIDS makes it difficult, if not impossible, to identify the disease through simple observations. In contrast, the short incubation period, swift course, and violent and unambiguous symptoms make cholera easily recognizable, especially in the midst of a full-fledged epidemic.

Much mystery surrounds both the origin and the symptoms of HIV/AIDS. The study participants generally had a very vague idea of how AIDS manifests itself and by what signs they could or would identify an ill person. "[W]e don't know how AIDS comes about, because even those who have AIDS, don't know it," explained a female focus group participant. With very few exceptions, the study participants had not known or seen anyone who, they were sure, was infected with the virus. As one man in a focus group discussion said:

> Yes, we had these conversations [about AIDS]. But as far as I'm concerned, I have never seen a person who has AIDS for sure. Well, for me, those are conversations that I catch out there, but I am not certain. Because for those who died of malaria, I already know that so and so died of malaria. So and so died of cholera. But someone who died of AIDS . . . Sometimes I can see a body on a picture [in a newspaper], a body of someone whom I don't even know.

Conversations about HIV/AIDS are often sparked by information coming from more formal institutional sources – mainly through radio, but also, at least for a minority of residents, through TV and newspaper reports – or the *palestras* (Portuguese for a public lecture, talk, or discussion) occasionally organized by the propagandist brigades of the Ministry of Health or of the Mozambican Association for the Development of the Family (AMODEFA). However, although this formal and centralized information is crucial in shaping individuals' general perceptions of the disease, it does little to advance their concrete knowledge of it. Because AIDS symptoms are rarely unique and the known presence of the epidemic in the community has been relatively short, people are unable to accurately identify AIDS in their everyday social practice. The lack of practical knowledge is compounded by a deeply rooted distrust of the government and of the official health sector: it is widely aknowledged, for example, that doctors and other health workers do not disclose the true diagnosis to AIDS patients – ostensibly to prevent them from going on a last-chance sexual rampage. AIDS almost never appears as a cause of death on death certificates. The official health sector therefore only reinforces the uncertainty about the real threat and dimensions of the epidemic. Confused by the gap between the fairly adequate general notion of HIV/AIDS and the almost non-existent practical experience with it, people turn to trustworthier peer network channels to reconfirm and even reconstruct the official information. Informal social networks therefore play an increasingly important role in absorbing, culturally molding, and redistributing HIV/AIDS-related information among individual members of the community. But because the lack of practical encounters with AIDS is nearly universal, social networks generate and spread mainly rumors or unconfirmed suspicions that, nonetheless, after being churned in multiple exchanges, acquire a semblance of veracity.

The continuous lack of confirmed practical experience with HIV/AIDS tends to decrease the intensity of HIV/AIDS-related communication over time, even as the spread of the epidemic continues. "Yes, we have talked about AIDS," said a 39 year-old male interviewee about HIV/AIDS-related conversations in his community, "but now we no longer pay as much attention . . . Well, in the beginning, when AIDS first appeared, people talked more about it . . . but now, I can say, it has passed." In some extreme cases, such a decrease in interest leads to a complete denial of the threat of HIV/AIDS. As a 29 year-old woman noted, "Yes, we talk [about AIDS], but still there are many people who don't believe that AIDS exists at all. They don't believe, perhaps, because they have never seen a sick person [who has AIDS]. And what they hear others say doesn't matter [to them]."

In contrast to HIV/AIDS, in most informants' accounts, the symptoms of cholera are hardly problematic. Even though massive diarrhea and vomiting per se are not unique to cholera, they were seen as such by Maputo residents in the second half of 1997, and the inaccuracy of this visual diagnosis then did not matter. Identifying an ill person was therefore not difficult and no social consultation was needed for that purpose. What was needed and what did require some socially supported opinion was predicting where and whom the plague would strike next. Hence, by identifying and spreading the information about new cases of cholera, social networks helped to demarcate the battleground and update their participants about the enemy's recent moves.

After some delay in the beginning of the cholera epidemic, information on disease prevention began to pour from all official media. Individuals' conversations echoed this chorus of official warnings. "They talked a lot [about cholera] on the radio and television all the time," recalled a 26 year-old male interviewee, "so people always talked about cholera too." Unlike the case of HIV/AIDS, this information was easy to understand and to relate to the rapidly increasing number of clearly identifiable cases of infection. The role that social networks assumed was therefore that of applying and enforcing the measures of prevention recommended by the official medical propaganda – such as boiling and chlorinating drinking water, washing hands and produce, keeping latrines clean, carefully disposing of waste, and other measures of general hygiene. Because the epidemic hit the community so swiftly and indiscriminately and because of the inherent popular belief that the government "doesn't tell the whole truth," social networking was also instrumental in expanding individuals' reactions to the epidemic beyond the measures recommended by radio broadcasts and the Health Ministry cholera-prevention brigades. Yet, as the content of this "beyond-official" reality was moot, so were the behavioral strategies negotiated through the process of social interaction. For example, the official propaganda singled out unwashed lettuce as a likely harbor of cholera vibrio, but the public buzz reinterpreted the message and made the vegetable itself into a major culprit of the plague. This led to a nearly complete avoidance of lettuce, otherwise a very popular part of the daily diet.

The magnitude and concentration of the threat associated with cholera eclipsed the society's epidemiological skyline, ousting fears and concerns about other, no less dangerous threats such as malaria, cholera-unrelated diarrheal disease, or acute respiratory infections. Not surprisingly, the HIV/AIDS themes all but disappeared from conversations during the few months that cholera ravaged through the city. "That conversation on AIDS seemed far away, because all what we had in front of us was cholera," noted a 42 year-old female interviewee. This near complete communal focus on cholera could have also numbed, at least temporarily, people's awareness of the HIV infection risks and even decreased their prudence in sexual contacts.

However, even after the cholera "distraction" was gone, the public discourse and the social interaction that conveyed it did not focus on HIV/AIDS as a paramount epidemiological hazard with a uniquely destructive potential. Partly because of the way AIDS is presented in official informational circuits and partly due to the persisting confusion about the nature and course of the disease, the public discourse tends to embed, even if inadvertently, HIV/AIDS issues in a broader theme of sexually transmitted diseases. "Yes, we talk about AIDS, but what we talk more about are STDs [because] it is what happens to us more," noted a 50 year-old male interviewee. This vision of HIV/AIDS that concentrates on its transmission channels instead of its outcomes dilutes the criticality of HIV/AIDS in social exchanges and hence diminishes the social networks' ability to mobilize the community's resistance to its proliferation.

The sexual connotation of HIV/AIDS is a major factor affecting exchanges of information and opinions on the topic. People clearly understand the fatal nature of AIDS and realize well that sexual intercourse is a primary channel of HIV transmission. However, this sexual connotation of HIV/AIDS also significantly hinders their exchanges of information about the disease. Ideally, one would expect that the deadly threat of AIDS should force individuals – both men and women – to reduce the number of their sexual partners. This is, however, not an easy change in a sub-Saharan context typically characterized by relative sexual freedom not only for men but also for women (Caldwell et al., 1989). Because multiple sexual ties are normally expected and accepted, picking the uninfected sexual partners – as opposed to reducing their number or using condoms – is often the preferred method of self-protection. Individuals, particularly men, attempt to identify such potential partners by consulting with their trusted peers. Social networks are utilized to ensure that the current or prospective partner's sexual behavior does not carry the risk of infection. Obviously, given the little knowledge and understanding of HIV/AIDS, the assessment of the risks derived from informal interpersonal communication is grossly inadequate. However, the assurance of the peers that a woman or a man is not "that kind" of person (i.e. not sexually promiscuous, involved in potentially dangerous sexual contacts) is often sufficient to engage in a relationship. Such "screening" of potential partners for the risk of infection rather than reducing their number or practicing safer sex appears to be common in non-commercial extramarital relationships in similar sociocultural settings (e.g. Havanon et al., 1993).

People's general uneasiness in discussing sex-related issues coupled with the difficulty of a commonsensical diagnosis of AIDS results in an increased importance of non-verbal and indirect interaction. Many of the specific HIV/AIDS-related stories that circulate in social networks originate from visual observations rather than verbal communication, or from tail-ends of overheard conversations of others. Such information, often inaccurate at its origin, is further distorted, dramatized, and mystified, as the rumors are transmitted through the chain of social networking.

In contrast to HIV/AIDS, the cholera-related interaction, especially in the heyday of the epidemic, was uninhibited by any embarrassing implications and connotations. As the disease spread and became a grim quotidian reality, exchanges of information on new cases in the neighborhood and elsewhere, mutual consulting on methods of prevention, warning about a market vendor whose produce might be infected, sharing the lye to disinfect water, or chastising the national and city health bureaucrats for indifference and incompetence were common occurrences.

THE CONCEPTS OF ILLNESS AND CURE AND SOCIAL NETWORKS

To better comprehend the role of social networks in the community's reaction to the two epidemics, one needs to be cognizant of the notion and meanings of illness in that society. The perception and explanation of illness in a contemporary sub-Saharan context intertwine what in the western analytical parlance could be called the natural and the non-natural elements. The two categories are not seen as mutually exclusive or even contradictory. An illness can be caused by both witchcraft and other forms of interpersonal evil influence, usually mediated by the ancestors' spirits, and by natural causes operating independently of the ancestors' will. This ample and flexible vision of illness helps to explain individual failures of both traditional and biomedical treatments without questioning the validity of either medical system. Thus it is not uncommon for a witch-doctor to perform a complex procedure of exorcising evil spirits from a patient (or that of appeasing the patient's angered forebears) and at the end to recommend that the patient take chloroquine pills in case the disease was actually malaria.

Illness-related social communication reflects this dualism. On the one hand, prompted by the natural vision of illness, individuals feel the need to share their concerns and experiences in conversations with others. On the other hand, however, because any infirmity may involve the works of evil or unsatisfied spirits, conversing about it with others may entail the risk of falling under the spirits' spell or becoming more susceptible to contracting the disease in some other ways. Such an unwelcome prospect tends to discourage people from talking with others about their or someone else's malaise. This applies particularly to HIV/AIDS due to the mystery and myths surrounding its etiology, symptoms, and especially its prolonged incubation period that is difficult to fit in traditional views of illness. The study participants expressed their suspicions and fears. For instance, one 34 year-old man explained his reluctance to talk about AIDS with others in the following way: "I don't like to talk about these things because when someone starts talking to you [about AIDS], you don't know why he does that.... You don't know if he wants to harm you."

In the case of cholera, however, the panic of the universalized plight eliminated such fears. The rapid, generalized, and indiscriminate sweep of the epidemic through the city ruled out any credible explanations in terms of spirits' actions, for such actions are commonly assumed to be individualized and well targeted. At the same time, the public anxiety was magnified by the ostensible irrelevance of biomedicine. In this cultural context, biomedicine strongly connotes radical and technologically sophisticated interventions (e.g. pills, injections, surgery, etc.), but for the prevention and treatment of cholera, mainly such banal and therefore often distrusted solutions as general hygiene, disinfection of water and food, and oral rehydration were offered.

This breakdown of the expected order of things and the chaos it generated helped to clear off the conventional social barriers to interaction. The formidable disease became everyone's concern and everyone shared their worries with others. As a 52 year-old interviewed man said, "We talked a lot about cholera because we saw a lot of people lose their lives to cholera."

The seemingly universal community engagement was accompanied by a strong fear of contagion through casual personal contact, and especially through sharing meals and drinks with others and even through a simple handshake. A 30 year-old female interviewee described these fears as follows: "During the cholera time I was telling [the other household members] to be careful. Not to enter a house where there is cholera, because once you enter a house where there is cholera, you also get it. And in order not to get cholera we stayed at home. When cholera comes, we are here at home [meaning that they would contract the disease only if it came to their house]." These two opposing forces – the emotional need for support and for sharing their anxiety and experiences, that was pushing people together, and mutual suspicion and the fear of contagion, that were pulling them apart – shaped the unique dynamics of social interaction.

SOCIAL DISTANCES AND SOCIAL NETWORKS

Characteristically, cholera-related interaction brought together and mixed kin and non-kin networks. Even though both immediate and extended relatives and affines were the primarily caretakers of the sick, the cholera-related interaction easily flowed over the kin/non-kin divide. The data indicate that day-to-day conversations on cholera, especially on specific measures of prevention, were primarily territorial and involved relatives insofar as residents of the neighborhood. Informal interaction and community mobilization with regard to the threat of cholera often utilized local formal administrative resources. Here is how a 34 year-old woman described this process in her neighborhood:

> The chief of the quarter [an unpaid semi-formal position at the lowest level of the municipal hierarchy] called a meeting of residents of our quarter. There we elected a lady who would go from house to house to see at least how the outhouses were kept. You see, she was supposed to inform him [the chief] so that he could go to those people whose outhouses were not in order and talk to them, you know, make sure that those people do leave the outhouses tidy.

In comparison, in HIV/AIDS-related interactions the kin vs. non-kin distinctions retain a certain importance. These distinctions mirror the complexity of the social nature and meanings of relations with kin. Even in the traditional, rural context, relatives and in-laws are seen as the closest, most frequent and trusted social contacts, but at the same time, the potentially most dangerous ones as rivalry and personal dislike among relatives and affines is believed to often prompt them to resort to witchcraft. This ambivalence is further exacerbated in the urban environment where individuals' social options and ambitions are more diversified and particularized, but people are still forced to rely on their kin for daily survival. Reflecting this duality and, to some extent, the potentially embarrassing sexual ramifications of the HIV/AIDS theme, the study participants generally pointed not to relatives or affines, but to friends and co-workers as primary confidants in partner-selecting strategies and in most other issues surrounding personal interface with the risk of HIV/AIDS infection. At the same time, as most interviewees agreed, relatives, like in the case cholera, do assume the main caring role once the disease's symptoms became apparent. Unlike the case of cholera, however, where relatives quickly and without hesitating inform neighbors and friends about the misfortune, the relatives of AIDS-stricken persons, fearing the stigma, usually guard against the spread of the news beyond the close family circle. Thus, with respect to cholera both kin and non-kin networks act to maximize individuals' mobilization in the prevention of the disease, whereas in the prevention of HIV/AIDS non-kin peer networks are most utilized. However, once the disease manifests itself, it is the family that takes the center-stage in both cases, even if the relatives' interaction with the outside world tends to differ from that of non-relatives.

In a society where dominant gender ideologies rigidly constrain the structure and dynamics of social networks, social interaction with regard to cholera crosses the gender line relatively easily, and the epidemic becomes a vital concern for the entire community. In contrast, the sexual connotation of HIV/AIDS further enhances the gendered nature of informal social interaction, as HIV/AIDS-related information exchanges are channeled primarily through gender-segregated circuits. In interviews and focus group discussions, men, who are, compared to women, generally more outgoing, have more time and opportunities for socializing and tend to have more sexual partners, demonstrated much greater exposure to and participation in HIV/AIDS-related information exchanges than women did. Women's interaction on these issues is generally limited and is clouded by mutual suspicion and a fear of entrusting their intimate concerns to a *fofoca* (a loquacious woman unable of keeping a secret) who will spread gossips around.

Although men in this society are generally more promiscuous than women, multiple sexual partnership is by no means seen as a uniquely male prerogative. To justify their own promiscuity, men's communication tends to exaggerate women's proclivity to outside sexual relationships to the point of equating it to that of men. This may discourage some men from having less and/or safer outside sex, for they may perceive their permanent partners as a potential source of infection. At the same time, a woman's distrust of her permanent partner's commitment to their union, strengthened by her peers' tales about their partners' infidelity, may also stand in the way of her taking greater precautions in outside relationships.

The gendered nature of men's informational networking on HIV/AIDS, however intense and informative, can in fact retard and even prevent real behavioral changes. All-male networks tend to cultivate and uphold all-male values, attitudes, and habits, especially those revolving around the ideal of masculine prowess and unrestrained sexual gratification. Thus a commonly held dislike for using condoms during intercourse, which one male focus group participant likened to "eating a banana with the peel on," may be further enhanced in man-to-man conversations. At the same time, the gender-based segregation of information exchanges on HIV/AIDS tends to increase women's vulnerability to HIV. Because of the disease's sexual overtones and a greater restraint on women's sexuality imposed by the dominant patriarchal ideology, women are more reluctant to talk amongst themselves about avoiding partners who might carry the virus, which may affect their exposure to the risk of infection.

The gendered circles of social interaction rarely overlap. As one 39 year-old woman, a primary school teacher from a remote peripheral *bairro*, said when asked whether she would talk to an unrelated man about the risks of HIV/AIDS infection, "With a man [one on one]? No! . . . I think this conversation hasn't gotten there yet. Because if we get to that point, it means that there is something between the two of us." Hence such cross-gender conversations are usually avoided, especially by women, as they may signal to the man that the woman is sexually interested in him, and he may then spread gossips that would damage her reputation in the community.

Nonetheless, the intersection of gendered networks with respect to HIV/AIDS does occur. A greater inter-gender openness is especially likely in gender-mixed environments, such as a formal-sector work setting, where traditional gender distances and functional differences are blurred by a less gendered division on labor. Thus the same woman whose doubts about the appropriateness of individual conversation with men I quoted above later qualified her position: "[With] men we can talk about [HIV/AIDS] in the form of, like, a collective." Another interviewee, a 31 year-old woman working in the cafeteria of a government office gave the following example of such conversations with her male colleagues:

> Yes, I talk [about HIV/AIDS] with men at work. With many people. When they start that chat about AIDS here, AIDS there, we all talk to one another. One says that yes, AIDS exists. Another says that he has never seen someone with AIDS but already saw a person with red hair flying, falling. And I ask him, 'Who saw for real that AIDS exists?' And he says, 'Yes, Elise, it exists! Once you see someone with his hair like this when the cold weather begins.'

Importantly, however, women are grossly under-represented in the formal work sector, and therefore only few of them can benefit from such cross-gender learning.

Somewhat less noticeable but nonetheless important for the transmission of HIV/AIDS are the age barriers that constrain exchanges of information about the disease. HIV/AIDS-related communication, like much of social interaction in this community, rarely involves individuals of different generations. If it does, however, it is often unidirectional: older people instructing or advising younger ones, and the latter passively and reverently listening. Yet often such ostensible deference to the older persons' opinions is a way of ignoring their message. Although general respect for age is still strong in society, many younger men and women reckon – not without a reason – that older people's views reflect the old days' reality and are of little use for such modern problems as HIV/AIDS.

Compared to HIV/AIDS, information on cholera-related issues overcome more easily traditional gender, age, and similar social barriers even outside such atypical social settings as the formal workplace. As the entire community comes under threat and mobilizes to confront the epidemic, the usual circuits of interaction, delineated on the basis of gender and other forms of social stratification, are easily rearranged and expanded. Women and men, kin and neighbors, old and young engage in these panic-driven, sometimes chaotic yet always purposeful exchanges. Such exchanges not only become more common, but they also often reverse traditional hierarchies and conventional modes of interaction. For example, at the time of the epidemic it became possible and common for a woman to chide an unrelated man for urinating on the street or defecating outside the toilet – something that would be unthinkable under "normal" circumstances. As a 26 year-old female interviewee phrased it, comparing conversations about cholera with those about HIV/AIDS, "This [cholera] conversation is different because it's about saving life." Thus, in her perception, the diluted and hard-to-assess risk of HIV/AIDS is not as life threatening as the much more immediate and observable threat of cholera. The concreteness and immediacy of the threat along with the lack of any indecent connotation were the primary factors behind this expansion of communication about cholera through informal social networks.

HOUSEHOLD AS A NODE OF SOCIAL NETWORKS

Households function as nodes of social networks. The perceptions, decisions, and strategies of household members, especially of marital partners, are molded by the exchanges of information they receive from their respective networks. Within the conjugal unit the spouses engage in conversations in which each shares what she or he has learned about the risks of the disease from informal interaction with peers as well as from more formalized sources of information. However, there appear to exist important differences in how the knowledge acquired by spouses from their respective networks affects the couples' response to the threat of the HIV/AIDS and cholera infection.

In both cases, the spouses as well as other household members try to translate the information they get from their networks into coordinated efforts of disease prevention. However, in the case of HIV/AIDS, because of the segregated social networking outlined above, the effectiveness of their cooperation is often undermined by distrust and emotional distancing. Of course, the perceived threat of HIV/AIDS does encourage some negotiation across conventional social divides, but such negotiation rarely produces a concerted and consistent household strategy of prevention.

In contrast, with regard to cholera household decision making and strategies are derived from relatively egalitarian and age-, gender-, ethnicity-, and even class-blind exchanges in social networks. This leveling of the social playing field, however, does not reign any longer than the epidemic itself. Mainly due to the shortness and suddenness of the cholera epidemic, the fundamental social hierarchies re-emerge largely unscathed after the plague is gone. Likewise, the intra-household hierarchies and distances are quickly restored.

CONCLUSION: SOCIAL NETWORKS AND THE FUTURE OF EPIDEMICS

As the cholera epidemic subsided, the theme of cholera virtually disappeared from the arena of the formal public discourse and from the conduits of informal social interaction alike. With that, the preventive measures – popularized and endorsed by informal social interaction during the epidemic but now seen as unnecessary inconveniences – were all but abandoned. It is not that people reckoned that the return of the scourge was impossible or even unlikely – in fact most study participants thought that cholera might come back, especially with the onset of the rainy season. But such seemingly simple procedures as boiling drinking water require major efforts as well as non-negligible expenditure on fuel, and therefore add a significant burden to many a household's daily struggle for survival. And most study participants admitted that they were no longer as careful about the household hygiene as during the apogee of the cholera epidemic, and many were limiting their prevention routine to covering jars containing drinking water or not buying spoiled-looking produce from the market. Many also reported that this curtailing of cholera-related precautions was common in their neighborhoods. As much as the learning through social networks catalyzed the adoption of preventive measures in the face of the growing threat of contagion, so much it helped to dismantle this system and mechanism of self-protection once the annoying and costly precautions were no longer perceived as indispensable.

Yet the experience of a cholera epidemic could have a more lasting and profound impact. Although the 1997 epidemic was too short to fundamentally and irreversibly rearrange the communal social space and distances, its shock was powerful enough to resonate across the existing social boundaries and conventional network channels, and to scare, at least temporarily, almost the entire community into a generalized and rather egalitarian social interaction aimed at maximizing the effectiveness of the response to the disease. The city formal public health programs could capitalize on the mobilization of social networks during such events as cholera outbreaks by utilizing these channels of interaction to sustain the community's awareness of a possible recurrence of the disease and to encourage a continuing compliance with – and an eventual habituation for – the system of sanitary precautions that could better shield people not only from cholera but also from other diseases whose prevention is contingent on individual hygiene and communal sanitation.

In contrast to the receded menace of cholera, the HIV/AIDS epidemic is looming, and despite recent governmental and non-governmental efforts, formal information channels appear unable to adequately confront it. Given the relative weakness of the formal information and prevention mechanisms, the role of informal social networks in understanding the risks and in adopting corresponding behavioral changes could greatly increase. In a sinister irony, however, this study suggests that the public awareness of HIV/AIDS may not be increasing but may, in fact, be declining as HIV/AIDS is routinized as just another abstract theme of the public health discourse. Due to the nature of the HIV/AIDS epidemic and of the available information on it, the disease has been slowly creeping into the body public largely without transgressing and transforming its established social norms, boundaries, and hierarchies. HIV/AIDS-related information exchanges, not supported by any practical evidence or experience of the disease, tend to degenerate into innocuous chatting about a serious yet ever-remote and eluding danger.

In this environment, therefore, the preventive potential of social networks may not only be under-utilized; social interaction may in fact slow down the spread and legitimation of attitudinal and behavioral changes necessary to combat the epidemic. The situation may turn around when the hitherto "invisible" HIV/AIDS achieves disastrous proportions and its death toll becomes as large and manifest as in some other sub-Saharan countries. Of course, it can – and should – happen earlier, so that many deaths can be averted. The official signals of HIV/AIDS prevention can be attuned to the cultural modes and language in which social interaction occurs, thereby galvanizing and concretizing informal communication on HIV/AIDS and eliciting the public response commensurate with the epidemic's devastating potential.

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THE DIFFERENTIAL IMPORTANCE OF FRIEND, RELATIVE AND PARTNER RELATIONSHIPS FOR THE MENTAL HEALTH OF YOUNG ADULTS

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ABSTRACT

This study examines the positive and negative effects on mental health of three types of network members – friends, relatives and partners. It focuses on how the mental health impact of these relationships changes among young adults who are single, cohabiting, married, or divorced. We test the hypotheses that the negative impact on mental health of problematic relationships varies inversely with the degree to which they are voluntary while the positive impact on mental health of supportive relationships varies directly with the degree to which they are voluntary. Data come from a sample of 1257 young adults who were 25–31 years-old in 1992–1994. Mental health status is controlled through the use of a depression measure obtained from the same persons seven years earlier. In general, the findings support both hypotheses. Problems with partners and relatives have

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the strongest direct relationships with depression while support from friends has the strongest inverse relationship with depression. For this sample of young adults, relationships with friends have a stronger relationship to mental health than relationships with relatives. However, the results vary across marital statuses: friendships are especially important for the mental health of single and divorced people while problems with partners have a greater impact on depression for married than cohabiting people. The implications of the findings for the functions of network members on mental health are discussed.

INTRODUCTION

Studies of social networks have illuminated many aspects of how social relationships affect health and mental health. One type of network study focuses on the structural interconnections between network members. Studies in this tradition emphasize how informal network connections influence whether or not people in distress enter formal systems of care (Kadushin, 1968; Friedson, 1970; Horwitz, 1978; Pescosolido, 1992). For example, people whose networks are tightly interconnected are less likely to enter psychotherapy when informal support is available. A second type of social network study examines how the strength of social networks directly affects mental and physical health (Berkman & Syme, 1979; House, Robbins & Metzner, 1982; Haines & Hurlbert, 1992). These studies generally focus on how network size and strength influence the amount of social support available to individuals to mediate the impact of stressors on health outcomes. In general, people with larger networks are better able to cope with a variety of social stressors.

Both of these styles of network research, however, tend to neglect the contributions that *particular* types of network members make to psychological well-being. This study fits into a third style of network research that examines how the characteristics of various social network members influence well-being. Although it should be self-evident that different kinds of network relationships have different impacts on emotional well-being, the network literature has paid little attention to how the particular qualities of network relationships influence mental health. For example, Wellman's research shows that relatives are the principal sources of instrumental support while friends primarily provide companionship (Wellman & Wortley, 1989; Wellman, 1990). Most network studies, however, aggregate the number of network ties into a single index that measures the quantity of social support. Yet, treating every social tie as equal negates the distinction between different types of social relationships.

We also consider network ties as the source of problems as well as of support. This study emphasizes the negative, as well as the positive, effects of network ties on mental health. The bulk of the social network and social support literatures assumes that social relationships are uniformly supportive (e.g. Berkman & Syme, 1979; House, Landis & Umberson, 1988). Yet, the same relationships that provide support can also be sources of conflict. We assume that relationships with partners, friends, and relatives involve disappointment as well as gratification, conflict as well as support, distress as well as well-being (Rook, 1984; Horwitz, McLaughlin & White, 1998). Some research suggests that the detrimental influence on mental health of the negative aspects of a relationship is not simply the inverse of the positive impact of the beneficial relationship with the same person (Fiore, Becker & Coppel, 1983; Rook, 1984; Glenn, 1990; Revenson, Schiaffino, Majerovitz & Gibofsky, 1991; Turner, 1994; Umberson, Chen, House, Hopkins & Slaten, 1996; Rosenfield & Wenzel, 1997). To the extent this is true, the positive and the negative aspects of relationships are two separable dimensions of relationships that have independent impacts on mental health.

Most studies that examine both the supportive and the problematic side of relationships focus on populations with a particular disability (for exceptions see: Umberson et al., 1996; Horwitz et al., 1998). These studies usually show that the negative aspects of close relationships have a stronger impact on well-being than the positive aspects (Fiore et al., 1983; Rook, 1984). When relationships involve both positive and negative aspects, the supportive side can buffer some of the deleterious impact of the problematic side (Revenson et al., 1991).

This study considers how relationships with three types of social network members -friends, relatives, and partners – affect mental health. Relationships with friends, relatives, and romantic partners are marked by different levels of commitment, salience, expectations, and obligations. Further, some relationships are relatively easy to leave while others entail more long-standing and unbreakable ties. We expect that problems in relationships that are expected to be sources of support and that are difficult to leave will have the greatest negative effect on well-being.

The Nature of Relationships with Friends, Kin and Partners

Companionship forms the basis for friendships (Fischer, 1982). Friendships can exist solely for companionship and be broken when companionship is absent (Wellman & Wortley, 1990; Wellman, 1990). In contrast, while kin can also provide companionship, kinship relations are not grounded in this quality and cannot be abandoned when companionship is not present (Fischer, 1982).

Cultural norms dictate that kin provide support without the expectation of reciprocity (Wellman, 1990; Harris, 1990). Indeed, in relationships between parents and adult/children, emotional aid is provided equally by those who do and do not define the relationship as an intimate one (Wellman & Wortley, 1989). In times of crisis and need to borrow money, people are likely to turn to family before friends (Wade, Howell & Wells, 1994).

Network relationships also differ in the degree to which they are voluntary, as friendships are chosen while kinship ties are ascribed (Harris, 1990). Family members have obligatory social roles, which they cannot leave (Fischer, 1982). Friendships, in contrast, are voluntary ties that people can enter and break at will (Fischer, 1982; Wellman & Wortley, 1989; Thoits, 1995). In general, kinship ties are based on obligations, concern, and permanence while friendships involve voluntariness, companionship, and transitoriness.

Relationships with romantic partners incorporate elements of both friendship and kinship and yet are also unique. In contrast to relatives, but like friends, intimate relationships with partners are freely chosen and entail close companionship (Cutrona, 1996). Individuals expect their spouses to respect and care for them (Wallerstein & Blakeslee, 1995). Support from one's spouse makes up a large portion of the total support one receives (Wellman & Wellman, 1992). But like kinship and unlike friendship, once they are chosen they become obligatory and difficult to escape. Indeed, these relationships are binding as each is responsible for the other's well-being (Lin, 1986). Partner relationships are also intense, multi-faceted, and multiplex (Gove, Style & Hughes, 1990).

The Expected Impact of Relationships on Mental Health

The different nature of kinship, friendship, and partner relations should have strong implications for mental health. We expect that relationships with binding and strong ties have greater positive and negative impacts on mental health than weaker and easily breakable relationships. In addition, the stronger the obligations to provide support in a relationship, the greater the negative impact on mental health when support obligations are not met.

Support forms the basis of friendships; social expectations of friendships involve unconditional positive support. Therefore, on the one hand, friendships should be associated with psychological well-being. On the other hand, people can end their friendships when interactions with friends become negative. Because friendships are breakable when they become undesirable, we would not expect that negative relationships with friends have a strong association with mental health.

In contrast to their friendships, people expect to have both negative and positive interactions with their kin. In most cases, kin ties cannot be abandoned when problems arise. We expect that supportive relationships with kin have less effect on mental health than supportive relationships with friends. In contrast, because kin relationships cannot be abandoned, the problematic aspects of kin relationships might have stronger effects than problems with friends have on mental health.

Finally, relationships with romantic partners are intense, multifaceted, and time intensive and expected to be of paramount importance for well-being. Marital relationships provide individuals with a sense of self-worth (Gove, Style & Hughes, 1990). Further, because they cannot be abandoned easily they should have more influence on mental health than kinship and friendship. Both the positive and negative interactions they entail should have important consequences for mental health.

The impact of positive and negative relationships should not be constant across all types of network ties. Support from partners and friends may be of greater mental health import than support from kin, because kin are obligated to be supportive. Negative ties with partners should be particularly distressful. Ross' (1995) finding that people who have no romantic relationships are less depressed than those with unhappy romantic relationships supports this prediction. In addition, Umberson (1995) found that individuals who experience the death of a parent report declining support and increasing negative behaviors from their spouses. A major reason for dissatisfaction with spouses was the failure of their support efforts to match expectations. Therefore, we expect that problems with spouses will have the strongest impact on mental health, followed by relationships with relatives, and by relationships with friends.

Little empirical literature specifically compares the impact of network ties on mental health. One study finds that support in spousal relationships has a primary effect on depression, followed by support from friends, while support from relatives has no impact (Dean, Kolody & Wood, 1990). After an important life event, support from a lover/spouse buffers distress better than support from friends or relatives for those who are not currently dealing with marital disruption (Lin, Woelfel & Light, 1986). Elderly married women who have stressful relationships with their spouses are lonelier than others are, but relational quality with neither friends nor relatives is related to loneliness (Essex & Nam, 1987). The greater impact of spousal relationships may be due to the social expectations or to the length of time and familiarity the married dyad shares.

The Varying Importance of Relationships Across Marital Status

Our first expectation is that different network ties have different impacts on mental health. However, we do not expect these impacts to be constant across all role sets. Our second expectation is that the impact of different network ties changes within different role configurations. In particular, marital status should influence the impact of various network ties on mental health. Here, we examine how relationships with kin and friends depend on the sort of partner relationships that individuals maintain. We expect that kinship and friendship relations should not have the same relationship to mental health for people who have partners compared to those who do not.

Little research examines how friend, kinship, and partner relationships vary across a variety of marital statuses and the possible mental health effects of these differences. A large literature documenting wide disparities in mental health for people in different marital statuses shows that married people have the best mental health, separated and divorced people the worst, with single people intermediate between the currently and formerly married (e.g. Ross, Mirowsky & Goldsteen, 1990; Horwitz, White & Howell-White, 1996; Mirowsky & Ross, 1992). Further, although cohabitation is the most rapidly growing living arrangement, very little research compares the mental health of cohabitors to that of people in other marital statuses. Those who cohabit do report less happiness with their partners and less commitment to the relationship than those who are married (Nock, 1995). Brown and Booth (1996) find that cohabitors who are not specifically planning to get married have poorer relationship quality than the married but those who do plan to marry have equivalent relational quality to the married. Ross (1995) finds no significant differences in depression between those who cohabit and the married. Instead, she reports that people with no romantic attachments have the most depression, followed by people whose romantic partners live outside their households, with those who live with romantic partners reporting the lowest levels of depression. The presence of a supportive partner rather than marital status *per se* best accounts for depression. Horwitz and White (1998) echo Ross' findings in showing that levels of depression are comparable between married and cohabiting people, although cohabiting men report more problems with alcohol. We expect that partner relationships among cohabitors are more easily broken than those among married people, so that partner relationships will affect the mental health of married people to a greater extent than the mental health of cohabitors.

Relationships with partners not only have direct impacts on mental health but also create changes in the social network. One of the first tasks of a newly married couple is to separate from the parents and turn their attentions towards the marriage (Wallerstein & Blakeslee, 1995). Further, after marriage, individuals shift their inner circle of privilege from friends to the spouse (Rawlins, 1991). A change in marital status is linked to a high turnover of network members as relationships are readjusted to match their new roles (Hess, 1972; Brown, 1981; Wellman, Wong, Tindall & Nazer, 1996). In general, we expect that people who have partners will place less reliance on friends than those without partners. Greater involvement in the marital dyad may lead married couples to drop peripheral friends from their networks. Partnered individuals may not only drop peripheral friends but have less investment in relationships with friends who remain in their networks (Shulman, 1975; Turner & Marino, 1994) In contrast, kinship relationships may intensify after marriage (Moore, 1990; Hurlbert & Acock, 1990), especially after children arrive (Shulman, 1975). Married people do have smaller friendship networks and larger kinship networks than single people (Fischer, Sollie, Sorell & Green, 1989). Further, the married are less likely than the single to turn to friends for help and are more likely to turn to the family (Wade, Howell & Wells, 1994). Those who are single interact more with peers who share similar concerns and are less likely than the married to name kin as a close network member (Shulman, 1975). The few studies that compare the parent-adult child relations of those who cohabit and are married suggest that cohabitors have poorer relationships with their parents (Nock, 1995) and put less value on living near their parents (Clarkberg, Stolzenberg & Waite, 1995).

The change from a married to a separated/divorced status also has indirect effects in changing the structure of the social network as well as direct effects on mental health. Marital dissolution is especially disruptive of social support systems (Lin, Woelfel & Light, 1985; Leslie & Grady, 1985; Wellman et al., 1996). After a divorce, women have to rely heavily on relatives for support, although the satisfaction they feel with their network depends largely on the presence of friends who provided emotional closeness (Leslie & Grady, 1985). The composition of the networks of divorced people more closely resembles those of single than of married people in that the divorced report less kin and more friends than do the married (Hurlbert & Acock, 1990). Little is known, however, about differential importance of partner status in affecting different social domains.

The Importance of Life Stage

Age has a direct effect on depression, with young and old people having more depression than people in mid-life (Mirowsky & Ross, 1992). People of different ages also differ in marital roles, employment roles, resources, and physical health, each of which also directly affects mental health. In addition, the relative importance of various social relationships varies at different points of the life course (Hess, 1972). Friendships are extremely important in the lives of adolescents and young adults, until they marry (Brown, 1981). Young adults are at a life stage where they wish to assert independence from relatives yet may also need material support from them. While about 70% of high school students expect to live on their own before marrying (Goldscheider & Goldscheider, 1987), young adults are also likely to receive financial help (Wellman & Wellman, 1992). Among the elderly, friend support is more important for distress among the old-old than the young-old because younger elderly persons have more opportunities to make new friends and to have other sources of support (Matt & Dean, 1993). That is, the salience of friendships changes over the life course, based on the existence of other relationships in the social network.

Because relational needs, obligations, expectations, and investments all change over the life course, it is important to control for the period of the life course under study. This study focuses on young adults between the ages of 25 and 31 to control for the importance of life cycle affects on social relationships. The influence of relatives, friends, and romantic partners should be quite different at various stages of the life cycle. Young adults between 25 to 31 years of age are very heterogeneous in their network contexts. Many have never married and maintain primary commitments to friends and families of origin. Others are in the early stages of marriage with networks focused on spouses and young children. A third group is cohabiting with a partner of the opposite sex. A final group has already seen their marriages dissolve. A group of young adults thus affords the opportunity to view much variance in how friend, relative, and partner relationships affect mental health.

The focus on a particular stage of the life cycle allows us to control for both the direct effect of age on mental health and the effect of age on relationships with members of the social network. The use of a sample of 25 to 31-year olds also has the benefit of containing a broad representation of marital statuses including married, cohabiting, never married, and divorced/separated people. The cost of the focus on the social networks of young adults is that it limits the generalizability of our findings to this particular stage of the life course.

In sum, we address several research questions about network relationships and mental health:

What is the impact on mental health of supportive and problematic relationships with partners, friends, and relatives?

What is the relative impact of partner, friend, and kin relationships on mental health and does this impact change for the supportive and problematic dimensions of the relationship?

Is the mental health impact of friendship and kinship relationships different for people with and without partners?

How is the mental health impact of partners, friends, and relatives different for people who are cohabiting or married?

DATA AND MEASURES

Data for this study stem from the Rutgers Health and Human Development Project, a longitudinal study that follows adolescents into adulthood. Respondents were initially chosen in 1979–1981 through a random selection of telephone numbers from 16 of 21 New Jersey counties. At this time, households were screened for the presence of 12, 15, and 18 year-old residents. A quota sampling procedure that insured the presence of equal numbers of males and females in the three age groups guided the initial selection of respondents. A total of 1,380 respondents who were 12, 15, or 18 participated in the original study. The income levels of participants' parents and religious backgrounds of subjects are representative of the state of New Jersey at the time of the original period of data collection (U.S. Bureau of Census, 1984). The racial composition of the sample includes more whites (90%) than the 83% found in the New Jersey population in 1980.

Members of the initial sample were re-interviewed three subsequent times between 1982–1984, 1985–1987, and 1992–1994. Most of the information used in this chapter stems from the final interview when respondents were 25, 28, and 31 years old. At the final interview, 1,257 (91% of the initial sample) were re-interviewed. At each measurement point, respondents came to the testing site for a full day of testing and interviews (for more extensive methodological details about the study see Pandina, Labouvie & White, 1984). The data used here stem from self-report questionnaires, which were administered individually by a trained interviewer.

Measures

Dependent variable. Our measure of mental health is a thirteen-item scale of depression from the SCL-90-R (Derogatis, 1977). Respondents were asked the extent to which they experienced each symptom in the past 30 days on a scale that ranges from one (never) to four (frequently). The responses are summed and divided by ten to yield the total depression score. Higher scores indicate greater levels of depression. The psychometric properties of the SCL-90-R have been documented elsewhere (Derogatis & Derogatis, 1996). The scale is highly reliable (Cronbach's Alpha = 0.91) in these data.

Independent variables. Marital status contains four categories of single, divorced/separated, cohabiting, and married. The regressions use dummy variables that are coded so respondents holding each status are given the value of 1 and others the value of 0 and married individuals serve as the reference category. In this sample, 40% of respondents are single, 10.4% divorced or separated, 11.7% cohabiting, and 37.9% married.

We examine relationships with three categories of network members: partners, friends, and relatives. Respondents were asked the same questions about the frequencies of eleven aspects of relationships with a spouse/partner, friends, and the relative that they maintain the most contact with and feel the closest to (excluding spouses and children). Only married and cohabiting respondents answered the questions about partner relationships. Therefore, we have no information on the romantic relationships of unmarried and non-cohabiting respondents.

Respondents were asked how often the network member provided help, cheered them up, confided in them, shared mutual interests, disagreed about important things, were critical or disapproving, understanding about feelings, got on their nerves, lost their temper, respected their opinion, and expected too much of them. Responses to each question ranged from 1 (never) to 5 (often). Factor analysis of these questions indicated that the eleven items cluster into two distinct factors for partners, friends, and relatives (see Horwitz et al., 1998), so scales of relational support and problems were created with reliabilities (Cronbach's Alpha) of above 0.75 for each relationship. Higher values on the scale of support indicate a more supportive relationship and higher values on the scale of problems indicate a more problematic relationship.

Control Variables. We use the identical scale of depression obtained from the same respondents seven years earlier to control for the possibility of mental health selection in various marital statuses. This allows us to control for the possibility that people with varying amounts of depression enter into different types of relationships with network members.

A second control variable is an index of the number of stressful life events respondents have experienced over the past year. Much previous research indicates a robust, although moderate, relationship between stressful events and depression (e.g. Wethington & Kessler, 1986; Thoits, 1995). Respondents were asked how many out of a list of over forty possible stressful events they encountered over the past year. They reported a mean of 1.97 life events, with a range between zero and sixteen. The few respondents who experienced five or more events were grouped into the highest category of "five or more" events.

Finally, sex is a dichotomous variable coded 0 for women and 1 for men. We do not include a variable for age because preliminary analysis showed the restricted age composition of the sample (25, 28, or 31 years old) has no effect on the dependent variable of depression or any of the relationship variables. The only difference by age was that of marital status in that single individuals were the youngest and the married were the oldest.

Analysis

We use multiple regression analysis to examine the impact of network ties and marital statuses on current levels of depression, controlling for levels of prior depression, the number of stressful life events, and sex. The supportive and the problematic aspects of relationships with friends and relatives are considered for the entire sample. The supportive and problematic aspects of relationships with partners are restricted to married and cohabiting respondents. We also conduct regressions separately within the four marital statuses to compare the importance of supportive and problematic friendship and kinship relations for people in different marital contexts[1]. We conduct interaction tests among the network and control variables with marital status to see whether the impact differs among people who occupy different marital statuses. Finally, we test the impact of positive and negative relationships with partners, friends, and relatives separately for married and cohabiting people.

FINDINGS

Table 1 shows the means and standard deviations of the network and the control variables for the entire sample and for each marital status. The results indicate that people are far more likely to report that their network ties are supportive rather than problematic. This holds across all types of relationships and within each marital status. The results also show people report that friends and relatives are sources of comparable levels of support and problems.

Tests of ANOVA and post hoc Scheffe tests (not shown) indicate several significant differences of means across the four marital categories. Married

Table 1. Means and Standard Deviations for Study Variables for Whole Sample and by Marital Status.

	Possible Range	Whole Sample		Single		Divorced/Separated		Cohabiting		Married	
		(*n* = 1200)		(*n* = 477)		(*n* = 126)		(*n* = 141)		(*n* = 456)	
Supportive Friendships	6–30	24.83	(4.20)	25.14	(4.05)	24.49	(4.94)	25.24	(3.66)	24.52	(4.26)
Problematic Friendships	5–25	11.18	(2.76)	11.52	(2.68)	11.49	(3.07)	11.16	(2.75)	10.73	(2.71)
Supportive Relative	6–30	24.50	(4.03)	24.43	(3.89)	23.83	(4.78)	24.54	(4.12)	24.75	(3.91)
Problematic Relative	5–25	11.17	(3.09)	11.62	(3.13)	11.74	(3.54)	11.25	(3.09)	10.52	(2.79)
Supportive Partner	6–30							26.72	(3.83)	26.81	(3.45)
Problematic Partner	5–25							12.60	(3.63)	11.89	(3.22)
Current Depression	1–4	1.49	(0.54)	1.49	(0.55)	1.78	(0.71)	1.49	(0.48)	1.41	(0.46)
Prior Depression	1–4	1.59	(0.55)	1.60	(0.55)	1.69	(0.61)	1.69	(0.59)	1.53	(0.50)
Recent life events	0–5	1.77	(1.71)	1.62	(1.67)	2.33	(1.96)	2.35	(1.84)	1.57	(1.54)
Male/ Female	1/0	0.49	(0.50)	0.54	(0.50)	0.50	(0.50)	0.47	(0.50)	0.43	(0.50)

people report fewer problems with friends and with relatives than single or divorced/separated people. Furthermore, the married group reports fewer problems with partners than those who are cohabiting. Among the control variables, divorced/separated people report higher levels of current depression than the three other marital groups. Divorced/separated and cohabiting people report equivalent levels of prior depression, which are significantly higher than the currently married. These two groups also share similar levels of recent stressful life events, which are significantly higher than the number of events married and single respondents report.

Our first question targets the relative impacts on mental health of friendship, kinship, and partner relationships. Panel A in Table 2 compares the impact of support and problems with friends and relatives when the four marital groups are combined. Panel B compares the influence of partners with that of friends and relatives for cohabiting and married people.

Panel A in Table 2 shows that friendships, compared to kinship ties, have more influence on mental health. This holds for both the supportive and the problematic sides of these ties: support from friends is related to less depression and problems with friends to more depression. The positive effect of support from friends on mental health has the strongest association of any kind of friend or kin ties. In contrast, neither support from or problems with relatives are associated with levels of depression. For the whole sample, levels of prior depression, female sex, and more stressful life events are associated with higher levels of current depression. Further, those who are single or divorced have significantly higher rates of depression than those who are married.

The relative mental health impact of partnered relationships with friendships and kin ties can only be tested within the married and the cohabiting groups. The results of Panel B in Table 2 show that the impact of different network ties changes for the supportive and problematic dimensions. The only effect of problematic ties is found among people with partners. Problematic partner relationships are associated with more depression but problems with kin and friends have no effect on depression. In contrast, supportive relationships with both partners and friends have positive and equivalent effects on mental health. Supportive kin have no impact on well-being. Overall, relationships with partners have the most influence on depression but friendship remains an important source of well-being for young adults, even after they enter partnered relationships. At this young adult stage of the life cycle, kin have little influence on mental health. There is no significant difference between married and cohabiting subjects in their levels of depression.

Our third question asks whether the impact of friendship and kinship ties change when young adults enter partner relationships. To address this question

Table 2. Regression of Depression Quality and Type of Relationships and Marital Status.

	Panel A Whole Sample (*N* = 1202)			Panel B Partnered Only (*N* = 598)		
	b	(S.E.)	Beta	b	(S.E.)	Beta
Relationship Variables						
Supportive Friend	-0.023	(0.003)	-0.180***	-0.020	(0.004)	-0.176***
Problematic Friend	0.017	(0.005)	0.085***	-0.003	(0.007)	-0.019
Supportive Relative	-0.003	(0.004)	-0.025	-0.002	(0.005)	-0.020
Problematic Relative	0.007	(0.005)	0.039	0.004	(0.007)	0.026
Supportive Partner				-0.018	(0.006)	-0.137***
Problematic Partner				0.025	(0.006)	0.179***
Marital Status^a						
Single	0.070	(0.030)	0.063*			
Divorced/separated	0.252	(0.046)	0.143***			
Cohabiting	-0.006	(0.044)	-0.004	0.021	(0.040)	0.019
Control Variables						
Prior Depression	0.345	(0.026)	0.348***	0.209	(0.033)	0.235***
Male	-0.128	(0.028)	-0.118***	-0.178	(0.037)	-0.189***
Stressful Events	0.054	(0.008)	0.169***	0.034	(0.010)	0.121***
Adjusted R squared			0.299			0.266

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

^{a} Reference category is married individuals.

we divide the model into four separate marital status categories in Table 3. Of the two friendship and two kinship measures, support from friends has the strongest impact on lowering levels of depression. Contrary to expectations, supportive friends are not more important for the mental health of people without partners. Indeed, the mental health impact of supportive friends is strongest for cohabitors. The results for the problematic aspect of friendships show that problems with friends are directly related to depression for both of the non-partnered groups but for neither of the partnered groups. This result must be interpreted with caution because the significant coefficient among larger group of single people is weaker than the coefficient in the smaller group of cohabitors. However, it is clear that problems with friends are not important for married individuals. Tests of interaction (not shown) indicate that divorced/separated people experience a significantly greater impact from problematic relationships with friends than married people.

Table 3. Regression of Depression on Friend and Relative Relationships, by Marital Status.

	Panel A			Panel B			Panel A			Panel B		
	Single ($N = 478$)			Divorced/Seperated ($N = 126$)			Cohabiting ($N = 141$)			Married ($N = 457$)		
	b	(S.E.)	Beta	b	(S.E.)	Beta	b	(S.E.)	Beta	b	(S.E.)	Beta
Supportive Friend	-0.018	(0.006)	-0.129**	-0.030	(0.011)	-0.211**	0.036	(0.010)	-0.275***	-0.021	(0.005)	-0.190***
Problematic Friend	0.019	(0.009)	0.094*	0.038	(0.018)	0.164*	0.029	(0.015)	0.165	0.002	(0.008)	0.012
Suppportive Relative	-0.003	(0.006)	-0.024	-0.004	(0.012)	-0.028	-0.016	(0.010)	-0.140	-0.001	(0.005)	-0.008
Problematic Relative	0.002	(0.008)	0.010	0.014	(0.016)	0.073	-0.026	(0.013	-0.167	0.023	(0.008)	0.140**
Prior Depression	0.445	(0.041)	0.446***	0.405	(0.093)	0.346***	0.227	(0.064)	0.279***	0.249	(0.040)	0.269***
Male	0.005	(0.045)	0.005	-0.265	(0.110)	-0.187*	-0.233	(0.082)	-0.245**	-0.170	(0.042)	-0.183***
Stressful Events	0.052	(0.013)	0.158***	0.079	(0.027)	0.219**	0.018	(0.020)	0.071	0.052	(0.013)	0.173***
Adjusted R squared			0.317			0.390			0.190			0.222

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Support from relatives is not related to depression for any marital category. Problematic ties with relatives raise levels of depression only for the married group. In fact, interactions (not shown) indicate that the impact that problematic relatives have on the mental health of the married is significantly different from their impact on those who cohabit ($p < 0.01$). In general, friends are considerably more influential than kin for the mental health of this young sample.

The impact of the control variables on depression is comparable within the four groups. The exceptions are that sex is not related to depression among single people and stressful life events have no effect on depression among cohabitors. Overall, the model best explains depression among divorced/separated people and single people than among the two partnered groups.

Our final question concerns whether the impact of kin, friend and partner relationships on mental health are similar or different for people who are married or are cohabiting. The test for interaction (not shown) between partner status and relational quality is significant despite the fact that partner status has no direct effect on mental health. The interaction between partner status and problematic relationships with relatives is significant ($p < 0.05$).

Table 4 shows the results of the model separately for married and cohabiting people. Support from friends has positive impacts on mental health for both cohabiting and married people but is especially important for cohabitors. Supportive friends have nearly double the effect on reducing depression for cohabitors compared to the married. Problems with friends do not affect levels of depression for either partnered status, perhaps indicating both that the role of friends for those with partners is exclusively a supportive one and that friends can be dropped from the social network if relationships with them become problematic. Support from relatives is not influential for depression levels for either married or cohabiting people, again suggesting that support from friends is more important than support from relatives at this stage of the life cycle.

Findings for the influence of problematic relationships with relatives on mental health show a curious difference between married and cohabiting people. As expected, married people who report problems with relatives also report higher levels of depression. For cohabitors, however, problematic relationships with relatives are actually associated with significantly less depression. We might expect that cohabitation would be associated with the most problematic relations with relatives because of the moral stigma some relatives would associate with it.

Problems with partners have considerably greater negative impact on the mental health of married people than on that of cohabitors. Indeed, they are not related at all to levels of depression among cohabitors. Support from partners, however, has an equivalent inverse relationship with depression for

Table 4. Regression of Depression on Friend, Relative and Partner Relationships, by Marital Status.

	Model A			*Model B*		
	Cohabiting ($N = 141$)			Married ($N = 457$)		
	b	(S.E.)	Beta	b	(S.E.)	Beta
Supportive Friend	-0.032	(0.010)	-0.249**	-0.016	(0.005)	-0.145***
Problematic Friend	0.019	(0.016)	0.111	-0.009	(0.008)	-0.054
Supportive Relative	-0.015	(0.010)	-0.129	0.002	(0.005)	-0.014
Problematic Relative	-0.027	(0.013)	-0.176*	0.016	(0.008)	0.094*
Supportive Partner	-0.021	(0.011)	-0.165	-0.018	(0.006)	-0.134**
Problematic Partner	0.008	(0.014)	0.060	0.029	(0.007)	0.202***
Prior Depression	0.208	(0.066)	0.256**	0.222	(0.038)	0.240***
Male	-0.218	(0.083)	-0.229**	-0.154	(0.012)	-0.165***
Stressful Events	0.015	(0.020)	0.059	0.041	(0.041)	0.138***
Adjusted R squared			0.217			0.290

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

both partnered groups. The statistically significant relationship among married people only may be due to the larger number of married people in the sample.

Finally, we compare the relative influence of supportive and problematic relationships with partners, friends, and relatives among cohabitors and married people. When partner relationships are added to the model, the relationships change. Cohabitors report that supportive friends have the strongest impact on mental health, followed by problematic relatives. Relationships with partners do not have a significant impact on the mental health of cohabitors. This finding perhaps indicates the lower level of commitment cohabitors have to their partners. In contrast, problems with spouses have the strongest effect on the mental health for married people. Support from friends has a greater impact than support from partners and problems with relatives for married people, while neither problems with friends nor support from relatives has a significant impact on the mental health of the married.

DISCUSSION

We examine several ways in which social networks influence mental health. The first is how different network ties influence levels of depression. Here we consider how three important types of network ties – partners, relatives, and friends – affect mental health. Each of these relationships differs in the obligations and expectations for support they entail, how freely they are chosen, and how easy they are to break. The second question is whether the mental health impact of friendship, kinship and partner relationships changes across different marital statuses.

Partners have strong obligations for support, are freely chosen, but are difficult to leave (Gove et al., 1990; Wallerstein & Blakeslee, 1995). The importance of partner relationships should make both the positive and negative aspects of partners have major impacts on mental health. Our results confirm this expectation for those who are married but not for cohabitors. Both sides of the spousal relationship are related to mental health: conflict with spouses is related to more depression and support from spouses to less depression. That support from cohabiting partners was not significantly related to depression may be due to the smaller sample size of cohabitors, but it is clear that negative relationships with partners have no impact on the mental health of the cohabitors. So while problems with partners have the greatest impact on the mental health of the married, it has no impact on the mental health of the cohabitors. This may indicate both the expectations associated with the spousal role and the difficulty of breaking the relationship. In comparison, it is easier to leave a cohabiting than a marital relationship when problems arise.

Relatives also have strong obligations for support, are not freely chosen, and cannot be abandoned (Fischer, 1982; Wellman, 1990; Harris, 1990). We predicted that the expectations of support from relatives but the impossibility of breaking kin ties would lead problematic ties with relatives to have a greater impact on depression than supportive ties. This prediction was partially supported. Support from relatives was not related to depression for any of the marital groups. Problematic relationships with relatives were not related to depression for those without partners but were related to higher levels of depression for those who were married. This supports the idea that kinship relationships intensify after marriage (Moore, 1990; Hurlbert & Acock, 1990).

One puzzling finding is the impact that problematic relatives have on mental health of cohabitors when controlling for the quality of the partner relationship. Here we see a significant relationship in the opposite direction than was seen for the married. Problems with kin are expectably associated with more depression among married people. Among cohabitors, however, problematic kin ties are actually associated with less depression. We suspected a spurious relationship and questioned whether the married and cohabiting picked a different type of relative as the one they "were closest to." Previous literature suggested that those who cohabit rather than marry are likely to be those with less attachment to their parents (Clarkberg, Stolzenberg & Waite, 1995) so we examined whether the cohabitors where less likely than the married to select parents. Further investigation (not shown) indicated that approximately the same percentage of cohabiting and married individuals selected their parents as the relative they felt closest to. Therefore, the type of relative does not explain this difference between the married and cohabiting. This remains as a question for further research.

Finally, friendships are expected to be supportive, are freely chosen, and can be more easily broken than partner and kin relations (Fischer, 1982; Wellman & Wortley, 1989). Because of this, we predicted that support from friends would be related to positive mental health while problems with friends would not be related to depression because of the ease with which the friendship tie can be abandoned. We do find that supportive friends are related to lower levels of depression for each of the marital groups but we also find that problems with friends are related to greater depression for the single and divorced/separated. This suggests that perhaps the friendship tie cannot be easily abandoned by everyone. For the cohabiting, problems with friends may be non-significant because of the sample size. However, problematic friends do not affect the mental health of those who are married. This fits with the expectation that when people marry, they drop peripheral friends and place less investment in remaining friends (Shulman, 1975; Fischer et al., 1989).

We also compared the relative importance of different ties for each of the marital groups. The results indicate that friends, especially the supportive aspect of the friendships, are much more influential than kin for the mental health of this young adult sample. For those who are married, the partner relationship has the greatest impact on their mental health.

Our findings stem from a particular stage of the life cycle. The importance of network ties, however, should vary at different points in the life cycle. For example, we would speculate that the importance of supportive friends would decline as our young adults enter mid-life. Conversely, the importance of kin ties may grow as more sample members have children (Shulman, 1975). What changes might occur in relationships with partners as these respondents age is an open question.

A number of limitations of these data must be stressed. Although the design is longitudinal, it is not sensitive to the dynamic nature of network relationships. Most importantly, we are unable to test how changes in network ties are related to changes in mental health. A different sample design would be necessary to see, for example, what impact the emergence of problems has both in affecting changes in the social network and in mental health. Likewise, these data cannot address the question of how changes in marital status from unpartnered to partnered and from partnered to unpartnered might bring about changes in network composition and mental health. Our data are only suggestive of how these dynamics might work.

Another limitation lies in the age range of the sample, which is restricted to 25–31 year olds. Although this age range allows us to control for the important impact of life stage on both network composition and mental health, it limits the generalizability of our findings to young adults. We do not know the impact of partner, friend, and kin relationships on the mental health of older or of younger persons.

Finally, additional weakness of these data stems from the measurement of network ties. The question on close friends does not allow us to make finer distinctions across types of friendships. For both partner and relative relationships, the respondents consider the one person in each category to whom they feel closest but for the category of friends, they think in general terms rather than considering their best friend. The questionnaire did not ascertain any possible romantic relationships among respondents who were neither married nor cohabiting. More adequate data on network ties would result in a better understanding of the influence of social networks on mental health.

CONCLUSION

This study shows the importance of particular types of network ties on mental health. Relationships with different members of the social network do not have equivalent mental health impacts. Summary measures of network size or of structural properties of networks will not be sensitive to the relationally-specific aspects of how social networks influence mental health. In addition, social network studies must be sensitive to how network ties have problematic as well as supportive aspects. In many cases, the mental health impact of the problematic side of network ties is of greater importance than the supportive side to mental health. Network studies should always consider the double-sided nature of social relationships in assessing mental health. Finally, it is clear that the impact of particular network ties such as friendship, kinship, or partner relationships can only be considered as part of a total role configuration. The mental health impact of a particular relationship changes when other changes occur in network composition. Further, these changes are not independent of dynamic alterations of role configurations across the life course. Social networks have important effects on mental health that can be studied most adequately within contextual and dynamic studies over time.

NOTE

1. For each marital status, we tested for interactions between the presence of children and the positive and negative aspects of relationships with friends and relatives. Of the 16 tests of interaction, only two were significant. For the divorced, those with children and problematic relations with a relative had increased levels of depression. For those who cohabit, negative relations with a relative was only related to lower depression for those without children. We also conducted tests of interaction for sex by the positive and negative aspects of the friends and relative relationship for individuals in each marital status and found only two of the 16 interactions to be significant. For the separated and divorced, a supportive relationship with a relative had a significantly different impact on the mental health of men and women and for the married, a problematic relationship with a relative only affected the mental health of women.

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GENDER, SOCIAL SUPPORT, AND EXPERIENTIAL SIMILARITY DURING CHRONIC STRESS: THE CASE OF FAMILY CAREGIVERS

J. Jill Suitor and Karl Pillemer

ABSTRACT

In the present chapter, we use data from two studies of family caregivers to elderly relatives to investigate whether stressful circumstances interact with experiential similarity to produce gender similarity in patterns of support. Taken together, the set of findings demonstrate that gender is important in explaining patterns of support among family caregivers to the elderly. First, women reported a substantially larger number of associates from whom they received general emotional social support than did men; however, there were no important gender differences in the number of associates who provided emotional or instrumental support specific to caregiving. Second, both quantitative and qualitative analysis revealed that experiential similarity was much less important in explaining men's than women's patterns of support. We suggest that these findings are consistent with the argument that experiential similarity is most important following status transitions when the transition is salient to the individual.

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INTRODUCTION

Although social science attention to gender differences in social support has been relatively recent, awareness of this issue has a long history. More than 1,500 years ago, for example, Talmudic scholars commented that the charity that a woman could offer was "better than that of a man" because the woman's support provided direct sustenance, while a man's support would be remunerative, and would require conversion before being utilized (Langer, 1997). In our own time, as the study of the causes and consequences of social support has grown, differences in men's and women's provision and receipt of support has become a central issue, resulting in the publication of more than 100 articles over the past two decades alone. In the present article, we will focus on one aspect of this complicated issue – whether experiential similarity plays a similar role in men's and women's patterns of social support.

GENDER AND SOCIAL SUPPORT

The literature demonstrates remarkably consistent patterns regarding gender differences in the solicitation and receipt of emotional support. Although men are generally more likely than women to receive high levels of support from their spouses, they are far less likely than women to receive support from *all* other sources throughout the life course (cf. Akiyama, Elliott & Antonucci, 1996; Anderson, Earle & Longino, 1997; Lynch, 1998; Okun & Keith, 1998; Schuster, Kessler & Aseltine, 1990; Turner & Marino, 1994; for exceptions, see: Greenberger & O'Neil, 1993; Strain & Chappell, 1982).

For example, studies of adolescents reveal that girls are more likely than boys to report engaging in mutually supportive interactions with friends (Canaan, 1990; Frydenberg & Lewis, 1993; Raja, McGee & Stanton, 1992). Studies of college students also find that young women are more likely than young men to report receiving support from friends (cf. Parker & de Vries, 1993; Sarason, Sarason, Hacker & Basham, 1985). Research on parent-child relations in adolescence and young adulthood shows the same trend, with greater closeness and more supportive interactions between parents and daughters than parents and sons (Hagestad, 1984; Miller & Lane, 1991; O'Conner, 1990; Suitor & Pillemer, 1997).

Such gender differences in support appear to be maintained in adulthood. Women have larger networks of confidants and receive higher levels of social support from friends and relatives than do men (cf. Brugha, Bebbington, McCarthy, Wykes & Potter, 1990; Cramer, Riley & Kiger, 1991; Harrison, MaQuire & Pitceathly, 1995; Matt & Dean, 1993; Okun & Keith, 1998; Ross

& Mirowsky, 1989; Schuster, Kessler & Aseltine, 1990; H. Turner, 1994; R. J. Turner & Marino, 1994; Van der Pompe & de Heus, 1993). Consistent with the earlier years, women also have more supportive ties with parents, as reported by both generations (Angres, 1975; Miller, Bengtson & Richards, 1987; Rossi & Rossi, 1990; Silverstein, Parrott & Bengtson, 1995; Spitze, Logan, Deane & Zerger, 1994).

Further, there is evidence that gender differences in support may become more marked across the adult life course. Fischer and Oliker (1983) reported that men were less likely than women to "replace" friendships that were lost in the later years, consistent with Field and Minkler's (1988) finding that women's contact with associates remained relatively stable across the middle years, while men's declined. Similarly, both Wister and Strain (1986) and Matt and Dean (1993) found greater gender differences in interaction patterns among older than middle-aged adults.

Taken together, this literature reveals remarkable consistency in gender differences between men's and women's patterns of support. It has been argued that these gender differences exist because men's socialization leads them to be: (1) less willing than women to admit needing or desiring support (cf. Barbee et al., 1993; Dunkel-Shetter & Skokan, 1990; Riggio & Zimmerman, 1981); (2) less willing than women to accept support when offered (cf. Barbee et al., 1993; Dunkel-Shetter & Skokan, 1990; Riggio & Zimmerman, 1991); (3) less proficient than women at soliciting support (cf. Barbee et al., 1993); and (4) less willing and able than women to reciprocate support (cf. Barbee et al., 1993; Cutrona & Russell, 1990; Dunkel-Shetter & Skokan, 1990; Parker & deVries, 1993; Riggio & Zimmerman, 1991; Sarason, Sarason, Hacker & Basham, 1985).

A key question, however, remains unanswered by the existing literature: Despite the consistency of this pattern of gender differences, are there some circumstances under which patterns of support are similar for men and women? In particular, is it possible that the differences in men's and women's patterns of support become muted in the face of a recent negative life event?

The few studies whose findings contradict the pattern of gender differences outlined above suggest that this may be the case. For example, Kohen (1983) found little difference in men's and women's likelihood of talking to family or friends when worried or when "something bad happened." Similarly, Reinhardt (1996) reported few gender differences in support from family and friends when facing vision loss, and Gerstel (1988) found that men and women were almost equally likely to turn to relatives for emotional support following divorce. Further, Brugha and colleagues' (1990) study of depressed patients revealed no gender differences in confiding. Thus, there may be some basis for suggesting that recent "focal events" (Sarason, Pierce & Sarason, 1990), such as status transitions, negative events, and illness reduce the differences generally found in men's and women's patterns of support.

In this chapter, we will explore this issue by presenting a conceptual framework outlining the importance of experiential similarity in explaining support, and using data from two studies of family caregivers to elderly persons to investigate whether especially stressful circumstances interact with experiential similarity to produce gender similarity in patterns of support.

EXPERIENTIAL SIMILARITY, GENDER, AND SOCIAL SUPPORT

Homophily theorists have long argued that individuals are more likely to develop and maintain supportive relationships with others who are similar to them on important social dimensions (cf. Feld, 1982; Lazarsfeld & Merton, 1954; Marsden, 1988; Merton, 1968). Homophily may produce these patterns because individuals who share social statuses tend to hold similar values and are more knowledgeable about one another's circumstances, resulting in greater empathy. In previous discussions of this issue (cf. Pillemer & Suitor, 1996; Suitor & Pillemer, 1993, 1996; Suitor, Pillemer & Keeton, 1995), we have suggested that such shared values and knowledge are primarily the result of *experiential* similarity. Specifically, we have argued that it is actually shared experiences, rather than merely shared positions in the social structure, that result in greater support between individuals who share social statuses. Building upon a theoretical argument developed by Thoits (1986), we proposed that associates who have been through similar experiences are more empathetic because they are better prepared to help stressed individuals understand their feelings. Further, associates with similar experiences are less likely to reject individuals because of their distress (Suitor et al., 1995).

Our analyses of data on both middle-aged returning women students and caregiving daughters (Suitor & Pillemer, 1993, 1996; Suitor, Pillemer & Keeton, 1995) demonstrated that network members who had experienced a similar transition were more likely to be a source of emotional support, and were less likely to be a source of interpersonal stress, such as criticism, direct interference, or unmet expectations for support. Consistent with our findings, Dunkel-Shetter and Wortman (1982) and Wortman and Lehman (1984) found that women with breast cancer were more accepting of support from other women who had also experienced breast cancer than from other well-meaning but inexperienced associates. Similarly, Weiss' (1974) study revealed that women found support groups for divorce particularly helpful because of the high degree of similarity among the participants. Last, Gouldner and Strong's (1987) study of mid-life women indicated that similarity of experience was important in both the development and maintenance of friendships following major life events. Taken together, these findings demonstrate the importance of experiential similarity for women experiencing focal events. However, they do not shed light on whether this dimension of similarity is equally important in explaining patterns of support among men.

We believe that equally compelling arguments can be made for two alternative hypotheses. On one hand, it can be argued that experiential similarity may be even more important for men than women in explaining the circumstances under which individuals seek and accept emotional support. The studies already cited suggest that men face greater obstacles to receiving support; therefore, the greater empathy and understanding between associates with shared experiences may be even more necessary for men than women to both solicit and accept support. Further, there are bases for suggesting that experiential similarity may be especially important when men experience focal events that are generally experienced by women, such as becoming a caregiver. Women who become caregivers step into a somewhat familiar "kinkeeping/caring" role (cf. Gerstel & Gallagher, 1993). In contrast, men are unlikely to have been socialized to these roles, and therefore may feel less competent and comfortable; as a result, men may particularly benefit from the facilitating effect of experiential similarity. Last, men's greater difficulty reciprocating emotional support may be less problematic with associates who have had similar experiences, since these individuals have greater understanding of the way in which stressful events diminish the ability to reciprocate (cf. Pillemer & Suitor, 1996).

This argument, then, suggests that experiential similarity moderates the relationship generally found between gender and social support. In particular, this argument suggests that patterns of support reported by men and women would be the most similar when the support was specific to a recent focal event, *and* was provided by experientially similar associates. In contrast, patterns of support would be the least similar when the support was not specific to a focal event (e.g. support for personal or day-to-day problems) and was provided by non-experientially similar associates.

Alternatively, there are grounds to argue that experiential similarity may be *less* consequential for men than women, even in times of crisis. Men and women may have markedly different psychological needs for and conceptualizations of support, which may produce gender differences in the importance of similarity. Discussions ranging from scholarly discourses by Gilligan (1982) and Chodorow

(1978) to popular books, such as Gray's *Men are from Mars, Women Are from Venus* (1992) and Tannen's *You Just Don't Understand* (1990) have argued that women place greater emphasis on understanding others' experiences than do men, particularly in relation to one's own experiences. Since experiential similarity increases mutual understanding, women may be more likely than men to focus on similarities and differences between their experiences and those of their associates. Based on this line of reasoning, we hypothesize that experiential similarity would be more important in explaining women's than men's patterns of support.

To examine these hypotheses, we use data from the first wave of two longitudinal studies of family caregivers to elderly relatives with dementia.

THE TWO FAMILY CAREGIVERS STUDIES

Study No. 1: Caregivers' Networks Across Time

The data for the Caregivers' Networks Across Time study were collected between January of 1989 and April of 1993 during two-hour interviews with individuals who were identified as the primary caregivers to elderly relatives with some form of irreversible dementia.

Ninety-one percent of the participants were referred to the study by physicians at 13 major medical centers in the northeastern United States that had dementia screening programs. The remainder of the participants were referred by psychiatrists and neurologists who worked extensively with dementia patients. We requested that we be placed in contact with the primary caregiver to all of the patients who received a diagnosis of Alzheimer's disease or a related dementia. Based on the information from each of the sites, we estimate that we were provided with approximately 90% of the appropriate cases from the medical centers, and approximately 75% of the appropriate cases from the private physicians.

One of the major considerations in the design was to interview the individuals shortly after they had acquired the formal status of caregiver. In order to accomplish this, we attempted to limit our sample to individuals whose parents had been given a diagnosis of dementia within the previous six months.[1] (Due to errors in the referral process, a small number of the care recipients had been diagnosed more than six months prior to the interview).

We completed interviews with 60% of the individuals who were eligible for participation, resulting in a sample of 256 caregivers. (Sample characteristics are presented below).

Study No. 2: Partners in Caregiving

The data for the Partners in Caregiving study were collected between March, 1994 and April, 1997, using basically the same procedures as those employed in the Caregivers Across Time study. There were only two differences in the procedures. First, all respondents were recruited through one major medical center, located in northwestern New York State. Second, all potential respondents were informed that if they participated in the study, they might be asked to spend one hour a week for eight weeks with a "friendly visitor" discussing caregiving, in addition to completing four interviews across a period of one year. The potential respondents were also informed that the friendly visitor would be an experienced caregiver who had been trained to provide support and information. Approximately half of the 146 caregivers who participated in the project were assigned to the "friendly visitor" intervention. The quantitative analysis were conducted using data from interviews that took place prior to the "friendly visitor" intervention. Some qualitative data from the T2 interviews of the respondents who participated in the friendly visitors program were also used to explore gender differences in salience of experiential similarity.

Based on the information from the referral site, we estimate that we were provided with approximately 77% of the appropriate cases. We completed interviews with 42% of the individuals who were eligible for participation, resulting in a sample of 145 caregivers.[2]

Characteristics of the Combined Sample

The combined sample of 401 caregivers included 169 daughters, 34 sons, 35 daughters-in-law, 98 wives, 46 husbands, eight siblings, eight other relatives, and three non-relatives who were viewed by the respondents as equivalent to kin. The mean age of the caregivers was 56.8 (SD = 13.8). Forty-eight percent had completed high school, 22% had completed some college, and 30% were college graduates. Twenty-one percent had a total family income of less than $20,000 during the year of the study, 33% had a total family income between $20,000 and $39,999, 23% had an income between $40,000 and $59,999, and 22% had an income of $60,000 or more. Forty-eight percent were not employed, 22% were employed part time, and 34% were employed full time. All but six of the respondents were white and non-Hispanic.

The mean age of the care recipients was 76.7 (SD = 7.9). Sixty-six percent were women; 34% were men. In 55% of the cases the elderly relative lived in the respondent's home, in 26% of the cases the relative lived elsewhere in the community, and in 19% of the cases the relative lived in some type of nursing home or board and care facility.

Measures of Social Network Structure and Function

In both studies, we used the name-elicitation approach developed by Fischer (1982) to collect information on the structure and function of the caregivers' social networks. We asked each respondent whether there was anyone on whom she or he relied for a variety of instrumental and emotional tasks, including tasks specific to caregiving, and tasks not directly related to caregiving. The questions specific to caregiving included: (1) whether anyone had helped to provide care to the elderly relative; and (2) whether anyone had done anything to make it easier for the respondent to care for the relative. The respondents were also asked to whom they talked about their elderly relative. The socio-emotional tasks not specific to caregiving included talking about: (1) day-to-day issues that bothered them; and (2) other personal problems. The respondents were also asked with whom they were the most likely to get together or talk on the phone. We asked the first names of the people on whom the respondent relied for each of these dimensions of support.

In addition, we collected information on each of the caregiver's household members, siblings, and children, regardless of whether they were named as sources of support or stress. Altogether, we collected data on 4,518 associates named by the 401 caregivers, including both kin and non-kin. It is important to note that formal service providers (e.g. medical, social service, and legal professionals) were not included among the 4,518 associates. These associates were omitted from the analyses because their bases for providing support were more likely to be affected by their formal positions than by the factors under investigation.

For each of the 4,518 network members named, we collected data on the individual's demographic characteristics (age, educational attainment, gender, marital status, employment status, etc.), and whether the associate had experience caring for an elderly relative. For the present analysis, network members were categorized as a source of emotional support if: (a) the caregiver *directly stated* that the network member had provided emotional support (e.g. "she always supports me emotionally," "he tries to cheer me up when I'm upset about my mother," etc.); or (b) the caregiver's response met Cobb's (1976) classic definition of emotional support – the caregiver's statement indicated that she or he viewed herself or himself as loved, cared for and esteemed in terms of the caregiving context (e.g. "my friend Susan is just there for me in terms of my mother)." We considered any associate who was coded positively on either of these items to be a source of emotional support specific to caregiving.[3]

Network members were categorized as a source of instrumental support if the respondent stated that the associate had provided some form of concrete assistance regarding caregiving. The types of instrumental support included providing direct care to the parent, running errands for the caregiver, staying with the parent to relieve the caregiver of her responsibilities, contributing household labor, and seeking information for the caregiver (e.g. legal advice, respite care services, etc.).

Our examination of the distributions of the number of associates listed in response to each name elicitation question indicated that for each item, a few respondents named a substantially greater number of people than did rest of the sample. Rather than leaving the data in this form, we chose to truncate the distribution by collapsing the highest 10% of the distribution for each item. For example, more than 90% of the respondents named seven or fewer associates when asked to whom they talked about the care recipient; however, a few respondents named a much greater number. For the present analysis, we collapsed the highest category into seven or more associates for this variable. The same procedure was used for each of the name elicitation items.

Qualitative Data

At some points in the discussion of results we draw on the qualitative data that were collected as part of both studies. As noted above, the data for studies were collected during extensive personal interviews that were tape recorded and transcribed. The qualitative materials presented in this paper were drawn from responses to open-ended questions regarding caregiving experiences, sources of social support, and, in the case of respondents who participated in the "friendly visitor program," the ways in which they felt that the program had helped them cope with their caregiving responsibilities.

PATTERNS OF EXPERIENTIAL SIMILARITY AND SOCIAL SUPPORT

Gender Differences in Patterns of Support

We began the analysis by examining gender differences in the number of associates named as sources of a variety of dimensions of social support, including both instrumental and emotional support for caregiving, emotional support for other issues, and socializing.

The mean values presented in Table 1 show the number of associates listed by men and women in response to each of the name elicitation questions. The findings suggest few gender differences in support specific to caregiving, but substantial differences across other dimensions of support. Men and women reported similar numbers of associates as sources of both emotional and instrumental support specific to caregiving; however, the findings regarding all other dimensions of support reveal consistent and pronounced gender differences. Women named a larger number of associates with whom they talked about the care recipient, and about both personal and day-to-day problems. Women also named a greater number of associates with whom they socialized.

We suggested earlier that gender differences might be the least pronounced when the support was specific to caregiving and was offered by associates with caregiving experience. However, as shown in Table 2, restricting the analysis to network members with experiential similarity did little to change the patterns found when using the full network of associates (see Table 1). In fact, the only discernable change was that the gender differences between the number of associates named by men and women for talking about the elderly relative, personal problems, day-to-day problems, and socializing were *greater* when considering only experientially similar associates than when considering the entire network.

Table 1. Mean Number of All Associates Providing Support by Gender.

Support Dimension	Females ($n = 316$) Mean (S.D.)	Males ($n = 85$) Mean (S.D.)	p Gender Difference
Emotional Suppport Specific to Caregiving	0.37 (0.69)	0.31 (0.64)	ns
Instrumental Support Specific to Caregiving	2.17 (1.57)	1.88 (1.50)	ns
Talking About the Care Recipient	3.48 (2.04)	2.73 (1.80)	0.001
Talking About Day-to-Day Problems	2.34 (1.47)	1.46 (1.34)	0.000
Talking About Personal Problems	1.92 (1.36)	1.15 (1.32)	0.000
Socializing	3.59 (1.88)	3.13 (1.86)	0.043

Table 2. Mean Number of Associates with Caregiving Experience Providing Support by Gender.

Support Dimension	Females ($n = 316$) Mean (S.D.)	Males ($n = 85$) Mean (S.D.)	p Gender Difference
Emotional Suppport Specific to Caregiving	0.15 (0.36)	0.09 (0.29)	ns
Instrumental Support Specific to Caregiving	1.12 (1.12)	0.95 (1.09)	ns
Talking About the Care Recipient	1.17 (1.07)	0.57 (0.77)	0.000
Talking About Day-to-Day Problems	1.17 (1.07)	0.57 (0.77)	0.000
Talking About Personal Problems	0.88 (0.82)	0.44 (0.70)	0.000
Socializing	1.78 (1.38)	1.12 (1.25)	0.000

To be certain that these findings were not the result of other systematic gender differences in either demographic characteristics or caregiving experiences, we conducted a series of regression analyses for each dimension of support, controlling caregiver age, marital status, educational attainment, employment status, and the emotional and physical stress of caregiving.[4] These findings mirrored those revealed by the bivariate analyses presented in Tables 1 and 2 in terms of gender differences in number of associates named as sources of support or socializing.

Taken together, the findings discussed above seriously call into question whether experiential similarity affects patterns of support for both genders. If experiential similarity affected men and women in the same way, we should have found little or no gender difference in the number of associates named when restricting the analysis to network members with caregiving experience. Not only was this not the case, but the differences between the number of supporters named by men and women was *greater* when using only the restricted network of fellow caregivers.

To investigate more directly whether experiential similarity affected men and women differently, we conducted a series of logistic regression analyses using the associate as the unit of analysis. In these analyses, we examined whether associates with caregiving experience were disproportionately named as a sources of support by both men and women.[5] These findings demonstrated clear differences in the importance of experiential similarity in explaining men's and women's patterns of support. As shown in Table 3, caregiving similarity was a consistent predictor of which associates were named as sources of support to women respondents. In fact, this factor was important across all of the dimensions of support on which we collected data. In contrast, for men, caregiving similarity was important only in explaining which associates provided instrumental support specific to caregiving.

Perhaps the greater importance of experiential similarity for women than men can be explained by the higher level of salience and demands of the caregiving role for women (cf. Allen, 1994; Arber & Ginn, 1995; Coward & Dwyer, 1990; Finley, 1989; Horowitz, 1985; Lee, Dwyer & Coward, 1993), often resulting in decreases in women's time and energy for social interaction. If interaction must be limited, perhaps restricting contact to those associates who have the greatest understanding of the difficulties and constraints of caregiving reduces stressful interactions for women caregivers (Pillemer & Suitor, 1996; Suitor & Pillemer, 1993, 1996; Suitor et al., 1995).

Our qualitative data suggest that this is the case. The women often explained friends' and relatives' attitudes and behaviors on the basis of whether the associates had experience providing care to elderly relatives, and noted the importance of that factor in their relationships:

> [When you talk to others who have been caregivers] you're able to verbalize your feelings, what you're going through, what's happening . . . You get the support of each other . . . They have the full understanding of what you're going through. . .That's a big help in itself.

Table 3. Logistic Regression Analysis of All Dimensions of Support by Gender ($N = 687$ male associates, 3286 female associates).

Support Dimension	Females B (std. error)	Males B (std. error)
Emotional Support Specific to Caregiving	0.77*** (0.18)	0.14 (0.40)
Instrumental Support Specific to Caregiving	0.77*** (0.09)	0.92*** (0.21)
Talking About the Care Recipient	0.56*** (0.08)	0.16 (0.18)
Talking About Day-to-Day Problems	0.36*** (0.09)	0.32 (0.21)
Talking About Personal Problems	0.21* (0.09)	0.18 (0.22)
Socializing	0.35*** (0.08)	-0.02 (0.18)

> [My friend Laura and I] are a sounding board for one another. She's here with me every day. She went through [caring for her mother] last year. Her mother [was in a nursing home] and I was very supportive of her too.

In contrast, none of the men mentioned the issue of caregiving similarity when discussing their relationships with network members. For men, such discrimination among associates in terms of caregiving similarity may be less important, since their caregiving activities are a less central focus of their day-to-day lives.

Experiential Similarity and Gender in a Community Intervention

As a final step in exploring gender differences in the importance of experiential similarity, we examined qualitative data that were collected as part of the Peer Support Project (PSP). As noted earlier, the PSP involved an intervention designed to provide new caregivers with support from volunteers who had themselves been caregivers. To explore gender differences in the salience of experiential similarity, we compared the responses of the 12 men and 42 women who completed the intervention.[6] While men and women were equally likely to say that they would recommend the program to other caregivers, their reasons for recommending it, and statements regarding what they found helpful differed markedly.

For the majority of the women, the most positive aspect of the program was talking to someone with similar experiences, who therefore, as one women explained "shared a mutual understanding":

> [The most important aspect] was talking to someone who had the same problem I have . . . It was nice to talk to somebody who really understood . . .

> . . . to talk to somebody who wouldn't say to me, you know, you must be crazy. You must be making this up. That was most important thing for me.

> You need people to talk to who are in the same situation. Family provide support, but they don't understand everything you're going through.

In contrast, the men's positive comments regarding the intervention focused on instrumental activities, as would be expected based on the literature on gender differences in task-oriented social interactions:

> [I found it helpful because] you get to learn a few things you haven't thought of.

> I guess the most important thing was how to satisfy the needs of the . . . Alzheimer's person.

> [The volunteer] gave me a lot of suggestions and hints and comments, and little, we call them, curly-ques. [How to] handle different things . . . All the little nooks and crooks you can make to accomplish it, they all help.

In sum, while the women often emphasized the importance of experiential similarity in explaining the benefits of the program, the men generally emphasized instrumental functions when discussing the program's attributes. Thus, these findings also demonstrate the greater salience of experiential similarity for women than men caregivers, consistent with our earlier quantitative analysis at both the respondent and the associate level.

DISCUSSION AND CONCLUSION

Taken together, the set of findings presented in this chapter demonstrate that gender is important in explaining patterns of support among family caregivers to the elderly. First, while men and women reported similar numbers of associates who directly provided both emotional and instrumental support for caregiving, they reported substantially different numbers of associates who provided support for other issues. Specifically, women reported a substantially greater number of associates to whom they talked about their elderly relative, as well as to whom they talked about day-to-day problems and personal problems.

We believe that these findings suggest a pattern that may shed light on the conditions under which gender differences in support are the most pronounced. The two support items on which there was the greatest gender similarity were those that asked the respondent to name who had either "done anything to make caregiving easier" or "helped" the relative. Thus, the respondent did not necessarily have to take an active role in seeking this support. In contrast, for other dimensions of support, the respondents were questioned about the people to whom *they talked.* Implicitly, these questions elicit information about active behaviors on the part of the respondent, unlike the questions regarding instrumental support, which measure only the respondents' *receipt* of support. This distinction may help to explain why the gender difference persisted for the item "To whom do you talk about your relative?" While this item focuses specifically on the issue of caregiving, respondents must play an active role in the process to be provided with support on this dimension.

Second, and more importantly, the analyses revealed that experiential similarity was much less important in explaining men's than women's patterns of support. In fact, the gender differences in number of supporters were greater across almost all dimensions of support when using the subsample of experientially similar associates than when using the full network of associates in the analysis. Further, analyses with the associate as the unit of analysis revealed that experiential similarity was much more important in explaining women's than men's sources of support. Among women caregivers, network members who had caregiving experience were more likely to have been named as sources of all of the dimensions of support included in the study. In contrast, among men caregivers, experiential similarity affected only which network members were a source of instrumental support specific to caregiving.

Perhaps, as we suggested earlier, experiential similarity is less important for men than women because women place greater emphasis on understanding others' experiences than do men, particularly in relation to one's own experiences (cf. Gilligan, 1982; Chodorow, 1978). However, there is an alternative explanation. Perhaps the fact that men solicit support primarily from their wives (cf. Akiyama et al., 1996; Anderson et al., 1997; Lynch, 1998; Okun & Keith, 1998; Schuster et al., 1990; Turner & Marino, 1994), whereas women draw from a wide range of sources (cf. Gouldner & Strong, 1987; Oliker, 1989; Wellman & Wortley, 1990), means that women particularly need to develop selection criteria for soliciting such support. Thus, for women, experiential similarity may facilitate successfully "filtering" their network in an effort to ensure access to the most empathetic members. For men, there may be no such selection processes.

Another possible gendered explanation is that our findings may be specific to status transitions that are more salient for women than men. For example, becoming a family caregiver is an extension of women's traditional kinkeeping/caring role (cf. Gerstel & Gallagher, 1993), and appears to result in more intensive "hands-on" activities for women than men (cf. Allen, 1994; Arber & Ginn, 1995; Coward & Dwyer, 1990; Finley, 1989; Horowitz, 1985; Lee, Dwyer & Coward, 1993). The expansion of women's traditional kinkeeping role, both psychologically and pragmatically, may increase the salience of the transition for women, also making similarity of caregiving experience more salient for women than men.

Studies we have conducted of caregivers whose relatives died suggest that this may be the case (Suitor & Pillemer, 2000). Specifically, using both quantitative and qualitative data, we found that following the death of the care recipient, caregiving similarity became important in explaining which associates men, as well as women, sought as sources of emotional support. Further, the analysis suggested that similarity of the transition from caregiving to bereavement became a focal point for dyads in which the associates had experienced both caregiving and the subsequent loss of the care recipient.

It is important that future research investigate whether the findings presented here and in our study of bereaved caregivers can be replicated using other major status transition and life events. Studies of other focal events that are highly salient to both men and women, such as divorce and job loss, have not investigated whether men are as likely as women to disproportionately likely seek support from similar others. We know from the literature that men are less likely than women to join support groups that foster such experiential similarity (Wuthnow, 1994); nevertheless, men may become more sensitive to such similarity at critical junctures than they do at other points in their lives. Investigation across a variety of negative life events may be able to help provide a more comprehensive answer to this question.

NOTES

1. Our rationale for selecting respondents whose relatives had been diagnosed recently was that caregiving responsibilities are most likely to become clearly defined at the time that a formal diagnosis of dementia is made. This suggestion has been supported thus far by our findings. Many of the respondents have made statements indicating that being given a specific diagnosis solidified their view of themselves as caregivers. (Suitor & Pillemer, 1990, for a more complete discussion of this issue).

2. We believe that the lower rate of participation in the Peer Support Project than the Caregivers Across Time study can be attributed to the fact that all potential participants in the PSP were informed that half of the respondents would be asked to participate in the intervention. Thus, each caregiver was aware that his or agreement to participate would potentially involve a commitment of as many as 20 hours of contact across a one-year period. In contrast, participants in the AD study were asked to agree to only six hours of contact across a two-year period.

3. To determine coding reliability for both emotional and instrumental support, the all of the open-ended responses regarding support at T1 were coded separately by two individuals – the first author and a graduate assistant. A reliability analysis of these coding decisions produced an unmodified Kappa coefficient of 0.94 (cf. Brennan & Prediger, 1981).

4. We conducted two sets of logistic regressions for this analysis. The analysis presented in Table 3 included all associates named by the respondents (excluding formal service providers). We conducted a separate analysis from which we omitted minors (children, nieces, etc. under the age of 17), since many of the control variables were not salient (e.g. educational attainment, employment status). There were no systematic differences between the findings of these two sets of analyses.

5. Throughout these analyses, the following variables were controlled: (a) the associate's age; (b) the respondent's age; (c) the respondent's marital status; and (d) the number of miles that the associate lived from the respondent.

6. The *N* of cases for this analysis is lower than the original 50% who were assigned to the intervention condition because several caregivers did not complete the volunteer program.

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EXPLORING THE STRUCTURAL CONTEXTS OF THE SUPPORT PROCESS: SOCIAL NETWORKS, SOCIAL STATUSES, SOCIAL SUPPORT, AND PSYCHOLOGICAL DISTRESS

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ABSTRACT

Despite the long-standing interest of sociologists in the impact of social structure on the psychological well-being of individuals, the structural contexts of the support process remain understudied. To begin to fill this gap, some support researchers have used social statuses to tap location in the social structure. Others have analyzed the interpersonal environments in which individuals are embedded by using quasi-network data that describe categories of alters or, less commonly, network data linked to specific alters. We use network data to test models that examine: (1) direct effects of network structure on perceived adequacy of social support; and (2) their direct and indirect effects (through social support) on psychological distress – net of social status effects. Our results suggest that the social network context is more important in the support process than researchers using quasi-network data have concluded.

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INTRODUCTION

Ever since Durkheim, sociologists have been interested in the impact of social structure on the psychological well-being of individuals. Researchers using the standard sociological model of the support process have used two approaches to explore the effects of structural contexts on the determinants and consequences of social support. The first approach uses social statuses to tap location in the social structure. This approach has established that perceptions of social support and psychological manifestations of distress vary systematically by social class, gender, age, race, and marital status.[1] The second approach uses network concepts, methods, and measures to develop an alternative to these "largely categorical descriptions of social structure" (White, Boorman & Breiger, 1976, p. 732). It has produced less consistent results, in part, because different researchers conceptualize and measure differently the interpersonal environments in which individuals are embedded.

We begin our exploration of the structural contexts of the support process with a constructive critique of these differences. Here, we use the distinction between the "social integration" and "network structure" ways of conceptualizing and measuring interpersonal environments to develop two arguments. First, support researchers who use the social integration strategy to study the social network context overlook key aspects of network structure. Second, support researchers using both network strategies have paid relatively little attention to the relationship between social networks and social statuses. To begin to fill these gaps, we use data from persons in southwestern Louisiana affected by Hurricane Andrew to assess links among social networks, social statuses, social support, and psychological distress.

THE SOCIAL NETWORK CONTEXT OF THE SUPPORT PROCESS

Like sociologists more generally, support researchers have moved away from sociologies that "decontextualize" the individual (Coleman, 1986; Galaskiewicz & Wasserman, 1993) by emphasizing the constraining and enabling aspects of the social structures that are produced and reproduced by individuals in their everyday lives. Yet, as recent reviews make clear (e.g. by Aneshensel, 1992; House, Umberson & Landis, 1988; Pearlin, 1989; Thoits, 1995; Turner & Marino, 1994), the structural contexts of the support process remain relatively unstudied. To begin to fill this gap, some researchers have turned to stratification research to document the impact of social statuses on support and psychological distress (Aneshensel, Rutter & Lachenbruch, 1991; Kahana et al., 1995; LeClere, Rogers & Peters, 1998; Mirowsky, 1996; Simon, 1998; Turner & Marino, 1994; Turner, Pearlin & Mullan, 1998; Turner, Wheaton & Lloyd, 1995). Other researchers have shown that studying social structure directly, by analyzing the interpersonal environments or social networks in which individuals are embedded, improves our understanding of the determinants and consequences of social support (Antonucci, 1990; Beggs, Haines & Hurlbert, 1996a, b; Haines & Hurlbert, 1992; Haines, Hurlbert & Beggs, 1996; Lin & Ensel, 1989; Morgan, Carder & Neal, 1997; Pescosolido, 1991, 1992; Suitor, Pillemer & Keeton, 1995; Walker, Wasserman & Wellman, 1993; Wellman & Wortley, 1990).

What remains less clear is how to study social support, social networks, and the relationship between them. Early attempts to incorporate insights from social network analysis in the study of the support process confounded social support and social networks by constructing network measures of social support (e.g. the use of strong and homophilous ties as indicators of social support (Lin, Woelfel & Light, 1985; Lin & Ensel, 1989)). Researchers now widely recognize social support and social networks as conceptually and empirically distinct phenomena.

The terms "social integration," "social network," and "social support" have often been used interchangeably. To clarify the differences among these concepts, House et al. (1988) offered the following definitions. "Social integration" refers to the existence, quantity, and, later, frequency of social relationships (Pugliesi & Shook, 1998; Turner & Marino, 1994; Umberson et al., 1996). "Social network" refers to the structural properties that characterize a set of relationships. "Social support" refers to the emotionally- or instrumentally-sustaining quality of social relationships. By separating social integration and network structure from social support in this way, this approach contributed to the ongoing use of two strategies for exploring the impact of the social network context on the support process: the social integration and network structure strategies.

Social Integration and Network Structure Strategies for Exploring Social Network Context

The social integration strategy and the network structure strategy both define social networks as sets of ego-alter relationships that are defined from the point of view of a focal individual (ego). Both strategies collect information from egos to describe properties of their interpersonal environments. But they differ in the aspects of network structure that are used to measure social structure and, therefore, in the type of data on ego-alter relations that must be collected.

The social integration strategy requires information on the existence, quantity, and frequency of social relationships. Its proponents use quasi-network data; that is, data that describe *categories* of alters (e.g. family, friends, coworkers) but are not linked to specific alters. By contrast, key measures used by the network structure strategy (e.g. density, homogeneity, relationship duration) can only be constructed from information about ego's ties to *specific* network members. The standard procedure for collecting these network data is the "name generator-name interpreter" sequence. Name generators elicit the names of network members. Name interpreters are "follow-up questions" (Campbell & Lee, 1991) that elicit additional information about these named individuals (e.g. their personal characteristics, their relationships to ego).

Social support researchers tend to use the social integration strategy and, therefore, the limited range of measures of network structure that can be constructed from quasi-network data (Denton, 1997; Hirdes & Strain, 1995; Hogan & Eggebeen, 1995; Krause, 1991; Pugliesi & Shook, 1998; Turner & Marino, 1994; Turner et al., 1998; Umberson et al., 1996). If other dimensions of network structure are important determinants of the reception and perception of social support and psychological distress, then the social network context may be more important than support researchers conclude (e.g. Hogan & Eggebeen, 1995; Turner & Marino, 1994). To investigate this possibility, we follow the social support strand of network analysis and use measures of network composition (the average characteristics of network members), network size, and network density in our assessment of the role of social network context in the support process.

Since network characteristics tap only one of the structural contexts of people's lives that affect the support process (House et al., 1988; Pearlin, 1989), it is also necessary to take seriously the social status approach to exploring the structural contexts of people's lives. Network analysts control routinely for the effects of social class, gender, age, race, and marital status in models of the determinants and consequences of social support. But because they focus on the effects that network structure exerts on support and mental health outcomes, network analysts have paid much less attention to the relationship between the social network and social status contexts. To explore this relationship more systematically, we develop models that examine the direct effects of network structure on social support and their direct and indirect effects (through social support) on psychological distress.

In developing these models, we draw on the social status, social integration, and network structure approaches to the study of the structural contexts of the support process. Because our data target the effects of Hurricane Andrew, we also draw on research on helping behavior during disasters and on disaster framings of the stress process. Research on the specificity theme of the support process suggests that the determinants and consequences of support transactions are situation-specific (Brock et al., 1996; Brown, Lemyre & Bifulco, 1992; Cutrona & Russell, 1990; Jacobson, 1986; Pearlin, Aneshensel & LeBlanc, 1997; Pescosolido, 1992; Simon, 1998; Thoits, 1995). Our exploration of the structural contexts of the support process must, therefore, be tailored to the disaster situation.

Two other ongoing controversies in the debate over how to conceptualize and measure social support emerge in the disaster context. The first controversy centers on the relative importance of received support vs. perceived support. Accumulating evidence suggests that perceived support is more consequential than received support in the etiology of psychological distress (Burrera & Baca, 1990; House, 1981; Sarason, Pierce & Sarason, 1990; Sarason, Sarason & Pierce, 1990; Thoits, 1995; Turner & Marino, 1994; Wethington & Kessler, 1986). Therefore, we follow the perceptual approach and measure social support as the experience of being supported by others (Turner, 1983; Turner & Marino, 1994). During disasters, perceptions of the availability of social support are put to the test. In these circumstances, perceived adequacy of social support is more consequential for mental health outcomes than perceived availability of social support is. Therefore, we use this facet of perceived support in our exploration of the structural contexts of the support process.

The second controversy revolves around the relative importance of emotional support vs. instrumental support. Most researchers accept arguments for the primacy of expressive support (Aneshensel, 1992; Lin et al., 1985; Lin & Ensel, 1989; Pugliesi & Shook, 1998). Some evidence suggests that instrumental support may also be important in situations like disasters (Beggs et al., 1996a; Haines & Hurlbert, 1992; Kuo & Tsai, 1986; Norbeck & Tilden, 1983; Wellman & Wortley, 1990). Thus, we include information on expressive support and instrumental support in our measure of perceived adequacy of social support.[2]

The Social Status Context

Supportive responses are most likely where stressors are "unambiguous and visibly distressing – where potential providers recognize the need, see it as legitimate, and know how to help" (Kaniasty & Norris, 1993, pp. 395–396; see also Dunkel-Schetter & Skokan, 1990; Eckenrode & Wethington, 1990). Because disasters satisfy these criteria, it is not surprising that enhanced levels of social support are common during the preparation and short-term recovery phases of hurricanes. But even in these phases of disasters, not all victims participate equally in support transactions. Some individuals are more likely than others to receive more adequate support and, therefore, to experience lower levels of psychological distress (Beggs et al. 1996a; Bravo, Rubio-Stipec & Canino, 1990; Comfort, 1990; Drabek, 1986; Leivesley, 1977; Mileti, Drabek & Haas, 1975).

Perceptions of social support and psychological distress vary by social class, gender, age, race, and marital status. For every social status, however, studies of the social distribution of social support have produced inconsistent results. Turner and Marino (1994, p. 196) concluded their review of research on differences in perceived social support across socioeconomic groups with the observation that the "available evidence" was "too mixed and too limited to allow a confident conclusion" (see also Vaux, 1988). But other reviews and studies support the conclusion that higher socio-economic status is associated positively with perceived and received support (House et al., 1994; Ross & Mirowsky, 1989; Thoits, 1995; Turner & Marino, 1994; Turner et al., 1998) and that women have higher levels of perceived support than men do (Turner & Marino, 1994; Umberson et al., 1996).

The relationship between age and social support has also been the subject of an ongoing debate, with some researchers finding no relationship, others an inverse relationship, and still others a positive relationship. But the weight of evidence inside and outside the disaster context suggests that age has a negative effect on perceived adequacy of social support (House et al., 1994; but see also Antonucci, 1990). However, the connection between race and social support has received less attention, making the prediction of the effect of race more difficult. If the effects of race are consistent with usual status patterns, then minority group members should report lower levels of adequate support (Hogan, Eggebeen & Clogg, 1993; Hogan & Eggebeen, 1995). Finally, the distribution of social support by social status is clearest for marital status. Most studies report that married individuals have higher levels of social support than unmarried individuals (Thoits, 1995; Turner & Marino, 1994).

Studies of the social distribution of psychological distress have produced more consistent results. Higher levels of psychological distress are consistently associated with lower socio-economic status (Aneshensel & Sucoff, 1996; House et al., 1994; Mirowsky & Ross, 1995; Ross & van Willigen, 1997; Turner et al., 1995). Gender differences in psychological distress are also well documented, with women experiencing higher levels than men (Aneshensel, 1992; Aneshensel et al., 1991; Gore & Colten, 1991; Horwitz, White & Howell-White, 1996; Kessler & McLeod, 1984; Mirowsky & Ross, 1995; Pugliesi, 1995; Roxburgh, 1996; Turner et al., 1995; Umberson et al., 1996). Studies of the relationship between age and psychological distress typically find an inverse relationship (Matt & Dean, 1993; Turner & Marino, 1994; Turner, Wheaton & Lloyd, 1995) but results may vary where samples include older (post-retirement) individuals. Whites are less distressed than blacks (Kessler & Neighbors, 1986; Ulbrich, Warheit & Zimmerman, 1989) and married individuals have lower levels of psychological distress than unmarried individuals (Gore & Colten, 1991; Mirowsky & Ross, 1995; Turner et al., 1995).

From Social Statuses as Structural Contexts to Social Networks

Studies of the social status context have improved our understanding of the structural contexts of the support process. But they have not explored the effects of a second structural context that influences the determinants and consequences of social support: the social network context.

Network studies of the support process have explored the impact of network structure on support reception (Beggs et al., 1996a; Haines & Hurlbert, 1992; Lin & Ensel, 1989; Suitor et al., 1995; Vaux, 1990; Wellman, 1992) and, less commonly, support provision (Haines et al., 1996; Wellman & Wortley, 1990). Because the effects of the social network context on perceived adequacy of social support and psychological distress remain relatively unstudied (but see Lin et al., 1985; Lin & Ensel, 1989), we ground our predictions for both outcomes in research on support reception and provision. The logic of our argument is: individuals who are embedded in the kinds of networks that theoretical and empirical research suggest are effective conduits of social support should report higher levels of adequate support and lower levels of psychological distress.

Starting with perceived adequacy of social support, research outside the disaster context has shown that family members are key providers of expressive and instrumental support (Antonucci, 1990; Walker et al., 1993; Wellman & Wortley, 1990). This research also suggests that ties to women and ties to individuals who have high socio-economic status are important conduits of social support. Studies of disasters have also established the primacy of kin as sources of social support (Kaniasty, Norris & Murrell, 1990; Quarantelli, 1960; Solomon, 1986). In the case of disasters, however, men are more likely than women to provide support to people outside their families (Drabek, 1986).

Individuals' predisaster roles also affect their propensity to provide assistance (Drabek, 1986; Nelson, 1977). During disasters, relationships with individuals with less education may be more salient because these individuals may be more likely to be in occupations that develop or use disaster-relevant skills (e.g. construction trades). Three predictions about the effects of network composition follow. *Individuals who are embedded in networks with higher proportions of kin, men, and those with lower educational attainment should report higher levels of adequate social support.*

Network studies have shown that strong ties are more important conduits of social support than weak ties are, in part because strong ties "have a greater motivation to be of assistance and are typically more easily available" (Granovetter, 1982, p. 113). Because strong ties are characteristic of dense networks or dense sectors of networks, individuals who are embedded in dense networks receive more support in routine and crisis situations than individuals in wide-ranging networks do (Granovetter, 1982; Marsden, 1987, 1992; Smith-Lovin & McPherson, 1993; Walker et al., 1993; Wellman & Wortley, 1990). Network size has also been shown to affect positively levels of received and perceived support (Haines & Hurlbert, 1992; Vaux, 1990; Wellman, 1992). Therefore, *we predict that both of our measures of network density (average closeness and average relationship duration) and our measure of network size should have positive effects on perceived adequacy of social support.*

Some attempts to explain the effects of network structure on psychological distress rely either implicitly or explicitly on the role of interpersonal ties as conduits of social support. Others argue that social network context can affect psychological distress, independently of its connection to disaster support. The most obvious process contributing to this independent effect is social integration. Larger networks signal higher levels of social integration (Marsden, 1987; Pescosolido & Georgianna, 1989; Smith-Lovin & McPherson, 1993) and, as sociologists since Durkheim have shown, social integration is inversely related to stress-related outcomes, including psychological distress. Network density signals the presence of the strong ties that facilitate the production and reproduction of shared values and, therefore, high social integration. Thus, *individuals who are embedded in larger networks and individuals who are embedded in more dense networks should experience less short-term psychological distress.*

The social integration argument also underpins our prediction for kin composition. Because kin-dominated networks show high levels of social integration, greater kin composition should have a negative effect on short-term psychological distress. However, effects of other measures of network composition on psychological distress are difficult to predict and we do not evaluate specific hypotheses for them in models of psychological distress.

DATA, MEASURES, AND ANALYSIS PROCEDURES

Data

Data for this study were collected from residents of two adjacent southwestern Louisiana parishes that the Louisiana Office of Emergency Preparedness identified as most strongly affected by Hurricane Andrew. These parishes lie near, but not directly on the Gulf coast. Industrial activity in both parishes is dominated by fishing, sugar cane farming, and fabrication of offshore platforms. Some residents are employed in offshore drilling.

Hurricane Andrew struck the Gulf coast of Louisiana in the late hours of Tuesday, August 25 and the early hours of Wednesday, August 26, 1992. With winds of over 150 miles per hour, Andrew was one of the worst storms to hit this area in many years. Damage to homes, businesses, and property in these parishes was extensive. In one parish, 5% of the homes were destroyed and over 95% incurred some damage. The effects on the other parish were comparable. Grants and loans for housing, businesses, and personal and economic injury in the two parishes totaled over 39 million dollars.

Despite this extensive damage, these parishes experienced only minimal disruption of their telephone service. Because their telephone lines were buried, most residents had telephone service throughout the storm. Service that was disrupted was restored within days of the storm. For this reason, we were able to use telephone interviews to collect data from residents of three towns in these parishes and the surrounding rural areas that have the same zip codes as the towns they adjoin. Chosen randomly from a list of telephone numbers, the 594 respondents who completed the interview represent 70% of screened eligible respondents. Most interviews were conducted in October and November of 1992; the remainder were completed in early December. Interviews usually lasted 30 to 45 minutes, with interviewers reporting that all respondents remembered clearly the events of the storm.

Measures

Short-Term Psychological Distress

To measure psychological distress, we used a modified version of the Center for Epidemiological Studies' Depression Scale (CES-D) that is described by Ross and Mirowsky (1989; Mirowsky & Ross, 1990; see also Radloff, 1977). We asked respondents: "How many times (0–7) during the past week have you: (1) felt that you couldn't get going; (2) felt sad; (3) had trouble getting to sleep or staying asleep; (4) felt that everything was an effort; (5) felt lonely; (6) felt you couldn't shake the blues; and (7) had trouble keeping your mind on what you were doing." Following Mirowsky and Ross (1990), we constructed our measure by first summing across the items and then dividing by 7 to arrive at a measure of psychological distress that ranges from low (0) to high (7). The alpha reliability is 0.88. In our study, this measure taps short-term psychological distress because of the timing of our interviews (two to four months postdisaster).

Perceived Adequacy of Social Support

Our measure of perceived adequacy of social support was constructed from respondents' reports of whether (1) or not (0) they had enough people to help them in the preparation and recovery phases of Hurricane Andrew (instrumental support) and whether (1) or not (0) they had enough people to talk to about the storm in its preparation and recovery phases (expressive support). It can range from 0 to 4, with higher values indicating more adequate social support.

Social Network Context.

Network data were collected with the standard procedure for collecting survey network data. Our first name generator modified the name-eliciting question that was used in the 1985 General Social Survey. It asked respondents to name up to five individuals with whom they discussed "important matters" in the six months prior to Hurricane Andrew. This name generator taps relatively strong ties (Marsden, 1987; Bailey & Marsden, 1999). To tap weaker ties, we asked respondents to name up to five individuals with whom they socialized in the six months prior to Hurricane Andrew (see Fischer, 1982). The networks that we examine include all non-redundant alters elicited by these two name generators. Our name interpreter questions generated information about the personal characteristics of the named alters (e.g. gender) and the characteristics of their relationships with our respondents (e.g. the closeness of the tie).

Our measures of network composition are the proportion of network members who are kin (constructed from a measure contrasting kin (1) with non-kin (0)), the proportion of network members who are men (constructed from a measure contrasting men (1) with women (0)), and the proportion of network members with a high school education or less (constructed from a measure of each alter's education, in years). We use two measures of network density. The first is a measure of the average closeness between the respondent and the alters in his or her network. It was constructed from respondents' reports of whether they felt especially close (1), somewhat close (0.5), or not close at all (0) to each alter.[3] Our second measure, relationship duration, measures the proportion of network members whom the respondent has known for at least six years. Network size is the total number of non-redundant alters elicited by our two name generators (maximum possible is 10).

Social Status Context.

Our two indicators of socioeconomic status are education and family income. Education is measured in years. Family income is measured in thousands of dollars.[4] Gender is coded male (1) and female (0). Age is measured in years. Race is coded white (1) and non-white (0).[5] Marital status is measured with a series of dummy variables. The first is coded never married (1) and otherwise (0); the second is coded separated, widowed, and divorced (1) and otherwise (0). The reference category is married.

Controls: Disaster-Specific

Our measure of loss is respondents' reports of the severity of damage to their residences. It ranges from practically no damage (1) to severe damage (4). Household dependents measures the number of household members who are either under the age of 18 or over the age of 65. Chronic health problems taps whether (1) or not (0) a respondent has a chronic illness or physical disability. Our measure of past hurricane experience is whether (1) or not (0) respondents had been through a hurricane prior to Hurricane Andrew. Our measure of household insurance is whether (1) or not (0) respondents had insurance on their homes and possessions at the time of the storm. Means and standard deviations for all variables are presented in Table 1.

Analysis Procedures

Table 2 summarizes our predictions for the effects of the social status and social network contexts on perceived adequacy of social support and psychological distress. Our exploration of these structural contexts expands conventional network studies of the support process to cover the indirect effects of network structure on psychological distress. To determine whether this refinement improves our understanding of the support process in the disaster context,

Table 1. Means and Standard Deviations of Variables Used in the Analysis.

	Mean	Standard Deviation
Psychological Distress	9.46	12.58
Perceived Adequacy of Support	3.84	0.48
Social Status Context:		
Education	11.82	2.91
Family Income	27.79	19.47
Gender (male)	0.43	0.50
Age	46.26	16.58
Race (white)	0.66	0.47
Never Married	0.11	0.31
Separated/Divorced	0.20	0.40

Table 1. Continued.

	Mean	Standard Deviation
Disaster-Specific Factors:		
Loss (House Damage)	2.53	1.00
Household Dependents	1.01	1.19
Chronic Illness	0.20	0.40
Past Hurricane Experience	0.86	0.35
Have Insurance	0.80	0.40
Social Network Context:		
Proportion Kin	0.66	0.32
Proportion Male	0.47	0.30
Proportion Alters less than High School	0.77	0.30
Mean Closeness	0.94	0.11
Relationship Duration	0.92	0.20
Network Size	4.11	1.84
($N = 537$)		

we begin by using ordinary least squares regression to estimate models of perceived adequacy of social support (Table 3) and psychological distress (Table 4). In both tables, Model A explores the effects of the social status context, net of the set of variables we include to contextualize the disaster situation. In Model B, we add our measures of network structure to Model A to see whether they predict our outcomes, net of effects of the social status context and, in the case of psychological distress, net of the effect of perceived adequacy of social support. In Fig. 1, we explore whether social network context affects psychological distress indirectly, through its effects on social support. Tests for collinearity established that our independent variables are not sufficiently correlated to cause problems in the estimation of our equations.

RESULTS

Social Statuses, Social Networks, and Perceived Adequacy of Social Support

Table 3 presents the results of our analysis of the impact of the social status and social network contexts on perceptions of social support. Starting with the social status context, Model A shows that socio-economic status, race,

Table 2. Summary of Predictions for Effects of the Social Status and Social Network Contexts on Perceived Adequacy of Social Support and Psychological Distress.

STRUCTURAL CONTEXT	SOCIAL SUPPORT	DISTRESS
Social Status		
Social Class (education, income)	+	–
Gender (male)	–	–
Age	–	+
Race (white)	+	–
Marital Status (married)	+	–
Social Network		
Composition		
Proportion Kin	+	–
Proportion Men	+	
Proportion < High School	+	
Density		
Mean Closeness	+	–
Relationship Duration	+	–
Size	+	–

and marital status affect this outcome and that, in each case, the results are consistent with predictions derived from the literature on support transactions more generally. The positive effect of education on perceived adequacy of social support confirms that higher social statuses are generally associated with better access to social support. So does our finding that whites report more adequate levels of social support than non-whites. Our finding that, compared to their married counterparts, those who are separated and divorced report less adequate levels of social support also reproduces results of studies of received support and perceived availability of social support. Two disaster-specific factors also predict this outcome. Having more dependents in the household and experiencing more loss (house damage) both reduce the perceived adequacy of social support.

Model B of Table 3 examines the effects of the social network context on perceived adequacy of social support, net of the social status and disaster-specific determinants. Socio-economic status, race, marital status, household composition, and loss continue to have significant effects. Four aspects of the social network context also affect this outcome. Starting with the compositional measures, the proportion of network members who have a high school education or less has a positive effect on perceived adequacy of social support – a finding

Table 3. Unstandardized Regression Coefficients for Models of Perceived Adequacy of Social Support.

	Model A	Model B
Social Status Context:		
Education	0.02*	0.02*
Family Income	0.00	-0.00
Gender (male)	0.04	0.07
Age	0.00	0.00
Race (white)	0.10*	0.11*
Never Married	-0.07	-0.02
Separated/Divorced	-0.23**	-0.20**
Disaster-Specific Factors:		
Loss (House Damage)	-0.07**	-0.08**
Household Dependents	-0.04*	-0.04*
Chronic Illness	-0.05	-0.07
Past Hurricane Experience	-0.01	-0.06
Have Insurance	-0.01	-0.00
Social Network Context:		
Proportion Kin	–	0.00
Proportion Male	–	0.04
Proportion Alters less than High School	–	0.16*
Mean Closeness	–	0.34^{+}
Relationship Duration	–	0.26*
Network Size	–	0.05**
Intercept	3.803	2.84
R^2	0.11	0.17
N	537	537

that is not surprising in the disaster context. Turning to network range, both of our measures of network density (relationship duration and mean closeness) and our measure of network size have significant effects. As predicted, individuals who are embedded in networks of greater density and size report higher levels of perceived adequacy of social support.

Social Support, Social Statuses, Social Networks, and Psychological Distress

In Table 4, we begin our examination of the links among social networks, social statuses, social support, and psychological distress. Model A of Table 4 examines the effects of the social status context and perceived adequacy of social support on psychological distress, net of the effects of the disaster-specific factors we include to contextualize our exploration of the support process. Three social statuses affect this outcome. As predicted, individuals with higher family incomes report lower levels of short-term psychological distress during Hurricane Andrew than individuals with lower family incomes do. Men are less distressed than women are. Our results for age are also consistent with those of other studies, inside and outside the disaster context. Older individuals report higher levels of psychological distress than younger individuals. Having a chronic illness or disability and having more house damage also has a positive effect on psychological distress in the disaster context, while having insurance on one's home and possessions prior to the storm reduces this form of distress. Not surprisingly, perceived adequacy of social support also has a significant effect, with individuals experiencing less adequate support reporting higher levels of psychological distress.

In Model B of Table 4, we extend our examination of the effects of structural contexts on psychological distress to include the social network context. Two things are clear from these results. First, the effects of the social status context, the disaster-specific factors, and perceived adequacy of social support do not change when we add our measures of network composition and form. Second, the only aspect of the social network context that has a significant effect on psychological distress, net of the social status context and perceived adequacy of social support, is the proportion of network members who are men. Our results show that individuals who are embedded in social networks with higher proportions of men report higher levels of psychological distress than their counterparts in networks with lower proportions of men. None of our predictions for kin composition, network size, and network density was supported.

Taken by itself, the analysis of the determinants of psychological distress presented in Model B of Table 4 provides, at best, weak support for calls for including the social network context in studies of psychological distress. However, this specification only tests whether this structural context affects psychological distress independently of its connection to social support. As Model B of Table 3 makes clear, aspects of network composition and form do predict perceived adequacy of social support. To explore fully the role of social networks in the etiology of psychological distress, then, their indirect effects (through social support) must also be considered. Figure 1 does this by using standardized regression coefficients to present the effect of perceived adequacy of social support on psychological distress and all of the statistically significant paths (from Tables 3 and 4) through which network structure affects psychological distress.

Table 4. Unstandardized Regression Coefficients for Models of Psychological Distress.

	Model A	Model B
Social Status Context:		
Education	-0.08	-0.02
Family Income	0.08**	-0.08**
Gender (male)	-1.90$^+$	-2.17*
Age	-0.19**	-0.19**
Race (white)	0.95	0.85
Never Married	-1.39	-0.51
Separated/Divorced	1.45	1.84
Disaster-Specific Factors:		
Loss (House Damage)	1.38**	1.23*
Household Dependents	-0.39	-0.40
Chronic Illness	5.29**	-4.97**
Past Hurricane Experience	-0.82	-1.07
Insurance	-4.21**	-4.31**
Perceived Adequacy of Support	-4.62**	-5.15**
Social Network Context:		
Proportion Kin	–	0.33
Proportion Male	–	3.71*
Proportion Alters less than High School	–	1.60
Mean Closeness	–	-1.03
Relationship Duration	–	2.54
Network Size	–	0.39
Intercept	39.27	35.17
R^2	0.21	0.22
N	537	537

Perceived adequacy of social support has a strong, negative effect on distress. The proportion of network members who are men also has a direct effect on psychological distress but its effect is positive. Four aspects of the social network context have indirect effects on psychological distress, through social support. To explore the direction and magnitude of these indirect effects, we multiplied the endogenous paths.[6] They show that network size, network density (relationship duration and average closeness of ego and alters), and network composition influence levels of psychological distress. Individuals who are embedded in larger networks, individuals who are embedded in more dense

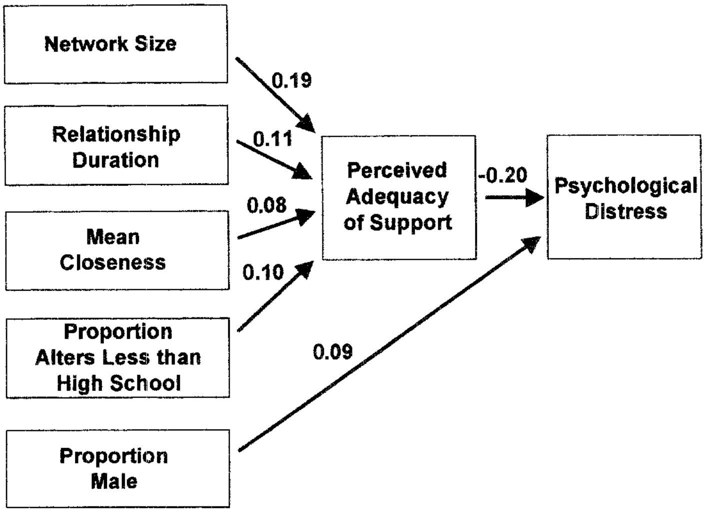

Fig. 1. Standardized Coefiicients for Direct Effects and Indirect Effects of Social Network Context on Psychological Distress.

networks, and individuals who are embedded in networks with higher proportions of alters with a high school education or less all experienced lower levels of psychological distress during Hurricane Andrew than their counterparts in smaller networks, less dense networks, or networks containing alters with higher levels of education. The magnitude of each of these effects is modest. But the presence of one direct effect and four indirect effects of network structure on psychological distress supports arguments for taking this structural context seriously in studies exploring the health-related consequences of social support.

DISCUSSION

To explore more fully the role of the social network context in the support process, we used a network structure strategy, expanding its analytical focus to explore indirect effects of network structure on psychological distress. Our results suggest that the role of the social network context in the support process will become clear only when its direct and indirect effects are considered.

Our analyses of the direct effects of network structure on perceived adequacy of social support and their direct and indirect effects (through social support) on psychological distress suggest that the social network context is more important in the support process than studies using the social integration strategy conclude. In their influential study of the social distribution of social support and its consequences for mental health, Turner and Marino (1994) used quasi-network data to construct four measures of the social network context: the availability of relatives, contact with relatives, the availability of friends, and contact with friends. They concluded: (1) that "these measures of support resources are completely inconsequential [for mental health] when the perceptual measures [of social support] are considered" (Turner & Marino, 1994, p. 204); (2) that "except in the case of gender, the epidemiology of support resources provides little suggestion that such resources importantly condition the clearly significant dimension of perceived support" (Turner & Marino, 1994, p. 205) and, therefore; (3) that their results "offer little basis for attaching significance to such resources" (Turner & Marino, 1994, p. 204). Our results do not support these conclusions about the significance of the social network context in the support process. We found that using the network structure approach to expand the range of measures of the social network context improves our understanding of the determinants of social support and that considering indirect effects of network structure on psychological distress provides substantial evidence for the relevance of this structural context in the etiology of this outcome.

NOTES

1. A second variation of this approach focuses on social roles (see: Aneshensel, Pearlin & Schuler, 1993; Burton, 1998; Hong & Seltzer, 1995; Link et al., 1990; Simon, 1995, 1997; Waldron, Weiss & Hughes, 1998; Wheaton, 1990).

2. Our models also include a set of variables that disaster framings of the stress process have shown to be important: loss (financial and personal losses such as storm-related damage to property), number of household dependents, chronic illness, past hurricane experience, and hurricane insurance. Experiencing higher levels of loss, having more household dependents, having a chronic illness, and not having hurricane insurance should all increase psychological distress (Freedy, Kilpatrick & Resnick, 1993; Kaniasty & Norris, 1995; Riad & Norris, 1996; Tobin & Ollenburger, 1996). The effect of previous hurricane experience is more difficult to predict. Norris and Murrell (1988) suggest that its effect on psychological distress should be negative – a suggestion that is consistent with the argument that life events have the greatest depressive impact on individuals who have not previously experienced other stressors (Eaton, 1978; Aneshensel, 1992). Others (e.g. Freedy et al., 1993; Moore & Moore, 1996; Turner et al., 1995) predict that previous disaster experience should increase distress.

3. As Campbell, Marsden and Hurlbert (1986) point out, there are two approaches to measuring network density. One approach focuses on ties among alters. The approach that we follow focuses on respondent-alter ties, based upon the argument that networks with high proportions of strong ties also tend to have high proportions of ties among alters.

4. Each respondent was asked to place his or her income in the first appropriate category (under \$5,000; under \$10,000; under \$15,000; under \$25,000; under \$35,000; under \$75,000; \$75,000 and over). The first six categories were recoded to their midpoints; the seventh was recoded to \$85,000. Fifty-nine respondents failed to report their family incomes. We developed a prediction equation to estimate their family income that included marital status, gender, race, household size, the length of time the respondent has lived in the area, whether the respondent has taken problems to local government, and the number of organizations in the community to which the respondent belongs. Because this equation was used only for prediction, the criterion used to select it was to maximize R^2.

5. One of the communities that we studied contained a reservation; our sample therefore included a small number of Native American respondents. Because the Bureau of Indian Affairs provided assistance to the reservation very quickly and efficiently (thus reducing or eliminating the need for support from other sources), we excluded these individuals from our analyses.

6. Network Size: $0.19 * (-0.20) = -0.038$; Relationship Duration: $0.11 * (-0.20) = -0.022$; Mean Closeness: $0.08 * (-0.20) = -0.016$; Proportion Alters with Less than High School: $0.10 * (-0.20) = -0.020$.

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FACTORS RELATED TO MULTIPLEXITY IN SUPPORT NETWORKS OF PERSONS WITH SEVERE MENTAL ILLNESS

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ABSTRACT

While social network support has been found to be critical for persons with schizophrenia and other severe mental disorders, these persons are at risk for having smaller, less functional networks than non-clinical populations. Multi-purpose or multiplex network ties are especially beneficial because they are known to be associated with positive outcomes. This study examined which types of factors were related to network multiplexity over a ten-year period in a sample of 234 persons with severe mental illness, three-fourths of whom had schizophrenia-spectrum disorders. We asked whether clinical characteristics, the nature of the sheltered-care social environments in which subjects were living at baseline, and the number of residential care episodes predicted network multiplexity at follow-up. Using three different conceptualizations of network multiplexity as outcomes, we found that, in general, a prior history of long-term institutionalization, social environments rated higher on practical orientation, and fewer residential care episodes over the study period predicted networks deficient in tie multiplexity. Contrary to expectations, psychopathology was related to only one of the multiplexity outcomes.

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INTRODUCTION

Research conducted over the past two decades has found that persons with schizophrenia as well as those with other major psychiatric disorders have smaller, less functional social networks than non-clinical populations (Tolsdorf, 1976; Cohen & Sokolovsky, 1978; Meeks & Murrell, 1994). This is troubling given the importance of social network support to a wide variety of outcomes in both general (Berkman & Syme, 1979; House, Landis & Umberson, 1988) and psychiatric populations (Strauss & Carpenter, 1977; Grusky, Tierney, Manderscheid & Grusky, 1985; Pescosolido, Wright & Sullivan, 1995). The provision of social support has been conceptualized as one of the many critical functions of networks (Pescosolido, 1991), and the web or network of relationships or ties conveying various types of support has been studied for its structural properties also (Hammer, 1986; Pescosolido, 1992).

Multiplexity as a network tie characteristic is particularly interesting because it reflects whether a social relationship serves more than one purpose, involves multiple social roles, or entails more than one type of social activity. Richer, more complex, and multi-purpose or "multiplex" network relationships are known to be especially beneficial and to be related to positive outcomes (Morin & Seidman, 1986). Yet, persons with schizophrenia and other severe mental disorders are at risk of having few of these ties within their networks (Cohen & Sokolovsky, 1978; Lipton, Cohen, Fischer & Katz, 1981; Hamilton, Ponzoha, Cutler & Weigel, 1989).

Studies have begun to explore the factors associated with social network support among mental health clients and inpatients. Cross-sectional research has established that psychiatric hospitalization, residential care placement, symptomatology, and social functioning are related to social network characteristics including network multiplexity (Lipton et al., 1981; Denoff & Pilkonis, 1987; Goering, Durbin, Foster, Boyles, Babiak & Lancee, 1992). However, few studies have taken a more rigorous longitudinal approach to examining factors thought to be associated with social support networks as outcomes (Moos & Mitchell, 1982; House, Landis & Umberson, 1988; Meeks & Murrell, 1994).

While research on the nature and impact of the social environments of community-based residential programs or services has proliferated in the past two decades (Moos, 1974, 1975; Segal & Aviram, 1978; Blake, 1987; Segal & Moyles, 1988), most investigators have not studied the influence of these environments, clinical factors, or patterns of residential service use on how clients or residents build and maintain personal social networks over a significant period of time (Denoff & Pilkonis, 1987; Goering et al., 1992; Nelson, Hall, Squire & Walsh-Bowers, 1992; for exceptions, see Segal & Holschuh, 1991, 1995). Such factors are suspected to play an especially important role in network outcomes for persons with severe mental illness (Cresswell, Kuipers & Power, 1992; Brugha, Wing, Brewin, MacCarthy & Lesage, 1993).

This study addressed these issues using longitudinal data to examine three sets of factors hypothesized to predict multiplex ties in the social networks of persons with severe mental illness. We asked whether individual-level clinical characteristics, the nature of residential sheltered-care social environments, and the number of residential care placements were related to network multiplexity over time. In doing so, we employed three different conceptualizations of network multiplexity discussed in the literature. We also examined differences in a number of socio-demographic, clinical, socio-environmental, residential service use, and social network factors between persons with severe mental illness who had at least one multiplex relationship in their network at follow-up and those who did not.

MULTIPLEXITY IN SOCIAL NETWORKS

As the formal study of social networks developed during the 1950s, social anthropologists and sociologists became interested in the concept of network multiplexity (Boissevain, 1968, 1971; Mitchell, 1969; Wolfe, 1978). Yet, no single accepted definition of *tie multiplexity* exists in the extensive literature on social networks (Verbrugge, 1979; Minor, 1983; Holschuh, 1994). Originally, Gluckman (1955, 1962) introduced the term to denote the co-existence of different normative elements in a social relationship. He pointed to the co-occurrence of distinct social roles in a dyad, or *role-based* multiplexity. For example, a father and son are also employer and employee. Network relationships which contain only one such role represent “uniplex” or “single-stranded” ties. Those that involve two or more roles are “many-stranded” or “multiplex” links (Barnes, 1972).

Kapferer (1969) offered a second definition of tie multiplexity: the overlap of different exchanges or activities in a social relationship. Thus, a multi-stranded or multiplex relationship is “multi-purpose” and contains more than one focus of interaction or content area (Fischer, 1982; Sokolovsky, 1986). This is *exchange* multiplexity. A third definition of multiplexity is common membership in organizations, peer groups, neighborhoods, or kindred groups (Wheeldon, 1969). In this case, multiplex ties exist when two people have two or more memberships in common.

Whether defined by roles, behaviors, or affiliations, tie multiplexity connotes multiple bases for interaction in a social dyad. The most common and compelling implication is that people who are bound together in more than one way are more securely bound to each other (Mitchell, 1969; Fischer, 1982). Multiplex relationships are thought of as "stronger," more "powerful," and more "important" relationships (Tolsdorf, 1976). The concept of multiplexity has been associated with stronger dyadic ties as a result of individuals' detailed knowledge of one another's needs and multiple claims on one another's attention (Verbrugge, 1979; Ferrand, 1989).

Multiplex relationships enable actors to maintain ties more easily because there exist more reasons to do so within such relationships (Hammer, Makiesky-Barrow & Gutwirth, 1978). Networks with multiplex ties are more likely to result in the mobilization of support, especially in times of need, because multiplex relationships, by definition, have multiple bases of interaction (Wellman & Wortley, 1990) and because there is less chance that any one type of support will be unavailable (Morin & Seidman, 1986).

Classic network studies of persons with serious psychiatric disorders by Tolsdorf (1976) and Cohen and Sokolovsky (1978) found significantly fewer multiplex relationships among persons with schizophrenia than among non-psycotic controls. A study comparing first admission with multiple admissions patients diagnosed with schizoprenia found that first admission patients named a greater overall number of multiplex ties in their networks and a greater number of multiplex ties among both kin and nonkin (Lipton et al., 1981). The proportion of multiplex to total relationships was significantly greater within the kin but not the non-kin sector of first admission compared to multiple admissions patients. The investigators concluded that the marked reduction in the number and complexity of social contacts of multiple admissions patients was associated with the course of schizophrenia and subsequent hospitalizations.

In a sample of VA men with schizophrenia, Hamilton and associates (1989) reported a greater number of multiplex relationships with non-kin than kin and that a higher subject score on a negative symptoms summary scale was related to having fewer multiplex relationships with non-kin. Sokolovsky and associates (1978) also found that having networks with a paucity of multiplex ties predicted rehospitalization among persons with schizophrenia living in an SRO hotel in Manhattan who had been discharged from a state mental hospital.

Although definitions of tie multiplexity vary, multiplex relationships consistently have been found to be inherently beneficial and to be related to positive outcomes (Morin & Seidman, 1986). Such ties are related to overall satisfaction with social networks and to better support and mental health in nonpsychiatric populations (Hirsch, 1980). While persons with major mental disorders are capable of forming these relationships, they do appear to be at risk of fewer multiplex ties within their networks and these are likely to decline over time. Therefore, the identification of factors associated with tie multiplexity is integral to an understanding of network development and maintenance among this population.

Yet, definitions of *network multiplexity* that consider the network as a whole vary in the literature also. Theoretical work on social networks and support has examined whether individuals have *any* important social relationships in their networks (Lowenthal & Haven, 1968; Miller & Ingham, 1976; Gottlieb, 1981). This approach argues that it is not the number of particular ties such as multiplex ties that matters but whether a person has *at least one* such tie within the network (Hammer, 1981; Reichmann, 1989). Compelling evidence to support this in the social support literature finds spousal or confidant ties to be the critical network relationships (Cohen & Wills, 1985; Kessler & McLeod, 1985; Thoits, 1995).

Competing conceptualizations posit that it is the *proportion* of multiplex ties in relation to all types of ties that matters (Lipton et al., 1981). Finally, still other constructs hold that the *total number* of multiplex ties is what is crucial (Tolsdorf, 1976; Cohen & Sokolovsky, 1978; Hamilton et al., 1989) and that "more is better," although no evidence for this exists (Vaux & Athanassopulou, 1987). Some network studies have used both the "at least one" and the "total number" approaches, with varying results (Haines, Hurlbert & Beggs, 1996). This remains an important conceptual issue in the study of social networks. It is critical to determine whether certain factors related to network multiplexity conceived as the network having at least one multiplex tie are also associated with network multiplexity constructed as the proportion and the total number of such ties.

Clinical and Socio-environmental Factors Affecting Networks

Clinical Factors

Psychopathology and a history of institutionalization are characteristics that make it difficult for persons with severe mental illness to acquire social interaction skills, develop and maintain social ties (Hammer, 1981), and achieve successful independent living (Van Putten & Spar, 1979; Goering, et al., 1992). Level of psychopathology has been found to be related negatively to network size (Pattison, DeFrancisco, Wood, Frazier & Crowder, 1975; Hammer, 1980; Cresswell, et al., 1992) and to the strength, diversity, and multiplexity of networks (Parks & Pilisuk, 1984).

In a study of positive vs. negative symptoms in schizophrenia, patients with a greater number of negative symptoms had smaller, more dysfunctional social networks and fewer multiplex ties among non-kin than patients with fewer negative symptoms (Hamilton et al., 1989). The investigators concluded that the negative symptoms typical of social withdrawal represent a lack of engaging social behavior that stands as a serious impairment directly responsible for deficits in the social relationships and social networks of these patients.

In the light of this literature, we hypothesized that higher levels of psychopathology would result in a lower probability of multiplex ties within the social networks of study respondents. However, the studies noted above used cross-sectional data, limiting their ability to document conclusively the direction of the negative relationships between psychopathology and network dimensions. Because it is important to determine temporal ordering and to move toward establishing causality, we hypothesized specifically that higher levels of psychopathology in 1973 would predict less network multiplexity at follow-up. Based on extensive findings that have documented the socially debilitating effects of long-term hospitalization (Goffman, 1961; Gruenberg, 1967; Wing & Brown, 1970; Denoff & Pilkonis, 1987), we also hypothesized that a history of institutionalization would result in a lower probability, proportion, and absolute number of multiplex ties.

Sheltered-care Environment

Sheltered-care residences are supervised living arrangements such as board and care homes, family-care homes, half-way houses, and psychosocial rehabilitation facilities. Past research has explored the effects of sheltered-care or residential care social environments that emphasize an affectively "supportive atmosphere" approximating the therapeutic community (Cumming & Cumming, 1963; Gunderson, 1983; Drake, Wallach & Hoffman, 1989) and those that maintain a "practical orientation." In the study of residential care social environments, Moos (1975) conceptualized a practical orientation as one that focuses on helping residents develop skills and goals that will move them toward discharge from the program or setting. This focus on very practical skills is found most often in "high-expectation" programs and transitional settings (Weinman, Kleiner, Yu & Tillson, 1974; Lamb, 1976; Denoff & Pilkonis, 1987).

Although early work on the impact of high-expectation environments supported the hypothesis that such an approach was related to positive outcomes for discharged mental patients (Lamb & Goertzel, 1972), subsequent studies found that very practically oriented, "high demand" approaches can reactivate symptoms and lead to relapse (Goldberg, Schooler, Hogarty et al., 1977; Lamb & Peele, 1984). Linn and associates (1979) found that a non-threatening and "low demand" environment that offers activities and opportunities to socialize rather than insight-oriented therapy is a more effective model of treatment for persons with chronic schizophrenia. Other research has reached similar conclusions regarding the negative effects of transitional settings (Crystal, Ladner & Towber, 1986; Appleby & Desai, 1987).

In a review of the literature, Nelson and Smith-Fowler (1987) reported that residential program characteristics were related to social network interactions for persons with chronic mental disabilities. In a recent study, Nelson and associates (1992) found that the supportive aspects of residential care social environments designed to facilitate forming friendships and developing interpersonal skills did lead to greater frequency of network support provided and received and to supportive transactions with both more friends and professionals.

Given the significance of social networks in outcomes for this population (Strauss & Carpenter, 1977; Faccincani, Mignolli & Platt, 1990; Pescosolido et al., 1995) and the need to determine the most appropriate types of residential care environments (Cournos, 1987), it is crucial to examine the *independent* effects that supportive and practical orientation social environments have on the development of multiplex ties in these networks. From the literature reviewed above, we hypothesized that residents who lived in sheltered-care environments that rated high on supportiveness in 1973 would have a greater probability, proportion, and total number of multiplex relationships in their networks at follow-up ten years later. Residents living in environments that they rated high on practical orientation were expected to have less network multiplexity. Although some residents rated their 1973 sheltered-care residence high on both dimensions, this generally was not the case.

Residential Care Episodes

Previous findings suggest that client experiences of community care placement and hospitalization are central to understanding network development and maintenance among this population. Lipton and associates (1981) found that a history of repeated hospitalizations was associated with deteriorated networks for persons diagnosed with schizophrenia. Because this study was cross-sectional, the direction of the relationships between these factors could not be established conclusively. Similarly, Holmes-Eber and Riger (1990) reported that a greater number of previous hospitalizations was related negatively to the number and percentage of relatives in the network. However, having more hospitalizations was associated with a greater number and percentage of mental health and service professionals, number of persons met in a mental health-related context, and the percentage of short-term relationships.

Contrary to the initial hypotheses, research using longitudinal data revealed that a greater number of *community placements* in sheltered-care residential settings was related to a range of *positive* network outcomes for persons with severe mental illness (Holschuh, 1994). Thus, rather than being a negative "revolving-door" treatment experience similar to repeated hospitalization episodes (Harris & Bergman, 1988), a pattern of multiple placements in community-based sheltered-care settings was related to having larger networks with more ties in which emotional support was given, received, and reciprocated and instrumental support was received (Segal & Holschuh, 1991, 1995).

Each episode of sheltered-care may serve as a form of respite care for the family or significant other(s) which allows them to continue their relationship with the client. Contrary to assumptions about the deleterious effects of residential mobility, the act of moving in and out of sheltered-care from time to time may focus attention on the individual with mental illness and promote social network interactions. Many such persons do not require continuous placement in residential care and are able to live with family or on their own at times. By providing multiple social contexts as opportunities for social interaction (Feld, 1981), moderate residential mobility may be related to positive network outcomes.

The general population network literature supports this idea. While moving may lead to a loss of some social ties, Fischer's choice-contraint model holds that individuals establish new community ties wherever they settle (Fischer, Jackson, Stueve, Gerson, Jones & Baldassare, 1977). Wellman's (1979) and Wellman and Wortley's (1989) work demonstrated that proximity is not required for the maintenance of community ties, especially in the modern age of improved transportation and communication technology. The convoy model of social network relationships over the life course asserts that the inner circle of closest, most significant ties is the most stable core of the network (Kahn & Antonucci, 1981; Antonucci & Akiyama, 1987). These relationships tend to remain intact during a move, while ties at the mid-range may shift to the outer circle of network relations, and those in the outer circle or periphery of the convoy are most vulnerable to loss. Similarly, Magdol (1995) found that frequent movers have greater tie turnover but retain network size in spite of changing network composition.

Finally, Meeks and Murrell (1994) have suggested that for some persons with severe mental illness, professional community support services related to residential care placement may provide substitute supports and embellish clients' social networks. Therefore, we hypothesized that a greater number of times in sheltered-care would result in a greater probability, proportion, and total number of multiplex relationships in respondents' social networks.

Control Variables

Individual-level Factors

Because of the extensive findings in general population and other samples on the relationships of sex (Fischer & Oliker, 1983; Wellman & Wortley, 1989; Moore, 1990), age (Cohen & Sokolovsky, 1980; Fischer, 1982; Marsden, 1987), and physical health status (Cohen & Syme, 1985; House, Landis & Umberson, 1988; Thoits, 1995) to various network and social support dimensions, these factors were included as control variables in the conceptual models. To adequately examine the impact of three sets of independent variables on network multiplexity as an outcome, this study also controlled for levels of social interaction with family and friends at baseline in 1973.

In summary, based on the literature and controlling for pertinent factors, we hypothesized that study participants with higher levels of psychopathology, a history of institutionalization prior to 1973, and who rated their residences at baseline higher on practical orientation would have networks with no or fewer multiplex relationships at follow-up. We hypothesized that those who rated their sheltered-care setting higher on supportiveness at baseline and who had more episodes of residential care during the interim period would have networks with a least one such tie.

From the seminal work of Berkman and Syme (1979) who documented the significant impact of social support networks on morbidity and mortality over a nine-year period in the Alameda County Study, we proposed that networks and the clinical and social factors associated with them have powerful and enduring qualities. Indeed, recent work on the long-ranging influence of both macro and micro-level social factors on a variety of outcomes supports this idea (Link & Phelan, 1995). Thus, we expected that our sets of independent variables would impact social networks over the time period of this study.

METHODS

Sample and Data Collection

This paper used nonexperimental survey data that were gathered as part of a ten-year, two-wave longitudinal study of a stratified, multi-staged cluster sample of 393 adults with severe mental illness who were living in 211 California sheltered-care facilities in 1973. The study divided the state into three strata to obtain probability samples of both facilities and residents. The resident sample is representative of all sheltered-care residents in California in 1973 between the ages of 18 and 65 with a severe mental illness.

A total of 360 sample members (91.6%) was located at follow-up between 1983 and 1985. No significant differences on socio-demograhics were found between those who were located and those who were not. Of those located, 270 (75%) were alive and 90 (25%) were confirmed dead. Of those located alive, 17 (6.3%) refused and 253 (93.7%) provided formal written consent to be re-interviewed. A review of the 253 interviews deleted 19 cases due to questionable data. This paper reports on the panel sample of 234 persons who completed valid interviews both in 1973 and at follow-up.

Data were collected from study participants during structured, face-to-face interviews administered by trained social workers at baseline in 1973 and at follow-up. Extensive information on the personal social networks of panel sample members was gathered during the follow-up interview only. Medical records of participants' known psychiatric hospitalizations were obtained at follow-up from 119 inpatient facilities in 15 states. The survey methodology used in the two-wave study has been described in detail elsewhere (Segal & Aviram, 1978, Appendix A, pp. 289–292; Segal & Kotler, 1993).

At follow-up, the average age of sample members was 53 years (SD = 12.4), and 53% were male. More than three-quarters (78.9%) of the sample were white. The mean years of education was 11.3 (SD = 3.0), and over half (53.6%) had never been married. More than half (56.4%) of the sample were living in a sheltered-care residence, 30.3% in the community, and 13.2% in institutions. Twenty-two per cent were living in the same sheltered-care residence as in 1973. It is important to note that the average number of episodes in a sheltered-care setting over the ten-year course of the study was low, 2.2 (SD = 1.8). Half (51.3%) of the respondents were in sheltered-care only once, 23.3% twice, and 15.1% three or four times. The remaining 10.3% were in from five to ten times. The mean length of time in the 1973 residence was 4.75 years (SD = 4.0).

More than three-quarters (76.7%) of the sample members had a lifetime or modal diagnosis of a schizophrenic disorder. A small number had organic mental disorders (6.4%), substance abuse disorders (6.4%), or affective disorders (4.5) and the rest had other disorders such as other psychoses or paranoid disorders. Slightly fewer than half (43.5%) had spent two or more continuous years in a mental hospital prior to 1973. More than a quarter (28.6%) had no symptoms present, and over half (54.3%) exhibited very mild to mild symptomatology in 1973. In rating their 1973 residences on both dimensions, about two-thirds (62.4%) of the sample perceived them to be high on support, and only one third (35%) described the social climate as high on practical orientation. Most residents did not rate their sheltered-care social environments high on both dimensions ($r = 0.26$).

Constructs and Measures

Network Multiplexity

This study examined the overlap of different types of interactions or exchanges in each social dyad within a respondent's network. Adapting Kapferer's definition of multiplexity, we considered whether respondents had at least one relationship within their social networks in which both *emotional* and *instrumental* support interactions existed. Information on residents' social networks was gathered using the Personal Network Inventory, an adaptation of the Pattison Psychosocial Kinship Inventory (Pattison et al., 1975; Segal & Holschuh, 1991, 1995).

Support was measured on a five-point scale ranging from (1) not at all to (5) very frequently with respect to the following patterns of exchange: emotional support received, emotional support given, instrumental support received, instrumental support given. Only response categories that indicated a substantial degree of support were used: (3) on some occasions; (4) often; (5) very frequently. The categories of (1) not at all and (2) rarely were excluded. For each network member named by the respondent, if the relationship involved *both* emotional and instrumental support either given or received or both, it was defined as a multiplex tie. In operationalizing multiplex ties, we were not concerned with reciprocity of support but with the co-occurrence of the two types of support. The total number of such ties was the global measure of multiplex relationships within a subject's network.

Three alternative indicators of network multiplexity were used as separate outcome variables. Drawing on the theoretical work of others, one perspective on multiplexity is whether an individual has *any* multiplex ties. This predominant approach in the network literature argues that it is not the number of ties that matters but whether a person has at least one such tie (Hammer, 1981; Reichmann, 1989). Thus, our first and conceptually strongest measure of multiplexity was constructed as a dichotomous outcome variable: no multiplex relationship vs. at least one such relationship within the network.

Other investigators have used the *proportion* of multiplex ties in relation to the total number of ties (Lipton et al., 1981) or simply the *total number* of multiplex ties (Hamilton et al., 1989) as indicators of network multiplexity. Because this is an important conceptual issue as well as a methodological concern, we constructed two other outcome variables in these ways and compared findings based on the three different approaches.

Predictor Variables

Clinical Factors

Two individual-level characteristics were hypothesized to affect negatively a resident's ability to form social networks: level of psychopathology and history of institutionalization. To determine temporal ordering and move toward establishing causality, we used a measure of psychopathology from the 1973 respondent interview to predict network multiplexity in 1983–1985. Levels of psychopathology of study participants did not differ significantly between 1973 and follow-up, supporting this decision. Psychopathology was operationalized as symptom severity and assessed using the Brief Psychiatric Rating Scale (BPRS). The BPRS was developed to rate the severity of 16 discrete psychiatric symptoms (Overall & Gorham, 1962) and has been used extensively with psychiatric patients (Rhoades & Overall, 1988).

Clinicians rated the severity of each symptom on a 7-point scale which ranged from (0) not present to (6) extremely severe. Standardized respondent scores ranged from −1.59 (low) to 3.83 (high) with an internal consistency reliability of alpha = 0.79. Interrater reliability based on joint interviews by three psychiatrists and a psychiatric social worker was $r = 0.90$ (Segal & Choi, 1991). Also during the 1973 interview, respondents were asked whether they previously ever had spent a continuous period of two or more years in a state psychiatric hospital. The response was coded as a dummy variable, with yes = 1 and no = 0. This hospital chronicity measure was used as a categorical indicator of institutionalization in the analyses (Sommer & Whitney, 1961).

Sheltered-care Environment

The concept of "social environment" was operationalized as the social climate of the sheltered-care residences in which respondents were living in 1973 as perceived and reported by the residents. The "supportive" and the "practical orientation" social environments of these sheltered-care settings were measured using two subscales of the Community-Oriented Programs Environment Scale (COPES). The COPES has been used extensively in residential program assessment (Moos, 1974, 1975).

The Support Scale is an eight-item, true/false response measure designed to assess "the extent to which members [residents] are encouraged to be helpful and supportive toward other members and how supportive staff are toward members" (Moos, 1974, p. 231). The Practical Orientation Scale consists of ten true/false items that measure "the extent to which the member's [resident's] environment orients him toward preparing himself for release from the program.

. . . training for new kinds of jobs, looking to the future, and setting and working toward goals" (Moos, 1974, P. 231).

Residential Care Episodes

Because not all respondents were living in sheltered-care settings at follow-up, community "residential care episodes" was operationalized as the total number of times in sheltered-care from 1973 through follow-up. For example, two different placements in the same setting were considered as two times in sheltered-care. Data on this variable were collected at follow-up as part of the general residential history of each respondent and were obtained from several sources: self-report, medical records, social security records, voter registration, and Department of Motor Vehicle records.

Control Variables

Physical Health Status

We operationalized physical health status as the presence or absence of self-reported relatively major health problems. Our Health Problems Scale (HPS) was developed directly from questions on the annual National Health Interview Survey (National Center for Health Statistics, 1985). It measures the number of health problems, out of a possible 10, experienced in the past six months. The problems are: (1) hardening of the arteries; (2) high blood pressure; (3) heart trouble; (4) stroke or general neurological problems; (5) Parkinson's disease; (6) epilepsy, fits, or seizures; (7) fainting or loss of consciousness; (8) trouble controlling bowel movement or urination; (9) trouble with the teeth or gums; (10) other injury or chronic condition. Scores on the HPS at follow-up were used as a continuous control variable in the analyses.

Baseline Network Support Factors

This study used as proxy measures of baseline network interaction and support two subscales of the External Social Integration Scale (Segal & Aviram, 1978) that assessed respondents' access to, and participation in, family and friendship activities in 1973.

The Family Access and Participation Scale is a six-item measure that assesses the ease of contact with one's family by phone call and visit and the frequency of such contact. Possible responses in a Likert-type format range from (1) very difficult/never to (5) very easy/very often. Scores on the scale are the sum of response values on the six items. Higher scores represent greater involvement with the family. Internal consistency for this scale was alpha = 0.83.

The Friendship Access and Participation Scale is a measure consisting of six items that parallel those of the family scale but pertain to "close friends" and "acquaintances" rather than to "immediate family" and "more distant relatives." Again, response categories range from (1) very difficult/never to (2) very easy/very often. Scores are sums of response category values, and higher scores represent greater involvement. Internal consistency was alpha = 0.87.

Additional Control Variables
The age in years of each respondent in 1973 was used as a continuous control variable. The sex of each respondent was coded as a dummy categorical variable, with male = 1 and female = 0. Calculated using data from the general residential history, the total length of time in the baseline sheltered-care residence was a continuous variable.

DATA ANALYSIS

Ordinary Least Squares (OLS) regression was used to examine the individual and joint effects of the predictor variables on the two continuous outcome measures of multiplexity: the *proportion* of multiplex ties to total ties and the *total number* of multiplex ties. Logistic regression has been suggested and widely used as an alternative to the linear probability model for qualitative and limited-dependent variables (Maddala, 1988; Hosmer & Lemeshow, 1989). The logistic technique was used to determine the effects of the same predictor variables on the probability of occurrence of at least one multiplex relationship. An approximation of the relative risk or the odds ratio was obtained by transforming the unstandardized regression coefficient of each independent variable in the logistic model.

Descriptive Findings

Indicators of Network Multiplexity
When network multiplexity was conceptualized and measured as a *dichotomy*, more than a quarter (27.4%) of the sample had no multiplex relationships and slightly less than three-quarters (72.6%) had at least one multiplex tie in their networks. As a *proportion* of multiplex ties to total network ties, 27.4% of respondents had no such ties (0%) and 26.1% had networks in which all ties were multiplex (100%). For more than a third (35%) of the sample, from 26% to 75% of their network relationships were multiplex. The average proportion of multiplex to total network ties was 51.2% (SD = 39.2%). When the indicator

of network multiplexity was *total number* of multiplex ties, 27.4% of the sample had none, 28.6% had 1 or 2, 28.2% from 3 to 5, and 15.8% from 6 to 10 ties. The average number of these ties was 2.7 (SD = 2.6).

Comparison of Persons with Multiplex and Non-multiplex Networks

We compared respondents who had at least one multiplex relationship in their networks at follow-up ($n = 170$) with respondents who had none ($n = 64$) to determine if there were differences in sociodemographic variables. The only significant difference in sociodemographics between groups was that subjects in the multiplex group were younger ($t = 2.28$, $p = 0.02$).

The analysis reported in Table 1 compared respondents with multiplex networks to those without on clinical characteristics, sheltered-care environment, residential care episodes, and other network factors. The only significant finding on baseline clinical variables was that multiplexers were less likely to have had a history of two or more years continuous hospitalization prior to 1973. At follow-up, however, multiplexers had significantly lower levels of psychopathology as measured by the BPRS and rated their general life satisfaction higher on a three-point scale than non-multiplexers.

There were no differences between the two groups on the COPES Support Scale in 1973, but subjects with multiplex networks rated their 1973 sheltered-care residences significantly lower on the Practical Orientation Scale. Analyses revealed that the total length of time in the baseline setting did not differ between the two groups, but the total number of times in sheltered-care from 1973 to follow-up did, with multiplexers having 1.5 times as many episodes as non-multiplexers.

For network factors in 1973, the two groups did not differ on Family Access and Participation Scale scores, but multiplexers scored higher on the Friendship Access and Participation Scale. At follow-up, multiplexers reported significantly larger total networks with twice as many kin and almost four times as many informal non-kin such as friends in their networks, but no difference in the number of formal non-kin such as service providers. There was a trend for non-multiplexers to name network members who lived at greater geographic distance on the average ($p = 0.09$).

Multivariate Findings

Network Multiplexity

As standard practice, zero-order correlations of all predictor and outcome variables are listed in Table 2. Table 3 compares results of the three models using three different indicators of network multiplexity as outcomes. Model 1 utilized

Table 1. Comparison of Respondents with at least one Multiplex Tie and those with no Multiplex Ties in Social Networks at Follow-up (1983–1985).

Variables	Total Sample	Multiplex $n = 170$^	Non-multiplex $n = 64$	t-value X
Clinical Factors, 1973				
Psychopathology^^	-1.7(1.0)	-0.21(1.0)	-0.04(1.0)	1.16
2 yrs+ previous hosp.	43.5%	39.6%	54.1%	3.81*
Life satisfaction ~	2.3(0.8)	2.3(0.8)	2.3(0.8)	0.22
Clinical Factors, follow-up				
Psychopathology	-0.15(1.2)	-0.30(1.0)	0.30(1.5)	2.81***
Schizophrenia	76.7%	79.6%	69.1%	2.47
Life satisfaction	2.1(0.7)	2.2(0.7)	1.9(0.7)	-2.27*
Sheltered-care Environment, 1973				
Support Scale	0.01(1.0)	0.01(1.0)	0.01(1.0)	0.00
Practical Scale	0.06(0.9)	-0.02(1.0)	0.27(0.8)	2.16*
Residential Care Episodes				
Years/1973 Residence	4.8(4.0)	4.5(3.9)	5.4(4.3)	1.59
Times/Res. Care	2.2(1.8)	2.4(2.0)	1.6(1.0)	-3.98***
Network Factors, 1973				
Family Scale	0.07(1.1)	0.08(1.0)	0.05(1.2)	-0.21
Friendship Scale	0.9(1.1)	0.18(1.1)	-0.14(1.1)	-2.04*
Network Factors, follow-up				
Size	4.5(2.8)	5.3(2.4)	2.4(2.6)	-7.92
No. of kin	2.6(1.9)	3.0(1.7)	1.6(1.8)	-5.07***
No. informal non-kin	1.5(1.6)	1.8(1.7)	0.47(0.9)	-7.88***
No. formal non-kin	0.39(0.7)	0.44(0.7)	0.27(0.8)	-1.58
Geo. proximity ~~	2.9(0.9)	2.8(0.9)	3.1(1.2)	1.69

^ sample sizes vary slightly due to missing data.
^^ mean (standard deviation) for all variables unless noted as %.
~ 1 = dissatisfied; 2 = somewhat satisfied; 3 = very satisfied.
~~ 1 = same house; 2 = within 30′; 3 = within 1 hr; 4 = within 8 hours; 5 = beyond 8 hours.
* $p < 0.05$, two tailed test;
** $p < 0.01$, two tailed test;
*** $p < 0.001$, two tailed test.

logistic regression to examine three sets of factors hypothesized to be related to whether a resident had *at least one* multiplex relationship at follow-up (Model chi-square = 35.75, df = 11, $p < 0.000$). Model 2 used OLS to test whether the same sets of factors were related to network multiplexity conceptualized as the *proportion* of multiplex relationships to the total number of relationships

Table 2. Zero-order Correlations of Predictor and Outcome Variables in the Three Regression Models.

Variable	Sex	HPS Score	BPRS Score	2 yrs+ Hosp.	Support Scale	Prac Or. Scale	No. Res Episod.	Total Time	Fam. Scl.	Frnd. Scl.	Mult (0/1)	Mult (pro)	Mult (tot)
Age	−0.23***	0.04	−0.03	0.21***	0.03	−0.10	−0.26***	0.39***	−0.21***	−0.22	−0.14	−0.09	0.19**
Sex		−0.12	0.08	−0.02	0.02	−0.00	0.04	−0.12	0.10	0.07	−0.06	−0.08	−0.13*
HPS Score			0.08	−0.02	−0.02	-0.06	−0.05	−0.06	−0.08	0.04	0.13*	0.13*	0.11
BPRS Score				0.02	−0.20**	−0.01	0.16	−0.02	−0.12	−0.22***	−0.08	−0.05	−0.15*
2 yrs+ Hosp.					0.03	0.04	0.09	0.19*	0.02	−0.06	−0.13*	−0.14*	−0.19**
Support Scale						0.26***	-0.02	0.07	0.12	0.09	0.00	−0.02	−0.02
Pract. Orient. Scale							0.12	-0.04	0.07	0.09	−0.14*	−0.11	−0.12
No. Res Episodes								-0.39***	0.03	0.03	0.20**	0.10	0.09
Total Time/1973 Res.									−0.11	−0.17**	−0.10	−0.04	−0.06
Family Scale										0.48***	0.01	0.12	0.14*
Friends Scale											0.13*	0.12	0.16*
Multiplexity (0/1)												−0.75***	0.63***
Multiplexity (proportion)													0.73***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (two-tailed tests).

Table 3. Estimates and Odd Ratios of Factors Related to Three Outcome Measures of *Network Multiplexity* at Follow-up.†

	Model 1		Model 2		Model 3	
	Logit		OLS		OLS	
	(dichotomous)		(proportion)		(total no.)	
Variables	b coef	O. R.	b coef	Beta	b coef	Beta
Clinical Factors						
Psychopathology	-0.18	0.83	-7.9E-05	-2.1E-04	-0.35*	-0.13
(1973)	(0.18)		(0.03)		(0.17)	
2 yrs+ continuous						
Psych Hospitalization	-0.79*	0.45	-0.13**	-0.17	-0.86*	-0.16
(prior to 1973)	(0.37)		(0.05)		(0.36)	
Sheltered-Care Environment						
Support Scale	-0.02	0.98	0.00	0.00	-0.10	-0.03
(1973)	(0.19)		(0.03)		(0.18)	
Practical Orientation	-0.54**	0.58	-0.06*	-0.16	-0.44*	-0.16
Scale (1973)	(0.20)		(0.03)		(0.19)	
Residential Care Episodes						
Number of Times in Sheltered Care	0.39**	1.48	0.04*	0.17	0.15	0.11
(1973 to follow-up)	(0.15)		(0.02)		(0.10)	
R			0.13		0.18	
Adj R			0.09		0.14	
F			2.86**		4.19***	

† Analyses control for age, sex, physical health problems, total time in 1973 residence, and network support factors in 1973. (N = 217).

* $p < 0.05$, two-tailed test; ** $p < 0.01$, two-tailed test; *** $p < 0.001$, two-tailed test.

(F = 2.86, df = 216, $p < 0.001$). Model 3 also used OLS to test whether these same factors were related to network multiplexity conceptualized simply as the *total number* of multiplex relationships (F = 4.19, df = 216, $p < 0.000$). All three models were significant as noted.

Controlling for other variables, only one of the clinical factors was related to network multiplexity at the $p < 0.05$ level or better in each of the three models. As hypothesized, Model 1 shows that two years or more continuous state psychiatric hospitalization prior to 1973 resulted in less likelihood of having at least one multiplex relationship at follow-up. The odds ratio was 0.45 and, thus, respondents with this history of institutionalization were 55% less likely than those without to have such a tie. In Models 2 and 3, this hospitalization history was related to a lower proportion of multiplex ties and to a smaller total number of such ties, respectively. Contrary to the hypothesis, scoring higher on the BPRS in 1973 was not related to network multiplexity in Models 1 and 2 but was related to having fewer multiplex relationships overall in Model 3.

Controlling for other variables, only one of the sheltered-care environment factors was related to network multiplexity at the $p < 0.05$ level or better in each of the models. As hypothesized, Model 1 reveals that respondents who rated their sheltered-care residence higher on the Practical Orientation Scale in 1973 had a greater probability of no multiplex ties, with an odds ratio of 0.58. Thus, for each standard deviation increase in the Practical Orientation Scale score, respondents were 42% less likely to have a multiplex tie. In Models 2 and 3, a higher score on this scale was related to a lower proportion of multiplex relationships in the network and fewer such ties overall. Contrary to the hypothesis, rating the 1973 residence higher on the Support Scale was not related to network multiplexity as conceptualized and measured in any of the three models.

The number of residential care episodes was related significantly to network multiplexity in Models 1 and 2 but not to this outcome in Model 3. For each additional episode in sheltered-care in Model 1, respondents were 48% more likely to have a multiplex relationship. A greater number of times in sheltered-care was related to a higher proportion of multiplex ties but not to a greater absolute number of such ties in the other models.

It is important to note that while sex was included only as a control in the analyses, it was significantly related to all three multiplexity outcomes. Men were 52% less likely than women to have had at least one multiplex tie, had a lower proportion of these ties in their networks ($p = 0.04$), and fewer such ties overall ($p = 0.001$). Also, older respondents had fewer multiplex ties overall ($p = 0.02$). Finally, for each standard deviation increase in the Friendship Scale score in 1973, respondents were 48% more likely to have had at least one multiplex relationship in their networks at follow-up.

CONCLUSIONS

This study examined network multiplexity, a social network outcome of importance to researchers and to direct service workers concerned with improving community-based services to persons with schizophrenia and other severe mental disorders. We assessed whether certain key factors were related to the development of multiplexity in the social networks of persons with major psychiatric disorders living in California sheltered-care settings in 1973 and followed-up ten years later. The theoretical framework involved three sets of factors. Two clinical characteristics, two aspects of the sheltered-care environment, and a measure of residential care episodes were included in three conceptual models which also controlled for sex, age, physical health status, total time in the 1973 residence, and baseline network support factors.

Only one clinical factor was related to network multiplexity across all three models which used different indicators of multiplexity as outcomes. A history of institutionalization was associated with a lower probability of network multiplexity, a lower proportion of multiplex ties, and fewer of these ties overall. The capacity to engage in and maintain multi-purpose or multiplex relationships has been viewed as the most functionally complex aspect of interpersonal and social interaction (Tolsdorf, 1976; Hammer, 1986; Morin & Seidman, 1986). Institutionalization and its subsequent impact on interpersonal skills and social encounters makes achieving and/or maintaining multiplexity an enormous task (Lipton et al., 1981). It comes as no surprise that subjects with a history of institutionalization in this study were less likely to have even one multiplex tie in their networks. This finding across the three models replicates previous results and supports theories about the iatrogenic effects of institutional settings and the disintegration of patients' social interaction skills (Wing & Brown, 1970; Gruenberg, 1967, 1974; Holmes-Eber & Riger, 1990).

The second clinical factor, symptomatolgy or the level of psychopathology, was related negatively to network multiplexity, but only in Model 3 where the outcome was the *total number* of multiplex ties. Both positive and negative symptoms are known to impair interpersonal skills and disrupt the ability to interact socially (Breir, Schreiber, Dyer & Pickar, 1991; Mueser, Bellack, Douglas & Morrison, 1991; Cresswell et al., 1992). Thus, higher levels of psychopathology can impede the formation or maintenance of multiplex network relationships. This finding confirmed our hypothesis and agreed with results from the Hamilton and associates (1989) study which found a significant negative relationship between the number of negative symptoms and the number of multiplex relationships with non-kin network members. Our results also replicated this finding for general symptoms levels in another sample of former mental patients residing in board and care homes (Parks & Pilisuk, 1984).

Yet, psychopathology was not associated with whether or not subjects had at least one multiplex relationship nor with the proportion of multiplex ties in the networks. This could be due to our decision to use a rather distal measure of psychopathology from 1973 and/or the fluctuating nature of symptomatology throughout the course of severe mental illness, although other work has documented a negative association between symptoms and the probability of support reciprocity over the same time period (Segal & Holschuh, 1995). Future research should examine further the circumstances under which psychopathology may be related to multiplexity when conceptualized as a proportion and as the probability of having at least one such tie.

The findings highlight the influence of the sheltered-care social environment on network multiplexity for persons with severe mental illness. This study found negative relationships between residents' ratings on "practical orientation" in 1973 and all three network multiplexity outcomes. A higher score on the Practical Orientation Scale was associated with less likelihood of having a network with at least one multiplex relationship and with a lower proportion and total number of such ties. This replicates earlier research which documented the negative effects of exclusively practical, high-expectation therapies and transitional programs on client or resident outcomes (Goldberg et al., 1977; Caton & Goldstein, 1984; Appleby & Desai, 1987). More importantly, our findings show that these effects hold across distinct constructs and indicators of a specific outcome, network multiplexity.

The items in the Practical Orientation Scale reflect elements of both high-expectation and transitional programs such as "training for new kinds of jobs," "expected to demonstrate continued concrete progress toward their goals," "making specific plans for leaving the program," and "expected to make detailed specific plans for the future" (Moos, 1974, p, 374). This kind of treatment approach and social climate would be considerably less conducive to providing a relaxed social setting or milieu in which residents could practice socializing and developing the social interaction skills requisite for building and maintaining more complex interpersonal relationships. Thus, it seems reasonable that residents who lived in sheltered-care settings they rated high on this aspect of the social environment would be at risk of networks deficient in tie multiplexity.

Contrary to expectations, however, having lived in a social environment rated "supportive" in 1973 and promoted by a number of earlier investigators (Lamb & Peele, 1984; Crystal, Ladner & Towber, 1986; Drake, Wallach & Hoffman, 1989) was not related to network multiplexity in any of the three models. Thus, the supportive social environment or supportive approaches to treatment may have less impact on the development of support multiplexity within networks than on network outcomes examined previously. As noted in prior work, supportive treatment approaches or philosophies appear to encourage the type of interpersonal skills that lead to the formation of network relationships characterized primarily by emotional not instrumental support (Segal & Holschuh, 1991, 1995).

Study results revealed the use of residential services to be a positive factor in the development and maintenance of social networks for this population. A greater number of sheltered-care placements during the interim period was associated with the occurrence of at least one multiplex relationship and with a greater proportion of multiplex ties in respondents' networks. Some persons with long-term psychiatric disorders may use sheltered-care services intermittently as respite from the challenges of independent living and/or to obtain concrete resources such as food, shelter, and clothing (Wiseman, 1970; Lewis & Hugi, 1981). The ability at times to live more independently also may reflect higher general levels of functioning that could be related to better social interaction skills. Thus, we did control for functioning when examining service use by including the two clinical factors in the models.

Respondents in our study who had several residential care placements over the course of ten years were more likely to have multiplex networks than those who were in fewer placements possibly because each of these settings provided a social context within which to develop social interaction skills and resulting social ties (Feld, 1981). Additionally, this pattern of residential service use may encourage the kind of social interaction that promotes the development of particular types of ties. Moving in and out of sheltered-care may lead to building relationships that have multiple domains or overlapping content areas or functions. A client may know someone as a fellow consumer of services while in the setting but also work with that person in a volunteer job or go to the same church at another time (multiplexity). Also, more contact with service providers involved in placement decisions and activities could result in relationships which include both emotional and instrumental support interactions indicative of tie multiplexity (Meeks & Murrell, 1994).

According to Fischer and associates' (1977) choice-constraint model, individuals tend to establish new community ties wherever they move, and proximity is not required for the maintenance of established ties in this age of improved transportation and communications (Wellman, 1979; Wellman & Wortley, 1990). Also from the network literature on general populations, the life-course convoy model (Kahn & Antonucci, 1981; Antonucci & Akiyama, 1987) posits that a core network often remains intact during moves and over time. Finally, Magdol's (1995) work on residential mobility has demonstrated that frequent movers experience greater tie turnover and shifting network composition while retaining network size. Thus, the moderate residential mobility of our study respondents did not act as an impediment to network development but instead resulted in networks with multiplex ties.

Contrary to our hypothesis, the number of residential care episodes was not related to the total number of multiplex ties. Yet, a higher level of psychopatholgy was associated with fewer multiplex ties in Model 3. We tested to see if psychopathology mediated the relationship between the number of residential care episodes and network multiplexity measured as the total number of multiplex ties, but it did not. Researchers should explore further the factors related to multiplexity when conceptualized as the total number of multiplex ties and why this differs slightly from the other two constructs. From a social network perspective, the strongest conceptualization of global network multiplexity is whether there are *any* multiplex ties within the network as a whole (Hammer, 1981; Reichmann, 1989). This is supported by research that shows the presence of an intimate relationship or a spousal tie to be the most parsimonious measure of network support and best predictor of health and mental health outcomes (Cohen & Wills, 1985; House, Landis & Umberson, 1988; Thoits, 1995). This construct was used as the outcome in Model 1 which was also the strongest model empirically. In it, three of five hypothesized factors were significant predictors of network multiplexity, and two of these were at the $p < 0.001$ level. While the results are similar across the three models, our findings support the use of this conceptualization of network multiplexity. The proportion strategy is most appropriate for examining one type of tie in relation to all others, and the total number approach excels for measuring the extent of sociability within the network.

Possible limitations of this study include design issues and the potential unreliability of the COPES ratings. Using a nonexperimental design, we did not assign subjects randomly to different social environmental conditions but accounted for possible confounding factors by including controls in the models. Yet, there may be factors we did not account for adequately. For example, in examining the impact of the social environment on network multiplexity, we did control for length of time in the 1973 residence. But we did not measure and, therefore, could not account for the influence of social environmental factors in the settings beyond the baseline residence for respondents who were in multiple settings. Future research should do so.

Regarding the COPES measures, our subjects rated their sheltered-care social environments in 1973 based on their perceptions of these settings. It is possible that staff responses to residents' individual characteristics may have resulted in residents' being treated differently by staff according to these characteristics. Differential treatment by staff may have influenced residents' perceptions of their environments. Or individual characteristics themselves such as age, psychopathology, or a history of institutionalization may have influenced residents' perceptions of their social environments. We can control for these factors in looking at the relationships between the COPES measures and network multiplexity but cannot control for how residents were treated by staff based on these or other unmeasured individual characteristics. Therefore, future work should be designed to account for these factors in assessing resident perceptions of the social environment.

In summary, this study found that sheltered-care residents who had a prior history of long-term institutionalization, rated their baseline residence higher on practical orientation, and had fewer residential care placements during the study period were less likely to have had *at least one* multiplex relationship in their networks at follow-up. These respondents also had a lower *proportion* of multiplex ties. While institutionalization, psychopatholgy, and the practical orientation social environment were related to the *total number* of such relationships, the number of residential care episodes was not.

We concluded that these factors do impact network multiplexity among persons with schizophrenia and other major mental disorders. Our results replicated a series of findings that have documented the deleterious effects of institutional experiences on social interaction skills and point to the wisdom of developing community-based residential services and solutions to the social network and interpersonal functioning problems of this population. Application of knowledge from general population studies and the social network literature seems critical to understanding the patterns and processes of networks in the social worlds of persons with severe mental illness (Hammer, 1986; Lovell & Sokolovsky, 1990). Such knowledge should be considered in future efforts to develop models that will reveal further the complex factors and processes involved in the development and maintenance of social networks by persons with schizophrenia and other major mental disorders.

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DRUG USERS' LAY CONSULTATION PROCESSES: SYMPTOM IDENTIFICATION AND MANAGEMENT

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ABSTRACT

We present findings from a National Institute on Drug Abuse funded study of drug use and health care. Our data indicate that stigmatization of illicit drug-users in health care settings and health care providers' diagnostic focus on the contributions of drug use to their illnesses delays treatment, lengthens hospitalizations, and increases health care costs. Our findings show that, not unlike their conventional counterparts, drug users consult their peers for advice, self-treatment, referrals to services, or simply to obtain non-judgmental counsel prior to or in lieu of seeking formal care. Such lay consultation processes influence symptom recognition, attribution, and management as well as the process of formal care seeking and its timing. Discussions with drug-using peers shape perceptions of potential problematic health care interactions. In this regard, interviewees and their lay consultants believe that to be labeled as a drug user, either through self-admission or medical diagnosis, compromises the care they

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receive. We conclude our chapter by discussing appropriate strategies to improve the quality of care and lower the health care costs of treating drug-using patients. Such interventions include acknowledging and supporting existing lay consultation processes, disseminating better health care information through and within drug users' networks, and encouraging health care providers to conduct more holistic evaluations of drug users' health and illnesses.

INTRODUCTION

Illicit drug use correlates with a variety of physical and mental health outcomes including soft tissue infections, respiratory problems, and mental disorders. Both injecting and non-injecting illicit drug users are at increased risk for contracting and transmitting numerous needle-borne diseases including HIV/AIDS, hepatitis and endocarditis directly through the sharing of injection paraphernalia (Centers for Disease Control and Prevention, 1997) and/or indirectly through sexual disinhibition that produces high risk sexual behaviors (Fitterling, 1993; McCoy & Inciardi, 1993). Additionally, more than 70 conditions (e.g. abscesses, burns and trauma related injuries) requiring hospitalization have been attributed solely or in part to drug use. Substance abuse problems also complicate treatment for specific illnesses. Analyses of health care costs indicate that patients hospitalized for pneumonia, burns, and septicemia who have secondary substance abuse diagnoses remain hospitalized more than twice as long as those without such a diagnosis (Center on Addiction and Substance Abuse, 1993).

In this chapter, we present findings indicating that stigmatization of drug users in health care settings along with the tendency of health care providers' to highlight the contributions of illicit drug use to such patients' illnesses, delays care, yields longer hospitalizations, and increases health care costs. In the year prior to interview, 53% of our interviewees delayed care for trauma, 35% for drug related conditions, 16% for infections, and 15% for other chronic conditions (e.g. AIDS, mental problems). To avoid being stigmatized for illegal drug use, our interviewees typically consulted members of their drug-using social networks before going to or often in place of formal care. They sought advice, treatment, referrals to services, or simply nonjudgmental counsel from their drug using peers. These lay consultation processes influenced the recognition, attribution, and management of symptoms as well as affecting formal care seeking and its timing. As Bloom (1990) also discovered, discussions with other drug users shaped both willing and reluctant patients' perceptions of the potential for problematic health care interactions.

In the course of our ethnographic study of drug use and health care, we discovered that, like most other population groups, our study participants relied on members of their relationship networks when diagnosing ambiguous symptoms such as abdominal pain, fever, or chills. Distinguishing differences between illness and the negative physical correlates of drug consumption formed a key aspect of this lay consultation process. Even participants with private insurance might forego formal medical care to avoid stigmatization, forced withdrawal from their drug of choice and potential loss of insurance coverage. Instead they trusted knowledgeable drug-using friends to prescribe appropriate remedies, particularly when pain management was involved. Overall, interviewees and their lay consultants believed that being labeled as a drug user, either through self-disclosure or medical diagnosis compromised their care. Drawing upon insight from our findings, we end our chapter by discussing appropriate strategies that acknowledge and support existing lay consultation processes to reduce costs and improve medical treatment to drug using populations. These tactics include disseminating better health care information through and within drug users' networks, and encouraging more holistic evaluations of drug users' health and illness by health providers.

DESCRIPTION OF THE STUDY

We analyzed selected findings from a National Institute on Drug Abuse-funded study (R01 DA9665) of San Francisco drug users' experiences with health care services, specifically access and utilization. We focused on the role of lay consultation processes in influencing drug users' symptom identification and illness management including attributions of illness to drug use, self-care efforts, and avoidance or use of formal health care services. Toward this end, we recruited 240 active illicit drug users using stratified chain-referral sampling techniques. Once enrolled in the study, trained interview staff administered a 20-minute screening instrument to solicit basic demographic information, a 12-month history of prior drug use, drug treatment history and health insurance status, three measures of health status, a modified health status scale, and severity of acute illnesses and chronic illnesses (Stewart, 1988).

Individuals qualified for inclusion in the sample by meeting minimum levels of sickness and drug use. Of the 240 study participants, 121 (51%) were IDUs. Interviewees reported using primarily one of the following drugs: heroin 22% (53), marijuana 35% (85), methamphetamine (speed) 17% (40), powder cocaine 3% (6) and crack cocaine 17% (42). The remaining 6% (14) self-identified as primary users of heroin and crack or cocaine in combination.

Along with the screening, the interviews consisted of tape-recorded depth interviews and quantitative questionnaires. Depth interview topics included but were not limited to: family, education, employment, criminal activities, drug use, health, and health care utilization histories; evaluations of past experiences in health care settings focusing on patient-provider interactions; barriers to health care utilization; symptoms that precipitated accessing care; attribution of the drug relatedness of the illnesses/injuries experienced; the number and type of social support networks; and, unmet health and social service needs. Areas covered in the questionnaire included: drug use history, insurance status, and care seeking issues for up to five illness/injury episodes experienced in the 12 months prior to their interview. Health care coverage was classified according to three health insurance categories: private, public (Medi-Cal and/or Medicare), and no insurance.

Demographic Description

Fifty-six percent (135) of the sample were men, 103 (43%) women and two (1%) transgenders (male to female). The mean age was 38 years and 56% had more than a high school education. Most had resided in San Francisco for two or more years. Forty-nine percent were European American, 33% African American, 10% of Latin descent and 7% reported one of the following: Native Americans, Pacific Islanders and Middle Eastern Americans. Fifty-four percent were unemployed, dealing drugs, or living on government assistance. Thirty-three percent lived in Single Room Only (SRO) hotels or were homeless. Seventy-two percent had been arrested as an adult, 25% served time in jail, and 31% had served time in prison. At the time of interview, 5% were wanted by the police and 2% were wanted by probation or parole agents.

Theoretical Framework

The theoretical orientation guiding our analyses entailed a particular type of methodology or "... the qualitative study of people in situ ... a process of discovery. This method requires investigators to discover what people believe themselves to be doing rather than impose a preconceived or outsider's scheme" (Lofland, 1971, p. 27). To this end, we developed a conceptual framework predicated on the assumptions of the symbolic interactionist and phenomenological perspectives as articulated by the theories of Hubert Blumer (1969) and George Mead (1934). Phenomenology, with its focus on everyday life and the meanings that actors attach to everyday situations, permits analyses of how people interactively construct social meanings and situations over time (Schutz, 1967). This approach allows investigators to explore the relationships between actors' thoughts and emotions, social activities, and interpretations of the world (Ritzer, 1992, pp. 187–228; Blumer, 1969). We chose to use this theoretical orientation to analyze drug users' lay consultation processes in light of their contributions to the social construction of drug users' perceptions of health care interactions.

Goffman's (1963) theory of stigma as an interactional process forms the cornerstone of the phenomenological framework used in analyzing our data. We posit that Goffman's conceptualization of the conferring and experiencing of stigma is essential to understanding the social positions and perspectives of various drug-using communities vis à vis health care providers. We found that as a social construct, Goffman's notion of stigma provided a rich theoretical perspective for analyzing drug users' lay consultation systems along with their symptom recognition, utilization of health services, and definitions of health and illness. This conceptualization became the basis for our understanding of drug-users experiences with and interpretations of illness; their daily experiences as members of stigmatized and often marginalized subcultures; and the impact of these memberships on how they gave meaning to and managed sickness episodes.

LAY CONSULTATIONS AND CARE

Self-care has been defined as ". . . lay individuals interacting in specific social situations that perform health-related behaviors, including decisions to seek and comply with professional care" (Dean, 1989, p. 137). Considerable research demonstrates that upon recognizing personal symptoms of illness, individuals must decide whether self-care is sufficient or if others' help is needed. When self-care efforts prove inadequate, consulting one's relationship network typically forms the next step in symptom management prior to seeking formal care. (Freidson, 1961; Mechanic, 1968; Coe, 1970; Levin & Katz, 1976; Twaddle & Hessler, 1969).

Differences in formal care-seeking patterns emerge when analysts account for social class and the diversity of cultural norms pertaining to how health and illness is experienced. Individuals lacking health insurance or other material or structural prerequisites (e.g. money or transportation) must rely upon self or lay care from friends or family. The dominant culture that influences the United States health care system tends to misunderstand, under-report, and inadequately treat the health problems of its stigmatized and marginalized subpopulations. Additionally, many recent immigrants and individuals with strong generational ties to non-Western cultures distrust Western medical models of care. These populations tend to eschew formal medical services except as a "last resort," preferring self-treatment and reliance on personal social networks (Bayne-Smith, 1996). The lay consultant network, therefore, forms an important component of stigmatized individuals' health care and symptom management activities.

Researchers have identified numerous important health-related functions of social networks including encouraging social integration, nurturing, reassuring self-worth, offering guidance and advice, as well providing timely information (Simmons, 1994; Berkman, 1984; Walker et al., 1977; Weiss, 1969). These functions have proved essential for managing symptoms of illness and maintaining long-term health. More specifically, epidemiologists and other health researchers have discovered that greater social integration and support is associated with reduced mortality risks for such conditions as cardiovascular disease, stroke, accidents, and suicides. Increased social integration also improves mental health, while social isolation and unsupportive social interactions can decrease immune function (Seeman, 1996). Although social integration appears to improve health outcomes, it is the *quality of existing ties* that influences *the extent* of these health benefits (Kawachi et al., 1996; Seeman, 1996).

Freidson's work (1961) on patients' perceptions of medical care examines how people acquire guidance and advice through interacting with their social networks, particularly when confronted with ambiguous symptoms. Freidson found referral networks of lay consultants advised their members about symptoms, treatments, and the next lay person or appropriate professional to consult. Discussions with, and advice from, lay consultants commonly resumed after doctor visits, affecting the patient's perceptions of his/her physician, medical regimens, and future prescribed measures (Freidson, 1961).

Kadushin (1969) found that people with a suspected or diagnosed illness often sought advice for the health problem from others with "special expertise" or experience with the disorder. For example, Kadushin noted that patients needing psychotherapy tended to have family members who did not share professional conceptual frameworks for mental illness and consequently were unable to provide advice. Instead, such patients consulted others in their network they believed to be knowledgeable about mental health problems prior to accessing formal care (Kadushin, 1969).

Similar to the drug using and mentally ill populations, Edwardson and colleagues (1995) found that elderly people often consulted one another about their illnesses before, during, and after formal care seeking since they experienced symptoms unique to their own social groups. In such instances, they benefited from and were influenced by their peers' personal experiences, and such discussions became the basis for anticipating what to expect when encountering health care providers. Older people may also experience chronic symptoms that do not disrupt daily functioning but complicate the decision-making process for seeking formal care. In such instances, reliance on lay consultants can become particularly important. Edwardson and his colleagues (1995, p. 402) observed that, "The amount and type of advice given by persons in the social network is especially important with respect to self care of symptoms that never reach the attention of professional care givers." Other reasons for seeking lay consultation included eliciting sympathy, support and information, reinforcement and validation of health behaviors, and intervention by those involved with the sick person. In brief, lay consultation plays an ongoing role in the long-term management of health and illness (Furstenburg & Davis, 1984; Freidson, 1961, 1970; Dean, 1986).

DRUG USERS' LAY CONSULTATION PROCESSES

According to Power and his colleagues, ". . . networks are structured and bound by rules that ensure their functioning" (1995, p. 572). Drug-using subcultures typically are constructed around drug-using activities and are not functionally or structurally homogeneous across all users or types of drugs used. Therefore, drug networks embody distinct value systems and rules of behavior. These rules permit or prohibit specific methods of use, dosage, and administration; and offer members identity and social integration. These rules also latently serve to control drug use in order to improve the health and well being among members of drug-using networks (Young, 1971; Stimson, 1973).

In the last ten years, numerous investigators have examined the social worlds of intravenous drug users, in response to the urgency of HIV, hepatitis, and other communicable disease transmission. For example, Power and colleagues (1995) found that injection drug users learned coping strategies for HIV-related risks through interactions within their social networks. The authors observed that drug users procured material necessities (e.g. clean syringes) and ". . . perceived wisdom on issues such as health and drug technology" from their peers. As a consequence of common interests unique to intravenous drug use, these subcultures shared and practiced ". . . group behaviors that become an everyday part of their daily routines" (1995, p. 566). For example, our injection drug-using study participants reported being discouraged by their peers from needle-sharing and learning syringe cleaning methods and safer injection techniques from other network members (see also Kelley & Murphy, 2001; Duterte et al., 2001). Smokers and snorters were given advice from peers concerning drug purity, appropriate dosing levels and learned effective ingestion techniques.

Relationship networks also greatly influence methods of reducing drug-related harm. Zapka and colleagues (1993) found that drug users who reported having friends who used bleach to clean their injection equipment and with whom they had discussed cleaning their syringes were more likely to clean and bleach their equipment themselves. These authors also found that the number of peers practicing unsafe injecting techniques in an IDU's social network influenced their drug-using behaviors; that is, people with many drug-injecting friends who engage in risky practices may need more help "... breaking out of potentially harmful social network interaction" (1993, p. 357).

Drug users share common experiences not unlike that of other special populations such as elderly persons and people who are mentally ill. Similar to these sometimes stigmatized or socially devalued subgroups, drug-users experience symptoms of illness unique to their particular social group. Most people who do not consume illicit drugs lack the knowledge or experience required to assess drug-related symptoms. Consequently, drug users must turn to peers to define what it means to be sick and to teach or verify the relationship between illness and drug use. Telles and Pollack (1981) explored this notion of "legitimization" by focusing on "feeling sick" as a principal criterion of health and illness. They found that people in the general population legitimize symptoms with lay consultants through a social process of explaining illness or "proving that one is ill" (1981, p. 243). Through social discourse with lay consultants, illness is either validated or refuted, and the sick person subsequently may be redirected to a physician, treatment provider, or some other official serving as the gatekeeper to services. Drug users go through this process when they consult each other to distinguish between illness symptoms, withdrawal symptoms and pharmacological effects. These consultation processes shape users' decision making regarding utilization of formal health care services.

Drug users rarely encounter sympathy for illness from anyone other than fellow drug users. The stigma of illicit drug use and its negative consequences for health yield the notion among many professionals and the lay public that drug users' illnesses should be punished rather than treated. Since most drug education purposely avoids language that might be construed as sanctioning consumption of illicit drugs, methods of safe and responsible drug use seldom are mentioned or taught. Consequently, drug-using networks often constitute the only source of information for drug users regarding self-care, emergency procedures for handling drug-related medical crises, and the prevention of future drug-related illnesses. Given this paucity of information and its negative consequences for health, a few investigators argue for expanding drug education, drug abuse prevention, and risk-reduction programs to include a focus on dealing with the social aspects of drug users' lives (Pivnick et al., 1994; Grund, 1993).

Stigmatization

Our study participants reported reticence in accessing formal care due to the shame, stigma, and possible undesirable repercussions of having their drug use identified or discovered. Adverse effects included loss of insurance benefits, employment difficulties, legal penalties for violating parole or probation, and negative reactions from family, friends or co-workers upon finding out about their drug use. Rather than risk incurring these costs, interviewees reported delaying or foregoing needed care. For example, when asked why she typically postponed seeking medical treatment for numerous abscesses, participant 166 (an IDU) explained that she "usually [pushes] it to a point . . . where I almost die before I go to the doctors because of the way they treat you!"

Some uninsured interviewees saw health care as a privilege only available to the stigmatized when critically ill. For example, interviewee 015 had several injection-related abscesses. She explained that with each new abscess she would put off seeking treatment until the site became so swollen that she clearly qualified for care at a local public clinic. Unless she could display an obviously serious condition, she assumed that clinic staff would refuse her treatment for not being ". . . sick enough," and she had neither private nor public insurance to go elsewhere. By the time she typically accessed care at the facility, her abscesses were so large and inflamed that she required hospitalization rather than outpatient care to drain them.

Not unlike IDUs, such as the informant described above, marijuana users also worried about doctors discovering their drug use. Besides concern that doctors might incorrectly attribute any presenting conditions of illness to marijuana use, they echoed other drug users' distaste at being morally judged. The possibility that such judgments could also translate into misdiagnoses or compromised care was not lost on interviewee 012. When asked why she avoided medical care, she replied:

012: Because of the stigma, and you're scared, and I just, you know . . . I mean, even just an interpersonal thing. I don't want the doctor to think I'm some – it's all stigma, but I don't want him to think I'm some terrible person or anything. Or think, "Oh, well, course she's got a fever! She's been . . ."
Interviewer: Smoking pot or something?
012: Yeah.

Perhaps because they were receiving treatment through public entitlements, uninsured participants felt public rather than private health care providers were more likely to condemn them for using drugs. With little or no access to private health care providers, they assumed that poor treatment was endemic to use of public health care settings. For example, interviewee 053 recalled that a doctor at a public facility chastised he and his wife for being on welfare, having children and doing drugs. Interviewee 027 who was treated at the same facility similarly felt that the entire staff treated her like a "dope fiend."

Loss of Medical Privacy

Many interviewees distrusted hospital and clinic procedures for insuring the confidentiality of their medical records, a concern that inhibited them from being honest with health providers about their drug use. For example, a marijuana smoker explained his concerns about the potential loss of personal and medical privacy should he admit to using drugs:

> I have a very real concern about privacy rights and the violation of my privacy rights. And I happen to know that doctors are very, um, apt to record anything you say in the record. It becomes a permanent record available to a whole host of entities and people.

Such worries about confidentiality often translated into delays in care seeking. For example, although eligible for health insurance benefits through his wife's employment, Interviewee 007 postponed seeking medical treatment because he feared job-related repercussions for his wife if his heroin use became known:

> **Interviewer:** So when you went to the doctor did you tell him that you're a heroin user?
>
> **007:** I try not to go to the doctor . . . See, when I retired from work, my wife took over and I'm on her [insurance] plan now . . . So, my wife took over and she pays about $150 a month. So, I didn't want her to get in it. That's one thing I don't like to do. She's doing me a favor in a way, and then I get her in trouble? No! I don't tell.
>
> **Interviewer:** Your primary reason was to protect her?
>
> **007:** Protect her. If I tell 'em, you know, then it might have some repercussions. Well, he's a hype, he's bad. So it's not worth it.

In contrast to concerns about confidentiality, Interviewee 001 initially complained that the many hours of waiting required to be seen at public health facilities discouraged him from seeking care – a common grievance among drug users in general. Yet, when pressed, he also admitted that loss of confidentiality about his drug use was a far greater concern. He went on to tell us: " I mean, because, you know, whatever gets in, in your medical record could really drastically affect your life."

Issues of Secrecy and Trust

Interviewee 007 also pointed to a general distrust of health care providers as an additional barrier to disclosure of drug use in health care settings:

> If I was absolutely sure of a doctor, you know, if I had the actual health insurance and the ability to find a regular doctor and develop a rapport with him, which is impossible now, you know, certainly not without disclosing my drug use, and it would certainly, I'm sure, cause me to get better health care, you know . . . But, I mean, as it is, my only contact with doctors now is pretty much transitory, you know. Here they [doctors] are. Do you trust them, or don't you trust them? I don't think so.

Based on personal experience and advice from his relationship network, Interviewee 041 similarly argued that being truthful about drug use exacts a cost when seeking medical care:

> After doing it once [disclosing his drug use] and, you know, having the doctor say, "I ain't giving you nothing that's got opiates in it." And also a couple of friends of mine are nurses and, um, they told me [not to disclose his drug use]. Then I had people in AA [Alcoholics Anonymous] also told me, "Don't ever tell a doctor you are in recovery. They treat you very differently." And it is true . . . they wouldn't treat you as nicely, or as . . . they didn't care if you were suffering. They wouldn't give you nothing for pain.

Like the informant quoted before him, and other drug users in the sample, 041 perceived a need to hide the evidence of his drug use from treatment providers if he wanted access to full treatment options.

For the most part, our interviewees agreed that health care providers cannot be trusted to maintain secrecy about their patients' drug use or not to permit such knowledge to adversely affect treatment or judgments about patients' personal lives. Additionally, our informants also believed that being identified as a drug user in health care settings negatively influenced how much staff trusted them and believed in what they said. Interviewee 053, a crack-smoker, for example, described being unable to convince her doctor and nurses that she smoked rather than injected drugs:

> Because one time, I went in there [public hospital] and I had a fever, really, really bad. I think I got a hold of some bad stuff? And they couldn't find anything wrong with me. But my temperature was 102, and I felt like I was dyin.' And I kept telling them, "I didn't shoot up, I didn't shoot up. But I just used crack." And, I don't think they believed me . . . But, I never shot up in my life. And, that was just the way they made me feel, you know? But they kept me there . . . just for observation because they couldn't find anything wrong with me. And they kept coming and asking me, "Are you sure you didn't shoot up? Are you sure you didn't shoot?" The way and as many times as they asked me really meant they didn't believe me.

Similarly, Interviewee 041 also perceived that health care providers doubted his veracity when reporting his illness:

> I've visited the clinic cause I got a spider bite, a bad spider bite. The first thing the doctor said was, "Is that from dope? Is that from shooting?" And it wasn't... [they] sent me home with minimal medication because they were suspicious that it was an abscess.

For drug users, then, drug use becomes the basis of a stigmatized master status that can color judgments about the truthfulness of what they say and the diagnosis of the symptoms they present. For some, dishonesty offers a way to circumvent the consequences of such labeling with all of its negative consequences. Outright lying to doctors about drug use and its association with their conditions posed one means for being seen faster and receiving better treatment. Interviewee 028, for example, spun various untruths each time he sought medical care for his periodic abscesses that he developed through self-administered intramuscular injections of heroin into his buttocks:

> ... I always lied about how I got the abscesses. Which is hard to do because doctors can pretty much tell. I told 'em, my best one was I got a shard of sheet metal stuck in there. Or, I'd say I was cleaning ... [my] boat and I got a piece of paint in there. But they'd always be in the same places. I've got three big scars from abscesses ... But they'd also give me a painkiller. 'Cause usually if you tell a doctor you're a junkie, they won't give you pain killers.

Informant 028 surmised that some of his stories must have appeared credible since he believed that doctors would not prescribe pain medication for injection drug users.

Of course, not all attempts by drug users to disguise or withhold information about current or former drug practices prove successful. Recounting a negative health care experience that had occurred several years prior to being interviewed, Informant 133 explained that friends or family can inadvertently or unwittingly reveal a drug-user's secret. At the time of the incident, this informant had been clean for approximately one year. Her doctor misdiagnosed a staph infection, and she became so ill that she slipped into a coma. Out of concern for her life, her boyfriend disclosed her past drug injection history to the hospital staff. Ignoring that she had been clean and sober for some time prior to the illness; they withheld pain medication and spoke to her in ways that shamed her. At the time of her interview, she was extremely hesitant about seeking care, and adamantly refused to disclose her drug-use when faced with needing medical assistance. Her experience of characterization as "once a drug user, always a drug user" confirms Goffman's (1963) observation that stigmatizing labels often remain long after the causal behavior disappears.

Pain and Withdrawal

Interviewees, particularly heroin users, reported that when they were hospitalized if doctors were aware of their drug use they were given inadequate medication for pain or flatly denied medication. Many felt their only recourse was for friends or associates to bring heroin or illegally obtained painkillers into the hospital to relieve their suffering. Rather than risk experiencing unrelieved pain, others fled health care settings when labeled by staff as opiate-dependent. Moreover, they feared going into withdrawal while in the hospital and being inadequately medicated for the management of the painful symptoms of detoxification. Interviewee 185, who was ill with untreated tuberculosis explained why she postponed going for care that clearly was needed:

> Yeah, but then I didn't want to like, be withdrawing in the hospital, so . . . But, I still should go. I'm like – because I haven't gone for a while for that [tuberculosis].

When asked about her fears concerning hospitalization, she replied:

> Cause I know that . . . if your TB is active and you're in the hospital, you are quarantined, you know? 'Cause it's like contagious. If it's active, it is contagious. And I also think they also like, hospitalize you or something, right? And so . . . I'd be like locked up in a room where like, nobody could come near me unless they had some suit on or something. And then I'd be hospitalized, and I'd be like in withdrawals in this fucking room. That would totally suck . . . And besides – well, what if I'm in there and they took my pills away, you know? And it's like – or what if they didn't give me enough in there, or something . . .? So it's just like scary goin' in there even for a little bit.

Zenker and Lang found similar results in their study of German heroin addicts requiring emergency care (1992). These authors determined that "most patients leave the medical care system as soon as possible because of withdrawal symptoms" (1993, p. 117). When physicians were interviewed about this phenomenon, 93% agreed that "a central drug emergency unit, offering medical and psychosocial care would solve the present problems and would be a possibility for lowering drug emergencies and . . . drug mortality" (1993, p. 117).

Lay Social Networks of Advice

Most intravenous drug users learn how to inject from other more experienced users (Kelley & Murphy, 2001; Murphy, 1987; Murphy et al., 1991). In the course of this research, we found that IDUs' social networks also provided information about drug-related health and illness. Feeling sick and getting well had particular meaning for heroin users like 076. Abstaining from regular heroin use on the streets produced withdrawal symptoms that were physically and emotionally painful. Like other heroin users, 076 learned the difference between withdrawal ("dope sick") and other illnesses such as the flu from members of his relationship network. Similarly, 115, a 47-year-old woman, recounts when she confirmed what being dope sick meant with her boyfriend:

> **115:** I didn't realize I was hooked yet.
> **Interviewer:** How often were you using?
> **115:** Every day . . . but I didn't know what sick was. He wouldn't tell me what sick was. And I hadn't ever seen him sick. So this is about a year's gone by. And one day, I didn't fix. I knew that you didn't feel right, but I didn't know what is . . . he wouldn't tell me so it would help when I would be sick.
> **Interviewer:** You didn't know what to expect . . .
> **115:** I didn't know what to expect, but I knew I felt really, really bad. I thought I had the flu. So I would take care a myself as the flu, and I was gettin' nervous and shaky and . . . then he came in and he told me why, you know, [I'm] sick. "You gotta fix, you know?" So he fixed me.
> **Interviewer:** And what'd you think at the time? I mean, when you thought it was the flu and he told you that you were dope sick. What did you think? Did it scare you?
> **115:** Yeah . . . it scared me a lot 'cause then I realized, you know, it took me a whole year to realize that I was on my way to bein' hooked . . . and I had to really like depend on this drug.

Injection-related conditions like abscesses and septicemia (blood poisoning) were typically understood, accurately or not, through interaction with other IDUs. Individuals learned the causes of these conditions, how to prevent them, and self-care procedures to avoid illness as well as formal care. Interviewee 166, who injected "speed" three to four times a week, recalled her first experience with diagnosing an abscess:

> **Interviewer:** When was the first time you had an abscess?
> **166:** When I was thirteen.
> **Interviewer:** Did you know what it was at first?
> **166:** No.
> **Interviewer:** What did you think was happening?
> **166:** Um, I didn't know until it was explained to me like three days later . . . I didn't know what was happening. So it was kinda scary.
> **Interviewer:** And did you just come out and ask somebody? What did you do?
> **166:** Well, the person that I used to shoot drugs with, they finally, um, told me. 'Cause I told him it was burning real bad? They kept hittin' [injecting] me, you know? And two or three days later, I asked him, I said, "What the hell's goin' on here?" He says, "You got an abscess. It's from missin' it [not injecting into the vein]." I go, "Well, thanks!" You know? But that was pretty scary.

Interviewer: So your first abscess, you didn't get treatment? You treated it yourself?
166: Basically, yeah.
Interviewer: Were there people showing you how to care for yourself?
166: Yeah.

Through interactions with her other IDU acquaintances (mainly in street settings), drug users learn to recognize signs of drug-related illnesses and self-care methods. For example, participant 166 obtained prescription drugs like antibiotics and tranquilizers from street sellers (not always knowing what she was buying), because prior negative interactions with nurses and doctors left her hesitant to use her publicly funded health care coverage:

Interviewer: You also mentioned that you had problems with your kidneys?
166: Yeah, my left kidney. In fact, it's been hurting me a lot lately . . . It's hurtin' a lot.
Interviewer: And have you gotten any treatment for that?
166: Um, just antibiotics and a lot of cranberry juice, which I hate. And lotta water.
Interviewer: Are you getting antibiotics from the street or are you . . .?
166: No. Well, I have a few times.
Interviewer: And who are . . . where are you going for treatment? Where are you getting your scripts [prescriptions]?
166: I was getting them from [a public hospital in a southern Bay Area county]. But, I mean, I haven't gone for a long time. Um, I hate goin' to [the same public hospital]. I hate being – I mean, the emergency room doctors treat me like shit . . . that's why I won't go there anymore.

Another IDU interviewee, suspecting that she was suffering from a drug-related illness, had her suspicions confirmed and her condition diagnosed as "cotton fever" by a more experienced friend. When asked by her interviewer if she had sought help from a doctor, she responded:

076: No, I thought it was something wrong with the dope. But, I mean, I realized that I wasn't passing out. I could function. I was just, you know, shaking.
Interviewer: So how did you know it was cotton fever?
076: My friend told me the next day . . . [she asked what happened] And I told her and she goes, "Oh, you had cotton fever."

Variations in Social Networks and Consultation Processes

Regardless of whether or not they injected, the speed users in our sample appeared to be socially closer and more connected to each other than members of other drug subcultures. They were mutually involved in "scenes" such as bikers, ravers and the gay community, and were already immersed in other somewhat deviant subcultures. These shared experiences may translate into denser lay consultation networks. Two participants with epilepsy identified themselves as members of the gay community who used speed intravenously for sexual and recreational purposes. They managed their epileptic conditions by consulting with each other and with a mutual doctor-friend. They elicited information regarding potential health outcomes of their drug use; specifically whether methamphetamine use would induce seizures or interact with prescribed medications and the safest mode of ingestion for epileptics. Both were fortunate to have private insurance and access to a sympathetic doctor who treated many other gay drug users. Other speed users, such as younger users from the "rave scene" or people without insurance, consulted each other regarding eating and sleeping habits; how to manage pharmacological effects (e.g. coming down); safer injection techniques; quality of drugs; and where to access care, particularly the HIV-positive participants.

Perhaps because marijuana use was seldom directly implicated with illness, marijuana smokers in our sample seemed to rely less on their social networks for information regarding health management. Some participants who only used marijuana reported that they believed that sharing smoking equipment (e.g. water pipes) with friends increased their respiratory problems. Most (95%), however, did not attribute any of their previous year's illness episodes to marijuana use. A majority of their illness episodes were trauma-related illnesses (e.g. bicycle, skateboard or car accidents) that for the most part were not directly attributed to marijuana use, although parenthetically many smoked marijuana to cope with trauma related pain (Duterte et al., 2001).

The lack of reliance on social networks within this population may vary with insurance status and social class. For the most part, marijuana users in our sample tended to be younger, in college and middle-class, while those using hard-core drugs were older, less educated and living close to the poverty level. They also tended to have been socialized by their families from early childhood to seek formal care and they were able to access care through college health care services or employee-based medical insurance. Another factor may be that participants did not connect their marijuana use to their health problems.

Crack smokers did connect a myriad of health care problems with their drug use both socially (for example, being beat up for stealing drugs) and pharmacologically (being malnourished and suffering psychotic episodes resulting from sleep deprivation). They too relied on relationship networks for advice and counsel. Interviewee 046 believed that she could enjoy crack smoking without adverse affects if she followed the advice she had received early in her crack-smoking career from a seasoned peer:

> An old lady told me a long time ago, "If you are gonna mess with that stuff, make sure you put back in your body what that stuff take out." Usually people don't drink no water. You know how somebody be dry mouth when they be smoking? I'm gonna keep me drinking and eating. So, that's my equalizer. It keeps me mellow. I don't trip and all that stuff. If it's [crack] gone, it's gone. I'll go buy me a $5 rock and when it's gone, I inhale my joint. I have my joint and I go eat and forget it. Simple as that.

Based on information from another crack-smoker, this informant perceived that marijuana smoothed out the "come down" from crack and stimulated her appetite – thus helping her to avoid the negative effects of episodic compulsion other crack smokers have described (see Reinarman et al., 1997).

DISCUSSION

Our interviewees delayed seeking medical care because they expected to be stigmatized in health care settings, and they also believed that doctors attributed all of their health problems to their drug use. When illness required hospitalization, they feared untreated withdrawal from the (illicit) drugs that they regularly used and denial of the (licit) drugs they needed to get well. Perhaps, acute care hospitals should work with substance abuse experts when treating drug habituated patients for their presenting conditions to ensure that they are comfortable, receive appropriate symptom management, and are able to heal. The fiscal and human costs of delayed care among a population at risk for numerous health problems, including communicable diseases, are enormous.

Drug users relied not only on their own experiences, but also on the advice and counsel from their relational networks as to when to self-treat vs. seeking formal care. Unpleasant experiences with health care providers or breaches of confidentially in medical settings became the fodder for folk tales in drug-using networks with far reaching repercussions. Understanding the amount and type of advice that drug users give their peers is key to identifying and understanding illnesses and conditions that may go inappropriately diagnosed or inadequately treated.

Barriers hindering this stigmatized population's access to quality health care should be addressed by understanding and building on how drug users normally maintain their health and manage illness symptoms outside medical settings. Community health outreach workers could infiltrate drug user networks as health educators, providing these peer networks with accurate information and referrals. Drug users also should be encouraged to utilize health care services and to use appropriate methods of self-care that include responsible and safer drug use. To promote such utilization, health care systems must facilitate continuity of care thereby encouraging candor in the discussions concerning drug use that could occur between drug users and their doctors. Ensuring confidentiality is also a key to success in persuading drug users to disclose their drug using practices. Overall, open communication will likely affect the quality of health care and, in the long run, decrease costs.

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GENDER DIFFERENCES IN DEPRESSIVE SYMPTOMS: INSIGHTS FROM A LIFE SPAN PERSPECTIVE ON LIFE STAGES AND SOCIAL NETWORKS

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ABSTRACT

This paper examines possible explanations for gender differences in depressive symptomatology. Using a life span framework, two explanations of this difference are explored: women's higher likelihood of experiencing life strains and women's more social network relational orientation. Data are drawn from a regional stratified probability sample of 1,436 people ranging in age from 18 to 93. The findings indicate that the magnitude of gender differences in depressive symptoms does change over the life span, that life strains and social network relational orientation do influence the magnitude of gender differences and such influence varies with age. These findings suggest the importance of a life span perspective, as well as life strains and a social network relational orientation for understanding the frequently documented gender difference in depressive symptomatology.

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GENDER DIFFERENCES IN DEPRESSION

One of the most consistent findings in research on depressive symptomatology is the higher prevalence among women. The origin of this gender difference remains unclear, although a number of explanations and quite a bit of supporting evidence have been offered (such as: Kessler & McLeod, 1984; Nolen-Hoeksema, 1987, 1990; Mirowsky, 1996; Culbertson, 1997). The issue, nevertheless, is still quite controversial. In this paper we suggest that a life span framework which recognizes the similar and different life trajectories of men and women can best explain the diversity of findings reported in the literature. We propose that there are multiple factors that influence the depressive symptoms of men and women. The relative degrees of influence of those factors vary at different stages over the life span of men and women. We believe that failure to recognize this phenomenon has produced the apparent contradictory findings.

In this paper, we focus on two alternative explanations which have been debated in the literature for some time. One explanation is the greater exposure of women to life strains as a key factor in their higher levels of symptoms. This argument focuses on the objective differences between men and women's exposure to life strains. Men and women are known to be differentially exposed to both the resources and strains normally experienced over the course of one's lifetime. These different experiences are hypothesized to lead to the observed unequal status between the two genders from young adulthood through old age. Life span experiences accumulate over time as people move through the usual roles and relationships experienced in adulthood. Documented gender differences in marital status, employment, economic hardship and health status increase over time and are proposed to account for much of the observed gender difference in depressive symptoms among adults (Gore & Mangione, 1983; Mirowsky & Ross, 1992; Mirowsky, 1996; Rosenfield, 1989). To be explicit, it is proposed that women, to a greater degree than men, are more likely to experience the absence of a spouse, economic hardship, and poor health (Ross & Huber, 1985). It is generally accepted that being married, having financial security and being in good health are all important resources which help people achieve a better quality of life and substantially improve their well-being. Not having these resources has consistently been linked to depression.

The second prominent explanation attributes the higher symptom levels among women to their greater vulnerability to depression. In other words, given exposure to similar life strains, women are more likely to manifest symptoms of depression because women are conditioned or socialized in such a way that they are more vulnerable to depression. One line of research promoting the vulnerability hypothesis has documented "feminine socialization" which emphasizes social network and relationships, making women more vulnerable to depression in the face of interpersonal difficulties or the suffering of other people in their social networks (Antonucci, Akiyama & Lansford, 1998). Men and women are socialized according to different sets of norms from the very early stages of their lives. Male norms in American society tend to emphasize independence, individualism, assertiveness and competition, while female norms focus on feelings of empathy, sensitivity, social connectedness and social skills. Thus, male norms are often characterized as self-oriented and female norms as network or relation-oriented. When men and women are socialized with such gender norms, women, more than men, learn to give priority to their social networks and relationships. They tend to be more sensitive to others' feelings and emotionally involved in the problems which family members and close friends experience. Kessler and McLeod (1984) called this the 'cost of caring.' In short, in American society, feminine socialization is hypothesized to make women more emotionally responsive to interpersonal difficulties and the suffering of their social networks, and, therefore, more vulnerable to depression.

The life strains and vulnerability explanations both suggest the importance of a life span perspective. The life strains perspective suggests that life strains build up over the life course and accumulate over time. However, gender differences would dissipate in late life when employment status, economic status, and health status tend to equalize. Thus, these resource deficits, although experienced more frequently by women at earlier stages in the life span, may become more equitable in late life when economic hardship and poor health, in particular, are likely to be experienced by both men and women. As to the vulnerability explanation, the impact of feminine socialization is also expected to vary by age. Women become increasingly vulnerable as they accumulate feminine socialization experiences, especially during middle age, when one tends to have an extended social network and is most embedded in family and other role relationships. These age related changes in gender differences in life strains and vulnerability due to feminine socialization experiences will most strongly affect women in middle age and these, in turn, will be associated with higher levels of depressive symptomatology.

Examination of the life strain and vulnerability explanations within a life span and gender specific framework suggests the following hypotheses: (1) the magnitude of gender differences in depressive symptoms will vary over the life span, with differences increasing from early to mid-life and then decreasing in old age; (2) life strains will have a more significant impact on gender differences in the depressive symptoms of the middle aged when multiple life domains are most likely to converge than those of young or older adults; and (3) feminine socialization with its relational orientation and sensitivity to the experences of their social network will explain differences in depressive symptoms between men and women from adolescence through old age. However, the influence is also hypothesized to be most pronounced among middle aged people because they are more socially embedded than other age groups.

DATA AND METHODS

Sample

Data are drawn from the "Social Relations and Mental Health Over the Life Course" survey (Antonucci & Akiyama, 1994), a regional stratified probability sample from the greater Detroit metropolitan area which consists of 1,702 people ranging in age from 8 to 93. The survey was conducted by the Survey Research Center of the University of Michigan. Professional interviewers administered in-home, structured interviews approximately one hour in length. The questionnaire included measures of mental health, physical health, social relations, sources of stress, personality traits, and demographic characteristics. The response rate was 72%.

The analysis for this paper was performed on a subsample of 1,436 individuals (589 men and 847 women) who were 18 years old and older. Sixty-one percent of men and 46% of women were married. Sixty-five percent of men and 45% of women were employed. The average years of formal education were 12.99 and 12.54 for men and women, respectively.

Measures

Depressive Symptoms

Depressive symptoms were measured by the Center for Epidemiologic Studies Depression Scale (CES-D) consisting of 20 items. The CES-D is one of the most widely used measures in general population surveys for assessing current levels of depressive symptoms. Respondents are asked to rate the frequency with which they experienced each item during the past week. Responses range from rarely or none of the time (0) to most or all the time (3). Four items (4, 8, 12, 16) are stated positively and are reverse scored. The scale has been reported to have excellent psychometric properties which hold across major subgroups in the United States (Radloff, 1977). The total CES-D score, which is a sum of all items with the possible scores ranging from 0 to 60, was used for the analysis. The alpha reliability is 0.88 for the total sample, and 0.85 and 0.89 for men and women, respectively.

Life Strain Measures

Education is the number of years of formal education which a respondent completed. Marital Status was dichotomized into married, i.e. those who were currently married and not married, a group which combined all other categories (1 = married). Employment was dichotomized into employed and not employed (1 = employed). Economic Hardship was measured by a single item, "How well off are you (and your family living here) financially?" This measure was coded on a 5 point scale (1 = very well off; 2 = fairly well off; 3 = average; 4 = not so well off; and 5 = not well off at all). Poor Health: The mean from two measures was used to construct the health variable, "How would you rate your health at the present time" (1 = excellent; 2 = fairly good; 3 = average; 4 = not very good; 5 = poor) and "Compared to most people your age, would you say that your health is 1 = much better, 2 = better, 3 = about the same, 4 = worse, 5 = much worse." The scale ranges from 1 to 5, with a high score indicating poor health.

Social Network Relational Measures

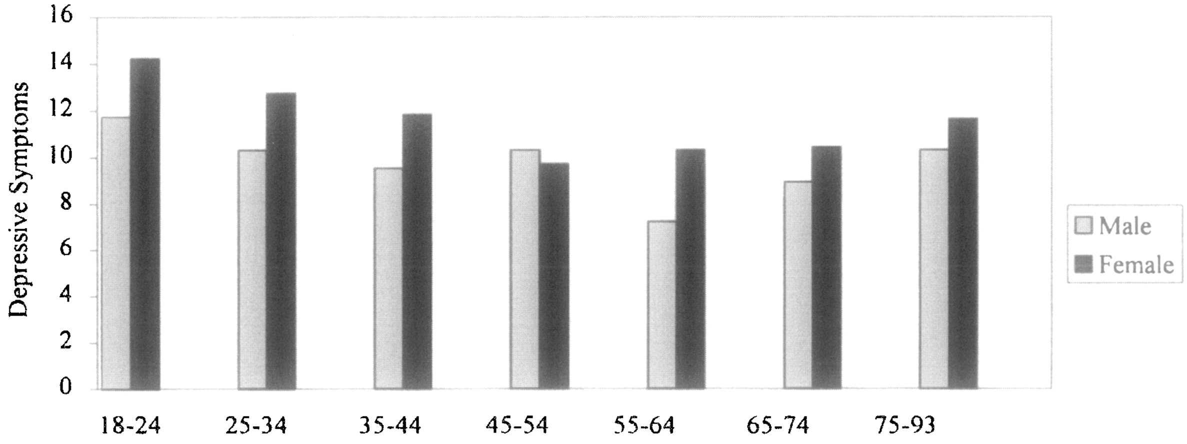
Social Network Relational Orientation: Respondents were asked to rate the extent to which the following list of personality characteristics apply to themselves – shy, loyal, sympathetic, sensitive to the needs of others, understanding, compassionate, eager to soothe hurt feelings, warm, tender, does not use harsh language, loves children and gentle. They were coded on a scale of 1 to 7, from 1 = almost never true to 7 = almost always true. The social network relational orientation measure was created by taking the mean of these measures. Social Network Relational Life Events is the count of life events that are related to relationships and events experienced by members of the respondent's social network i.e. family or close friends during the year prior to the interview. Some examples of the social network relational events are: "Has your relationship with your spouse become worse?," "Has any member of your family been ill or badly injured?," and "Have you started living with your children?." There are 18 relational events altogether. These types of life events have been referred to as "network events" (Kessler & McLeod, 1984). Social Support and Negative Relations: In the questionnaire, the respondents were asked a set of questions about their relationships with mother, father, spouse, child (if a respondent has more than one child, the respondent was instructed to identify one to whom he/she feels closest), the best friend of same gender and an opposite gender friend. Based on these questions, two indices, social support and negative relations, were constructed. Social support is a three item scale comprised of the following questions: (1) "I feel my (e.g. mother) supports me, that she is there when I need her." (2) "I can share my very private feelings and concerns with my mother"; and (3) "I feel that my mother believes in me." Respondents were asked to rate their relationships for these three statements on a five point scale (5 = agree; 4 = somewhat agree; 3 = neither agree for disagree; 2 = somewhat disagree; and 1 = disagree). The social support scale was created by taking the mean of the responses to these three items from each relationship. Negative relations is a two-item scale derived from: (1) "My (e.g. mother) makes too many demands on me"; and (2) "My mother gets on my nerves." Thus, both social support and negative relations scores were summed and ranged from 1 to 5 with higher scores indicating higher levels of social support and negative relations, respectively.

RESULTS

The raw means and mean differences in depression across 10-year age groups for men and women are shown in Fig. 1. The patterns of relationships between depressive symptoms and age are consistent with prior studies (Mirowsky, 1996). The relationship between age and depressive symptoms is U-shaped for both genders. For both men and women, the reported levels of depressive symptoms decrease in early adulthood, reach the lowest level in middle-age, and increase in late life. Women reported a higher level of depressive symptoms than men in all age groups except one, 45 to 54, though significantly so in only two of the seven age groups (25–34 and 55–64). The age with the lowest average depression is about ten years younger for women (ages 45–54) than men (ages 55–64). This lag closes the gender gap in the 45–54 age group and yields the biggest gender gap in the 55–64 age group. The difference between men and women appears to narrow in old age.

In the subsequent analyses, age categories were collapsed into three groups: young adults (ages 18–34), middle-aged adults (age 35–64) and older adults (age 65–93). This step was taken to secure a sufficient number of cases in each age category for multivariate analyses. Table 1 presents the average levels of depressive symptoms and the means (or percentages) of all independent variables for men and women in the three age groups. There were significant gender differences in depressive symptoms in the two younger age groups. Women reported a higher level of depressive symptoms in both age groups. Men and women were not significantly different in depressive symptoms among the older adults.

Turning next to the set of five variables which assessed life strains, Table 1 indicates that significant gender differences emerged in ten of the fifteen comparisons. In the case of education, men are more educated than women in the oldest group. With regard to marital status, both middle aged and older men



Gender Difference t-value	-1.2	-2*	-1.8	0.4	-2.8**	-1.3	-0.7

*p<.05; **p<.01.

Fig. 1. Means and Mean Differences in Depressive Symptoms.

Table 1. Means and Standard Deviations by Gender and Age for All Variables.

	18–34			35–64			65–93			
	Male Mean (SD)	Female Mean (SD)	Gender Difference *t*-value	Male Mean (SD)	Female Mean (SD)	Gender Difference *t*-value	Male Mean (SD)	Female Mean (SD)	Gender Difference *t*-value	Range
Depressive Symptoms	10.71 (8.51)	13.08 (10.24)	–2.23*	8.94 (8.56)	10.94 (10.40)	–2.63**	9.39 (7.91)	10.97 (10.20)	–1.62	0–60
Life Strain Variables										
Education	13.17 (2.02)	12.89 (1.79)	1.35	13.52 (2.70)	13.37 (2.15)	0.81	11.91 (3.35)	10.96 (2.92)	–2.99**	0–17
Married (%)[a]	47 (0.50)	53 (0.50)	1.20	72 (0.45)	62 (0.49)	7.77**	69 (0.46)	20 (0.40)	96.44**	–
Employed (%)[a]	92 (0.27)	60 (0.49)	42.93**	81 (0.39)	61 (0.49)	32.69***	12 (0.33)	8 (0.27)	1.82	–
Economic Hardship	2.91 (0.86)	3.23 (0.87)	–3.42**	2.77 (0.92)	3.02 (0.90)	–3.48**	2.75 (0.91)	3.08 (0.80)	–3.90**	1–5
Poor Health	2.09 (0.64)	2.23 (0.66)	–2.01*	2.14 (0.77)	2.31 (0.83)	–2.61*	2.41 (0.91)	2.37 (0.87)	0.51	1–5
Relational Variables										
Relational Orientation	5.53 (0.77)	5.94 (0.57)	–5.71***	5.69 (0.69)	5.96 (0.62)	–5.40***	5.91 (0.63)	6.15 (0.60)	–3.76***	1–7
Relational Life Events	1.52 (1.35)	1.67 (1.47)	–0.93	1.23 (1.22)	1.42 (1.23)	–2.03*	1.09 (1.18)	1.15 (1.12)	–0.51	0–8
Social Support	4.39 (0.47)	4.43 (0.49)	–0.86	4.54 (0.49)	4.51 (0.48)	0.69	4.69 (0.44)	4.8 (0.39)	–2.66**	1–5
Negative Relations	2.62 (0.86)	2.68 (0.85)	–0.61	2.23 (0.87)	2.45 (0.86)	–3.32**	1.96 (0.89)	1.82 (1.00)	1.34	1–5

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

[a] For testing Gender difference, chi-square was used.

are more likely to be married, and younger and middle aged men are more likely to be employed than women. On the other hand, women in all three age groups report significantly higher levels of economic hardship. With respect to the life strain of poor health, younger and middle aged women report significantly poorer health than their male counterparts, whereas no significant gender difference is evident among the oldest age group.

Four sets of variables are included among the social network relational variables for this analysis: network relational orientation, network relational life events, social support, and negative relations. Table 1 presents the means and standard deviations of these variables for each age by gender group. *T*-tests for independent group means indicate that there are significant gender differences in six of the twelve comparisons. There are significant gender differences in network relational orientation for each of the three age groups (18–34; 35–64; 65–93). In each case, women report higher levels of network relational orientation than men. In the case of network relational life events there is only one significant gender difference. Among those 35 to 64 years of age women report higher levels of network relational life events than men. For combined social support variables, a significant gender difference is evident only among the oldest group, those between the ages 65 and 93 years. In this case, older women reported higher levels of social support than older men. And finally, for the combined measures of negative relations, gender differences emerged only among the middle aged group. Women reported higher levels of negative relations than men. Thus, we could say that overall women experience more life strains, are more network or relation oriented and more likely to suffer from the life events experienced by their social network members.

Table 2 shows the results of regression analyses which were performed to assess the influence of two types of explanatory variables on the observed gender differences in depressive symptoms in the three age groups. Four models were tested. Model 1 is a base model in which gender is a single predictor. In Models 2 and 3, life strain variables and network relational variables were entered in addition to gender, respectively. Gender, life strain and network relational variables were all entered in Model 4. The Model 1 results indicate gender was a significant predictor of the individual differences in depressive symptoms for young and middle-aged adults. However, this is not the case for older adults.

In Model 2, five life strain variables were entered into the regression model. If the gender differences in depressive symptoms are largely accounted for by gender differences in life events, the coefficients of gender in Model 1 should be considerably reduced. The coefficient of gender was little affected by adjustment for life strain among young adults. A similar adjustment reduced the coefficient of gender by 60% for the middle-aged adults. This indicates that

Table 2. Summary of OLS Regression Analysis Predicting Depressive Symptoms.

Independent Variable	Age 18–34 ($N = 361$) Model				Age 35–64 ($N = 679$) Model				Age 65+ ($N = 409$) Model			
	1	2	3	4	1	2	3	4	1	2	3	4
Female	0.13^{**}	0.11^{*}	0.13^{**}	0.10^{*}	0.10^{*}	0.04	0.06	0.01	0.06	0.01	0.11^{*}	0.02
Education		-0.03^{*}		-0.02		-0.01		-0.02^{*}		-0.01		-0.01
Married		-0.04		-0.03		-0.09		-0.12^{**}		-0.05		-0.12^{*}
Employed		0.05		0.01		0.01		0.00		-0.11		-0.12
Economic Hardship		0.05		0.04		0.06^{**}		0.04		0.03		0.04
Poor Health		0.14^{**}		0.13^{**}		0.18^{**}		0.16^{**}		-0.13^{**}		0.12^{**}
Relational Variables												
Relational Orientation			-0.02	-0.01			0.01	-0.01			-0.11^{**}	-0.11^{**}
Relational Life Events			0.05^{**}	0.05^{**}			0.07^{**}	0.05^{**}			0.07^{**}	0.07^{**}
Social Support			-0.12^{*}	-0.09			-0.09^{*}	-0.10^{**}			-0.07	-0.07
Negative Relations			0.11^{**}	0.11^{**}			0.10^{**}	0.09^{**}			0.07^{**}	0.07^{**}
Constant	1.40	2.26	1.67	2.22	1.36	2.19	1.42	2.50	1.43	2.06	2.13	2.81
R^2	0.02	0.10	0.12	0.17	0.01	0.17	0.10	0.24	0	0.11	0.08	0.19

* $p < 0.05$; ** $p < 0.01$.

more than half of the gender differences in depressive symptoms could be attributed to the differential life circumstances of men and women in the middle stages of the life span. The coefficient of gender is still not significant for the older adults in Model 2.

The four network relational variables, instead of the life strain variables, were entered in to Model 3 in addition to gender. The results indicate that the relational variables had no effect on the magnitude of the coefficient of gender for the young adults. However, adjustment for the relational variables reduces the coefficient of gender by 40% for the middle-aged adults. Unexpectedly, the coefficient of gender, which was not statistically significant in Model 1, increased more than 100% in the oldest age group. In other words, when the effects of network relational variables on depressive symptoms were controlled for, gender differences in depressive symptoms emerged in the oldest group.

In Model 4, gender, life strains, and network relational variables were all entered into the regression equations. These variables accounted for 17%, 24% and 19% of the variance of depressive symptoms among the young adults, middle-aged adults and older adults, respectively. Thus, a substantial portion of the individual variations in depressive symptoms could be attributable to social networks, social relations and life circumstances for adults in all ages. However, the association of such variables with gender differences in depressive symptoms varies by stages in the life span.

Adjustment for life strains and network relational variables changed the coefficient of gender very little in the young adult sample. This indicates that the gender differences in depression among young adults cannot be explained by gender differences in social network relations or life circumstances, at least the social network relations and life circumstances that were measured in this study. Something else must account for gender differences in depressive symptoms in this age group. By contrast, a similar adjustment reduced the coefficient of gender by 90% in the middle-aged adult sample. Controlling for life strains and network relational variables, gender differences in depressive symptoms virtually disappeared. This substantial reduction of the coefficient of gender implies that gender differences in depressive symptoms among middle-aged adults could be largely explained by differences in social network relations and life circumstances of these middle aged men and women.

The coefficient of gender was not statistically significant in the older adult sample in Model 1, Model 2 or Model 4. To examine possible explanations for the unexpected results in Model 3 for the older adult sample, interaction terms of gender and each of the relational variables were added to the Model 3 regression equation. Only the interaction between social network relational orientation and gender was found to be statistically significant. Older women

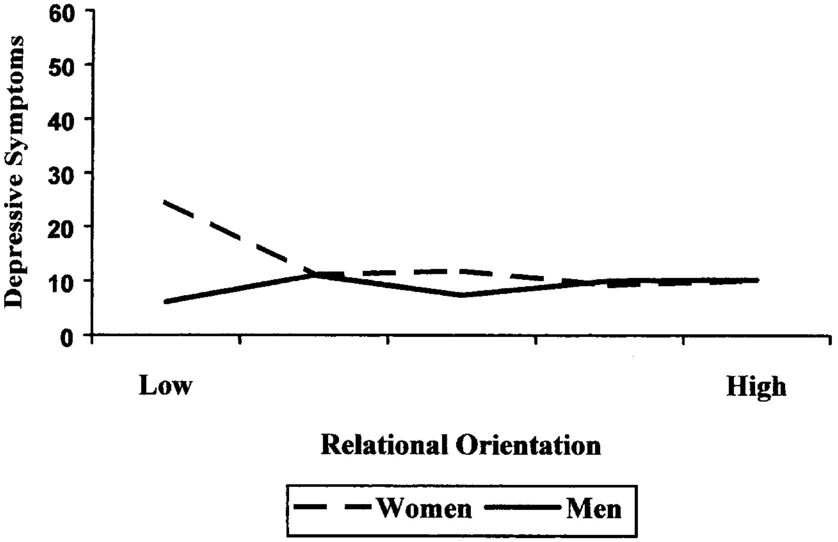


Fig. 2. Relational Orientation and Depressive Symptoms for Men and Women, Aged 65+.

with stronger social network relational orientation, were less likely to be depressed than those who were not relationally oriented, while relational orientation had very little effect on depressive symptoms among older men, (see Fig. 2). This result indicates that, contrary to our expectation, social network relational orientation reduces, rather than increases, the vulnerability to depression, at least among older women.

CONCLUSION

This paper applies a life span perspective to the examination of the association between gender and depressive symptoms. Although a longitudinal study that followed people from age 18 through late life would have been ideal, since such data were not available, we examined gender differences in depressive symptoms in three cross-sectional age groups. The overall results suggest that both life strains and social network relational vulnerability influence depressive symptoms at all ages. However, the influence of these variables on the gender-depression link varies by age group, which we consider a proxy for life span stage. We begin by reviewing the results in light of our hypotheses and then discuss the gender-depression link in each age group.

In the first hypothesis we predicted that the magnitude of gender differences in depressive symptoms changes over the life span, increasing from early to mid-life and then decreasing in old age. The hypothesis was only partly supported in our cross-sectional data. As shown in Fig. 1, the gap between men and women in depressive symptoms narrowed with increasing age. Consistent with our hypothesis, the gender gap became smaller from mid-life to old age. Contrary to our hypothesis, however, we found some increase in the gender gap from early to later young adulthood with the least gender differences among those at mid-life rather than an increase in gender differences from early to mid-life as well.

The second hypothesis posits that life strains would have a more significant influence on gender differences in depressive symptoms of middle-aged adults than those of younger or older adults. The data supported this hypothesis. When we entered the life strain variables into the regression model (Model 2), the gender effect was significantly reduced only in the middle-aged group, but not in the younger or older groups. This finding indicates that gender differences in depressive symptoms in mid-life are at least partly due to the greater life strain experienced by women compared with men.

Our third and final hypothesis predicted that feminine socialization with a social network relational orientation would explain the gender gap in depressive symptoms from adolescence through old age. However, the influence would be most pronounced in the middle-aged group, because people are more socially embedded at this age than in any other age group. This hypothesis was also partially supported. As we predicted, the magnitude of gender differences in depressive symptoms substantially decreased by entering the social network relational variables in Model 3 only for the middle-aged group. However, we also found the unexpected effect of social network relational variables on the gender difference in depression among the oldest group. While gender was not a significant predictor of depressive symptoms among the older adults in Model 1, it became a significant predictor once the social network relational variables were entered into the regression in Model 3. This finding indicates that the narrowed gender gap in depressive symptoms in old age is partly due to the stronger social network relational orientation of women compared to men. It suggests older women may possess some effective interpersonal mechanism which protects them from depressive symptoms. We will speculate about a possible mechanism for this later in this discussion.

We turn now to a discussion of the gender-depression link in each age group. First, among the youngest group, those between the ages of 18 and 34, gender was a significant predictor of depression across all four models. Neither social network relational variables nor life strain variables entered into separate regressions, designated as Models 2 and 3 respectively, significantly reduced the effect of gender on depressive symptoms. Similarly, when both social network relational and life strain variables were simultaneously entered into the regression equation, i.e. Model 4, the effect of gender was still not substantially reduced. These findings indicate that among those in the early stages of the adult life span, even though both relational and life strain variables do explain a significant amount of variance in depression, the variance explained by these variables does not overlap with the variance explained by gender in this age group. These life strain and social network relational variables seem to equally affect levels of depression among men and women. We conclude that there must be other factors that differentially affect the depression of men and women at the early stage of adult life.

The parallel analyses for people in middle age, those between 35 and 64, suggest a quite different set of associations. In these analyses while gender is a significant predictor of depression in Model 1, once social network relational and/or life strain variables are introduced in Models 2, 3, and 4, the gender difference virtually disappears. Thus, for those in the middle stages of the life course, life strain and relational vulnerability account for the largest proportion of variance in depressive symptoms explained by gender. We interpret this as indicating that in midlife it is a combination of life strain and social network relational characteristics, rather than gender, which explains depressive symptoms.

And finally, among the oldest sample we examined, those 65 and above, gender was not a significant predictor of depressive symptoms when entered into the regression equation alone in Model 1. Life strains, as considered separately in Model 2, did not change the previously non-significant effect of gender demonstrated in Model 1 but gender emerged as significant in Model 3 when social network relational variables were entered into the model. Furthermore, among the relational variables, we found that the social network relational orientation, in particular, is differentially associated with the depressive symptoms of men and women. Although relational orientation has little affect on the level of depressive symptoms in older men, relational orientation appears to protect older women rather than making them vulnerable to depression. This finding, which is contrary to our expectation, could be explained by the socioemotional selectivity theory (Carstensen, 1987). Carstensen argues that with increasing age, people become more selective about their personal network in order to conserve physical energy and to regulate affect. Maximizing interaction and investment in one's closest relationships and minimizing contact with less familiar people is an adaptive mechanism for affect regulation, particularly in old age. In other words, by reducing the number of people in one's social network and the levels of social interaction, older people optimize the experience of positive affect and minimize negative affect. According to this theory, it is plausible that social network relational orientation in old age protects people from depression rather than making them vulnerable, because their social networks consist of individuals selected for maximizing positive affect. Furthermore, as social network and social relations are more central in women's lives, the relational orientation might have greater alleviating effects on depressive symptoms for women than for men.

We interpret these findings as indicating that the observed association between gender and depressive symptoms can best be understood within a life span perspective. Among the youngest people, gender, more than life strains or social relationships, is significantly associated with depression. Among those in middle age, however, gender becomes much less important in predicting depressive symptomatology once life strains and social network relations, as experienced at this life stage, are considered. This suggests that at midlife when people are both much more likely to be embedded in social networks and to experience life strains, these variables more than gender, predict depression. On the other hand, for those at the later stages of the life span, gender alone does not predict levels of depressive symptoms. This is consistent with the general gerontological literature, which suggests that many gender differences disappear in late life. Furthermore, our findings suggest that feminine socialization with a social network relational orientation might contribute to closing the gender gap in depressive symptoms in old age, given that their social networks tend to consist of individuals selected for maximizing positive affect compared to those of younger people.

Our findings convince us of the unique contribution and importance of a life-span perspective for investigating the longstanding research question of the etiology of gender differences in depressive symptomatology. The findings reported above indicate that factors raising levels of depressive symptoms among women are not the same across life stages. It is clear that even the same factor, such as social network relational orientation, can differentially affect depressive symptoms in different life contexts over the life span. Such complexity may explain why there have been contradictory findings in prior research. This investigation, using a life span perspective, may suggest a significant advance in our understanding of the association between gender and depression. Future research, ideally using longitudinal data, is needed to verify and confirm these findings.

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