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Andrew Brookes

Preventing Fatal Incidents in School and Youth Group Camps and Excursions

Understanding the Unthinkable

Springer

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Series Editor Foreword

This book, the second in our series, focuses on what is clearly the single most important principle and priority for outdoor educators and others who lead outdoor activities, especially those involving young people, namely, that young people should return from such activities alive and unharmed. This obligation is in many ways an equivalent to the moral and legal duty (often referred to as the 'standard of care') that a physician owes to a patient in their care. In this sense, we confidently predict that this volume will become an enduring reference for outdoor educators and leaders seeking clarity on the standards of care appropriate to the activities they organise and lead.

Fatal incidents are rare in outdoor education and related fields, but most are preventable. This book provides practical evidence-based advice and will assist those responsible for outdoor programmes to develop the requisite knowledge and expertise to prevent fatalities. It will be an invaluable resource for staff training or self-study and provides an authoritative reference for researchers, students and accident investigators.

Andrew Brookes approaches the prevention of fatal incidents in outdoor education and related fields through meticulous examination of the role of case-based knowledge in fatality prevention. Although safety in many fields has long been built on accumulated lessons from past incidents, tragedies on school or youth group camps and excursions are so infrequent and so widely scattered that knowledge from previous incidents can elude those who would benefit most. Nevertheless, the emergence of unlearned lessons from the past weighs heavily on those affected by a tragedy (such as grieving parents) when they judge whether an incident should have been prevented, and on the minds of those who feel some responsibility. This book provides a foundation for a detailed and comprehensive understanding of fatality prevention in outdoor education programmes and in youth camps and excursions. It compiles, examines and analyses information on fatal incidents that have occurred over many decades, involving many types of groups and endeavours, from around the globe. It provides a thorough and careful examination of how prevention expertise can be developed from case knowledge. No previous work has attempted this task.

This book demonstrates that most, but not all, outdoor education tragedies can be prevented through a combination of

- A strict aversion to risk of serious harm
- Knowledge of local and wider circumstances sufficient to recognise serious hazards and
- Knowledge and understanding of previous incidents

It demonstrates that many fatal incidents have occurred in a relatively small set of knowable circumstances that can be broadly divided into hazards extant across a broad community (such as the risks underlying travel to or from a venue) and hazards which are more local (such as the known propensity of some tree species to shed branches spontaneously).

Although tragedies involving loss of life are usually investigated, and some have been analysed in great detail, no previous work has examined fatality prevention in outdoor education comprehensively.

We are personally delighted to include Andrew's work in our series because we have had a long history of working together. Noel first encountered Andrew when he was invited to become an external member of the Course Advisory Committee for the outdoor education programmes at the institution then known as Bendigo College of Advanced Education (now La Trobe University). Andrew was a key contributor to the early development of these programmes and continued to be so for many years, culminating in a period during which he was Head of the School of Outdoor and Environmental Education.

After Noel was appointed to La Trobe University as Foundation Professor of Outdoor and Environmental Education (the first such appointment in Australia), Andrew played a particularly significant role in further developing the school's innovative programmes and its research productivity. The fact that the school's flagship course, the Bachelor of Outdoor Education, is undoubtedly the pre-eminent course of its type in Australia, in terms of the quality of its entrants, student satisfaction and graduate employability, owes a great deal to Andrew's leadership.

Andrew's research on fatal incidents has directly impacted the field of outdoor education and led to numerous invitations to prepare expert witness reports informing legal proceedings. This was very clearly exemplified by his involvement in the aftermath of the 2008 Mangatepopo Gorge tragedy (see Chapter 4 of this volume), in which six teenage students and a teacher died on a trip conducted by New Zealand's Outdoor Pursuit Centre (OPC). Local press reports at the time indicated that Andrew's fatal incident studies were instrumental in his invitation by the law firm employed by the OPC as 'top of their list' to prepare an independent review (together with a local QC and a NZ safety auditor). The incident was widely reported in NZ media and regarded as a national tragedy. The Review Team visited the site, interviewed survivors, witnesses, and staff, and reviewed voluminous files of documents from OPC and NZ authorities, including the Police, MetService and the

National Institute of Water and Atmospheric Research. Part of Andrew's role in the review was to conduct the survivor interviews, establish a chronology and analyse the root causes. The Coroner, Police and Department of Labour also conducted inquiries. The impact of the incident on the NZ outdoor sector cannot be overstated and the Review Team's report was subject to intense scrutiny. As a colleague working closely with Andrew at the time, Noel was very aware that Andrew's participation in the inquiry was not only intellectually demanding but also emotionally draining.

The Coroner took the Review Team's report as evidence, suppressed until his findings were released. The Trust pleaded guilty to Department of Labour charges for each death, but no police charges were laid. The Coroner's account closely followed the Review Team's Report, including the timings, which Andrew determined to within 2 or 3 minutes after interviewing a witness who had not provided a statement to, nor been interviewed by, the police. The Coroner explicitly endorsed the Review Team's report and its recommendations, including those arising from the root cause analysis, which had sector-wide implications.

After the Coroner's findings were made public, the Trust elected to make the report available to interested parties, which directly resulted in Andrew receiving numerous invitations to deliver keynote addresses at national and international conferences. We are also aware that the Review Team report has been cited widely in publications both within and beyond outdoor education.

It is somewhat ironic that Andrew's Ph.D. thesis (Brookes, 2006), which we had the privilege of supervising at Deakin University, is titled *Situationist Outdoor Education in the Country of Lost Children,* acknowledging Peter Pierce's (1999) study, *The Country of Lost Children: An Australian Anxiety.* The irony is that Andrew has dedicated much of his professional life and research activity to ensuring that, in the context of outdoor education, no child will ever be 'lost', in any sense of the word.

However, it is also important to emphasise, in the context of this series, that Andrew's work speaks to broader issues of outdoor and environmental education by elaborating connections between safety and curriculum decision-making, especially in relation to curricula framed around deep and detailed knowledge of the specific environments in which educators, leaders and guides operate (whether that be a trail in the Australian bush, a gorge in New Zealand, a bay on the English coastline or a river in the Canadian tundra). For Andrew, safety is not just a precondition, but is also an important dimension of a place-responsiveness curriculum for outdoor and environmental education – of the necessity of *local* knowledge and familiarity and of being 'at home'in *particular* places.

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Acknowledgements

Many individuals and organisations have helped me to locate information or have alerted me to incidents. Since I began what I thought would be a small project to collect some fatal incident cases almost two decades ago, the interest and helpfulness of colleagues from Australia and around the globe has been remarkable. I have baulked at trying to do justice to each of those who have assisted by listing individual contributions; I hope that those who have assisted will be able to see where and how they have contributed to safer experiences for young people in the outdoors.

Marcus Bailie, Head of Inspection, UK Adventure Activities Licensing Service, shared details he had compiled of UK incidents and generously shared his thoughts and writing.

My work has been informed and improved by countless discussions with colleagues at La Trobe University and from many other organisations. My original intention was to gather curriculum materials, and I have learned from students as I developed fatality prevention curriculum and as I refined my practice in the light of what I had learned.

Some of the research that has contributed to this volume was completed during a period as research-intensive Associate Professor at La Trobe University in 2013 and 2014.

I am grateful for the support and encouragement of the Series Editors, Professor Emerita Annette Gough and Professor Emeritus Noel Gough. Noel provided patient support as one deadline after another passed and provided insightful and meticulous feedback on drafts of each chapter.

This volume is an attempt to learn from tragedies. I extend my sympathy to those who lost a loved one, to the survivors and to those involved in an incident or its aftermath.

Contents

About the Author

Andrew Brookes, Ph.D., worked in outdoor education and outdoor guiding before moving to the former Bendigo College of Advanced Education (later part of La Trobe University), where he has contributed to the development of undergraduate and post-graduate outdoor education for almost three decades. His fatality prevention research has resulted in numerous publications and presentations. He has worked as a consultant both privately and through La Trobe University, Bendigo.

Recent publications include:

Brookes, A. (2015a). Foundation myths and the roots of adventure education in the Anglosphere. In B. Humberstone, H. Prince, & K. Henderson (Eds.), *International handbook of outdoor studies* (pp. 11–19). London/New York: Routledge.

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Abbreviations

AALA	Adventure Activity Licensing Authority (Great Britain)
BCU	British Canoe Union
BES	British Exploring Society (formerly, BSES)
BSES	British Schools Exploring Society
D of E	Duke of Edinburgh Award
EPIRB	Emergency Position Indicating Radio Beacon
GPS	Global positioning system
HF	High frequency
HRO	High Reliability Organisation
HSE	Health and Safety Executive (UK)
MCIB	Marine Casualty Investigation Board (Ireland)
MICA	Mobile Intensive Care Ambulance (Victoria)
NLDN	National Lightning Detector Network
NOLS	National Outdoor Leadership School
NP	National park
NSW	New South Wales (Australia)
NZ	New Zealand
NZHSE	New Zealand health and safety in employment
OB	Outward bound
OE	Outdoor education
OH&S	Occupational health and safety
OPC	Sir Edmund Hillary Outdoor Pursuits Centre (NZ)
OSHA	Occupational Safety and Health Adminstration (USA)
OTS	Organization of Tropical Studies
PFD	Personal flotation device
PLB	Personal locator beacon
QLD	Queensland (Australia)
RIB	Rigid inflatable boat
RNLI	Royal National Lifeboat Institution (UK and Ireland)
SA	South Australia
SCUBA	Self-contained underwater breathing apparatus

SLSA	Surf Lifesaving Australia
SMS	Safety management system
TAFE	Technical and Further Education (Australia)
TAS	Tasmania (Australia)
TOPEC	Taranaki Outdoor Pursuits Centre (NZ)
TQM	Total quality management
UK	United Kingdom
USA, US	United State of America
VIC	Victoria (Australia)

List of Tables

Chapter 1
Introduction

For those visited by tragedy it is of little comfort that fatal incidents in outdoor education (OE) – understood here as educational activities involving adult-supervised young people in the outdoors – are very rare. For those in charge of such a program, that a death was unlikely could be scant protection from the material consequences of any preventable fatality. Many incidents turn out, on investigation, to have been preventable and to have had precedents. For a parent, the idea that a child might not return alive from a camp or excursion is almost unthinkable, particularly in circumstances where a child would not have died if only lessons from the past had been learned. Apart from the impact on bereaved relatives and friends, fatal incidents, particularly those involving multiple deaths, can and do have implications beyond any single organisation. In the aftermath of a tragedy, OE policy, purposes, and practices can be the subject of intense public scrutiny, the implications of which can reverberate for many years.

The purpose of this volume is to assist those who work in the OE field to understand and to apply lessons from past fatal incidents. Although some prevention lessons might apply narrowly to a particular program or location, other insights offer what Toft and Reynolds (1994) termed isomorphic lessons – which apply to similar organisations and circumstances, and iconic lessons – which apply more generally. This book compiles and examines both isomorphic and iconic learning in a broadly defined field of OE. It provides a more comprehensive account of past tragedies than has previously been available, and a detailed guide to learning from those incidents. It argues that both comprehensive and detailed case-based knowledge are essential to future prevention, and considers some implications for organisations and individuals involved in OE.

When an accidental death occurs it is common to assume that there must have been a freak accident, but few OE deaths prove to be caused by misfortune alone. Most involve failures to learn from the past. To study fatal incidents as part of OE training is vastly preferable to learning hard lessons in a coroner's court. To review an OE program looking for the kinds of vulnerabilities revealed by past incidents is

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vastly preferable to having inadequacies revealed by a calamity. To evaluate the likely effectiveness of organisational approaches to risk management, drawing on case-based expertise, is onerous but nothing compared to the aftermath of a preventable death. Fatality prevention requires a substantial commitment to learn from past cases, but the reward for effort is confidence that expertise in preventing OE fatal incidents is attainable and likely to be effective.

At the isomorphic end of the spectrum, knowing what has gone wrong in the past directs attention to circumstances where a fatal incident could occur. Knowing where to look greatly enhances the likely effectiveness of vigilance. Case-based fatality prevention is not premised on identifying every uncertainty or each possible mishap, only deadly circumstances, which become recognisably familiar as more cases are studied. Detailed studies of cases build expert intuition into exactly what to look for when planning programs, reconnoitring locations, or supervising young people in the field. Past incidents involving steep ground, or cold water, for example, direct attention to those environments, but wet, cold, or steep conditions usually do not result in death, and most of those who venture in or on water do not drown. Familiarity with the details of past cases builds expert intuition that recognises when, where, and how to intervene. Cases point to how to prevent deaths in the outdoors, and also provide insights into how individuals or organisations can fail. Moreover, at the iconic end of the spectrum, patterns of failure across incidents in different environments shape vicarious experience of human errors and organisational failures.

The investigation of a major incident in OE can reveal multiple failures. Beneath what can be complex layers of causation examined in sometimes book-length reports, there is often revealed a recognisable hazardous situation that could have been avoided or mitigated by a teacher, leader, guide or other responsible adult. Irrespective of the amount of organisational involvement, fatality prevention requires individuals with expertise to distinguish between circumstances where failures would be relatively inconsequential and those in which failure could be deadly. The analyses presented in this volume hinge on the roles of those responsible for OE programming and on those directly responsible for the care of young people in the outdoors, and are premised on the feasibility of developing effective expertise in fatality prevention.

Chapter 2 examines the use of cases to inform OE fatality prevention. Fatal incident cases often refer to named individuals with some responsibility for traumatic events. Some material I have used was derived from investigations aimed at allocating responsibility or blame. Fatality prevention is not served by a focus on particular individuals or on allocating blame, but does require effort to understand what motivated and informed actions revealed, in hindsight, to have contributed to one or more deaths. Although understanding and blame cannot always be kept separate, I argue that fatality prevention must, like Janus, strive to have two faces, one which looks to the past with understanding and compassion, the other which looks to the future with rigour and vigilance.

All accident reports are partial, in the sense that it would always be possible to include more detail. All accident reports are interpretations, in that they have been shaped by ideas and beliefs. All reported causes are attributions, in that they involve

judgements about evidence. All causal accounts are incomplete, because influences can be traced back in time indefinitely. Fatality prevention is a pragmatic search for those insights that most serve prevention, focussing on: the most proximate causes, the most mutable events or elements, and individuals according to their responsibilities. For the purposes of prevention "cause" is determined counterfactually, which is to say a cause is an element "but for" which a death or deaths would not have occurred.

In some cases a coronial or other inquiry has made recommendations for future prevention, but those examining past cases must be open to the possibility that conclusions drawn at the time might help prevention less than contemporary re-analysis would. Although past cases must be understood in context, prevention must be envisaged in contemporary circumstances in which improved knowledge and the affordances of technology could have transformed what measures would be feasible.

Chapter 2 concludes with some epistemological considerations. Certain insights from past tragedies could be expressed in the form of guidelines or rules, but fatality prevention can also require situated action involving expert judgement, informed by vicarious experience gained by close study of actual cases. Those who work in the field have to assess to what extent knowledge distilled from cases can adequately substitute for actual knowledge of cases.

Chapter 3 examines how fatality prevention is shaped by implicit standards of care. It argues that a standard of strict aversion to any preventable death is one necessary element of fatality prevention. Other elements include knowledge of past fatal incidents and knowledge of the particular environment in which a program is located. OE fatal incidents are circumstantial, and while some prevention measures could be enacted in advance based on research and reconnaissance, once a group is in the field events can reach a point where only accompanying adults could know what was going on and be able to enact safety measures.

Adoption of a standard of strict aversion is logically consistent with taking all reasonable steps to prevent death, but it is also an implicit standard in community response to a tragedy. Based on recent cases, even if a formal enquiry does not focus on prevention, bereaved parents, and those directly involved in an incident, understandably focus on what could have been done to prevent a death. Although many who are entrusted with the care of young people in the outdoors would maintain that prevention of death was a priority, fatalities have occurred in circumstances where other priorities took precedence. To avoid a tragedy would have required aversion to preventable death as the overriding priority, which in some cases would necessitate cancelling a planned program or activity.

Deaths have occurred in programs that were ostensibly successful and well run. Chapter 3 considers in detail four incidents that illustrate, counterfactually, what taking all reasonable steps to prevent a death must entail.

Following a preventable death, standards that weigh risks against benefits, or that weigh the cost and effort of prevention against an assumed low probability of death, are rarely supported. I consider why legal responses, community responses, and the

views of bereaved parents, are likely to lead to an increased likelihood of strict aversion to fatal incidents being adopted as an OE standard.

Chapter 3 concludes by examining whether adoption of external published standards could provide an alternative to case-based prevention knowledge. I argue that published safety standards, however authoritative they might seem, must be measured against case-based prevention. Evidence that standards have been based on actual knowledge of past cases can be appraised, and preventative measures can be compared with what case-based prevention would require. External standards might be internally consistent, impressively presented, and widely accepted, but nevertheless inconsistent with lessons from past tragedies.

Chapters 4, 5, and 6 summarise and review fatal incident cases from a prevention perspective. Chapters 4 and 5 survey multiple fatality OE incidents globally, since 1900. Chapter 4 examines water-related incidents, Chapter 5 examines those not water-related. Chapter 6 considers incidents having one or two victims.

OE-related immersion deaths have some distinctive elements, but immersion deaths, particularly from drowning, are a major cause of preventable deaths in wider communities and there is a considerable literature on drowning prevention. Immersion death prevention can by guided by some epidemiological elements, but to be fully effective must be attuned to particular circumstances and the supervision of individuals. The literature on cold-water immersion is relevant to some OE-related catastrophes. There are indications that some past incidents must be reinterpreted to better take account of cold water.

I introduce immersion cases with a detailed discussion of the 1993 Lyme Bay tragedy, which resulted in both the first conviction of an individual for corporate manslaughter under British law, and also led to the introduction of licensing for some OE providers. I group the water-based catastrophes broadly according to the nature of the environment: Open water, ocean shores, floods, and currents. Water based incidents have tended to be catastrophic when a whole group has been caught in hazardous conditions, or when one individual has been in difficulty and others, including adult supervisors, have attempted rescue.

Chapter 5 examines catastrophic OE incidents that did not involve water. As in Chap. 4 I group incidents according to environmental circumstances. I include a discussion of catastrophic incidents involving transport to or from a program, not all of which could have been prevented by those responsible for a program. It might be that an OE program required unusually hazardous transport arrangements, but in some cases deaths were attributable to OE only insofar as the victims happened to be en route to an OE venue. Understanding, and minimising, transport risk is arguably part of OE safety but not wholly within its orbit.

I have grouped structural collapses, building fires, and intentional deaths (mass homicide) together as preventable catastrophes that also, in many cases, might not be preventable by those responsible for an OE program.

The remaining incidents are grouped according to knowable environmental hazards directly related to OE programming. I consider avalanche tragedies and deaths in blizzards or storms in the context of on-going improvements in weather forecasting and environmental monitoring, and in the light of the affordances of mobile information technologies.

Chapter 6 examines fatal incidents involving less then three deaths. Such incidents are not only more common than multiple fatality incidents, but also occur in a wider range of circumstances. I draw on a study of all known OE related deaths in Australia or involving Australian OE groups, with additional consideration of some incidents in the UK. Because OE practices vary around the world, as do physical environments, case-based fatality prevention elsewhere in the world must be supplemented by studies of local cases.

Falls from height have been a recurring cause of death in Australian and UK OE, almost always claiming a victim who was a young male, not closely supervised, and unroped. Deaths on ski slopes have also exhibited a clear pattern, with most deaths occurring as a result of colliding with a fixed object. Falling trees or branches deaths cannot be completely eliminated, but prevention requires situation awareness that could be quite distinct from the expertise required to run a particular activity. Falling trees and branches could occur during any activity in the vicinity of trees. Deaths from falling rocks have tended to occur during activities involving one participant moving on steep ground above another participant. A key question for prevention is whether any essential educational purpose is ever served by allowing one participant to be in a location where they could be struck by material dislodged by another.

Chapter 6 treats immersion deaths in dams and lakes separately from deaths involving a current or waves. Immersion deaths are circumstantial and case analysis shows prevention usually requires knowledgeable supervision. Australian cases illustrate the different demands of particular situations. Immersion deaths comprise a relatively large proportion of OE fatality cases in both Australia and the UK, but I did not consider UK immersion deaths comprehensively. I discuss a small number of salutary incidents in which circumstances differed from any of the Australian cases.

Other than deaths associated with water or gravity, deaths have occurred in which extreme heat or cold was a factor, and from lightning strikes. As in the previous two chapters, I argue that future prevention must consider the affordances of technology not available at the time of a tragedy. Chapter 6 concludes with discussion of OE deaths attributable to causes extant in the wider community, including animal bites or stings, homicide, building fires, and natural causes.

Chapter 7 further considers OE fatality prevention in organisational contexts. Many OE programs are conducted by or within organisations, and responsibility for a fatal incident has in some cases been traced back to organisational decision-making. I outline how fatality prevention failures can occur in what might otherwise be considered successful and generally safe organisations. Organisations themselves operate in wider cultural and social contexts, to which cause could be attributed in some cases. Case-based knowledge might not provide complete guidance on how to achieve fatality prevention in organisational situations, but will provide clear guidance on what fatality prevention must achieve on the ground. However large an organisation, for a parent the question is always: “How is my child being kept safe?” There has been no OE equivalent to an industrial disaster – even catastrophic incidents have comprised multiple instances of personal injury linked to the immediate situation of each victim.

Chapter 7 considers research on industrial safety and its relevance to OE fatality prevention, and discusses whether safety orthodoxies from industrial settings can defensibly be applied to OE situations. I review attempts to apply structuralist systems theories to OE fatality prevention.

Chapter 7 concludes with an examination of the relationship of OE fatality prevention to organisational risk management. The scholarly literature on organisational risk management is somewhat at odds with common assumptions about risk management, which has implications for those responsible for OE fatality prevention. Organisational risk management is not an alternative to case-based fatality prevention in OE, and any successful application to aspects of OE fatality prevention will still require case-based expertise. Evaluation of organisational risk management must be open to the possibility that it could be some mix of helpful, unhelpful, or harmful to OE fatality prevention.

Chapter 8 draws on preceding chapters to argue that OE fatality prevention requires particular expertise, which includes case-based knowledge of fatal incidents, prevention-focussed research and reconnaissance of program locations, and prevention-focussed planning and supervision. Prevention requires individuals who know what they are looking for, who monitor, and who act with fatality prevention as an overriding priority.

Fatality prevention warrants a specific focus in OE training and qualification, in staff appointment criteria, in staff development and training, in safety planning, in location research and reconnaissance, in program decision-making and in active supervision of individual children and youths. A specific focus on fatality prevention is necessary not only to identify prevention measures that might otherwise have been unrecognised. It also reduces the possibility that fatality prevention could slip as other priorities occupying decision-makers. Self evidently, prevention measures are only effective if known, and if consistently enacted.

OE fatal incidents involve new actors and old scripts, although every fatal incident case contributes nuance and context to prevention knowledge. Developing and circulating case-based knowledge is a continuing imperative for fatality prevention. Knowledge sharing can be systematically impeded by risk management practices that prioritize reputations and markets over sharing prevention lessons from tragedies. Researchers in the OE field might have to work with bereaved relatives to recover narratives of incidents that were never properly shared or not thoroughly investigated.

This book is my contribution to what must be continuing efforts to maintain and distribute fatality prevention knowledge in OE. Every lesson or insight in the following pages has come at an awful price for those affected by each incident. I hope this effort to ensure those lessons are heeded provides some small solace to those who have had to live with tragedy.

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Chapter 2
Lessons Learned and Two Faces of Accident Case Study

2.1 Looking Backwards with Compassion, Forwards with Vigilance. Interpreting Accounts of Past Tragedies

To study fatality cases, even those from decades ago, is to revisit events that continue to profoundly affect not only the bereaved but also those involved in an incident and its aftermath. Case based fatality prevention re-visits traumatic events, and in so doing could cause further distress. For the bereaved, and for those involved in a fatal incident, a tragedy can be something that they learn to live with but which is always present. It is not the aim of this volume to re-try old cases, to re-open wounds, or to point the finger at individuals. No doubt unanswered questions will remain, but unless the answers contribute to future prevention they could remain unanswered. Prevention is less served by judging what a *particular* individual could or should have done in the past. Prevention is more served by asking what *any* individual could do in a similar situation, and how best that person could be equipped – in the broadest sense – to act.

It would be naïve and impractical to deny that blame has a role in understanding accidents and the consequences of accidents. Blame is uncomfortable, but it cannot be wished away. Individuals can and do blame themselves for errors or omissions that resulted in death, sometimes with good reason (Davis, Lehman, Silver, Wortman, & Ellard, 1996). Past incidents have resulted in criminal proceedings, which can and do allocate blame. Civil actions allocate responsibility in a process that could feel like blaming to defendants, even if a claim is settled out of court on a commercial basis.

Refusal to countenance blame could be harmful. In the medical field, Levitt (2014) criticised use of a "systems approach" to medical errors that eschewed blame completely. He attributed a failure to successfully reduce medical error rates to "exclusion of blame [which] is a blindfold against this common source of harmful error" (p. 1051). For those considering past incidents, denial of blame, in some

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circumstances, could be less helpful than acknowledgment, forgiveness, acceptance, and understanding. Every individual, at some point, suffers mishaps – perhaps minor – which could be fairly described as their own fault. The idea that an adult could protect a child in some circumstances requires, inseparably, the possibility that an adult in such circumstances might fail to protect a child. In the outdoor education (OE) field responsibility for the care of young people in the outdoors has to be coupled with potential responsibility for care failures – the one is meaningless without the other.

Although blame might be unavoidable, understanding with a view to prevention could be impeded by a focus on blaming (Wachter, 2004). In cases where human error can explain a death – in the sense that but for an error no death would have occurred – it is very often true that in slightly different circumstances the same error would have had no adverse consequence. Humans make mistakes all the time, but usually no one dies as a result. Although some of the case materials available are the products of enquiries specifically aimed at establishing blame (for example prosecutions), fatality prevention might require a different focus and a careful re-reading of case material. Fatality prevention is almost certainly best served by an attitude driven to understand how, in the same circumstances, anyone might have been involved a similar fatality. The possible hubris of "that would never happen to me" is closely related to the regret of "I thought that would never happen to me". Those tempted to conclude: "That would never happen to me" should re-examine a case in question until they can see how such an incident could occur. From the outset of my research into fatality prevention I have maintained that: "Fatality analysis must, like Janus, the Roman god of the past and future, have two faces, one looking back with fair-mindedness, one looking ahead with vigilance." (Brookes, 2003, p. 22)

To understand future prevention, past cases, while understood in context, must also be envisaged in the near future. The question is how could such an incident be prevented now or in the future. Case-based learning considers how to prevent similar incidents, given the lessons of hindsight, and taking into account the affordances of technology. In particular, the possibilities for determining location using GPS devices, communicating using mobile or satellite phones, obtaining assistance using personal locator beacons (PLBs) or other devices, improved environmental forecasting and monitoring, and access to data in the field using mobile devices necessitate that old cases – including those only a few years old – be re-imagined and re-evaluated. The 1986 Mt. Hood tragedy, for example, involved exhausted searchers hunting for a buried snow cave days after a group from the Oregon Episcopal School failed to return from an ascent of Mt. Hood. Two party members who had left the cave to seek help were unsure of its location. It was eventually found by probing. Only two of eight in the cave survived (Holaday, 1999). Had the group carried an altimeter – a device that was available at the time – the search could have been concluded sooner, but the subsequent widespread availability of GPS devices must be taken into account when considering future prevention. Rescue in severe conditions remains difficult, but a cell phone call providing a GPS location would have been transformative once the group required rescue. A climber requiring rescue

on Mt. Hood in 2012 used Facebook to tell friends and family to stop calling him so he could preserve his battery for communication with rescuers (Speik, 2012).

Potential sensitivities involved in revisiting past tragedies are amplified if individuals are named. When I first set out to study fatal incidents, I sought only material already in the public domain, and avoided using names:

> I have not included names of victims, nor of any individuals involved with any of these incidents. However, anyone developing case studies to inform their own practice, or for teaching purposes, will soon encounter names and personal details. It is incumbent on all who use these incidents as 'cases' to recognise the trauma that each incident has already occasioned, and to be mindful of the potential distress that uncovering the details of incidents may trigger. (Brookes, 2003, p. 22)

I have largely kept to that approach in this volume, but some incidents have been so widely reported and so closely identified with the name of the victim that I have used a name. To use a different name would potentially hinder those seeking documents about the case. Some documents I refer to, particularly inquest reports, contain the name of a victim in the title of a document I have referenced. An option would have been to refer to "the victim", which I have done in some cases, but I have, to some extent, taken my lead from the published material available. It is not necessarily a kindness to refer to a loved individual as "the victim". In many cases bereaved parents have actively sought to have their son or daughter remembered. Organisations involved in a death might prefer that an incident be forgotten; in my view preventing future incidents takes precedence over any sensitivities those responsible for an organisation might have about past failures.

In truth any research into cases that collects primary material or news reports will reveal the names of those involved, and of any organisation. I am inclined to the view that real names of actual individuals are part and parcel of the potential power of case studies to motivate future prevention and provide insights into past tragedies.

2.2 All Accident Reports Are Partial, and All Causal Accounts Are Attributions, But OE Prevention Is a Pragmatic Search for the Most Useful Insights Available

Ideally every fatal incident would be attended, within the hour, by a specialist team to record key locations, note environmental features and environmental conditions, collect witness statements from fresh recollections, examine equipment, collect and review current documents, and capture website data, weather forecasts and other digital ephemerae before it vanishes or is altered. That rarely happens, and to my knowledge has never happened in the case of an accidental OE fatality. Those called in to assist and those involved tend to be caught up in coping and responding.

Management can move swiftly to frame – or attempt to frame – how an incident is perceived; I did not systematically examine immediate responses to tragedies, but anyone collecting case material will encounter instances of exemplary care and concern for survivors and others affected, and instances, less uplifting, of spokespersons moving to shape emerging narratives and protect an organisation. OE fatality analysis has to consider the quality of available evidence, and to evaluate inevitable gaps and distortions.

Even with an ideal investigation, no account of an incident, and the circumstances, can be complete or undistorted. Locations could be recorded, but how individuals moved about over time cannot be known precisely, and environmental conditions can only be represented by approximations. There is always room for more detail. Even relatively detailed witness accounts cannot describe everything, and every witness account is constrained by what a witness noticed, by how they have framed their narrative, and is subject to the limitations of human recollection. It is useful to distinguish between fact and interpretation, but the distinction is never absolute. A witness endeavouring to be objective is still going to make subjective choices about relevance and emphasis. Elements of any incident could go unobserved or unrecorded. Exactly how events unfolded in time can be difficult to determine, particularly when different actors were in different locations, unobserved. In the case of the 2009 Mangatepopo tragedy in New Zealand, only the presence of an observer on a power station structure at the time the deaths occurred enabled a review team to connect sequences of events described by those in the gorge, those who had left the gorge, and those arriving in response to a radio call for assistance (Brookes, Corkill, & Smith, 2009). When the independent review was conducted, the witness had returned to Europe without leaving a statement. The witness was never interviewed by investigating police, who were almost certainly unaware of his existence.

In OE case material very few witness accounts were recorded at the time of an event – most are reconstructions. Apart from missing details, memories can be distorted by confidently recalled, but false, details that fill gaps and add coherence (Gerrie, Belcher, & Garry, 2006). Memory can fail due to transience, absent-mindedness, blocking, misattribution, suggestibility and bias (Schacter, 2001). Few accounts are unreflective, and hindsight bias is a perennial consideration in accident research, not only because hindsight is a powerful prevention tool – case analysis is an exercise in hindsight – but also because it can be tempting to imagine that one would have foreseen an incident no one foresaw at the time (Lundberg & Svenson, 2000). Hindsight serves prevention but can be cruel to those involved in a past incident. Observations made at the time, and later reconstructions, can be affected by confirmation bias, which (Reason, 2001) contends is the most universal systematic bias in analysing accidents: “We ‘pattern match’ a possible cause to the available signs and symptoms and then seek out only that evidence that supports this particular hunch, ignoring or rationalising away contradictory facts” (p. 13).

In one sense all OE accident reports are incomplete, because no report could unequivocally be “complete”. If a task of prevention were to model OE programs in

order to predict fatal incidents, missing and ambiguous information would be a serious impediment. Fortunately the task of prevention is less demanding. The threshold for acceptance is whether a case provides useful insights into future prevention. Prevention could be served by identifying just one of several causes, because removing only one cause can be sufficient to prevent a death. Prevention does not require fore-knowledge of exactly when and where a tragedy will occur – it is sufficient to know under what conditions fatal incidents could occur, in order to deploy precautions just in case.

Prevention, by definition, requires a pragmatic reading of case studies. Inevitably any reading will draw on the existing experience and knowledge of the reader. It follows that the knowledge and experience of the individual studying a case is integral to what insights are drawn, as can be the case in accident investigation:

> [A] morphological approach to analytical incident investigation is based on the structure of the system being studied. The morphological approach focuses directly on potentially hazardous elements (for example operation, situations). The aim is to concentrate on the factors having the most significant influence on safety. When performing a morphological analysis, the analyst is primarily applying his or her past experience of incident investigation. Rather than looking at all possible deviations with and without a potential safety impact, the investigation focuses on known hazard sources. Typically, the morphological approach is an adaptation of deductive or inductive approaches, but with its own guidelines (Sklet, 2002, p. 22)

Because case material is necessarily partial, and because causal accounts are constructions, rather than rely only on what past analysis has concluded, case-based fatality prevention could revisit past cases and derive new or different insights from those derived previously. The affordances of technologies not previously available are one reason. Additional information about locations, environmental conditions, adolescent decision-making, or insights drawn from other cases could transform or refine how an incident is interpreted. An experienced operator, with knowledge of a particular environment, might make something of a past incident that a novice would not. The task of interpreting cases is, in part, to seek reasonably complete and accurate information, but prevention-focussed interpretation, in the end, is a pragmatic search for whatever insights could be most useful to those best positioned to act. It is not a quest for the one true and complete account of any incident (cf. Salmon, Williamson, Lenné, Mitsopoulos-Rubens, & Rudin-Brown, 2010).

Studying cases for prevention does not face the epistemological hurdles that an attempt to fully explain or model any particular tragedy requires, nor must it meet a threshold of proof beyond which blame could be confidently, and fairly, distributed. Tragedies can invariably be attributed to multiple causes, but identifying even one cause, but for which a death would have been avoided, is a potentially useful contribution to future prevention. Although fatality prevention builds primarily on counter-factual analysis – "what would have prevented a death" – many OE fatal incident narratives include survivors' accounts. Factual consideration of the reasons why some individuals in more or less the same circumstances survived when others did not can also assist fatality prevention.

2.3 The Contribution of Coronial and Other Court Findings to OE Fatality Prevention

It is not the purpose of this volume to provide guidance on the different legal contexts and jurisdictions in which OE operates, nor to review or expand on the possible legal consequences of any failure to prevent a death. However, court documents can provide useful material for fatality case studies, provided such material is interpreted mindful of differences between seeking to resolve legal questions and seeking to understand future prevention.

Fatality prevention and coronial processes can follow similar paths, depending on how focussed a coroner, or a coronial system, is on future prevention. Writing in an Australian context, Freckelton (2007) reviewed critiques of coronial decision-making and practices, and identified a number of potential issues:

- the unclear modern status of the coroner;
- inconsistency in decision-making by coroners;
- inflexibility in coroners' procedures;
- poor utilisation of data and expertise by coroners;
- the limited capacity of coroners to deal with complex cases;
- the questionable effectiveness of coroners in relation to hospital deaths and indigenous deaths;
- the substantial overlap of coroners with other investigators in relation to workplace deaths, e.g. occupational health and safety investigators;
- the lack of rigour in some coroners' decisions;
- the uninformedness of some coroners' recommendations;
- inconsistency among coroners' recommendations;
- the weakness in coroners' recommendations involving government;
- the limited implementation of coroners' recommendations;
- the limited accountability of coroners;
- the minimal training of coroners;
- the limited legal guidance available for coroners;
- inadequate resourcing of coroners' offices; (pp. 243–244)

This somewhat confronting list merely implies that those considering cases should be open to critiquing aspects of coronial findings or recommendations. I have not considered any studies of coronial roles outside Australia, but my observation is that coroner's findings that are debateable, or unhelpful, are not confined to Australia. Freckelton (2007) observed that, unlike the situation in some Australian jurisdictions at that time, in New Zealand coroners were required to report on future prevention. Even so, in the case of the 2012 Paritutu Rock tragedy, described by a sentencing judge as "eerily similar" to the 2008 Mangatepopo tragedy ("Ministry of Business, Innovation and Employment v Taranaki Outdoor Pursuits and Educational Centre Trust. Summary of Facts.," 2013) a New Zealand coroner elected not to hold an inquest. Consequently there is no publically available report explaining how an "eerily similar" catastrophe occurred while the lessons of the earlier tragedy were so fresh.

Those seeking to understand OE fatality prevention will no doubt conclude that many, indeed most, coroner's reports are helpful and insightful, but there will be instances where fatality prevention could be better served by the evidence a report documents, reviewed afresh, than by simple reliance on coronial recommendations.

2.4 The Role of Counterfactual Reasoning in OE Fatality Prevention

Attribution of accident causes is not absolute. Strictly speaking any accident can be traced back indefinitely in time, examined in infinite detail, and placed in ever widening social and cultural contexts. Taking "cause" to mean "sufficient cause", which is to say everything that contributed to an accident, would render accident investigation impractical, "because to identify the sufficient cause of an accident, that is, the entire set of factors that went into the producing the accident, is impossible, practically speaking." (Hopkins, 2014, p. 5) Moreover, as analysis moves from proximate causes to more remote organisational causes, attribution "becomes a matter of expert judgment, and the causal connections become probabilistic statements rather than logical deductions" (Hopkins, 2014, p. 6). Fatal incidents could be caused by organisational climate, by budget stringencies, by organisational priorities or by educational goals, but attributing such causes is likely to be contestable and difficult to prove.

In the aftermath of an OE death causal attributions could differ, not only between individuals, but also depending on the social and legal context in which they are made. Those involved in a tragedy might hold themselves responsible, while court processes – coronial, civil, or criminal – might not. A bereaved parent might blame an organisation, while those responsible for the organisation might argue, and believe, that cause lay elsewhere. In such deliberations cause is seldom defined as sufficient cause,[1] but as necessary cause.[2] Necessary causes tend to be defined counterfactually, as "antecedent [conduct] but for which the result in question would not have occurred" (Spellman & Kincannon, 2001, p. 242). Thus in a motor vehicle fatality, failure to wear a seat built could be considered a cause of death, in the counterfactual sense, but in everyday life most individuals would understand that failure to wear a seat belt in a motor vehicle would not, on its own, normally result in death.

Spellman and Kincannon (2001) reported that in real life, leaving aside difficult cases in which an incident can be attributed simultaneously to more than one causal chain, individuals tend to reason counterfactually in much the same way the (USA) courts expect them to. That said, they also note that counterfactual reasoning can be

[1] Sufficient cause refers to all of the things that had to go wrong for the death to occur. The set of sufficient causes is potentially infinite.

[2] Any factor that had to be present for the death to occur. By definition eliminating any necessary cause would prevent a fatality.

influenced by the way alternatives are framed (Spellman & Kincannon, 2001). In particular, counterfactual reasoning depends on what the person doing the reasoning regards as mutable. They suggest that, subject to exceptions:

1. Exceptional or unusual events are more likely to be treated as mutable than normal events,
2. Events on which a narrative focuses are more likely to be treated as mutable than those positioned on the margins,
3. Controllable events will be mutated more than uncontrolled events
4. Immoral events will be mutated more than moral events

Legal definitions use the term "proximate cause", which constrains the theoretically infinite number of possible "but for" causes to "those for which it makes sense to hold people liable" (Spellman & Kincannon, 2001, p. 242). In the case of OE, it is not surprising that public discussion and legal processes can focus particularly on those responsible for the care of a deceased victim at the time of their death, which is to say those responsible for an OE program and OE staff deployed in the field.

Because counterfactual logic produces necessary, but not sufficient causal explanations, and because there is always more than one mutable element but for which a death or deaths would not have occurred, no accident investigation is a foregone conclusion and no enquiry conclusion is indisputable. However, for those weighing their own actions, for those mulling over a tragedy that has affected them, and for those conducting formal investigations, "what could those responsible for the OE program have done to prevent this?" will almost certainly be a dominant question.

One important implication of the difference between "but for" causes and direct causes, is that failures "but for which a death would not have occurred" might be present on countless other occasions without a death ensuing. The counterpart of the "if only" approach which generally dominates reflection and analysis of a preventable OE death is a "what if" approach to planning and practice. One purpose of studying cases is to flesh out the details of "what if" analysis.

An important implication of the use of "cause" in the "but for" sense is that in every case there will be mutable causes attributable to different human agents, and some attributable to chance or nature. For example, in the case of the 2008 Mangatepopo tragedy a weather event, a faulty weather forecast and decisions made by both management and field staff were causal. In such a case, which is to say in most cases, there will be room for argument, post-incident, that takes into account the responsibilities and circumstances of individuals. Causal attribution is a social construction, often entwined with processes to determine legal and financial consequences. Those who study cases with a view to understanding OE fatality prevention should be mindful that for individuals or organisations with a specific role in OE planning, support, and operation, "but for" analysis will lead to one overriding question: what could *you* have done to prevent a tragedy, given your responsibilities?

2.5 The Nature of Case-Based OE Fatality Prevention Knowledge

"What could you have done to prevent a tragedy?" does not imply that all fatalities can be prevented by simple behavioural formulae (see Hopkins, 2006), merely that prevention has to be enacted, which in turn requires agents. Prevention must be understood in the light of situated action, and is constrained or enabled by power and opportunity. In the case of some fatal incidents it is dependent on the knowledge, skills, and attitude of those on the ground or in management roles. Preventative action could range from an individual building a body of knowledge and experience over some years, or developing case-based fatality prevention training across a program, through to simple actions such as placing a helmet on a student.

At the heart of a case-based approach is the observation that some prevention actions are situational and require a knowledgeable individual to make decisions according to particular circumstances. Attention to prevention that requires expert intuition is not exclusionary. Some prevention could defensibly rely on individuals with no knowledge of actual cases being able to draw on someone else's distilled knowledge in the form of algorithms, rules, procedures or abstract principles.

Where purported safety measures already exist without any overt connection to past cases, case-based knowledge can inform a review of proposed or established safety measures. The outcome of a review could be, of course, to confirm the soundness of existing practice. No doubt a great deal of existing fatality-free OE practice already incorporates distilled wisdom from past tragedies, even if a connection to fatal incidents is not explicit. On the other hand, a fatality free record is not sufficient evidence of good prevention measures. A fatality-free record is too often revealed by a tragedy to have been due to good fortune rather than good management. "This has never happened before", often offered in defence of a program, ironically can amount to a tacit admission that an organisation had not taken fatality prevention sufficiently seriously until forced to do so by tragedy. Even a modest familiarity with fatal incidents would be sufficient to know that almost all OE fatal incidents are the first such incident for a particular organisation or program.

A meta-question, for those considering cases, is to what preventative measures, in the circumstances, would have required experience and knowledge, and what measures could have been achieved by providing specific training in set procedures. To the extent that OE safety is epistemologically similar to control in and out of a classroom exercised by teachers, combined professional knowledge and experience could be a default starting point. To the extent that OE safety is epistemologically similar to parenting, informal experience could be a starting point. To the extent that OE safety is epistemologically similar to endeavours such as sea kayaking or mountaineering, some mixture of specific training and expert experience could be the initial reference point. But to the extent that OE contains elements of production in controlled and consistent environments – some work with ropes or other equipment

might qualify – standard operating procedures could be a default starting point. There have been deaths that would have been prevented by clearly defined procedures, but there have also been deaths preventable by less reliance on defined procedures in circumstances that called for expert judgement.

Elements of received wisdom in OE safety, particularly in organisations, might have been more shaped by management considerations, or by epistemological assumptions derived from industrial production, than by hard-earned lessons from previous deaths. OE fatality prevention could be undermined by approaches devised to solve problems unrelated to OE fatality prevention or developed for unrelated circumstances. For example while some leader-decision making research in NZ has tended to be framed as expert intuition (Boyes & O'Hare, 2003, 2011), other approaches to organisational OE in NZ have been influenced by industrial production (Davidson, 1992; Hollingsworth, 2011), including a bias towards standard operating procedures, arguably contributing to the 2008 Mangatepopo (Brookes, 2011) and, possibly, the 2012 Paritutu Rock catastrophes.

Debates about the extent to which OE requires adult supervisors conceived broadly as professionals, artisans, or production workers, add complexity to OE fatality prevention. The key implication for a safety regime is whether the mix of procedural measures and reliance on professional judgement is consistent with counterfactual analysis of fatal incident cases, alert to distorting influences such as cost-saving or convention.

Concerns about distorting influences inform debates about safety in other fields (for example Ricci, Panos, Lincoln, Salerno, & Warshauer, 2012). Employing expert professionals is potentially more costly and difficult than training and directing process workers, which results in a perennial tension between safety and cost. Tucker (2012), for example, argued persuasively that understanding organisational risk creation begins with production pressure. He supported a long-established view that "… the central regulatory problem was how to counteract the pressure to prioritize production over safety" (p. 3).

Use of procedural measures such as check-lists are not necessarily "mere" tick-box exercises, as work in fields such as surgery has shown, where carefully conceived and thoroughly tested, parsimonious checklists have been demonstrably effective in reducing errors (Gawande, 2009). Procedural or algorithmic approaches to problem solving or decision-making are not necessarily simplistic, for example in the case of artificial intelligence (AI), although in practice complex algorithms derived from OE fatality cases might be less useful than having leaders study cases themselves. For some elements of OE fatality prevention the limits of algorithmic approaches, or reliance on standard operating procedures, could be pragmatic rather than ontological. For example, once immediate first-aid has been provided, there could be good reason for a leader to consult a manual, but more generally an approach that required a leader to frequently consult a manual, or a supervisor, for guidance or direction, might be unworkable in the field.

If procedural solutions have their limits, reliance on expertise presents different problems. One problem with reliance on expertise was raised by Kruger and Dunning (1999) in a much cited paper informatively titled "Unskilled and Unaware

of It: How Difficulties in Recognizing Incompetence Lead to Inflated Self-Assessment". They argued that, in some circumstances, incompetent individuals suffer "a dual burden: Not only do they reach erroneous conclusions and make unfortunate choices, but their incompetence robs them of the ability to realize it" (Kruger & Dunning, 1999, p. 1121). Not all OE safety relies on self-assessment of competence, and it is not always true that incompetence cannot recognise itself. For example, I know that I cannot speak Russian, and I know that I should not sing in public. Nevertheless the question of determining how to assess or evaluate claims to expertise is relevant to OE fatality prevention.

Whether or not an individual has studied fatal incident cases is one obvious indication of individual competence in fatality prevention. Most fatal incidents involve failures to adopt prevention measures shown to be necessary by previous fatal incidents. For those who have not studied fatal incidents, OE environments potentially constitute what Hogarth (Hogarth, 2001 cited in Kahneman & Klein, 2009) termed "wicked environments" in which wrong intuitions could develop. Many fatal incidents involve prevention failures which previous experience would seem to indicate were inconsequential.

Studies of expert intuition and inexpert intuition show that both operate in the much the same way. Researchers contributing to the naturalistic decision making (NDM) literature have tended to focus on the former, those researching heuristics and biases (HB) have tended to focus on the latter. In a joint paper, Kahneman and Klein (2009) provide some insights that could guide those grappling with the extent to which OE fatality cases could inform expert judgement. They point out that "[s]ubjective experience is not a reliable indicator of judgement accuracy" (p. 515) and that reliable expert judgement requires both a predictable environment and "an opportunity to learn the regularities of that environment" (p. 515). A central argument of this volume is that many of the regularities, or patterns, which occur in OE fatal incidents are unlikely to be learned from personal experience – the patterns are to be found in cases.

NDM research has tended to focus on fields in which there is good evidence that professional expertise can develop, including fire-ground commanders, chess players, system design, and military command and control. If knowledge is considered, borrowing from Rouse (1987, p. 62) as a "performative grasp on the world" OE contains strong elements from outdoor fields such as canoeing, mountaineering, rock-climbing, skiing, and camping in which it is relatively easy to find some agreement on what constitutes an observable expert performance, at least in normal operations. Those elements of OE that involve human behaviour, containing elements of parental supervision, outdoor leadership, and perhaps classroom control, also involve the possibility of expertise, but what constitutes expertise is probably more contestable. HB researchers have tended to concentrate on fields in which purported expertise was empirically contestable, including forecasts by clinical psychologists and economists.

Kahneman and Klein (2009) cite earlier work by Shanteau (1992) that identified demonstrable expertise in livestock judges, astronomers, test pilots and photo interpreters, among others, and poor "expert" performance is fields such as stockbrok-

ing, college admissions officers, personnel selectors, court judges and intelligence analysts. The list was not strictly binary, and some professions, such as auditors, nurses, and physicians appeared on both lists. Importantly for OE fatality prevention, experts can be better at dealing with routine situations than with unfamiliar situations. In many OE fatal incidents poor fatality prevention has been tragically revealed in a program that would be been judged exemplary, based on routine performance. Reading many cases, it is easy to surmise that those involved in the program would have averred, if asked, that the program was going very well, right up until the point that tragedy struck.

A premise of case-based approaches to OE fatality prevention is that fatal incidents are outlier events, and those involved in OE practice would rarely accumulate experiential knowledge of fatal incidents. Vicarious knowledge of past cases is not equivalent to personal experience, but is nevertheless a plausible foundation for OE fatality prevention (North & Brookes, 2017):

> We consider that outdoor education teacher preparation which does not include specific study of relevant fatal incidents – bearing in mind that fatal incidents overall are few in number and uncommon – will fail to prevent the recurrence of similar incidents in the future. (p. 193)

According to Simon (1992 cited in Kahneman & Klein, 2009, p. 6) "The situation has provided a cue: This cue has given the expert access to information stored in memory, and the information provides the answer. Intuition is nothing more and nothing less than recognition". Provided fatality prevention is conceived as recognising and acting on unlikely but possible eventualities, more than on predicting adverse events, I argue – although those studying cases can decide for themselves – that OE fatal incidents exhibit patterns, some of which can be articulated, while others form tacitly recognised gestalts.

Most professions, according to Kahneman and Klein (2009) involve a mixture of expert and faulty intuitions, depending on whether the environment provides sufficient clues and feedback for intuitions to improve over time. The risk is that professional confidence borne of a domain that provides good feedback – for example paddling, or group management – produces overconfidence in making predictions about matters for which feedback is delayed, sparse, and ambiguous. In education generally, including OE, classroom control and pedagogy both provide immediate and useful feedback, but making predictions about how life will turn out for any particular student in the future is a different matter. In OE safety, managing day-to-day mishaps – and successes – might be distinguished from preventing fatal incidents, which are not only sparse, but which also can involve failures that had remained unrecognised until after a tragedy.

Kahneman and Klein (2009) point out that even for decisions in predictable environments, "ceiling effects are encountered and occasional lapses of attention can cause humans to fail" (p. 10). Such failures are different from failures due to unwarranted confidence in decisions made on the basis of untrustworthy intuitions, for which: "Subjective confidence is often determined by the internal consistency of the information on which a judgment is based, rather than by the quality of that infor-

mation" (p. 8). Procedural approaches to fatality prevention, in particular, could exhibit confidence-inducing internal consistency without necessarily being consistent with case-based fatality prevention measures.

2.6 Learning from OE Fatal Incident Cases

Many OE cases are in narrative form and could be read as cautionary tales. Insights from some incidents require an attempt to determine how material was produced, or require critical reading, mindful of potential limitations, distortions, or disputable material. Cases do not necessarily boil down to maxims or advice. Providing case-derived guidance or direction to those directly responsible for the care of young people in the outdoors might not be sufficient to prevent fatalities. Although prevention could be partially achieved by studying insights distilled from cases by another party, the development of expert intuitions almost certainly requires actual study of cases.

Leaving aside the always-partial nature of case material, insights from fatality cases are inevitably subject to the strengths and limitations of the interpreter. Those reading cases bring their own understandings of contexts. Contradictory readings might result from different ontological and epistemological assumptions, derived in turn from different worldviews and influenced by regulator requirements, management orthodoxies, or geographic location. Insights and understanding can decay over time.

Deaths are rare in OE, and most of those who work in the OE field will never have a tragedy occur on their watch. When a fatal incident occurs it is usually the first time those responsible have been involved in an OE death. The argument for learning from past cases is overwhelming, but those who would learn from the past must periodically revisit cases to refresh, and possibly revise, their understandings.

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Chapter 3
Strict Aversion to Fatal Incidents as a Standard

3.1 OE Fatality Prevention Requires a Self-Imposed Standard of "Strict Aversion" to Preventable Deaths

Not much is true of every outdoor education (OE) program. OE programs have long been conducted for many reasons, in all kinds of circumstances by diverse organisations. Thirty years ago, Ford (1986) observed that outdoor education was not one thing, but many:

> Outdoor education programs are sponsored by elementary and secondary schools, colleges and universities, youth camps, municipal recreation departments, and private entrepreneurs. They exist in every geographic location and are administered by people of widely varied backgrounds. Elementary school teachers, physical educators, biologists, resource managers, and recreation professionals all work in outdoor education programs and may consider themselves outdoor educators. There is no single body of outdoor professionals in outdoor education because the field transcends school boundaries into recreation departments, youth-serving agencies, conservation organizations, resource management agencies, and many other facets of society. (p. 2)

What *is* true of all OE programs is that parents expect their child will return home alive. It might not be explicit beforehand that the social licence for any OE program is contingent on absolute aversion to preventable deaths, but it is consistently clear in the aftermath of preventable tragedy. For example, following the deaths of seven students in an avalanche in the Connaught Valley 2003, a consultant commissioned by the Strathcona-Tweedsmuir School reported, my emphasis:

> … *no* parent, administrator, or board member spoken with would agree that educating students about backcountry skiing was worth the price that was paid on the trip in Rogers Pass on February 1, 2003 (Cloutier, 2003, p. 53)

Prior to a tragedy, espoused attitudes to risk and safety might imply some tolerance of low probability fatality risks – not wanting "bubble-wrapped kids" – but in the wake of a death there is almost always a search for any and every reasonable

A. Brookes, *Preventing Fatal Incidents in School and Youth Group Camps and Excursions*, International Explorations in Outdoor and Environmental Education, https://doi.org/10.1007/978-3-319-89882-7_3

prevention measure. It could be that tragedies bring unspoken expectations to the surface, or it could be that tragedy changes attitudes. Espoused risk tolerance and perception can change in response to personal experience of an adverse event (Blum, Silver, & Poulin, 2014; Paton, Johnston, Bebbington, Lai, & Houghton, 2000; Silver & Andrey, 2014).

Attitudes to risk are never strictly rational or consistent, in part because humans react emotionally to tragedy, but also for other reasons. Dorman (2006) observed that both at individual and community level, risk perception and tolerance do not vary on a continuum, but behave more as if there are thresholds beyond which large changes in response are elicited:

> [T]he community will turn on a dime, so to speak … One common version is the lowest perceptible level of risk. In this case, the community responds as if it believes there should be no risk of this particular sort (p. 37).

A fatal incident is a threshold event that could indeed turn attitudes and perceptions "on a dime", if a hitherto faint possibility was devastatingly realized. In practice it might be difficult to determine whether a particular tragedy changed minds about risk, or merely focussed attention and clarified existing attitudes. Either way, very often a whole program and its management come to be viewed through the lens of what might be the worst event in an organisation's history, for many staff the worst event in their career, and for bereaved parents the worst event in their lives.

OE-related deaths are rare, and chance invariably plays a part in any OE tragedy. When the unthinkable does occur, it is natural to imagine, at first, that misfortune alone was responsible. On occasion facts confirm that supposition, but more often it emerges that misfortune came knocking on a door behind which stood multiple failures to avert a known – or knowable – fatality risk. Not surprisingly, failures on the part of those specifically charged with the care of youth attract particular scrutiny. Apart from deaths due to natural causes, or deaths arising during travel to or from an OE venue, with hindsight most past fatal incidents occur in circumstances where, questions of blame aside, capable individuals could in principle have prevented any deaths.

My concern in this chapter is not with deaths caused by prevention failures outside the orbit of OE organisations and staff – for example an air traffic control failure while an OE group was in flight, or a terrorism attack in a hitherto safe region where an OE group happened to be camped, but with prevention in the hands of those most directly responsible for an OE program.[1]

Strict aversion to OE fatal incidents is not simply a matter of good intentions. It requires knowledge derived from counterfactual analysis of past tragedies. It is enacted, it can be observed, and it can be explained. It does not involve avoidance of all risks, only deadly risks. It does not equate to "health and safety gone mad", and is more to do with how individuals enact their roles and responsibilities than

[1] This is consistent with conventional, or text-book approaches to OE safety more generally, for example: "Field instructors and guides are the people most directly able to ensure safety because of their training, experience, expertise, and continuous interaction with participants" (Attarian, 2012, p. 26).

with procedures or regulation. If anything, generalised risk aversion and over-management, like complacency, could indicate insufficient interest in, or lack of knowledge of fatality prevention. Strict aversion could – probably must – be habitual, but it is exhibited decision by decision and can lapse or wither.

If strict aversion does lapse, usually nothing happens immediately. No bell rings and only rarely does a tragedy result. It follows that OE fatality cases very often reveal causes that had been latent prior to a death, and that multiple opportunities had existed to remedy a missing or inadequate precaution.

Determination to take precautions against any possibility of fatal incidents is one leg of the three-legged stool of OE fatality prevention (Brookes, 2015). Strict aversion to fatal incidents is the first leg of the stool, exemplified counterfactually by incidents in which a known fatality risk was tolerated. Some past fatal incidents have occurred in circumstances in which those responsible for the care of youth were specifically aware that death was a possible outcome, could readily have averted that possibility, and yet chose to roll the dice.

Knowledge of environmental hazards is the second leg, instantiated by incidents in which field staff or planning staff could have prevented a fatal incident had they better knowledge of a location or of conditions on the day, or if they been more closely monitoring situations and behaviours. Although it could be a relatively simple matter to learn of the existence of some hazard, such as a cliff or a rip current, deploying staff unfamiliar with an area is a common short cut for the obvious reason that research and reconnaissance are costly, particularly for expeditions. Less obviously, familiarization might take place, but not focus specifically enough on potentially fatal hazards and prevention options. Adults cannot monitor youth constantly, but counterfactual analysis of past incidents points to how supervision must be matched to circumstances if deaths are to be prevented.

The third leg of the fatality prevention stool is knowledge of fatal incidents, including case-based knowledge of actual incidents. In outdoor environments what can go badly wrong usually does not, and it is possible to know an environment well without understanding latent or ephemeral hazards. "Nothing like this has happened before", often sincerely offered as mitigation after a tragedy, usually signifies ignorance. Although many OE fatal incidents are first such events for an organisation or individual, almost none are new to the field of OE fatality prevention. A fatality-free track record can coexist with repeated failures to take reasonable fatality prevention measures. The alternative to becoming a new traveller down a well-worn path to tragedy is to learn from those who have gone before. On downhill ski slopes, for example, experience would teach that most injuries are to extremities, due to falls, and involve mainly novices. Supervisors can and do learn to effectively limit such injuries. Deaths on the other hand nearly always involve collision with a fixed object, usually a tree, and more skilled skiers are likely to be victims because they can and do ski faster and on steeper slopes than novices. Such collisions are uncommon, and it follows that what experience teaches about supervising groups on ski slopes is unlikely to be sufficient to prevent fatal incidents (Brookes & Holmes, 2014).

A three-legged stool has it limits as a metaphor. Remove one leg from an actual stool and it immediately falls over. Omit one or more leg of the fatality prevention triad and probably nothing would immediately go wrong. Most of what are attributed, counter-factually, as causes in OE fatal incident reports could have been present for years as latent failures or hazards. Unlike deficiencies in normal operations, which by definition produce evident shortcomings, deficient fatality prevention can easily go unnoticed.

A stool metaphor also overlooks interconnections between the three "legs", by oversimplifying the dynamic nature of fatality prevention. Rather than three legs of a triad, strict aversion to fatal incidents, knowledge of fatal incidents, and knowledge of the physical environment can be mutually constitutive. Knowledge of fatal incident cases could shape attitudes, and in turn an attitude of strict aversion to fatal incidents could focus attention and drive curiosity. In cases where deaths have involved insufficient local knowledge, or failures to recognise a potentially fatal circumstance, the question follows whether individuals motivated by strict aversion could, and should, have learned more about hazards and improved their understanding of potentially fatal circumstances. Organisational level ignorance might also be explained by lack of curiosity, or worse, not-wanting-to-know – so-called strategic ignorance (McGoey, 2012). Ignorance might be explained, but not excused, by lack of curiosity. Arguably it is reasonable to expect curiosity about deadly hazards of an organisation or individual specifically tasked with the care of youth in the outdoors.

A "strict aversion" approach, developed in practice from counterfactual analysis of fatal incident cases, materialises less as procedures or policies, and more as demonstrated continual interest in and pursuit of fatality prevention knowledge. There is an argument that overriding commitment to preventing fatal incidents is the key element, but unless and until that commitment has led to actual knowledge of fatality prevention, which in turn focuses aversive action, espoused commitment is merely a good intention. In that sense the three-legged stool metaphor is sound – each leg is required to support fatality prevention.

Cases can help to situate abstract notions of fatality prevention in actual circumstances and can focus understanding on actors and agency. Preventative action requires actors, and actors are always situated. Most OE fatal incidents are human scale, local events. Counterfactual analysis of OE cases routinely demonstrates not only how capable OE staff could have prevented a fatal incident, but also how, at certain points, a competent adult directly involved would have been uniquely placed to recognise a dangerous situation, determine what action was required, and take action. It should not be surprising that although attributions can be inferred from cases about less proximate causes, including organisational involvement, regulatory frameworks, theoretical constructs such as systems and legal considerations, overwhelmingly public discourse and formal investigations look foremost at those best-placed to act and those most directly responsible for an OE program.

3.2 Reviewing an OE Program Against a Standard of Strict Aversion to Fatal Incidents, and What Action Might Be Required

For an OE professional, fatality prevention knowledge provides both a clear focus and a way through what can be thickets of requirements, policies and procedures around safety and risk. OE fatality cases demonstrate that a professional OE teacher, instructor, or guide motivated never to be in the position of having failed to prevent a fatality, could be confident that strict aversion to fatal incidents is feasible. OE fatal incidents tend to occur in specific circumstances that an individual could learn to recognise and do something about. They involve long understood hazards such as water, cold weather, and steep ground, resulting in personal injury rather than industrial scale disaster. Because prevention failures are rarely immediately followed by a tragedy, there would usually have been time to notice and correct failures. Even after applying the filters of proximity, mutability, and responsibility – which is to say focussing only on causal failures attributable to those most in a position to act and most obligated to act – past cases almost invariably exhibit, counterfactually, opportunities for prevention by an adult acting alone.

It is possible that a review of any particular OE program, premised on strict aversion to fatal incidents, would merely affirm existing practice. Arguably a considerable body of OE practice has been built on lessons from past tragedies. Drowning prevention has long been a specific focus of water safety programs and has in general been systematically built on evidence from drowning deaths. For example, surf lifesaving at specific beaches has been shown to be almost completely effective in preventing deaths (Branche & Stewart, 2001; Hartmann, 2006; Surf Lifesaving Australia, 2014). Training for OE based on outdoor activities such as mountaineering or canoeing has drawn on depths of safety knowledge traditionally derived from accidents reports. Relatively small groups, very often largely responsible for their own safety, tend to be involved in activities such as mountaineering or sea kayaking. For individuals in those fields, self-preservation would motivate practices based on lessons learned from past incidents. It is not surprising that case-based learning is particularly well established is those fields. In the OE field itself, as distinct from adult outdoor recreation, aversion to fatal incidents informed by past incidents is common, if not ubiquitous practice (e.g. Ajango & Landis, 2005; Attarian, 2012). In programs previously shaped by established safety knowledge, fatality prevention might entail refinement or adjustment of existing practices and approaches, including changing venues or ruling out operations in some weather conditions, while largely providing reassurance about existing approaches to safety.

Fatality prevention could require that some individuals abandon a planned program completely because they lack the skills, knowledge, and experience to prevent a fatality, even if they could probably manage to conduct a program in normal circumstances. For the dilettante, or occasional OE leader, fatality prevention is a substantial consideration, because learning to operate comfortably in an environment

prior to leading others could take years, reconnoitring and researching locations could take days or weeks, and studying fatal incidents could require many hours. Fatality prevention is not necessarily about minor adjustments. Some OE fatalities have occurred in circumstances that no child or youth should have been placed in, under the supervision of adults seriously unprepared for their role.

The basic unit of OE can be thought of as a group under the care of an adult, not necessarily associated with any larger organisation. Involvement of an organisation that manages or checks staffing and programming decisions could add a layer of safety, but organisational involvement can also interfere with fatality prevention. In practice most fatal incident investigations examine organisational involvement by tracing back lines of responsibility, with an emphasis on staffing and programming decisions. Enquiries might not extend to other operations of the organisation, meaning it can be sometimes difficult to determine if a tragedy had resulted from a one-time failure or something more entrenched. The most common systemic problem in the OE field by far, based on fatality cases, is a tendency for organisations to deploy staff with insufficient expertise, and to over-rely on procedures, rules, and written guidance. Production pressure and budgeting considerations, in turn, work against any fatality prevention measures that increase costs without directly contributing to program goals.

In OE organisations, strict aversion to fatal incidents might clash with other priorities – in fact it is almost certain to. To be effective, prevention of fatal incidents has to persist as an overriding concern that would require action, from time to time, which frustrated or limits the primary goals of an organisation. Tucker (2012) contends that tension between worker safety and production costs is the central structural problem across the board in occupational health and safety (OH&S). Tension between production costs and safety, a perennial element in workplace safety generally, is clearly evident in some OE fatal incident cases and must be suspected in others. Even if it does not impinge on programming, fatality prevention requires time and effort that might not contribute to production. It is a cost to maintain staff knowledge of and engagement with fatality cases. It is a cost to deploy or train staff who can operate expertly in chosen environments. It is a cost to send staff on reconnaissance trips to assess potential fatality hazards and mitigation options, or to employ local experts. The costs of fatality prevention might deliver no improvement in customer satisfaction or program effectiveness. At the time of writing there undoubtedly exist programs premised on staffing fit for normal operations but unfit for prevention of fatal incidents. Some expeditionary programs, and OE abroad programs, in particular, have operated using leaders who lack local knowledge and experience and who do not sufficiently understand local hazards.

Fatality prevention could require that an OE organisation cease operating, or confine its operations to certain destinations or programs.

3.3 Failure to Adopt Strict Aversion in Practice – The Death of Laura McDairmant

Case-based methods reveal what strict aversion consists of by demonstrating its absence. I chose the examples I discuss here because they illustrate different facets of strict aversion, and because detailed external reports are available in the public domain.

The first case I will consider is the death of Laura McDairmant:

> Laura McDairmant … died in the Dumfries and Galloway Royal Infirmary, Dumfries on the 26th of July 2006 as a result of injuries sustained in a fall at Grey Mare's Tail Burn, Galloway Forest Park on the 25th of July 2006. (Johnston, 2010)

An inquiry into the death of Laura McDairmant heard evidence and submissions for 22 days in 2009 and 2010. She died while attempting a gorge jump at two pools in Grey Mare's Tail Burn, Galloway Forest Park.

> On the 25th July 2006 Laura was one of a group [who] went with instructors to the Grey Mare's Tail Burn, Galloway Forest Park to participate in an activity referred to as gorge jumping. This activity formed part of the programme offered at Barcaple and consisted of jumping from height into a pool of water…. Barcaple made use of two pools of water on the Grey Mare's Tail Burn for gorge jumping…. the group went first to the pool further down stream. I will refer to that pool as the first pool. The group then went to another pool further upstream. I will refer to that pool as the second pool…The first pool has over hanging sides and is in the form of a large pothole. There are two sites at different heights from which participants can jump. There are no obstacles to entry of the water from either of these points. The highest jumping off point is approximately [6 metres] above the surface of the water… The second pool has formed at the base of the Grey Mare's Tail waterfall. At the edge of the pool there are ledges of rock, which protrude from the water level of the pool. There was one jumping point available for participants on a small clearing amongst vegetation. It is directly above a section of the protruding ledge of rock. This jumping point is 9.5 metres above the water level of the pool and is reached by walking down a grassy incline. The clearing there can only accommodate two people. (Johnston, 2010, p. 8)

An important difference between the two pools was that a slip, or failure to step away from the launching area, at the first pool would almost certainly be inconsequential, whereas at the second pool failure to clear protruding rocks would result in almost certain injury, including a mortality risk of approximately one in four (see Warner & Demling, 1986). The coroner observed:

> The use of a qualifying jump to assess the ability of a young person to complete the jump at the second pool was misconceived. The pools differ in nature and present different challenges. At the first pool the jump is from a lower point above the water and there are no obstacles to a clear entry into the water. At the second pool the jump is from a much higher point and a ledge of rocks have to be cleared to land in the clear, deep water (Johnston, 2010, p. 8)

Some facts were uncontested. The protruding rocks were partially visible to participants. The instructor pointed the rocks out. Jumping was explicitly a free choice,

and there was no overt pressure to jump. What is more difficult to assess is whether the jump had acquired connotations of a "challenge", rather than a more neutral choice between several options. One could choose not to accept a challenge, if that is how it was perceived, but there might be negative connotations.

I doubt there exist any defensible educational rationale for "challenges" that exact serious injury or death as the price of failure. Failure is part and parcel of learning, and everyone makes mistakes. The second gorge location, at which slips or failures would result in serious injury if not death, qualified for the over-used term "accident waiting to happen". Nothing of any particular educational value would have been at stake had the jump been forsaken – Laura herself had attended the camp previously and not opted for the second gorge jump. Particularly given that adolescents tend to wrongly assume something is safe if they try it and experience no adverse consequence (Reyna & Farley, 2006), there was arguably a miseducative message in the activity.

Participants themselves could have wisely decided not to attempt a jump requiring them to clear a potentially fatal rock ledge in order to land in the water. However, the instructor indicated that he could protect against a misjudged step, although he:

> … was not secured by any method. Once a participant committed to a jump and stepped or jumped into the air, he could not control their direction or speed to ensure that they landed clear of the rocks. He had told the children that he would be able to give them a push if they were not jumping in the right direction. *He did not intend to do this and had only told the children this to give them some reassurance*. (Johnston, 2010, p. 9 my emphasis)

The court was told that a launch speed of 2.4 miles per hour[2] (mph) was needed to clear a 1.5 ledge from a height of 9.5 m, which is correct, but strictly speaking one would want to clear the ledge by at least half a metre, so in my opinion 3.2 mph[3] would be required, which would require a reasonably vigorous stride (A different expert observed, incorrectly, that the jump was equivalent to a standing long jump of 5 ft.[4]).

The gorge jumps were introduced into the program in 2002. The coroner considered in detail what approvals had been sought, who knew about the activity and what expertise might be required to devise such an activity, and what written risk assessments existed. She found multiple failures. Without disputing the coroner's approach, it should be clear that no special qualifications or expertise would be needed to recognise a risk of death or serious injury. The possibility of striking the rocks below was observable on every occasion a participant made the jump, and for that matter on every occasion an instructor demonstrated.

During the period in which the 2nd gorge jump operated there were four different chief instructors, one of whom claimed not to know about the activity. In 2005 an instructor reported to a chief instructor (CS) that she thought participants could strike the rocks in the second gorge jump. Later the same year, a different instructor

[2] 3.9 km/h.

[3] 5.1 km/h

[4] 1.5 m.

watched the 2nd gorge jump activity and concluded that it was only a matter of time before someone failed to clear the rocks. He also raised his concerns with CS. A subsequent instructors meeting concluded that the instructor who had raised concerns would not be asked to conduct the activity at the second pool but that the activity would continue. In an earlier incident, the brother-in-law of CS had slipped when making the jump and had to twist in mid-air to avoid the rocks. He had advised CS of the incident.

The hazard which should have categorically ruled out the 2nd gorge jump as an activity for dependent youth was always present, was readily observable, and could have been comprehended without any special knowledge or training. No complicated reasoning or technical knowledge was needed to prevent any death. Every time a child or youth made the jump there was an evident failure to treat prevention of death as an overriding criterion. On three occasions the possibility of a death had been specifically pointed out to staff with direct responsibility for the activity but the only defensible course of action, which would have been to cease the activity immediately, was not taken until a death had occurred.

The Barcaple tragedy inquest report catalogues organisational and regulatory failures, which I have not restated here. The coroner itemised reported changes to safety systems and procedures at Barcaple, which had already been implemented, and recommended reviews of systems for licensing and inspection. There are reasons for her recommendations and endorsements, but decision-making processes, staff qualifications, oversight, and inspections can and do fail to prevent fatal incidents unless strict aversion to fatal incidents is an overriding criterion. The Barcaple tragedy involved an operational decision risking death that a single individual could have recognised, almost at a glance, and which could only be eliminated by abandoning that particular activity at that location. Operational staff might be less inclined to review an activity that is a long standing program fixture in an organisation with a hierarchical decision making process, although to their credit three adults had done so prior to the fatal incident.

3.4 Failure to Adopt Strict Aversion in Practice – The Death of Catherine Peters

The second case I will consider is the death of New Zealand student Catherine Peters in 2009. She died attempting a “bridge swing”:

> Ms Peters was in a waist and chest harness, secured to a swing rope. She has left the handrail of the bridge and appears to have gone straight down, hitting the ground immediately below where she jumped from, rather than swinging. Ms Peters was subsequently admitted to Palmerston North Hospital Intensive Care Unit where she died (Scott, 2011, p. 1).

Catherine Peters was an 18-year-old first year veterinary student at Massey University. She was participating in an annual bridge swing event organised by the Massey University Alpine Club. The swing on the Ballance Bridge on the Manawatu

River had been operated for 9 years by AM, basically a one-person operation, normally on a commercial basis but not on this occasion.

> The swing required … the jumper, to put on a body harness and to have that body harness then attached to the rope. The rope was passed under the bridge and was attached to the other side of the bridge rail … by two half hitch knots. The rope was then stretched taut under the bridge and when all was ready the jumper jumped, or on occasions was thrown … into open space. There was obviously a pendulum effect then which was referred to as the swing … momentum stopped with the jumper then being about three metres from the dry section of the riverbed … The rope would then be untied from the bridge, the jumper would be lowered to the riverbed, detached from the rope, and the process … start[ed] all over again. (Scott, 2011, p. 2)

Catherine Peters died because when she was thrown from the bridge the rope had not been re-attached to the bridge by AM. In fact, she was thrown from a position that a correctly attached rope would not have reached. The coroner provided a clear and detailed account of how human error occurred on the day, explained a vulnerability of the operation to human error, and provided a compelling case for how the operation could have been conducted differently. The report is readily available and in my opinion should be required reading for those who work in the OE field.

The coroner observed that a system of crowd control, and marshalling of the next jumpers would have prevented distractions. A mark on the bridge would have functioned as an alert that the rope was too long or not tied off. There was no independent check that a jumper was properly tied to the harness and the rope secured to the bridge. It appears these failures were not unique to the day Catherine Peters died, but might have been observable deficiencies on every occasion over the nine-year period the swing operated. The idea that the rope should be attached at both ends and of the correct length is not so technical a matter that it required special expertise to understand. A normal, prudent person could have observed that the operation was vulnerable to human error, and lacked proper provision – which is to say redundant checks – to guard against human error. A second operator so that one could check the other's work, as distinct from a work experience assistant and ad hoc helpers present on the day, would have eliminated reliance on a single individual never making a mistake. Normal operation might only have required one operator, but fatality prevention would have required two.

Strict aversion to fatal incidents has to take into account that humans can make mistakes. On this occasion AM was distracted by a sequence of events, including the arrival of a young woman he had met on a dating site, and to whom he had promised a free jump in exchange for a coffee, but that event merely exposed a long standing failure to take every precaution against an obvious risk. The death had nothing to do with the risks that mountaineers might accept, or with the truism that it is impossible to eliminate all risk, because reasonable and feasible prevention measures in a relatively controlled environment were not taken. The safety deficiencies would not have disrupted normal operation of the swing, but would have been readily apparent had a "what if" exercise based on obvious risks been conducted.

One reason I chose this example is that it illustrates circumstances suited to set procedures, and a checking process. There would be variable elements linked to

weather, traffic, and group behaviour, but the bridge and rope were constant elements requiring exactly the same prevention measures, checks, and redundancies every time. Unlike the Barcaple case, strict aversion failed not so much because a deadly risk was deemed acceptable but because insufficient attention had been paid to how prevention measures might fail.

3.5 Failure to Adopt Strict Aversion in Practice – Two Bear Attacks in 2011

The third example comprises two cases, involving several casualties including the death of Horatio Chapple. Both involved bear attacks. The first was in Alaska, the second in Norway.

On July 23, 2011, an unaccompanied group of seven students on a National Outdoor Leadership School (NOLS) expedition in the Talkeetna Mountains, Alaska, encountered an Alaskan Brown Bear at close range. The bear attacked, injuring four students, two seriously. On August 5 2011 a starving Polar Bear entered the camp of a group organised by the British Schools Exploring Society (BSES, now BES) on the island of Svalbard, Norway, killing Horatio Chapple 17, and injuring both adult leaders and two other participants, some seriously. Neither group included any individuals with previous experience of bear encounters.

Very few expeditions in bear country report close encounters with bears. Events rarely test precautionary measures, which could become, if not tokenistic, exercises based on third or fourth hand knowledge. From a fatality prevention perspective, both incidents must be understood not through normal operations, but in the light of how well each group was prepared for a close encounter with an aggressive bear. Both organisations, to their credit, commissioned and published detailed investigations of the respective incidents. As with each of the examples discussed in this section, my comments should be read in conjunction with the detailed reports.

According to NOLS the July 23 attack was the first bear attack in over 200,000 person days hiking in Alaskan brown bear habitat, and in over 2,500,000 person days travel in bear habitat generally, except for one injury from a black bear (Leemon, 2012). The report on the incident is an in-house report, which I have relied on in the absence of an external, independent report.

> On the evening of July 23, seven male students ages 16–18 were hiking through thick brush at the bottom of a shallow drainage (small valley) when they encountered an Alaska Brown Bear at close range. They were hiking in a single file line following a narrow, shallow creek. The first student in line spotted the bear about 40–50 feet[5] away. He recognized it and turned to tell the students behind him when suddenly the bear attacked, knocked him to the ground, and bit his head, shoulder, and leg. The bear left the first student and attacked three others before leaving the area. It was the 24th day of their 30-day course in the Talkeetna Mountains of Alaska, the incident occurred 93 miles north of Anchorage, Alaska on public

[5] 12–15 m.

> land administered by the state. Two of the four injured students were more seriously injured. All the injured students were provided first aid by their coursemates. The group activated its personal locator beacon (PLB) to send a distress signal to initiate a rescue, set up a tent, and awaited rescue; a helicopter arrived five hours and 14 minutes later. Two separate helicopters eventually evacuated the students to two different locations within 10 hours of the attack. The students responded well after the attack to provide first aid, take care of each other, and initiate the rescue. (Leemon, 2012, p. 2)

Contrary to what instructors had taught, the students were following a creek rather than a ridge because they wanted to fish. They were in single file because of the brush on either side of the creek, which meant that for all intents and purposes when the first student rounded a boulder and saw a bear, the bear would have seen not a group, which almost certainly would have been protective, but a lone human. Rather than face the bear and talk softly the first student turned and warned the others. The bear immediately attacked. Rather than staying together and deploying bear spray, each member of the group ran, some in different directions. None of the three students who carried bear spray attempted to deploy the spray. One of the students running away changed direction and ran back to the creek, where the bear attacked him. He did not stay down, and when he stood up the bear attacked him again. Another student, thinking the bear had gone, ran to help the first student, and was attacked by the bear. At some stage the bear returned and attacked the first victim again, who was "playing dead" as he had been taught. A fourth student returned to the creek and was attacked by the bear as he made his way downstream. It is likely the bear was a mother protecting a cub.

When the bear was gone the students applied first aid and set up camp with bear sprays ready to use. They had difficulty activating a Personal Locator Beacon (PLB) because a tab for deploying the aerial broke. Because the students were not equipped with a satellite phone, they could not communicate the nature of their emergency. A press account elaborated on the difficulty this posed for rescuers (Epler, 2011). Almost 7 h after the attack a helicopter arrived, but it was not equipped for medical evacuation. A state trooper determined that two of the injured would needed a medical helicopter, which subsequently arrived about two and a half hours later.

From a fatality prevention perspective the NOLS incident can be examined as if it was fatal incident. The bear could have inflicted fatal injuries on one or more victims. Had the injuries been different, delay in obtaining a medically equipped helicopter could have proved fatal. News discussions canvassed reasons why a group might choose to have less than optimal communications, citing a philosophy of self-reliance and cost saving as possible reasons (Epler, 2011).

The NOLS report referred to potential benefits of unsupervised youth expeditions, and a low probability of any bear encounter, perhaps implying but not explicitly advancing an argument for trading off risk against reward. Fatality prevention as an overriding priority would focus on feasible prevention, rather than probability, and on whether any purported benefit, for the particular individuals involved, could be had with a lower risk of bear attack.

OE safety is very often premised on supervision because children and adolescents do not always follow advice and instructions. It is perhaps unremarkable that

the group followed a vegetated streamline rather than a ridge, which would have been safer, given their intention to fish. It is understandable that fear and surprise dictated their reactions when they encountered the bear. The NOLS report avers that "[i]t is impossible to answer the question of whether this incident would have occurred if an instructor had been hiking with the student". On that question, the NOLS report, as in an in-house document from an organisation dedicated to outdoor leadership but historically invested in unaccompanied expeditions, could be unreliable. It is likely that adult supervision would have prevented the incident, or limited its consequences. No prevention measure provides certain protection, which is a reason to prefer layers of protection, not a reason to reject any measure.

One NOLS response to the incident was to revise and improve student bear awareness training (Leemon, 2012). Although the in-house report lacks detail, and perhaps also lacks critical distance, it does direct attention to boundary areas where "strict aversion" involves shades of grey.

The possibility of wild animal attack invites debate about risk that could not be reasonably avoided entirely. In many areas of the world, including large parts of North America, there is a small but definite possibility that a person in the outdoors could encounter a large carnivore (Penteriani et al., 2016). For parents of a student who lives with the possibility of bear encounter while checking the mailbox or walking to school, constant supervision is not feasible, and a carefully assessed and evaluated education program might be not only defensible but also essential. Risks of shark attack in many parts of the globe cannot be avoided for certain without shunning the ocean. In Australia even staying indoors is no certain guarantee against a spider bite or snakebite. In the end strict aversion to fatal incidents is a starting point for analysis that must also take into account what is reasonable and what is feasible.

In the second 2011 bear attack there is no suggestion that British youths should have been unaccompanied in polar bear country. In that respect it is a more typical fatal incident in which attention focuses on the adults responsible for the care of the youths involved.

On August 5 2011, at about 07:30, a polar bear attacked a camp in the Svalbard archipelago, Norway, of 5 tents occupied by ten youths on a BSES expedition and two adult leaders. The bear crossed a trip wire without triggering a warning explosion. An independent report commissioned by the BSES described the incident:

> The bear appears to have initially made its way to the tent containing E7, E3, and Horatio [Chapple] … the bear must have ripped open the tent on Horatio's side. It then dragged Horatio out causing serious, indeed probably mortal wounds to his head. The screaming and shouts of "bear" woke the rest of the camp. E4 opened his tent. He could see that the remains of the tent had collapsed on E3 and E7. L2 emerged from the Leaders' tent at about the same time though not yet armed with a rifle. Horatio appeared to try to sit up or even stand up whereupon the bear reared up and slammed into him. He fell to the ground. He was not seen to move again. (Steel, 2012, p. 34)

L2 obtained the rifle, operated the bolt, and attempted to fire. On each occasion the rifle did not fire and the cartridge was ejected. He continued until the rifle was

empty. (The Mauser rifle had a 3-position safety lever. It could be set so that the bolt would operate, to unload the rifle, but the trigger would not operate. It is likely this is why the rifle did not fire.)

> The bear then turned on L2 and mauled him about the head. L2 dropped the gun. L1 had previously emerged from the rear of the leaders' tent. With L2 disabled he was unable to pick up the gun as the bear was over it. In any event he realised that, having seen the attempts to shoot the bear fail, he needed to find the spare bullets … [he] shouted for help in finding them.
>
> In the meantime E4 had gone out of the rear of the tent he shared with E9 and E5. He went to E1 and E8's tent to explain that there was a bear and to encourage them to try to stay calm. At the same time E10, E2, and E6 were shouting for help from L1 and L2. E4 made his way to the rear of the [l]eader's tent to encounter L1 outside unsuccessfully trying to load a pen flare. L1 then picked up a stone and threw it at the bear which duly got the bear off L2 but onto himself. He in turn was mauled badly. Thereafter L1 started to make his way over towards Horatio in case there was anything he could do for him.
>
> E4 went out to the other girls' tent to try to calm them down. He then returned to the leaders' tent and reached through the front for the rifle. The bolt was back and the magazine was empty … he started looking for spare bullets … (Steel, 2012, p. 34)

When either of the two injured leaders moved the bear came back to them, before returning to the body of Horatio.

> Having failed to find any bullets E4 came back out of the tent and found himself then chased by the bear. The bear thereafter went to E3's tent and attacked E7. E3 decided to make a break from the tent and in turn found himself attacked by the bear.
>
> In the meantime E9, E5, E8, and E1 had crawled out the back of their tent and, having got behind a ridge, started to head to Base Camp. They had only got about 20 metres. L2 now managed to find one of the bullets that had been ejected, went back to the tent to retrieve the rifle and, as the bear came back close to him, shot it dead. (Steel, 2012, p. 34)

The independent report (Steel, 2012) is an important addition to the OE field's stock of detailed incident analysis. The response of the BSES, as evidenced by its website at the time, was notable,[6] as was its release of the report to the public.

I have some reservations about the Steel (2012) report as a case study.[7] (1) The report too readily sets aside the possibility that the bear was drawn to the camp by smell. The group cooked in their tents the evening before the attack, rather than at a separate location, and the campsite had been used on other occasions (Steel, 2012). There were girls in the group, but the investigation did not examine whether used tampons could have attracted the bear (Steel, Personal Communication). Research in the late 1970s on both captured and free-ranging polar bears near Churchill, Manitoba, established that used tampons were as strong an attractant as seal oil or blubber, and much stronger than food smells, human blood, and animal smells

[6] The web pages no longer exist, but were partially captured by www.waybackmachine.org, search http://www.britishexploring.org/ExpeditionsProgrammes/SvalbardTragedy.aspx

[7] In fairness, it was not intended for that purpose.

(Cushing, 1983).[8] (2) A passing mention of 24-hour solos, in the circumstances questionable, elicits no comment, perhaps indicative of narrow terms of reference. (3) Although bear spray is not commonly used in Svalbard (Strange, 2014), it should have been considered for close personal protection. There is evidence that bear spray can deter polar bear attacks (Smith, Herrero, Debruyn, & Wilder, 2008). The expedition supplied (insufficient) flare pens, but those are not designed to be accurately aimed, which is self-evidently problematic at close quarters. Use of a firearm when an animal is already in a campsite risks accidentally wounding one of the party – the Alaska Department of Field and Game advises: "If you are inexperienced with a firearm in emergency situations, you are more likely to be injured by a gun than a bear" (cited in Leemon, 2012). (4) It is reasonable to surmise that the report could have benefited from North American expertise – much of the English language research literature and guidance on bear safety is North American. For example, the effectiveness of alarmed fences as warning devices, particular two or three wire fences, was established by research in the late 1970s (Wooldridge, 1983). Steel (2012) rejected two wire systems because they might be too much trouble to set up, which is inconsistent with taking all reasonable steps. Apart from anything else a two-wire system provides some redundancy in case one mine or alarm should fail to trigger. (5) The report avers that the campsite was not on the coast, but does not provide a specific location or an actual distance that would allow others to evaluate whether the camp really was sufficiently far from the coast to reasonably discount bear attack. Moreover, it endorses, or fails to challenge, the fallacy that preparedness can be somehow amplified or attenuated according to the imagined probability of a deadly attack. Should an attack eventuate any preparation must be equal to the nature of the attack – very rare attacks are not somehow easier to defend against than rare ones.

The material BSES provided to parents would have supported a belief that all reasonable steps to prevent any fatality would be taken. Reportedly that is an assumption Horatio Chapple's parents made (Press Association, 2014). The recommendations Steel (2012) makes are largely consistent with strict aversion to preventable fatal incidents, but his analysis focuses more on fairness to those involved than on harvesting prevention knowledge. From a prevention perspective, too narrow a focus on what definitely caused one unique incident can get in the way of understanding what might reasonably be thought to prevent a class of incidents.

Because prevention is not served by unfair blame, accident analysis must be Janus-faced, looking to the past with understanding and to the future with vigilance. Steel (2012) adopted one face, and judged an act or circumstance to be causal only if he had no doubt. To be useful for fatality prevention the report must be re-interpreted, to consider not only measures that would almost certainly have prevented the exact incident, but also to determine what measures might reasonably prevent any future fatal polar bear encounter. Not only must the threshold be different – "reasonably likely" rather than "beyond reasonable doubt", but also the

[8] In contrast, black bears showed no interest at all in human menstrual odours (Rogers, Wilker, & Scott, 1991).

focus; very often a fatal incident investigation reveals prevention failures linked to near misses for those who survived, or latent problems that could have been causal had the incidents played out differently. Such revelations could be as informative for fatality prevention as those specifically linked to a death. For example, Steel (2012) reports that *none* of the groups on the Svalbard expedition had likely effective bear fences. Taking the compassionate face of Janus, he sees this as mitigating any particular blame for the leaders of the fatal group, which was unlucky enough to have its defences tested. Taking the vigilant face of Janus, latent failures across the whole expedition pose new questions about root causes, common-mode failures and organisation-wide failures to adopt strict aversion as an overriding consideration.

Consistent with its approach, the report considers, and then sets aside, several specific failures (Table 3.1). The report documents each prevention failure, which is useful, but rather than set any aside on grounds of fairness, future prevention requires all to be considered.

Attacks are rare, but not unheard of. Between 1998 and 2005 13 polar bears were shot in Svalbard in self-defence (Gjertz & Aarvik, 2006). Almost all OE fatalities involve a measure of bad luck, which perhaps mitigates blame, but trusting to luck is not a reasonable response to an otherwise preventable fatality risk. No group abandoned polar bear defences on the grounds that an attack was vanishingly unlikely. Instead they tolerated half-measures that could have failed in the event of an attack. Since it is not logical to suppose that an unexpected bear would probe defences any less determinedly than an expected bear, the only conclusion is that leaders were implicitly hedging their bets rather than acting to take every reasonable fatality prevention measure.

There are reasons to be cautious about allocating blame: (1) Individual actions must be understood in organisational contexts, and (2) in developing a workplace safety culture, blame could discourage open discussion of safety problems. However, reservations about blame could be balanced against recognition that in guided outdoor activities it would be difficult to reconcile accepting responsibility for the care of youth with never accepting responsibility for any failure to exercise due care.

I have considered the Steel report in detail in order to tease out some differences between conclusions legitimately aimed at avoiding unfair allocation of blame, and conclusions driven by a search for any and every insight into future prevention.

Steel (2012) nominated failure to post a watch, manifest deficiencies in the fence design and execution, and inadequate firearms drilling as causal. He documented ten distinct weaknesses in the fence system and its deployment, including: (1) The equipment used was a crude design never intended for protecting human life (2) The expedition did not have enough stakes and mines, so each group received at most enough for a 3 sided fence, (3) Most of the mines lacked the triggering plates, and so were jury-rigged with wires attached to the arming pin, which did not allow enough travel to reliably fire the mine. (4) Small Karabiners to aid set up were missing.[9]

[9] The report refers at various times to “trip flares”, although it seems that BSES used, at different times, electronic rape alarms and, on the fatal expedition, devices that triggered a blank shotgun cartridge. As a case study more specific details would have been helpful.

Table 3.1 Some prevention failures that the Steel report excuses in order to be fair to individuals, reinterpreted against the espoused BSES standard to take all reasonable steps to ensure safety

Fairness perspective (Steel, 2012)	Fatality prevention perspective
"It was perfectly legitimate and proper to review the issue [of a bear watch] each evening [and] to try and balance any risk against the problems of exposure of lookouts to cold and rain and the potential risk of accidents … as a result of fatigue." (p. 45)	Fatality aversion is not something to be re-calibrated daily. Both cold and fatigue could be managed without compromising bear safety. An unacceptable tragedy cannot defensibly be weighed against discomfort or the inconvenience of scheduling more sleep.
[circular tent arrangement] "the reactions of a starving bear to a different set up must be treated as wholly uncertain" (p. 46)	With the bear in the middle of circle, there was no place a flare gun could have been aimed without risk of moving the bear onto another victim.[a]
[cooking in tents] "it is difficult to see what other course of action is open to them … whether the point was material is again highly speculative" p. 47	Overwhelming weight of evidence is that cooking smells increase risk of a bear encounter.
[trip wire as close as 2.5 metres to tent, rather than more than 10 metres] "whether it would have made any difference in the circumstances of the attack is highly speculative … this would have merely raised the alarm a second or so earlier" p. 50	The figure of one second assumes that a bear would not pause on triggering an alarm. Canadian research found 93% + polar bear detection with a proper fence.[b]
"[N]either Norwegian Regulations nor the advice from Sysselmannen called for a bear watch as such … I have some considerable sympathy with an organization which takes at face value local advice" p. 50	In the OE or outdoor recreation fields, to regard advice from a tourism office together with actual regulations as *sufficient* knowledge is unheard of.[c]
[Failure to follow through on policy despite some safety committee members actively lobbying for a mandatory bear watch] "I doubt whether a policy of routine bear watch … would have been adopted". p. 57	To discount a failed safety measure because other failures would have defeated it is unhelpful to organisational learning. A fatality-averse conclusion would be that there was an organisation-wide failure to respond to low-likelihood catastrophic consequence risks.
[Failure to follow appointment procedure, including interview for chief leader] "I doubt whether it is remotely possible that he would not have been approved." p. 62	The leader had never seen a polar bear in the Artic (Press Association, 2014), and made arguably unsafe decisions. A well-conducted interview could have probed risk attitude and safety knowledge, neither of which can necessarily be inferred from experience and qualifications.
[Appointment of deputy chief leader with very limited Artic experience, who was acting chief leader on the fatal night] "While I doubt that he gave any advice from which the [chief leader] would have dissented, this was not entirely satisfactory" p. 63	The proper test would be whether a co-leader with more Artic experience, or a safety focused OE qualification, would provide another layer of safety decision-making.

(continued)

Table 3.1 (continued)

Fairness perspective (Steel, 2012)	Fatality prevention perspective
[Planned leaders' introductory weekend specifically focused on artic expeditions was not conducted] "the significance of the failure to arrange it remains highly speculative" p. 94	A comparable weekend for the Spring 2011 Svalbard expedition, was conducted and included several hours familiarization with the Mauser rifle,[d] use of flares, and use of HF radios, including live firing at a range.

[a]Many well-founded OE fatality precautions would not meet the test applied here. The proper test is reasonably likely to prevent a fatality, not certain to prevent a particular incident. Very few precautions are certain to be effective

[b]Tests involving 191 observed intrusion attempts by free-ranging polar bears, with the success rate likely improved with device refinements (Wooldridge, 1983)

[c]A revised tourist advice makes clear what should have been obvious at the time of the attack: "Your safety depends, above all, on yourself. You are expected to have the knowledge and the equipment to handle the arctic conditions." (The Governor of Svalbard, 2012)

[d]The ex-World War II Mauser rifle has a three-position safety. In the middle position the bolt can operate, and cartridges eject, but the rifle will not fire

> Provisioning was the responsibility of BSES office staff. Stores sent to Svalbard were not deficient in bear-fence components only. EPIRB transmitters and HF radio equipment was missing until requested by the leader, who had not noticed at that time that fence components were also missing: "the Chief Leader, in consultation with the leaders decided that the expedition should simply manage without them" (Steel, 2012, p. 71).

A properly functioning alarmed fence can be almost 100% effective in warning of a polar bear intrusion (Wooldridge, 1983), but as Steel (2012) pointed out the design of fence chosen was poor:

> In short the trip wire system as installed was inadequate. It is remarkable that no complaint was made by any of the leaders (although some simply did not use it). But I have the gravest doubts whether had such steps been taken and further equipment obtained that it would even then have furnished any adequate protection. (p. 50)

The attack highlighted differences between measures intended for a very close encounter, and measures more suited to deterring a bear some distance away. According to a BSES letter seeking permission from the Governor of Svalbard to conduct the expedition, "Flare pens will [would] be issued to all participants" (Steel, 2012, p. 14), although in fact only two or three flare pens were issued to each group due to insufficient provisioning. Moreover, "members received little or no training in flare use" (p. 74). It appears that the type of flares intended to be distributed were small devices that, once loaded, project a small flare up to 45 metres, which then burns for approximately 5 s. Provided a bear was still some distance away there should be time to load a pen launcher and land a flare between the bear and a group, the idea being that the bear would be deterred. Once a bear had entered a circle of tents, there would be the problem of accurately aiming a device not designed for that purpose, and the risk of sending the bear in an unsafe direction. For close encounters a handheld flare that could be pointed directly at the bear, and which would burn for longer, would almost certainly be more useful. Taking into consideration what could have happened, and not just what did happen, one would conclude protection against bear attack might include pen flares and pepper spray for each person, and handheld flares for each tent (Tangent Expeditions, 2016).

When the polar bear attacked, the rifle, spare ammunition, the two hand-flare launchers, and the four flares supplied were all in the leaders' tent. It is not clear what the plan would have been had the bear first approached that tent. It is not clear if anyone other than L2 knew where the spare ammunition was stowed. With both leaders injured and the rifle empty a student searched for, but could not find spare cartridges. After the attack an injured leader directed students to where the satellite phone was stowed, but they had difficulty determining their location using a GPS, and instead provided a landmark location. The students attempted to contact the expedition doctors by pager, but failed. Eventually the students located the EPIRB and spare cartridges (Steel, 2012). That leaders could be disabled and students have to implement emergency measures was foreseeable. Leaders or instructors have been among the victims in many OE fatal incidents.

The example of a polar bear attack illustrates how elements of fatality prevention differ from measures needed for normal operations. An excellent track record in normal operations could coexist with repeated, habitual failures to implement effective fatality prevention, without consequence until a tragedy occurs. While some elements, such as making sure group members know where emergency communications will be stowed, are straightforward, understanding and preparing to deter or defend a polar bear attack is non-trivial. Polar bears investigate camps too infrequently for most individuals to gain experience in bear deterrence. Those responsible for prevention would have to determinedly seek out knowledge from past incidents and published research, and, counter-intuitively, to act and prepare as if a bear encounter was expected.

Strict aversion to fatal incidents would require that decisions around potential fatal incidents be approached differently from everyday operational decisions, with prevention measures maintained consistently rather than weighed up, assessed, and traded off against other priorities. One interpretation of the Svalbard tragedy is that, across the board, BSES decision-makers made a category error in treating polar bear protection as just another contingency, and a somewhat low priority one at that, rather than a life or death matter which had to be got right as a pre-condition for the expedition to proceed. An experienced leader might manage everyday uncertainties by making plans and attending to the most likely possibilities. Should things not go according to plan, in normal circumstances a leader might adjust plans, improvise, or tolerate failures or disappointments. If lives were not at stake, many OE leaders would regard coping with setbacks or failures as part and parcel of a program, but if lives are at stake a different approach is warranted. Polar bear protection is an example of fatality prevention that requires strict adherence so long as there is any possibility of an encounter.

Fatality prevention can require non-trivial skills, and expertise not required in normal operations. Nowhere is this clearer than in the reliance, in Svalbard, on rifles:

> It has to be remembered that they were only going to have to deploy a rifle in an extreme situation. Firing four rounds from a Mauser [rifle] from a standing position with no time limitation is little preparation for that … if I am right about the explanation for the failure for the gun to operate initially, such would be a classic example of poor rifle drill which can only be instilled with training in the relevant weapon (Steel, 2012, p. 74)

Given limited training it would be understandable that a leader emerged from a tent without a rifle in the first instance, and then attempted to fire with the safety lever in the wrong position. Herrero (1985) discusses the use of firearms for protection against bears at some length. His concern is more with a grizzly bear charging through brush than with an otherwise undeterred polar bear approaching across tundra, but his comments have some relevance, particularly to the actual circumstances of the Svalbard tragedy (my emphasis):

> Regardless of what firearm you use you must be thoroughly familiar with its mechanism … you must be expert in your chosen firearm. The type of shooting I have described is not hunting. It is self-defence shooting under extremely demanding conditions. *Training should include shooting hundreds of rounds with the chosen firearm under a variety of conditions* … (Herrero, 1985, p. 245)

Herrero (1985) describes the death of an experienced big game hunter in 1979 who evidently jammed his rifle by attempting to load a cartridge into an already loaded breech when a grizzly bear charged.

Summarising, while ordinary leadership decision-making might involve less attention to unlikely situations, and more attention to the day-to-day realities of life in the artic, the only way to be properly prepared when a polar bear intrudes would be to be properly prepared whenever such intrusion was possible. While experience reliably informs everyday leadership decision-making, it is a poor guide to decisions about seldom-experienced but completely unacceptable events. Polar bears are intelligent, powerful predators that can – indeed strive to – turn up unannounced. Fatality prevention requires precautions that are routine, even when experience might indicate they could be omitted, and even if precautions would be disruptive or inconvenient. Polar bear safety evidently requires a body of knowledge, some skills and training, and substantial commitment of time and effort. Because precautions would almost never be tested by actual polar bear encounters, prevention efforts must be routinely appraised counter-factually, by envisaging how effective they would have been in any conceivable polar bear encounter.

The Svalbard expedition was not organisationally complex, in that although it involved multiple groups, each group was a conventional small led group in a tiered organisational structure. In principle individuals in any layer of organisational responsibility could have enacted prevention of a fatal injury as an overriding priority. Whether or not the expedition was staffed adequately for normal operations, it was not staffed for effective protection from polar bears. (1) An expedition committee could have refused approval on that basis, had it chosen to make any leader's understanding and commitment to fatality prevention a pre-condition for appointment. (2) On arrival in Svalbard, the discovery that insufficient flare pens and fencing components had been provided, could have led to the chief leader delaying the expedition until better defences could be obtained, or failing that, cancelling the expedition. (3) Individual leaders, even if lacking specific training in polar bear safety, could have made common-sense assessments not to rely on a

plainly inadequate fence, particularly given it was unclear how pen-flares or a single rifle could be deployed once a bear was at a tent. A watch system, as Steel (2012) argued, would provide another layer of protection and a reasonable chance of earlier warning of an approaching bear. The task of deterring a bear would remain even were one detected. The provisioning for group protection was not fail-safe, and protection for individuals was non-existent, so there would have been justification for individual leaders to cancel the trip. The group, as did other groups, had a single firearm, a very small number of cartridges, and only two flare pens with four flares between them.

Notwithstanding its focus on specific causes of the Svalbard tragedy, the Steel (2012) report documents potential prevention failures across all of the groups and at multiple campsites – and at all levels of decision-making, including both leaders with every group, chief leader, deputy chief leader, expedition committee and staff responsible for provisioning. Normally an accident analysis that found multiple or repeated failures would all but rule out coincidence, and look instead for one or more root causes which could explain all or many of the failures. Root cause analysis is particularly important to identify common mode failure, which is to say one unsafe aspect of a program that could defeat layers of safety and redundant provision. Root causes are attributions, rather than facts, evaluated for prevention purposes as much for their utility as for their analytic soundness. Meretricious arguments might exist for more than one root causal account, some more helpful than others. The Steel (2012) report could support arguments that linked failures to budgetary constraints and production pressure, to insufficient attention to differences between guided youth educational experiences and adult expeditions or recreation, and, as Steel (2012) discusses, pressure on quality due to staff appointment processes which were, at least on occasion, more a matter of trying to obtain recruits than selecting the best of suitable candidates.

I chose this example because there can be little doubt that everybody associated with the expedition understood that a polar bear attack was a distinct risk, and that a polar bear attack could be fatal. Moreover, at least some deficiencies in preparedness for a polar bear incursion would have been obvious to any person capable of envisaging such a situation. Even if accounts of decision-making are treated with caution, the Svalbard tragedy involved multiple occasions when prevention of a polar bear incident was apparently not treated as a firm pre-condition to be satisfied before proceeding with a program or program component.

"What were you thinking?" is perhaps the most asked but least answerable question after a preventable tragedy. Actors themselves, with hindsight, might struggle to know whether their recollections are reliable. Nevertheless it is useful to consider whether root causes could plausibly involve misconceptions. The Svalbard incident might be explained, in part, by an organisation-wide tendency to be swayed by a perceived low probability of any polar bear encounter, instead of prioritising the complete unacceptability of any preventable death.

3.6 Strict Aversion Defined by Lessons Learned

Counter examples demonstrate that deaths can occur if strict aversion to fatal incidents is not practiced. In definitive cases decision makers, with hindsight, have in effect elected not to take available precautions against distinct known, or knowable, fatality risks. What such cases usually signify is not reckless disregard for human life, but a kind of rounding error: Actors behaved as if a very unlikely event was an impossible event. The possibility of tragedy was not accepted so much as discounted. While hindsight reveals that, in effect, a possible tragedy had been countenanced, decision makers might simply have focussed on likelihood rather than preventability.

Although most organisations would claim that safety is a first priority, instances where feasible precautions against a relatively obvious – if improbable – fatality risk have been more or less consciously rejected provide some insight into what effective fatality prevention requires, and what distinguishes fatality prevention from normal operational decision-making. In particular:

1. Decisions are made as if a possible adverse event – for example a polar bear encounter – will actually occur. Unless vanishingly improbable, any possible catastrophe is planned for *as if probable*.
2. Decisions about fatality risks do not rely on experience, which is unreliable in the case of very infrequent events, but instead take into account accumulated knowledge of the hazard in question. Even though taking a chance will probably not result in a fatality, the chance is not taken.
3. The counterpart of deficient fatality precautions is production pressure. Calling off a planned program or activity has to be a real option that is routinely considered, and sometimes enacted, by decision makers at every level. In some fatality cases fatality precautions appear to have been, in practice, contingent on a program. To prevent deaths a program must be contingent on fatality precautions, not the other way round.
4. Absent or deficient fatality prevention measures would result in a program altered or cancelled almost automatically. It would be a warning sign if a program struggled to find suitable staff but never cancelled program.
5. Unambiguous fatality prevention precautions would not be diluted or traded off against other considerations – they would be consistently enacted. “Please return my child alive” is an overriding condition, not a preference contingent on expediency or program outcomes.
6. A staff member might have outstanding qualifications and experience for every aspect of a normal OE program but be deficient in understanding of fatality prevention. Fatality prevention knowledge must be assessed specifically because it is somewhat distinct from operational knowledge.
7. A program could be judged by all stakeholders to be an outstanding success, and could boast a fatality-free record but might nevertheless be deficient in fatality prevention. Fatality prevention measures must be audited or evaluated specifically and not inferred from the overall quality of a program. Good programs can have poor fatality prevention. A good safety record can coexist with poor fatality prevention.

3.7 Alternatives to "Strict Aversion": Community Responses, Legal Consequences, and Standards of Care in OE

For many individuals the merit of avoiding any preventable OE death would be self-evident, without reference to community expectations, "industry standards", or legalities. From that perspective, any concerns about community responses or legal consequences would be important secondary considerations. However, it is not uncommon to find safety practice, and by implication fatality prevention, primarily guided by risk management procedures or published standards that purport to represent community, industry, or legal standards. Do alternative approaches to determining standards of care have consequences for fatality prevention?

With good reason, fatal incident cases often serve to illustrate or inform about legal obligations and possible legal consequences. Not every OE accident results in legal action, but in cases of accidental death there is usually some kind of legal process. Some deaths are the subject of an inquest, which, in some jurisdictions, would consider future prevention. This volume considers incidents from around the globe over a long period of time – what the outcome of any particular legal case implies about standards of prevention has to be considered in context. What was true in Anglo-American contexts might not be true in others. As I observed in the previous chapter, one might read a case and gain useful insights from the facts but dispute some recommendations.[10] In reviewing case material from legal proceedings, it could be necessary to disentangle observations and insights about legal consequences from prevention lessons.

Legal considerations vary considerably internationally. In North America there is considerable emphasis on civil lawsuits (Heshka, 2006, 2007; Moss, 2015), whereas New Zealand abandoned tort-based compensation for accidents in favour of universal accident compensation in 1974 (Bismark & Paterson, 2006). Fulbrook (2005) provides a book length treatment of outdoor activities and negligence, mainly from a UK perspective, including discussion of many fatal incidents. He points out that legal judgments that turn on whether a standard has been breached look at minimum, rather than optimum requirements. "The 'highest skill' is not required" (p. 148) and UK courts are not free to choose a preferred approach where there are alternative defensible approaches. The minimum that a court has accepted in the past is not necessarily a guide to how best to prevent any future fatality. Standards can change over time and court judgments over time would reflect such changes, albeit probably lagging with respect to new or improved prevention measures.

A small number of fatal incident cases have resulted in criminal trials. More case study material comes from inquests. The most helpful of the latter are those that contain transcripts or summaries of evidence. The least helpful are those focused mainly on a coroner's recommendations. Recommendations might be inapplicable

[10] See, for example, Murray's (2015) discussion of coronial recommendations after white water rafting fatalities in Queensland, Australia.

outside specific circumstances, might be out of date, and might be arguable. In a review of the coronial role in Australia Freckelton (2007) argued:

> The question arises as to how appropriate it is to have a legal official who principally has investigative and fact-finding responsibilities making potentially broad-ranging and socially significant proposals for reform. The media highlight such recommendations and there is the potential for misunderstanding to be engendered and harm caused if the recommendations are not well founded. But how well qualified are coroners to engage in such a responsible and challenging role? There are few empirical data on the issue and still only a modest number of scholarly studies. (p. 4)

Some fatal incidents have resulted in prosecutions under workplace health and safety legislation. There has been considerable examination in the workplace safety literature about relatively weak legal responses to workplace deaths, in many jurisdictions, compared to other negligent deaths. For example, Barab (2006) argued:

> Employers often get away with blaming deaths and injuries on freak accidents and other excuses—at least in the public eye. They are typically quoted about the freak accident in a short on-day story in the local newspaper and by the time experts are found (if anyone bothers) or the OSHA report comes out explaining the employer's failure to provide a safe workplace, the local media have often lost interest. (p. 8)

Other workplace deaths might have been underreported, but if anything OE-related fatal incidents, particularly those involving multiple casualties, tend to be extensively reported (Brookes, 2011).

3.8 What Would the Press Say? What Would a Coroner Say? What Would a Bereaved Parent Say?

From a case-based prevention perspective, inquiry findings, public opinion, and legal consequences, are secondary sources. Prevention might not be served by attention to legal consequences at the expense of learning from antecedents. For those working in the field a conversation can easily shift from care of others in the field to self-protection in the courtroom. However, legal cases are often what those interested in prevention have to work with, and they serve as reminders of how an OE program could be viewed after a death. In many cases, the overall quality and reputation of program becomes secondary to what happened on the day. The many things that those involved in the program routinely and consistently got right are subordinated by failures linked to deaths. The collective experiences of the many students taking the program are eclipsed by what happened to the victims. Unlikely events, barely considered beforehand, become the main focus of attention. Counterfactual thinking – what could have been done to prevent the tragedy – dominates. Risks as a balance of probability and consequences are displaced by strict aversion to the worst consequences, however improbable.

Although prevention knowledge is derived from antecedents to a fatality, attention to consequences can reinforce that fatality prevention requires its own form of

counterfactual analysis, operating at a local, individual level. Unlike everyday feedback and evaluation, which quite rightly focuses on how things went, fatality prevention requires attention to what *could* have gone catastrophically wrong, in what has been termed a "pre-mortem" (Kahneman & Klein, 2009). "Strict aversion" is categorical, but there are, inevitably grey areas in the definition of "reasonable care". In the case of school based OE, Heshka (2006) has pointed out that what constitutes reasonable care depends on whether the "reasonable person" is a careful parent, a careful professional guide, or something in between. He argued there was some reason to think that in Canada, at least, courts could move towards a standard more based on careful professional outdoor educator. Referring to the Connaught Creek 2003 tragedy, in which seven students died in an avalanche, he argued:

> It is a different story, however, when contemplating outdoor education. The exposure to catastrophic risk should be eliminated as a goal and the likelihood of a mass casualty incident should approach nil. This is not to be interpreted as a backlash against outdoor education programming but rather as a reality check or wake-up call. It does not matter that guides were also skiing in Connaught Creek or that the Executive Director of the Canadian Avalanche Association would have made the same decision to ski that route. What matters is that a trip intended to expose students to the wonders of backcountry skiing crossed some three dozen avalanche slide paths and that the same curricular objectives could have been attained in another equally spectacular but less dangerous area. (Heshka, 2006, p. 39)

3.9 Why Strict Aversion, Rather Than Acceptable Risk, Is Likely to Be Applied to OE Fatality Judgments

At least in the USA childhood deaths have been regarded as preventable, rather than attributable to Providence, since the beginning of the twentieth century (Zelizer, 1985). After the 1903 deaths of eight high school children in a trolley collision in Newark, a Rector opined: "…the will of God is not shown in the death of these children, for God did not take these children out of the world. They were thrown out of it by those responsible…". (quoted in Zelizer, 1985, p. 44)

Few OE fatal incidents cases are truly random, and very few more recent deaths have been attributed to acceptable risk. Usually a sequence of decisions had placed a group of youth in circumstances where known catastrophes were not only possible, but as events unfolded, increasingly likely. Often there had come a point where imminent catastrophe could have been prevented by a capable adult supervisor. Subsequent public narrative is driven by regret and focuses on actors and choices they were afforded.

OE fatal incidents tend to involve the kinds of proximate causes that humans have understood since the beginning of time. While the so called "idiots' guide" – that only drowning, impact, and exposure cause OE deaths (Bailie, 1996) – was intended to be a simplification, it is largely true and helps to explain why OE fatality prevention, on the whole, could be seen as feasible and practical, even if risk management in general is seen as over-complicated or burdensome (Hogan, 2002).

For future fatal incidents that can be understood as foreseeable and preventable – and many past tragedies have been both – there are several reasons to expect that a standard of strict aversion, rather than acceptable risk, will likely hold in the court of public opinion at least:

1. Potentially fatal circumstances could be essential to adult outdoor recreation goals but are almost never essential to OE goals. Invariably stated educational goals could have been met, in principle, in safer circumstances.
2. In high income countries successful accident prevention has resulted in more or less continuously dropping rates of youth mortality overall. Expectations of OE have lifted on a rising tide of improving community safety (Brookes, 2011).
3. Technology affords improved prevention.[11] In particular, GPS location and navigation, communication devices, emergency beacons, monitoring of environmental conditions, forecasting of environmental conditions, and access to information have increased prevention options in some situations.
4. Case based knowledge grows as cases accrue, and tends to become more accessible as material finds its way online. Although almost all OE fatal incidents are first-time tragedies for the individuals and organisations involved, almost no past incidents have been unprecedented. Ignorance of past lessons is likely to be increasingly attributed to lack of curiosity rather than lack of information.
5. Research on adolescent development and adolescent risk-taking has largely debunked folk-theories that, by extension if not explicitly, advocate taking deadly risks as educational. There are developmental reasons to lean towards keeping young people safe from serious harm until adulthood rather than exposing them to deadly risks too early. For example in a major review of the literature, Reyna and Farley (2006) concluded:

> Crime, smoking, drug use, alcoholism, reckless driving and many other unhealthy patterns of behaviour that play out over a lifetime usually debut in adolescence. *Avoiding unhealthy risks or buying time during adolescence before exposure to risks can therefore set a different lifetime pattern*. (p. 8 my emphasis)

and

> In the heat of passion, on the spur of the moment, in unfamiliar situations, when trading off risks and benefits favors bad long-term outcomes, and when behavioural inhibition is required for good outcomes, adolescents are likely to reason more poorly than adults. (p. 12)

Moreover, knowledge of risks encountered in OE might not generalize:

> There are no firm grounds for assuming that education about risks in one context (e.g. road safety), will lead to the application of the same principles that can be applied and used to manage different risks (e.g. substance abuse) (Health and Safety Executive, n.d.)

[11] This is not an argument about how new technology affects accident *rates*. That could go either way – for example mobile phone use while driving is dangerous. It is about how any given incident could reasonably have been prevented, and improvements in prevention afforded by improvements in technology.

6. Popular arguments generally supportive of OE or outdoor activity for young people in general (for example Louv, 2008) will have little bearing on how any preventable tragedy would be judged. In my view:

> [A]nxiety about the youth of today seems to be in transition from concerns about "the PlayStation Generation" to concerns about "the Facebook Generation". Whether or not such concerns are well founded, concerns about youth are perennial … [but] general claims about the "youth of today" do not meaningfully scale down to provide a rationale as to why, on a particular day, an individual youth should be in a situation characterised by inattention to weather forecasts, lack of knowledge of natural hazards, instructor inexperience, or other factors which can contribute to fatal incidents. (Brookes, 2011)

7. Popular rejection of generalized over-protectiveness – expressed as "children cannot be bubble-wrapped", for example – are unlikely to sway opinions, after a tragedy, about the kinds of specific prevention failures evident in many OE fatality cases. Those associated with a tragedy might point to the truism that all risk can never be eliminated, but that is more of an argument against overreaction than a defence of failed precautions against death. For example:

> All the expeditions are physically demanding, including activities in remote locations which attract a level of risk… The only way to eliminate risk is to cease conducting the activity which raises it. But that, in my judgement, would be an absurd over-reaction. (Steel, 2012, p. 38)

There is a world of difference between eliminating all risk and taking reasonable steps to prevent death. Perhaps Steel anticipated calls to shut down the organisation responsible for the death and injuries in Svalbard. My view is that expeditions *should* be cancelled rather than proceeding with deficient polar bear protection. In the end Steel also adopts the position that reasonable steps could and should have been taken to prevent a polar bear attack, while not spelling out that in their absence the expedition should not have gone ahead.

3.10 Compliance with Published Standards as an Alternative to Strict Aversion

Published safety standards could be adopted in OE for many reasons, including to satisfy external review; here I will focus on their potential to support, or impede, fatality prevention. Almost four decades ago, introducing an article titled *Only a fool relies on safety standards,* Peters (1978) observed: "For those who know little about safety, it seems quite plausible and reasonable to expect that the existence of good safety standards and a sufficient conformance to those standards should be an adequate measure of safety assurance" (p. 25). More recently, Timmermans and Epstein (2010) noted: "[U]nless efficiency or safety is the explicit goal of standardization, any given actual standard is not necessarily the cheapest, most efficient, safest, scientifically most reliable, or technically most advanced outcome…" (p. 79).

In an examination of the politics of standards, Busch (2010) noted standardization in the military generated early successes. Uniforms effectively signalled rank and distinguished friend from foe, and it was self-evidently useful to have ammunition that reliably fitted a particular calibre weapon. More contentiously, from early on the advent of military standards for manufactured items "presented the illusion that soldiers were themselves 'uniform' and hence replaceable" (p. 58). In an early cautionary note on over-reliance on standards, Thorstein Veblen had observed: "what is not completely standardized calls for too much craftsmanlike skill, reflection, and individual elaboration, and is therefore not available for economical use" (1904 quoted in Busch, 2010, p. 60). Nevertheless by the 1930s national standards organisations were ubiquitous, produced by a complex network of institutions, hundreds of specialized standards bodies, and, after World War II, international standards bodies.

Proliferation of standards brought complications, including the burden of demonstrating compliance. Veblen 1904, cited in Busch (2010, p. 58) had surmised that the development of standards, certification of products, and accreditation of certifiers would spawn a bureaucratic network equivalent to or greater than any government processes standardisation had supplanted. Subsequently, according to Busch (2010), although "government bureaucracies have hardly withered" (p. 72), state regulation was replaced by equivalently burdensome market regulation that was less accountable and which ceded standard setting to "a small group of experts and other interested parties [without] any semblance of democratic control" (p. 72).

Timmermans and Epstein (2010), in a sociological review of standards, distinguished between standards for design, terminology, performance and procedures, each category further differentiated according to different origins and histories. The term "standards" could connote a source of authority, a level of performance, or uniformity. They held that procedural standards, originating in the Scientific Management movement, predominated, and

> … are presumed to be in the public interest, but the public to whom standards apply is usually not directly represented in standard creation … Standardization by committee leads to compromises, bitterly contested power plays, and negotiations. A participant with an extensive national tradition of standard creation … can steer the content of standards. Similarly, a strong personality can influence the creation of standards … the composition of standard committees inevitably creates an institutional bias, which may be less of an issue for, say, technical standards in telecommunications … but is more problematic for the creation of medical treatment standards where drug companies sponsor the evidence and the research of committee members (Timmermans & Epstein, 2010, p. 77)

They argued that unless specifically designed to achieve safety or efficiency standards would not necessarily achieve either. Standards can struggle to accommodate human diversity, can reflect a lowest common denominator, the power of the strongest participant in standard setting, a negotiated compromise, or a confirmation of common practice (Timmermans & Epstein, 2010).

Procedural standards pose particular problems:

> [N]o rule can adequately capture the requisite work of a prescribed action. On the ground, every standard is simultaneously over-determined and incomplete. To coordinate diverse

> interests and activities, standards necessarily delegate some residual work that requires active participation and submission of people to the standard's directives. Tinkering, repairing, subverting, or circumventing prescriptions of the standard are necessary to make standards work … a recurring surprising finding is that loose standards with great adaptability may work better than rigidly defined standards. (Timmermans & Epstein, 2010, p. 81)

In shifting emphasis from case-based safety to published standards, compliance could become an end in itself. The risk is that over time conformity to rules develops into a ritual disconnected from the resolution of the problem a standard was devised to achieve (Busch, 2010; Timmermans & Epstein, 2010).

The title of Peter's (1978) article alluded to the adage that "rules are for the guidance of the wise and the direction of fools", although it is untrue that only fools rely on OE safety standards. Over-reliance on safety standards could occur as a result of naiveté, faulty assumptions, misplaced trust, or failure to exhibit sufficient curiosity about how a standard was devised and who devised it.

Some of Peter's (1978) reservations about over-use of standards could apply to OE safety standards:

1. Standards can contain out-dated criteria. Although for the most part OE involves long understood hazards that result in the proverbial "new folks, same old accidents", OE fatality prevention improves over time due to accumulating knowledge, affordances of technology, and rising community expectations.
2. Standards can generate inconsistent requirements, and when they do: "unfortunately the background, rationale and justification … is rarely available for evaluation … the user must have sufficient general knowledge and background experience … to make some assessment or appraisal of the standard." (p. 26).
3. Standards might not be designed to eliminate a particular hazard. Peters (1978) uses the example of a water slide standard specifying a water-depth devised to halve the rate of serious injuries, rather than eliminate them. Any OE standard not specifically designed to eliminate all preventable fatal incidents might fail to do what it was never intended to do. A published standard could be based on minimum preventative measures rather than all reasonable steps, on common practice, or simply the set of measures a particular group could all agree on.
4. Standards may reflect industry pressure. For example, although lifeguard supervision of public swimming pools is suited to development of a standard based strictly on drowning prevention, a standard published by the RLSSA "represents the collective opinion of the aquatics industry across Australia" (Royal Life Saving Society of Australia, 2016). A report prepared for the Victorian State Coroner's Office into public pool drowning between 1998 and 2002 found problems with a lack of cross-referencing, with requirements for specific induction to each facility, and with guidelines for low patronage pools. In particular pool managers were misusing low patronage pool guidelines "to significantly reduce the operational costs" (Bugeja, 2004), and the associated requirements for lifeguard qualifications were inadequate. Moreover, the report identified problems in practice stemming from employment of young casual staff, and high staff turnover not adequately taken into account in training and preparation.

5. Standards committees may be dominated by one individual or by sectional interests. Peters (1978) noted: "So-called consumer or public representatives can be carefully selected according to known biases or lack of knowledge, given ancillary diversionary tasks, or kept in the dark or confused relative to pertinent information … [r]egardless of the entity that issues a standard … it is nothing more than an expression of opinions of a committee that may or may not be modified by the political compromises of a reviewing authority. It is manmade, not God given" (p. 28). It can be very difficult to determine what process shaped the composition of a standard-setting group or committee, and how a committee functioned in practice. It can be difficult to evaluate the expertise of a committee, and the reasons for particular inclusions or exclusions from a standard. It is feasible that vested interests might be more motivated to contribute to the development of standards than independent experts volunteering in the public interest. At least in some circumstances "regulatory capture"(Levine, 1998) would almost be expected (e.g. Brookes, 2006).
6. In the event of a preventable death, the question arises how compliance with an industry or other standard would weigh in legal proceedings. Peters (1978) argued that, at the time of writing in the USA, conformity to standards for product safety left legal obligations unchanged. Although legislation can change, and varies between jurisdictions, in any contested legal process there can be competing arguments. Both sides would consider how to approach any relevant safety standards. Philo (1965) observed "[s]ince the trial is an art form, and the trial lawyer is an art director using the art director's tools in the staging of a trial, it is well to consider in what manner those tools are useful in the trial as regards safety codes … [l]awyers must use standards and codes to recognize and prove liability and ridicule the standards which are much less than due care. … While codes, standards and practices are valuable in personal injury cases, they represent only custom and not due care. Codified negligence is still negligence" (p. 11).

Certain published safety standards could contribute specifically to OE fatality prevention. Choices of equipment such as personal flotation device, EPIRBs, and helmets, for example, would almost certainly be constrained by product standards. Lifeguarding procedures developed from case-based knowledge and specifically focussed on fatality prevention would be another example.

More generally, counterfactual prevention of many OE fatal incidents would require a knowledgeable decision maker responding to particular circumstances. A fatality prevention standard could, of course, refer to knowledge of cases, years of experience, local knowledge, and fatality-averse practice; it need not offer detailed prescriptions. OE fatality prevention would be only partially served by detailed procedural standards because OE fatal incidents tend to be circumstantial due to specifics of localities, transient environmental factors and the vagaries of human behaviour. In his highly cited work on checklists, a specific form of standard, Gawande (2009) observed:

> Complex problems are ones like raising a child. Once you learn how to send a rocket to the moon, you can repeat the process with other rockets and perfect it. One rocket is like

> another rocket. But not so with raising a child … [e]very child is unique. Although raising one child may provide experience, it does not guarantee success with the next child. (p. 49)

Checklists, Gawande (2009) argued, can be demonstrably effective in improving safety in complex fields such as aviation and surgery. To be effective checklists must be short, simple, exact, and thoroughly tested in practice. They have to become part of workplace culture, and they have to be continually reviewed.

> It is common to misconceive how checklists function in complex lines of work. They are not comprehensive how-to guides … [t]hey are quick and simple tools aimed to buttress the skills of expert professionals. Gawande (2009, p. 128)

OE managers might over-rely on published safety standards in the hope of saving money. Sociological studies have explained workplace safety as in continual tension with organisational imperatives to contain expenditure and maintain financial viability, if not maximise profits. Tucker (2012) examined debates about occupational health and safety over four decades and concluded that the central problem was "structural pressure to put profit over safety" (p. 44). Tombs and Whyte (2010) examined workplace safety in the UK, in a context of government policy and received wisdom that safety compliance was a burden on business. They argued that substantially reduced inspection and enforcement by government, premised on self-regulation, had previously resulted in increased numbers of workplace deaths:

> As employers cut back on basic maintenance, training, replacement of hardware and software, and as work is intensified in general, it is little wonder that recessions kill and injure, as our recent experience testifies: between 1981 and 1985, for example, fatal and major injury rates increased across British manufacturing by 31 per cent and in construction by 45 per cent. (Tombs & Whyte, 2010, p. 18)

OE safety standards tend to prescribe or guide the details of particular practices, but standards can have a wider focus. Industry and proprietary standards aimed at overall safety systems have entered the space vacated by government inspections (Tombs & Whyte, 2010, p. 17). Safety Management Systems (SMS) were an outgrowth of Total Quality Management (TQM). For an auditor or manager, to examine an organisation's SMS could be simpler than examining the detail of its safety practices. While they might save money, evidence on the effectiveness of SMSs in reducing injuries is mixed (Tombs & Whyte, 2010).

Perhaps not surprisingly, given the range of SMS packages available and individual variations in how any package is implemented, Davis (2004) argues that "in some cases SMS may exert a negative influence on health and safety" (p. 95), particularly when the introduction of a system amounts to a more management-centred approach. As is the case with safety systems generally, adoption of an SMS is not necessarily contingent on effectiveness at reducing injuries:

> First, commercial organisations and consultants aggressively promote these products. Second, it is precisely these types of SMS that are likely to prove popular with management since they emphasis management control and provide relatively easy tools to measure progress. And third, even though employees are frequently unhappy with such systems, it appears that they are usually unable to resist them. (Davis, 2004, p. 95)

Approached in the same way they would be in the event of a preventable fatality, published safety standards, whether specific to an element of outdoor education,

such as lifeguarding, or aimed at overarching safety processes in an organisation, are not substitutes for case-based fatality prevention knowledge. Rather, the appropriateness and effectiveness of any proposed standardization must be evaluated in the light of case-based knowledge.

3.11 Taking All Reasonable Steps to Prevent Any Fatality in OE

Strict aversion to fatal incidents, as distinct from acceptance of some risk of tragedy, requires all reasonable prevention measures be taken. Determining what those measures are, in any given circumstance, requires knowledge of lessons derived from past fatal incidents. The following three chapters provide a detailed introduction to case-based prevention knowledge.

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Chapter 4
Multiple Fatality Incidents on School and Youth Group Camps and Excursions – Water-Based Activities: Lessons for Prevention

4.1 Introduction

In this chapter I consider multiple fatality incidents on youth outdoor excursions and camps (OE), which involved water-based activities. Immersion deaths comprise a substantial proportion of OE related fatalities, perhaps not surprising when considered in a global context; according to the World Health Organization (2014), more than 40 people drown every hour. The incidents examined in the chapter are distinguished by multiple victims, by youth involvement, and in particular by an identifiable organisation responsible for devising activities, choosing the environment, and arranging supervision.

In order to reveal patterns that can inform prevention, I have brought together incidents that were widely separated in time and space, and which involved not only different organisations but also different kinds of organisations. While lessons from some tragedies might have travelled far and endured, unless actively pursued many lessons would have limited reach and could fade over time. This chapter contributes to that pursuit.

4.2 Preventability of Immersion Deaths

The World Health Organization (2014) classifies all involuntary immersion deaths as preventable, but actual prevention requires somebody capable of acting and in a position to act. After any catastrophic outdoor education (OE) incident, in which young people were in the care of an organisation and supervised by specific individuals, it likely that investigation and public discussion will focus on decisions and actions of the supervisors and the organisation. Prevention of immersion deaths is often self-evidently a matter of thwarting immersion or timely rescue, which means

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focus will inevitably shift to second order considerations around programming and supervision – how the group came to be in a hazardous situation, and why those in a position to act failed to prevent deaths. The incidents examined in this chapter are not necessarily very different from numerous non-OE related incidents, except that they are distinguished by the involvement of an OE organisation with some or all responsibility for the circumstances of the incident. In fact, in the case of an immersion incident not involving ferries or other large-scale operations, an OE organisation and its staff would usually be best placed to have prevented that particular incident. The immersion deaths considered in this chapter were local, human-scale tragedies amenable to action by small groups and individuals on the scene.

I searched online for relevant incidents that occurred anywhere in the world since 1900. There will have been incidents that my search terms failed to turn up, incidents that were not reported, reports that had not been digitised and reports that were not in English. Although as I accrued incident reports each additional incident tended to confirm existing patterns, it is possible that I missed whole classes of incidents occurring in different geographic regions where English is not spoken or reports are not available online.

There were more brief reports in English of relevant incidents in India than I have reported here. Approximately 76,000 drowning deaths occur in India annually, or 7.6 per 100,000 head of population (Peden & McGee, 2003). Some of those deaths occur when a teacher has taken a group to the seaside, or to a river to bathe. A study that considered fatality prevention for those not residing in high-income Anglophone countries would have to account more for social, cultural, economic and geographic differences than I have been able to do here.

I found few primary sources on the public record, such as witness statements, interview transcripts, field observations, or documents such as safety plans and weather reports. I found a small number of detailed secondary sources, such as coroner's narratives, investigation reports, or monographs. In other cases I found only news reports written prior to any investigation or inquest. It is likely that some reported details were wrong, and that some missing detail, if known, would change how an incident could be interpreted. Brief reports can help to show patterns helpful to future prevention, but where limited information is available great care should be exercised not to draw inferences about the actions of those involved. Even in well-described cases knowing what those involved were thinking, and understanding how they saw the circumstances they found themselves in, will always be a matter for interpretation.

There may be some distinctive elements of OE related immersion deaths, but drowning prevention more generally is a global problem. Drowning is a major cause of unintentional death in children and youth (Bierens, 2006; Weiss, 2010; World Health Organization, 2014). According to the World Health Organization (2014), at the global level drowning is highly preventable although evidence for the success of broad-brush public health initiatives, such as swimming lessons, pool fencing legislation, or personal flotation device (PFD) legislation is mixed (Moran, Quan, Franklin, & Bennett, 2011; Wallis et al., 2015; Weiss, 2010). There is debate about

what public health measures can effectively reduce drowning rates, but not about whether immersion deaths are preventable in principle.

Drowning prevention is most demonstrably effective when prevention measures are specific to a particular hazardous situation, because drowning is circumstantial. For example, in order to determine whether PFD use can reduce deaths across an at-risk population it is necessary to identify sub-groups differing only by PFD use. Cummings, Mueller, and Quan (2011) examined records of boating accidents in which some passengers wore PFDs and some did not, and found that overall for individuals involved in the same boating accident, one not wearing a PFD was twice as likely to drown as an individual wearing a PFD. PFD use does not absolutely prevent immersion death because although a PFD can extend survival time in the water, humans cannot survive indefinitely in water if self-rescue or rescue do not eventuate. While a pattern of lives saved by PFD use is difficult to establish, instances where a PFD would have improved a victim's chances are readily identified. The potential effectiveness of life jackets in particular circumstances was evident soon after the first such devices were invented and deployed by lifeboat crews in the nineteenth century (Golden, 2004). Even a relatively universal measure such as pool fencing requires attention to local detail to be effective. Pool fencing can logically reduce deaths of small children – one can observe a fence keep a small child away from danger, and properly designed 4 sided fences with working self-latching gates have been shown to protect children up to the age of 3 (Wallis et al., 2015). However:

> [L]aws and ordinances regarding pool fencing may have dangerous loopholes. Perimeter fencing with self-locking or alarming doors between the house and pool area are often considered acceptable, and in some locales, pool covers can substitute for a fence. Often, the fence law pertains only to new pool construction or to homes in which a young child is actually living at the time of the pool installation. (Weiss, 2010, p. 5)

In a review of the literature on interventions to prevent child and adolescent drowning, (Wallis et al., 2015) observed:

> Pivotal to any prevention effort is an understanding of where, how and why drowning occurs within that sequence of events, and what associated factors may affect the outcome. Consequently, any prevention effort must take into account risk factors such as age, aquatic location, behaviour, proximity of water, social and physical environmental factors. (p. 195)

Some evidence for the effectiveness of public health approaches to reducing drowning can be obtained by comparing rates in different countries. Public health approaches can, of course, be designed to focus on prevention directed at specific risks. Rates of childhood and adolescent drowning vary greatly between countries (Rahman et al., 2009). More immersion deaths per head of population occur in low-income countries than in high-income countries, possibly due to more effective prevention measures in the latter, but some differences could be due to differences in exposure – only those in the vicinity of water are at risk of immersion death. Morgan (2011) examined drowning risk relative to exposure, and estimated that if drowning risk in Australia was calculated per hour of exposure to water, then hour for hour of exposure the risk of drowning was many times greater than the risk of death in a road traffic accident.

Some national differences in drowning rates cannot be explained by differences in exposure. Ellsäβer and Berfenstam (2000) compared childhood drowning prevention in Germany and Sweden: "despite the large number of lakes and inland waterways [in Sweden] … in the period studied, drowning mortality for children aged 1–4 years was three times higher in Germany than in Sweden" (p. 42). They attributed Swedish success in reducing childhood drowning to well funded, well-conceived national prevention programs working in concert with local networks.

Changes over time provide further evidence that prevention measures can be effective, particularly when reductions in drowning correspond with increasing participation. Reductions in drowning rates over time in Australia are almost certainly attributable to incremental improvements in drowning prevention. Between 1920 and 2007–2008 drowning deaths per 100,000 people dropped from 8.76 to 1.32 deaths, with a continuing downward trend. Between 2002–2003 and 2006–2007 the rate per 100,000 people dropped from 1.61 to 1.23 (Franklin, Scarr, & Pearn, 2010).

It is likely that the preventability of any OE related immersion death would be measured against self-evident possibilities to avoid immersion or rescue a victim. In most high-income countries, OE deaths will also be measured in the light of steadily improving drowning rates in the wider community, and against accumulating evidence that some, if not all, essential elements of prevention fall within the responsibilities of an OE program. Prevention measures work better when focussed on particular kinds of hazards and at-risk groups. Preventing particular deaths can depend on action determined by hazardous conditions and risky behaviour at a particular place and time. The domains with which an OE program concerns itself – activities in a particular location – are precisely those in which prevention of immersion deaths can be best achieved.

Safety around beach environments provides a well-studied example of the essential role of local knowledge and supervision. Short and Brander (2006) point out that assessing risk in beach environments requires attention to the nature of the "readily identifiable and predictable" (p. 152) physical hazards and, more problematically, to the behaviour of beach-goers. It follows that supervision might be necessary to monitor behaviour. Moreover, some physical hazards are transient, also requiring monitoring:

> Each beach type has a characteristic and predicable combination of wave-tide processes and morphological character such as bar, trough, or channel. The physical character of the beach and surf zone and its processes in turn determine the type of hazards that prevail. These include transient hazards such as breaking waves, wave bores, and associated surf zone currents, particularly rip currents. Morphological hazards such as absolute and variable water depth, and permanent hazards such as headlands, rocks, reefs, and structures are also included. (Short & Brander, 2006, p. 153)

The singular importance of direct supervision and monitoring follows from Wallis et al.'s observation (2015) that prevention of drowning among young people requires attention to "age, aquatic location, behaviour, proximity of water, social and physical environmental factors" (p. 195). An OE organisation might assume responsibility for some necessary safety decisions, such the choice of activity, and

location, but in some circumstances, such as beach activities, any prevention measures will be insufficient unless suitably capable and empowered adults are deployed to observe and assess transient conditions and participant behaviour.

As might be expected evidence for the potential effectiveness of supervision has been derived from observations of supervised situations and by inference from examination of fatal incidents. Hartmann (2006) argued that drowning rates along Israel's Mediterranean shore were high by world standards, and high relative to other Mediterranean countries, due to knowable environmental conditions: "For the non-scientific observer, drowning is an event of pure randomness … the best correlation is, however, not with human factors but rather with an environmental signal... hazardous rip currents" (p. 1513). However, the drowning rate over several decades has been close to zero at specific Israeli beaches with strictly controlled lifeguarding mandated by bathing laws introduced in 1964. After the introduction of the laws, which provided for both guarded and unguarded beaches, the rate of drowning in Israel approximately halved (Hartmann, 2006), with the still-high overall rate of drowning attributable to non-guarded beaches. Branche and Stewart (2001) report similar instances of zero to low drowning numbers at lifeguarded beaches in the United States. In Australia no drowning occurred at lifeguarded beach areas between July 2012 and June 2014 (Surf Lifesaving Australia, 2013, 2014). The number of rescues performed provides another indication of the potential effectiveness of supervision by lifeguards. Surf Lifesaving Australia volunteer lifesavers and professional lifeguards performed over 12,000 rescues and undertook over 1.2 million preventative actions in 2014–2015 (Surf Lifesaving Australia, 2015).

Lifeguarding can fail, or be ineffective, but the conditions for probable success are observable and long established. Israel's demonstrably effective mandated requirements for designated bathing beaches were established in 1964. They include a tower at the centre of an 150 m section of beach occupied by at least 3 qualified professional lifeguards, mandated equipment, on-duty paramedic, landline and wireless communication and access for emergency vehicles (Hartmann, 2006). Pelletier and Gilchrist (2011) examined lifeguarding failures at swimming pools in the United States between 2000 and 2008 and identified 140 deaths. Schwebel, Jones, Holder, and Marciani (2010) observed that pool lifeguards in the United States must:

> … sit for long hours, often in hot weather, watching for a very rare event to occur. A large body of scientific literature documents the incredible cognitive and perceptual challenge this presents to human beings. … With lifeguards, the situation is compounded by the fact that most are young, fairly inexperienced, and poorly paid. As adolescents and young adults, many lifeguards are developmentally unprepared to handle the responsibility of their positions. (p. 1)

Spot checks of pools in the United States found mostly high quality surveillance but also recorded numerous instances of inattention (Schwebel et al. 2010).

Pia (1984) observed that deaths under lifeguard supervision involved intrusion of other duties, distraction from surveillance, and failure to recognize what drowning can look like. In particular, he observed that active drowning victims (as distinct

from those who have become unconscious due to a heart-attack, for example) are unlikely to either call for assistance or to wave. Lay observers might not recognize that a person was drowning. He described instinctive, ineffectual arm movements, thrashing the water with laterally extended arms:

> The person usually manages to turn towards shore. The body is upright with no apparent supporting kick. The person's head sinks lower and lower in the water as the drowning progresses. The arm movements become less visible and more feeble, until only the top of the head and the grasping hands can be seen. The process can last as long as 60 seconds and as short as 20 seconds. (Pia, 1984, p. 2)

More generally supervision failures contribute to most childhood immersion deaths in which victims had been expected to be around water (Weiss, 2010), almost always due to momentary lapses of supervision rather than its complete absence. Bennett and Branche (2007) point out that effective supervision in any given situation requires ability to recognize and assess a potentially dangerous situation and might require rescue skills, attributes which parents or other lay supervisors might lack. By implication, supervision by a professional supervisor, such as one deployed by an OE organisation, should be preferable, assuming the bar for supervision is set higher for professionals.

OE practices specifically developed to reduce immersion deaths were introduced into summer camps in the United States in the 1920s and 1930s, guided by the ethos and expertise of the American Red Cross. Safer waterfront designs and better supervision were driven by community aversion to childhood accidental deaths and increasing professionalism of summer camps (Van Slyck, 2006). Prevention of immersion deaths in OE is a self-evident social expectation, but it is also reasonable and feasible given evidence that the most effective drowning prevention is a function of the immediate environment and actual behaviour of individuals, which is of course, precisely what an OE program takes responsibility for.

The application of lessons learned from particular tragedies to the prevention of immersion deaths was well established in the nineteenth century. Deaths at sea were a recurring source of anxiety for immigrant societies like Australia. According to Staniforth (1992, p. 57):

> There were a total of 22 ships wrecked in the nineteenth century which resulted in some deaths among the passengers on the voyage to Australia … [t]hese wrecks resulted in 3,396 deaths out of approximately 1,600,000 passengers who made the voyage.

A measure of safety resulted from government requirements that emigration and convict ships were good quality, not overloaded, and had certified officers. Actual shipwrecks also pointed to necessary local responses, including better charts, lighthouses, navigation markers, pilot services, and onshore lifeboat services (Staniforth, 1992). Staniforth (1992) pointed out that mortality was affected by "remote locations particularly mid-ocean, environmental effects such as extreme cold, timing effects such as night time, psychological effects such as panic" (p. 58).

4.3 Cold Water Immersion

Shipwrecks, which involve multiple immersions, have directed some research attention to what determines survival, including the effect of water temperature. Massive losses occurred in the first half of the twentieth century due to two world wars, many in cold water. Losses of British merchant marine crew in the Atlantic numbered 33,000 during World War II (Schofield, 1981). In 1942 Allied shipping losses in the Atlantic peaked at 1160 ships. A review of all British losses at sea during the war found that two thirds of casualties survived the action that sank their ship but failed to survive in the water (Golden, 2004). Post war research into survival in cold water has underpinned some public awareness campaigns (e.g. National Water Safety Congress, 2013), but the role of water temperature, and human responses to cold water, has not been consistently reported or examined in OE immersion death reports. While lay individuals might not have an expert understanding of cold-water hazards, it would be problematic if any OE organisation involved in water activities did not act in accordance with long established research findings.

Raffan (2002), in his influential account of the 1978 Lake Timiskaming tragedy, argued that the dangers of cold water had been understood to some extent at the time of the Balsam Lake tragedy, in 1926. The deaths of ten boys and one leader on Balsam Lake had widespread reverberations for open water canoeing, particular the use of large "war" canoes, in Canada. Commenting on the choice of craft in the Timiskaming tragedy three decades later, he observed "it is astonishing that no one remembered that disaster sufficiently to admonish [those who decided to use large canoes on Timiskaming]" (Raffan, 2002, p. 115). Raffan's (2002) book included a concise summary of cold water hazards, drawing in particular on work by Giesbrecht (2000).

Tipton (1989) reviewed the literature on initial responses to cold-water immersion, which occur in 4 stages:

1. Initial responses to immersion (0–3 min),
2. Short-term immersion (3–15 min),
3. Long-term immersion (>30 min) and
4. Post immersion.

Normally, the possibility of hypothermia does not occur until stage (3) (30 min); before this, the immersed individual must survive the initial responses to immersion. (p. 1)

Tipton (1989) reported that cold shock (Stage 1) increases blood pressure and heart rate within 30 s to 2 min, which poses a risk for those with hypertension or coronary heart disease. Respiratory responses, comprising an immediate gasp reflex followed by uncontrollable hyperventilation, are a greater threat because they put all victims at risk. The gasp response drastically reduces maximum breath holding

time, which puts victims at great risk if there is a period of forced immersion or choppy water. Tipton (1989) concludes: "cold-shock response can result in the death or serious incapacitation of an individual long before general hypothermia develops. As such, this response is probably responsible for the majority of annual open-water immersion deaths" (p. 6). Cold shock deaths cannot be distinguished from other immersion deaths at autopsy (Piette & De Letter, 2006), which makes it more likely that cold shock could be overlooked as a contributing cause.

Cold shock occurs regardless of swimming ability, but varies with individuals and is strongly temperature dependant (Button, Croft, Cotter, Graham, & Lucas, 2015; Mekjavić, Prairie, Burke, & Lindborg, 1987). Abrupt immersion produces a particularly strong reaction (Goode et al., 1975). A study in 1981 of UK expert canoeists (Baker & Atha, 1981) found 54 of 85 who had capsized in mid winter had experienced breathing difficulties and 5 had lost consciousness (Baker & Atha, 1981). More recently, Giesbrecht (2000) records that in some cases death can occur from heart failure at this stage.

Swimming failure (Stage 2) follows initial gasp and hyperventilation responses. Earlier research had found that no swimmers could swim for 12 min at 4.7 °C, in some cases failing abruptly, although they report a war-time case of a survival for 9–14 h, possibly due to an overcoat and body fat (Keatinge, Prys-Roberts, Cooper, Honour, & Haight, 1969). A later study found swim failure occurred after the initial gasp response and hyperventilation, but before swimmers were even moderately hypothermic, contradicting earlier reports that had attributed swim failure to hypothermia (Tipton, Eglin, Gennser, & Golden, 1999).

Victims who survive cold shock and remain afloat will eventually suffer from hypothermia, although the credo "[n]o body is dead until they are warm and dead" (Hilmo, Naesheim, & Gilbert, 2014) has been demonstrated through good outcomes for a victim whose core temperature was 13.7 °C, and in another case in which resuscitation resulted in the return of spontaneous circulation almost 7 h after hypothermic cardiac arrest (Hilmo et al., 2014). A study of the victims of the Lakonia, abandoned at sea in 1963, found that many of 124 deaths had occurred by 7 h in the water of over 17 °C, most by 15 h; 23 survivors entered the water (Keatinge, 1965).

In a more recent review prepared for Transport Canada, Brooks (2003, pp. 1–2) summarized:

> Even though there are well established teaching programs, good regulations and much improved life saving equipment, there are still in the order of 140,000 open water deaths each year. What has been overlooked is the significance of the first two stages – cold shock and swimming failure as a cause of death. The severity of the effects of cold shock is directly proportional to the water temperature peaking between 10–15 °C. …The layperson and accident investigators are often surprised that some people do not survive a lengthy immersion. Theoretically they are within the "safe" boundaries of one or more of the survival curves that have been developed to predict death from hypothermia. These people do not die of hypothermia per se. They die from a variety of problems in which moderate hypothermia is enough for them to lose their physical ability and mental determination to keep their backs to the waves. They thus inhale the next wave and die from drowning in spite of wearing a life jacket … entry into water below 15 °C should be avoided. Direct entry into a life raft should be the objective. …[o]perating a vessel close to the shore or in

> groups or the carriage of EPIRB are not reasons for waiving this requirement because death from cold shock will occur within 3–5 minutes, swimming failure in under 30 minutes.

Brooks (2003) pointed out that within 10–15 min of immersion, due to loss of manual dexterity, it could become impossible to perform self-rescue actions such as activate life jacket inflation, cling to a line or operate a flare. Wider understanding and better prevention of cold related immersion deaths has been impeded by failures to investigate whether cold shock or swimming failure had contributed to deaths:

> It has now become clear that over half of the immersion-related deaths occur during the first two stages of immersion, i.e. cold shock and swimming failure…. [but] investigators still concentrate on the cause of the marine accident and not the precise cause of an individual's death. It is still hard to accurately document at what stage of the immersion death occurred. This is because little history has been gathered from survivors or by investigators…. [t]he problem is further compounded by the fact that such a good job has been done educating people on the dangers of cold water, immersion and hypothermia, that even the pathologists now list the cause of death as hypothermia, even though the cold, wet body on their autopsy table actually died from cold shock or swimming failure and drowning (Brooks, 2003, p. 16)

Considered in the overall context of what is known, or what is knowable, about the prevention of immersion deaths, young people in the care of a dedicated organisation that can choose how, when, and where encounters with water environments occur, and which can monitor, guide and supervise those encounters, should be particularly safe. Thus the question to be asked of the incidents in this chapter is not only what would prevent such accidents in the future, but also what role different actors can play, particularly field staff and their managers. I have excluded incidents such as ferry disasters involving OE groups as passengers, because different considerations apply to those, and OE organisations and staff might not be best placed to prevent those incidents, other than as informed consumers.

Given that the potential hazards of water environments have been long known, and the possibility of prevention has been long proven, the investigation of OE related immersion deaths tends to focus on the role of the OE organisation and its staff. In the past, debate and reaction has occasionally extended more widely to consider broader safety structures affecting OE, and other agents such as schools, educational authorities, industry associations and government. The 1993 Lyme Bay tragedy is an example of the latter. It led not only to the first convictions of a company and company director for manslaughter in the UK, but also to specific legislation designed to regulate the provision of adventure activities for young people by commercial organisations. The Lyme Bay tragedy not only serves as an introduction to questions that relate OE to issues of regulation and compliance in the broader community, but also provides a particularly robust benchmark of community standards – very few OE incidents result in criminal convictions.

Lord Justice Swinton Thomas outlined the facts in the Court of Appeal ruling which upheld the convictions of the company and the Company Director, and reduced the prison sentence of the Company Director from three years to two:

> On March 22, 1993 four school children aged 16 and 17 were drowned in a canoeing accident in the sea. They were students at a school in Plymouth, and were four of a party of 23

> students who were engaged in an activity holiday at the [St. Alban's] Centre. They were accompanied by two teachers from the school. On the morning of March 22, eight students, a teacher and two instructors—Mr Mann and Miss Gardner—went on an open sea canoeing trip from The Cobb, at Lyme Regis to Charmouth. The distance is about a mile and a half and involved going across the open sea. They set out at about 9.30 a.m. Very early on the teacher got into difficulties, being unable to manage the canoe, and he repeatedly capsized. Mr Mann stayed with him and Miss Gardner went on with the students. Undoubtedly Miss Gardner was very inexperienced, and that was one of the primary facts relied upon by the prosecution in their case against Mr Kite [the company director] and Mr Stoddart [the centre manager], albeit that the case against each of them was put differently. The group drifted out to sea and got into difficulties. The canoes were swamped. It was very cold, and four of the young students were drowned. Miss Gardner and the other children were rescued.

Miss Gardner, the female instructor (FI) had never previously paddled on the sea. She had completed a British Canoe Union (BCU) one star personal skills course (an encouragement award) 14 days previously (Fulbrook, 2005; Jenkin & Jenkinson, 1993). Mr. Mann, the male instructor (MI), had more experience, but had the same elementary award. He said in evidence he had never received any training to take people out on the open sea (Jenkin & Jenkinson, 1993). The company had previously employed the FI as a cleaner. In answer to a question in court about emergency procedures she replied "'I am not sure I was too familiar with what an emergency was'" (Fulbrook, 2005, p. 24).

There is very little room for doubt that the incident would not have occurred had qualified and experienced staff been deployed. The BCU requirement for leading inshore sea trips was Senior Instructor (Sea) (Jenkin & Jenkinson, 1993). The local education authority (LEA) supplied codes of practice for water based activities with the same requirement, and also requirements that students should be well practiced in the use of life jackets, that craft should have sufficient buoyancy and winds should not be in excess of force 3 (Jenkin & Jenkinson, 1993).

A qualified instructor would probably not have set out in the forecast moderate wave heights and offshore wind of force 3–4. Had a trip proceeded, a qualified instructor would probably have required an escort boat for a novice group. A qualified instructor would probably have ensured the life jackets were inflated and the kayaks had additional buoyancy. A qualified instructor would probably have carried flares. A qualified instructor would probably have ensured there was a clear arrangement in place should the group fail to return at the expected time… the deficiencies of the trip were so comprehensive – perhaps excepting the fact the students wore wetsuits, at their own insistence – that none of the reports and commentary on the incident has expressed doubt that the trip should not have taken place (e.g. Fulbrook, 2005; Jacobs, 1996; Jenkin & Jenkinson, 1993). Debate and discussion focused instead on how such gross negligence[1] occurred.

In spite of the notoriety of the incident it is not easy to obtain a detailed account. A report prepared by for the Devon County Council, obtainable from the council archives, is the most comprehensive I am aware of (Jenkin & Jenkinson, 1993). According to that report, the group planned to paddle from Lyme Regis harbour to Charnmouth, a distance of approximately 4 km. The coast is crescent shaped, and a

[1] "R. v Peter Bayliss Kite", No. 295 (Cr. App. R.(S) 1996).

direct line would have taken the fleet no more than 500 m from the shoreline. There were eight students aged 15 or 16, one teacher, and the two instructors. The students and teachers were novices. The group were in general purpose kayaks, without spray decks. The teacher and instructors were in shorter, lower volume, less stable craft. The instructors wore cagoules and had spray decks fitted. The group left the shore on 22 March 1993 at around 10.30 am. Forecast winds were NW 2 or 3 increasing to force 4 then locally force 5, sea slight to moderate. Sea temperature was 10 °C, maximum air temperature 11 °C. The planned direction of travel was NE, so the wind was offshore.

Jenkin and Jenkinson (1993) provide the following account:

> Very soon after setting off it appears that one of the students … capsized his canoe. The water was shallow enough for him to stand in. With assistance from [the male instructor, MI] he got back in and rejoined the group … Almost immediately thereafter [the teacher, T] capsized; with the assistance of [MI] he got back in; he again capsized; again he got back in; the rest of the group tried to hold position so that [T] and [MI] could rejoin them; [MI] attached a line to [T]'s canoe in order to tow him to the group but still [T] capsized; the effort of constantly climbing back into his canoe was seriously debilitating for [T]; he was sick in the water; he recalls the whilst the rest of the group was still in sight he suggested that he and [MI] return to shore as he felt he was a hindrance to the group; [MI] appears to have thought it important to remain as a group and therefore directed his efforts to keeping [T] afloat; perhaps so that they would not become separated the rest of the group "rafted up" with the exception of [the female instructor FI]; in the event [T] and [MI] were unable to rejoin the group which eventually disappeared out of sight.
>
> Because the canoes in the raft were not fitted with deck lines nor had any other lines available they could not be tied together. To stay together members of the group had to cling on to adjoining canoes. Because the canoes did not have spray decks sea water started to fill the cockpits of the canoes – particularly those on the raft's outer edges. Initially, the outer canoes were paddled by two of the girls. Fairly soon the two boys in the group moved their canoes to the outer edges of the raft. [FI] joined the raft in the middle.
>
> Before too long, the canoes on the outer edge of the raft filled with water, capsized, and were abandoned … the two boys in the group were the first to be in the water. They then laid across the remaining canoes, one to the front and one to the rear. For greater stability paddles were placed across the canoes….
>
> However, with the additional weight of the two boys the remaining canoes would have sunk lower in the water. The outer canoes in the raft began to take an increasing amount of water. Canoeists in the outer boats moreover were attempting to paddle indian (sic) style; the physical demands were increasingly severe.
>
> One by one canoes filled with water, capsized, and were abandoned until eventually just one canoe, paddled by [a female student, who survived], remained upright. Eight canoeists attempted to cling to it. With no deck lines they could only hope to cling to a slippery superstructure – an impossible task as they grew increasingly colder and wearier. They decided to capsize [the last] canoe with a view to climbing onto the upturned boat and attempting to paddle in to land. The attempt failed. Not all were able to climb on. The canoe went round in circles …

> … the raft, albeit decreasing in size, was driven further from the shore [as the wind slightly strengthened and turned offshore as forecast]. At the same time further inshore [MI] was struggling to keep [T] afloat; at some stage [T] lost his paddle; for [MI] to have left [T] would, in all probability, have resulted in early capsize for him – so that even if [MI] had the ability to paddle in to shore against the wind he would have been concerned for the immediate safety of his charge.
>
> Nine canoes capsized during the course of the day; eight were subsequently found within some proximity of most of the group. When a canoe capsizes it floats, often on its side, immediately below the surface of the water. The canoes were coloured red; they were, however, virtually invisible to other shipping – indeed the crew of the lifeboat which was directed to pick them up by a helicopter virtually ran over them before spotting them.
>
> Nine canoeists were in the water; eight students were wearing yellow lifejackets. Upon examination after retrieval from the water it was clear that with the exception of one lifejacket, which had a small amount of air in it, none had been inflated….
>
> No canoeist wore a helmet; in consequence they were almost certainly less visible than the capsized canoes from above. From shore, they would be almost impossible to spot.

Table 4.1 summarizes times reported by Jenkin and Jenkinson (1993). It should be noted that in water of 10 °C the chances of survival for 4 h would have been slim for individuals without wetsuits, unless well endowed with body fat (Brooks, 2003; Tarlochan & Ramesh, 2005). It seems possible that more students could have survived had the Coast Guard been alerted earlier, and provided with more accurate information.

There were criticisms of the Coast Guard response.[2] Those requiring rescue might improve the effectiveness of rescue by providing details about a group and its plans in advance, but calling for external assistance sooner rather than later, and by providing accurate and complete information, each of which were deficient in the Lyme Bay case.

Four students and three adults were rescued, and survived the Lyme Bay tragedy. This volume examines fatal incidents, but it should be noted that there have been similar incidents in which all survived, due to timely rescue. Table 4.2 briefly describes five such incidents. I have not searched exhaustively for near-miss incidents. The Lyme Bay tragedy could have been a near-miss for the deceased, had the rescue eventuated sooner, and of course was a near-miss for the survivors, all of whom could have died without rescue; any of the incidents in Table 4.2 could have had multiple fatalities, had rescue taken longer.

External rescue is by definition out of the control of OE organisations and staff; from that perspective it must be considered possible that optimal rescue might not be available, or might not eventuate. The Lyme Bay rescue involved a level of organisational scale and complexity that the actual canoe trip did not.

An accident report compiled from multiple witness statements might tempt the reader to view the incident from a magisterial position that transcends the limitations of any one actor's situation. Actual prevention is constrained by what is

[2] "R. v Peter Bayliss Kite", No. 295 (Cr. App. R.(S) 1996).

Table 4.1 Chronology of Lyme Bay incident (based on Jenkin & Jenkinson, 1993)

10.30	Group departs Lyme Regis	
11.00	Teacher and male instructor separated from the rest.	
12.30	*Time the group expected to have returned from Charmouth*	Assuming a 15 min stop at Charmouth
13.30	All canoeists in the main group capsized and in the water by this time	
14.43	Capsized canoe found by fishing vessel.	Coast guard first alerted to possible problem
14.58	Coastguard learn that group from St. Alban's centre overdue/missing	
15.07	Coastguard told by centre that ten (sic) overdue on trip from Lyme Regis to Charmouth	Actually eleven. In evidence Coastguard said they were told group consisted of 7 18 year old boys with competent instructors, had flares, and that the wind was onshore
15.16	Ground search along coastline and from vantage points	Nothing sighted
15.36	Time Coastguard conceded in evidence helicopter and inshore rescue boat search should have commenced	
15.51	Portland helicopter scrambled	
16.08	Sea King helicopter arrives in search area	South of Golden Cap
16.11	Lyme Regis inshore rescue boat launch request	
16.29	Second helicopter requested by first	Second Sea King, RAF Wessex from Chivenor and Lynx from HMS Beaver join search subsequently
16.30	Rescue boat launched	
16.55	Empty canoes sighted	Approx 6 km SE from Lyme Regis approx 1.5 km offshore
?	Inshore rescue boat reaches canoes. No persons found.	
17.30	T and MI instructor sighted in canoes off West Bay in Bridport	11–12 km from Lyme Regis approx. 500 m offshore
17.34	First of main group sighted and lifted by helicopter	Each of the main group must have been in the water for at least 4 h
17.38	Inshore rescue boat recovers and puts T and MI on shore	MI was holding T up.
17.46	Five more persons recovered by helicopter	
18.04	Two more persons recovered by helicopter	
18.44	Last person sighted by fishing boat and recovered by helicopter	Student, survived after intensive care.

Table 4.2 Some near-miss open water incidents similar to the Lyme Bay tragedy

April 2006	16 year 9 students, 2 teachers, 2 instructors (West Coast Surf School / Lara College) on sit-on-top double ocean kayaks blown 5 km out to sea in forecast severe weather, off Torquay, Victoria, Australia. Alarm raised by two passing jet-skis. Group were rafted up when rescued, all out of the water. Rescued by two jet-skis in two runs, assisted by rubber ducks on the second run. Helicopter spotlight marked the group for the second run in poor visibility and worsening conditions.	Dingle (2006)
2 July 2007	15 year 12 students and 5 supervisors from Westminster College, Adelaide, in sea kayaks overturned in rough seas and high winds on Victor Harbour, South Australia. Some swam to Granite Island, others rescued by two helicopters. Severe weather warning in place when the group set off. School commissioned an independent report.	ABC (2007)
26 May 2011	"On the morning of Thursday 26th May 2011, a group of pupils from St. Brigid's Girls National School, Glasnevin, Dublin 2 arrived at the Neptune Outdoor Centre in Clogherhead, Republic of Ireland, for a day's adventure sports. The group consisted of 27 girls from sixth class and one teacher. One group of 7 girls were taken out in kayaks by one instructor. In the rough conditions, all the kayaks capsized and the combined effect of the wind and remainder of the ebb tide was to carry the kayaks and their occupants away from the shore out to sea. The group was subsequently rescued by the RNLI, brought ashore to Port Oriel Harbour…. A seventh girl, who had become separated from the group managed, with some difficulty, to make her own way ashore" (MCIB, 2012, p. 4). Gale and small craft warning in place, wind offshore.	MCIB (2012)
June 21 2012	17 MacKillop Catholic College, Busselton, students and their teacher rescued from Hardy Inlet, Augusta, Western Australia, when two canoes capsized in forecast squally conditions, resulting in four students in the water. A spokesperson for the school declared it was a "freak accident".	Manuel (2012)
May 2 2016	6 students and 2 teachers from Bauer College, Warrnambool, were rescued from 1 km offshore at Anglesea, Victoria, Australia, by off-duty lifeguards. The group had been unable to return to shore after setting out on sit—on-top kayaks with forecast severe weather.	(Martin (2016)

knowable and what individuals could do, given the circumstances they were in. Leaving aside that individuals can fail to do what someone in their position might have done, the Lyme Bay incident illustrates not only where knowledge and skills could be best deployed to prevent similar incidents, but also what could reasonably be expected of different actors. In the case of the Lyme Bay tragedy the repercussions were unusually wide ranging.

Before considering actors who had no direct involvement, it is worth reiterating that an expert leader could have prevented the incident, as could an expert at the activity centre with oversight of all activities on the day. Although only an adult with the group could have observed actual conditions and the unfolding of events, it has remained uncontested since the tragedy that the group should never have taken to the water. The planned undertaking was local, and small scale. It involved a well-understood environment, with known (or knowable) hazards. The requisite expertise, through the British Canoe Union, was established, codified, and relatively uncontested (Jenkin & Jenkinson, 1993). There were no serious obstacles to cancel-

ling the trip. All, or almost all, of the safety deficiencies that emerged in hindsight would have been observable and comprehendible by an expert on the ground. The undertaking did not require organisational complexity; it did not involve inherently opaque processes; it did not depend on tightly coupled elements; it involved processes that were linear and well understood.

In a crucial distinction from what are sometimes described as systems accidents in highly complex technological systems such as space shuttle launches (Perrow, 1999 (orig. 1984)), in principle individuals acting alone could prevent Lyme Bay type tragedies at almost any point in the decision-making process. For example: (1) A parent could refuse permission on the grounds of insufficient information. A difficulty for any parent would be lack of knowledge, compounded if a program has been outsourced to another organisation that a parent would have had no direct communication with. (2) A school administration or Principal could deploy at least one expert to evaluate and verify fatality prevention measures in any outside program (3) A school OE coordinator could determine whether staff employed by a centre had sufficient expertise and experience. (4) A company director could have done what Peter Kite was gaoled for not doing, including taking whatever steps were needed to be sure the program manager was capable of preventing fatal incidents, and consistently took all steps to do so. (5) A program manager could have prevented a trip from proceeding, given staffing and conditions. (6) A single capable staff member with the group could have prevented any deaths (7) Although not directly in the decision-making chain, those who contributed to staff training might evaluate whether more emphasis could be placed on ensuring trainees understand their limitations.

4.4 Open Water Catastrophic Incidents

Table 4.3 lists open water incidents qualitatively similar to Lyme Bay tragedy. Table 4.4 lists open water incidents that I have categorised loosely as less similar.

No two incidents are identical but there are many similarities in accounts of small craft on open water that capsize or are swamped. Once an individual is immersed, water temperature, flotation, and options for rescue matter more than what kind of craft the individual had been aboard prior to immersion, although some swamped craft provide better support than others.

It is likely that more of victims succumbed to cold, before drowning, than accounts indicate. Water temperature is not recorded in some case reports. Possibly squalls or storms contributed less than early newspaper reports indicated. Raffan (2002) noted that news reports of the 1926 Balsam Lake tragedy referred to a storm that he is confident never occurred. He argued that a crabbed paddle would have been sufficient to upset a large canoe.[3]

[3] Arguably, all narratives are constructions that attempt to link what are necessarily fragments coherently. See Gough (1994).

Table 4.3 Open water incidents A

Incident	Date	#	Location	Description	Sources
Sheppey disaster 1912	4/8	9	River Thames, Isle of Sheppey, England	5 adults and 24 Scouts from the 2nd Walworth troop rowing down the River Thames from Waterloo Bridge to Leysdown, Isle of Sheppey. Cutter overturns in a violent squall and 9 scouts die.	Walker (2009)
Big Pond Otis 1919	26/7	11	Big Pond, Otis, Massachusetts, USA	27 campers, Springfield Boys Club, in a small launch towing a rowboat boat, both overloaded. One capsized in choppy waters. 11 drowned.	Boston Daily Globe (1919)
Balsam Lake 1926	20/7	12	Balsam Lake, Canada	One adult and fifteen campers in the middle of Balsam Lake, in a large canoe. Capsized. All survived the capsize, clung to the canoe. Over the next 17 h 11 boys and a leader succumbed to cold and drowned.	Raffan (2002) and United Press (1926)
Chazy School Picnic 1927	3/6	5	Chazy Lake, USA	Interclass picnic for small high school. Five students and one teacher on Chazy Lake in a rowboat, caught by sudden storm. Boat swamped. Teacher rescued unconscious, clinging to upturned boat. All children died.	Chazylaketimes (n.d.)
Gardner Lake Tragedy1936	19/6	12	Lake Gardner, Marion, Maine, USA	End of school year picnic at Lake Gardner, Maine. 16 children on a boat which was struck broadside by wind when it left a sheltered area, spilling the occupants into the water. 1 swam to shore, 3 were rescued, 12 drowned.	Associated Press (1936)
Baltic Sea 1948	20/7	23	Baltic Sea, Poland	23 Boy Scouts on the Baltic Sea, Poland, died when high waves capsized two boats.	Associated Press (1948)
"Wangle III" 1950	19/8	10	Off Calais, English Channel, France	Unballasted whaler, probably overloaded, with buoyancy tanks removed and replaced with vehicle inner tubes, attempted a return crossing of the English Channel with 8 Sea Scouts and two leaders. Difficult cross-sea conditions, wind against the tide. Lost at sea. 6 bodies found, 4 never recovered.	Carpmael, Thomson, and Halliday (1951)

(continued)

Table 4.3 (continued)

Incident	Date	#	Location	Description	Sources
Oakville 1954	31/7	3	Oakville, Ontario, Canada	4 cutters from Oakville Sea Scouts on Lake Ontario caught by a storm. Flotilla scattered. 3 cutters and crew brought to safety from 5 km offshore. Large disorganised search for the missing boat, two children and one leader missing, found two bodies after several days, one never found.	Elliot (2004)
Lake Hume 1963	15/8	7	Lake Hume, NSW, Australia	12 OB participants 2 night canoe trip. 2nd morning. 1 canoe swamped, party beached canoes. Resumed journey, hit by severe squall, water temp 9 °C. Boats swamped. Two craft made shore, another's occupants climbed into a tree. Of six remaining in water, one survived after 4 h in water clinging to a tree. 2 instructors arrived after the capsizes, also perished attempting rescue after assisting 2 in tree.	The Sun (1963)
Timiskaming 1978	11/6	13	Lake Timiskaming, Canada	27 boys aged 11–13 and 4 leaders in 4 large canoes heading for James Bay on Lake Timiskaming, Quebec. Following wind and rough conditions. In a futile attempt to find calmer conditions attempted a diagonal crossing. One capsized, followed closely by a second that had turned around to assist. Later both of the other canoes capsized while attempting rescues. 12 boys and one volunteer adult leader died after succumbing to cold. Water about 10 °C.	Raffan (2002)
Gulf of California 1978	17/1	3	Gulf of California, USA	OB unaccompanied kayaking trip off Punta Pulpito, Gulf of California, 9 students. Multiple capsize in high seas and high wind. Self-rescue failed, 6 went for help, 3 died.	Eugene Register-Guard (1978)

(continued)

Table 4.3 (continued)

Incident	Date	#	Location	Description	Sources
Lake McNaughton 1982	6/8	6	Lake McNaughton, Canadian Rockies	29 Scouts in 5 patrols canoeing along Lake McNaughton, Canada. After 3 days wind and swells increased. Two leaders and 4 scouts from one patrol found floating in life jackets along the shore. Speculation that all succumbed to hypothermia while trying to empty canoes from the water.	Associated Press (1982)
Lake Alexandrina 1987	22/8	4	Lake Alexandrina SA, Australia	11 Scouts and Venturers including 1 leader and 1 other adult, 3 day canoe trip. 2nd day hit by severe squall 1 km from land, water temp 10 °C. 1 boat swamped, capsized, then others. 2 craft made it to shore, 1 survivor clung to craft for 2 h before landing, 2 swam/waded to shore. Other 4 drowned. Two survivors raised alarm, others rescued in the night, very cold.	Brown and Pearce (1987)
Lyme Bay 1993	22/3	4	Lyme Bay England	8 novice kayakers, two outdoor centre staff, one a former cleaner on her first sea trip, and a teacher, on open sea crossing in winter conditions in slalom kayaks without spray skirts. Off shore wind and tide. Group was wearing un-inflated life jackets. Kayaks had insufficient buoyancy. No powerboat in support. Fleet carried out to sea in heavy swell, dispersed, some capsized, some sank. Delayed rescue. Four teenagers died.	Fulbrook (2005)
Camp MacDougall 2003	31/5	2	Lake Huron, Canada	Nine Girl Guides in four aluminium canoes on Lake Huron. One canoe overturned, occupants taken in other canoes. Blown off course. Five rescued, still in canoes. Four found in water, hypothermic, two died.	Helwig (2004)

(continued)

Table 4.3 (continued)

Incident	Date	#	Location	Description	Sources
Gulf of Mexico 2005	26/2	2	Suwannee, Florida, USA	8 children and two adults from the Darlington School in a mixed fleet of kayaks, canoes, and motorized cataraft (pontoon boat) travelling along coast from Suwannee River. Motor cut out in deteriorating weather. Five craft tied to the cataraft, but one canoe had become separated. Bodies of two 14 year old boys found 18 km offshore. Water 15 °C.	Brink, George, and Tomalin (2005) and Helwig (2004)
Southern Cross Beach 2008	24/9	3	Southern Cross Beach, South Africa	School excursion. Nine students in four inflatable boats (Crocs). Three boats capsized in rough sea conditions. Six students rescued, three drowned, including one who slipped out of lifejacket when grabbed by rescue swimmer.	Steyn, Gerber, and Damons (2008)
Præstø Fjord 2011	11/2	1 +	Præstø Fjord, Denmark	2 teachers and 13 students, aged 16–18, from Lundby Efterskole were in a flat-bottomed dragon boat that capsized in Præstø Fjord attempting to return to shore after a weather change. Water 2 °C. Teacher died, 7 students were placed in artificial comas after suffering heart attacks from spending hours in the freezing water, many suffered brain damage. School and headmaster convicted of grievous bodily harm.	Wenande (2013)
Lake Tekapo 2015		2+		11 semester abroad students holidaying in NZ on a break rented sea kayaks on Lake Tekapo. Attempted to paddle to Motuariki Island. Wind and waves increased. Some craft capsized. Two died, including one who had swum back out to assist.	Sherwood (2015)

Table 4.4 Open water incidents B

Incident	Date	#	Location	Description	Sources
Croy Shore 1910	25/6	5	Croy Shore, Ayr district, Scotland	Sunday school excursion, group of 7 children and two adults pushed off the shore in an old, unseaworthy boat, which was blown a short distance off shore and sank. Five drowned.	Hastings (n.d.)
Oulton Broad Disaster 1914	5/6	6	Oulton Broad England	Four Sea Scouts (1st Carlton troop), two masters, and one instructor on River Waveney in a 16′ boat. Attempted to raise a sail. Boat capsized, all trapped under sail except for one survivor.	Walker (2009)
Fork Lake 1928	6/8	4	Fork Lake, Wyoming, USA	10 Girl Scouts and two boy leaders in a motor boat on Newfork Lake at dusk. Bow swamped when passengers moved to the bow. Rescue took place in poor light. 4 died.	Rootsweb (n.d.)
Grafton tragedy 1943	11/12	13	Clarence River, Grafton, New South Wales, Australia	28 Cub Scouts in a punt on the Clarence River, with 3 older scouts. Punt was 4.9 m long and had about 8 cm of freeboard. Leaving the shelter of trees it got into difficulty in waves. Two older boys went overboard to propel it by kicking their legs. Occupants panicked and moved to one side, wave broke and swamped the punt. Remaining 29 in the water, many wearing packs and many non-swimmers.15 of the cub scouts saved, 13 drowned.	Langston (2011)
Great South Bay 1943	19/4	10	Islip, NY, USA	10 Sea Scouts and an adult skipper on a 12 m converted cabin cruiser. Great South Bay, New York. Wave smashed over the boat, one overboard. Two attempted rescue in dinghy. All disappeared. Boat began taking water. Survivors clung to boat, all succumbed to cold except the skipper. Ten died.	The Milwaukee Journal (1943)
Lake Eyrie 1950	10/4	4	Cleveland, Ohio, USA	4 Boy Scouts took a small life raft onto Lake Erie, Cleveland, to retrieve a canoe. They had one paddle. Strong winds swept them off shore. A massive sea and air search found them dead after 17 h. Hypothermia / drowning.	United Press (1950)

(continued)

Table 4.4 (continued)

Incident	Date	#	Location	Description	Sources
Lake Cowichan 1977	28/7	7	Lake Cowichan, British Columbia, Canada.	7 campers with disabiiities, a counsellor, and a lifeguard on a pontoon boat with a fenced deck on Lake Cowichan, British Columbia. A pontoon caught under a wave while the craft was turning, throwing the occupants to one side, which flipped the craft. All campers, two of whom were in strapped down wheelchairs, were trapped inside the fence. Lifejackets kept them against the upturned deck. All 7 drowned.	Associated Press (1977)
Camp Algonquin 2008	14/11	3	Fox River, Illinois, USA	Teenage campers took six paddleboats onto the Fox River at 1.30 am. Drain plugs had been removed from the boats for the winter, but the boats were unsecured. One sank immediately. Two occupants drowned, as did another camper who went to their assistance.	Keeshan and Filas (2008)
Malaysia Dragon Boat 2010	17/1	6	Macallum Street Ghaut, Malaysia	18 on a high school dragon boat training at sea. Boat got into difficulty due to waves and collided with another vessel. 5 crew and a teacher, not wearing life jackets, failed to surface.	(No author (2011)

Undoubtedly drowning deaths have occurred that could have been prevented by effective PFDs, but I found few of those have occurred since 1960. Life Jackets in the 1993 Lyme Bay tragedy had been un-inflated, which could have rendered them ineffective as victims lost consciousness. A student slipped out of a life jacket and drowned as a rescue swimmer attempted rescue in the 2008 Southern Cross Beach tragedy. An adult leader, who subsequently died, removed his life jacket in the hope of swimming unimpeded in the 1987 Lake Alexandrina case.

Some incidents culminated in rescues that undoubtedly saved the lives of survivors. In the cases of Balsam Lake 1926, Lake Hume 1963, Timiskaming 1978, Gulf of California 1978, and Lake Alexandrina 1987 those who survived had made it to shore when rescued, as had most those involved in the Lake Tekapo 2015 incident. In the Lake Tekapo incident a helicopter was reportedly at the Lake within 3 min of the alarm being raised by the company that had rented out the kayaks, and found one survivor in the water within 4 min (Howie, 2015). Except for the Gulf of Mexico 2005 incident, in which a teacher called for assistance with a cell-phone, rescues were initiated either when a group failed to rendezvous or when survivors raised the alarm after reaching land. In the Gulf of Mexico case, it was some hours before a teacher obtained a cell-phone signal. At that stage two boys who subsequently were found dead had drifted in their open canoe far from the group. In other cases, such

as Lake Alexandrina, Lyme Bay, and the Gulf of California, groups had separated by the time search efforts began. Use of EPIRBs or similar devices could almost certainly prevent some deaths, however in some cases individuals were not with their swamped or upturned craft when rescued, and were in some cases scattered by wind, currents, or their own efforts to reach dry land. An EPIRB with each individual, or at least with each craft, could be necessary if rescue is to succeed before individuals succumb to cold.

In the Lake Alexandrina and Lake Tekapo cases, happenstance determined that helicopter assistance was available very quickly. In the Lyme Bay case problems with the Coastguard search were reported to Parliament (Hansard HL, 1996). The possibility that rescue could fail to reach victims immersed in cold water in time is emphasised by incidents in which some victims survived after rescue and some did not, including Lyme Bay 1993, Praestø Ford 2011, Southern Cross Beach 2008 and Lake Tekapo 2015. In the 1993 and 2008 incidents not all craft capsized. All of the deceased in Table 4.3 had been immersed. Similarly all of the victims in Table 4.4 were immersed, except in the case of Lake Eyrie 1950. The victims were still in a tiny life raft when found after 17 h. They had evidently succumbed to hypothermia and drowned in the bottom of the craft (United Press, 1950). Staying out of the water extends survival time, but not indefinitely.

In many incidents individuals have had to choose between acting on their own or staying with a group, staying with a swamped vessel or heading for land, and between persisting with rescue or saving themselves. Self-evidently, once adults are in the water their capacity to lead or assist is diminished. Adult leaders perished in Balsam Lake 1926, “Wangle III” 1950, Oakville 1954, Lake Hume 1963, Timiskaming 1978, Lake McNaughton 1982 and Praesø Ford 2011. Of Table 4.3 incidents, adults died in the Croy Shore 1910 incident, Oulton Broad Disaster 1914 (the only survivor was one of the Scouts), and the Malaysia Dragon Boat 2010 incident.

With good reason, commentary or analysis after many open water incidents considers the seaworthiness of the craft involved and the skills of those responsible. However, once a group is in the water, and a craft cannot be righted and emptied, probably the most important characteristic is whether the craft provides a stable platform that allows individuals to get out of the water. Almost certainly some Lyme Bay deaths could be attributed to swamped kayaks having insufficient buoyancy, resulting in swamped vessels sitting too low in the water, while some individuals survived because of the length of time their rafted up kayaks remained afloat and kept them out of the water.

Almost certainly some incidents could be attributed, in part, to mistakes or lack of skill on the part of those operating a vessel. That said, fatal incidents have involved a wide variety of small craft and some involved evidently skilled individuals. Most of the incidents in Table 4.3 were caused, counterfactually, by wind and waves, and in cases where individuals could swim or had effective flotation survival depended on water temperature and distance from land. Many who survived did so because they reached land before succumbing to cold. Regardless of craft, the environmental hazard is an underlying cause, factors being distance from shore (or size

of the body of water), wind, waves and water temperature. But for wind and waves most if not all of the tragedies would have been incident free. But for water temperature many capsizes in which individuals wore PFDs would have been swims rather than tragedies. In some cases a different wind direction could have drifted some victims to shore, and safety.

Counterfactual analysis could point to deployment by an OE program of a dedicated powerboat on standby, with the capacity to quickly retrieve a situation in which some or all of a group are in the water and unable to self-rescue. The safety of a designated support craft itself would become a consideration, consistent with boating safety more generally (e.g. U.S. Coast Guard, 2013). In the Lake Tekapo 2015 incident the operators of the business that provided the kayaks did not deploy their powerboat because conditions were too rough. In the case of the Neptune Outdoor Centre near miss (Table 4.2), neither of two rigid inflatable boats (RIBs) available could be deployed. The engine of one had been stolen, and the other could not be started.

The Gulf of Mexico 2005 incident involved an RIB, but it was part of the OE fleet rather than a redundant support craft. The tragedy began to unfold when the fleet spread out due to different speeds of the RIB, canoes, and kayaks. In an archetypal single point failure, the RIB motor failed. The group had been heading NNW. Winds from the NE and were building. The National Weather Service had issued an alert for small craft that morning. Waves were over 1 m. The fleet rafted up, but one canoe, facing a headwind with an offshore component, never reached the raft. Although the intention had reportedly been to follow the coast, albeit a coast with many promontories and inlets, the offshore wind pushed the missing canoe out to sea. Two days later the missing canoe and the two boys, deceased, were found 16 km out to sea after an extensive search.

The open water incidents in Table 4.3 underscore some common, although not universal, elements of fatality prevention in OE. Fatal incidents involve prevention failures identical to past failures, but previous instances involving OE could have occurred long ago or far away. While OE incidents tend to have particular make-ups of adults and young people, and particular aims, purposes, or traditions, the underlying nature of the incidents – for example cold-water immersion when a small craft has been upset by wind and waves – are hardly new or unknown kinds of mishaps. If anything these represent incidents that humans have experienced and known since the dawn of seafaring. Most catastrophic fatal incidents involve an unplanned-for circumstance that is very different from normal operations. For example, as the reports of the Lake Tekapo 2015 tragedy make clear, the headline activity – paddling in fine weather on calm water – is no preparation for an unrecoverable capsize in cold water far from shore, in conditions too choppy and windy for other craft, crewed perhaps by novices, to attempt a rescue. The incidents examined span more than a century, during which time possibilities for recovering from such an eventuality have expanded, but it is fair to say each incident in Table 4.3 involved a foreseeable circumstance that – for no doubt many different reasons – had not been sufficiently allowed for.

Some of the incidents in Table 4.3 perhaps belong in Table 4.4, and vice versa. The division is broadly on whether an incident was primarily an open water incident or alternatively a boating mishap that happened to occur on open water. The distinction is not always clear-cut. Croy Shore 1910, possibly the Grafton Tragedy 1943, Lake Eyrie 1950, and Camp Algonquin 2008 involved young people more or less spontaneously taking to the water in completely unsuitable craft. The Croy Shore incident involved adults, which underscores that adult supervision requires expertise and a fatality averse disposition, not just adulthood, but the incidents have much in common with other tragedies in different hazardous environments involving unsupervised youth. Young people cannot be supervised all the time, but supervisors could pay attention to whether an environment is suitable for unsupervised activities or not. Fatal incidents point to which environments require close supervision, and on what such supervision should focus.

In both Oulton Broad 1914, and Lake Cowichan 1977 a capsized vessel trapped the deceased. Fork Lake 1928 and Malaysian Dragon Boat 2010 are perhaps typical open water incidents, except that there was a boating mishap – passengers unbalancing the craft in one case, a collision in the other. In the Timiskaming 1978 tragedy, the fourth and last canoe to capsize did so when a just-rescued adult leader, acting irrationally (possibly because of hypothermia), stood up. The 1943 Great South Bay incident involved a larger cabin cruiser, which is a point of difference from many of the incidents, although once the group was in the water what kind of craft had put them there probably made little difference.

4.5 Ocean Shore Incidents

Table 4.5 lists ocean shore incidents. Ocean shore incidents can and often do claim single victims. In most catastrophic incidents either several individuals were washed into the sea by a large waves, or several individuals were caught in a rip current. Deaths in such circumstances are not peculiar to OE. In Australia in 2013–2014 there were 12 deaths while rock-fishing, usually attributable to waves, and 13 deaths attributable to rips. None of those incidents involved OE groups. Although some catastrophes involved distinct OE activities, presence in a hazardous location is the common element.

The Lands End 1985 tragedy involved a group of children who had climbed down to a rock platform, unaccompanied by teachers. A large wave washed five into the sea. The inquest was reportedly told that one victim died trying to assist his struggling friend. The inquest was also told the area was known to be unsafe. Parents attributed the deaths to lack of supervision. Both the Lost Coast 2000 incident and the Paritutu Rock 2012 incident occurred during coastal traverses. In the Lost Coast case two students went to the aid of a parent who had fallen backwards after being struck by a wave on her lower legs. She had been traversing a surge channel, and retreating water began to drag her away. As she struggled to remove her pack, two students dropped their packs and went to her aid. As they tried to help her to her feet,

Table 4.5 Ocean current or waves

Incident	Date	#	Location	Description	Sources
Lands End 1985	6/5	4	Lands End England	School excursion, 51 students 3 teachers 2 parents. About 12 children climbed down to a rock area unaccompanied by teachers. A large wave swept 5 from the rocks, 4 died.	The Glasgow Herald (1985)
Sandbar Beach 1998	15/12	3	Sandbar Beach NSW, Australia	Group of 30 at unsigned hazardous beach; 1 participant, 1 counsellor went to aid of participant in trouble; all drowned. Several others rescued.	Miranda and Lalor (1998)
Lost Coast 2000	25/3	3	California, USA	21 students, 2 teachers, 3 parents from Calgary hiking Lost Coast Trail. Wave knocked a parent off her feet. Two students went to her aid, and two more went to their aid. A larger wave swept all 5 out to sea. The parent and two students drowned. Two were rescued.	Goldi Productions (n.d.)
Bay of Bengal 2004	13/3	11	Katka seafront, Bangladesh	78 students on a university excursion, Bay of Bengal, bathing in the sea. A large wave washed some into the sea. 11 drowned.	The Independent (2013)
Iloilo 2004	17/10	7	Barangay Purok campsite, Philippines	Last day of inaugural Jamborette. 7 boys and one Scoutmaster went swimming in the sea. 7 drowned. Scoutmaster was also in the water and "noticed they were missing".	Philstar.com (2004)
Richards Bay 2005	22/05	8	Richards Bay, South Africa	250 students and teachers from Piet Retief spent the night sleeping on buses. In the morning students went swimming before lifeguards came on duty. Many caught in rip current. Some rescued, 8 drowned.	BBC (2005)
Palo Seco Beach 2006	9/6	4	Playa Palo Seco Costa Rica	3 Kansas students on language and arts trip to Costa Rica swimming at a beach. Caught by current. Teacher entered the water to attempt rescue. All 4 drowned.	Associated Press (2006)
Panambur Beach 2007	20/7	3	Panambur Beach, India	48 including two professors on an excursion to the sea. 3 students caught in strong current and drowned.	Deccan Herald (2007)
Tagore Beach 2009	9/8	3	Rabindranath Tagore Beach, Karwar, India	30 year students on excursion with 3 teachers and an attender. 3 washed out to sea by large wave. Local fishermen had warned them about the rough sea.	Daijiworld (2009)

(continued)

Table 4.5 (continued)

Incident	Date	#	Location	Description	Sources
Sea of Azoz 2010	7/7	7	Sea of Azov, Russia	Summer camp for 63 children and 7 adults. Excursion to an island in the Sea of Azov. Swimming in the sea. 8 children caught in current when sand gave way close to shore. I counsellor entered water to attempt rescue. Other counsellors drinking on the shore. Two children hospitalized, counsellor and 6 children died.	RIA Novosti (2010)
Huraa Island 2011	9/9	5	Huraa Island, Kaafu atoll, Maldives	Year nine students on science excursion, snorkelling. Some non-swimmers possibly drawn into deep water by a current. School principal attempted to assist 8 students. 4 rescued, 4 died and the principal.	Asian Tribune (2011)
Bejuco Beach 2011	27/4	3	Playa Bejuco, Costa Rica	Ten students, one teacher, and a parent on the last day of a church mission trip from Ohio to Costa Rica. Five students caught in a rip current. Two rescued, three drowned. Known hazardous beach.	Leff (2011)
Paritutu Rock 2012	19/8	3	Paritutu Rock, Taranaki, New Zealand	School group at outdoor centre, traversing a rock outcrop above the sea. 3 students washed off a rock platform by a wave. Instructor dived in to help or was washed in. Instructor and 2 students died. One student rescued from sea by helicopter. Remaining group members rescued from rock face by helicopter. Centre pleaded guilty under workplace safety laws.	Anthony and Keith (2012)

they and two other students who had moved to assist were hit by a larger wave and carried out to sea. A student ran 2 km to get help. The coastguard helicopter was out of service. Locals in fishing boats rescued two of the five.

The Paritutu tragedy involved a sequence of waves. A group from the Taranaki Outdoor Pursuits Centre (TOPEC) was traversing the base of Paritutu Rock on the seaward side. The group had departed too late to ensure the trip could be completed before the tide was too high, and the leader and program manager had relied on swell heights from Port Taranaki rather than swell forecasts. The leader was relatively inexperienced, and not familiar with some indicators that other leaders would use to assess tides and swells. One month prior to the tragedy, TOPEC had eased the cut-off for the trip from 1 m swells to 2 m. As the group proceeded wind and waves increased. The leader commented to an intern that they should not have come. The leader radioed that the group would be late, but did not seek advice. One student was washed by a wave and the group had to move higher than usual to avoid waves:

> [The leader] rigged the cave traverse, but did not rig it from the staging point to the start of the traverse despite the rope he had being long enough. [He] decided to take two students at a time from the staging point to the rigged start of the cave traverse. This was an unroped 12.5 metre section around a bend. The remainder of the group could not see [the leader] and the students once they dropped down and went around the bend. ("NZHSE 10," 2013 [11])

The leader took the first two students, and returned for others. Clipping on was awkward, and when the first wave struck one student had clipped on, another, KG, had not. The first student was left dangling:

> After [he] re-gathered himself and looked around [KG] was not there. The first of the next two students [M] had come around the corner. This first wave had also struck [M] and [W]. The wave crashed over [M] who lost a shoe and pushed [W] against the rocks. They continued moving to where [S] was who was screaming [KG] had gone … [M] and [W] could see [wave two] coming, but had not yet reached the rigging so were not clipped on. Both were knocked off the rock. [W] was able to climb back onto the rock to a flat area above [S] until he was rescued. He stayed there unclipped until the helicopter rescue.
>
> When [the leader] came into view [S] and [W] yelled that there were two people in the water. The next thing they saw was [the leader] in the water ("NZHSE 10," 2013 [11])

The rest of the group could see the leader in the water. He had the radio. The intern used a student's mobile phone to call for assistance. Rescue boats arrived in 12 min, shortly after the instructor, who had been swimming strongly, disappeared (Moir, 2012). Forty minutes after the call a helicopter arrived and first rescued [S], followed by the others. One body was eventually recovered, two were never found.

None of the victims were wearing PFDs. Average water temperature in Taranaki, in August is 13.5 °C (World sea temperatures 2017, 2017). For immersed swimmers who survived the initial cold shock, without a PFD death from drowning due to cold water swimming failure would be likely (Tipton et al., 1999). There had been at least one previous incident[4] in which a TOPEC participant had been washed off the Parituru traverse into the sea, successfully rescued by an instructor who entered the water (Moir & Rilkoff, 2012).

Some incidents attributed to waves involved students and staff who were in the sea at the time. Rip currents are caused by high energy breaking waves, so it is possible that rips also caused some incidents attributed to waves in news reports.

The judge sentencing TOPEC commented on the similarity to sentencing in the Mangatepopo 2008 case: "at the risk of being melodramatic eerily similar" ("NZHSE 10," 2013 [24]). Although I have grouped incidents around environmental hazards and the immediate circumstances of catastrophes, when wider circumstances and preceding events are considered patterns and similarities can be discerned across incidents involving different kinds of hazards. The Mangatepopo and Parituru Rock catastrophes arguably involved almost identical failures in organisations which struggled to consistently deploy highly experienced staff, and which arguably over-relied on standard operating procedures that failed when staff failed

[4] Court documents referred to two incidents, which might have been a reference to the student being washing in followed by the instructor diving in.

to recognise a potentially deadly circumstance soon enough. Unfortunately no independent review, nor inquest, was conducted, so it is impossible for those outside TOPEC to know how efforts to heed lessons from the Mangatepopo incident failed.

Some water-based catastrophic incidents, although broadly describable as a single incident, unpack as sets of closely related instances of tragedy and survival. In the Paritutu Rock tragedy one requirement for prevention was evidenced by survival of those either clipped on or positioned above wave height. Those who entered the water did so at different times. One student had already been washed into the sea, and another, clipped on, was reportedly shouting to that effect, when two more students, briefly unsupervised, descended to the exact location that the first victim had just been swept from. The third victim, the leader, appears to have leapt into the water voluntarily immediately on learning that students were in the water.

In about half of the incidents in Table 4.5 one or more victims had been attempting to rescue an earlier victim. The Huraa Island 2011 tragedy reportedly occurred when eight students snorkelling on a science excursion, who had not been asked if they could swim, found themselves in deep water. Strong currents were reported in the area. The principal successfully rescued four of the eight, but was hampered by panicking students who clung to him (Asian Tribune, 2011). The Sea of Azoz 2010 tragedy also involved at least eight summer campers caught in a current when a sandbank collapsed in a reportedly known hazardous area. Six children and a physical education instructor drowned. Camp counsellors were found to have been drinking alcohol.

Deaths in rip currents illustrate a difference between "preventable" death, and what particular individuals could have done to prevent a death. A responsible adult who could not recognise a rip in the first place would be unlikely to know how to survive in a rip, much less effect a rescue of more than one person. At Sandbar Beach 1998 initially only one camper got into difficulties while wading, due to a rip. A counsellor and another camper went to assist, and also got into difficulties. Others then went to help, and also required rescue. A local using boogie boards rescued at least 6, including some saved by advice to let the rip take them to shallow water, which it did. Two campers and a counsellor died. Richards Bay 2005, and Panambur Beach 2007 both involved large groups led to a beach with dangerous currents. Those incidents, in South Africa and India respectively, point to the likelihood of many similar incidents that I am not aware of because I only searched online, in English.

Two incidents in Costa Rica, Palo Seco Beach 2006 and Bejuco Beach 2011 occurred with 10 km of each other. Both involved visiting groups from the USA, neither group in the care of OE specialists, taking an excursion to a beach as a break. In Costa Rica drowning matches road trauma as cause of accidental death. Between 2001 and 2012 approximately 590 deaths were due to rip currents (Arozarena, Houser, Echeverria, & Brannstrom, 2015).

Deaths due to rips are completely preventable, although one key prevention measure – provision of lifeguards – is very limited in Costa Rica (Arozarena et al., 2015). It is not difficult to find information about the dangers of Costa Rican beaches. Almost any attempt to research hazards for visitors to Costa Rica would

highlight the hazardous beaches. Commenting on a lawsuit after the death of another US student in Costa Rica, who treaded water for half an hour when carried beyond the breakers by a rip, waiting in vain for rescue, Malveaux (2016) observed:

> Toward the end of the semester in Costa Rica, Duke [University] and the Organization of Tropical Studies (OTS) took their students on a surprise celebratory trip to the beach at Playa Tortuga on the south central Pacific Coast… Caught in a rip current, Ravi Thackurdeen drowned in Playa Tortuga that afternoon… It is asserted that "Ravi's death was 100% preventable by Duke and OTS."… A point of backing is that the dangers of Playa Tortuga were well known and Duke University and OTS should have been aware of them… Almost every website or brochure that discussed visiting Playa Tortuga mentioned the dangerously strong rip currents and that swimming at the beach was not advisable…. The students were told that it was safe to swim in the waters, and they were given only the following instruction: to swim parallel to the shore if they were caught in a rip current…. This lawsuit clearly brings forth the point that institutions and their affiliates must have solid regional awareness of the overseas location and must properly advise students on regional dangers. (Malveaux, 2016, p. 122)

4.6 Floods

Table 4.6 lists catastrophes involving floods. All water based prevention requires attention to: (1) avoiding immersion in the first place, (2) surviving while immersed, (3) self-rescue or rescue by those involved in the program, or (4) outside rescue, but once individuals are immersed in high energy floodwaters, prevention might be impossible. In the Mangatepopo 2008 tragedy, every member of the group caught in a canyon entered the water, singly or in pairs, to be washed downstream. The leader towed one victim to safety, and later retrieved one other with the aid of a throw-bag as he went past her location. She had moved downstream around a bend, and had no way of communicating with the accompanying teacher who was with the students waiting their turn. All were alive when they passed her stance, before being swept over a dam wall and into turbulent waters below. Of those carried over the dam wall, two survived. An accompanying teacher and six students drowned.

As is true in probably half of all OE fatal incidents, prevention requires not just attention to immediate environmental conditions – which is to say river levels in this case – but to forecast conditions and observable precursors. The precursor to rising river levels is precipitation in upstream catchments. In the case of ocean waves, although waves can be observed there might not be much time to take action when a larger wave is spotted. Rain in catchments, and rising waters further upstream, might be observed hours before an OE site was affected. In circumstances in which there is no rain in catchments and river levels upstream are normal OE could proceed with effectively zero risk of a flood on unregulated rivers. Dam releases can result in deaths. In Himachal, India at least 24 engineering students died when a hydro dam released water while they were on the banks of the River Beas taking photographs.

The Storms River 2000 tragedy was more of a commercial tourism related incident than an OE incident, although there were some children in the group. I included

Table 4.6 Floods

White's Creek 1929	23/3	8	White's Creek, TN, USA	Floodwaters in White's Creek, Tennessee swept away a bungalow with 28 Boy Scouts on the roof. 7 boys and 1 leader drowned.	Beitler (2009)
Lynmouth Flood Disaster 1952	15/8	3	Filleigh, Lynmouth, England	Widespread floods, 28 died. 3 Boy Scouts on annual camp near Filleigh drowned.	Ringer (n.d.)
French Creek 1956	13/5	3	French Creek, Pennsylvania, USA	7 Scouts and 3 leaders on overnight canoe trip on French Creek, Pennsylvania. All 5 canoes capsized in rain-swollen creek. 2 boys drowned, and a leader attempting to rescue one.	United Press (1956)
Virgin River 1961	17/9	5	Virgin River, Utah, USA	26 Scouts caught in a narrow canyon by a flash flood caused by heavy rainfall. 4 drowned and 1 leader.	National Weather Service (2012)
Kolob Canyon 1993	15/7	2	Kolob Canyon, Zion National Park, USA	Five Scouts and 3 adult leaders abseil into canyon and encountered flood conditions. Attempting to descend a series of waterfalls one leader drowned, then later a second. Survivors waited five days for rescue.	Burrows (2000)
Cliff Cave 1993	24/7	6	Cliff Cave County Park, USA	St Joseph's Home for Boys caving trip. Two counsellors and five boys trapped by rising water due to thunderstorm in catchment. One boy found alive after 18 h, others died.	Smothers (1993)
Antelope Canyon 1997	12/8	11	Coconio County, Arizona, USA	Organised tour group in canyon, severe thunderstorm warning in place, swept away by flash flood. 11 died. 2 bodies not recovered.	Muller (2002)
Saxeten Gorge 1999	27/7	21	Saxeten Gorge, Switzerland	Commercial tour groups entered Saxeten Gorge, Interlaken during thunderstorms. Gorge flooded, 21 drowned. Six employees at the time convicted of negligent manslaughter.	Fleck (2001)
Storms River 2000	25/3	13	Storms River, Tsitsikamma, below Witteklip confluence, South Africa	Commercial river tubing trip 20 clients, including children, and 4 guides. Encountered high water, but continued towards exit point. Larger flood engulfed the group.	Hogan (2002)

(continued)

Table 4.6 (continued)

Mangatepopo 2008	15/4	7	Mangatepopo Stream, New Zealand	10 students, 1 teacher, and 1 instructor entered the Mangatepopo Gorge, walking upstream. On their return downstream the party was stranded on a ledge due to rising floodwaters. The group exited the ledge singly, or in some cases in pairs connected by a sling and karabiner. The instructor went first, with one student, intending to stand on the bank a little way downstream and throw a line to each of the others in turn as they floated downstream. One student was rescued in this manner. All three survived. The others all were carried over a dam wall a short distance below her stance. Two survived going over the wall. 6 students and the teacher drowned. Centre pleaded guilty under workplace safety laws.	Brookes et al. (2009)

it not because there are strong grounds for attributing it to OE but because it offers relevant lessons for prevention. The incident unfolded when a commercial rafting company, or guides working for the company, decided to proceed with river descents for three large groups of rafters in spite of heavy rain in the early hours of that morning (Hogan, 2002). Sections of the river were known to be dangerous if the water level was high, and there were protocols in place to exit if the observed level was too high. Rain continued, and two groups made their descents without incident. The last group, which left later:

> [was] somewhat slower than the other groups, [and] found on reaching the confluence with the Witteklip River that the tributary was significantly flooded, noticeably swelling the water in the Storms River. Instead of taking the inexperienced tubers off the river at this stage, the guides opted to continue the last half kilometre to the emergency exit where arranged transport was waiting for them. Unfortunately from that point on, the water level in the Storms River itself apparently rose rapidly and significantly, with the result that the river guides were unable to control the group of inexperienced tubers, and a number of tubers and guides were swept into the dangerous narrow gorge section, where most died. (Hogan, 2002, p. 26)

Nine escaped on a rope ladder, and two survived clinging to rocks for 36 h (The Herald Online, 2010). Thirteen participants died. The incident was widely accepted as resulting from a freak flash flood, but a subsequent analysis of the hydrology of the river found this to be untrue (Hogan, 2002).

Hogan (2002) determined that rainfall equivalent to that which caused the flood could be expected three times a year, on average. She also determined that in the event of widespread rainfall, as had occurred on the day in question, the Storms River would rise below the confluence of the Witteklip River in two stages, firstly a modest rise originating in the Witteklip River catchment, which was closer, and about an hour and a half later a larger increase from the catchment of the Storms River itself, which is larger, but more distant. Even guides who have travelled the river many times would not necessarily have experience of a thrice a year brief flood event, but a guide who had sought to study the recorded hydrology of that section of the river could have recognised a modest rise in the river during widespread rain as an almost certain precursor to a larger flood.

Hogan (2002) concluded:

> The study of the hydrology of the Storms River during this accident period on 24/25 March 2000 shows that the flood experienced was not an unusual event, or even a flash flood, as suggested by the media. In fact, in hydrological terms, it was a common minor flood, with similar floods in all the other rivers in the whole Tsitsikamma mountain range… Based on the rainfall experienced on the morning of the 25 March 2000, the guides could have expected a rise in water level and flooding in the Storms River later in the day. It seems that the accident may have been avoided if the guides had an understanding of the hydrology of the river. (p. 28)

Although it might seem obvious that flooding moves downstream from catchments where runoff from rainfall has occurred, it is not uncommon to find river activity guidelines focussed on actual river heights rather than attention to rainfall in catchments. In the case of the Mangatepopo tragedy, the flood experienced was one that could be expected once every 2 years, although in 1999 six such floods had occurred. Flooding could be expected at the accident site 2–3 h after rainfall in the catchment. Although New Zealand rainfall radar availability was at the time limited to hourly images from only two radars on the North Island (a surprising deficiency in a wealthy country so affected by weather), the rainfall event would have been visible to staff prior to the tragedy had they reviewed on-line radar imagery. As was the case in the Storms River tragedy, it had been raining when the group set off (Brookes, Corkill, & Smith, 2009).

Media attribution to "freak" events following both the Storms River and Saxeten Gorge 1999 tragedies surmised natural dams had broken upstream. After the Mangatepopo tragedy there were reports of a rain bomb. All three incidents involved more or less normal floods. In the Saxeten Gorge tragedy 18 novice participants and three guides died when a 2m wall of water swept through the gorge as four groups from one company were traversing it. Two of the groups were caught in a slot section of the gorge when water from forecast thunderstorms, was funnelled by the catchment. Storm activity was visible when groups entered the gorge. The only way the slot section of the canyon could carry an increased volume of water was by the water level rising dramatically – a sudden rise was a normal response in a gorge that was, in effect, the neck of a natural funnel. A different company cancelled trips in the gorge the same day, and a local fireman had warned one of the four groups not to enter the gorge (Jenkins, 1999).

All of the dead had been caught in the slot section, except for guide Karin Müller, who jumped in and rescued one of her clients, then jumped in twice more to successfully rescue clients flushed from groups further upstream. She died attempting a fourth rescue. As was the case in the Mangatepopo tragedy 9 years later, the victims wore wetsuits, helmets and lifejackets (Jenkins, 1999).

Three directors of the company, Adventure World, and the company's lead guide and two managers were convicted of negligent manslaughter. Those convicted dropped appeals, but reportedly continued to maintain that the flood was unforeseeable (The Sun-Herald, 2002). Less than 1 year later, another Adventure World client died after being attached to bungee cord too long for the site, resulting in a ground fall (Kunkle, 2000).

I searched only for English documents on the Saxeten Gorge tragedy, meaning I did not consult police reports or court documents. M. Jenkins (1999) provides a detailed account in English. He interviewed past guides who reported that as the company grew, work once performed by guides with years of experience was performed by guides with months of experience. Over time guides with less experience conducted training. What was at first expedient, because sufficient numbers of experienced guides were not available to match the company's growth, became a preference because inexperienced guides were cheaper and more compliant with management directives. Seven of the eight guides on the day were in their first year of guiding. He quoted one former guide:

> [M]anagement saw they could hire new guides for less and the older guides started getting pushed out. There was so much overbooking that there was pressure to go when the weather wasn't right, and the company knew the new guides weren't going to stand up and say, 'No, I won't go.' (Jenkins, 1999, p. 3)

Both the Mangatepopo 2008 and Paritutu Rock 2012 tragedies involved not-for profit organisations operating under tight budgets, and both tragedies involved guides with limited experience. In the Mangatepopo case, the Independent Review Team reported:

> Following its visit to OPC in July 2008, there was an exchange of correspondence between the Review Team and the Trustees as to levels of experience, and the need to employ contractors in the short term. The Review Team had a serious concern which required immediate action, rather than being left until the completion of the final report. The Review Team reported that the Centre had been operating with too few experienced staff and continued to do so. A concern the Review Team referred to was that, as at 1 August 2008, 7 out of 23 instructing staff had less than one year of experience at OPC. Those persons do not necessarily have "transferable skills". This could have implications for the deployment of field activities, particularly those in more hazardous environments in which inexperienced staff instructed alone. (Brookes et al., 2009, p. 23)

In the Antelope Canyon 1997 case, there was reportedly a thunderstorm warning in place and a Navajo woman warned the guided group not to enter the canyon (Muller, 2002). Only the guide survived of a group of 12. The Cliff Cave 1993 incident, which involved a group caught in a cave rather than a gorge by rising floodwaters, was claimed by a spokesperson for the Catholic Charities of St. Lewis as a unique and freakish event (Smothers, 1993), although the roads into the park were

closed at the time due to floods and thunderstorms had been forecast (Kramer, 1993).

Three scouts who died in the Lynmouth Flood Disaster 1952 were among 28 victims of widespread, extensive flooding. Similarly the White's Creek 1929 tragedy involved widespread flooding, and a building that was caught by rising floodwaters and eventually washed away.

In the Kolob Canyon 1993 tragedy, a group entered a canyon in which the water level was controlled by a dam releases. They had reportedly checked the level with the National Parks Service. Once in the canyon the adult leaders were dismayed by the water level, which was at 29 cubic feet per second (0.8 cubic metres per second). It is unclear in published material whether the advice from National Parks had been inappropriate, or whether the group was overconfident. Normally a safe level would be below 3 cubic feet per second (0.08 cubic metres per second). Two adult leaders drowned in separate incidents attempting to negotiate waterfalls, after which the survivors, including the only remaining adult and the 14-year-old son of one of the victims, stopped and waited for rescue. The canyon was narrow and 1300 ft. (400 m) deep. As is true for incidents in caves, and in other deep narrow canyons, communication devices, including satellite communications, might not be effective.

The five dead in the Virgin River 1961 tragedy were part of a large group hiking through "The Narrows" caught by a flood described in one report as a wave 3 ft. (1 m) high which preceded water rising 6–9 ft. (2–3 m). Some were above the water level. A group of 15 in a side canyon lashed themselves to trees. Four Scouts and a Scoutmaster were swept away and died (Jenkins, 2012). A group of seven adults died in similar circumstances in the nearby Keyhole Canyon in 2015, in a flood caused by an afternoon thunderstorm. Possible thunderstorms had been forecast prior to their departure, although actual warnings were not issued until the group were probably already out of cell phone range. Because such trips involve terrain in which communication is difficult (or impossible), and which is particularly affected by thunderstorms (because runoff concentrates in gorges and gorges can be difficult to escape), for an OE group only weather in which the risk of thunderstorms was close to zero would be consistent with taking all reasonable steps to prevent death. In this case that was probably true in the morning, because thunderstorms can build in the afternoons as the ground heats up. In circumstances where a thunderstorm could foreseeability create an inescapably deadly circumstance, fatality prevention would require trip cancellation if a chance of thunderstorms was forecast.

It is not clear to what extent the French Creek 1956 incident is attributable to floods. It is possible the incident would have occurred at normal river levels. A canoe struck a tree and overturned. The other canoes then overturned (United Press, 1956). The first five incidents in Table 4.6 involved Boy Scouts, which could be an artefact of my search.[5]

[5] Reports of flood-related drowning are numerous, which makes supervised incidents involving young people difficult to locate. "Scout" is a discriminating search term that very often returns youth-related incidents. It is possible I found more Scout related incidents simply because they were easier to find.

Table 4.7 Moving water

Squaw Dam 1958	2/4	3	Colorado River, Arizona, USA	Scouts, clinging to upturned boat, swept through lock on Squaw Dam, Colorado River, Arizona. Dam was an irrigation diversion structure. All 3 died (17–18 year old).	United Press (1958)
Wisconsin River 1960	28/6	6	Confluence of Wisconsin and Lemonweir Rivers, USA	18 campers and a 21 year old leader attempt to reach an island in the Wisconsin River. Leader stepped in a hole and group lost their grips on a rope. 6 13-year-old boys drowned.	No author (1969)
French Pass 2000	10/3	3	French Pass, New Zealand	Participants in a Dive Master Course. Planned drift dive at slack water, misjudged tide. Strong current, group sucked down 60 m by whirlpool. 3 students drowned. Operator found guilty under workplace safety laws.	Smith (2003)
Tonie Sap 2007	22/11	5	Tonie Sap River, Cambodia	Dragon boat crew of 22 attempted to paddle upriver after a race. Strong currents. Boat sank. 5 drowned, not wearing life jackets. Panel of inquiry found multiple failures.	Tan (2008)

Table 4.7 lists catastrophic incidents involving a current but not necessarily a flood. Currents do not necessarily claim multiple victims. Multiple deaths occur either when individuals follow a victim into a current, usually as rescuers, which I consider in the next section, or when current threatens a whole group. The latter occurs when a group is literally all in the same boat, as in Squaw Dam 1958 and Tonie Sap 2007. It is possible that PFDs would have saved some or all lives in the Tonie Sap 2007 incident and the Wisconsin River 1960 incident. Although the latter was not a boating incident, if individuals are carried out of their depths or away from safety by a current they are at greater risk without flotation irrespective of what activity led to them being in that situation. PFD use tends to be associated with boats, but in OE should be considered in any circumstances where immersion is possible.

French Pass 2000 involved adult novices rather than an OE group. I included it as an instance of apparent failure to operate according to strict aversion to preventable death.

4.7 Catastrophic Rescue Attempts

In some open water, ocean shore, and flooded river catastrophes one or more of the victims had been attempting to rescue others. Table 4.8 lists additional incidents that would have had a single victim, but for rescue attempts. Fatalities resulting in water rescues provide strong evidence supporting an argument that cases cannot be wholly

reduced to rules or advice. Not every rescue fails. Some incidents described in this chapter would have had more deaths, but for rescues, and there have undoubtedly been many near-miss incidents that did not make this volume because all potential victims were rescued. What is clear is that rescue must itself be considered a potential cause of death.

Barnett Lake 1943 involved a rescue, but not a rescuer death. Responding to cries for help shortly after a group began skating on Barnett Lake, a teacher and students were able to successfully rescue a 14-year-old girl, but were unable to save the 15-year-old boy she had been skating with. Later it was noticed two other students were missing, and staff members dived into a hole where shoes and a glove were found and recovered two bodies. Published reports did not indicate that supervision of the second victims failed because supervisors were, understandably, pre-occupied with the first rescue, but the incident does point to the possibility that an incident involving some members of a group could resulted in supervision failure elsewhere in that group. The same school had lost three students struck by a car while walking into town approximately 2 years earlier (Canadian Press, 1943).

The deaths of 5 Scouts on a suburban camp attempting to cross the Des Plaines River reportedly occurred when four went to the aid of one who fell through thin ice (Chicago Daily Tribune, 1951).

The proximal cause of the Convict Lake 1990 tragedy was a decision by five teenagers from one of the earliest private "troubled teen" facilities in the US to go out onto the ice, documented by Mallard (2011) in a book on the incident. Supervision consisted of a counsellor's verbal advice to "be careful". It appears the boys, aged 13 to 16, were testing how far they could get. It took less than 10 min for the boys to move about 200 yards (200 m) away from shore. The ice cracked, and four of the five were in the water. One went for help. One managed to regain the ice by turning his gloves inside out and using the rough inner lining for grip. He slid on his belly, and then swam, to the opposite shore. A counsellor ran to aid the group in the water. As he attempted to assist the ice gave way and he fell in. The second counsellor, and Clay Cutter, a local caretaker equipped with ropes separately went out to assist, and held one of the youths and a counsellor, but were unable to get them completely out of the water. While waiting for assistance, the counsellor tried to move to a new position and also fell into the water. By this stage a victim he and Cutter had been supporting was unconscious.

Rescuers attempted to push an aluminium boat out across the ice, somewhat delayed by attempts to find enough rope to keep the boat lined to the shore. About 30 min after the boys first fell in, that boat broke through the ice and was stranded. Baitz, a fire fighter then moved to Cutter with a ladder and ropes. As he attempted to get the counsellor Cutter had been supporting from the water the ice broke and Baitz fell in. He was tangled in the rope and the ladder pulled him under. Anderson, also a fire fighter went out along the rope and realized he needed a knife. Another

fire fighter from the shore got part way to the rescuers and threw Anderson a knife. Anderson and Cutter then fell through the ice. Three boys, both counsellors, Baitz, Anderson, and Cutter, who by this stage had been out on the ice for over an hour, were in the water.

Rescue now consisted of those on the shore pulling a rope attached to Baitz, which was also entangled in the ladder, towards shore. He kept being pulled against the ice and forced under, but the efforts created a channel. Anderson and Cutter swam behind him. A fire fighter in a wetsuit dived in and was able to support Baitz, who was assisted onto an inflatable that two other fire fighters had got to the scene. Cutter and Anderson were seen struggling, almost certainly suffering from cold-water swimming failure. Cutter, Anderson, both counsellors and three boys died. Cutter's wife and children had been watching from their house overlooking the lake.

Mystery Cave 1990, Godavari 2001, Split Rock Falls 2003, and Meramec River 2006 all involved companions, rather, than leaders, attempting rescue in what must have been reflex, or almost reflex, decisions. In the Meramec River tragedy at least four would-be-rescuers did not know how to swim (Frankel & Bryan, 2006).

An OE program's preparation to provide immediate assistance, and capacity to call in outside assistance, are only tested when potential victims are in the water. The incidents in Table 4.8 can be read as underlining that preparation for normal operations, and the measures an organisation or individual might call on to judge program success and staff competence, might give no indication of absent or inadequate fatality prevention. Even given adequate measures to prevent immersion, inadequate readiness to respond to an immersion incident could be present as latent fatality causes. Fatality prevention requires distinct, specific measures.

In slot gorges and caves prevention based on immediate assistance, or outside rescue, could be problematic. Immediate assistance by others in the group can be either impossible, or dangerous, as in the Mystery Cave 1990 incident, and outside rescue requires either a survivor to make their way out to raise the alarm, or someone on the outside to recognise that the group is overdue. In Mystery Cave rising water in an underground creek impeded the way out of a cave for a school group. The leader stood in the thigh-deep water and anchored a human chain in an attempt to cross the creek. The alternative would have been to wait in the cave for the water to subside. A 14-year-old girl, the smallest in the group, lost her footing and was carried downstream into the darkness. Another girl, who had already crossed the stream, went to her aid and at first succeeded in helping her gain her footing, before both were carried out of sight. A teacher then followed to assist them. The group was not equipped with headlamps. The teacher leading the trip then went after the three, leaving the remaining students alone in the cave. They were rescued soon after midnight. The leader was not rescued until around five in the morning. The three he had been trying to find died. He died in a fall from a hotel window after given evidence at the inquest.

Table 4.8 Attempted water rescue/thin ice

Barnett Lake 1943	27/11	3	Barnett Lake, Lacombe, Canada	3 students from Canadian Junior College died in two separate incidents skating on Barnett Lake, near the college. 4th student rescued.	Canadian Press (1943)
Des Plaines River 1951	20/1	5	Des Plaines River, USA	Suburban camp. Five Scouts drowned, thin ice, 4 attempting to rescue the first.	Chicago Daily Tribune (1951)
Convict Lake 1990	19/2	7	Convict Lake, California, USA	16 teenagers and 2 counsellors from troubled youth facility on thin ice, Convict Lake, California. 4 teens and 5 adults ended up on the water - some were attempting rescue. 1 rescuer and 1 teen survived. 7 died.	United Press International (1990)
Mystery Cave 1990	3/7	4	Tasmania, Australia	3 teachers, 8 students, caving. Crossing thigh-deep creek with 'human chain'. 1 girl slipped, carried away. 2nd girl went to assist. Teacher went to assist both. All 3 drowned. Survivors trapped for 7 h, leader for 12. Leader later died in fall from hotel, apparent suicide.	Herald Sun (1990)
Godvari 2001	6/12	5	Godvari, India	67 students on 5 day excursion. One boy slipped into the river, 6 students went to his aid. Boy who slipped plus 4 who attempted rescue drowned.	The Hindu (2001)
Split Rock Falls 2003	12/8	4	Adirondack Mountain Region, USA	Camp counsellors, 18–19 day off, visiting Spit Rock Falls, engorged by heavy Summer rain. One slipped off narrow ledge into foaming pool. Other three jumped in to rescue him. All four drowned in aerated water.	Polgreen and Healy (2003)
Meramec River 2006	9/7	5	Meramec River, Near St. Louis, USA	One child from a church excursion including around 50 children got into difficulty, others jumped in to help. 5 drowned including 4 siblings. Rescue/recovery efforts hindered by uncertainty about how many missing.	Frankel and Bryan (2006)

4.8 Preventing OE Water Catastrophes

Fatality prevention must consider single victims incidents, as well as catastrophes, but catastrophes warrant special consideration. Some catastrophes have been the result of events that overwhelmed measures in place which would have protected an individual, for example when adult leaders have become victims. Some catastrophes have unfolded from a single immersion.

In drowning prevention generally, many, but not all, deaths cluster around water based activities, such as rock fishing, boating in various craft, or swimming. Some

OE deaths were not linked to any particular activity other than venturing near water. To include all possibilities prevention must focus firstly on potentially hazardous environments and secondly on human activities.

Although catastrophic incidents tend to garner a great deal of attention, lessons to be learned can have limited reach and can fade over time. In Australia the Lake Hume 1963 tragedy involved the first intake of a newly formed Victorian Outward Bound School. Front-page headlines in Victoria signalled the promise of the program for young Australian men. As that first course ended, front-page headlines chronicled the deaths of five participants and both instructors in one group. The 1987 Lake Alexandrina incident, also in Australia, was very similar, but it occurred more than 20 years later, in a different State, and involved a different organisation. In the latter case, the Scout Association had previously banned open water crossings on Lake Alexandrina. It was never clear why the leaders, who perished in that incident, ventured onto the lake, but they would not necessarily have known the lessons from Lake Hume.

When catastrophic incident cases from around the world over many decades are assembled, patterns that connect incidents in similar environments are striking. It is a truism that drowning can occur in any body of liquid, but case studies bring into focus how catastrophe unfolds in particular situations. Catastrophe prevention requires not an unattainable capacity to anticipate all risks, or blanket avoidance of any body of water, but an achievable ability to know what to look for. For any group or individual that undertakes to supervise and care for youth around water, catastrophe prevention requires local knowledge and a sound understanding, derived from cases, of what could go badly wrong and how it would go wrong in that particular environment.

Almost every catastrophe has involved one or more adults implicitly accepting a potentially catastrophic risk, albeit through ignorance in some cases. Catastrophe prevention would require never taking such a bet. Some decisions were probably intuitive, or reflexive, not necessarily informed by deliberation, including some rescues and attempted rescues. In circumstances like the Mystery Cave 1990 incident, the problem of rescuing any individual swept downstream into darkness would have been apparent before a leader attempted to cross a swollen stream. In the Paritutu Rock 2012 incident, danger was not only evident, it was commented on by the leader prior to his death. In either situation groups could have waited on higher ground for rescue. One possible root cause is that leaders immersed in a culture of adult outdoor recreation, in which adults sometimes accept risk of death to reach a particular location, fail to adjust their attitude to suit care of youth in the outdoors.

In some cases fatality prevention would not have required educational goals to be abandoned. For example, all of the programs that proceeded in ultimately disastrous weather conditions could have gone ahead in more benign conditions, indicating that fatal weather conditions were not essential to the program.

In-depth studies contribute to understanding how individuals or organisations come to grief. Some catastrophes can be interpreted as years in the making. *Deep Waters*, James Raffan's (2002) account of the Lake Timiskaming 1978 catastrophe, provides a detailed explanation of how knowledge of canoes, canoeing, and of the

conditions known to occur on Lake Timiskaming, would have prevented a disaster. He identified missed opportunities to learn; from locals with better knowledge of Lake Timiskaming, from more expert canoeists, from safer OE programs, and from accidents and near misses in the same program that could have signalled a need to change attitudes and approaches to safety. He describes a catastrophe rooted in attitudes to environmental hazards, childhood, and education, eliciting lessons applicable across the OE field.

Raffan (2002) described events in which crews were dumped in the water when large canoes overturned as a frequent, and accepted part of program premised on "adventure". He argued:

> Had they analysed more carefully the reasons for the dumpings and upsets, St. John's staff might have concluded that adding three inches of freeboard to otherwise stable … canoes … could have made the … canoes more susceptible to upset. The modifications of the St. John's canoes, the decisions to paddle in large bodies of water, the sense of urgency, the impossibly long days, and the effect that additional wind pressure would have on a five-inch higher bow and stern – all these factors may have combined to create a situation full of risk. (p. 124)

He quoted an unnamed former student:

> The purpose of the trips did not extend beyond making us do something hard. The instructors did not have much experience [in] canoeing. The learning was mostly through discovery for the students, and for the masters. (p. 125)

It is not uncommon for OE advocates to link risk with educational benefits. Most such claims could not be read as endorsing fatal risks, but Raffan (2002) quotes from a published celebration of the St. John's program from 1967 that did not distinguish between "venturing" and recklessness:

> For the boy may die who ventures out upon Lake Winnipeg, and the child may die who dares to set out to swim. But what of the child who ventures not at all? For him, there are other deaths, more dreadful still, because they steal so silently upon the soul. They are deaths unsung and unobserved and into which no inquests are ever called … 105

Raffan (2002), as does Mallard (2011) in his account of the Convict Lake tragedy, point to programs zealously premised on moulding individuals.[6] Both authors discuss the subsequent development of outdoors-based troubled teens programs, marketed to worried parents as an answer to a wide variety of adolescent problems. Very little in the academic literature has examined abuse in such programs, although the US Government Accountability Office has published a report detailing ten cases (Kutz & O'Connell, 2007) and referring to many more (see also Szalavitz, 2006).

Irrespective of educational beliefs, case-based prevention of immersion catastrophes would require a decision-maker to have knowledge of fatal circumstances and of the program locality. Fatality prevention which requires familiarity – being at home in the outdoors – has to be reconciled in some cases with OE premised on venturing into the unknown (Brookes, 2006, 2015). Arguably in cases such as the Mangatepopo River and Storms River tragedies, leaders could have had a better

[6] Children were affected, but not moulded, but both programs (Mallard, 2011; Raffan, 2002).

knowledge and understanding of the environment and potential hazards without diminishing the experience curated for participants.

Fatality prevention requires expertise, but it also has to be an overriding priority. Pia's (1984) observation that lifeguards can fail if they do not know what to look for is consistent with a more general point that fatality prevention requires case-based knowledge of what fatal incidents are like. Pia (1984) also observed that some failures could be attributed to the intrusion of other duties, or to distraction. Unlike lifeguarding, most OE programs do not have fatality prevention as a central aim; the most parsimonious explanation for some failures to make fatality prevention an overriding priority is that decision makers were focussed on achieving their primary goals, and busy with quotidian tasks. Until it was too late, fatality prevention was perhaps a distraction from more pressing, and perhaps less hypothetical tasks.

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Chapter 5
School and Youth Group Camp and Excursion Catastrophic Events on Land: Lessons for Prevention

5.1 Introduction

This chapter examines multiple-fatality incidents on youth outdoor excursions and camps, other than those involving water-based activities. As in the previous chapter I have defined an outdoor education (OE) catastrophic incident as one involving three of more fatalities.

Undoubtedly there have been some (perhaps many) catastrophic incidents that my search failed to find. I searched only in English. Except in a few cases, I searched only on-line. Although many old news reports are now on-line in a searchable form, digital archiving is incomplete and patchy. Some reports might not have used words or phrases distinctive enough for me to locate OE related tragedies among the more numerous youth tragedies unrelated to OE.

Although whether a catastrophic incident could have been prevented can be determined analytically, whether it should have been prevented depends at least in part on whether there had been unlearned lessons from past incidents. In practice knowledge of past incidents is unevenly distributed and tends to fade over time, only to be recalled in debate following a catastrophe. The contribution of this chapter is to review potential lessons from a wider compilation of catastrophic incidents than has previously been studied, to embed knowledge of them in the OE literature, and to consider some implications of any evident patterns.

As I reiterate throughout this volume, insights from this study should assist program reviews. A voluntary program review in the light of precedent events is vastly preferable to a forced review in the wake of an actual tragedy. Although a catastrophe is an anomalous event, it can trigger fundamental external scrutiny of an OE program. An investigation will usually consider what the aims of the enterprise were, what benefit was supposed to ensue, and what knowledge, experience, and qualifications the organisers had. Catastrophic events can thus become unsolicited lenses through which not only particular programs, but also the OE field, is

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examined. In New Zealand a series of tragedies contributed to a decision to review commercial adventure activities (Department of Labour, 2010), and subsequent regulations (Gulley, 2013; Mateparae, 2011). In the UK the deaths of four teenagers on Lyme Bay, in 1993 (discussed in Chaps. 4 and 7), led explicitly to changes in legislation (Allison & Telford, 2005; Bradford, 2002). Accident analysis often entails a public interrogation of pedagogical, epistemological, and ontological assumptions at the core of OE theory and practice.

As in each case-study chapter, I have provided sufficient details on each catastrophic incident in the accompanying tables, including at least one reference, to enable anyone interested in a particular incident to locate more information, including, in most cases, the names of any victims, which combined with the date should facilitate a search for news reports and more detailed records. When I refer to an incident in the text I use the name allocated in the table.

I searched exhaustively on-line for incidents with three or more fatalities involving organised youth camps or excursions since 1900. I did not apply a tight definition of OE as a filter; my primary focus was on catastrophic incidents in particular circumstances, whether or not the endeavour met any particular definition of OE. I expected that because particular environmental hazards might give rise to similar incidents regardless of the aims and purposes of the group, examining a range of groups in similar circumstances was likely to be more informative than a more limited study. My search will have missed some incidents I define as catastrophic about which nothing has been published in English, about which nothing has been published on-line, or which my search terms failed to elicit. I used an iterative process in which I persisted until any new search terms or search constraints I applied elicited no additional incidents. I found some incidents by searching recently digitised newspaper archives; additional incidents should come to light as digitisation proceeds. To keep the study manageable, I excluded, with some exceptions, incidents involving groups of adults, incidents involving multiple casualties but fewer than three deaths, and clusters of single fatalities.

Although catastrophes are rare in OE, and any incident might seem unprecedented to those affected, patterns emerge when incidents involving youth groups of any kind from any country over a period of more than a century are considered.

Adventure based OE is sometimes defined in terms of risk (Boyes and O'Hare, 2003), which is not to say risk of *catastrophe* must be accepted as a part and parcel of OE. As I discussed in Chap. 4, detailed analyses of some past tragedies have shown that each could have been avoided without abandoning any educational goals (Brookes, 2011; Cloutier, 2003; Raffan, 2002). This chapter further considers what reasonable steps could be taken to prevent any catastrophe in OE.

Unless some aspects of a catastrophe indicate otherwise, prevention is premised on three conditions which apply to both program planning and care of youth in the field: (1) a decision-maker who has experience and local knowledge sufficient to understand that particular environment and any potentially catastrophic hazard (2) a decision-maker who has a strict aversion to catastrophic risk (as distinct from calculating or weighing risks when less is at stake), and (3) assuming that few leaders will have extensive personal experience of serious incidents, a decision maker who has

studied relevant serious incidents in order to have a good understanding of how they occur. There will, of course, be wider human, organisational or societal circumstances that influence or determine if these three conditions are met. In reviewing a catastrophic incident counterfactually to determine what could have prevented deaths, in some cases it is evident that once events have reached a certain point only adults present at the scene could have taken any effective preventative action.

There have been catastrophes involving leader inexperience, such as the Cairngorms 1971 incident (Table 5.8). There have been incidents in which experienced leaders implicitly tolerated a level of catastrophic risk. For example, Cloutier's (2003) detailed analysis of the Connaught Valley 2003 incident (Table 5.7), in which seven students led by experienced adults died in an avalanche, identified several alternative routes that the leaders could have chosen to avoid the possibility of avalanche completely.

In outdoor recreation, as distinct from OE, strict aversion to catastrophic risk is not universal. Cloutier (2003) emphasises a distinction between adults caring for young people, which ethically and often legally requires strict aversion to catastrophic risk, and adults making choices about their own recreation, which may entail conscious acceptance of some catastrophic risk (see also Johnston, 1989). Post-tragedy the question of risk versus benefits is not an abstract consideration, because very often program goals could be achieved without catastrophic risk, in which case the question of relinquishing goals does not arise (see, for example, Brookes, Corkill, & Smith, 2009). Alternatively specific goals that entail catastrophic risk could be replaced with safer, equally meritorious goals.

Some deaths have been attributable to ignorance of what could go wrong. Studying cases aims to bridge any gap between the experience of an individual and collective experience, especially for events outside most individuals' experience. Use of case studies to develop knowledge of accidents is accepted practice in many fields, and indeed is implicit in every detailed accident report. Failure to have a system in which leaders learned about previous incidents was specifically identified as a factor in the Mangatepopo tragedy in 2008 (discussed in Chaps. 4 and 7), in which six students and one teacher died in a flash flood (Brookes et al., 2009).

The process of pattern recognition that develops as incidents are studied is consistent with dual process models of developing expertise. Patterns include "fuzzy gists" of adverse situations (Galloway, 2002; Reyna, 2004). It is, difficult to prove, but plausible that gaining vicarious experience through case studies would develop ability to recognise dangerous situations analogously to gaining actual experience of adverse events:

> Decision makers recognize the gist of a risky situation (often multiple gists of that situation) based on prior experience, and simultaneously encode its verbatim representation. Verbatim representations rapidly fade, and judgment and decision making are instead governed by a fuzzy processing preference (i.e., decision making preferentially operates on the gist representations, not on the verbatim ones). This tendency to base decisions on simple qualitative gist increases with age, experience, and expertise. (Reyna & Farley, 2006, p. 19)

I have tabulated catastrophic incidents in groups for the purposes of this chapter. Grouping them in different ways could produce other useful comparisons.

5.2 Transport to and from Venues

Tables 5.1 and 5.2 describe 28 catastrophes involving multiple fatalities en route to, or returning from camps or excursions. The lists are not exhaustive.

Table 5.1 Transport catastrophes: air and water

Incident	Date	#	Location	Description	Sources
General Slocum 1904	15/6	958	East River, New York, USA	Chartered Sunday School excursion. Wooden side-wheel paddle steamer. Caught fire, and captain did not pull in to shore but maintained full speed in the middle of the river. 958 passengers died, less than 400 survived.	King (2012)
Bombay1963	28/7	28	Bombay Airport, India	24 Philippine Scouts en-route to the 11th World Scout Jamboree died in a plane crash.	The Philippine Genealogical Society On-Line (2012)
Lake Geneva 1969	18/8	19	Thonon, France	Pleasure steamer carrying 50, including 33 children from a school camp, sank stern first. At least 8 of the 19 drowned were children.	United Press International (1969)
Überlingen 2002	1/7	71	Überlingen, Germany	Russian charter flight carrying 51 children attending a UNESCO sponsored festival in Barcelona collided mid-air with a DHL freight plane, killing all passengers and crew on both aircraft.	Nunes and Laursen (2004)
Kaduna 2005	21/5	8	Trappco Resort, Kaduna, Nigeria	School excursion, about 35 students taken on boat cruise on Kaduna Resort lake. On the final run the boat ran out of fuel and capsized. 7 children drowned, and the brother of one who went to assist from the shore also drowned.	Sa'idu (2012)
Periyar River 2007	21/2	18	Periyar River, Bhootathankettu Reservoir, India	Group of 118 including 12 staff on a primary school excursion to Thattekkadu Bird Sanctuary. One of three boats, carrying 37 persons, capsized. 15 students and 3 teachers drowned.	Oneindia (2007)
Chaliyar River 2009	4/11	8	Chaliyar River, Keralla, India	Boat carrying 35 students home from school capsized.	The Hindu (2009)

Table 5.2 Road transport incidents

Incident	Date	#	Location	Description	Sources
Escalante 1963	10/6	13	Utah mountains 35 miles SE of Escalante, USA	Group of explorer Scouts and adult leaders riding on a flatbed truck en route to Hole-in-the-Rock, Utah. Driver attempted to downshift, gears did not engage. Truck rolled backwards, brakes failed. Rolled then dropped 10 m. 7 Scouts and 5 adults killed. 34 injured, one subsequently died.	United Press International (1963)
Matahina Dam 1969	4/9	5	New Zealand	Five unsupervised boys on a youth camp drowned when a vehicle ran into a lake. Iconic New Zealand author Barry Crump[a] and guide George Johnston were acquitted of manslaughter.	Lynch (1999)
Bourke 1979	26/8	8	Bourke NSW, Australia	"Informal" outback excursion – 1 teacher 1 aide, 2 vehicles. Dusty outback road, head-on collision (passenger sides) with panel van. 3 students died, 5 passengers in the panel van (locals) also died. Driver of panel van charged, acquitted.	Australian Broadcasting Commission (2005)
Christmas Creek 1979	21/4	4	Lamington Qld, Australia	19 students and 4 adults, teacher driving. Narrow winding road. Bus ran off road, rolled down slope 50 m. 7 injured, 4 died at scene.	Gubby (1988)
Merceuil 1982	31/7	53	Mercuil, France	Highway pile-up involving 2 buses and 7 cars in heavy traffic, wet conditions, and darkness. Buses carried 107 children and 6 counsellors to a camp in the alps. At least 44 of the victims were children aged 6 to 14.	Associated Press (1982)
Gordonvale 1987	4/2	8	Gordonvale Qld, Australia	Bus carrying 43 students and 2 teachers returning from camp left road, rollover. Driver (professional) blamed initially, found not to be at fault. Faulty brakes. 12 seriously injured, 8 died (7 at scene, 1 in hospital).	Wright (1987)
Guadalupe River 1987	17/7	10	Guadalupe River, USA	Church camp bus and following van encountered flooded road while attempting to reach higher ground. Bus stalled. Passengers exited vehicles in rising water. Group scattered by current, vehicles washed away and ten drowned.	Associated Press (1987)

(continued)

Table 5.2 (continued)

Incident	Date	#	Location	Description	Sources
M40 motorway 1993	1/11	13	M40 motorway, England	Minibus driven by teacher returning from school excursion collided with maintenance vehicle on road shoulder, caught fire. 13 died, two children survived.	Mackinnon (1994)
Semester at Sea 1996	27/3	7	India	University of Pittsburgh students on 4 day India field trip, as part of Semester At Sea. Planned air travel not provided, instead the students were put on a bus, the driver of which had reportedly been on duty over 30 hours and allegedly affected by alcohol. Bus crashed, killing 4 Semester At Sea students and 3 others.	Cherese Mari Laulhere Foundation (n.d.)
Albertville 1997	?	3	Albertville, France	UK school excursion to France. Coach left road near Albertville, 3 students died.	Boyland (2000)
Terrell 2002	24/7	5	Terrell, USA	Bus taking children to church summer camp collided with highway pillar. Driver and 4 children killed, many injured. Driver had poor record. Possibly a snake on the bus.	Lanford (2004)
Lim River 2004	4/4	12	Lim River, Bulgaria	Bus carrying 34 students and 16 adults on a school excursion lost control and plunged into the Lim River. 38 were rescued, 12 children drowned. Bus driver convicted.	Sofia news agency (2013)
Islamabad-Lahore Motorway 2005	27/2	10	Islamabad-Lahore Motorway, Pakistan	Bus carrying 61 school children on a school excursion overturned. Ten die and 50 injured.	Nawazish (2011)
Moncton 2008	12/1	8	Moncton, Canada	School basketball team returning from a game in US-style 15 passenger van. Fishtailed and collided with on-coming truck. Eight of 12 onboard killed.	CBC News (2008)
Minya 2010	29/12	15	200 South of Cairo, Egypt	Bus with 77 schoolgirls swept off highway by floodwaters. 14 girls and one rescuer drowned.	Associated Press (2010)
Idanre Hills 2010	17/3	42	Ondo-Ore federal road, Nigeria	More than 64 pupils and teachers packed into an 18 seat bus returning from a school excursion. Head-on collision on poor road. 10 died on the spot. Others died at least in part due to poor medical facilities.	Onyekakeyah (2010)

(continued)

Table 5.2 (continued)

Incident	Date	#	Location	Description	Sources
Nelspruit 2010	10/6	3	Nelspruit area, South Africa	UK College students on field trip, 4wd bus overturned. Two 19 year olds died at the scene, 22 year old died later in hospital.	Williams, Schlesinger, and Gysin (2010)
Islamabad-Lahore Motorway 2011	26/9	40	Islamabad-Lahore Motorway, Pakistan	Bus carrying 105 school children on a school excursion overturned. 31 die and 67 critically injured. Final death toll 37 students 2 teachers and deputy head.	Nawazish (2011)
West Bank 2012	16/2	6	Ramallah, Israel/ Palestine	Bus carrying students on a school excursion hit by an out-of-control truck in wet conditions. 5 children aged 4 to 6 and one teacher killed. 42 injured.	Associated Press (2012)
Tunnel de Geronde 2012	13/3	28	Sierre, Switzerland	Coach clipped a kerb and collided with wall in a tunnel. 22 children returning from a school skiing trip died. Teachers and drivers also died.	Lancefield and Meade (2012)

From 1959 Crump wrote humorous accounts of life in the New Zealand bush hunting. By the early 1990s his books had sold over one million copies in New Zealand alone (New Zealand Book Council, 2017)

Transport accidents have multiple fatalities for the obvious reason that all passengers can be at risk when a plane or bus crashes, or a ferry sinks. In some cases a catastrophe was entirely outside the control of the group leaders or organisers, which is to say the incident was preventable but not by them.

OE groups can be the victims of catastrophes that are unrelated to OE except by chance. The Bombay 1963 incident, in which 28 Philippine scouts died in a plane crash, or the fire on the General Slocum in 1904, in which 958 passengers on a Sunday School picnic charter died, just happened to involve youth groups. It follows that some transport deaths are not an OE phenomenon, so much as a consequence of wider circumstances in which OE occurs. Some OE related travel could be less risky than the everyday risks of pedestrian and vehicle travel that would apply should the trip not proceed. According to Van Slyck (2006, p. 83) parents in the USA at the beginning of the twentieth century saw summer camps as a relatively safe haven for their children from the hazards posed by motor vehicles in urban life in an era when children had few alternatives to playing on the streets.

OE has a more causal role in some transport incidents, if a teacher or leader was driving, or if a chosen route or conditions were hazardous. For example, the Kaduna 2005 and Periyar River 2007 catastrophes, both involving boat excursions, could be considered water related OE incidents rather than transport incidents. Some transport incidents involved the kinds of environmental and weather-related factors that figure in many OE serious incidents (Brookes, 2004). The Guadalupe River 1987 and Minya 2010 incidents both involved floods. Several incidents involved hazardous road conditions associated with the location or region chosen for the excursion, as was the case

with Escalante 1963, Bourke 1979, Christmas Creek 1979, Idanre Hills 2010 and possibly Nelspruit 2010. The Matahina Dam 1969 incident in particular was seen in New Zealand as OE related (Lynch, 1999) because it involved supervision deficiencies, and perhaps because it involved use of a vehicle during a program.

Non-OE groups can be victims of some situational hazards typically associated with OE. In the Chaliyar River 2009 catastrophe eight drowned when a boat carrying students home from school in India capsized. A similar incident occurred in New Zealand in 1900 (not included in the tables), in which every child from the village of Marenui, together with one adult, drowned when a canoe taking them to school evidently capsized in the Matu river (van der Wouden, n.d.). A parent also drowned, perhaps attempting rescue. No witnesses survived. In both examples risk was inherent, in that parents had no alternative but to accept a potentially dangerous journey if they wanted an education for their children. Although that circumstance might no longer be true in New Zealand, it remains the case elsewhere. Childhood mortality has varied greatly over time (generally diminishing in high income countries), and varies greatly geographically (Ahmad, Lopez, & Inoue, 2000). It follows that an excursion from a relatively safe OECD nation to a less safe non-OECD nation could entail orders of magnitude increases in day-to-day risk associated with transport, housing, and health care.

Most OE tragedies involve hazards and situations that humans have encountered for centuries, and which could be comprehended and managed by an individual. In the broad field of accident analysis, which encompasses incidents such as oil spills during drilling at sea, or nuclear accidents, some new approaches have been required to examine the role of complex socio-technical systems:

> The growth of complexity in society has outpaced our understanding of how complex systems work and fail. Our technologies have got ahead of our theories. We are able to build things whose properties we understand in isolation. But in competitive, regulated societies, their connections proliferate, their interactions and interdependencies multiply, their complexities mushroom. (Dekker, 2011, p. xiii)

In a general sense to consider a role for safety systems is uncontroversial. That is different from an approach, more akin to a movement, or even fad, characterised by a zeal for "systems thinking" based on structuralism, which I discuss in Chap. 7. In most cases it does not assist prevention to characterise OE related catastrophes as a function of complex socio-technical systems, but there are exceptions. The Überlingen 2002, incident, in which 51 students en route to a UNESCO festival were killed in a mid-air collision, is exceptional in that it was indisputably a complex systems incident (Brooker, 2008; Nunes & Laursen, 2004), albeit one which just happened to involve a youth excursion.

5.3 Fire, Structural Collapse, and Intentional Deaths

Incidents that involve OE more by happenstance than by some particular connection with OE are not confined to travel. I have included instances of multiple murder (Table 5.3) in this category. In both incidents it appears the existence of an offender

Table 5.3 Intentional deaths

Incident	Date	#	Location	Description	Sources
Camp Scott 1977	13/6	3	Locust Grove, Oklahoma, USA	3 girls on summer camp raped and murdered	Morgan (2007)
Utøya 2011	22/7	68	Utøya, Norway	Lone gunman shoots 90+ at youth summer camp on the island of Utøya. 68 died.	Flynn (2011)

Table 5.4 Fire, electrocution

Incident	Date	#	Location	Description	Sources
Gillingham Park 1929	11/7	14	Gillingham Park, Kent, England	Naval Cadets, Sea Scouts, and Firemen, planned fire-fighting demonstration at the Gillingham Fete. A real fire on the first floor of the building blocked the exits and trapped those above. 9 children aged 10 to 14 died in front of the spectators. 6 adults, mostly firemen, died.	Oschefski (n.d.)
Thorndale 1983	13/8	3	Kin Camp, near London Ontario, Canada	10 unsupervised campers with mental disability left unsupervised in cabin. Fire at 4.00 am. 3 died.	Canadian Press (1983)
Pat Sing Leng hill fire 1996	10/2	5	Hong Kong	Party of 54 students and teachers from Fung Yiu King Memorial Secondary School hiking on a steep slope caught by a wildfire coming from below in windy, dry conditions, probably started by students smoking. 2 teachers and 3 students died, many others seriously burned.	Chow (2003)
Sealand Youth Training Center 1999	30/6	23	Hwaseong-gun, Gyeonggi-do, South Korea	Seaside children's camp dormitory, 3 storeys made of shipping containers. Unknown number sleeping. Fire at about 2.30 a.m. caused by mosquito coil. 23 died, including 19 kindergarten children.	So-young (n.d.)
Fort A.P. Hill 2005	27/7	4	Virginia, USA	4 volunteer Scoutmasters killed when a dining tent pole they were raising for the 2005 National Jamboree apparently touched a power line.	Barringer (2005)

was more significant than any opportunity for offending a camp situation might have unwittingly provided. It is conceivable that an OE program could entail an elevated risk of mass murder because of the part of the world chosen, but I did not find any examples.

Multiple deaths from fire (Table 5.4) have occurred in OE-like situations. OE might involve a circumstance of rustic or informal accommodation with relatively poor fire protection (c.f. Sealand Youth Training Centre 1999). Fires in buildings tend to have multiple victims for the same reasons plane crashes do. Two fatal incidents in Australian OE, discussed in Chap. 6, both had two casualties, one of

Table 5.5 Structure collapse, electrocution while assembling structure

Incident	Date	#	Location	Description	Sources
Cave Creek 1995	28/3	14	Cave Creek, Paparoa National Park, New Zealand	17 outdoor recreation students from Tai Poutini Polytechnic and Department of Conservation field manager crowded onto a viewing platform. Platform collapsed into Cave Creek, occupants fell 30 m. 14 died, 4 seriously injured.	Noble (1995)
Swing Bridge 1995	?	3	Unknown. USA	Three Scouts, 13, 14,14, drowned after falling into swollen river when swinging bridge collapsed. Location unknown.	Bell (2006)

whom died in each case (Brookes, 2003a). Fire prevention and fire safety have substantial systemic aspects that reside in the wider society.

Societal improvements in fire safety contribute to overall expectations of community safety, and by implication raise the bar for OE fatality prevention over time (see also Brookes, 2011). At least in some countries, deaths from fire have decreased steadily and significantly over recent decades. For example, in Great Britain deaths have halved over a 20-year period (Department for Communities and Local Government, 2012).

Like road safety and ferry standards, fire safety standards vary internationally. The Sealand Youth Training Center occurred in South Korea, where the overall risk of fatal injury to youth from any cause was nearly 500 per cent greater than in the safest OECD countries. Based on 1991–1995 data, the annual death rate from accidents for 1–14 year olds in South Korea was 25.6 (per 100,000 of population), compared to 5.2 and 6.1 for Sweden and the UK respectively (UNICEF, 2001). Any group from the UK travelling to South Korea would not necessarily encounter a five-fold increase in risk of death from fire, because the risk might not be uniformly distributed, but that possibility should be carefully considered.

Wildfire can be a community risk in some weather, but the risk varies geographically, meaning OE programs could enter high-risk zones in high-risk conditions. However, the Pat Sing Leng hill fire 1996 is the only instance I found involving an OE group and wildfire, which suggests such incidents are more rare than those involving water or storms, perhaps because water and snow are more suited to OE than areas of dry vegetation in hot windy conditions. In the Pat Sing Leng case all of the necessary conditions for wildfire – fuel, topography, weather, and ignition, were arguably linked to OE programming decisions.

Table 5.5 describes multiple-fatality falls caused by structures failing. In the Cave Creek 1995 a structurally deficient platform collapsed. The victims could not have known about the deficiencies. I could not find details of the Swing Bridge 1995 incident to determine if the victims had any way of knowing or intuiting the bridge might collapse.

The Cave Creek 1995 tragedy involved simple engineering failures with complex socio-economic root causes (Noble, 1995) unrelated to OE. I consider it in more detail in Chap. 7.

5.4 Knowable Environmental Hazards

Other than many of those in Tables 5.1, 5.2, 5.3, 5.4 and 5.5, incidents in this study can be grouped around a relatively small set of particular, environmental hazards, based on location, conditions, or both. Table 5.6 catalogues incidents that, like the Pat Sing Leng hill fire 1996, appear to be particularly unusual.

In the Untersberg 1988 incident four unsupervised male teenagers slid to their deaths on a snow slope. Deaths from falls are a distinct pattern in OE (Brookes, 2003b), but typically the victim is a single unsupervised teenage male, which I discuss in Chap. 6.

The Ptarmigan Peak 1997 incident had two deaths and some other casualties, also from falls on steep snow, in the course of a supervised mountaineering descent. I found no similar OE-related incidents. On Ptarmigan Peak there were fewer than three deaths and victims were young adults, which puts it on the margins of this study. I included it because it is a well-known OE incident that has generated considerable analysis and discussion (Ajango, 2000). A better comparison for that incident might be with incidents described in the annual *Accidents in North American Mountaineering series* (for example Williamson, 2012), rather than with OE incidents. Certainly multiple fatalities caused by a single climber falling and pulling or knocking off others roped together has precedents outside the OE domain, including during the descent from Edward Whymper's first ascent of the Matterhorn in 1865 (Goodwin, 1997).

Table 5.6 Falls/rockfall

Incident	Date	#	Location	Description	Sources
Untersberg 1988	4/4	4	Untersberg Mountain, Austria	UK school snow excursion. 29 students not directly supervised, teachers in a restaurant. 6 boys went onto a snow slope, 4 slid 150 m to their deaths.	The Glasgow Herald (1988)
Ptarmigan Peak 1997	29/6	2	Ptarmigan Peak, Alaska, USA	12 students and 2 instructors descending a snow couloir on Ptarmigan Peak as part of an introductory university mountaineering course. Groups of 3 and 4 roped together, one moving at a time in soft snow while the others leaned on their ice axes. Ropes attached to waist. Climber in the top group slid, unable to self arrest, pulled both other climbers on the rope off their stances backwards. All of the groups below dislodged in turn by sliding climbers from above. Whole party fell about 300 m. Two died, more deaths likely had 3 skiers not happened upon the pile of bodies at the bottom.	Miller, Ratz, and Williamson (1997)
Gracetown 1996	27/9	9	Western Australia	Group of parents, teachers and children watching an interschool surfing carnival. 10 sheltered under a limestone cliff, landslide (30 tonnes), all but one died.	Moore (1996)

In the Gracetown 1996 incident, a cliff of limestone and sand collapsed while parents and teachers sheltered beneath an overhang from rain during a school surfing competition. Landslide deaths are very rare in Australia. Coates (1996) found only 32 fatalities between 1803 and 1994, compared to nearly 4300 due to heat waves over nearly the same period. The nine Gracetown victims were locals, and the cliffs were visibly unstable, so the circumstances did involve a knowable environmental hazard. In common with other multiple fatality incidents some of the victims were adult supervisors. Also in common, the morphology of the incident is better described in terms of an environmental hazard than an outdoor activity – the activity involved – spectating – explains only why the group was near the hazardous location.

Local rescuers slid heavy machinery down near vertical slopes to access the beach (Moore, 1996). A local volunteer removed rocks and pebbles by hand and was able to reach the hand of the sole survivor, a 10-year old girl whose face had not been buried in sand because it was pressed so hard against rock her nose was broken, her toes almost touching her face. She begged the rescuer not to let go her hand, and asked where her mother was. Her mother had been completely buried and did not survive (Daly, 1996). Palmer (2001) examined the immediate aftermath of the tragedy, arguing that both the successes and failures of the efforts of local authorities to deal with those traumatised by the tragedy could be attributed to doing things "by the book".

5.5 Avalanche Incidents

Table 5.7 lists avalanche deaths. I found eight catastrophic incidents involving school or youth groups. Two incidents involved military recruits, the Jungfrau 2007 incident in which the victims were five military recruits reportedly aged 19 to 23, and a sergeant, and the Vassdalen 1986 incident which claimed 16 victims aged 19 to 26. I included the military incidents because adolescent development extends into the early 20s (Steinberg, 2008), and because the victims were on a training course.

Most fatal avalanches claim just one victim (Avalanche.org, 2013), although in North America between 1998 and 2013 there were 17 incidents with more than two deaths. The only incident in that period with more victims than the Connaught Valley 2003 incident occurred on January 1 1989 when nine died in a school gymnasium in Quebec during a New Year's Eve party (Avalanche.org, 2013). The worst recorded incident in Canada was at Rogers Pass in 1910 (58 died). Twenty incidents with six or more victims had been recorded in Canada prior to 2008 (Campbell, Bakermans, Jamieson, & Stethem, 2007), including the two in Table 5.7.

OE-related avalanche incidents claim multiple victims either because a large avalanche struck a spread-out group, or because the group was close together (Les Orres 1998) or tied together (Mt. Temple 1955). The Mt. Temple 1955 incident involved inexperienced leaders. The Les Orres 1998, Jungfrau 2007, and Valmeinier 2009 tragedies all involved professional guides.

From reports in English on the Tochigi 2017 incident it appears that a large group were snow-walking on lower slopes, having cancelled planned mountaineering due to avalanche risk, when they were struck by a large avalanche from high above.

Table 5.7 Avalanche

Incident	Date	#	Location	Description	Sources
Mt. Baker 1939	22/7	6	Mt. Maker, Washington, USA	Western Washington College of Education annual hike on Mt. Baker, 25 students and 2 guides. Avalanche. Six students died.	Associated Press (1939)
Mt. Temple 1955	14/7	7	Mt. Temple, Banff, Canada	A group of 22 schoolboys from the USA and two leaders climbing Mt. Temple. One leader did not accompany the group; the other turned back and allowed the boys to continue. Avalanche swept 11 200 m down the mountain. 7 died.	McPherson (1955)
Vassdalen 1986	5/3	16	Storebalak, Norway	Nato exercise. 27 conscripts and 3 sergeants moving by snowmobile on a newly formed track after heavy snowfall. All 31 were caught by a very large slab avalanche, 16 died 15 survived. A team on its way to bring the group out because of avalanche danger became the first responders.	Kristensen, Heir, Herlofsen, Langsrud, and Weisæth (2012) and Lied (1988)
Les Orres 1998	23/1	11	Les Orres, French Alps	Party of about 30 students, teachers, and guides on snowshoe trek in extremely high avalanche danger. Avalanche caught the party, 21 injured, nine seriously, and 11 died.	Marshall (1998)
Connaught Valley 2003	1/2	7	Rogers Pass, British Columbia, Canada	Relatively large group of outdoor education students ski touring in Connaught Creek, a known avalanche area in conditions of "considerable" avalanche risk on the slopes high above the group. An unusually large avalanche buried 14. Two nearby mountain guides assisted with the rescue of 7. 7 died.	Cloutier (2003)
Jungfrau 2007	12/7	6	Jungfrau mountain, Switzerland	Party of 14 Swiss defence recruits on week 17 of 21 week training program. Avalanche killed 6, 8 rescued.	BBC (2007)
Valmeinier 2009	11/3	4	Valmeinier ski resort, France	Seven school students and guide skiing off piste near Valmeinier resort. Avalanche 900 m by 600 m swept away all but one, who raised the alarm. Two rescued injured, 4 died.	BBC (2009)
Tochigi 2017	27/3	8	Nasuonsen Family Ski Resort Japan	51 high school students and 11 teachers on mountaineering course. Avalanche killed 8 students many more injured. Avalanche warnings were current, and the group were snow walking 500 m from their hotel.	Japan Times (2017)

Most of the incidents occasioned reported debate about decision-making and risk. The critical issue, in the case of dependent groups of youth on an education or training course, has been articulated by Cloutier (2003):

> The standard of care applied by commercial outdoor operators is inappropriate for schools because the tolerance for risk is much higher in a commercial trip than most parents would accept for a school trip. The philosophy held by an outdoor educator that risk is a necessary and worthwhile part of outdoor education is based on potential benefits and may not account for the real potential consequences … has faced the reality of the consequences of this philosophy, and no parent, administrator, or board member spoken with would agree that educating students about backcountry skiing was worth the price that was paid on the trip in Rogers Pass on February 1, 2003 (p. 53)

In the avalanche safety field more generally, experience and knowledge have not always been sufficient to prevent deaths (McCammon, 2004). Because catastrophes are rare, experience can reinforce that an avalanche will probably not occur (Furman, Shooter, & Schumann, 2010).

5.6 Blizzards, Storms

A storm on January 12 1888 that hit pioneering communities on the Great Plains, USA, after a morning of clear sky and mild temperatures, became known as "the Schoolchildren's Blizzard" because many of hundreds dead were school children caught on their way home from school. Laskin's (2009) account, which examines the weather systems, forecasts, warnings, and the individual stories of many of the victims and survivors, identifies many factors also discernable in OE tragedies. Some of the key elements of severe weather, inadequacies of clothing and equipment, the problem of finding and reaching shelter, difficult rescue conditions, problems locating victims, and lengthy searches for bodies are present in all cases described in Table 5.8.

Compared to an event such as an aircraft crash, blizzard-related catastrophes unfold more slowly and may affect victims at different times in different places; what might be loosely described as a single catastrophe could be better understood as a cluster of incidents caused by a single weather event.

In the cases of Wiesbachhorn Peak 1957, Old Baldy 1958, Mt Hood 1986 and Antuco 2005, individuals survived by leaving a group, as was the case in some open water catastrophes considered in Chap. 4.

The Cairngorms 1971 incident affected a generation of OE leaders and teachers in the UK (Allen, 2010; Duff, 2008; MacDonald, 1972). In Australia that tragedy was reported a few days later on page 2 of the *Launceston Examiner*, the front page of which was devoted to news that a school boy had died in a blizzard and others awaited rescue in a hut on Cradle Mountain, Tasmania (Lyons, 1971). That incident was, in turn, the 3rd school bushwalk hypothermia tragedy around Cradle Mountain in 7 years. One teacher also died (Brookes, 2003a). Newspaper reports of the 1971 event in Tasmania took a more critical line than was the case the earlier deaths in

Table 5.8 Hypothermia, lightning strike, tornado

Incident	Date	#	Location	Description	Sources
Teton Peaks 1951	1/8	5	Wind Caves, Driggs, Idaho, USA	Group of around 40 campers hiking, stopped at Wind Caves, Idaho. Group was about to head to lower ground after a nearby lightning strike when lightning struck the group, injuring many. 5 girls died.	No author (1951)
Dachstein 1954	15/4	13	Dachstein massif, Austria	3 teachers and 10 students from the German town of Heilbronn set off from Obertraun for the Dachstein massif, against advice. Soaked with rain after 2 h, but decided to carry on. After a massive search a body was found after 9 days. Last 2 victims found 43 days after search began. All died.	Schrenk et al. (2004)
Wiesbachhorn Peak 1957	29/8	4	Wiesbachhorn Peak, Austria	Group of 11 students and a teacher from Vienna caught in a snowstorm on Wiesbachhorn Peak. 5 made their way back to a hut, 3 rescued, 3 students and the teacher died.	Associated Press (1957)
Old Baldy 1958	15/11	3	Madera Canyon – Mount Wrightson trail, Arizona, USA	6 Scouts ages 12–16 set out to climb Mt Wrightson, Arizona, and camp overnight, against advice of Scoutmaster. 3 turned back, camped lower down. Rain overnight turned to heavy snow. Group camped lower rescued. Massive search in difficult conditions found the 3 bodies after 19 days.	Johnson (2012)
Routeburn Track 1963	?/12	2	Harris Saddle, New Zealand	Thirteen 11–13 year-old children and two teachers walking Routeburn Track section, school excursion. Caught in blizzard. Teacher carried one to hut, returned to two left in sleeping bags. Both students died, teacher found in coma.	Lynch (1999)
Four Inns 1964	14/3	3	Peak District, England	Rover Scouts annual "Four Inns Walk". Forecast showers/fine but heavy rain and strong winds eventuated. Three aged 19, 21, and 24 from two groups died. Large search for two, last body recovered after 3 days.	PDMRO (2012)

(continued)

Table 5.8 (continued)

Incident	Date	#	Location	Description	Sources
Cairngorms 1971	21/11	6	Cairngorms, Scotland	6 students, 20-year-old student teacher and 18-year-old assistant on overnight walk. Caught in a blizzard overnight. Search and rescue in extremely difficult conditions. Leader and 1 student survived. 6 died about 200 m from a shelter.	MacDonald (1972)
Mt Hood 1986	12/5	9	Mt Hood, Oregon, USA	Two adults and eleven children on a school ascent of Mt Hood in forecast poor weather. Descending in a blizzard, they built a snow cave for shelter, and lost some equipment. Two left the group to seek help the next day. Rescuers found 3 bodies on the following day, and 2 days later found the cave. 9 died.	Miller (1990)
Mt Ruapehu 1990	12/8	6	Mt Ruapehu, New Zealand	Two instructors and 11 trainees on an Army adventure training course on Mt Ruapehu. Caught by a blizzard in snow shelters. Attempted to find emergency hut, about 400 m away, failed, could not relocate shelters. Six recruits aged 18–23 died, hypothermia.	Cumming (2000)
Antuco 2005	18/5	45	Antuco Volcano, Chile	475 poorly equipped teenage recruits on 28 km march caught in blizzard conditions. 45 died in blizzard which lasted 5 days.	McDermott (2005)
Little Sioux Scout Ranch 2008	11/6	4	Iowa, USA	4 Scouts killed when a tornado went through a Scout camp.	Maag and Bowley (2008)
Mukdahan 2008	1/9	5	Mukdahan, Thailand	Teachers and students from Perth Australia, service-learning trip to Thailand. Teacher and accompanying youth worker, together with 3 local girls, killed when lightning struck while they were sheltering under a tree from a thunderstorm.	Palmer (2008)

1964 and 1965. Similarly, Lynch (1999) noted that public reaction to the Routeburn Track 1963 tragedy, in which two children died and a teacher almost succumbed, as relatively subdued.

Book-length accounts were published on the Old Baldy 1958 incident (Hufault, Carson, & Blake, 2010), Dachstein 1954 incident (Schrenk, Gruber, Schilling, & Zöpfl, 2004), and Mt Hood 1986 incident (Holaday, 1999). A reportedly classified report on the Mt. Ruapehu 1990 incident was due for release in 2015; a lone Japanese climber survived the same blizzard on the same mountain in a snow cave (Cumming, 2000).[1]

As with avalanche incidents, similar environmental conditions have occasioned morphologically similar incidents across a range of organisations, activities, aims and purposes. Two incidents: Old Baldy 1958 and the Four Inns 1964, involved unaccompanied Boy Scouts. Five incidents: Dachstein 1954, Wiesbachhorn Peak 1957, Routeburn Track 1963, Cairngorms 1971 and Mt. Hood 1986, involved led school groups. Two involved teenage military recruits on training exercises: Mt. Ruapehu 1990 and Antuco 2005. In this study I included only military training incidents involving youths; more generally, military operations have been beset by cold weather fatalities for centuries, with cumulative deaths numbering in the tens of thousands (Paton, 2001).

Incidents in Table 5.8 must be understood in their historical settings, but they also must be interpreted in the light of contemporary knowledge and technology, particularly when assessing what prevention is feasible. Each incident must be considered, or re-considered, in the light of current weather forecasting accuracy, the availability in the field of weather observations, improved navigation aids, and better communication devices.

Several incidents involved problems that GPS devices would resolve. Failure to locate shelter, or to know the location of the group, figured in the Cairngorms 1971, Mt. Hood 1986, and Mt. Ruapehu 1990 incidents. Three incidents involved long searches that current communications devices or emergency beacons would have circumvented, although rescue in steep terrain during blizzard conditions remains problematic (e.g. Leask, 2013) – Dachstein 1954, Old Baldy 1958, and Four Inns 1964. In other cases, Wiesbachhorn Peak 1957, Routeburn Track 1963, Cairngorms 1971, Mt Hood 1986, Mt Ruapehu 1990 and Antuco 2005, some victims survived until rescue, which indicates better clothing and equipment would have increased the number of survivors.

Technological improvements only add safety if they are deployed for that purpose. In the absence of strict aversion to catastrophic risk, some technological improvements in safety could be wholly or partly defeated by risk compensation (Hedlund, 2000), that is by employing technology to enable that which would previously have been too risky.

Table 5.8 includes two incidents involving lightning strikes. Multiple deaths are atypical – most lightning strikes claim a single victim (National Weather Service, 2013).

[1] Apparently a report not released at the time was never actually classified, but can only be accessed via a freedom on information request (Personal Communication). M. Johnson (2017) based an article on the report and interviews with survivors.

5.7 Weather Forecasts and Observation Data

Weather observations and data warrant a separate discussion, because weather and related conditions such as avalanche potential, or flood conditions, figure in so many incidents. In this study (including the water-related incidents discussed in Chap. 4), 70% of catastrophes not involving travel to or from a venue were weather-related to the extent that it could be reasonably inferred that but for the weather or related conditions the catastrophe would not have occurred.

Many incidents must now be understood as preventable in OE due to improvements in: Weather forecast accuracy, weather related observational data, the availability of forecasts and observation data, and the accessibility of weather related information in the field. One of the challenges for contemporary OE is to keep track of developments with potential to further shift the boundaries of safe practice.

Weather forecasting 3 or 4 days out improves continuously, mainly because of improvements in computing power. Between 1970 and 2011 inaccuracy in 3-day top temperature forecasts by the US National Weather Service had almost halved (Silver, 2012). In the space of 25 years forecasted hurricane landfalls 3 days out improved from a 350-mile radius (560 km) to 100 miles (160 km). Flood warning accuracy in New South Wales, Australia, measured as percentage of forecasts accurate to 0.3 m, has been improving on average by about 6 percentage points every 5 years over 20 years, and was about 90% in 2013 (Sooriyakumaran & Elliot, 2013). Overall deaths from tornados in the USA fell by a factor of about 15 in 75 years, in part due to better forecasts (Brooks & Doswell, 2002). Between 2008 and 2013 only seven USA deaths occurred in the absence of a Tornado Watch compared to 281 deaths with a Watch in place, meaning most deaths are not attributable to forecasting failures.

Compared to improvements in weather forecasting, it is difficult to quantify improvements in the availability of information, and feasibility of obtaining that information in the field, but large stepwise improvements can occur when a particular device or technology becomes available. While weather forecasting accuracy has improved fairly steadily, improvements in technology have been, if anything, exponential, meaning safety practices amenable to technology improvements could become out-dated almost overnight.

5.8 Other Knowable Environmental Hazards

Two encounters with bears, both resulting in multiple casualties but not multiple deaths occurred within a few weeks of each other in 2011 (Table 5.9). Both incidents are discussed in detail in Chap. 3. In both cases youths were in known bear country. In both cases prevention failures were arguably attributable to decision making shaped by the rarity of bear attacks as distinct from an attitude of strict aversion (Fiennes, 2013; Leemon, 2012).

Table 5.9 Bear attacks

Incident	Date	#	Location	Description	Sources
Svalbard 2011	4/8	1	Svalbard, Norway	11 youths and 2 leaders on a 5-week Arctic expedition. Polar bear attack. Tripwire alarm failed. Firearm failed to discharge 4 times, probably due to operator error. 1 killed, 4 severely injured including both leaders.	Steel (2012)
Talkeetna Mountains 2011	23/7	0	Talkeetna Mountains, Alaska, USA	Seven unaccompanied teenagers on a National Outdoor Leadership School (NOLS) course following a creek line. Lead student came upon a Brown Bear (probably with a cub) and yelled out. Bear attacked lead student, others ran in different directions. None deployed spray. Bear mauled 3 others (twice in one case), before leaving the area.	Leemon (2012)

The Talkeetna Mountains 2011 incident is notable because the organisation's risk management thinking has been articulated (Leemon, 2012), including reference to an argument for student autonomy (Sibthorp, Paisley, Gookin, & Furman, 2008).

5.9 Concluding Discussion

The first aim of this chapter was to conduct a relatively comprehensive a review of catastrophic incidents involving school and youth group camps and excursions. The compilation can be used to generate an understanding of what kinds of catastrophe a particular undertaking might be vulnerable to, and as a source of information to find potential case studies for staff development.

The second aim was to examine the circumstances in which catastrophic OE incidents have occurred. Almost all of the OE catastrophes reviewed occurred in distinct environmental circumstances, but there is spectrum from relatively widespread risks, which tend to be outside the control of a supervisor, and local hazards that an expert OE leader or teacher could circumvent.

Some hazardous circumstances apply across regions or populations and tend to be outside the control of OE staff, for example levels of road safety or safety standards for built structures. School excursions in Pakistan, for example, entail a much higher risk of a fatal bus crash than in many other parts of the world (Agence France-Presse, 2014), which not only means OE-related travel might be inherently dangerous in Pakistan to an extent unknown in some other countries, but also that OE from abroad to Pakistan could entail a level of risk on the roads unacceptable in the home country. To an extent hazards become part and parcel of OE in the case of travel abroad (e.g. Campbell-Price, 2013), avoided only by abstaining from the trip. I did not consider wide-scale disasters such as seismic events or war, but those are also considerations.

At the other end of the spectrum are hazards and environmental circumstances more specific to a particular OE plan, such as adverse weather, steep ground, dangerous wildlife, or snow conditions. Such hazards are more directly attributable to OE practice in the sense that they can be linked to program goals and mitigated by program decisions, although any exposed group – OE or not – could be at risk.

Leaving aside incidents attributable to hazards in the wider community, which could be present whether an OE program was undertaken or not, non-water-related OE catastrophes have occurred in relatively small set of specific, recognisable, environmental circumstances. Should an incident occur in the future it is very likely that it will have precedents and will involve a hazard that could have been recognised by knowledgeable leader. Even the quintessential random event – a lightning strike – is somewhat predictable, in that ground discharges are known to concentrate in certain regions during certain periods of time (National Weather Service, 2013; Vaisala, 2015) and have become more preventable over time. Apart from background risks such as road safety, building standards, and levels of crime, this study shows that it would be difficult to argue that catastrophic risk must be part and parcel of OE. There might be practical reasons why a program lacks an expert leader, cannot move to a safer location, or was not postponed for more suitable conditions, but those are not matters of educational principle.

The third aim was to consider what, if anything, distinguishes catastrophic incidents from tragedies with fewer victims. Most of the incidents involved a clear, if not obvious, potential for any serious incident to have multiple casualties, namely an adverse event affecting a whole structure or conveyance, weather conditions (particularly blizzards), and avalanches. The set of circumstances with catastrophic potential is small. There were exceptions in which incidents of a kind that might ordinarily have a single victim claimed several, namely lightning strikes, bear attacks, and falls. In the case of lightning strikes multiple victims are attributable to group members being close enough to be in range of a single strike. In contrast, bear attacks on a group that is closely spaced are unheard of (Leemon, 2012). Ordinarily climbers in a group can protect each other from falls. In other words there have been a small number of exceptional incidents in which the way a group was organised or behaved explains in part why an incident had multiple casualties. It remains true that overwhelmingly multiple casualties have resulted from a small number of specific, knowable circumstances which potentially put a whole group at risk.

The fourth aim was to consider patterns and preventability in the light of contemporary technology. I have discussed many similarities between events, but there is also a subjective sense of gestalt familiarity that became apparent as I examined more incidents. I would expect anyone who studies catastrophic incidents to become more attuned to recognising potentially catastrophic situations, but in the end individuals will have to decide if that is true for them. The role of technology in redefining what events are and are not preventable is far less subjective, and has and will continue to disrupt norms and standards in the OE field.

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Chapter 6
Single Fatalities on School or Youth Group Camps and Excursions: Lessons for Prevention from Australia and the UK

6.1 Introduction

The previous two chapters considered catastrophic outdoor education (OE) incidents, which I defined somewhat arbitrarily as incidents having 3 or more deaths. This chapter examines single and double fatality incidents, which are far more numerous. It draws on a study of all known Australian OE related incidents, including Australians abroad, between 1960 and 2016, and some additional cases involving UK groups, between 1990 and 2016. It is likely that these cases could inform fatality prevention elsewhere in the world, provided relevant local cases were also examined.

One insight from catastrophic incidents considered in previous chapters is that adequate measures to prevent a single death might not prevent a catastrophe. A fleet of small craft, for example, provides security in the event of single capsizes but not if there are multiple capsizes at the same time. Potential remediation by leaders or other group members fails if they also are struggling. On the other hand fatality prevention drawing only on knowledge of catastrophic incidents might fail to recognise circumstances rarely associated with more than one victim.

While some of what is true for Australian and UK OE fatality prevention would apply globally, there are almost certainly hazardous circumstances specific to other geographic regions that this chapter has not considered. For example, compared to Australia, New Zealand is steeper, colder, wetter and more geologically unstable. New Zealand OE has its own historical roots and has been influenced by distinctively New Zealand cultural, legal and social factors (Andkjær, 2009; Hollingsworth, 2011; Lynch, 1999; Zink & Boyes, 2006). A more complete understanding of fatality prevention in New Zealand would require a comprehensive review of New Zealand tragedies.

There could be potentially fatal circumstances that have not resulted in any OE deaths. For example, I found no fatal OE incidents involving open mine shafts.

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When developing fatality prevention knowledge for a particular locality, any fatal incidents should be considered, not just those involving supervised young people.

This chapter draws on an on-going research project to compile fatal incident case study material and to contribute to a "lessons to be learned" approach to OE tragedies. I first tugged at what I thought would be a short thread in October 2001. I discovered there had been more Australian OE deaths than I first imagined, but no easy conclusions about the overall safety of OE can be drawn from numerical totals. Incidence rates cannot be determined without quantifying participation, which is difficult. Moreover, I adopted a loose definition of OE, which had the effect of increasing total number of included cases. I was more interested in relevant insights into prevention than on how categorically a death could be attributed to OE, however defined. Deaths in the outdoors not involving supervised young people could also contribute insights, but I did not consider such cases (Brookes, 2002, 2003a, 2003b, 2004, 2006, 2007a, 2007b, 2011a, 2011b, 2015; Brookes & Holmes, 2014).

One reason for documenting fatal incidents comprehensively is that those responsible for an OE program can strategically study cases relevant to a program. Those incidents could be examined in more depth, and used as case studies in staff training or to inform prevention in other ways. I have not attempted to list every news report that referred to each incident, but such reports should be locatable with the information I have provided.

Available detailed reports on incidents usually name individuals involved, many of whom, in some measure, can be counted as victims. Very few incidents have been attributed to criminal intent or gross negligence. This chapter is more directed at learning how similar incidents could be prevented in the future than at making judgements about individuals. To conclude that a future incident could be prevented does not imply individuals involved in a past incident were responsible for a death. Determining fault is not necessarily helpful to prevention. Usually a fair determination of fault would require more information than is on the public record. Explanatory, exculpatory, or mitigating factors could be unrecorded.

Fairness aside, care to exercise restraint in making judgements about individuals is important because "bad apple" theories can get in the way of fatality prevention. Better to understand how, in the circumstances, one might have made a similar decision, than to risk hubris in imagining never making such an error. Everybody makes mistakes. Although it is difficult to know what was in the mind of those involved in any incident, it is clear that usually, for those involved, a fatal incident is shocking and unexpected. Death arrives "out of the blue" in programs which those involved might have thought – before tragedy began to unfold – was a great success. While there are cases that seem, implicitly, to have involved some deliberate tolerance of low probability deadly risks, it is likely that the assumption was that no death would occur.

Reluctance to attribute blame for specific past tragedies, for reasons of fairness, should not be confused with recognition that failures or omissions on the part of those responsible for the care of young people in the outdoors could result in preventable death. Accepting responsibility for the care of others entails the possibility of accepting blame for any consequences of failure to exercise reasonable care.

Fatal incidents are not normal in OE. One purpose of case-based learning is to help equip those who work in the OE field for eventualities that neither experience

nor demonstrated expertise in everyday OE could fully prepared them for. As I discuss elsewhere in this volume, fatality prevention is premised on the expertise required for normal operations in any outdoor environment, but also requires knowledge of such environments as seen through the lens of past tragedies.

OE fatality prevention requires *actors* to implement all prevention measures in their power, given their situation. In case after case it is evident that adults who supervise young people in the outdoors are on the frontline of OE fatality prevention. In many, if not most, circumstances it would be difficult to envisage how tragedy could have been averted, once a group was in the field, without positing action by a responsible adult on the scene. The role of management has to be seen in that light. Only some of the cases considered in this chapter provide direct insight into management and organisational contributions to fatality prevention. However, given only a capable adult in the field could have enacted certain precautions or preventative actions, the responsibility to deploy staff with sufficient knowledge and expertise is implicit in the prevention lessons of tragedy after tragedy.

6.2 Falls

Table 6.1 lists deaths from falls, other than sliding falls on ski slopes, which I consider separately. Most fatal falls involve a single victim.

If there is an iconic representation of "risk" in OE it is an image of roped rock-climbing, but none of the incidents in Table 6.1 involved a fall while roped. Deaths that did occur during roped activity were from hypothermia (Kanangra Walls 1991, Table 7) and from falling rocks (Bremmer Bay 1997, Lal Lal Falls 1990).

Some OE would involve top-roped climbing or abseiling off good anchors, situations in which properly deployed ropes would provide effective protection against serious falls. Fatal falls while roped can occur. The death of Catherine Peters in New Zealand, for example, discussed in Chap. 3 of this volume, involved a rope system failure. Fatality prevention could be informed by cases from other sources, such as OE outside Australia and the UK, or the extensive climbing and mountaineering literature (for example cases in J. Williamson, 2012; J. E. J. Williamson & Miskiw, 1997; J. E. J. Williamson & Podemski, 2005).

A first pass over the incidents in Table 6.1 indicates that rather than being strongly activity-related fatal falls can occur whenever participants are around a steep slope or drop. Some occurred during a walk, but others occurred during breaks from an activity or when no activity was programed. Although safety advice and qualifications are sometimes organised around activities, the history of fatal falls indicates that attention to environmental circumstances – in this instance steep ground – is essential, irrespective of what activity is undertaken.

Adult leaders in some cases were unaware of the presence of hazardous steep ground prior to their group encountering it. The student who died in the Bungonia 1995 incident had been allowed to lead a group of peers walking off-track, while the OE staff walked at the rear of the group. With the leaders' knowledge the group have ventured into an area that the leaders had not reconnoitred. Following a stream

Table 6.1 Falls, Australian and UK OE

Incident	Deaths	Date	Location	Institution	Brief description	News ref.
Joffre Gorge 1976	M 16	29/7/1976	Joffre Gorge, Karijini NP, WA	Hale School	Fell approximately 30 m, body not recovered until next day. A 15-year-old boy from the same school was seriously injured in a fall at nearby Weeno Gorge in August of the previous year (1975).	The West Australian (1976)
Tatachilla 1976	M11	7/7/1976	Tatachilla Camp, McLaren Vale SA	Sacred Heart College Brighton	4 teachers, 65 students at camp (old winery). One noticed missing (bed check). Found unconscious, died next day, severe head injuries. Extensive police interviews eventually established he fell while using a 1st floor window sill to get from one room to another during unsupervised play.	Ahern (1976)
Barkly River 1979	M16	24/2/1979	Lyndon Flat, Barkly River, VIC	Traralgon Technical College Victoria Lourdes College Traralgon	School club o/night bushwalk, 2 teachers, 2 ex-students 9 students 1 student from another school. (Sat.) 2 teachers and 6 students on day walk. In steep gully, camp in sight, 1 student allowed to take a different route alone, failed to reach camp. (Sun.) Search with own resources failed, (Mon.) police found body (dead) below 20 m cliff (spinal injuries).	Coroner (1979)
Grampians 1979	M15	23/11/1979	Grampians, VIC	Monivae College Hamilton	1 staff, 12 students (cadets) abseiling. Activity ceased due to rain. 1 student climbed unsupervised up 8 m unroped to use 2 way radio, large rock fell followed by the student, struck head (4.30 pm) Evacuation began, suspended (condition worsened). Breathing failed, ambulance arrived 6.30pm.	Coroner (1980)
Cathedrals 1983	M15	3/5/1983	Cathedral ranges, VIC	Nunawading High School	3 teachers, 21 students walking as a group along "Razorback" track. Girl fell 1m, uninjured. Boy fell from same spot 1.5 m. Head injuries (around 3pm). Evacuation began, 6pm, suspended 8pm (breathing failed), died 3.00am on mountain.	Adams (1983)

Hawkesbury River 1986	M15	10/8/1986	Fisherman's point Hawkesbury River NSW	Knox Grammar	30 students on orienteering exercise. 1 student stepped on or over a loose rock, fell 1.5 m, rock landed on top of him. Attended by doctor, died at scene.	Simpson (1986)
Freycinet 1987	M 15	11/2/1987	White Water Walls, Freycinet, TAS	Project Hahn	During free time group of boys left campsite for a walk unsupervised. Two decided to climb a cliff. After 20 m became scared, but decided continuing up was easier. Both fell as one assisted the other. Deceased fell 35 m	LNE (1987)
Bungonia 1991	M16	2/11/1991	Bungonia Gorge 40 km E of Goulburn NSW	Sydney City Mission Tallong Wilderness Centre	2 leaders, 4 juvenile offenders, canyoning. 1 fell 75 m during lunch break. Local police and homicide detectives investigated as possible suspicious death. Coroner unable to determine what caused the fall.	Hand (1992)
Boulder Falls 1992	M 20	11/2/1992	Boulder Falls, Mersey River, TAS	University of Newcastle, Geology	51 Students with unknown number of lecturers on 5 day bushwalk / Geomorphology excursion. Deceased was a member of a smaller group who detoured from the track for a better view of the falls. Fell 45 m.	McGuirk (1992)
Eton College 1993	M17	24/11/1993	Field off Eton Wick Road, Boveney, Buckinghamshire, UK	Eton College, UK	Fell 40 feet (12 m) parascending after insufficient ground preparation, as part of a Cadet exercise on school grounds during school time. His harness was seen to be detached but the Land Rover driver towing him could not near shouted warnings.	Fulbrook (2005) andDaily Mail (1994)
Bungonia 1995	M15	14/10/1995	Bungonia area ("Kirrikee") NSW	St Andrews Cathedral School Sydney	2 leaders and senior student, 15 students, 5 day bushwalk. Students leading, not directly supervised, attempted to find a way down a cliff. 1 fell 20 m, died at scene.	Elms (1996)
Gaping Gill 1995	M11	25/7/1995	Jib Tunnel, Gaping Gill, North Yorkshire	37th Blackpool Scouts, UK	Victim had decided to explore a completely dark tunnel. Unknown to him, and to his father who was present, the tunnel led to a 100 m drop. Court case found Scouts, not landowner, responsible for knowing of and warning of the hazard.	Blackpool Gazette (2001)

(continued)

Table 6.1 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	News ref.
Buckden 1996	M13	27/6/1996	Yorkshire Dales	Buckden House, UK	Student found dead in a waterfall pool, died from drowning, injuries consistent with a fall. Went missing from a group of ten supervised by two teachers and an activity leader, while walking to an abseiling site.	Daily Mail Reporter (1996)
Ashworth Camp 1998	M11	23/5/1998	Rochdale, Greater Manchester	Chadderton St Herbert's Scouts, UK	Slipped, slid 10 m on shale, then fell 20 m into a ravine while on an early morning walk with other boys and an assistant leader	Douglas (2002)
Snowden 1999	M10	16/10/1999	Snowden, Wales	Kingswood 1st Warmley Scouts, UK	Ten year old on his first scout trip descending a difficult route. Leader at the front, deceased apparently fell trying to find his own way down. Fell 200 m.	Douglas (2002)
Cader Idris 1999	M35[a]	23/10/1999	Snowdonia, Wales	Devizes Wiltshire Scouts, UK	Scout leader accompanied by one Scout attempt to scramble a route that required ropes. Leader fell while attempting to assist the Scout, who had been unable to proceed.	BBC (2001)
Clydach Gorge 1999	M19	3/11/1999	Clydach Gorge, S Wales	Longtown Outdoor Education Centre, UK	Trainee OE instructor tripped and fell over a steep drop when he bent over to pick up his camera	BBC (1999)
Fansipan Mountain 2001	F17		Fansipan Mountain Vietnam	World Challenge Expeditions, UK	Slipped while traversing a narrow path on steep ground in slippery conditions. Supervised.	Fulbrook (2005)
Mount Sugarloaf2003	M 16	16/3/2003	Mount Sugarloaf, West Wallsend, NSW	Merewether High School, D o E	24 students on D of E orienteering exercise. Descending a steep slope in a small supervised group, deviated from group with one other fell down a cliff.	Condon (2003)

Blackland Farm 2003	F41[a]	10/12/2003	East Grinstead, UK	Adventure Unlimited, UK	Instructor checking a zip wire, working alone. Found dangling, with no sit harness, arms constrained by chest harness, and helmet knocked back. Strangled by helmet strap.	The Argus (2005)
The Lizard 2004	M17	15/6/2004	The Lizard, Cornwall	Blackburn College, UK	Walking along a coastal path, supervised. Recoiled from a dog and fell. The dog was friendly but the victim had a religious belief that dogs were unclean, and was afraid of dogs.	Fulbrook (2005, p. 131)
Galloway 2006	F15	25/7/2006	Grey Mare's Tail Burn, Galloway Forest Park, Scotland	Barcaple Adventure Camp. Abernethy Trust	The victim was attempting, under close supervision, to jump from height into a pool. The location was unsafe. She failed to clear a rock ledge immediately below.	Johnston (2010); See Chap. 3
Austria 2008	M12	18/2/2008	Malinitz, Southern Austria	Howard School, Kent, UK	Unsupervised group walking to a viewpoint from their hotel found themselves on steep ground. 2 fell, one died	Pidd (2008)
Collado Jermoso 2009	M17	31/7/2009	Picos De Europa, Spain	Brathay Exploration Trust, UK	7 students and 3 leaders on expedition in very steep location. Victim had left the group possibly to relieve himself. Fell 300 m in twilight. Coroner highly critical of supervision and lack of local knowledge.	Louth Leader (2010)
Wadeville 2010	M 14	30/10/2010	Hanging Rock Falls, Wadeville, QLD	Waterford Demons Junior Rugby League Club	End of season trip for teammates, family and friends. Observed to slip and fall 10 m into waterhole, did not resurface.	Australian Associated Press (2010)
Legaston Quarry 2010	M34[a]	29/5/2010	Collieston, Scotland	British Army preparation course,	Instructor, unroped, attempted to free a stuck rope and fell.	BBC (2010)
Picos de Europa 2013	M24[a]	22/7/2013	Picos de Europa, Spain	Calvert Trust Exmoor, UK	Instructor assessing D of E groups, walking alone. Failed to arrive at expected point, found dead after extensive search	North Devon Journal (2015)

[a]Leader or supervisor

downhill, the victim had encountered a cliff, and fell while apparently trying to work out how to proceed. The leader of the UK group in which a 17 year old girl fell 150 m to her death down a ravine on Fansipan Mountain 2001, had never been to the area before, and reportedly told an inquest that he would not have chosen the route had he known what it was like. The ascent of the mountain had been aborted, and the group was trying to return to camp when the victim fell after losing her grip on a tree as she descended backwards. The weight of her pack could have contributed to her inability to hold the tree (Judd, 2001).

Self-evidently failures due to ignorance of static environmental hazards could be prevented by reconnaissance and research. This has nothing to do with how adventurous a trip might be for the participants, but about OE professionals having a good knowledge of hazards in their workplace (Brookes, 2011a, 2015). An otherwise well-qualified leader, guide, or instructor could lack local knowledge. Although obtaining relevant local knowledge can be relatively straightforward it is potentially a costly requirement for one-off programs or if staff turnover is high.

Not all fatal falls were from height. Hawkesbury River 1986 and Cathedrals 1983 each involved a fall of around 1.5 m. OE fatality cases would nearly always be better understood if the site could be inspected, but these incidents in particular are difficult to evaluate without knowing more about the specific locations, and exactly what the victims were doing at the time. The possibility of tripping, or of falling a short distance and receiving a head injury, is more or less pervasive, and not unique to outdoor locations – it is a risk associated with stairs, for example.

A second pass of the incidents in Table 6.1 points to the role of supervision in preventing fatal falls. Notably almost all of the victims were male adolescents, and only three of the victims were adult leaders or instructors. That distinct pattern is not shared with other gravity-related deaths. Victims from falling objects, and from accidents on ski slopes, were of both sexes and included more adult leaders (Tables 6.2, 6.3, and 6.4). A preponderance of male adolescent victims points to a likelihood that victim behaviour contributed to some or all of the fatal falls. Those responsible for the safety of young males must take into account a male adolescent's propensity to take deadly risks around heights.

Table 6.2 Fatal incidents on ski slopes – worldwide

Year	Victim	Cause	Location	Source
1961	M15	Tobogganning unsupervised. Struck head on large open vertical concrete pipe, fell in, drowned.	Falls Creek, Australia	Brown (1961)
1994	F Canadian	Collision with a tree	Frost Fire, USA	"Bouchard v. Johnson" (1996) and St. Paul Pioneer Press (1998)
2000	M16	Collision with a tree. **Novice**.	Thredbo, Australia	Brookes (2011b)

(continued)

Table 6.2 (continued)

Year	Victim	Cause	Location	Source
2000	F16 UK	Collision with a tree no helmet. **Novice** on Blue (intermediate) run	Heavenly Valley, Nevada	AALA Bailie
2001	F16 UK	Sledge collision with tree no helmet	Austrian Alps	AALA Bailie
2001	F24[a]	Collision with a padded post. **Novice**	Valloire, France	AALA
2005	M10	Collision with a snowmaking machine. **Novice**.	Okemo Mountain, USA	Barlow (2005)
2005	M16 Aarhus Denmark	Collision with a tree	Austria?	No author (2011a)
2007	M18	School trip, skiing at high speed, collision with a tree, no helmet	Breckenridge, USA	Doble (2007)
2009	F17	Collision with a tree helmet	Collingwood, Ontario	No author (2011b)
2009	M13	Collision with tree no helmet	Barrie, Ontario	Doucette (2009)
2009	F16	Advanced skier, black run, collision with tree, helmet	Perisher, Australia	van Zuylen (2011)
2009	F16	"Free skiing" while at "speed week" training camp for students. Collision with tree.	Sugarloaf ski resort, Maine, USA	Associated Press (2009)
2009	F16	**Inexperienced skier**, blue run, collision with tree, helmet	Thredbo, Australia	van Zuylen (2011)
2010	M16	Collision with a tree, helmet	Panorama, Canada	CBC News (2010)
2011	M14 UK	Fell off ski lift, strangled. Operator convicted of manslaughter.	Chatel, France	Daily Mail (2011) and McLelland (2015)
2011	F12	Slid off tow, lost helmet, collision with pylon	Sion, Switzerland	Wallace (2011)
2012	M7	Unsupervised ski team children on chairlift, one fell 16m, helmet	Sugarbowl Resort, California, USA	Magagnini (2013)
2013	F13	School ski trip, fell 6m from chair lift. Students jostling, unsupervised. Operator convicted of manslaughter.	Claviere, Italian Alps	Jaya Narain (2016)
2015	M13	School skiing trip, intermediate trail. Collision with tree. Helmet	Crested Butte, Colorado, USA	Pallares (2015)
2015	F13	Novice, school trip, difficult run with friends, collision with fence. Helmet.	Holiday Mountain, Manitoba	Schroeder (2015)
2016	F14	School ski club trip, collision with restroom building, helmet worn.	Soldier Mountain Ski Area, Fairfield, USA	Wootton (2016)

[a]Accompanying adult

Table 6.3 Falling trees or branches

Incident	Deaths	Date	Location	Institution	Brief description	News ref.
Steavenson Falls 1968	M19 M18 F15 F13	9/1/1968	Steavenson Falls, Marysville, VIC	Group of seven teenagers	Party of 7 teenagers bushwalking on well-used track on steep slope. Top of Mountain Ash snapped off (no wind) 12 m up. Broken section, 1 m in diameter, broke on impact and rolled down the hill, killing 4 and injuring 3.	Hamilton (1968)
Two Scouts Track 1975	M16 M16	19/9/1975	Towimbuk State Forest, Bunyip, VIC	Scouts	Group of 6 Venturer Scouts bushwalking (Armstrong 500 competition). Light wind. Tree (23 m 2.2 m girth) fell across a tent, killed both occupants.	Findlay (1976)
Meander Falls 1993	M17 M38[a]	17/8/1993	Meander Falls TAS	Hellyer College	5 students, 2 teachers, bushwalk in forest. Severe weather, very high winds. Tree snapped at base, fatally injuring 1 student 1 teacher. Remaining teacher injured, students went for help.	Crawford and Bevilacqua (1993)
Rowallan 1998	M12	11/9/1998	Rowallan Camp, Riddells Creek, VIC	Scouts	7 Scouts asleep in tents (150 at camp). 3 m Stringybark branch fell on tent, 1 killed, 1 injured (broken leg).	Kennedy and Dargan (1998)

(continued)

Table 6.3 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	News ref.
Crosslands Reserve 2001	F15 F15	3/12/2001	Crosslands Reserve, Hornsby Heights NSW	William Clarke College	10 adults, 39 students. Camping, severe storm. 15 m branch fell from 5 m onto tent. 2 occupants killed, 2 survived. D of E expedition. Unclear if adults present at the time.	Sofios (2001)
Carnarvon Gorge 2002	F?[a]	23/10/2002	Carnarvon Gorge, QLD	Urangan State High School	3 teachers 52 students on music camp. Large eucalyptus tree fell on group swimming. 1 teacher killed, 2 students injured.	Scholz (2002)
Wombeyan 2005	F16	2/2/2005	Wombeyan Caves area, 15km west of Mittagong, NSW	Queenwood (Sydney) (Wombaroo Adventure Centre)	Wilderness component of whole school camp. 16-year-old leading 15 year-8 girls, supervised by teacher and 1 camp staff. Severe storm, large tree fell on tent, 1 killed, 1 survived.	Maley, Stevenson, and AAP (2005)
McKillops Bridge 2005	F16	31/8/2005	McKillops Bridge, VIC	Toorak College/The Outdoor Education Group	12 students, with staff (? #) on first night of rafting trip. Camped in forest camping ground. Severe weather, very high winds, tree branch fell on tent around 2.00 am, killing one, one uninjured.	Spanos (2007)

(continued)

Table 6.3 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	News ref.
Felbrigg 2007	M11			UK	Students on an excursion to a National Trust property sheltered from rain under tree. A large bough fell killing one and injuring three. The tree had defects that would have been visible from the ground, but the areas had been judged as low usage.	"Bowen v National Trust for Places of Historic Interest or Natural Beauty" (2011)

[a]Leader or supervisor

Table 6.4 Falling rocks

Incident	Deaths	Date	Location	Institution	Brief description	References
Lal Lal Falls 1990	F12 F13	28/3/1990	Lal Lal Falls, VIC	Mowbray College	15 students, 2 senior students (belaying), 1 teacher 1 aide (top of cliff), rock climbing, top roped. Student climbing acc. dislodged large rocks that struck 1 student climbing an adjacent climb and a second student waiting below, with about 9 other students. Both died.	Johnstone (1990)
Serpentine Gorge 1990	M16	5/7/1990	Serpentine Gorge NT (died in Adelaide hospital)	Eltham College (Vic)	11 teachers 98 students, visit to Serpentine Gorge. Some climbed gorge walls. 1 dislodged 2 rocks 0.5 m dia., called warning, student climbing below unable to evade. Rocks struck head, fell 4 m. Died next day head injuries, complications.	Barritt (1990)

(continued)

Table 6.4 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Mt Edwards 1993	F13	31/3/1993	Mt Edwards near Moogerah Dam, QLD	Somerset College, Mudgeeraba	2 teachers, 32 students, bushwalk. Victim struck (pelvis area – unconfirmed) by rock dislodged by student higher up. Died at scene, blood loss.	Robertson (1993)
Bremmer Bay 1997	F15	16/1/1997	Fisheries Beach, Bremmer Bay WA	Scripture Union	18 participants 2 instructors, abseiling activity on youth camp (deceased joined abseiling but not on camp). 12.30 pm large rock fell from above, dislodging other rocks, hit 1 participant (belaying). Died during flight local hospital to Perth (app. 8 pm)	McGuire, (1998)
Tryfan 2000	M15	22/10/2000	Snowdonia, Wales	26th Birkenhead Scouts, UK	Scout lying with minor injuries from a rockfall killed by a second rockfall. Struck on the head by a boulder. 2 others injured.	Daily Mail (2000)
KwaZulu-Natal 2001	F17	1/08/2001	Kwa-Zulu-Natal	Outpost, City of London School for Girls, UK	D of E expedition. Student descending abseil dislodged a rock that struck the victim who had moved to the base of the cliff thinking she had permission to do so. Supervisors failed to notice her presence.	Moore (2002)

The role of adolescent decision-making must be contemplated in any death that occurred when no supervisor was present. None of the Australian deaths from falls occurred under close supervision, although two (Cathedrals 1983 and Bungonia 1991) occurred while adult supervisors were literally looking the other way. The latter incident, in a program for troubled youth, was investigated as a possible homicide,

and could have involved a deliberate push timed for when adults were not looking. Threats had been reportedly made. The deceased in that case was not on the edge of a cliff, but above a slope that terminated in a cliff some distance below – a push might have been deliberate but death accidental. In the Cathedrals 1983 case the teachers were attending a student who had suffered minor injury when the victim fell nearby. A protracted rescue took place. The fall occurred at around 3 pm. The victim died 12 h later while being carried out by a rescue party. A group had had to walk out to seek assistance. Those who came to assist thought they would be assisting with an evacuation, not a medical emergency. Knowledge of improved communication technology since that time must inform lessons from that incident. It is not certain more timely medical aid would have changed the outcome in that case, but the lesson for prevention is that time to medical prevention can be crucial.

In the Bungonia 1995 incident there was a leader and a trainee with the group, but both were walking at the back of the group in order that students could way-find unassisted. Encountering a steep drop while descending a gully, the victim fell while apparently attempting to view a way down. In the Grampians 1979 incident an abseiling activity had ceased due to rain. The victim was sent unsupervised to make radio contact with staff at the vehicles, and was apparently attempting to obtain better reception from a high point when rock gave way and he fell. In the Barkly River 1979 incident a student had been permitted to find his own way back to camp down a spur, while the rest of the group descended a gully. He was found at the base of a cliff that he would have encountered as he descended. The victim in the Mount Sugarloaf 2003 incident was separated from an orienteering group when he fell. In the Freycinet 2007 incident a group of participants left a campsite, unaccompanied, for a walk during free time. Two got into difficulty attempting to climb a rockface. Unable to down-climb they continued, both falling as one attempted to assist the other gain the top. At Buckden 1996 the victim went missing en-route to an abseiling site, from a group of ten students supervised by three adults. In the Collado Jermoso 2009 incident the leaders had limited knowledge of the route chosen prior to the trip, and the group arrived at very exposed campsite. The deceased had left the group – possibly to relieve himself – without the knowledge of supervisors, who were supervising loosely.

Adolescents do not always do what they are told, but some incidents appear to involve, if anything, misplaced enthusiasm, not misbehaviour. A third pass of the incidents in Table 6.1 suggests that what many victims were attempting when they died was arguably at least congruent with implied program aims, particularly when adventurous connotations of OE are considered.

Many, although not all, falls from height involved hazards that could easily be perceived, which implies some level of conscious risk taking. Table 6.1 is consistent with a considerable body of research on adolescent decision-making. In a major review of the literature, Reyna and Farley (2006) conclude:

> In the heat of passion, on the spur of the moment, in unfamiliar situations, when trading off risks and benefits favors bad long-term outcomes, and when behavioural inhibition is required for good outcomes, adolescents are likely to reason more poorly than adults. (p. 12)

Table 6.1 cases direct attention to prevention-focussed supervision of teenage boys around steep ground. Two of the UK participant victims were female (Fansipan Mountain 2001 and Galloway 2006). In both cases the victim was closely supervised by males and was attempting to comply with instruction prior to falling. Both incidents could be attributed to unsafe programming.

A series of deaths in the UK involving Scouts led to the Scout Association commissioning an independent inquiry, which concluded the association as a whole then exhibited a dated and cavalier approach to safety (Douglas, 2002). One death in particular attracted considerable attention. The death of a 10-year-old novice Scout, who had lagged behind the leader on a difficult descent of Snowden in 1999, resulted in the Scout leader being charged with manslaughter. He was acquitted.

Each of the accompanying adults who died from falls, in Cader Idris 1999, Blackland Farm 2003 and Legaston Quarry 2010 incidents, were specifically acting in their roles – assisting a participant, checking a zip wire and retrieving a rope respectively.

Most youths around steep ground do not fall to their deaths. If prevention requires, in part, knowledge of locations where a dangerous fall could occur, it also requires knowledge of the behaviour and motivations of youth. It is impossible to know exactly what motivated victims in most cases, but it might have been possible to observe unsafe behaviour prior to an accident, given direct supervision. The pattern of cases indicates that direct supervision around steep ground should be the default, with some room for judgement, informed by case knowledge, about circumstances where a fatal fall was unlikely and indirect supervision could be warranted.

6.3 Ski Slopes

Table 6.2 records fatal incidents on lift-served ski slopes. Unlike the other tables in this chapter, it includes incidents worldwide. It is not exhaustive. I searched only in English, and did not search USA archived news articles for less recent incidents.

The table draws in part on a study (Brookes & Holmes, 2014) that reviewed the extensive literature on snow sports accidents and safety, to determine how OE supervision on ski slopes could be informed by research. At least in Australia, ski slope supervision tends to be distinct from skiing or snow boarding instruction.

The fatal incidents on Table 6.2 can be grouped into ski lift accidents and ski slope accidents. Two of the four ski lift deaths resulted in manslaughter convictions for a lift operator. The implied lesson is that OE staff would have to make a situated assessment about what, if any, measures they could take to prevent incidents caused by operator negligence.

What is remarkable about the remaining deaths is that all involve collisions, mostly with a tree. It is been clear for some time that ski slope injuries occur quite differently from ski slope deaths. Tough and Butt (1993) found "[t]he individual most likely to die while downhill skiing is an experienced male skier, average age

31 years. He loses control while skiing too fast and strikes an object…" (1993, p. 12). While a victim's skiing inexperience is commonly a factor in skiing injuries (Langran & Selvaraj, 2002), victims of fatal incidents are more likely to be experienced, because experienced skiers ski faster and in less safe environments (Tough & Butt, 1993).

At least 5 of the deaths in Table 6.2 involved novices. One fatality prevention strategy for novices is to avoid situations where a novice could encounter a steeper slope.

Several deaths were of more experienced skiers, who would have had the skills to ski on steeper slopes at higher speeds. All fatal collisions involved speed and a fixed object. Because intermediate skiing or snow boarding can involve deliberately sliding at speed, collisions with any rigid object are severe:

> [C]onsidering an average 70-kg downhill skier or snowboarder travelling at 60 km/h, the transfer of kinetic energy during a collision against a tree in such an instance is almost 10 kJ, enough to switch on a 100 W light bulb for 360 hours … [t]he significance of collisions predominantly with trees in causing serious head injuries has been repeatedly confirmed in other [studies] (Siu, Chandran, Newcombe, Fuller, & Pik, 2004, p. 239)

In the more recent incidents, most of the victims were wearing helmets. Although helmets are protective in lower speed impacts, supervisors should not rely on helmets to protect against high speed collisions (Brookes & Holmes, 2014). Collisions resulting in impact speeds over 28 kilometres per hour will generate deceleration forces of over 300 g, which would result in head injury to a helmeted victim (Hume & Costa-Scorse, 2011). Scher et al. (2008) measured the average speed of children skiing and then tested head impacts at that speed using dummies. They found impacts at around 20 kilometres per hour to be sufficient to cause head injury with a helmet.

Fatal incidents on ski slopes indicate prevention should focus on situations where there is combination of speed and a fixed object downslope that a participant could collide with in the event of a fall or a misjudgement. The question for supervisors is what action is feasible to reconnoitre ski areas for fixed objects, and to confine skiing at speed to unimpeded slopes.

There can be no doubt that young people not connected with any OE program frequently ski in circumstances where a collision with a fixed object would be possible, as evidenced by the numbers of reports, every year, of ski slope deaths from collision with fixed objects. The question is what additional layer of safety an expert OE supervisor could add.

As is true of ski lifts, ski slopes are a managed environment. Could OE staff leave the safety of any particular slope entirely to management? The literature on the role of ski slope design and maintenance is thin compared to the ski safety literature overall, but provides some insights:

> The design and maintenance of a ski slope will play an essential role in avoiding high-energy collision accidents. As shown in our study and confirmed in many others, trees and other objects in the mountain slopes can pose serious harm to skiers and snow boarders. Minimising the placement of these obstacles, for instance in slopes prone to runaway conditions, will help reduce the risk of serious collision accidents. (Siu et al., 2004, p. 241)

One small study found resort managers were reluctant to allow research on the safety of ski slopes and trails was fear that the results of any such studies could be used in litigation (Kaineg, Van Valkenburg, & Winsnes, 2006). Comments by a US-based recreation law specialist tend to support that finding:

> Remember the big maps in ski patrol headquarters at ski resorts[?] Patrols used to stick a push pin or mark on the map where accidents occurred. Those maps are no longer found at the headquarters because they were proof that the ski area knew that accidents occurred at the locations with lots of holes in the map. If the injured skier can (sic) show his injury occurred at a holey part of the map, winning became much easier. (Moss, 2013)

Petrone (2012) noted there are no standards for testing the effectiveness of impact barriers. A study in California found inconsistencies within and between resorts in how slope and trail safety was managed. That study examined impact protection devices and systems; trail design and maintenance, resort boundaries, and terrain parks (Penniman, 2012). Slope ratings refer to level of difficulty, not hazards as such. One study found hazardous objects could be on slopes of any classification (Penniman, 1999).

Case-based prevention points to reconnaissance and monitoring of slopes for potentially hazardous fixed objects, and supervision to ensure slow speeds in locations where a fall could result in collision with a fixed object.

6.4 Falling Trees or Branches

Table 6.3 lists deaths from falling trees or branches, including one incident, in 1968 at Steavenson Falls, involving an informal group of friends, rather than an OE group. I included that incident as an example of a genuine freak accident. A section of tree trunk, which had fallen on a windless day, rolled down a slope and killed four teenagers who happened to be passing below on a walking track.

Trees or branches could fall wherever there are trees – no tree endures forever – but some OE programs entail more than usual exposure to overhead trees and branches. Particular deaths from falling trees or branches are preventable to the extent that (1) it could be possible to identify zones or areas less threatened by potential falling trees or branches (2) some trees could be determined, by observation, to be more hazardous than others, and (3) some weather conditions make it much more likely that trees or branches will fall.

Aside from the Steavenson Falls 1968 incident, all bar one of the incidents in Table 6.3 involved either camping in a tent or severe weather. Choice of tent site is within the scope of OE programming, as is choosing activities and locations according to weather conditions. In the case of the McKillops Bridge 2005 incident, the coroner recommended:

> 1. That outdoor educators venturing into isolated locations have access to reliable … communication … so that they can access current weather information and other emergency warnings proactively, and police and emergency services without undue delay if required.

> 2. That outdoor educators generally, promote a greater understanding of the tree hazard in the Australian bush, particularly as it impacts on safe campsite selection. (Spanos, 2007, p. 7 reference to 2-way communication omitted)

The likelihood that trees or branches will fall in strong winds is encapsulated in the Beaufort Wind Scale. By definition, a strong gale will break off (some) large branches, and a storm force wind will uproot (some) trees (Bureau of Meteorology, 2016). In the Meander Falls 1993 incident wind was bringing down trees and branches around a walking group before one falling tree killed a teacher, a student, and injured the second teacher. The victims in Crosslands Reserve 2001, Wombeyan 2005, and McKillops Bridge 2005 were killed in tents during severe weather. Rowallan 1998 occurred during heavy rain after a long drought. Whatever was true at the time of each incident, continuous improvements in forecasting accuracy (Silver, 2012), and improvements in communications and access to data, add potential to prevent tree related deaths attributable to weather.

Reconnaissance aimed at determining what sanctuaries or escapes from potential tree hazards a particular location affords, could be included in the planning stages of an OE program, but some assessments of hazards posed by particular trees, not only to tent locations but throughout the day, would be on-going. In previous work I considered what expertise an OE guide or leader could feasibly develop to support safety around trees:

> Expert assessment of tree hazards is a complex mixture of natural history, engineering, biology, mycology, and experience (see, for example Serken, 2005) … some aspects of hazard recognition and prevention that could reasonably be acquired by outdoor educators, based on my reading of some of the tree hazard literature, and on insights derived from my observations as I have attempted to develop better approaches to teaching about tree hazards with my own students …There is no single approach to hazard assessment in the literature. There are variations due to differences between forms of management (in urban areas, parks, forestry, and so on) and between species. Some differences seem to reflect the personal experiences and preferences of the authors. This is not surprising for a field whose origins are in practical natural history, however, all approaches centre on visual assessment. Although outdoor educators might not be able to assess structural weaknesses in any detail, or to identify particular pathogens, this might not be necessary. Arborists in many cases have to balance protecting trees with protecting persons and property (Lonsdale, 2000), and therefore, where there is doubt, conduct detailed assessments. For outdoor educators the aim … is more to recognise and then avoid trees which might be particularly hazardous than it is to develop an elaborate understanding of tree defects (Brookes, 2007a, p. 56)

Following several reported deaths from falling trees or branches I modified my own teaching, with final year OE undergraduates, to emphasise observational learning from previously fallen trees and branches, with the aim of surmising what caused a particular limb or tree to fall, and what determined the direction it fell (Brookes, 2007a).

Although changing locations according to forecast weather, or choosing a safer tent site are simple matters, developing local knowledge of alternative routes, venues, or campsites in severe weather, adopting the habit of observing trees for hazards as a matter of course, and learning to recognise when and how trees and branches fall, requires time and effort potentially directed away from program goals.

As is true of other fatality prevention measures, inadequate precautions against falling trees or branches could be readily observable by someone with expertise, but might not otherwise effect the quality of a program. Deficient fatality prevention could occur in otherwise sound programs.

6.5 Falling Rocks

Table 6.4 lists Australian and some UK incidents involving deaths from falling rocks.

In each case a rock or rocks was dislodged in the course of the OE activity. Two of the fatal falls in Table 6.1, Grampians 1979 and Hawkesbury River 1986, were probably initiated when victims themselves dislodged a rock.

The only incident in Table 6.4 involving rock dislodged by a victim was Tryfan 2000. The victim was beginning an abseil on a rope attached to a rock pinnacle above a ledge. The pinnacle failed as he pushed off vigorously, and he suffered minor injuries when a large rock struck him. As he lay on the ledge assisted by two others, a 2 m slab from above the pinnacle slid onto the ledge and tumbled, killing him and injuring the two rendering first aid. Some reports indicate the site was not known for loose rock (Whiteside, 2015).

As is the case with incidents due to falling trees or branches, it could be difficult to determine what signs or indications might have been visible prior to an object – tree or rock as the case may be – falling. The reports on the Tryfan 2000 incident that I relied on did not disclose what, if any, specific steps were taken to evaluate the soundness of the rock pinnacle as an anchor point.

The Gracetown 1996 tragedy (Chap. 5), which killed nine, was not triggered by human action. In that case the collapse of an already unstable limestone overhang was probably triggered by water saturation. There was at least some knowledge in the community that the cliffs were hazardous (Irving, 1996). Although I found no other OE deaths caused by more or less spontaneous rock fall, many such incidents can be found in the mountaineering literature.

All but one of the incidents in Table 6.4 occurred when a rock dislodged by one member of a group killed another. In such cases the question is why an individual was situated where dislodged material could strike them.

Understanding a past falling rock episode, or preventing a future one, requires local knowledge derived from a site inspection, as much to identify safe zones as to locate potential hazards. Based on cases, prevention requires: (1) as much as possible keeping participants away from zones that could be impacted by falling material (2) completely avoiding such zones when there is a person moving on a slope or cliff above (3) wearing helmets as protection against small rocks and minor falls (4) identifying and avoiding any visibly loose material (5) ensuring any person who disturbs a rock shouts an agreed warning. A person actually climbing or abseiling cannot be completely protected against a large evidently sound rock falling unexpectedly and striking him or her, but (2) would protect most participants on steep

ground most of the time. Self-evidently wearing a helmet, inspecting for loose rock, and shouted warnings are not fail-safe.

Consistent with the familiar grammar of OE fatal incident prevention, each of these prevention measures could be routinely violated without a fatal incident ensuing, and without otherwise altering perceptions of program success and quality. A knowledgeable adult could recognise absent fatality prevention precautions by simple inspection.

On any OE abseiling or top-roped climbing trip, most of the time most of the participants would not actually be abseiling or climbing. Perceived risk around so-called adventure activities could be a distraction from the more mundane problem of keeping all participants safe whenever they are around steep ground. The skills and knowledge to conduct an abseiling or climbing session are not the same as the skills and knowledge necessary to effectively manage and supervise groups of young people in an unfamiliar environment.

Unlike deaths from falls, it is doubtful that adolescent risk-taking contributed to any of the deaths in Table 6.4. While approaching the edge of a cliff is intuitively dangerous, approaching the base of a cliff might not feel dangerous. An experienced mountaineer would recognise at a glance that an individual was at risk of material dislodged by another, but a layperson might not see the danger.

It is somewhat understandable that incidents have been wrongly interpreted in the past as "one off" events or freak accidents. The Serpentine Gorge 1990 incident involved teenage boys deciding to climb un-roped on the walls of a gorge in the course of a coach tour. The Northern Territory coroner, in that case, was not critical of a situation that involved, in effect, unplanned solo rock climbing with no effective or qualified supervision. A large group of adults cannot collectively supervise a large group of young people as effectively as when smaller groups are each supervised by one or two adults.

The Lal Lal Falls 1990 incident, some 4 months earlier, involved a small well-supervised group and experienced instructors. That incident occasioned a detailed and critical coronial report that recommended, among other things, more stringent assessment of any sites used for rock climbing or abseiling with schools. The Lal Lal falls site was known for relatively unsound rock. Activity on the cliff posed a risk to any members of the public on a path below even if no participants were in the danger zone.

The victim in the KwaZulu-Natal 2000 incident was not wearing a helmet, and reportedly was in a hazardous location due to a misunderstanding. Counterfactually complete prevention is possible if sites are chosen and managed so that participants are never located in the potentially hazardous zone below an active climber or abseiler. For those familiar with OE fatal incident cases, the KwaZulu-Natal 2000 incident contains familiar elements, and could be considered a textbook preventable OE abseiling fatality. Nevertheless the incident was determined by a coroner to be, in effect, a freak accident (Fulbrook, 2005).

Fatality prevention would require that some programs be vetoed. Supervision that effectively keeps participants in safe zones while anyone is moving on rock implies resources invested in site assessments, knowledge of fatality cases, and staff

capable of both providing effective supervision and operating the headline activity. Some sites suited to abseiling might be unsuited to keeping non-participants safe. Some staffing arrangements might have to be rejected because there is insufficient expertise in supervising and managing groups, even if there is sufficient expertise to run the actual headline activity.

6.6 Immersion Deaths

A large number of the single victim fatal incidents can be categorised as immersion deaths, usually with drowning as the medical cause of death. I have used the underlying hazard, rather than the aims and activities of the victims, as the primary category, because similar incidents have resulted from different activities in similar environments. Incidents can occur during unsupervised periods, or on the periphery of organised activities. It is possible that an activity focus – as in canoeing safety, swimming safety, or river crossing safety – would overlook incidents attributable to the presence of a water hazard alone.

Prevention of immersion deaths is premised on robust and widespread consensus that drowning is preventable (World Health Organization, 2014). Almost inevitably, should a young person under the care of an OE program die from immersion, parents and others will want to know why immersion was not prevented in the first place, or why the victim was not retrieved from the water in time to prevent death. Although some incidents involved failed resuscitation attempts, no incident to my knowledge has resulted in speculation that more competent resuscitation might have saved a life, which although that is a possibility. No doubt there have been incidents in which resuscitation was successful, and therefore not included in this study.

Reiterating observations made in Chap. 4, the World Health Organization (2014) classifies all involuntary immersion deaths as preventable, but actual prevention could require somebody capable of acting and in a position to act. After any catastrophic OE incident, in which young people were in the care of an organisation and supervised by specific individuals, it likely that investigation and public discussion will focus on decisions and actions of the supervisors and the organisation. Prevention of immersion deaths is often self-evidently a matter of thwarting immersion or timely rescue, which means focus will inevitably shift to second order considerations around programming and supervision – how a group came to be in a hazardous situation, and the actions or omissions of adults directly responsible. The incidents in this section are distinguished from other immersion death cases by the involvement of an OE organisation with some or all responsibility for the circumstances of the incident. In the case of an immersion incident not involving ferries or other large-scale operations, an OE organisation and its staff would usually be best placed to have prevented a particular incident. Immersion deaths considered in this chapter can be understood as local, human-scale tragedies amenable to action by small groups and individuals on the scene.

As I argued in Chap. 4, there are good reasons to think that a short-term effect of cold water immersion is likely to have been an unacknowledged contributing factor in some deaths. In many cases water temperature was not reported, nor observations noted that could determine if cold shock or cold water swimming failure should be considered factors. Quoting again from a report prepared for Transport Canada:

> It has now become clear that over half of the immersion-related deaths occur during the first two stages of immersion, i.e. cold shock and swimming failure…. [but] investigators still concentrate on the cause of the marine accident and not the precise cause of an individual's death. It is still hard to accurately document at what stage of the immersion death occurred. This is because little history has been gathered from survivors or by investigators….[t]he problem is further compounded by the fact that such a good job has been done educating people on the dangers of cold water, immersion and hypothermia, that even the pathologists now list the cause of death as hypothermia, even though the cold, wet body on their autopsy table actually died from cold shock or swimming failure and drowning (Brooks, 2003, p. 16)

Possibly cold shock or cold water swimming failure has been an unacknowledged contributor to some OE deaths. There is a discrepancy between a likely role of cold water in many incidents and an almost complete absence of incidents attributed to cold water, other than to hypothermia.

6.7 Australian OE Immersion Deaths – Dams, Lakes and Pools

Table 6.5 lists single immersion fatalities in dams, lakes or pools. Table 6.6 lists immersion deaths involving moving water, such as river currents, tidal flows, or rip currents. The distinction is not always clear-cut, and others might have categorised some incidents differently. For example, in the Moogerah Dam 1976 case, the victim reportedly abandoned an attempt to climb a rock face above water. He pushed away from the face so he would not dislodge another climber below him, and consequently entered the pool below a waterfall, where he had swum on another occasion. The water had become more turbulent due to rainfall and he did not surface (Courier-Mail, 1976). It is unclear if wearing a personal flotation device (PFD) would have changed the outcome.

Although swimming pool safety is not a focus of this volume, there is some overlap with OE safety, particularly around supervision and lifeguarding. At Galston 1991, Bibra Lake 1994, Morley 2000, Bayswater 2000, Glenbrook 2006 a drowning was evidently not observed by any adult present, and only when a body was observed at the bottom of a pool did rescue attempts commence.

At Galston 1991, a six-year-old non-swimmer was reportedly left unsupervised in 2.5 m of water. His mother's distress was compounded when she learned that classmates had been taken by bus to view his body and be photographed with it (Keenan, 1999), apparently in an attempt to help them deal with the tragedy. At Bibra Lake 1994, a large adventure centre hosting almost 3000 school children from

Table 6.5 Drowning Dams, Lakes, Pools, Australia

Incident	Deaths	Date	Location	Institution	Brief description	References
Timbertop 1960	M?	4/2/1960 approx	Timbertop, VIC	Geelong Grammar School	Student drowned during swimming trials in school dam on the second day of term.	Clark (2003, p. 60)
Moogerah Dam 1976	M17	13/11/1976	Moogerah Dam, Boonah, QLD	Brisbane Grammar	Several boys with teacher canoed to rockface. Student climbing rock face unable to proceed, jumped off sideways to avoid student climbing below, landed in deep, turbulent pool, failed to surface. Rain, flood conditions.	Courier-Mail (1976)
Woorabinda 1980 (?)	M?	1980	Woorabinda Camp, Stirling, SA	Unknown special school	Drowning, details unconfirmed.	Personal Communication
Lake Eppalock 1980	M14	17/12/1980	Lake Eppalock, VIC	Kyneton Secondary College	20 students (approx.) swimming in muddy lake, around 200 other students and 30 teachers on shore. End of year activity. No one in particular supervising swimming. 1 student drowned.	Spencer (1981)

(continued)

Table 6.5 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Maroon 1981	M13	19/3/1981	Maroon Outdoor Education Centre, QLD	Ithaca State School	Noticed missing, found drowned. No details discovered on public record.	Personal Communication
Point Leo 1984	M13	22/11/1984	Point Leo, VIC	Altona Primary School	Drowned on school trip.	Levy (2012)
Greenpatch 1986	M	<1987	Greenpatch, Mulgrave River, Gordonvale, QLD	St. Augustine's College, Cairns	Un-witnessed drowning during weekend outing	Personal Communication
Kearneys Falls 1988	M?	?	Kearneys Falls, Cairns, QLD	Kairi State School	8 adults and 17 students excursion to Kearneys Falls. 1 student noticed missing at the top of the falls, found drowned in bottom pool	Personal Communication
Crystal Lake 1990	M11	7/11/1990	Crystal Lake Camp, Macclesfield, SA	Salisbury South EastPrimary School	Drowned, circumstances unknown. 4 supervisors, 24 (approx) swimming in muddy water, absence of 1 noticed at dinner time.	Jones (1991)
Galston 1991	M6	23/4/1991	Crusader Convention Centre, Galston, NSW	Birchgrove Community School, Sydney	Non-swimmer drowned in 2.5 m of water.	Keenan (1999)

(continued)

Table 6.5 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Bibra Lake 1994	M14	16/12/1994	Adventure World Bibra Lake, WA	Collie Senior High School	Large adventure facility, 3680 patrons including 2836 school children and 269 school supervisors. End of year activity. Approx. 350 people in swimming pool, two lifeguards. Boy dragged from pool by attendants, resuscitation unsuccessful. Took 2 h to discover which school had lost a student because some had gone home.	McCann (1995)
Avon Valley 1997	F15	1/12/1997	"Sappers Crossing" Avon Valley National Park, WA	Duncraig Senior High School	2 teachers, 12 students, overnight bushwalk. A small group swam out of sight of teachers; others joined them. 1 collapsed (early pneumonia) drowned.	Hope (1999)

(continued)

Table 6.5 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Murgon 2000	M13	21/11/2000	Bjelke-Petersen Dam, near Murgon, QLD	South Burnett Regional Cadet Unit	2 supervisors, 22 cadets, clothed, exercise in weedy, muddy, dam. 1 drowned.	Daley (2006) and Nolan (2001)
Morley 2000	M12	6/12/2000	Hampton Senior High School, Morley, WA	West Beechboro Primary School	3 staff, 38 students, 1 found on bottom of pool.	Capp (2000)
Bayswater 2000	M10	11/12/2000	Bayswater WavesAquatic Centre, WA	Boyare Primary School, Mirrabooka, WA	54 students 1 teacher, 1 substitute teacher, 4 parents at public pool complex. Lifeguards on duty. Weak swimmer drowned in diving pool; no adults watching at the time. Drowned. Coroner found parents not qualified to supervise.	Hope (2002)
Manchester Hole 2005	M14	14/11/2005	North Yorkshire	Bewerley Park Outdoor Centre	Novice caving group attempting to exit by a sumped out crawl passage after being trapped by unexpected and almost unprecedented flooding. Victim went missing during the wet exit.	Fell (2007)

(continued)

Table 6.5 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Glenbrook 2006	F8	15/12/2006	Glenbrook Swim Centre, NSW	Cambridge Gardens Public School	200 students at pool for end of year activity. Student drowned in vicinity of large inflatable device. Failure to identify non-swimmer. Failure to recognise risk due to inflatable device. Supervision failure.	Milovanovich (2008)
Mersey River 2009	M 15	16/11/2009	Mersey River, TAS	La Trobe HIgh School	120 students with 5 teachers on a school excursion to the Mersey River. One student drowned, coroner blamed inadequate supervision of weak swimmer out of his depth. Parents reportedly unaware their son was on an excursion.	Chandler (2012) and Kempton (2009)

(continued)

Table 6.5 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Kinglake 2010	M 12	17/2/2010	Alpine Ash Mountain Retreat, VIC	Aquinas College	Day 1 of year 7 orientation camp. Approx. 30 students swimming in 3.7 m deep "murky" dam supervised by "4 to 6" teachers and former students. Deceased got into difficulty. Teachers informed but could not find him. Police recovered the body approx. 2 h later.	White (2014)

several schools as an end of year activity, an estimated 350 people were in a swimming pool observed by two life-guards. The victim was not observed at the time he got into difficulty. School staff had lost track of which students were still at the centre and which had been picked up by parents, and were in no position to monitor which students were in what location.

Lifeguards add a layer of safety but only if deployed effectively. An OE supervisor could assess by inspection the likelihood that a lifeguard would be able to identify a drowning person and respond within 20 to 30 seconds (Pia, 1984). I doubt that that any reasonable observer would envisage that two lifeguards for 350 individuals in the pool at Bibra Lake would be sufficient to meet that criterion. In the Bayswater 2000 case, in which a non-swimmer 10-year-old drowned in a diving pool, two lifeguards were found by a coroner to be some distance away, talking and watching another pool. The coroner criticised self-regulation of pools by commercial operators (Hope, 2002). The supervisor allocated by the school to the dead boy's group was a stand-in for a teacher who was ill. The stand-in had not been briefed on her duties, and had no knowledge of the swimming abilities of the students in the class she was responsible for. Earlier the same day a parent had reported to her that a girl, a non-swimmer, had nearly drowned in the diving pool. The deceased had been paired with another boy, who was stronger swimmer. He told the court he thought he saw the deceased at the bottom of the diving pool, but hadn't been sure, so had gone looking for the deceased elsewhere.

Table 6.6 Immersion deaths, moving water

Incident	Deaths	Date	Location	Institution	Brief description	References
Stony Creek 1974	F18	19/7/1974	Stony Creek, Mt Feathertop, VIC	Gordon Institute of Technology	Party of 8, bushwalk, fast flowing water waist deep. Crossing one by one, holding fixed rope. 1 lost her footing, held underwater, released rope, swept away, drowned.	Humphrey (1975)
Thomson R. 1976	M16	10/10/1976	Thomson R., (Coopers Ck.), VIC	Prahran High School	30 students, 6 staff, canoeing with life jackets, activity ceased, 2 escaped supervision to repeat rapid, capsized, no life jackets, 1 drowned	Coroner (1977)[a]
Anglesea 1976	M28[b]	1/11/1976	2 km E. of Anglesea R., VIC	Geelong West Primary School	45 students on beach, 3 in difficulty, 5 staff, 1 drowned while assisting rescue.	Hammond (1977)
Crooked R. 1978	M15	14/12/1978	Crooked R., VIC	Melbourne Grammar School	4 14-15 year-olds with 3 older boys. "Boy-leadership" 5 day bushwalk. Rained heavily. river crossing, human chain, 6 swept away, 1 drowned (body found with foot entrapment).	Wheelhouse (1979)
Anglesea 1979	M13	15/6/1979	2 km E. of Anglesea R., VIC	Scouts, Sunshine District	2 leaders, 2 helpers, 30 Scouts on beach, several in difficulty, 1 drowned.	Guy (1979)

(continued)

Table 6.6 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Stokes Bay 1980	F15	23/5/1980	Stokes Bay, Kangaroo Island, SA	Quest Tours; Port Broughton Area School	3 students, clothed, wading, signed hazardous beach, swept Out to sea. Two rescued, one drowned.	Ahern (1981)
Shoalhaven R. 1990	M15	29/10/1990	Shoalhaven R. 700 m South of Tallowa Dam NSW	Scots College, Sydney	Canoeing, numbers unclear, father/son trip (unclear if teachers were with the group). Foot entrapment under snag while wading or swimming rapid, drowned.	Coroner (1991)
Logan R. 1990	F16	6/11/1990	Logan R., Waterford, QLD	Loganlea State High School	1 teacher 9 students 5 canoes, first canoe swept against pylon, pinned, student tangled in painter failed to surface drowned.	Johnston (1991)
Barrington R. 1995	M19[b]	6/12/1995	Barrington R.('the Moppy') NSW	Camden High School	Leading a group of 8, kayak entrapment 5–10 min drowned. D of E expedition.	Telegraph (1995)
Kurrawa Beach 1996	M 15	31/3/1996	Kurrawa Beach, QLD	Surf Lifesaving Australia	Surf Lifesaving Championships. Cyclone Beti was off the coast. Two under-18 surf ski crews on the same wave, skis collided. Immediate search, body found 4 days later.	Carlisle (2012)

(continued)

Table 6.6 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Conto Springs 1998	M15	30/11/1998	Conto Springs Beach, 25 km S. of Margaret R. WA	Mercy College Koondoola	2 teachers on beach (1 lying down, eyes closed). 25 students swimming. Signed hazardous beach. 1 student caught in rip, drowned.	Martin (2000)
Forth R. 1998	M15	7/12/1998	Forth R., TAS	Launceston Church Grammar School	(3/12/98) Year 9 class, 1+teachers, 2 kayaking instructors. Student (spectator?) attempted to reach rock in river, entrapment in snag. Rescue failed until water flow stopped at dam. Died in hospital 4 days later.	Wilson (1999)
Yarrunga Ck 1999	M15	24/10/1999	Tributary of Yarrunga Ck, Kangaroo Valley, NSW	Scots College, Sydney	1 adult (non supervising) 3 students on father/son bushwalk. Older brother (substituting for his father) swept away while attempting to cross a flooded creek. Drowned.	Stevenson (2001)
Stainforth Beck 2000	F13 F14	/10/2000	Settle, North Yorkshire, UK	Royds School	River walking activity in a normally gentle stream. River level was elevated. Two victims lost their footing and were swept away	Bailie (2004)

(continued)

Table 6.6 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Glenridding Beck 2002	M10	26/5/2001	Lake District, Cumbria	Fleetwood High School	10 year old accompanying a group of older students and their teacher on an excursion attempted a plunge pool activity. Water less than 9 °C. Panicked. Rescue attempts defeated by cold water and lack of a suitable rope. Teacher pleaded guilty to manslaughter, jailed.	HSE (n.d.)
Val d'Aosta 2003	M17	/7/2003	Val d'Aosta, Italy	Harrogate Grammar School, UK	Victim not directly supervised left a path which had a bridge and attempted a shortcut across a river. Apparently slipped and fell in the river after abandoning attempts to wade across.	Wainright (2005)
Tully River 2007	M47[b]	31/7/2007	Tully River, QLD	Merchant Taylors' School, Crosby, Merseyside, UK / RnR Rafting	Foot entrapment leading to drowning after raft overturned. Submerged for several minutes, died before ambulance arrived. School rugby trip, organised spare time activity.	Priestly (2011a)

(continued)

Table 6.6 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Kurrawa Beach 2010	M19	19/3/2010	Kurrawa Beach, QLD	Surf Lifesaving Australia	Under 19 Ironman Competition, as part of Surf Life Saving Championships. Cyclone Ului off the coast, 3m waves. Video appeared to show victim struck by a surf ski and knocked from his surf ski. Body recovered approx.1 h later.	Barnes (2011) and Coulsen and Raeburn (2010)
Bells Beach 2011	M40[b]	3/3/2011	Jarosite Reef, Bells Beach, VIC	West Coast Adventures / Shelford Girls' Grammar	Teacher accompanying group of year 10 students snorkelling with commercial operator. Dangerous surf conditions. Died when he got into difficulties during the rescue of several students caught in a rip.	Cannon (2013)
Kurrawa Beach 2012	M14	28/3/2012	Kurrawa Beach, QLD	Surf Lifesaving Australia	Under 15 board completion, as part of Surf Life Saving Championships. Victim evidently knocked unconscious after being dumped by a plunging wave on a sandbar. Body recovered next day.	Ryan (2016)

[a]Coroner's name illegible
[b]Adult supervisor

A non-school related death in Victoria, in 1998, occurred when a single lifeguard deployed at a pool by a private contractor had been attending to ticket sales and canteen duties. A member of the public suffered cuts breaking glass to enter a locked office in order to call an ambulance (Berry, 2002).

Less than a week prior to the Bayswater tragedy, a 12-year-old primary school student drowned on an excursion to a local high school pool, also in Western Australia. Another student observed him in difficulty, but thought he was playing. He had earlier pretended to drown. Teachers were present but did not observe the incident. As in the Bayswater case, a student alerted a teacher to the presence of a body at the bottom of a pool. Education officials reportedly averred that the group was well supervised on the basis that there were sufficient teachers deployed and that some had a water safety qualification (Capp, 2000).

The Bibra Lake, Morley, Bayswater, and Glenbrook 2006 incidents all occurred during start or end of year excursions, and involved unstructured activities, relatively large numbers of students of mixed ability, and several supervising staff, some or all of whom were not specialists in water supervision. The Glenbrook tragedy occurred during a visit to a public pool by 200 students as an end of year excursion. Nineteen teachers accompanied the group. As in other cases, a spokesperson for the local council, which operated the pool, claimed the pool was adequately staffed. According to news reports 3 of 4 lifeguards on duty were helping out in the canteen at some times (Kontominas, 2008) although a coroner concluded the victim might not have drowned during those periods. No lifeguard was supervising an inflatable obstacle course near which the victim's body was found. The victim herself had possibly filled in the part of the permission form relating to swimming ability for the excursion, which should have recorded her as a non-swimmer, but did not. It is likely she crept along the edge of the pool towards into the deep end, where an inflatable obstacle course that was the focus of much of the teachers' attention, was located. The coroner observed that the number of teachers present was sufficient, but.

> … it is also apparent that the supervision on the day was inadequate otherwise how could a child drown and not be observed on the bottom of a pool (for whatever period she was there) in the close proximity of some 19 teachers plus teachers aides. (Milovanovich, 2008, p. 8)

The Lake Eppalock 1980 case also involved an end of year visit by a large group of teachers and students to a venue that included a large lake. No staff specifically supervised the students who chose to go swimming, and when the victim got into difficulty another student had to leave the water and attract the attention of a teacher. Students who observed the victim in difficulty were at first unsure if he was drowning or not. Efforts by other students to bring him up were unsuccessful. One student attempted to bring him up, but dropped him. Another reported that he grabbed her ankle but she couldn't bring him up. The water was muddy and when teachers eventually reached the location they struggled for some minutes to locate him (Spencer, 1981).

At the Mersey River in 2009 one staff member had undertaken to supervise swimming. He testified he did not see the victim, a weak swimmer, in difficulty in deep water. Two nearby students noticed what would have been signs he was drown-

ing, but thought he was skylarking. The signs of drowning often go unrecognised (Pia, 1984), and accounts of nearby youth thinking a victim was "mucking around" are common in OE drowning cases.

As was the case at Eppalock, Timbertop 1960, Crystal Lake 1990, Murgon 2000, and Kinglake 2010 all involved high turbidity. Few details are on the public record about the first incident. In both the Crystal Lake incident and Maroon 1981 incident a body was found in the water after the absence of a student was noticed some hours after a supervised swimming activity. At the time of the Crystal Lake tragedy relevant Education Department requirements stipulated buoyancy vests should be worn for activities in turbid water, but buoyancy vests had not been worn for supervised swimming (Jones, 1991). Although there was speculation that the victim had somehow entered the water unobserved at some other time, that speculation relied on misconceptions about how visible a drowning would have been in such circumstances. It is not unusual for non-experts not to notice that an individual is silently drowning (Pia, 1984). The victim likely drowned in the presence of supervising adults. The Maroon 1991 incident could similarly have involved an unobserved drowning during supervised swimming, or an unexplained entry into water. Non-use of flotation vests was acknowledged as contributing factor to the death of a cadet at Murgon. Cadets wearing boots and uniforms had been instructed to reach a moored boat in water which was deep, and which contained weeds that entangled the victim and others (Nolan, 2001). As in the Eppalock incident, the muddy water made it difficult for peers to rescue him, although they did succeed in pulling him from the water.

One witness noted that the deeper Eppalock water was cold, and given the location it is possible the Timbertop water was also cold, but I found no record of any discussion that cold might have been a factor. Cold was a likely factor in the Kinglake 2010 tragedy, although it appears experts who gave evidence at the inquest did not consider the possibility of cold shock or cold-water swimming failure. A police diver recorded a water temperature of 19.2 °C and estimated the temperature below the surface could have been 12 °C. The victim had just started high school and was on a school camp for 79 students accompanied by 5 teachers and 6 former students as assistants. None of the staff had OE qualifications or water safety qualifications. Department of Education safety guidelines, developed jointly by government and independent schools, had not been consulted. The school was part of the Catholic School system, which did not require such consultation, although many Catholic Schools conducted outdoor programs using qualified staff, some of whom had contributed to the development of the guidelines.

The death took place during a swimming activity that should not have taken place, according to the Department of Education guidelines, according to a lifesaving expert who gave evidence (White, 2014), and had lessons from past tragedies been sought out and heeded. The water was cold and muddy. The banks sloped steeply and the bottom was black and slippery from rotted vegetation. After a few minutes in the water the victim appeared to panic and told nearby students that he thought he was having an asthma attack. He had only ever suffered one or two mild asthma attacks, and his panicked attempt to communicate could not be considered a

diagnosis. Cold water swimming failure deaths typically involve good swimmers, cold water, death occurring within minutes (much too early for hypothermia), healthy victims, often shallow water, often a few metres from shore (Brooks, 2003), and "deaths … occur in water as high as 15 °C long before standard survival curves would predict. It is now thought by many that the pressing threat to otherwise healthy individuals is the respiratory distress evoked by immersion and the consequent inability to control breathing and breath hold." (p. 16).

Although staff on the bank observed a struggle in the water, they failed to grasp what they were observing and did not heed calls for help. A student who left the water to seek assistance swore at a teacher in an effort to persuade the teacher that the student was not joking (White, 2014). Disorganised efforts by school staff to locate the victim failed, and a police diver recovered the body 7 m from shore in about 2.5 m of water after a short search. Although the inquest paid considerable attention to the responses of the supervising staff, from a case-base perspective disbelief and confusion are normal responses when unqualified and inexpert individuals are confronted by a potentially tragic situation they had not anticipated.

The school apparently went to considerable expense engaging medical and legal experts to posit that the death could have been from natural causes, which happened to occur during, but unrelated to, patently unsafe circumstances. Regardless of the immediate cause of a victim's distress, any activity in or near muddy water would require the use of PFDs. Debate about whether individual physiology constitutes a medical condition or merely increased susceptibility to environmental conditions would not arise if a victim in difficulty for any reason could remain afloat. The case illustrates how difficult a rescue can be in muddy water, even when a victim was able to draw attention to his plight and ask for help. Without flotation devices an adverse event – medical or accidental – could, of course, occur while an individual was submerged, in which case there would be no way for others to recognise a problem until much too late.

Although the absence of a "risk assessment" was raised at the inquest, assessing safety is integral to OE supervision as well as a discrete procedure. Lack of a formal risk assessment is not a consistent cause of OE fatal incidents, and deaths have occurred in spite of risk assessments. Risk assessment cannot compensate for lack of expertise and knowledge. According to Hubbard (2009) risk assessment that expresses safety as a generic procedure, if decoupled from questions of context, expertise and attitude, could itself be a source of risk. Understandably, for a coroner, faced with a failure of fatality prevention at the most mutable levels, which is to say program planning and student supervision, advocacy of formal risk assessment could be a pragmatic compromise.

Supervision – and supervisor expertise – is central to counter-factual prevention strategies in every case listed in Table 6.5, in choosing activities and locations, as possibly the only practical way of monitoring and influencing where youth go and what they do, and as the core of any immediate emergency intervention in the seconds between immersion of a distressed individual and death. In the Kinglake case, difficulty of searching in near zero visibility in a relatively deep cold dam, and the potential risk of a second victim among the would-be rescuers, problematize diving

rescues by non-experts. Although flotation devices are not necessarily associated with swimming, but would have been an accepted requirement for canoeing, the risks involved once an individual is under the water and out of sight are the same whether the individual fell from a canoe, entered the water voluntarily, or slipped in. Any educational benefit from a dip in a cold dam would not be badly compromised by a requirement that students wear a PFD for any activity around or in the dam.

The 2005 death of Joseph Lister in Manchester Hole involved flooding in an otherwise easy cave that had flooded quickly and unexpectedly, trapping a group. All wet caves can flood but in this case there were good reasons not to expect such an event, although with hindsight it could have been foreseeable. The coroner's summing up for the jury is a useful explication of limits to formal approaches, including qualifications, inspections, and risk management, in specific and complex environmental circumstances (Fell, 2007). With hindsight, had the group been staffed with two expert cavers one could have gone back to search while the other led the rest of the group, who were at risk of hypothermia, out of the cave system.

Provision of a second competent staff member as a fatality prevention measure likely highlights tension between cost and fatality prevention. The independent review of the Mangatepopo catastrophe in New Zealand, considered in Chap. 4, identified several circumstances in which a single staff member was satisfactory for normal operation but not in certain potentially fatal circumstances (Brookes, Corkill, & Smith, 2009).

6.8 Australian and Selected UK Immersion Deaths, Moving Water

Moving water cases point to the importance of the so-called pre-mortem approach (Kahneman & Klein, 2009) which bases prevention on an understanding of what a supervisor could – and could not – do if one or more participants were in difficulty, given a particular location and conditions. Flotation devices might sometimes delay or prevent immersion deaths in moving water, but in-water rescue by a supervisor in some situations could be dangerous if not futile. A gold standard for fatality prevention on a river or at a high-energy beach would be provision of an expert supervisor with detailed local knowledge and a comprehensive understanding of potential serious incidents in that environment. It requires a willingness to alter plans if conditions or locations are unsafe, however disruptive to program goals.

Examining OE fatal incidents requires some judgement to be made about what expertise and knowledge would be sufficient, and what form of knowledge would be required. It can be difficult to assess how preventable a death might have been, in any particular case, without detailed knowledge of the location and environmental conditions. Whether a particular fatality could have been prevented merely by signage, or by possession of a risk assessment document, and to what extent safety would have required training and experience, can be difficult to determine. In mov-

ing water environments hazards can vary according to changing environmental conditions, can shift, can lack clear boundaries and might only be manifested when humans interact in certain ways.

In some circumstances prevention would have to rely on strictly preventing immersion at certain localities, because any rescue would be problematic or dangerous. Several of the multiple fatality incidents examined in Chap. 4 began as single victim incidents and became catastrophic because of attempted rescues in moving water. Both Mystery Cave 1990 and Sandbar Beach 1990 – one involving a relatively expert leader, the other naïve visitors to a beach – resulted in the deaths of an original victim and two others attempting rescue of the first victim. Prevention of the Mystery Cave 1990 incident probably required a decision to wait until the level of an underground river dropped before crossing, because a rescue of any person swept into the darkness would be problematic, whereas an individual with lifesaving skills and a flotation device such as a surf board could almost certainly have retrieved the Sandbar Beach situation when the first participant got into difficulty.

Prevention in some cases would have required an expert adult presence. Stony Creek 1974 involved a group of youths from an outdoor club confronted by a stream in spate as they returned from a bushwalk. It would have been possible, if inconvenient, to wait for the stream to subside. The group attempted to cross with the aid of a fixed line they had erected. The victim, of slight build, lost her footing and was left in the grip of the current struggling to keep her head above water as she clung to the line. When she lost her hold the current took her downstream. No one had been positioned downstream for such an eventuality, and brambles along the banks hampered any attempt to move downstream to her aid.

Appraising the incident, which involved youthful leaders, requires consideration of at what age risks of adolescent decision-making no longer apply (Reyna & Farley, 2006), and whether a group in the care of an older youth should be considered unsupervised. Crooked River 1978 was a more clear-cut case of adolescent decision-making. Faced with a river in spate after rain, a group of 14–15 year olds led by youths 1 or 2 years older attempted to cross. The alternatives were to wait, or to walk several kilometres to a bridge. Six were swept away by the current, and as in the Stony Creek incident brambles (blackberry bushes) along the banks hindered any rescue attempts. In a near miss incident, another group participating in the same program, elsewhere in the same catchment, also were swept off their feet attempting to cross a swollen river. The victim in the Barrington River 1995 incident was an 18 year old leading a kayaking group. His kayak was entrapped on an obstacle.

The Thomson River 1976 incident occurred after a supervised canoeing activity had finished for the day. Two participants were carrying a canoe back to the vehicles when they evidently decided to put the canoe in the water for one more run down a low-grade rapid. Lifejackets had been worn for the supervised activity, but they did not put them on. A teacher saw them on the river and attempted to shout instructions, but the canoe overturned. One student released his grip on the canoe and disappeared under water before a teacher could reach him. A police officer that recovered the body observed the water was very cold. The Forth River 1998 incident occurred on the margins of a supervised canoeing activity. The students were being

taught how to float downstream. The instruction was conducted in still water above a hydro dam. Below the dam, a student had partly crossed the river to sit on an artificial boulder that formed part of a slalom course. Another student attempted to join him, but suffered a foot entrapment. Although the victim was in effect attempting a solo, hazardous river crossing, the coroner found, without conducting an inquest, that the group was well supervised. The coroner appears to have placed more weight on how well the actual instruction was conducted, which was irrelevant to the incident, and less weight on the necessity to supervise young people, particularly adolescent boys, for the entire period they are in a hazardous environment. Attempts to rescue the victim by supervising adults in the water and in kayaks failed due to the volume of water, and because the adults were unaware the victim was in difficulty until alerted by the first student. The flow of water through the hydro plant was reduced too late to save the victim.

The Yarrunga Creek 1999 incident involved a "father son" walk in which students led their parents on a bushwalk to demonstrate their skills towards the end of a stint at a rural campus. A group comprising two students, a parent, and an older brother, aged 15, standing in for a parent, were to walk for half a day to a campsite rendezvous with the whole cohort. A flood alert had been issued but not picked up by the outdoor centre that morning. The students had been instructed not to cross any flooded creek. The group had no radio, although one other group had been issued one. The group lost their way and did not reach the rendezvous. At 4.12 pm a severe weather advice was issued, but the outdoor centre was not aware of it, and, consequently, neither were the teachers at the rendezvous. In the early hours of the morning the campsite was abandoned due to flooding and the hike was abandoned. Meanwhile the missing group, who had camped on Yarrunga Creek, lost some equipment and had to move to higher ground due to floodwaters. A further flood warning was issued at about this time. The missing group made their way at first light in difficult conditions to the original rendezvous:

> The group eventually located the scheduled overnight campsite at about 8 am. However, there was no indication as to where the main group had moved to (no note or other marker) the members of Group 3 began to doubt whether this was indeed the correct site. (Stevenson, 2001, p. 9)

The group decided to make their own way back to base. They encountered a flooded tributary, spanned by two log crossings via an island in the middle. The crossed the first log successfully. The older brother, who had become the de facto leader, was half way across the second log when "a wall of water knocked him from the log into the water" (Stevenson, 2001, p. 10). The adult prevented the younger brother from entering the water after his brother. As in many river-crossing incidents, the terrain made an immediate search impossible. It is likely the victim drowned shortly after being swept away. There were some shortcomings in the search and rescue process later that afternoon, relevant to future fatality prevention, but immaterial to the outcome of this particular tragedy because the victim was almost certainly already dead.

The coroner was critical of an apparent disconnect between how teachers at the school understood safety risk management and actually keeping children safe. "The school was operating, and appears still to be operating, in the false belief that nothing major would go wrong" (Stevenson, 2001, p. 27). She recommended that the school post her findings on its website, and among other recommendations, advocated that independent schools follow safety guidelines prepared for government schools. A decade later the coroner in the Kinglake 2010 tragedy made a similar recommendation (White, 2014).

A decade prior to the Yarrunga Creek 1999 incident, another drowning had occurred, involving the same school, also in the course of a father-son expedition. In the Shoalhaven 1990 incident the victim, who had been canoeing Grade 2 water, was caught on a snag in a strong current apparently while attempting to negotiate a rapid by wading with a canoe in tow. The river was subject to variable flows due to a hydro dam upstream. The snag was visible at low river levels, and was subsequently removed by teachers. Reading this account almost 30 years later, the coronial summary of the Shoalhaven 1990 incident seems more focussed on not blaming the school than on probing how such incidents could be prevented by better knowledge of entrapment hazards, better river rescue skills, or the use of alternative activities or sites.

One month after the Shoalhaven tragedy another student drowned in a canoeing entrapment incident, in Queensland, in the Logan River 1990 incident. A group under instruction had paddled downstream and were returning upriver on an incoming tide. Two students in a canoe were attempting to travel between two bridge pylons. Construction work for a second bridge had narrowed the river and increased the speed of flow at that point. The canoe was swept against the pylon, and submerged, where it remained pinned. One student surfaced, the other did not, although her life jacket did. Her body was found entangled in a painter line in the pinned canoe (Johnston, 1991; Williams, 1990). Newspaper reports indicated that the school had been conducting canoeing on the same stretch of river for 6 years without incident, but Heraclitus' fabled dictum, that you cannot step in the same river twice, applied, not only because the construction works had added a new hazard, but because tidal and river currents vary. But for the current, and but for the construction works, a death would probably not have occurred, but the incident was preventable because both were knowable hazards.

Whether or not the approach taken by the coroner in the Shoalhaven 1990 case was sufficiently focussed on fatality prevention, undoubtedly 30 years later entrapment could not be viewed resignedly. There would always be some residual possibility of entrapment due to a hazard which could not have been anticipated or identified beforehand – for example due to unseen, recent changes on a river bed or a recently lodged snag, but many entrapment deaths are not of that kind.

The victim of the Tully River 2007 entrapment drowning was an adult client of a commercial white water rafting operation, who happened to be accompanying a school trip to Australia. The coroner in that case specifically considered how entrapment deaths could be prevented, and included the incident in a review of eight entrapment deaths in the North Queensland rafting industry, three prior to the 2007

death, and four more in the 2 years following that incident (Priestly, 2011a, 2011b, 2011c, 2011d, 2012). The coroner's argument that fatality prevention required efforts to know where potential entrapment hazards were, and how to protect against specific hazards, is persuasive and, arguably, feasible in the context of commercial rafting given sufficient resources and capacity to accrue and distribute knowledge of potentially hazardous locations and conditions.

The Queensland entrapments deaths enquiry is an object lesson in the specificity of fatality prevention. The coroner found that, in most cases, instruction in the white water float position was adequate, that all victims wore suitable PFDs, that all rafts were suitable and serviceable, and that crews and guides in most cases were competent, *except for* knowledge and response to specific entrapment hazards. The deficiencies were actual knowledge of specific, knowable entrapment hazards, and actions consistent with avoiding entrapment as an overriding priority. For commercial operations on particular rivers, very detailed knowledge is possible of potential entrapment points, of how to run each rapid to avoid known entrapment risks, and of cover positions to protect clients or guides who end up in the water (Priestly, 2012).

At the joint inquest experienced guides argued against imposition of standard operating procedures:

> The general approach of all operators was to train guides to a specified level of competency and then rely on their skill and judgement to safely navigate the rafts through the rapids. Many guides gave evidence to the effect that the river was a dynamic body of water and the question of how best to navigate a particular section on a particular day was best left to the individual guide. The guides and operators preferred to maintain this approach and were resistant to any notion of standard procedures for each set of rapids notwithstanding the fact that most guides could 'rattle off' (in evidence) standard approaches and routes to particular rapids that avoid known hazards. The high level of detail that the some guides were able to articulate in evidence stood in stark contrast to the dearth of material reflected in the operations manuals. (Priestly, 2012, pp. 5–6)

For the purposes of this volume the Queensland rafting cases contribute to understanding of how fatality prevention can fail in otherwise competent operations, and of the detailed knowledge that could be required to avoid entrapment in some locations. Fatality prevention is specific.

The coroner's dismissal of legitimate questions of power, agency, and epistemology raised by guides can be understood in a context of commercial operations that appeared not to be operating under a standard of strict aversion to preventable deaths. In a somewhat different context, Jasanoff (1999) has argued that different strands of risk management thought differ, "first, in theoretical stance with respect to the nature of environmental knowledge second, in their prescriptions for linking knowledge to political action" (p. 137), but the coroner might have been less concerned with resolving epistemological questions than with finding purchase for coronial recommendations on an otherwise resistant operation. In my reading the coroner describes, with some frustration, how the workplace safety authority, marine safety authority, and other organisations failed to improve entrapment prevention and rationalized failure.

Deliberation is required to determine if, and how, formal risk assessments, standard operating procedures, and documentation are practical, feasible, and capable of preventing fatalities, but a coroner is confined to one-time one-way communication:

> I detected a lingering concern on the part of some senior guides and managers that what was intended by my recommendations was the use of risk assessments to develop a prescriptive rule based approach to how rapids should be navigated and cover positions managed. Nothing could be further from the truth. This concern suggests a fundamental misunderstanding or lack of understanding about the current safety risk management practices common place in other commercial, recreational and industrial settings. (Priestly, 2012, p. 6)

However warranted in this particular circumstance, more generally re-casting what was a fatality prevention problem as "safety risk management" brings its own problems, as Murray (2015) argued in response to the Coroner's recommendations. Whether or not formal risk assessments and standard operating procedures are necessary, or sufficient, to prevent rafting entrapment deaths cannot be determined merely by noting that deaths have occurred in the absence of either. To the extent that a coroner's focus on preventing entrapment deaths could be misread as a more general endorsement of the applicability of industrial risk management to small groups in the outdoors, difficulties that arose in applying European working-at-height regulations to rock-climbing and abseiling in the UK are salutary:

> [T]o reduce the number of deaths and serious injuries through "falls from height" in industries such as construction where they remain the single biggest cause of death, disability and injury …. regulations started from the logical standpoint of avoiding or eliminating actually having to work at height where at all possible. They then gave a hierarchical approach to any situation. If working at height was unavoidable then a "cherry picker" or work platform should be used. Failing that scaffolding, then a ladder, and only if that were unfeasible should ropes be used. And even then it would have to be a two-rope system similar to the very prescriptive methods used in rope access. ….[T]he UK Health and Safety Commission (HSC)… were planning on applying it to any area they could – including climbing.
>
> From the very start climbing sought to be treated separately from the construction industries, as a sport it just couldn't be regulated in the same way. However right from the start climbers found themselves in the worst-case scenario with no room for manoeuvre. A core group from across adventurous activities (including individuals from the Training Boards and the BMC[1]) started close talks and correspondence with the Health and Safety Executive (HSE), the enforcers of the HSC, to attempt to put our point across. Frequently we were told they understood our point of view only for the next draft of the regulations to make no concessions to our sport. Then just as the team started to build up a dialogue, HSE staff were moved on and the whole process had to start again. (Hey, 2005)

Whether a regulator, auditor, manager, or river guide who lacks knowledge of entrapment prevention can effectively contribute if equipped with a documented risk assessment, documented standard operating procedures, and a code of practice is debateable, but it should be clear why anyone who did not really know what they were doing might gratefully reach for such devices.

[1] British Mountaineering Council.

Murray (2015) argued that the documentation the coroner recommended was feasible on the Tully River:

> There is a community of guides with hundreds of thousands of days combined experience on the Tully River. It also helps that the water can be and is regularly shut off which allows for inspection of possible entrapment points at low river levels. Anecdotal data about likely flip locations abounds because of the abundant raft traffic of the Tully River. The information could also be categorized to apply to the typically few variations of river levels as a result of incremental releases from Koombooloomba dam (Murray, 2015, p. 44)

He then argued the same might not apply to advanced OE practice. Unlike commercial rafting, OE at advanced levels can enter areas less known, less knowable, less consistent and less documentable, particularly in the case of multi-day journeys. Moreover, different aims and purposes point to different strategies:

> Each year I take a university outdoor education group down the Franklin River in Tasmania. The river is well known to me and the other staff that work with our groups. We have also learned vicariously by sharing stories about previous incidents in particular locations. However it would be unfeasible to create and use a document that attempted to assess each of the hundreds of rapids over the length of our ten-day journey…. In such a remote area, the choice to portage rapids that are not easily navigable by the students becomes a very easy one. We are there to get safely down that corridor through South West Tasmania whether it is floating or walking. We are not there to test ourselves in rapids to the brink of our abilities. This allows us to be very cautious about exposing ourselves to any potential entrapment location. (Murray, 2015, p. 47)

In the case of ocean beaches, a project to record and document fixed hazards and potential variable hazards at all Australian beaches (Short & Brander, 2006; Short, Williamson, & Hogan, 1993) has contributed to development of published safety guidance for each State, for example Short et al. (2000). High-energy beach safety requires knowledge of fixed hazards, knowledge of potential hazards, knowledge of conditions on the day, and actual observation of participant behaviour and transient circumstances. Rip currents contribute to most deaths. Longshore currents can also present a hazard, particularly for a swimmer attempting to escape a rip by swimming laterally to the rip but against a longshore current (Fletemeyer & Leatherman, 2010). As discussed in Chap. 4 immersion deaths within patrolled areas of ocean beaches can be almost completely prevented.

Deaths at Anglesea 1976, Anglesea 1979, Stokes Bay 1980, Conto Springs 1998 and Bells Beach 2011 all involved school or youth groups at unpatrolled beaches. In the case of Stokes Bay 1980 supervising teachers thought of themselves as accompanying a tour organised by a bus company. The beach is accessed by a narrow passageway through cliffs. Teachers arrived at the beach after the students and the coach driver, by which time three students had been washed out to sea, fully clothed. The Anglesea 1976 and 1979 incidents both occurred at the same location. In both cases several individuals had drifted with a current into deeper water around rocks. While adults present were pre-occupied with retrieving individuals from the water, a drowning occurred unobserved. In 1976 one of the teachers who had been assisting students from the water was noticed floating face down once the children were safe. In 1979 scouts from two different groups led by two adults and an older scout

were hiking along the beach. Some of the group, with tacit approval of one leader and the older scout, entered the surf for a swim or wade. Accounts differ as to whether the other leader, who was in charge, also signalled tacit approval or was intending to warn the group that the location was unsafe. As in the 1976 incident a current moved the group towards a rocky headland, where deep holes and currents around the rocks caused difficulties for weak swimmers The leaders, somewhat assisted by a human chain, retrieved most individuals from the water, but the deceased by that stage was out of sight. He had been observed in difficulty by another scout but not by the adults. His body was recovered some days later. Police gave evidence that the location was known to be hazardous and that the local surf-life saving club would have so advised had they been consulted.

At Conto Springs 1998 about half of a group of 26 at a beach were in the surf in what was a "semi-planned" (Martin, 2000, p. 16) activity during a school camp. A relatively weak swimmer ventured further out than his partner, who became preoccupied with getting himself out of the water. The victim was calling but his partner was unsure why. When a supervising teacher eventually realized a student was in difficulty, he swam to his assistance, at first aiming for a point he assumed, based on wrong information about the rip, the victim would be carried to. The rescuer had no flotation device to assist him. He retrieved the victim but CPR was unsuccessful. The excursion to the beach was not an essential part of the OE program, and could have been omitted. There were safer beaches in the area. One supervisor had not been not watching the water at all, the other had not immediately noticed the problem. The coroner pointed out that adults should not rely on adolescents always following instructions; effective supervision is required in potentially hazardous situations. Guidance from the Catholic Education Office was inadequate, as was the case more than a decade later, in Victoria, for the Kinglake 2000 tragedy. The complete inquest report provides a detailed case study of how well-intentioned adults, who no doubt thought they were acting competently, could fail to take all reasonable steps to prevent a death. It also provides some insight into the utility of knowledge-based lifesaving expertise over generic procedural workplace safety advice. From a fatality prevention perspective the coroner's report (Martin, 2000) should be required reading for prospective teachers. As in many detailed reports, some patterns relate to very similar environmental circumstances, others emerge from resonances with otherwise different incidents in matters of supervision, particularly the difference between focussed fatality prevention and what might be called "yard duty standard", human error, and adolescent behaviour.

In the Conto Springs incident, as in several other immersion deaths, a "buddy system" failed to protect the victim. In some cases erstwhile buddies have not be able to recognise an unfolding emergency, or have been unable to gain the attention of adults. In the case of Conto Springs a student's claim to have attempted to alert a teacher could not be corroborated, but in other cases witnesses have supported student accounts of struggles to get adults to understand that there was an emergency. Any individual not focussed on scanning for potential drowning might have difficulty re-framing their thoughts and priorities in order to enter rescue mode. A bell doesn't ring. The buddy system requires firstly a child to recognise a problem and

then to persuade an adult that there is a problem. Clearly buddy systems are not fail-safe, but there could be instances, not included in this study, where a buddy effectively raised the alarm and saved a life.

The most complete account of the Bells Beach 2011 I could locate was a newspaper report of the sentencing of the outdoor company that had pleaded guilty to workplace safety law violations. Permanently available detailed accounts are an important part of fatality prevention in a field in which deaths are almost invariably outlier events linked to specific circumstances; it is regrettable that neither the workplace authority nor the coroner provided a detailed narrative to inform future prevention. A group of 19 year 10 girls, three teachers, and two instructors were on the last day of a three-day surf camp. The group had no rescue equipment, and the instructors had not checked the surf conditions. Most of the group entered the water with snorkels and flippers and almost immediately were in difficulty due to waves and a rip current that took them out from the reef. The teacher who died had become exhausted assisting students to shore. One of the instructors had assisted him into knee-deep water, but another teacher who had found the current too strong for her and was unable to help subsequently observed him in difficulty. A victim impact statement described how his young daughter wondered why they couldn't have got a big rope to save her father, why they didn't have a boat, and why they couldn't tip the water out of her father (Cannon, 2013).

Three deaths at Kurrawa Beach, in 1996, 2010, and 2012, each of which involved a youth competing in an event at the national surf competition. Taken together the three tragedies provide insights into systemic and organisational failures. Each of the victims was apparently knocked unconscious (or perhaps inhaled water after an impact), in two cases by riderless surf skis, and in the third (probably) by impact with the bottom caused by a dumping wave over a shallow bar. Each incident was witnessed. In each case responders struggled to locate victims who quickly sank beneath the surface and were moved by underwater currents. Robert Gattenby in 1996 was not found for 3 days, even though in his case swimmers were in the water where he had been last seen within minutes. Saxon Bird in 2010 was not located for 53 min. Matthew Barclay was not found until the following day. None of the victims were wearing flotation devices of any kind. In the first two cases a cyclone off the coast had created hazardous surf. In the third case there was no cyclone but some observers had noted dangerously dumping waves on an outer bar.

There was no inquest after the death of Robert Gattenby. News reports many years later claimed that the coroner who decided not to hold an inquest was at the time president of one of the surf clubs competing in the event (Carlisle, 2012).

Even without an inquest, insights from reports of the death of Robert Gattenby could have prevented the other two deaths, had case-based prevention been implemented:

1. A safer beach could have been chosen. North Kirra beach would have been a suitable safer location, according to the SLSA's beach rating system and according the organisers' own contingency plans.

2. The difficulty of rescuing an unconscious patient was clear. Buoyancy aids, such as low flotation vests used in sports such as kite-surfing, or partial wetsuits used by surfers and triathletes, would have improved the chances of an unconscious victim being located in time. Normally humans do not float unless their thorax is expanded (Llana-Belloch, Lucas-Cuevas, Pérez-Soriano, & Quesada, 2013). If available equipment had been less than ideal it still could have been deployed and refined over time.
3. Specific measures to rescue an unconscious victim could have been in place. Once a victim is unconscious he or she must be secured within minutes, if not seconds. Only the first three or four minutes of any rescue response would be relevant to fatality prevention is such circumstances; the rest would be body recovery. The more common assisted rescue of a conscious swimmer in difficulty is less demanding.

The narrative of the SLSA tragedies that emerges from the inquests and the press reports could lend itself to thesis length treatment, but it is important to emphasise that, hypothetically, a competent OE teacher responsible for a group could have readily identified a safer location for any heat or event using the SLSA's beach rating database, and could have required participants to have more buoyancy in the form of a suitable wetsuit or impact vest of the kind used in kite-surfing. Such flotation would not keep an unconscious person's head above water, and would only assist if rescue craft crewed by an operator and a rescue swimmer were deployed and ready. Such measures did not in themselves require organisational complexity.

According to news reports, dozens of competitors were injured in the 1996 event, with Cyclone Beti off the coast. The iron women voted to suspend their part of the competition, but were reportedly told they would be disqualified because a TV channel was waiting to broadcast. Reportedly doctors at the local hospital expressed concerns about a large number of potentially life-threatening injuries. Neither the iron women competitors nor the doctors were interviewed as part of a subsequent internal inquiry by SLSA (Carlisle, 2012).

The second death also occurred in a surf ski event, also with a cyclone off the coast, and also in circumstances where many competitors and observers had expressed concerns about the conditions. The inquest was shown film of one event, which all officials present in court agreed demonstrated that the event should have been cancelled:

> The inquest viewed video vision of an under 19 double ski race that was run shortly after 10:00 am on Friday. Every competitor was knocked from his craft on numerous occasions. Competitors narrowly avoided being struck by wayward skis. It was just lucky that somebody was not seriously injured. (Barnes, 2011, p. 21)

The 2010 inquest (Barnes, 2011) was prevention-focussed. The coroner criticized a failure to distinguish responsibility for adolescents and adults voluntarily engaging in a risky sport:

> However, I don't accept SLSA's submission that the competitors voluntarily participated and therefore assumed the intrinsic risk if that is meant to suggest the organisers were, as a result, freed of responsibility for determining whether it was sufficiently safe for the com-

> petition to continue. The organisers brought the participants together and offered recognition and acclaim to those who succeeded. To a cohort of notorious risk takers ill equipped to realistically balance their best interests, it offered powerful inducements to participate even if the conditions made doing so unduly dangerous. (Barnes, 2011, p. 26)

The death in 2012 did not involve cyclonic conditions, but conditions were sufficiently dangerous for two lifeguards employed by the local council both to express concerns to organisers that conditions were unsafe for youthful competitors (Ryan, 2016). Several observers reported plunging waves that could dump a competitor on the sandbar.

The inquest into the 2014 incident was told there were many individuals present who did not recall thinking that the competition should have been abandoned. In the previous inquest the coroner had specifically commented on the notion of seeking a consensus rather than taking the most conservative action:

> While there may well have been credible witnesses who were of the view that it was safe to continue, there were also numerous competitors who thought more events should have been suspended or relocated. When lives are at stake it is not appropriate to seek to balance competing views or to seek consensus. Those responsible cannot try to calculate the average or most widely held view. The danger posed by wild surf is not capable of precise calibration. If there is any credible evidence that conditions are placing lives at risk then the only responsible thing to do is to suspend competition. When the cost of making the wrong decision is so high and the negative impact of acting more cautiously is so slight in comparison, officials should favour a wary approach. (Barnes, 2011, p. 30)

In 2012 Matthew Barclay was seen to be in trouble by operators of two jet-skis positioned to assist. One testified that he could not reach Matthew because competitors were in the way. The other jet-ski operator stayed with his craft rather than leaving it pilotless, which could have been hazardous. Because Matthew quickly disappeared under turbid water it is possible that any effort by an operator would have failed. There was supposed to be a crewed rescue boat deployed at the time of the race, but the race had gone ahead without a rescue boat on the water (Ryan, 2016).

Had a victim been equipped with a low-buoyancy flotation vest or wetsuit, the question of rescue by a jet-ski operator would have been more germane. The question of rescuing an unconscious victim was clearly foreseeable and could have been effected by deploying a rescue swimmer and a sled on each jet ski in time for resuscitation to have some prospect of success. There was an attempt to keep track of the location where the victim was last seen (Ryan, 2016), although a dye bomb, of a type used by rip current researchers, would also have helped determine where currents might have taken the body. The use of marker dye had been mentioned in the 2011 inquest (Barnes, 2011).

Discourse following the three surf lifesaving deaths – including evidence reported in the coroner's court – illustrates how conceptual frames that implicitly repudiate reasonable fatality prevention measures could influence decision making and incident analysis. Framing errors were possibly root causes of all three incidents: (1) Applying adult standards to the care of youth, (2) confusing difficulty

with danger (3) applying, or attempting to determine minimum safety thresholds rather than adopting all reasonable prevention measures.[2]

1. Arguments that apply to adult recreation about voluntary assumption of risk cannot be applied to adolescents in the care of adults. Males in particular are less capable of evaluating risk decisions until their early 20s (Casey, Jones, & Hare, 2008; Reyna & Farley, 2006; Steinberg, 2008). Discourse following each of the three deaths provides examples of a porous or absent distinction between adults making decisions on their own behalf and adults making decisions on behalf of children or youth in their care.
2. How difficult conditions are for competitors is related to safety, but assessing hazards is not the same as assessing difficulty. A connection between danger and level of difficulty could be weak or absent. A shark might appear amongst capable or struggling competitors alike. A loose surfboard could strike a competitor who was otherwise performing competently. Less capable competitors could be more vulnerable to plunging waves, but only to a degree. Discourse following the three tragedies provides numerous instances of difficulty conflated with danger. One consequence of framing "dangerous" as "challenging" is that prudence could be construed as shirking a challenge or admitting failure. Any difference in emphasis might be subtle, but fatality prevention is always in tension between quotidian decision-making (are competitors coping?) with decisions based on pre-mortem consideration of events that rarely occur (could there be a preventable death?). Expertise in assessing the difficulty of conditions, refined and affirmed by repeated observation, could lead to false confidence in expertise at recognising and responding to potential deadly hazards.
3. Case material indicates that at least some fatality prevention was premised on determining minimum standards rather than adopting all reasonable measures. Examples include use of a surf hazard rating system that required observers, at set intervals, to score each of seven aspects of the surf, combined to give a numerical hazard rating (McCoy & de Mestre, 2014), and a risk matrix on an iPad app (Ryan, 2016). Fatality prevention often involves thresholds – for example determining if an individual requires rescue – but in this case the threshold problem could have been avoiding by choosing a safer location. A search for thresholds also delayed, and then limited, deployment of helmets and buoyancy aids. A lengthy and elaborate investigation of buoyancy aids and helmets had delayed actual deployment of such devices at the time of the third death, and their adoption subsequently was mandated only is circumstances of "heightened risk" (Surf Lifesaving Australia, 2015). Personal protection devices already in common use could have been deployed while an investigation into such devices proceeded, and the "heightened risk" threshold could have been eliminated by requiring such devices for all competitors under 21 in all competitions.

The organisation reportedly used a risk management standard (ISO 31000:2009) in the aftermath of the 2010 death. Those familiar with the literature on the limitations

[2] See also Chap. 3.

of such standards (e.g. Lalonde & Boiral, 2012; Leitch, 2010; Purdy, 2010), which I consider in Chap. 7, would not be surprised that risk management procedures could fail where application of case-based knowledge would almost certainly have succeeded. Hubbard (2009) argued, in relation to risk management generally:

> The ultimate common mode failure would be a failure of risk management itself. A weak risk management approach is effectively the biggest risk in the organization. (p. 6)

It is understandable that those responsible for organisations, and lay individuals such as coroners, might accept widely applied published standards at face value. The term "standard" can refer not only to either minimum or optimum levels, referred to above and discussed in Chap. 3, it can also signify common practice or convention (Philo, 1965). From an organisational perspective adoption of standards widely accepted nationally or internationally provides a degree of immunity from criticism, insofar as criticism of a single organisation's use of a standard could imply criticism of hundreds of other organisations. There is no law which states that "thousands of organisations can't be wrong" but it might not be the role of an inquest into a single death to investigate and critique ubiquitous practices, particularly those advocated by risk consultants and in some cases health and safety professionals.

However, whatever an organisation's approach, fatality prevention in the surf comes down to the supervision of individuals, because hazards can be local or ephemeral, and because some latent hazards are only manifest when an individual is in the wrong place at the wrong time. Prevention measures, including head protection, buoyancy aids, and rescuers equipped and ready to retrieve an unconscious victim within 1 or 2 min could be evaluated by observation. For any given individual at risk, a single capable surf-lifesaver with case-based knowledge of fatal incidents could determine whether or not any organisation's risk management approach had succeeded in ensuring all fatality prevention measures were in place, regardless of how complicated the organisational processes behind such measures might have been.

6.9 Hyperthermia, Hypothermia and Lightning Strikes

Environmental conditions on the day, particularly weather conditions, are counterfactual causes in many OE fatal incidents. Table 6.7 lists Australian incidents involving (relatively) extreme heat or cold. I have included lightning strikes because they are weather related.

To derive prevention lessons from past OE fatal incidents always requires consideration of the affordances of current equipment and technology, epitomised by the GPS equipped smart phone. Improved access to forecasts, improved accuracy of forecasts, improved access to monitoring data, improved scope of monitoring data, combined with reliable location data and communication with potential rescuers separately and in combination transform how prevention of such incidents can be viewed.

Forecasts can be faulty, as was the case in the 2008 Mangatepopo tragedy discussed in Chap. 4. A forecast received by facsimile on the morning of the incident evidently had some words missing (Devonport, 2010). Electronic devices could be lost or damaged, and batteries could go flat. To the extent that safety devices permit activity that would otherwise not proceed – for example rock-climbing that would not be attempted without a rope – there is always the possibility that devices or technology that could be deployed to prevent fatal incidents are implicated in enabling, if not causing, a fatal incident. Individuals might defeat improvements in safety by compensating – for example by skiing faster when wearing a helmet. The idea that individuals adjust behaviour to maintain a more or less constant level of perceived risk – risk homeostasis theory – is contentious in some areas of safety research (Hedlund, 2000; Lasenby-Lessard & Morrongiello, 2011) but it is reasonable to assume that many OE decision-makers take into account the availability of communications, GPS, and emergency beacons when deciding if an activity is safe and should proceed.

Emergency communication can fail. In 2002 UK newspapers reported a failed rescue near Ulverston, Cumbria, of a man and his son trapped on a sandbank by an incoming tide in fog. The victims remained in contact with police through a series of phone calls, the first of which was made when the water was ankle deep, the last with the son on his father's shoulders. Although the victims could hear sirens, and police on the shore reported hearing the victims' cries, rescue teams could not locate the two before they drowned (Bunyan, 2002). The 2006 Kedumba Valley death (Table 6.7) was a distressingly clear instance of a failed attempt to obtain rescue using a mobile phone. David Iredale had made a total of seven mobile phone calls to the triple-zero emergency service prior to his death. One call went to the police, one dropped out before being allocated, and five calls went to the ambulance service. Information from three of those calls, only provided to police 4 days after a search had commenced, allowed the search to be narrowed and his body eventually to be found another 4 days later. Details of two other calls to the ambulance service were never provided to the police searching for him (Milovanovich, 2009). The supervisor of the call centre conceded in court that the response of one call-taker to David had been sarcastic (AAP, 2009). The coroner observed that that call takers failed to elicit relevant information, ignored what David was saying, and remained focussed on obtaining a street address, which the system required before an incident report could progress. David possibly died soon after making the last phone call, from the effects of dehydration. It is not possible to say that his death was caused, in the "but for" sense, by failures in the triple zero system, because a more timely rescue might still not have saved his life (Milovanovich, 2009).

David's 2006 death in the Kedumba Valley was one of three incidents in which hot or very hot weather could have been a causal factor. David, with two others, believing themselves to be completing a Duke of Edinburgh award requirement, had embarked in summer on a walk initially planned for winter. The walk was strenuous and the boys were carrying 15 kg rucksacks. Temperature was in the high 30s Celsius. They had camped overnight having exhausted their water supplies around 1600 h the previous day, and unexpectedly found no water at their campsite. Had the

Table 6.7 Hypothermia, hyperthermia

Incident	Deaths	Date	Location	Institution	Brief description	References
Cradle Mountain 1964	M15	5/12/1964	Cradle Mountain Lake St Clair NP, TAS	Parklands High School	2 teachers, 3 other adults, 15 students on day trip.Party became separated into several groups. Blizzard conditions. 1 died.	The Mercury (1964)
Cradle Mountain 1965	M25[a] M14	20/5/1965	Cradle Mountain Lake St Clair NP, TAS	Riverside High School	16 students, 2 teachers, 1 student teacher on 5 day bushwalk. Caught by blizzard between Waterfall Hut and Waldheim day 5. Student teacher apparently died attempting to carry hypothermic student to safety. Survivors found in several locations after boy raised alarm.	The Mercury (1965)
Cradle Mountain 1971	M15	23/11/1971	Cradle Mountain Lake St Clair NP, TAS (VIC school)	Footscray Institute of Technology	2 teachers, 19 students. 3rd day of bushwalk, reached hut, which was full. 4pm continued to next hut. Snow on ground, weather deteriorated. Both teachers and 5 students hypothermic, failed to reach hut by dark. During the night hut occupants worked to get all 7 to hut. 1 student died in the hut.	Hicks (1972)
Kanangra Walls 1981	M16	1/9/1981	Kanangra Walls area, NSW	Newington College	2 students, 1 teacher, "not official school outing" abseiling. Boy caught on knot. Lightly clad, cold conditions. Unable to self-rescue, companions unable to assist. Incident happened around midday; rescuers informed 8.30pm, reached area 5.30am.	Sydney Morning Herald (1981)
Lamington 1992	F12 F12	25/11/1992	Coomera circuit, Lamington NP, QLD	Upper Mount Gravatt State School	41 students, ? teachers on day walk in rainforest. 5 min storm 2 girls sheltering under large tree (on rise, near escarpment) killed by lightning that struck tree.	Davies (1993)
Kedumba Valley 2006	M17	11/12/2006	Kedumba Valley, NSW	Sydney Grammar (reportedly a private trip)	Party of 3 training unofficially for a D of E award. Victim went ahead of his companions to find a river, did not arrive. Three 000 calls from him caused a search. His body was found 9 days later. Possible (probable) dehydration/hyperthermia. Temperature high 30s C.	Milovanovich (2009)

(continued)

Table 6.7 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Thailand 2008	[a]M 41 M19	1/9/2008	Khon Kaen province,Thailand	Winthrop Baptist College, WA	1 Teacher, 14 year 11 students, 1 voluntary teaching assistant, service learning trip, swimming below a waterfall. Lightning strike killed the teacher, andteaching assistant sheltering under a tree. 3 Thai teenagers not with the group also killed.	Painter (2008)
Morocco 2012	M17	17/7/2012	Altas Mountains, Morocco	World Challenge Expeditions, UK	School trekking expedition. 39 °C. Victim collapsed. Died in a minibus which arrived 1 h later to evacuate him. No ambulance or medical assistance. Hyperthermia/possible low sodium levels (water retention)	Lynch (2014)
Plumbago Station 2016	M17	22/2/2016	Yunta, SA	Huntingdale School, VIC	School 4 day bushwalk in summer in an arid zone. Temperature in the low 40s. Victim collapsed and died before medical assistance by air arrived at the station (ranch).	Calligeros and Worrall (2016)

[a]Adult supervisor

walk been completed in June as originally planned, rather than December, there would have been water in nearby creek. David had carried and consumed two litres of water, the survivors between three and four litres each. The next day they descended towards a river. The two survivors lost contact with David around midday, who was alone when he made a series of increasingly desperate calls to the triple zero number. His body was found 8 days later in a dry gully 200 m off the walking track (Milovanovich, 2009). One counterfactual prevention approach would focus on systemic failures in the triple-zero service, but that is out of the control of those involved in OE. A competent adult leader could have prevented such a death, as would advice to carry more water. Even if the boys had been unsupervised in the field an adult with detailed knowledge of the trip could have been alerted by any one of the boys and taken over the task of properly informing rescue organisations. None of the boys had a GPS.

The death of Samuel Boon in 2012 occurred while he was part of a group walking in the foothills of the Atlas Mountains in Morocco. As in the Kedumba Valley incident temperatures were in the high 30s Centigrade. The Coroner notified the Secretary for Education of required action to prevent further deaths, including the following (S. Lynch, 2014):

> Samuel and his parents were given inadequate and misleading information about the level of fitness required or the risks involved in the trip and how they would be managed. Samuel was not adequately assessed as to his physical ability to participate. Formal risk assessments were inadequate and inaccurate with regard to the risk of heat illness and/or hyponatremia, and the risk of medical emergency generally. Information provided by the expedition company was not sufficiently accessed and considered either prior to or during the trip. Plans for evacuation relied almost entirely upon local agents to find and obtain appropriate facilities. They were appointed without their qualifications being checked or references obtained, and were not given any formal training. There were no arrangements in place for an ambulance with medical equipment and/or personnel to be provided in an emergency, and the facilities at local medical centres had not been assessed. (p. 2)

The 2016 Plumbago Station death had not been the subject of an inquest at the time of writing, and a medical cause of death had not been reported. As in the other two heat-related cases the victim collapsed while on a multi-day walk in hot weather. Temperature was in the low 40s C. The victim died before a Flying Doctor Service aircraft reached the station (Calligeros & Worrall, 2016). Each student was apparently walking with 4–5 litres of water in canvas water bag, and evidently were to be supplied with more water at each campsite (Green, 2016).

In cold conditions hypothermia incidents have in some cases claimed multiple victims. I consider such incidents in Chap. 5. The third of the three Cradle Mountain tragedies, all of which occurred in the same region the Cradle Mountain – Lake St. Clair National Park in Tasmania, occurred days after the 1971 Cairngorms tragedy in Scotland discussed in Chap. 5. In each of the three incidents a school group encountered blizzards. The equipment that any school group could reasonably have obtained at that time would have made survival in blizzard conditions overnight problematic in the absence of a hut or other shelter. In each case groups fragmented as some individuals could continue more strongly than others, and each incident could be considered a near-miss for other members of the group. A teacher died

attempting to assist a student, who also died, in the 1965 incident, and a teacher almost died in the 1971 incident that claimed the life of one student.

In the 40 or 50 years since those incidents clothing, tenting, navigation, and communication equipment has improved greatly, which is to say that in principle such incidents are more preventable than they were in the past. Weather forecasting, and access to forecasts, has also improved considerably in the intervening years. The 1964 and 1971 incidents were in early December and late November respectively (at the start of summer). It would be possible for a leader to have conducted a number of such trips, without necessarily having encountered a summer blizzard. The 1965 incident occurred 1 week before the start of winter. Expert intuitions informed by episodic experience could be faulty if not also informed by knowledge of potential environmental conditions obtained by monitoring. One could visit a location many times without encountering conditions that occur only occasionally.

Hypothermia was the medical cause of death when a student abseiling into a Kanangra Walls canyon in 1981 was caught on a knot Twenty years after that death a young man on a university mountaineering club trip in the Kanangra Boyd National Park also died from hypothermia on a waterfall-sprayed rope, attempting to rescue an unconscious companion who had apparently been struck below the helmet by a falling rock during an abseil (Matthew Moore, 2001).

Both lightning strike incidents, Lamington 1992 and Thailand 2008 claimed multiple victims. In the Thailand incident there were 5 deaths, two of which were OE related. Deaths caused by lightning in OE should be considered in the context of lightning safety more generally (National Lightning Safety Institute, 2017). Many circumstances unrelated to OE entail the possibility of a lightning incident. Both incidents in Table 6.7 involved groups sheltering under a tree that was struck. In circumstances where lightning can be seen or heard, and no absolute shelter is available, aversion to a multiple casualty event takes precedence over strict aversion. A spread-out group avoids multiple casualties, and thereby maximises the available first aid and rescue capacity in the event of a strike, but it in effect increases the chances of a lightning strike incident because potential victims are placed in multiple locations rather than just one. In neither case was there sufficient information on the public record to determine what prevention measures were available, apart from keeping a safe distance from tree trunks, but in both cases keeping more space between individuals could have prevented all but one casualty.

Inclusion of the lightning incidents is a reminder that those responsible for OE groups must understand how to mitigate the possibility of a fatal incident, but lightning safety applies across the community and requires knowledge derived from a comprehensive knowledge of lightning fatalities, rather than OE related cases.

6.10 Animal Related Deaths

Table 6.8 lists animal related deaths. I did not find instances of OE related deaths in Australia from snakebite, spider bite, or crocodile attack. Snakebite deaths in Australia are very rare. In a recent retrospective study Welton, Liew, and Braitberg

(2017) found an average of 2.2 deaths per year over a 17 year period, and notes that 19 of 35 bites occurred in the victim's residence, including 17 in urban areas. In 2008 a tour guide was sentenced to 3 years imprisonment (suspended) for the death of a tourist in a crocodile attack (Australian Associated Press, 2003). That incident was not included in this study because the victim was 23 years old.

The possibility of wild animal attack, including bites or stings, is framed by geographical distribution of species, seasonal factors, and habitat. Although numbers of deaths across the Australian continent might be small, prevention requires attention to situations and circumstances where an attack is possible or imminent, including foreknowledge about the local presence of potentially dangerous creatures, and observant supervision. It serves prevention better to recognise that from the animal's perspective although an attack on a human could be opportunistic, it would not be random. As in many OE fatal incidents animal attacks are highly circumstantial and prevention requires the expertise to recognise potentially hazardous situations.

Table 6.8 Animal related deaths

Incident	Deaths	Date	Location	Institution	Brief description	References
Blacks Beach 1984	M 16	29/11/1984	Mackay, QLD	Sarina State High School	150 students and 9 teachers on end of year beach excursion. 60 students on wind surfers, surf skis and catamarans. Victim was with 3 others on a catamaran 300 m off shore, when he fell into the water. Before the others could turn the craft around a 3-4 m tiger shark attacked him. He was assisted back onto the craft but died soon after.	Edmonds (2003) and The Age (1984)
Tanzania 1996	F18	2/5/1996	Tanzania.	World Challenge Expeditions	Scottish volunteer teaching English killed by a crocodile while swimming.	The Independent (1996)
Lake Challa 2002	F18	8/3/2002	Lake Challa, Kenya	Africa and Asia Ventures	Gap year volunteer killed by a crocodile while swimming at night.	Fulbrook (2005)

(continued)

Table 6.8 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
The Lizard 2004	M17		The Lizard, Cornwall	Blackburn College, Lancashire	School trip to a coastal walking path. An apparently friendly dog approached a student with an aversion to dogs. He retreated and fell 80 m.	BBC (2004)
Glenelg 2005	M 23	24/8/2005	St Vincent Gulf, SA	University of Adelaide	Graduate research assistant SCUBA diving to collect cuttlefish eggs. Party of 4. Shark Shield devices unused on boat. Victim taken by 5m Great White Shark during ascent to surface. The attack was witnessed – full predatory strike.	Schapel (2008)
Dubbo 2009	F 18	24/3/2009	NSW TAFE Rural Skills and Environment Centre, Dubbo, NSW	TAFE NSW Western Institute	Student riding a horse under supervision as part of jackaroo/jillaroo course. Horse bolted and student fell off, died at the scene. Reportedly TAFE had recently changed to a system in which contracted horses were brought to Centre – instructors unfamiliar with horses, horses unfamiliar with environment.	Wells (2011)

The example of wild animal attacks highlights the importance of drawing case-based fatality prevention knowledge from relevant geographical areas. Like Australia, India has many species of venomous snakes, but unlike Australia numerous deaths from snakebite occur every year. Menon, Joseph, and Whitaker (2017) report an estimate of 50,000 deaths per year. According to one report, over a 14-year period almost 900 school students in the Ashram (tribal) schools died from snakebite. (United News of India, 2017).

The possibility of snakebite, or of envenomation by a different creature, is possible over much of the Australian continent and could not be considered a hazard especially associated with OE. Case-based prevention must draw on cases from outside of the OE field and include instances where death was prevented by effective and timely medical treatment, including first aid.

I have included one OE related horse riding death. The victim was completing a riding course. Unknown to her, the leased horse that she was allocated was a thoroughbred racehorse that had recently raced. She was unable to pull it up when it bolted (Dingle, 2011). The educational organisation was convicted and fined $A300 000 (Harris, 2014). According to a relatively recent review article horse riding injuries tend to be severe and mortality tends to be high. Girls and young women are over-represented, possibly because of higher participation rates (Havlik, 2010). I surmise that horse riding is not a common inclusion in Australian OE programs. It is possible that there have been deaths that I did not discover. It is possible that a study that included serious injuries would be more informative.

A human in the water or on a riverbank is probably an ideal meal for a saltwater crocodile. Prevention in Australia relies on either removing crocodiles from certain locations or complete avoidance of situations in which an attack could occur. Crocodile attacks could be considered completely preventable in OE because the circumstances of attack are knowable and avoidable. The shark attacks in Table 6.8 were arguably unpreventable, in that complete avoidance of activities involving small craft on the ocean would not be reasonable and neither involved aggravating circumstances.

6.11 Murder, Suicide, Transportation-Related Deaths, Deaths from Natural Causes, Anaphylaxis and Fire

Fatal incident case studies can provide what Toft and Reynolds (1994) call isomorphic lessons – the application of lessons to other organisations or other situations, and iconic lessons – the more general learning about what can go wrong. There have been deaths that, to some degree, happen to have occurred during an OE program but which could have occurred in circumstances unrelated to OE. Here I consider some cases that contribute iconic fatality prevention in OE, in the sense that they represent possibilities that should be included in any review of potential fatal incidents in a program or location, even if they are arguably not “OE related” incidents as such.

I have not included incidents involving travel to or from OE programs in this chapter, although such deaths have occurred. I consider transport incidents having multiple deaths in Chap. 5. I examined Australian transport incidents in a previous study (Brookes, 2003a, 2003b, 2004, 2011b), including vehicle-related deaths that occurred during the course of programs. A school camp participant travelling in the tray of utility vehicle, driven by an unlicensed driver was killed on private property in South Australia in 1988. A student died wheeling his bicycle in the breakdown lane of a highway in the course of a Duke of Edinburgh Award expedition in New South Wales in 1990. Potter, Dubois, Haras, and Bedard (2013) conducted a detailed analysis of the safety considerations around 15-passenger vans used in many North American programs.

I have not considered deaths due to suicide.

Table 6.9 records three deaths due to murder, and a disappearance, Steavenson Falls in 1974. Loftia Park 1977 involved the murder of a child attending a camp by an older child, Brittany 1996 an attack on a sleeping child by a sexual predator, and Coogee Beach 1993 the death of a supervising teacher who had intervened in an altercation between one of his students and a member of the public on a beach.

Both deaths due to fire involved a small group of students in temporary accommodation and occurred when supervisors were otherwise engaged and not present at the immediate location. Both cases resulted in one death, one survivor with very serious burns, and some uninjured survivors. At Noojee 1984 a heavy army style canvas tent on a platform caught fire when wind blew a door flap onto a gas lantern. A child might have moved the gas lantern, although a coroner found a teacher had placed the lamp unsafely.[3] At Sutton 1994 an on-site caravan caught fire after students turned on an air-conditioner.

Both deaths caused by anaphylaxis involved 13-year-old boys on camp, in circumstances where the school had been informed the child was allergic to peanuts. Both deaths involved ingestion of peanuts that had been provided as part of the program. Both deaths illustrate how organisational layers can add points of potential failure to prevention measures that, in the hands of a single responsible adult would have been relatively straightforward. Both deaths involved failures at an organisational level to grasp the potential seriousness of peanut allergies, and arrangements that in effect relied on chains of communication that added multiple potential points of failure.

In the Yanko 2002 incident Hamidur Rahman knew he had a peanut allergy, as did the teacher in charge of the camp, but the teacher who included a peanut butter eating contest in trivia night competition did not. Hamidur was not being medically treated for his allergy and did not have an Epinephrine auto injector. The coroner commented:

> It is hard to believe that in 2002 educators could be ignorant of the extent of the problems with allergies, but each and every witness stated they were not aware. (Milledge, 2005, p. 10)

[3] Possibly an unconvincing finding, although I surmise it eased the path to compensation for the badly injured survivor.

Table 6.9 Murder, fire, anaphylaxis

Incident	Deaths	Date	Location	Institution	Brief description	Category	References
Steavenson Falls 1974	M11	4/9/1974	Steavenson Falls, Marysville, VIC	Young Australian League	Group of 40, 5 day camp. Day trip to view falls. Victim disappeared from the track, which was surrounded by thick bush intersected with many roads and trails. Search abandoned after 5 days, presumed dead, body never found.	Missing, never found	Sterel (1974)
Loftia Park 1977	M7	12/1/1977	Loftia Park Camp, SA	Adelaide YMCA	7 year old died, head injuries, struck several times on head with a brick, in retaliation for the deceased telling other children he had seen his assailant defecate near a car.12 year old convicted of murder 4/7/77, appeal dismissed 7/10/77. Suppression order on his name.	Murder	Brice (1977)[a]
Noojee 1984	M12	2/10/1984	Nayook, VIC	Churchill Primary School	25 students, 3 teachers, 2 parents at camp with on-site tents on platforms. Children settled and apparently asleep. 15 minutes after checking students teachers alerted to tent on fire. I student badly burned, 1 dead. Fire caused by gas lamp placed near tent; conflicting evidence as to who moved the lamp.	Fire	Adams (1986)
Brittany 1996	F13	18/71996	Pleine-Fougeres youth hostel	UK school	Student on a school trip to France raped and murdered by a serial sexual predator who had broken in to the hostel	Murder	The Guardian (2004)
Coogee Beach 1993	M21[b]	3/11/1993	Coogee Beach NSW	Joseph Varga Centre	Student on school excursion allegedly stole property from a fisherman. Fisherman chased and caught student; teacher came to aid of student, was stabbed by fisherman, died in hospital.	Murder	Hickie (1993)
Sutton 1994	M11	17/11/1994	Sutton, NSW	Kew East Primary (Vic)	School excursion, 6 students in caravan park cabin. Air conditioner caught fire 12.30am; 4 escaped, teacher from another school rescued 1 (85% burns), 1 died.	Fire	Hewitt and Strong (1994)

(continued)

Table 6.9 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	Category	References
Yanko 2002	M13	20/3/2002	Yanko, NSW	Hurlstone Agricultural High School	Student known by parents and teacher in charge to be allergic to peanuts took spoonful of peanut butter in trivia night challenge supervised by a different teacher who did not know of the allergy. Parents, teacher in charge unaware allergy could be fatal.	Anaphylaxis	Milledge (2005)
Daylesford 2007	M13	30/3/2007	Wombat Forest, VIC	Scotch College cadets	Death due to allergic reaction to peanuts in army beef satay ration pack. A doctor treated the victim at the scene. 4 ambulances including 1 MICA, plus helicopter dispatched. First ambulance arrived after 40 min, due to difficulty ascertaining location.	Anaphylaxis	Jamieson (2012)

[a][130 SA 10] R v M – Supreme Court, SA, Court of Criminal Appeal – 7 Oct 1977 CA No 40/77
[b]Adult supervisor

She continued:

> Hamidur's reluctance to put the fork in his mouth is a strong indication of his unease at the prospect of eating it. When he removed the fork, it was still covered in the substance and only a small amount was spat out into the sink in the toilets. His actions are indicative of a young man trying to 'save face' in front of his peers. Unfortunately he didn't know that a tiny portion could bring about a life threatening reaction. To suggest this game was not a competition is nonsense. Answer sheets were marked and scored, the peanut butter challenge invited students to try and finish first. At the end of the game, first second and third places were awarded to the teams. Regardless of how sensible Hamidur was, as a child suffering severe allergies, he was still a little boy wanting to please his peers and join in with his friends. He had already drawn attention to himself by his earlier reluctance to go to the front for the 'challenge'. He had been further disadvantaged on the excursion as he could not swim in the pool because he was allergic to chlorine. This in itself must have been a disappointment to him and set him apart from the other children. Psychologically, Hamidur would have felt pressure to 'conform'. Peer pressure is significant factor in any school. I am not suggesting he was bullied or pushed into his fatal action but he was standing out the front of all the groups, of both boys and girls, with his team relying on him to finish first. (Milledge, 2005, p. 5)

The coroner argued pervasive lack of understanding of anaphylaxis warranted improved training and guidance for students and teachers initiated at Ministerial level (Milledge, 2005).

In the 2007 Daylesford incident, the school had contracted with the Australian Defence force to provide rations for a cadet exercise. The Australian Army screens out recruits with severe allergies (Carins & Smith, 2010), and therefore did not screen its ration packs for potential allergens. The school had been informed that 13-year-old Nathan Francis had a severe peanut allergy. The volunteer doctor attending the camp had not been informed of his allergy. Army ration packs fell outside Australian food labelling regulations and contained no information about contents. The school employee distributing ration packs did not know of any student allergies, and provided no information to students about the ration packs except that pack "E" was suitable for vegetarians, even though it contained chicken. Nathan was given a meal marked "Beef Satay". As an allergy sufferer one could surmise he had never encountered satay sauce and would not know it contained peanuts.

Nathan realized he was suffering an allergic reaction upon tasting the meal. Although he had an EpiPen® on his person it was not administered to him until he had reached the camp doctor about 10 min after eating the food. Shortly afterwards he went into respiratory arrest. CPR and three additional EpiPen® doses were administered. An ambulance arrived 35 min after he had gone into respiratory arrest. The incident exposed deficiencies in emergency planning, but the coroner was unable to conclude that either more timely first aid nor more timely arrival of an ambulance would have saved him (Jamieson, 2012). Prevention required a fail-safe system of ensuring individuals with severe allergies to peanuts did not consume peanuts. The coroner observed that medical information had been treated primarily as something to be referred to if there was an incident rather than something that required active prevention measures to be put in place. Unlike the 2002 case, the incident was less due to systemic failure to provide anaphylaxis education and more due to failures to act in accordance with readily available knowledge. In 2008 the

Victorian government passed legislation mandating anaphylaxis management in schools (Jamieson, 2012).

Table 6.10 lists deaths attributed to natural causes on Australian OE programs that I am aware of. Iconic lessons – that such deaths can occur, that a victim could be a teacher or leader, and that there could be a delay before outside assistance is obtained – warrant consideration, but in other respects deaths from natural causes are a private matter and might go unreported.

Table 6.10 Deaths from natural causes, Australian OE

Incident	Deaths	Date	Location	Institution	Brief description	References
Bogong High Plains 1979	M?[a]	1979 (?)	Bogong High Plains, VIC	Bogong School Camp	Staff member accompanying bushwalk collapsed and died. Pre-existing condition, deceased knew, leader didn't.	Personal Communication
Coastal NSW 1991	??	1991 (?)	Coastal NSW camp	school group	Group including 14 asthmatics camping in tents. 1 died from asthma. Details unconfirmed.	Personal Communication
Renmark 1991	F14	19/5/1991	Murray River, near Renmark SA	Westminster College	6 staff, 30 students. Canoeing, 8pm. Mild asthmatic suffered severe attack.	Haran (1991)
Thailand 1991	M11	1991 (?)	Bangkok, Thailand	Sydney Church of England Grammar School	30 students on school excursion to Thailand. Collapsed beside the pool on 2nd day. Cause of death unresolved.	Cornwall (1991)
Coastal NSW 1992	?16	1992 (?)	Camp, Coastal NSW	Unknown School	Death from asthma. Smoking? Details unconfirmed.	Personal Communication

(continued)

Table 6.10 (continued)

Incident	Deaths	Date	Location	Institution	Brief description	References
Mt. Stirling 1996	M~16	27/11/1996	Mt Stirling, King River Hut, VIC	Timbertop, Geelong Grammar	Student on unaccompanied bushwalk collapsed and died from known pre-existing condition shortly after beginning steep climb. CPR for several hours.	Personal Communication
Sam Hill 1999	F14	2/7/1999	Samuel Hill Army Camp at Shoalwater Bay on Queensland's central coast QLD	School not stated; cadet camp	Girl collapsed (natural causes), unable to be revived (inhaled vomit).	Courier-Mail (1999)
Margaret River 2001	M50[a]	8/5/2001	Margaret River WA	Penrhos College	Teacher died of natural causes during school camp.	Perth Sunday Times (2001)
Thailand 2007	F 15	20/12/2007	Thailand	World Challenge Expeditions /Flora Hill Secondary College, VIC	4 students, 1 teacher on "World Challenge Expeditions" trip. Reported as heart failure en route to airport.	Bendigo Advertiser (2007)

[a]Adult supervisor

In Great Britain the Adventure Activities Licensing Authority (AALA) recorded nine deaths as likely due to natural causes between 1998 and 2010, including three accompanying adults. In some cases unexplained deaths have been assumed to be due to natural causes.[4] I suspect some deaths in water attributed to natural causes could have been caused by cold shock or cold water swimming failure, if only because that possibility was not investigated.

It is not uncommon for legal representatives for an organisation to pursue the possibility that a death could be attributed to natural causes. It could be that some individuals are more vulnerable to heat, cold, over-exertion or other circumstances

[4] Source Marcus Bailie, Adventure Activities Licensing Service

that might be encountered, as is the case with students vulnerable to allergies. In some accounts I have detected faint echoes of approaches to OE that involve toughening up individuals and sorting the weak from the strong, particularly in older cases – not exactly blaming a victim, but seeking mitigation based on some weakness in the victim. Fatality prevention, of course, must take into account individual differences and vulnerabilities.

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Chapter 7
OE Fatality Prevention at an Organisational Level

7.1 Introduction

Fatal incident reports do not always provide details of organisational contexts. If a fatality case record provides little or no detail about the organisation of a program, it might be possible to infer organisational lessons, because the question can be asked of any incident, hypothetically: What could any organisation do to prevent an incident of this kind? Less hypothetically, in a number of high profile catastrophic cases around the world, management, or an organisation, have been prosecuted and convicted following deaths,[1] including Lyme Bay 1993, Saxeten Gorge 1999, French Pass 2000, Mangatepopo Gorge 2008, Præstø Fjord 2011, and Paritutu Rock 2012.

From a case-based perspective any organisational arrangement is satisfactory that results in prevention measures consistent with accumulated knowledge of past fatal incidents. Conversely, however approved, accredited, widely adopted, smooth running, or internally consistent an organisation's approach to risk or safety may be, if it is not derived from accumulated knowledge of past fatal incidents it will almost certainly be deficient.

It is entirely possible for an organisation to have an excellent track record in program quality and in prevention of common, less serious safety problems, while exhibiting deficient, but latent, fatality prevention measures.

1. Fatal incidents have occurred because of ignorance at an organisational level. Declarations that a death was due to a "freak accident" often signify ignorance, in that usually such deaths have been foreseeable and preventable. Every death due to ignorance invites questions about how hard it would have been to learn what was required, and whether an organisation could and should have been

[1] "Cause" in this context is used counterfactually – "but for" the actions of an organisation, a death would not have occurred.

A. Brookes, *Preventing Fatal Incidents in School and Youth Group Camps and Excursions*, International Explorations in Outdoor and Environmental Education, https://doi.org/10.1007/978-3-319-89882-7_7

more curious. Organisational ignorance can be wilful or strategic (Kutsch & Hall, 2010; McGoey, 2012; Rayner, 2012; Robbins, 1990; Roiphe, 2011), although none of the literature on that topic is specific to outdoor education (OE). Prevention measures for most OE fatalities have been known – which is to say were knowable – for decades.

2. Organisations can fail to take prevention measures because of production pressure, expressed as a conflict between the cost and effort of preventative measures and a drive to produce as efficiently as possible. Although only a small number of OE case investigations specifically report cost as a factor, it would be naïve to assume that a long-standing and entrenched problem in organisational safety (Tombs & Whyte, 2010; Tucker, 2012) would not apply in OE. In sentencing Peter Kite for corporate manslaughter following the 1996 Lyme Bay tragedy, the Judge remarked that Kite appeared "more interested in sales than safety" (quoted in Fulbrook, 2005, p. 23). Although Kite was prosecuted under existing laws, the passage of subsequent legislation to introduce licensing for organisations offering adventure activities to young people was a response to more general fears in the UK at the time that some for-profit operators could cut corners on safety. Even if not expressed as a choice between safety and cost, OE fatality prevention can require time and effort at the expense of getting on with the program.
3. Organisational failure to deploy knowledgeable and capable staff, or organisational approval of a program beyond staff capabilities, are two sides of the same coin. OE fatality prevention requires deployment of capable, knowledgeable staff commensurate with the program and location. Many OE fatal incidents occur in physically isolated environments in circumstances in which survival, once an incident is imminent or unfolding, is dependant on the capability and decision-making of the adult leader.
4. Organisational failure can arise from delegation that amounts to abrogation. Particularly in programs outside a home country, supervision and care of young people in an OE program can pass from a school or other organisation, to a travel company or not-for-profit, to contract or casual staff, to an in-country operator or service provider. Any non-specialist teacher accompanying a group would be ill equipped to make spot judgements about program safety or to intervene.
5. Deaths have occurred because decision-makers wrongly assumed that organisational processes and procedures premised on third party safety standards, or on widely accepted risk management templates, would necessarily amount to OE fatality prevention. Reliance on outside bodies is unavoidable for matters outside the control of an OE organisation, for example airline safety when travelling or manufacturing standards for safety equipment. In the OE field itself, some standards and guidelines, for example around water safety or avalanche safety, have been transparently developed from case-based and other fatality prevention research and knowledge. More generally, as I discuss below, research into the development and application of industry standards, and organisational risk management, clearly shows that uncritical acceptance of off-the shelf standards or management orthodoxies would be unwarranted.

7.2 OE Fatal Incidents in Organisational Contexts

Prevention requires clear advice on what those best placed to do something could do, and in practice incident investigations tend to be bounded by that consideration. In theory any OE accident could be traced back, for example, to the outcomes of the Second World War, or to the invention of the printing press. In theory investigation of the circumstances of any accident could expand to include mass media images, or national economic policy, or global trade. As Giddens (1990) observed: "Every cup of coffee contains within it the whole history of Western imperialism" (p. 120). Like measuring a coastline, which only gets longer the more accurately it is measured, chains of causation do not converge onto any final or complete representation. The wider an investigation, the more causes emerge – every cause was itself caused by something. More complex causal accounts do not necessarily improve prevention.

Organisational causes are almost invariably considered only after investigation of medical causes and proximal causes, and not always in great depth. For many enquiries it is sufficient that an organisation was ultimately responsible for a program in which a death occurred.

Given that OE tragedies frequently involve familiar, localized, individual mishaps such as drowning, falls, or exposure to the elements, and OE by its nature involves provision of responsible adult supervision, the counter factual question – "who or what could have prevented this tragedy" is often satisfied without recourse to any complex account of wider circumstances or detailed historical investigation.

Outdoor education incidents need not be organisationally complex. In the case of the 1993 Lyme Bay tragedy, a prosecution for corporate manslaughter succeeded in part because a linear organisational structure meant responsibility could readily be assigned (Fulbrook, 2005). In the case of Catherine Peters, who died in New Zealand in March 2009 when a rope swing under a bridge failed because the rope had not been tied to the bridge, the organisation comprised a one-person adventure operation, assisted by a young woman on work experience, with informal involvement of Massey University Alpine Club. The owner-operator was distracted at a critical time by the arrival of a woman he had met on an Internet dating site. Uncontroversially, the coroner criticised the operation for having no proper system to check the rigging of the ropes before a person was thrown or jumped from the bridge (Scott, 2011). It is reasonable to attribute the death of Catherine Peters to human error, but also to consider that a degree of organisation that put in place checks and redundancies to protect against the consequences of human error would probably have prevented the death. In other cases a death has occurred because an adult with no special knowledge or training has taken youths to a dangerous location, such as a high-energy beach or a frozen lake.

In the OE field there have been some detailed enquiries or investigations that examined a multiple-fatality incident in a wider context. Following the deaths of 14 outdoor recreation students, and severe injuries to others, when a viewing platform above Cave Creek, Punakaiki, New Zealand, collapsed in 1995, the New Zealand

Government established a Commission of Inquiry, which identified an engineering failure as the dominant cause, but also examined wider circumstances:

> I do not claim to have identified all … lesser or contributing causes. With the benefit of hindsight, in the course of the evidence I identified over 30 what I called "if onlys", i.e. circumstances where, if something had been done differently then (in the six cases) the collapse would not have occurred and (in the remaining cases), it might not have occurred, or, if it had, the casualties might have been fewer … To understand what happened before, during and after construction, it is vital to be aware of the circumstances surrounding the birth and early development of the department, its resources (including staffing and funding), the demands upon those resources, the background against which staff worked on the West Coast and the working terms and conditions for staff at grassroots levels. (Noble, 1995, pp. 17–18)

The commission report into the Cave Creek tragedy is an exception which proves that, as a rule, OE fatal incidents do not involve engineering failures or other inherently complex proximal causes, and that community expectations – to understand how an incident occurred and how it could be prevented – are often satisfied by investigations into the actions of those directly responsible for what is usually a small group of students under the care of clearly identifiable individuals facing a more or less timeless environmental or situational hazard.

Except for travel to or from OE programs, incidents that those directly responsible for a program could not have prevented have been rare, not least because planners could usually have chosen a safer option or cancelled a program. The Utøya (Norway) 2011 incident, in which a lone shooter killed 68 campers, is an example of an event which those responsible for the camp could not have reasonably foreseen or prevented.

Usually a coronial process determines a medical cause of death, and examines immediate circumstances, particularly the physical environment and the actions of individuals directly involved or implicated. Legal frameworks in which deaths are investigated vary considerably between jurisdictions, but often an inquest is neither equipped nor resourced to conduct a wide ranging enquiry of the kind that would follow a space shuttle disaster, major airline collision, or nuclear power plant catastrophe (Freckelton, 2007; New Zealand Law Commission, 2000; Victorian Parliament Law Reform Committee, 2006). In cases where the main service provided by any outdoor education program is supervision and instruction of young people in a particular environment, it is to be expected that any death would be understood in the light of the fact that one or more adults had taken responsibility for the safety of the deceased. It is neither surprising nor incongruous that most OE fatal incidents are not investigated for contributing causes from wider social, cultural, economic, or historic factors, but OE fatalities never occur in closed systems and such factors would always be present.

OE catastrophes can occur on a larger scale linked to larger scale programs. The Antuco 2005 tragedy (Chile), in which 475 poorly equipped teenage recruits were caught in a blizzard on a 28 kilometre march, resulting in 45 deaths, could be

interpreted as an organisational disaster,[2] although it also could be understood as 45 individual tragedies that did not all occur in the exactly the same place and time. In contrast, a blizzard that swept across the Nebraska and Dakota prairies on January 1888 just as children were walking home from school, killing hundreds, is better understood as a natural disaster that affected multiple individuals and groups because of the scale of the event, rather the because of an organisational factor (Laskin, 2009). Even so, the latter event motivated efforts to improve weather forecasting in the US (Silver, 2012), so might contain lessons for organisation of weather forecasts and communication of warnings.

On three occasions, in 1996, 2010, and 2012, a teenager competing in an event at the Australian Surf Lifesaving Championships at Kurrawa Beach, Queensland, has died, in each case probably as the result of being struck by a boat, ski, or the sea floor. The later event involved over 8000 competitors in over 290 events and attracted over 80,000 people to the location. Undoubtedly each death involved organisational complexity over and above those ordinarily demanded by supervising youth in the surf (Carlisle & Hichens, 2013; Ryan, 2016). Involvement of an organisation nominally dedicated to surf safety, and the undoubted presence of numerous individuals who did (or should have been able to) recognize a potentially deadly circumstance unsuitable for youth, compels a detailed consideration of organisational factors in such cases.

Even in larger organisations, OE fatal incidents have more in common with personal injuries in a factory or on a ship than with events that threaten the whole factory or vessel. Although industrial safety distinguishes personal injury from risks to the whole enterprise, for example a factory explosion, OE fatality prevention on a larger scale nearly always boils down to the care of individuals. It has been rarely the case that only a manager could see a bigger picture, as might be true in an industrial disaster or on a battlefield. More commonly, once a program had commenced, it would be staff in the field who were uniquely placed to recognise and respond to a potentially deadly situation.

7.3 Locating OE Fatality Prevention in Wider Social and Cultural Circumstances

OE is a social and cultural construction and varies considerably internationally (Humberstone, Prince, & Henderson, 2015). Social influences which shape or determine who goes where and does what in the outdoors, and cultural templates which define how experiences in the outdoors might be conceived, provide more or less tacit backdrops for accident narratives. For example, in Australia fatality prevention premised on knowledge of potential hazards is framed by historical tensions between

[2] Based on what has been published in English.

OE conceived as an adventure in the unknown, and learning to be "at home" in the bush:

> At least in the early years, the bushwalker was someone who 'knew the bush'. Prior to the ready availability of accurate topographic maps, bush-walking clubs offered access to the previous experience of others, in the form of written accounts of trips, contacts with local stockmen who grazed cattle in the bush under licence, sketch maps of previous trips, and above all through providing relationships with experienced and trusted individuals. New bushwalkers were not taught skills so much as inducted into a knowledge-based social network. As might be expected, with the advent of bushwalking courses came an increased emphasis on navigation as technique, rather than 'knowing' particular areas of bush. Topographic map-reading and navigation became central to bushwalking instruction. Topographic maps originally developed for the military provided information that enabled the technically competent to plan a bushwalk as a strategic exercise in *unknown* terrain. Competence based not on familiarity with a region could thereby be substituted with its opposite; the definitive test of leadership was a navigation exercise in an unfamiliar place. (Brookes, 2002, p. 418)

In a more recent work, Hollingsworth (2011) argued that New Zealand OE safety practice was pushed from a judgement-based epistemology to a compliance-based approach by larger political and social changes:

> [A] change in 'normal' practice, from an 'apprenticeship' style of training, with little paperwork, to a 'systems' approach with a focus on audit trails. Interviews with six outdoor educators confirmed that the shifting discourse reflected related shifts in practice. These educators had very long lengths of service that enabled them to reflect on any historical changes. The interviews confirmed that the practice of the past emphasised experience, judgement and mentoring and the practice of the present is dominated by paperwork relating primarily to risk management. The interviews provided the clue as to when the practice changed – the era from the mid 1980's (sic) to early 1990's (sic). An examination of the wider literature of that time revealed the discontinuity – the thing or event that pushed knowledge in a different direction. In this particular case, that discontinuity was the election of a government that pursued a neo-liberal economic ideology. (p. 7)

I have not attempted to place the fatal incident cases in this volume in historical or geographical contexts, but they have to be read and interpreted in the light of the wider circumstances in which fatality prevention is to be attempted. Fatal incident cases can indicate what is required for fatality prevention in particular geographic locations, but not necessarily how to achieve it at an organisational level, or what is feasible within cultural, economic, social, and perhaps legal constraints.

7.4 OE Fatality Prevention, Even in Large Organisations, Always Comes Down to the "Sharp End", Which Is the Care of Individuals in Specific Situations

Should a fatality occur an organisation would be evaluated through the lens of what could be the worst possible example of its operation at the sharp end. Fatality prevention adopts a similar worst-case lens, in focussing only on whether an organisation can consistently and reliably put in place prevention measures shown to be

necessary by past tragedies. Investigations, of course, have hindsight to show where to look. Prevention has to look anywhere and everywhere a fatality could occur. Case-based fatality prevention is not informed by organisational arrangements that have successfully avoided any fatal incidents – it only draws on failures – and provides no guidance on how organisations could or should pursue primary goals.

The physical circumstances in which OE programs are conducted constrain how any organisation could exercise control or influence. Many deaths have occurred in circumstances in which adult leaders had to act autonomously. A leader in the field could possibly seek advice or be given direction via radio or telephone, but the person giving advice would be relying on descriptions of the situation. Over time it has become more feasible to avoid situations in which a group is incommunicado, but there have been few if any situations in which to deploy expertise on the end of a telephone would have been a better option than deploying expertise in the field.

Whether a manager or chief instructor could provide remote guidance or direction is one thing; whether to do so would serve prevention is another. There is a tradition of safety discourse centred on personal responsibility in the mountaineering literature. In Britain from the 1870s, relatively early in the development of what became a vast mountaineering literature, accident reports became a recurring feature (Robinson, 2015). In the USA the 1997 edition of *Accidents in North American Mountaineering* was the 50th anniversary edition, which from its inception aimed to study accidents to prevent accidents "with no intent to criticize persons involved, but rather to learn why these accidents occurred and to emphasize the lessons to be learned from them" (quoted in Williamson & Miskiw, 1997, p. 1). From the 1950s the publication was premised on cases rather than statistics. Not only was data non-parametric, accidents were accepted to have multiple causes, including immediate cause and underlying causes (Williamson & Miskiw, 1997).

Accounts in *Accidents in North American Mountaineering*, which by 2011 numbered almost 8000, lack any organisational dimension, except for rescue and body recovery. Rescues very often involve an organisation, and some incidents have been attributed to violations of National Park regulations. For example analysis of an incident on Mt McKinley noted: "[f]rom start to finish this expedition showed a total disregard for their own safety and others … to impress upon them the seriousness of their negligence … [the were issued with] citations for Disorderly Conduct and Tampering" (Williamson & Podemski, 2005, p. 31). Exceptions aside, mountaineering accidents most often involve a lone individual or small group in a relatively isolated environment in which safety is consistently and almost universally attributed to situated decision-making. Not every group had entered the mountains independently of any organisation, but even so once in the field only those present could comprehend critical aspects of their situation. Although mountaineering as a construct is routinely framed around risk, and while mountaineering in some environments inherently entails taking chances, most *Accidents in North American Mountaineering* reports persuasively argue not only that an incident could have been prevented but also that those involved should have been able to prevent it. There is a strong argument that at least within mountaineering as a sport, recreation, or profession it would be more accurately characterised as safety obsessed than risk obsessed.

Case-based accident reports and narratives also figure prominently in the expert literature in the fields of sea-kayaking and white-water paddle sports (Broze & Gronseth, 1997; Cunningham, 2013; Walbridge & Tinsley, 1996). These too can be read as evidence of at least a sub-culture dedicated to safety rather than risk, and exhibit many examples of trips or expeditions quite deliberately conceived and conducted independently of any organisation. As in the mountaineering literature, accident analysis is framed ontologically and epistemologically around the paddler and the situation in which an accident occurred, in the case of solo incidents, or the team members or group leader depending on whether the party comprised individuals of similar experience or a leader and dependent members. Reality is something to be physically encountered and knowledge is, to borrow from Rouse (1987), a performative grasp of the world. In most cases those making decisions are also those who bear any consequence, at least prior to rescue, and there is little or no room for alternative accounts that allocate causal responsibility to other parties, there being no one else involved in any decision-making. It is not surprising that this particular genre is characterised by a consistent focus on decision making and judgement, including unvarnished attention to human error. There is some room for blame to be allocated within a paddling group, but on the whole the complications of a blame-focussed discourse that might arise when there are layers of responsibility, complicated organisational arrangements, and power imbalances, are absent. The concept of blame is there, but with no menacing connotations. Paddlers routinely blame themselves for their misadventures.

I have argued in this volume, and elsewhere (Brookes, 2011) that fatality prevention in youth OE requires strict aversion rather than some form of "calculated" risk-taking. In some circumstances adult sea kayakers, white water paddlers, and mountaineers deliberately enter situations in which strict aversion to fatality is not feasible without relinquishing a goal. Bearing that distinction between OE and adult recreation in mind, learning from accidents in mountaineering and paddle sports has undoubtedly informed many OE programs from their inception (see, for example Loynes, 1998; Roloff, 1951). Within fields such as mountaineering or canoeing, accrued knowledge of safe practice embedded in safety guidelines and training courses or accreditation is at least in part derived from case-based knowledge. Cases in turn reinforce or provide nuanced context for established understandings of safe practice, and can be drawn on to determine whether safety guidelines or training remain consistent with fatality prevention.

Case-based knowledge from the wider outdoor recreation field adds weight to the accumulation of OE cases in which fatality prevention has been shown to be feasible but unavoidably reliant on an adult in the field with expertise not only in the outdoors but also in fatality prevention.

It should be no surprise that much of the attention on organisational roles, after a tragedy, turns on the appointment and support of staff with sufficient expertise. Unlike areas of manufacturing or other industries in which reliance on individual workers has diminished considerably, OE safety remains ontologically bound to placing youth in the care of safe hands.

7.5 How Applicable Is Industrial Safety to OE Fatality Prevention?

Fatal incident prevention lends itself to an instrumentalist perspective on organisational management, requiring only that organisations take all reasonable steps to prevent any fatality, by any means that would have prevented past incidents. Inevitably much attention focuses on deployment of staff with sufficient expertise to operate in a chosen environment, or on choice of a suitable environment, given available staff. Expert staff are the main expense of many OE organisations and it is unsurprising that attempts have been made to borrow cost-saving approaches from industry. To what extent could organisational management and support, for example in the form of operating procedures or documentation, moderate or alleviate a need for staff with expertise that could take years to develop? Not only are expert staff costly, organisations can and do struggle to recruit staff with sufficient expertise to operate programs. Supposing devices and strategies adopted to operate with less expert staff were successful in cutting costs and maintaining program quality, the question then would be; has fatality prevention been compromised?

One explicit adoption of industrial production orthodoxies in the OE field is elaborated by Davidson (1992), which uncritically advocated adoption by OE of safety systems used in manufacturing industry. Elements of an industrial approach were evident in the safety systems in place at the NZ Outdoor Pursuits Centre when 7 died in the 2008 Mangatepopo tragedy, and arguably underpinned a safety audit that coincided with the tragedy. The auditor chose to observe the group which suffered the tragedy prepare for the gorge walk, and subsequently assisted with communications as the tragedy unfolded. In what was possibly indicative of an auditing system more focussed on paper compliance than actual fatality prevention, the Centre was judged, after the tragedy, to have passed that audit. A subsequent prosecution, coronial report, and independent review were less sanguine (Brookes, 2011; Brookes, Corkill, & Smith, 2009; Devonport, 2010). Four years later an instructor and two students died at another NZ Outdoor Centre, in 2012 off Paritutu Rock, in what a sentencing judge described as an "eerily similar" tragedy ("Ministry of Business, Innovation and Employment v Taranaki Outdoor Pursuits and Educational Centre Trust. Summary of facts.," 2013). It remains unclear if the Mangatepopo and Paritutu Rock tragedies had common root causes, although it seems likely.

The Mangatepopo tragedy could be attributed to several root causes: (1) an adventure-based program reliant on the expertise of a single staff person for any group (2) insufficient experienced staff to have expert staff with every group (3) hazard management which did not, with hindsight, ensure all staff understood deadly risks (4) failure to pass on lessons from past incidents – loss of corporate experience (5) financial constraints leading to production pressure, and (6) over-reliance on management systems based on standard operating procedures, and over-reliance on competency-based, rather than experience and knowledge based, staffing deployment (Brookes et al., 2009). The Mangatepopo tragedy might be interpreted

as a call to refine and perfect a systems-based approach, but there is a stronger argument that it demonstrated some limitations of applying "systems thinking" derived from industrial settings to an OE program based on small groups in potentially hazardous environments. Case-based knowledge could inform decisions about which circumstances required expert judgement in the field and which were amenable to procedural approaches.

Another contested approach to organisational safety centres on long-running debates about high reliability organisations (HROs) and systems accidents surmised to be inevitable in new, high risk technologies involving tight coupling, interactive complexity, and opaque processes (Perrow, 1999 (orig. 1984)).[3] Although OE could be offered in organisationally complex situations, OE fatal incidents are unlike the kinds of disasters which Perrow was concerned with. Thus, when Ajango (2000) asserted categorically that HRO theory was a superior approach to outdoor accident prevention than normal accident theory, she was not, in my reading, skipping over complexities. Rather she was drawing the obvious conclusion that high reliability is a reasonable aspiration in the well-understood, simpler world of outdoor organisations. Outside the OE field, empirical examples of claimed HROs involve "large, internally very dynamic, and intermittently intensely interactive" organisations which "perform very complex and demanding tasks under considerable time pressure, doing so with a very low error rate and almost total absence of catastrophic failure" (LaPorte & Consolini, 1991, p. 21).[4] Strict aversion to serious incidents attributable to organisational failure should be vastly more achievable in the organisationally less complex world of OE, given sufficient resources.

Taking a less credulous, more critical, approach to the conventional wisdom of industrial safety than Davidson (1992), Blakstad, Hovden, and Rosness (2010) examined tensions between experience-based safety procedures and new management imperatives to develop risk analysis based deductive processes for the Norwegian railways system. Rail systems have engineering and network elements that OE does not, but Blakstad et al. (2010) succeed in illustrating tensions between outcomes based risk analysis[5] and incrementally gained practical knowledge. It is a more apt comparison for OE than nuclear power plan operation or space shuttle operation, both of which receive much attention in the systems safety literature. Blakstad et al. described several ways in which experience-based practical prescriptions could be accommodated in a risk based approach, but also found that the risk based approach was at best a supplement to established (experience-based) safety procedures. Blakstad et al. argued that top-down approaches had to be tested to see if rule contexts fit actual situations, to determine how existing experience-based safety processes fit, and to evaluate the knowledge used to support decisions.

[3] Somewhat confusingly (Perrow, 1999 (orig. 1984)) termed such incidents "normal accidents".

[4] The term "human factors" was adopted in this literature to describe the problem which human imperfections posed in otherwise perfect engineering enterprises. The term remains a useful marker of safety research premised on engineering considerations.

[5] The term "outcomes based approaches" is associated with risk management and in particular compliance monitoring.

If anything the case for caution in changing established experience-based prevention measures in OE would be stronger.

Other recent Norwegian work has considered how safety decision-making is influenced by context, and goes some way to explaining why organisations would adopt approaches to safety at odds with decades of accumulated credible prevention knowledge. Arena theory has a long history in risk scholarship and research (Almklov, Rosness, & Størkersen, 2014; Renn, 1992), as a way to represent socially situated action in which "[k]nowledge of physical consequences, the handling of risk information by individuals and social groups, the social and cultural meanings of risk causes and effects, as well as structural and organizational factors, shape the social experience of risk." (Renn, 1992, p. 179). Although originally formulated around the societal responses to risk, and explicitly focussed on symbolic arenas rather than geographic location, it is been shown to be a useful approach to understanding safety decision-making in context, in which each decision maker is constrained by the options, or "discretionary space" (Almklov et al., 2014, p. 91) available, and resources. Discretionary space is relevant to situations in which organisational controls and strictures constrain how an adult directly responsible for youth could act in potentially dangerous circumstances.

Størkersen (2015) drew on arena theory to argue that shipping regulation entailed juggling between "political arenas, business management, and administrative and technical support functions" (p. 91). Tension between pressure for profit or business survival, and disagreement between maritime actors, paralysed safety regulation development and arena constraints prevented regulators from acting effectively. Decision-making in different arenas can be constrained by factors such as limited authority, dependence on others for information, lack of hands-on knowledge, and conflicts of interest. Decision making criteria varied similarly, from optimising profit or performance, avoiding trouble, ease of decision making, achieving compliance, achieving consistency, finding consensus, or achieving status for a decision maker. (Størkersen, 2015).

Subsequently Størkersen, Antonsen, and Kongsvik (2016) examined the effects of regulatory shifts from prescriptive regulation to requirements that companies have safety management systems. The regulatory approach drove increased investment in and attention to safety management, and plausibly explained reduced rates of personal injury on ships. But actual ship accidents, such as running aground, increased between 2004 and 2014. Størkersen et al. (2016) argued that SMS requirements were not necessarily sufficient to counter cost-efficiency pressures in a competitive market – personal safety could be improved relatively cheaply, but shipping safety was expensive. Moreover, regulation itself had unintended consequences in the form of onerous administrative burdens and proliferation of procedures to a point where they hindered compliance. Risk appraisals could become a matter of copying and pasting, safety issues could be ignored if not required by regulation, with the potential for safety to become a compliance ritual. Ship's navigators reported that they were unable to focus absolutely on the task of navigation because

of time pressure to keep up with SMS documentation while navigating (Størkersen et al., 2016). For some interviewees, SMS were in conflict with "seamanship":

> Before, you had to be able to find your way – one criterion was that you were familiar with [your region]. Now you have to know about papers and computers and all this.
> It's over. There's nothing called seamanship anymore. Everything ... the seamanship is between two loose-leaf binders. (Størkersen et al., 2016, p. 12)

Apart from important differences between railway operation, shipping and OE, approaches to safety in other industries have to be considered in the light of debates about their effectiveness and evaluative evidence. OE fatality prevention can be informed by research and practice in industry, but industrial approaches cannot be assumed to offer any kind of panacea.[6]

7.6 How Applicable Is Structuralist "Systems Thinking" to OE Fatality Prevention?

Recurring patterns of fatal incidents point OE fatality prevention towards on-going practical efforts to avoid repeats of all-too-familiar small-scale accidents. In contrast, a subset of the wider risk and safety literature, the socio-technical systems literature, is usually concerned with developing theoretical models that could predict hitherto unimagined and novel catastrophic failures arising from increasingly complex engineering and information systems. At first glance the volumes of research, opinion, analysis, and theorising arising from disasters such as the destruction of the space shuttle Challenger and the Deepwater Horizon oil spill in the Gulf of Mexico is not an obvious place to seek insights into long understood risks to individuals posed by steep ground, rip currents, cold water and other natural hazards. However, those paddling a Google Scholar canoe around what Jones and Hood (1996) described as the archipelago of approaches to organisational risk and safety management, could find landfall on an island where "socio-technical systems thinking" is hegemonic, and might wonder whether there is application to OE safety.

Some readers might choose to skip this section, in which I consider if a largely academic literature centred on failures in or of socio-technical systems such as the loss of a passenger airliner, or patterns of medical treatment errors in large hospitals, is relevant to OE fatality prevention. My aim is to examine the applicability of "systems approaches" not to OE fatality *analysis* – all accidents could theoretically be linked to systems – but to fatality *prevention*. By "systems approaches" I mean not quotidian safety systems that any OE program might have developed, but to a distinctive theory or doctrine, which I describe below.

The possibility of catastrophic failure in complex engineering systems garners a great deal of media and researcher interest. Barab (2006) pointed out that in the

[6] See Hollingsworth (2011) for an excellent analysis and critique of a move away from expertise-based approaches to OE safety in New Zealand.

week in which seven workers died in the space shuttle *Columbia*, occasioning days of headlines and multiple reports – and, he might have added, constituting a durable reference point for academics in the safety field, particularly advocates of "systems approaches" – approximately one hundred other workplace deaths occurred in the United States. He observed: "Most workplace fatalities have nothing to do with stretching the limits of technology. They are caused by a failure of an employer to address well-recognized unsafe workplace conditions and implement effective safety programs in their workplaces." (Barab, 2006, p. 13).

Some OE deaths could conceivably be directly related to safety in large-scale socio-technical systems, although most are not. An OE group might happen to be caught up in a disaster involving complex engineered structures, for example a ferry or airliner catastrophe. Victims of the Überlingen 2002 incident, a mid-air aircraft collision frequently mentioned in the safety systems literature, claimed the lives of children en route to an event, albeit not an outdoor one. The aftermath of a human scale OE incident could involve air searches, highly organised rescue, and complex medical procedures. In OE fatal accidents involving travel to or from an OE site, for example motor vehicle tragedies, some combination of human scale factors and systemic contributing factors – albeit outside of the control of those involved in the OE program – could be implicated. If and how understanding such factors helps those responsible for OE programs to prevent fatalities is a matter for evaluation.

Although the socio-technical systems safety literature is by no means monolithic, Rasmussen's work is both prolific and often cited, and represents at least a prominent strand in the literature on safety systems thinking. He described his work as based on the problem of modelling safety systems in large scale industrial plants, expanding from a strict engineering focus to modelling which attempted, from an engineering perspective, to incorporate human and social factors (Rasmussen, 1997). His focus was on new and hitherto unknown failures associated with the fast pace of technical change in large industries such as transport and manufacturing, risks of very large scale disasters with increasing scale of industrial projects, increasingly coupled operations due to advances in communications and networks exemplified by potential and actual global financial crises, and increasing competition and aggression in the corporate world (Rasmussen, 1997). Later adherents of a "systems thinking" approach have made the contestable claim that "systems thinking" represents a new paradigm for understanding all accidents, including all OE accidents (Salmon, Williamson, Lenné, Mitsopoulos-Rubens, & Rudin-Brown, 2010).

One clue to the origins of over-reach in "safety systems thinking" emerges when Rasmussen (1997) implicitly expands his definition of "system" from an engineering entity (such as a power plant) nominally the responsibility of a particular organisation, to a definition that includes contextual elements such as government policy and regulation. Earlier approaches to systems thinking tended to emphasise a management role, and provided a warranted counter to any organisational tendency to shift blame down to individual workers. Rasumussen's broader and vaguer definition opened a way for managers to shift the blame for large engineering failures up to a larger system beyond their control. Organisations too could "blame the system" when something goes wrong.

Although there are indications in the "systems thinking" safety literature of mission creep, from large, novel, complex engineering projects to more routine engineering failures, a claim in the engineering literature that all led outdoor activity accidents, including fatal incidents, should be treated as socio-technical systems failures (Salmon, Cornelissen, & Trotter, 2011; Salmon et al., 2010) is perhaps reductio ad absurdum. Rasmussen's (1997) initial concerns overlapped only slightly with prevention of OE fatal incidents. OE fatality cases: (1) do not require teams of engineers constructing models and making predictions, (2) do not involve complex engineering, (3) are not necessarily beset by a problems of increasing scale, although they could be (4) involve little if any coupling between fatal events and (5) involve long understood tension between financial imperatives and safety, but not increasingly aggressive competition. OE programs employ safety systems, of course, but these are not the complex socio-technical systems to which Rasmussen (1997) referred.[7]

Rasmussen's (1997) systems approach considered not just engineered structures and the associated workforce but also the corporate environment, government, and wider society. His discussion attends carefully to the circumstances of individual decision makers (Rasmussen, Nixon, & Warner, 1990), but in shifting from strictly engineering to more ethnographic perspectives veers towards a holistic conceit which positions the authorial voice, and the reader, as all-seeing and all-knowing, in what feminist epistemologists (Haraway, 1988; Harding, 1992) have termed "the God trick". In large complex socio-technical systems individuals might not be able to perceive the implications of their actions in one part of a ship or factory to the operation of the ship or factory (Rasmussen et al., 1990), and an overview could be an adjunct to a narrative that also acknowledges situated perception and action; the "God trick" is problematic when it is privileged as the one true story (Harding, 1986). Accident analysis does not have to be directed at prevention, but the focus of this volume is on fatality prevention, which selectively attends to those causes that individuals could comprehend and act on, according to their situation. From a prevention perspective the question is not whether a systems explanation can be advanced, but whether to do so assists prevention. A bias towards or privileging of systems explanations would compromise fatality prevention. The risk is that advocates of "systems thinking" who insist that accidents must be understood through systems lenses direct attention away from practical prevention.

What is referred to as a systems approach in the engineering safety literature (e.g. Leveson, 2011) involves more than an uncontroversial extension of causal narratives to wider circumstances, including systems design and failure. Such extensions can already be found in some OE fatal incident investigations. My concern here is with *structuralist* elements of "systems thinking", in particular some unwar-

[7] The premise of the "systems thinking" approach is the possibility of disasters only preventable at a systems level. To assume that if systems level causes are present then other prevention measures must fail, would be converse error. Converse error more commonly occurs when an accident is assumed to be preventable because some element of chance or bad luck was involved. Most OE tragedies involve a measure of bad luck, but few OE deaths can be ascribed to chance alone; usually there are other, mutable causes on which prevention could focus.

ranted absolutist, assumptions: (1) A holistic perspective, (2) Dualism, i.e. binary oppositions, (3) De-centring the subject, which is to say de-emphasising individual acts, (3) Privileging relationships and de-emphasising components, and (4) Privileging systemic failures over failures of measures individuals could implement.

Structuralism developed early in the twentieth century initially in linguistics, and was subsequently applied to anthropology, cognitive development, literary criticism, Marxist criticism, sociology, mathematics, and education (Cherryholmes, 1988), and, at least on the margins very recently, OE safety. In a definitive critique of structuralism in education, Cherryholmes (1988) observed that structuralist assumptions tended to be unacknowledged and consequently unexamined. He argued that in education structuralism had over-promised and under-delivered not so much because of its inherent limitations but because of a lack of reflexive insight into its inherent limitations (cf Dekker & Leveson, 2014; Levitt, 2014; Stacey, Griffin, & Shaw, 2000). In medicine application of structuralist systems approaches have been controversial, particularly the treatment of human error and systems failures as mutually exclusive binary opposites (Fabri & Zayas-Castro, 2008; Levitt, 2014; Ricci, Panos, Lincoln, Salerno, & Warshauer, 2012).

Structuralist systems thinking invites the reader to perform the so-called "God Trick", to privilege a view in which the whole "true" picture can be seen. The same device is also a characteristic of another approach to organisational catastrophe prevention called High Reliability Organisations (HRO) theory. Objections to the idea of a master discourse were raised early, in an influential article:

> [T]he very idea of complete knowledge of any significant organizational decision situation is arguably impossible. Strategies, such as comprehensive analysis, are viewed with suspicion [by students of organisational theory] as the source of major program failures. The latter view rejects a centralized, rational decision process model in favor of one in which disagreement about means is likely. When differences of opinion or outright uncertainty about the appropriate means to accomplish an agreed upon goal exist, then professional, skilled judgment is seen as the suitable method of decision making to use: majority voting among those with experience would be the most appropriate basis for deciding (LaPorte & Consolini, 1991, p. 24)

Structuralist systems thinking, through dualism and absolutist assumptions, sets up a hostile bias to some well supported elements of OE fatality prevention: situated perspectives, individual responsibility for action, attention to equipment failures, and attribution of cause[8] to individual acts or omissions. In established OE fatality prevention, the possibility of an individual failing to prevent a death and an individual accepting responsibility for ensuring safety are two sides of the same coin. One could say that OE is the business of taking responsibility for the care of youth in the outdoors and that acceptance of that role is inseparable from the possibility that failure of care could result in harm.

[8] I remind the reader that counterfactual, or "but for" causes are not exclusive of other causes – they are necessary, but normally not sufficient, to explain an accident. Conversely removal or remediation of any "but for cause" would be sufficient to prevent the accident, but not logically necessary, in the sense that could also be other action which would also have prevented the accident.

Early work on so called systems accidents, for example (Perrow, 1999 (orig. 1984)) were concerned with large scale failures in highly complex, tightly coupled, engineering systems, caused not by human error and component failure but by unforeseen interactions. It is important to note that Perrow and those who followed usually acknowledged that most failures are more routine. These systems accidents were hypothesised to be "emergent" from complex systems. Emergence was proposed by Michael Polanyi (Boje & Polanyi, 2007; Polanyi, 1967, 1969, 1973) in the course of his project to develop a meta-theory which would integrate science and religion (Boje & Polanyi, 2007). Emergence posits reality structured in layers, in which properties of higher layer cannot be deduced or predicted from the properties of the lower layers, although the properties of the lower layers are requirements for the upper layers. Thus the properties of chemistry are required for the emergence of life, but some biological facts cannot be discerned from the study of chemistry alone. Literature emerges from language, and is impossible without language, but the study of literature cannot be derived from the study of language. According to Boje (in Boje & Polanyi, 2007) Polanyi's tacit knowledge speaks to complexity theory, but he also makes assumptions which rule out non-linear relations within or between systems:

> [Polyanyi is] caught up in systems thinking ... that there are levels (or strata) of systems, and that run from frameworks, mechanical, to open systems, more symbolic and languaged systems, to transcendental … it could be that systems are not so finalized, not so ordered, and could be more holographic ... Polanyi ... seems to remove the possibility of systems freely associating, or not being determined by principles of one level to another (Boje & Polanyi, 2007, pp. 74–75)

More, recently, Gough (2012) has explored the role of emergence within a larger debate about complexity in education.

All accidents probably involve elements of coincidence and happenstance, but most of the fatal incidents considered in this volume also involve circumstances in which a possible death could reasonably have been foreseen, and prevented by eliminating any one of several pre-conditions. Importantly, OE fatality prevention does not require accurate predictions of accidents – were that to be the case complexity and emergence would probably help explain why prediction was not possible. Fatality prevention deals with uncertainty, for the most part, by putting in place precautions whenever a fatal incident could occur, without attempting to guess which occasions those precautions could have been omitted.

At some point structuralist systems thinking advocates made an illogical leap from emergent accidents to emergent safety.[9] Leveson, Dulac, Marais, and Carroll (2009) asserted:

> The primary characteristics of a systems approach are: (1) top-down systems thinking that recognizes safety as an emergent system property rather than a bottom-up, summation of reliable components and actions …(p. 241)

[9] Apparently a converse error. Literature is emergent from language, but the converse is not true. An argument that accidents are emergent from systems does not imply that safety is emergent – quite the contrary it implies that accidents could be prevented by disrupting any number of contributing factors.

In conventional approaches to safety, although an accident could be – indeed usually is – a culmination of multiple factors, including a measure of bad luck, *prevention does not require accurate prediction nor does it require removing every causal element.* All that is required is to remove any one of the necessary causes.

Some pitfalls of applying structuralist systems theories un-reflexively to outdoor education fatality prevention are evident in an article in the engineering literature that reinterprets the Lyme Bay 1993 incident from a structuralist systems approach (Salmon et al., 2010).

The Lyme Bay 1993 incident, discussed in detail in Chap. 4, involved a small organisation with a simple, linear organisation structure. The two instructors were supervised by a program manager, who in turn answered to a company director, who was, in effect running a one-person company. One reason why the case made English legal history was that the company was so small, and the organisation so simple, that a "controlling mind" could be identified for prosecution (Fulbrook, 2005). The court of appeal summarised the incident:

> On the morning of March 22, eight students, a teacher and two instructors—Mr Mann and Miss Gardner—went on an open sea canoeing trip from The Cobb, at Lyme Regis to Charmouth. The distance is about a mile and a half and involved going across the open sea. They set out at about 9.30 a.m. Very early on the teacher got into difficulties, being unable to manage the canoe, and he repeatedly capsized. Mr Mann stayed with him and Miss Gardner went on with the students. Undoubtedly Miss Gardner was very inexperienced, and that was one of the primary facts relied upon by the prosecution in their case against Mr Kite and Mr Stoddart, albeit that the case against each of them was put differently.
>
> The group drifted out to sea and got into difficulties. The canoes were swamped. It was very cold, and four of the young students were drowned. Miss Gardner and the other children were rescued. ("R. v Peter Bayliss Kite," 1996)

A report for the local education authority, although not exhaustive, identified many failures to prevent the tragedy (Jenkin & Jenkinson, 1993). In the broader social, economic and political context the incident could be linked to years of Tory government that focussed on small government, reduction in red tape, and a tendency to diminish power of local education authorities. Adventure education in the UK could also be interpreted culturally and historically (Brookes, 2015; Loynes, 1998) – all accident narratives are partial and socially constructed. The Devon Council report detailed information on the training the instructors received, rescue efforts by the Coastguard, the role of the program manager (also charged, but the jury could not agree on a verdict).

While the incident can be viewed through lenses other than legal ones, the rule of law is a significant constraint on the social licence of any outdoor education program, as are the perceptions of lay individuals affected by or interested in a tragedy. Not all narratives are equally accepted. For the purposes of fatality prevention few incidents would be as categorically resolved as the Lyme Bay incident. At the time and since there has been no question that if a sea kayaking instructor holding the qualification established and widely accepted at the time had been present when group set out, they would have been able to recognise almost immediately many of

the deficiencies revealed by the tragedy. A similarly qualified person acting in the role of program manager would almost certainly not have authorised the trip.

Although there can be no doubt that existing case-based knowledge could have been applied by a single individual either in the company, in the school, or in the local education authority to prevent the tragedy, the case is unique because of the subsequent introduction of adventure licensing, a rare concession of market failure by a neoliberal government (Allison & Telford, 2005; Fulbrook, 2005; Rowland, Allison, & Higgins, 2007). Adventure licensing in turn was a check that existing known safe practices were complied with, if anything further embedding acceptance of existing fatality prevention knowledge. Neither at the time nor subsequently has there been any confusion or doubt about the preventability of the Lyme Bay tragedy, or any suggestion that the case presented a problem which required new thinking.

Salmon et al.'s (2010) re-interpretation, published in the engineering literature, of the Lyme Bay incident draws on an article by Dekker (2002). Dekker (2002) explicitly locates his work in that engineering literature concerned with aircraft crashes, although he surmises that "the principles … should apply equally well to domains ranging from driving to shipping to industrial and occupational safety" (p. 373). He makes no claim that his generalisations could apply to supervision of children, or to judgment-based fields like mountaineering or canoeing, and in general writers in those fields have turned to the social science literature rather than engineering literature for guidance (e.g. Michael A. Boyes & O'Hare, 2003, 2011). Dekker (2002) offers assertions that might, taken out of context, be read as universal principles, but does not explicitly invite extrapolation to personal injuries in natural settings.

The Dekker (2002) article is an unfortunate choice. Livingston (1981) had claimed that early systems safety arguments were rife with logical fallacies. He offered a taxonomy of fallacies prevalent in that safety science field. Although Dekker argued explicitly against what he averred were common logical fallacies in (engineering based) human error analysis, Dekker relied rhetorically on fallacies later mirrored by Salmon et al. (2010). He opens with a triplet of relevance fallacies – appeals to authority, popularity, and novelty – then constructs a false dilemma between a preferred "new view on human error", and purportedly the only alternative, the "old view". The "old view" is a textbook straw person. Hasty generalizations from some plausible and persuasive examples follow, then circular logic, which in effect asserts that all accidents must be systems failures because all accidents are systems failures. Dekker follows with a call to adopt a sweeping generalization. False logic does not necessarily imply a false case, of course, and a use of false logic could be warranted as a rhetorical device if others were persuaded by it.[10] At one point Dekker argues circularly for rationalism: "What people do makes sense to them at the time—it has to, otherwise they would not do it" (Dekker, 2002, p. 378). Of course human behaviour is not always rational – it can be driven by emotion or impulse rather than careful analysis. People act in ways that they cannot make sense of all the time. Moreover, going back to his earlier arguments, authori-

[10] The article can be read as a polemic in defense of pilots unfairly blamed for an accident by a military service; perhaps the rhetorical means justified the ends.

ties can be wrong, "new" views can be wrong, there are more than two views on human error, alternative views can be nuanced and defensible; what is true of one case might not be true of all and what is true of many cases might not be true of a particular case.

Salmon et al. (2010) offer no persuasive reasons for applying concepts developed for complex socio-technical systems to incidents lacking engineering complexity, and surprisingly omit to mention the socio-legal system perspective in which the Lyme Bay incident made legal history as the first conviction for industrial manslaughter under English law ("R v Peter Bayliss Kite" 1996). Their contentions are summarised in Table 7.1.

Given there is a robust argument that knowledge of small craft safety existing at the time of the Lyme Bay tragedy was sufficient, and given that canoeing trips can be conducted without any organisational complexity, application of structuralist systems thinking might be dismissed as an example of the proverbial academic solution in search of a problem. To do so might underestimate the appeal of an approach which (a) privileges a managerial perspective, and (b) deflects individual responsibility for any accident to "the system". Systems thinking is potentially appealing for those concerned about ever being held to blame for a tragedy, because it appears to repudiate the idea of individual responsibility.

The problem that the authors claim to be solving is a lack of universal frameworks and theory in what they term the "led outdoor sector", although why all accidents must be interpreted through "theory" – which turns out to be a set of structuralist pre-conceptions – they do not say.[11] Like Dekker (2002) Salmon et al. (2010) invoke established and uncontested elements of past incidents, and echo the former's appeal to logical fallacies. Debates about organisational complexity might apply if one chose to offer canoeing as part of complex, tightly coupled organisational structure, but that would beg the question: why add organisational complexity to an undertaking that did not require it?

Although Salmon et al. (2010) focus on establishing an account of the tragedy which aspires to documenting sufficient cause,[12] accident prevention has conventionally defined cause in terms of necessary causes and seeks prevention insights pragmatically.[13] Counterfactually, a cause is any factor "but for which" the accident would not have been fatal. Usually there are more than one such factors. Mutability, proximity, and responsibility provide a kind of Occam's razor that guides analysis towards the most feasible prevention measures.

[11] The assumption is reminiscent of a joke Ronald Reagan supposedly made about how economists responded to policy: "It works in practice, but does it work in theory?".

[12] Strictly speaking documenting sufficient cause is a theoretical ideal – all representations of incidents have gaps and limitations.

[13] At the risk of repetition, a necessary cause is not sufficient for an accident to occur. Very often necessary causes had been present on many occasions without incident prior to a death. A necessary cause is usually not sufficient to explain an accident. However, removal of any necessary cause, by definition, would have been sufficient to *prevent* the accident.

Table 7.1 Systems thinking as structuralist pre-conceptions

Assertion (Salmon et al., 2010, p. 931). Bold emphasis added.	Reservation
Safety is an emergent property of a complex socio-technical system.	Lyme Bay involved a small group of canoeists, some of whom died, and some of whom survived. There was a socio-*cultural* context, but complex engineering was not a significant factor. Safety could have been achieved by appointing a qualified leader. The socio-*legal* system determined it was a strikingly clear example of individual gross negligence.
Safety is impacted by the decisions of all of the actors—politicians, managers, safety officers and work planners— **not** just the front-line workers alone.	False dichotomy/straw argument. Examining the decisions of those directly involved does not exclude consideration of other influences.
Threats to safety or accidents are usually caused by multiple contributing factors, **not** *just* a single catastrophic decision or action[a]	False dichotomy/straw argument. Causal chains and circumstances of any event can be expanded indefinitely, but prevention requires only that specific acts that would have prevented a tragedy be identified. A focus on proximity, mutability, and responsibility is pragmatic and well proven.
Threats to safety or accidents can result from a lack of vertical integration (i.e. mismatches) across levels of a complex socio-technical system, **not** just from deficiencies at any one level alone.	False dichotomy. The Lyme Bay incident made legal history because the chain of responsibility was simple and linear, and involved gross negligence. The authors appear to confuse but-for causes (necessary causes) with exhaustive causation (sufficient causes).
The lack of vertical integration is caused, in part, by a lack of feedback across levels of a complex socio-technical system. Actors at each level cannot see how their decisions interact with those made by actors at other levels, *so the threats to safety are far from obvious before an accident.*	Not true in this case. The company director was convicted in part because he had been warned in writing specifically about the risk of a fatality. The unsuitability of the trip would have been *all too obvious* to a competent field manager. It would have been *all too obvious* to a qualified sea-kayaking instructor observing the group setting out that the trip was unsafe. Hence the first conviction of an individual for corporate manslaughter under English law.
Work practices in a complex socio-technical system are not static. They will migrate over time under the influence of a cost gradient driven by financial pressures in an aggressive competitive environment and under the influence of an effort gradient driven by the psychological pressure to follow the path of least resistance.	Assumptions, which might or might not be true in a particular case, and therefore unsafe pre-conceptions. It is unclear how treating a novice canoe trip as a complex-socio technical system, even as an exercise, serves prevention.
The migration of work practices can occur at multiple levels of a complex socio-technical system, **not** just one level alone.	False dichotomy. Attending to failures in one location does not deny the possibility of failures in others. The implication that others imagine safety at a single level is a straw argument.

(continued)

Table 7.1 (continued)

Assertion (Salmon et al., 2010, p. 931). Bold emphasis added.	Reservation
Migration of work practices causes the system's defences to degrade and erode gradually over time, not all at once. Accidents are released by a combination of this systematically induced migration in work practices and a triggering event, **not** just by an unusual action or an entirely new, one-time threat to safety.	Assumptions, which might or might not be true in a particular case, and therefore unsafe pre-conceptions. The last sentence appears to be a straw argument.

[a]This is perhaps the strangest assumption, because it seems to imply a misunderstanding of the wholly conventional way counterfactual, or "but for" causes are used in accident analysis. Care is required when reading structuralist systems thinking discourse not to confuse necessary and sufficient causes

The foregoing example of an attempt to apply structuralist systems thinking to one of the most notorious cases of individual negligence in British legal history is perhaps an outlier. However, followed to its logical conclusion it problematizes the possibility of an adult keeping a group of children safe in the outdoors. One "systems thinking" advocate has averred:

> It is now widely accepted that incidents are caused by multiple interacting factors across the overall system of work. This means that an incident reflects a systems problem and **there is no such thing as a root cause**. **Accidents aren't caused by individuals**, they are caused by systems. Interestingly, this lack of systems thinking in risk assessment is not limited to the outdoor sector. The literature across other safety critical domains (e.g. aviation, healthcare, transportation) is not populated with significantly alternative approaches to risk assessment than what we find in our own domain. The inescapable conclusion is that risk assessment processes have not kept pace with what we know about accident causation. In short we are not assessing all of the risks present within our systems – we are just scraping the surface. (Dallat, 2014 my emphasis)

OE is in the business of providing safe supervision of youth in the outdoors, and case after case has demonstrated that individual actions could have prevented a death. In case after case multiple failures have been usefully attributed to underlying (root) causes such inadequate staff training, inadequate staff knowledge, inadequate staff experience, lack of reconnaissance, or budget constraints. Dallat (2014) might be confusing a quest for everything which caused a death with the more usual pragmatic search for the most feasible means to prevent a death, but nevertheless to rule out, a priori, the role of individuals in maintaining their own safety on a mountain or on a river, or in caring for a group in the outdoors would be an extraordinary, and arbitrary departure from credible safety practice.

7.7 OE Fatality Prevention and Organisational Risk Management

If the structural systems thinking island is an outlier in the safety and risk archipelago, risk management is the mainland. On the face of it, the bones of formal approaches to risk management – establish context, identify risks, analyse risks, evaluate risks, treat risks (Davis, 2004, p. 95) – has a certain internal logic to it. Real-world decision-making does not necessarily occur in neat logical sequences, and not all risks are object-like, but the risk management rubric would make sense in at least some circumstances.

Many organisations have or endorse a structured approach to risk management, and the term appears in inquest reports and safety audits. In the OE field anecdotal accounts are legion of struggles to reconcile case based OE safety with risk management imperatives from management or from outside health and safety auditors.

The elements of risk management do not appear to be derived from research. That research which does examine risk management practices has found flaws. One study averred risk management is: "a rational ritual that provides the company with a false feeling of safety and thereby raises their overall risk level" (Lalonde & Boiral, 2012, p. 283). In a comprehensive study of the phenomenon of risk management – which he refers to as the failure of risk management – (Hubbard, 2009) recounted:

> [S]everal of the major consulting firms and international standards organizations have charged in with a variety of "formal methodologies" for risk management. Many companies just decided to make up their own approaches … And the most popular, newer methods don't necessarily build on the foundations of earlier methods that have stood up to scientific and historical scrutiny. It's more like the rapid construction of mining towns in the American West during the Gold Rush, where nice facades are quickly erected with minimal attention to structural quality of the rest of the building. And anybody can put up a shingle saying he is a risk management expert. (p. 40)

To the extent that a risk management standard is a special case of a procedural standard, some cautionary notes quoted in Chap. 3 are worth re-stating:

> [N]o rule can adequately capture the requisite work of a prescribed action. On the ground, every standard is simultaneously over-determined and incomplete. To coordinate diverse interests and activities, standards necessarily delegate some residual work that requires active participation and submission of people to the standard's directives. Tinkering, repairing, subverting, or circumventing prescriptions of the standard are necessary to make standards work … a recurring surprising finding is that loose standards with great adaptability may work better than rigidly defined standards (Timmermans & Epstein, 2010)

Risk management and fatality prevention are not equivalent. One difference is that organisational risk management focuses on all risks to an organisation, fatality prevention focuses on life-threatening injury. Different interests can be most clearly evident after a serious injury, when the person injured and the organisation can be on opposite sides of legal action. The interests of those who work on the front line

and organisational risk management might also not align, again evidenced by legal action in which managers and employees are opposed.

To the extent that a fatal incident poses a risk for an organisation, fatality prevention could be a component of risk management.[14] In a wider organisational context safety management is only part of risk management, and fatality prevention, in turn, is only part of safety management. Hogan (2002) observed that training OE undergraduates in a safety-focussed risk management system tended to overwhelm the students with detail, in which the essential task of preventing deaths could be overlooked. He concluded that a focus on fatalities was a more effective pedagogical strategy.

Purdy (2010) argued that in organisations generally, widely adopted approaches to risk management had drifted from safety over time. Subsequently, a focus on *any* negative outcomes expanded to include all uncertain outcomes, including positive outcomes. He observed that a Wall Street perspective, in which risk could equal opportunity, prevailed. ISO 31000:2009, which aspired to be "a new globally accepted standard for risk management" was developed by committee over 4 years and attempted to resolve "many inconsistencies and ambiguities that exist between many different approaches and definitions" (Purdy, 2010, p. 881). Risk came to be defined not in terms of negative outcomes but as optimisation in the face of uncertainty (Purdy, 2010). The effect of this shift in definition (which Hubbard (2009) attributes to a "blunder" by economist Frank Knight in the early 1920s) moved "risk" further from fatality prevention. Symbolising the unmooring of risk management from safety in ISO 3100:2009, the International Electrotechnical Commission Advisory Committee on Safety withdrew support for the standard (Hubbard, 2009, p. 84).

Lalonde and Boiral (2012) reviewed the literature relevant to ISO31000:2009 to consider "the limitations and myths that may arise within organizations by a formal approach based on … this type of standard … many organizations tend to adopt ISO standards quite superficially in order to reinforce their social legitimacy … too often mechanistic, ceremonial, and disconnected from internal practices … [and] may be perfunctory and project an idealized image of risk management" (p. 273).

They pointed out that risk management standards had failed in practice for several reasons. The most relevant to OE fatality prevention are: That organisations might be too small to develop sophisticated all-risk systems, that risk management might fail to be integrated into work/praxis, that risk management becomes "a rational ritual that provides the company with a false feeling of safety and thereby raises their overall risk level" (p. 283) and that organisations do not invest in staff. They averred that the standard is a starting point for organisations, to be used selectively and with discretion, as suggestions that might complement other approaches.

Leitch (2010) pointed out that ISO31000:2009 "includes some idealistic requirements that, taken literally, are impossible to comply with" (p. 891) including studying all significant causes and consequences indefinitely into the past and future respectively. Moreover:

[14] In strict risk management terms a fatal incident risk could be insured against, shifted to another party (for example to a contractor), or mitigated by provision for legal defense and public relations.

> The standard writes about risks as if they are naturally occurring phenomena that define themselves and only need to be identified and described (p. 890)

and

> … Clause 5.4.2 on risk identification is keen to stress the importance of identifying all risks. This continues with the habit of writing about risks as if they are naturally occurring physical objects that appear in finite numbers, rather than uncertainties in our thinking. The standard offers no definition of what it means to say "all risks" and there is no generally accepted solution to this problem. (p. 891)

In the OE field imperatives from organisational management, or a workplace safety authority, can require a risk management process the scope of which might range from an entire organisation through to a particular rapid on a river (e.g. Murray, 2015). Leitch (2010) criticises ambiguity in ISO31000:2009, observing that it is unclear:

> [W]hether they are suggesting one, monolithic process with one set of meetings, techniques, documentation, and schedule, or a multitude of processes, each with their own meetings, techniques, documents, and schedules … And if it is a multitude of processes, are they all identical or adjusted to fit the needs of each management team (e.g., managers of different projects)? ... it talks about "the" process as if there is only one … On the other hand it repeatedly states that the risk management process should be an integral part of business processes … there is a sentence that says: "The framework assists in managing risks effectively through the application of the risk management process … at varying levels and within specific contexts of the organization." (pp. 890–891)

In qualified defence of ISO31000:2009 Leitch (2010) reiterated that it "is the work of a committee of people from different countries and speaking different languages. We must also remember that an abstract topic like risk management is far harder to write about clearly than, say, the size and electrical properties of a new electronic socket" (p. 892). However, he offers the following summary for those who might be challenged on why they do not use the standard: [it] "(1) is unclear; (2) leads to illogical decisions if followed; (3) is impossible to comply with; and (4) is not mathematically based" (p. 892).

Leitch's (2010) reference to mathematics did not imply that all risk could be managed mathematically. Hubbard (2009) reviewed the role of quantitative methods in risk management comprehensively. He argued that corporate risk management, largely devised by management consultants, was frequently untested (except for certain quantitative methods in some industries), continued to use elements known not to work, and failed to use methods known to work for certain risks. He observed that a faulty approach to risk management itself exposes an organisation, or industry, to common mode failure:

> The ultimate common mode failure would be a failure of risk management itself. A weak risk management approach is effectively the biggest risk in the organization. (Hubbard, 2009, p. 6)

Hubbard (2009) argued that those responsible for risk management in organisations tended to report that they believed their efforts were successful, but neither knew if their methods worked nor had considered what evidence would provide

Table 7.2 Generic likelihood/consequence risk assessment table using rankings not measurements

	Consequence rating 1 –5 (1 = least serious 5 = most serious)					
Likelihood or frequency rating 1 – 5 1 = frequent 5 = rare		1	2	3	4	5
	1	Yellow	Orange	Red	Red	Red
	2	Yellow	Yellow	Orange	Red	Red
	3	Green	Yellow	Yellow	Orange	Red
	4	Green	Green	Yellow	Yellow	Orange
	5	Green	Green	Green	Yellow	Yellow

proof. Although risk management could be "a mere formality of getting proper rubberstamp approval from the right authorities … [it] would be mistaken to confuse regulatory compliance with an actual improvement in risk management" (p. 35). In the OE fatality prevention field the Mangatepopo 2008 tragedy is one case that highlighted different implications of what could be either: (a) a faulty conception of risk management or (b) a well conceived but poorly implemented risk management system (Brookes, 2011; Brookes et al., 2009). The first would require a rethinking of approaches to fatality prevention, to align them more with case-based knowledge and rely less on generic risk management frameworks borrowed from industry, and the second could suggest a doubling down on an existing risk management approach. Whether a very similar tragedy that occurred in a different New Zealand outdoor centre 4 years later, at Paritutu Rock, could be attributed to doubling down when a change in approach was called for cannot be determined because there was no inquest.

Hubbard (2009) warned that faultily conceived risk management might simply be a waste of time and effort, but might also "cause erroneous decisions to be made that would not otherwise have been made" (p. 51).

Bromiley, McShane, Nair, and Rustambekov (2015) reviewed literature on Enterprise Risk Management (ERM), which they argued was reasonably distinct risk management variant. They cautioned that rather than being a panacea, ERM:

> may be part of the problem … [a]dvocates have implicitly assumed firms will use "better" tools in ways the originators intend, and that the tools will influence firm behavior in obvious, desirable ways. The massive literature on organizational change clearly demonstrates the shortcomings of such assumptions … Simpleminded attempts at organizational change often result in complex, unforeseen dynamics." (p. 273)

They also note that ERM may fail to properly recognise that:

> [M]ost strategic decisions occur outside the formal process. If strategy scholars are correct, then the ERM emphasis on risk analysis in formal strategic planning is misguided. (p. 273)

One particular problematic element of risk management is the use of matrices. Risk management is sometimes defined at the level of individual risks, recorded using a risk management matrix (Table 7.2). For example, the Victoria Department of Education and Early Childhood Development (n.d.) published a risk rating matrix that was to be applied to any risk. Cox Jr (2008) noted that risk matrices are used in

fields as diverse as "terrorism risk analysis, highway construction project management, office building risk analysis, climate change risk management, and enterprise risk management" (p. 497). Risks are assessed subjectively on two ordinal scales, likelihood and consequence, and then, in a process which removes information, combined into a single colour coded score.

Cox Jr (2008) pointed out that scales are a ranking, not a measurement, but a matrix process is superficially equivalent to risk calculations based on quantifiable losses (for example monetary losses) and calculable probabilities. Thus a risk in any one year of a 10% loss could be seen, over time, as equivalent to a loss of 100% every 10 years. Taking a mathematical approach, he proved that in the cases where the underlying probabilities are distributed so that the probability of the middle rating is 0.5, and the expected losses of the middle rating are 50% of the most serious losses, the derived risk rankings would be defensible, but because probability distributions and loss distributions can vary, 50% of the time a subjectively ranked matrix will incorrectly rank risks in the middle of the table.

Cox Jr (2008) concluded that risk matrix tables had poor resolution, had inherent potential for errors that render them worse than useless for decisions about resource allocation, and had severe limitations due to the subjectivity of the inputs.

Hubbard and Evans (2010) reviewed research on use of ordinal scores in risk management, which they observed were widely promoted by management consultants and international standards organisations and had the attraction of being easy to create and easy to teach: "Respected organizations have designed such methods and represent them as best practice for thousands of users" (p. 2). Their review considered flaws that extend beyond the mathematical problems examined by Cox Jr (2008). Hubbard and Evans examined vulnerability of subjective scoring to known cognitive biases, the problem of inconsistent application of verbal scoring labels, the problem of invalid references derived from arbitrary scales, and an inability of templates based on discrete risks to effectively consider correlations, for example those which cause cascading problems or common mode failures.

In OE fatality prevention, potential cascading problems could arise from budget constraints or ill-suited approaches to risk management. Hubbard and Evans (2010) consider why scored risk management could be so commonly used, if it was as flawed as they claim:

> One main reason may be that these methods tend to be applied to decisions for which the results are not immediately apparent, and the quality of the decision is not obviously measurable. If an organization uses a scoring method to rank the risks of some relatively infrequent event (e.g., flu pandemics, engineering catastrophes, or major IT security breaches), a very long time may be required to determine whether the assessments effectively track outcomes. In addition, this assumes that the organization is systematically tracking the event and statistically analysing the results with respect to original forecasts, which is not often the case (p. 3)

A Victoria Department of Education and Early Childhood Development (nd) pamphlet, which I referred to earlier, provides a risk matrix and a typology of risk comprising: educational outcomes, wellbeing and safety (single category), operational objectives, finance, reputation, and strategic. Within the safety category a

death would be ranked as a most serious outcome, but could also be categorised, in a blanket assessment, as rare. Thus a fatal incident could score the same as a trivial but common mishap. Unless fatality prevention was an overriding priority reasonable prevention measures would be omitted, because the risk could be ranked as acceptable. At the risk of unfairly singling out one of hundreds of organisations that use similar approaches, use of the matrix as intended might result in indefensible and unwarranted omission of fatality prevention measures.

In a detailed criticism of the unsuitability of matrix approaches for high consequence events, Hopkins (2014) concluded a defence in depth approach should replace any matrixes that imply that accidents are chance events, rather than caused events (in the "but for" sense):

> [U]sing the defence in depth approach, the question is: have we done all that is reasonably practicable to ensure that the required defences are in place? In legal proceedings that follow a major accident, this is always the question that courts focus on, and they almost invariably find that controls that were supposed to be in place were missing. (p. 15)

Hopkins' (2014) conclusion is consistent with a strictly aversive approach to OE fatality prevention. Most OE fatal incidents would be preventable, provided all reasonable steps were taken to prevent fatalities irrespective of other priorities – such as production pressure or financial stringency – and provided measures were not omitted on the basis that a fatal incident was thought to be unlikely.

7.8 Evaluating OE Fatality Prevention in Organisational Contexts

> *For any risk management method … we must ask, again, "How do we know it works?" If we can't answer that question, then our most important risk management strategy should be to find a way to answer it and adopt a risk assessment and risk mitigation method that does work.* (Hubbard, 2009, p. 24)

Even in large organisations, OE fatality prevention requires knowledge of fatal incidents, strict aversion to fatal incidents, and knowledge of the actual environment and location employed for a program. It usually requires deployment of someone accompanying youth in a position to monitor safety and with the expertise to recognise deadly circumstances. There is no approach to organisational risk or safety management that obviates the requirement for staff who know what they are doing and who are motivated to prevent deaths. Within the wider risk and safety literature, I found no convincing argument or theory, in the face of past tragedies, which could argue away the importance of the carer in situations where youths are in the care of one or more adults and death is a possibility. Not all OE situations or activities are potentially deadly, and some OE programs occur in much safer circumstances than others, but to confine a program to safer situations would still require a decision-maker equipped to recognise and choose safe situations.

Fatality prevention is specific. It will not follow as a natural consequence from normal operations, is not assured by a good previous safety record, and cannot be assumed to result from any kind of organisational risk management process not based on actual knowledge of fatality prevention, even if such approaches were better founded and more successful than those discussed above. Fatality prevention requires decisions about staffing and programs to be made by staff who understand fatal incidents in the chosen environments, understand what knowledge and expertise are required to prevent them, and are empowered and motivated to take all reasonable steps to prevent any death.

As in almost any industry or community sector, production pressure and financial constraints are in constant tension with fatality prevention. Fatality prevention can require programs to be modified, delayed, or cancelled. It occupies staff time and effort in ways that do not contribute to the primary goals of the organisation. It requires constant, active attention, because if precautions are neglected usually nothing happens. A bell doesn't ring, at least not until and unless tragedy ensues.

Although some OE fatal incident cases point to straightforward neglect of safety in general and fatality prevention in particular, misconceived or ill-chosen approaches can impede, rather than simply fail to provide, fatality prevention. My purpose in this chapter has been to provide some insights that could assist those trying to understand fatal incident cases that have been – or could be – interpreted as organisational failures. My purpose has also been to provide some insights which could assist those who must keep youth and staff safe within organisational contexts that have signed on to approaches from industrial safety which can make work more difficult for an OE fatality prevention expert.

What I have not done is attempt to research or document organisations that do operate consistently with lessons learned from fatal incidents. I have no doubt that many such organisations exist, and that in many cases, perhaps most cases, organisational involvement adds layers to safety premised on care of small groups by a competent staff member. The test, as always, is whether precautions shown to be necessary by past fatalities are routinely evident, in the field.

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Chapter 8
Preventing Fatal Incidents

8.1 OE Fatality Prevention Requires Specific Expertise and Knowledge

Many, if not most, workplace deaths from injury or work-related disease are preventable, but, according the International Labour Organization, every day 6300 such deaths occur globally (International Labour Organization, 2017). Almost all drowning deaths are preventable, but, according to the World Health Organization, every hour on average 40 drowning deaths occur globally (World Health Organization, 2014). Some work-related deaths, and some drowning deaths, could be difficult to actually prevent because of entrenched social, economic, educational and perhaps cultural factors. To imagine zero such deaths globally might be to conjure Utopia. However, at least in higher income countries and in most geographic regions, there is nothing Utopian about an outdoor education (OE) program aiming for zero preventable deaths. Apart from deliberate deaths or some deaths associated with transport to or from a program, counterfactual analysis of incidents shows capable individuals responsible for a program could prevent most OE deaths.

To be effective fatality prevention has to consistently be an overriding priority, which of course it might not be. Past incidents evidence unsafe OE programs can and probably still do exist. Unsound practices, for example deployment of staff lacking fatality prevention expertise and relevant local knowledge and experience, figure repeatedly in fatal incident cases. Individuals responsible for an OE program could neglect or ignore the possibility of a fatal incident. There have been deaths in evidently well-run and nominally safe programs in which a specific, known fatality prevention measure had been omitted in favour of pressing on with a planned program, perhaps because a decision maker assumed that an unlikely circumstance would not eventuate. There have been deaths in programs in which inattention to fatality prevention was evidently more pervasive.

A. Brookes, *Preventing Fatal Incidents in School and Youth Group Camps and Excursions*, International Explorations in Outdoor and Environmental Education, https://doi.org/10.1007/978-3-319-89882-7_8

Granted determination and focus, actual prevention of OE fatal incidents is shaped by questions of responsibility, mutability, and proximity, and pivots on expertise. Given a particular locality and circumstances, which individuals would be in a position to do what, and what would be their fatality prevention obligations? It is important that most past OE fatal incidents could have been prevented by measures known, or discoverable, from earlier tragedies. Prevention knowledge is attainable. It is equally important that those on whom responsibility most explicitly rests – those who devised programs and those who supervise youth in the outdoors – would almost always have been best placed to directly prevent past OE deaths, had they the expertise. OE fatality prevention begins with two key elements in place more or less by definition – adult oversight of activities, locations, and timing, and actual adult supervision of young people during a program.

Because in practice one or more prevention measures could fail, protection against deadly risks conventionally involves multiple layers. Fatality analysis consistently identifies multiple points at which a death could have been prevented. In particular, layers involving checks and oversight could contribute to confidence that every child or youth would be in the care of fatality-averse staff in the field and protected by competent, fatality-averse programming decisions. Defence in depth against fatal incidents of course requires attention to the effectiveness of staff deployment, training and qualification, to safety auditing or reviews, to regulations, and to research, but these layers support, rather than obviate the need for, expertise and motivation at program level.

Defence in depth requires any layer to independently intervene to prevent any death, but, somewhat paradoxically, no layer to act unilaterally to cause a death.

Failure to deploy or to empower front line staff with sufficient expertise and knowledge frequently emerges as a counterfactual root cause of an OE fatal incident. If not subject to external checks or audits it is a potential single point failure. Particularly in organisations with high staff turnover, the cost of fatality prevention training and preparation could be substantial. For example, an expedition group leader who had studied fatal incidents relevant to a particular venue, and who had completed a safety and logistics reconnaissance of the planned venue, would undoubtedly be better equipped to prevent fatal incidents than a leader whose first visit was with a group in tow. For a one-off contract the cost to an organisation of the safer leader could be more than double the wages and travel costs of the less safe leader.

OE fatality prevention requires those responsible for the care of youth in the outdoors to have specific expertise in fatality prevention, and requires those with an indirect or management role to understand the importance of such expertise, even if they themselves lack it. Avowed understanding is one thing, but demonstrated understanding requires that a program be cancelled if staff with fatality prevention expertise cannot be deployed, however disruptive, costly, and unpopular such a decision might be.

When a tragedy is imminent events can reach a point where prevention would be doubtful, dangerous to rescuers, or impossible, but very few OE deaths have occurred that no one could have prevented at any point. Many OE deaths have

occurred in circumstances where the *particular individuals* responsible for the care of youth either were unaware or unable to recognise a potential hazard, and either did not know or lacked the ability to take otherwise feasible prevention measures. Almost none have occurred in circumstances that *more capable individuals* could not have anticipated or recognised.

The issue of expertise raises the possibility that to assess one's own competence could require competence, which is to say that incompetence might not be capable of recognising itself (Kruger & Dunning, 1999). The person who only thinks they can ride a bicycle will fall off and know the truth soon enough, but delusions or misconceptions about fatality prevention expertise could persist unrecognised until exposed by a tragedy. Fatality-free experience might even reinforce delusions or misconceptions. Demonstrated and established competence in teaching groups and performing activities might be assumed, wrongly, to be equivalent to fatality prevention expertise. The key interrelated questions for individuals directly responsible for the care of youth in the outdoors are:

(1) How sound is my understanding of past fatal incidents in the kinds of OE program I am contemplating or involved with?
(2) How sound is my understanding of the entire program (not just the headline activity), location, and environmental conditions from the perspective of fatality prevention?
(3) Do I consistently take all reasonable precautions to prevent any death, as determined by (1) and (2)?

Any of the questions, particularly the third, could invite glib responses, but little effort or imagination would be required to devise follow up questions to separate expertise from pretence or self-delusion. For example: How was fatal incident knowledge acquired? How was knowledge of the location and environmental conditions acquired? How often has a program been cancelled or modified due to weather or unavailability of suitable staff?

Sometimes those reviewing or discussing a preventable OE death are moved to comment on purported benefits of OE, and the undesirability of shutting down OE programs. Invariably the incident in question could have been avoided while still achieving evident program goals. Expert fatality prevention hones in on particular circumstances and deals with them, it is not premised on pervasive over-caution. Almost always an expert in fatality prevention, at least in principle, could have revised a program, or made changes to location or timing that removed a risk of death and without affecting educational outcomes. A particular group might miss out on an activity because of unsuitable conditions or because prevention measures were deficient on the day, but case-based fatality prevention does not imply an unqualified threat to any important OE aims or goals. Some program approaches are less compatible with fatality prevention than others – for example aims which fetishize risk or the idea of adventure as a foray into the unknown could be less suitable than aims framed around learning to be at home in the outdoors (Brookes, 2006, 2015) – but not irreconcilably so.

I have not emphasised weighing risks against benefits, although that is always a consideration. A parent fleeing a war zone could decide to accept a risk of serious harm to their children because the alternatives were worse, but OE curriculum choices are never of that nature. It is true that certain pervasive risks, for example the presence of trees which could drop a branch, or roads on which the behaviour of other road users cannot be controlled, would have to be accepted in almost any outdoor program. My reason for not emphasising a weighing up process is that in most fatal incident cases the educational aims were relatively general and the circumstances that actually led to tragedy quite specific. A bereaved parent could have chosen a different program or even the same program at another time and not encountered the particular circumstances implicated in a death. In the past some coroners in the UK appear to have waved through fatal incidents, particular those abroad, premised on at least an implied acceptance that a death was an acceptable price to pay, but those are controversial decisions that probably placed too much weight on what prevention measures were convenient, or typical, and insufficient weight on what measures were reasonably possible.

In some past cases a particular OE program *should* have been abandoned, or an organisation shut down, because prevention measures possible in principle were not implemented. Not every fatal incident can be attributed to an isolated lapse or failure. Deaths have occurred in programs that were not equipped to prevent fatal incidents, in effect relying on the hope that a rare event would not eventuate. Failures to deploy staff with fatality prevention knowledge, or failures to provide staff, once appointed, with time and resources to seek information and conduct reconnaissance on planned venues could point to an unsafe business model. In the case of OE conducted abroad, the difference between appointing staff who have not been to a planned destination prior to leading a group there, and employing staff who have not only been there but have specifically reconnoitred fatality prevention, would be substantial.

8.2 OE Fatality Prevention Requires Specific Focus

The only way to be confident that all reasonable fatality prevention measures are in place is to check *specifically*. Otherwise-competent staff could be deficient in fatality prevention knowledge and otherwise-successful programs could have chronic latent fatality prevention deficiencies. Fatality prevention does not automatically follow from demonstrated effective management of less serious safety matters – there is no "look after the scrapes and bruises and the deaths will look after themselves" rule. Organisational risk management procedures could fail to incorporate or enhance fatality prevention, and in some instances could hinder fatality prevention. Risk management is not a proxy for fatality prevention – there is no "look after risk management and fatality prevention will take care of itself" rule.

Fatality prevention requires on-going attention because corporate knowledge can decay over time (de Holan & Phillips, 2004). Fatality prevention knowledge is particularly vulnerable to decay because deficiencies might not disrupt normal operations. Other priorities will almost certainly be more palpable and more immediate.

If anything, things might run a little more smoothly without the distraction of fatality prevention measures. Moreover, changed circumstances and the affordances of technology could render some fatality knowledge obsolete.

To prevent future fatal incidents, my priorities would be as follows.

(1) I would expect specific fatality prevention to be discernible, and evaluable, **in OE training courses**, including the use of case studies (North & Brookes, 2017).
(2) I would expect program and locality-specific fatality prevention expertise and knowledge to be explicit **staff appointment criteria** for many types of OE program.
(3) I would expect that on-going **staff development and training** would include a focus on fatality prevention and probably periodic discussion of relevant case studies.
(4) I would expect that **safety planning** would document fatality prevention explicitly, to the extent that documentation made sense.
(5) I would expect that **location research and reconnaissance** would specifically attend to potential fatality locations, potential and actual fatal weather or water conditions, communications black spots and safe locations. There is a case for accumulating and documenting local knowledge, up to a point, but the key element is that those staffing a trip have themselves, perhaps under guidance, conducted a safety reconnaissance.
(6) I would expect **supervision** of youth in the field to be explicitly and coherently focussed on fatality prevention, and that decisions in the field would routinely demonstrate prevention as the overriding priority.
(7) In **reviewing practice** I would expect, in at least some cases, to find examples of program changes, including if necessary cancellations, which demonstrated active application of fatality prevention as an overriding priority. There have been many deaths in circumstances where the program should not have proceeded *on that particular occasion.*

In some respects an inquiry into a tragedy is an external review that already knows where to look, or at least that knows where to start looking. It begins with the situation in which the victim died and works back in time and outward through layers of influence and responsibility. A fatality prevention review must take a similar course, except that it has to consider all potentially fatal situations based on past cases and knowledge of the program and locale. One question for those reviewing their own practice or program is whether or not they have internalised elements of the status quo to such an extent that blind-spots prevent them from recognising or acknowledging, certain deficiencies.

An external review could be required to avoid blind spots. To remedy identified prevention measures could be disruptive, time-consuming, expensive, and could require decisions that particular individuals are not authorized to make. An internal review might not contemplate certain prevention measures because such measures would be, literally, out of the question, in the circumstances. It could take an external review to problematize "out of the question" matters and force resultant fatality deficiencies into the open.

8.3 Case-Based Fatality Prevention Establishes What Organisational, Regulatory, or Other Managerial Responses Must Achieve, But Not How

OE fatality prevention renders the potentially complex field of organisational failure down to just two things, (1) organisational level reasons why capable program staff did not act to prevent a death or (2) organisational failure to deploy capable staff.

Organisational imperatives could obstruct, diminish, or simply distract from, fatality prevention on the ground. Although in principle most OE fatal incidents could have been prevented by adults directly responsible for the care of participants, in practice a newly appointed or contract staff member, for example, might not be empowered to question long-standing practices or directives. An individual in that position could refuse employment and explain why, but the program might proceed, unsafely, regardless. In an organisation that did not persistently and insistently make fatality prevention an overriding priority, it could be difficult to determine, in hindsight, what would have constituted a reasonable threshold for an individual employee to push back against norms or directions on fatality prevention grounds.

At a program level, expertly devised OE fatality prevention could mesh awkwardly with procedural requirements imposed by either an organisation itself or an outside authority. OE programs could be subject to organisational requirements or external health and safety mandates. The question then becomes whether compliance with imposed templates, however ill fitting, and expertise-based fatality prevention can both be satisfied. Compliance might be burdensome and unhelpful without necessarily impeding provision of all reasonable fatality prevention measures. Case-based fatality prevention knowledge provides grounds for determining whether compliance is consistent with fatality prevention, but does not necessarily provide guidance on how to deal with any incompatibilities.

In the early 2000s the Health and Safety Executive (HSE) in the UK proposed applying European Working at Height Directives, developed to reduce injuries on building sites and other workplaces, to all working at height situations including non-recreational mountaineering, rock-climbing, and abseiling. Considerable organized lobbying resolved, eventually, what would have been a situation where an imposed regulation was at best incompatible with well established mountaineering safety practices, at worst unworkable or unsafe (Hey, 2005). More typically, incompatibility between case based prevention and regulatory or managerial imperatives could be less obvious, but similarly devised for arenas dissimilar to OE. When licensing for (some) providers of (some) adventurous activities for young people was introduced in Great Britain in the aftermath of the 1993 Lyme Bay tragedy, the Health and Safety Executive (HSE) delegated licensing inspections to a private company with expertise in OE fatality prevention. In effect the licensing authority sat between the commercial OE sector and generic health and safety regulations, and remains an exemplar of to what extent tensions between a potentially bureaucratic process and fatality prevention could be negotiated (Bailie, 1996, 2004, 2005, 2006).

In one sense case-based fatality prevention is relatively agnostic about what administrative, regulatory or organisational arrangements result in fatality prevention. In another sense the problem of regulation or management is the same as the problem faced by any parent, writ large: How can I know that my child will return from a camp or excursion alive? What is clear is that there is no answer to that question that does not involve responsible adults who are fatality-averse, who understand fatal incidents, and who know the program and its environs well enough to apply that understanding.

8.4 Failures to Pursue or Share Lessons from OE Tragedies

Not every past OE fatality has been investigated with a view to preventing future tragedies in the wider OE field. Not every incident account is obtainable. Some available accounts lack detail. Although there are variations within jurisdictions, and also differences between countries or states, OE fatality prevention has at best been inconsistently served by past fatality enquiries.

In some jurisdictions improvements are evident over time. On-line publication of inquest reports has helped. Some coroner's offices that at one time charged for copies at legal-firm rates, which is to say dollars per page, now publish inquests online. On-line news reports, including digitised archives, have simplified searches and made available accounts that would otherwise have been almost unobtainable. Individuals, for example bereaved parents, can put up a webpage and publish what others will not.

In some instances case material is available but those who could learn from it have not sought it. Those who work in the OE field could ask themselves what active steps they have taken to learn from past – or recent – tragedies. Parents of prospective students could put the same question to OE staff. For some the answer would be "every step". Nevertheless, at least as a generalisation, there appears to be room – perhaps considerable room – for those who work in the OE field to contribute more to fatality prevention by searching for fatal incident cases, obtaining detailed materials (some of which might only be available in local hard copy), and sharing those materials with colleagues. Summarised accounts from inquests or other sources are useful, as are news reports, but full transcripts or witness statements can help those trying to understand fatal incidents to better grasp the often messy details of an actual incident.

Not all deaths are investigated with a strong prevention focus, or with a view to determining wider implications. More engaged professionals would be better advocates for prevention-focussed investigations. In some jurisdictions coroners have discretion about whether to hold an inquest or whether to make findings about future prevention.

In some cases an organisation, after suffering a fatal incident, has commissioned an external review. Some have made such reviews public; others have kept them secret, which means that not only others in the OE field cannot learn from the case,

but also the organisation itself obtains less benefit from outside interpretations and responses. I am not persuaded organisations that keep such enquiries secret are fully committed to fatality prevention, although one could be devoted to the safety of ones charges while indifferent to the safety of anyone else.

The existence of unreleased reports points to a broader tension between sharing incident details with a view to preventing deaths and suppressing information with a view to protecting reputations. OE fatal incidents cannot be likened to institutional child abuse,[1] but there are insights to be gained from child abuse prevention. One former victim turned activist, who had campaigned for years with little success, observed (my emphasis):

> I expected clergy to care about the victims and to do the right thing…. I had not realized *they were just managing risk*. To this day I still am embarrassed by how long it took me to understand this. (Salveson, 2013)

From a risk management perspective obstruction, in this case by the Catholic Church in Philadelphia, *made sense*. Organisational risk management, in the end, is about managing risks to an organisation. Most OE fatal incidents have neither involved abuse nor been systemic, and reluctance to share information about fatal incidents does not necessarily constitute a cover-up, or even a conscious decision to put reputation ahead of contributing to future prevention. Even so, as in the case of institutionalised cover-ups of child abuse, calculated risk management could in part explain organisational responses that hinder future prevention by not sharing information. Risk management is a legitimate organisational endeavour; the question is how it ranks with fatality prevention as a priority.

There are undoubtedly gaps in the OE fatality case study record attributable to actions determined by risk management, particularly when no third party investigation has been published. In at least parts of the United States, a coroner would not necessarily investigate a death that had occurred overseas. Civil action could generate news reports and a court finding, but most civil cases are settled confidentially, leaving no record that could inform fatality prevention.

In some cases bereaved parents have become reluctant activists in the face of what they have perceived as failures to systematically learn from the past. Activist parents can work around institutional resistance to publicity by self-publishing accident accounts, especially on-line. One group in the United States concerned with study abroad deaths, some of which have been OE related, successfully lobbied for legislation in Minnesota for mandatory reporting of deaths and injuries during study abroad programs. That group described their motivation:

> *PSA advocates for honoring the dead by telling their stories* ... By *not* telling the stories of our children as deceased students, they are stripped of more than life. They are stripped of death's meaning... We honor the memory of these students by speaking their truth—all of it. Through their stories, we personalize student safety issues. This can motivate industry change, and thus, benefit future students. (Protect Students Abroad, 2016)

[1] Some deaths have been linked to physical abuse, for example Kutz and O'Connell (2007).

Failure to contribute fully to fatality prevention, could, of course, rebound on an organisation or industry if others publicize what the organisation would rather suppress:

> The study abroad industry must expect that bereaved families will suddenly see through industry claims of safety to recognize something else: on the front end, marketing, and on the dark end, lawyers, insurers, and boards ... The study abroad industry must understand that for a student's family, on the front end, we believed we were giving our child a precious gift, the world—on the dark end, there's a corpse in a box, ashes in a can, or no body at all (Protect Students Abroad, 2017)

At least some study abroad deaths must be considered OE related, although only some deaths of students abroad involve outdoor activities, and not all involve clear responsibility for supervision. There is a counterpart to criticisms of an apparent reluctance to track and report deaths on the part of the US study abroad industry in the form of criticisms in Australia of failures to consistently track and report deaths of visiting international students (Johnson & Gilmoure, 2009), including those from the US. Australia is probably a relatively safe destination for international students, but a prospective student from the US, or their parent, who wanted to confirm that was true, and to understand in what circumstances US students had died in Australia, would have to do their own research, looking for individual news reports of cases. It could be that the home city of a US student was, in general, less safe than an Australian destination city, but there could be particular local hazards that an international visitor might not be aware of.[2] Fatality prevention includes learning to understand and recognise exceptional circumstances that make a usually safe situation deadly.

In the study abroad example, colleges might argue that international students and study abroad students are legal adults acting independently. Whatever the legal circumstance, students younger than 22 or 23 have experienced the world mostly as children and are developmentally less capable of making decisions about risk than adults (Casey, Jones, & Hare, 2008; Fischhoff, 2008; Reyna & Farley, 2006; Steinberg, 2008). Furthermore, universities, particularly in wealthy countries such as Australia and the USA, would be far better placed than individual parents and students to research and track student deaths, and to advise on the particular circumstances in which such deaths have occurred and could occur in the future. It is a dismal choice to eschew determined prevention efforts in favour of relying on legal tactics, insurance, and public relations in the event of a death.

Returning to OE fatality prevention more generally, it could be possible to remedy deficiencies in past enquiries. Some of those touched by a tragedy might be bound by confidentiality agreements, but others might have kept files and clippings that could guide OE researchers. What the OE field might have forgotten bereaved relatives will not. OE deaths abroad can fall through investigative cracks due to the involvement of multiple legal systems and in some cases, layers of delegation or sub-contracting. Deaths in the "troubled teen" industry, which are arguably OE related, have been under-researched and could be re-visited.

[2] For example, the legal minimum drinking age in Australia is 18, in the USA 21.

Deaths have occurred in the non-Anglophone world which I did not consider, and local or regional geographic and environmental factors that would inform fatality prevention in those parts of the world in which I only considered catastrophic incidents. It possible that in some regions, to compile and review local or regional incidents would provide new insights, even if only by situating fatality prevention knowledge in more relevant contexts.

Some of the patterns and repetitions evident to anyone who examines OE fatality cases are quite distinct; others are subtler. It is clear that OE fatal incidents fit the maxim: "old accidents, new actors", but it is also true that every incident is unique. Each account of a tragedy contributes incrementally to the ability of those who study it to recognise prevention failures in new contexts or in slightly different manifestations. Every account shared and circulated contributes to the necessary process of distributing and revisiting lessons that would otherwise fade or decay.

8.5 Final Observation

OE fatality prevention knowledge is attainable, and effective prevention is feasible. For many who work in the OE field this volume will have gone over ground that has been tilled before. For those readers I hope it has served to affirm what was already known but also has contributed to a necessary process of revisiting, reviewing, and reworking safe practice. Fatality prevention can deteriorate over time if left unattended.

For bereaved parents the death of child on an OE camp or excursion is a ghastly event made worse, if that is possible, by any subsequent knowledge that tragedy could have been prevented. In many such cases there would have been no way for a parent to discern that the safety provided was less than what was promised or implied prior to the fatal trip. It comes down to whether those entrusted with the care of youth can be trusted to keep them safe. It is incumbent on those who work in the OE field to be trustworthy.

Fatality prevention obtains its direction from the perspectives of bereaved parents, but it pivots on the expertise of those staff most directly responsible for OE programs. It is the responsibility of those who work in the OE field to honour a promise repeated after many a tragedy, to never let such an incident happen again.

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