

Safe Communities: An Ecological Approach to Safety Promotion

Dale Hanson

Staff Emergency Physician, Mackay Base Hospital, Queensland Health.

Senior Clinical Lecturer, School of Medicine, James Cook University.

Paul Vardon

Senior Health Promotion Officer, Statewide Public Health Unit, Queensland Health.

Jacqui Lloyd

Director of Health Promotion Services, Tropical Public Health Unit, Queensland Health.

Abstract

Injury is like a multifaceted crystal. It may be viewed from a number of different perspectives, each unique, each important, each contributing a different truth, but none sufficient in isolation to generate a comprehensive understanding of the problem.

Injury Prevention has been dominated by a number of different, and at times opposing, paradigms: the Medical Paradigm, the Health Education Paradigm, the Public Health Paradigm, the Bioengineering Paradigm, the System Engineering Paradigm and more recently the Sociological Paradigm. Each paradigm brings a unique perspective to the injury problem. Progress is now limited by the cultural division between paradigms which impairs the ability of different professional groups to understand and appreciate the contribution of other groups.

This article proposes a social ecological model as a unifying cognitive framework within which to develop a Safe Communities Project. To focus solely on the medical concept of “injury prevention” is to misunderstand the fundamental nature of the human experience, and hence how the positive state of “safety” is achieved. For safety is a psychological, environmental and sociological phenomenon, as much as it is physiological. Safety is an ecological concept, determined by the relationship between an individual and their physical and social environment. The proposed social ecological model emphasises the *dynamic interface* between these three dimensions.

This ecological system provides a complex web of causation, creating a rich context for intervention. Looking for the most effective leverage points within the system reduces complexity and ensures strategic action.

Introduction

Injury is like a multifaceted crystal. It may be viewed from a number of different perspectives, each unique, each important, each contributing a different truth, but none sufficient to generate a comprehensive understanding of the problem.

The science of safety promotion has evolved through the contribution of a number of different injury paradigms: the Medical Paradigm, the Health Education Paradigm, the Public Health Paradigm, the Bioengineering Paradigm, the Systems Engineering Paradigm and the Sociological Paradigm. Each paradigm brings a unique perspective to the injury problem. Progress is now limited by the cultural division between paradigms which impairs the ability of different professional groups to understand and appreciate the contribution of others. Like a crystal, each facet of the injury problem must be studied to appreciate the whole picture, and thereby generate a comprehensive solution.

This paper is an attempt to facilitate improved dialogue between paradigms and define common ground on which to build a community based safety promotion program.

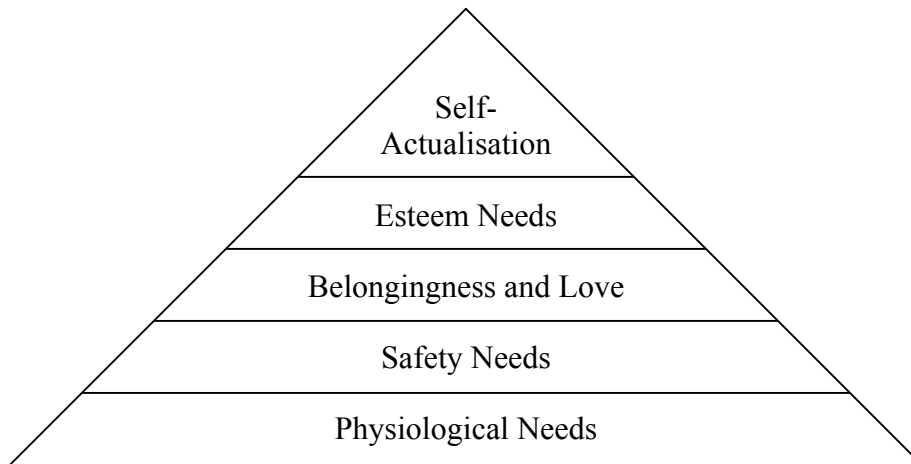
Safety promotion

“Safety”, like “health”, is an elusive concept that defies straightforward definition. While safety may be hard to define and therefore to measure, it is an important determinant of “Quality of Life”¹.

The United Nations in their 1994 report on human development⁴ assert safety is a “fundamental human right and an essential condition for the sustainable development of societies”. The Queensland Government lists “safer and more supportive communities” as one of seven key policy priorities⁵.

According to Maslow’s Hierarchy of Needs^{2,3}, safety is one of the basic needs of human beings, and a prerequisite for fulfilling higher psychological needs (Figure 1).

Figure 1. Maslow's Triangle: A Hierarchy of Needs Theory



To focus solely on the medical concept of “injury prevention” is to misunderstand the fundamental nature of the human experience, and hence how the positive state of “safety” is achieved. For safety is a psychological, environmental and sociological phenomenon, as much as it is physiological.

Maurice et al⁶ define “safety” as a “state in which hazards and conditions leading to physical, psychological or material harm are controlled in order to preserve the health and well being of individuals and the community. It is an essential resource for everyday life that an individual and a community need in order to realise their aspirations.”

The positive state of “safety” is as much concerned with the subjective dimension – the perception of safety, as it is with the objective dimension – the absence of injury⁶. A dynamic, and often paradoxical relationship, exists between these two dimensions⁷. This is part of the problem! People feel inappropriately secure in dangerous situations, and fail to take appropriate action to minimise their risk of injury. Contrastingly, they may feel needlessly frightened in relatively safe situations.

Sections of the community are highly fearful of the risk of unprovoked violence, yet this fear is not substantiated by documented epidemiological data. In Mackay, 91% of injury results from non-intentional injury, while only 5% of injury results from assault⁸. By contrast, risk behaviours and environments around the home are not perceived as dangerous by Mackay residents⁹, while the epidemiological data indicates 40% of injuries occur in the home⁸.

Therefore, to promote the concept of community safety, we need to address the community’s perception of “safety” and “danger” while simultaneously intervening to reduce the behavioural, environmental and sociological factors that produce injury.

The Medical/Health Education Paradigm

Despite a history dating back to John Snow that emphasised the importance of social systems to maintaining health, a pervasive ideology of individualism has colonised public health science¹⁰. This takes for granted a reductionist view that the individual is the basic unit of investigation. Thinking has been dominated by the “Medical Model”^{10,11,12}, which perceives the individual as a natural entity whose existence is unproblematically physical, and largely independent of social context¹⁶.

Epidemiology focused on the identification of “individualised” risk factors, while health promotion has attempted to “prevent people from adopting high-risk lifestyles”^{13,14}. Kickbusch¹⁵ observes, “the link between social change, pressure for social reform and public health has been lost...public health has over time lost its broad-gauged approach and moved into a phase of medical dominance and concern for behavioural epidemiology, preventative medicine and health education.”

The medical education/behavioural paradigm understands a person and their injury risk in terms of individual behaviour, leading many to conclude that education is the major, if not the only tool with which one can address safety promotion issues¹⁶.

A widespread societal bias toward “individual accountability” approaches injury as a consequence of personal failure. This “victim blaming” approach^{6,16,17}, allows society to evade its collective responsibility for injury as a sociological phenomenon.

While it is true that an individual can exert some control over their behaviour and their immediate environment, it is also clear that they are not completely free agents. We may suffer injury as a consequence of the intentional or unintentional actions of others. We may suffer injury as a result of the physical environment in which we live, or the social environment in which we behave. Thus events culminating in injury can at times be outside an individual’s direct sphere of influence, and in this regard somewhat “unpredictable”. This results in a “fatalistic” attitude to injury, “bad things happen ” and, “it is not my fault because events were not under my control”^{6,16,17}.

The combination of society blaming the individual, and the individual blaming fate allows everyone to evade responsibility for injury. With no willingness to take personal or collective responsibility, there is no motivation for change and in the event action is taken, it may be misdirected. In reality, a balance between acknowledging personal responsibility and societal duty is required^{16,18}.

The Public Health Paradigm

The pioneering work of Gordon¹⁹, De Haven²⁰ and Haddon²¹ radically transformed how injury was conceptualised. Significant progress has been made by the application of principles from the sciences of epidemiology and bioengineering²¹.

Gordon^{19,21} hypothesised that epidemiological concepts of infectious disease could be generalised to an injury event, resulting from the interaction between a host (human), agent (hazard) and the environment^{19,21,22,23}. McGraven²⁶ and Barry²⁷ reasserted the strategic importance of taking a population (rather than an individual) approach to public health interventions and injury prevention.

William Haddon demonstrated the application of epidemiological principles to injury²¹, developing Haddon's Matrix^{21,24}. In its original form (Figure 2) it cross-tabulated a trichotomy of injury factors (human, vehicle, and environment) against time (pre-event, event, and post-event)²⁴. A key innovation was concept of an agent of injury^{21,22}, initially conceived to be the product or device that caused the injury. Gibson²⁵ refined the concept, proposing that the agent of injury is energy, and Haddon²¹ further developed this idea proposing the injury vector was the carrier (eg motor car, knife) of the agent (energy)^{21,23,27}. This epidemiological framework with its emphasis on the interactions between the host, the agent, the vector and the environment has since dominated thinking in injury prevention.

Figure 2. Haddon's Matrix for a Motor Vehicle Accident

	Human (host)	Vehicle (vector)	Environment
1. Pre-crash	<ul style="list-style-type: none"> • Fatigue • Alcohol use 	<ul style="list-style-type: none"> • Tire blowouts • Mechanical failures 	<ul style="list-style-type: none"> • Signs/signals • Policing
2. Crash	<ul style="list-style-type: none"> • Packaging of humans eg. seat belts 	<ul style="list-style-type: none"> • Crumple zones • Energy absorbing steering wheel 	<ul style="list-style-type: none"> • Trees, ditches, poles, bridges • Soft shoulders on roadside
3. Post-crash	<ul style="list-style-type: none"> • Haemorrhage 	<ul style="list-style-type: none"> • Cost of vehicle damage repair 	<ul style="list-style-type: none"> • Emergency telephones • Emergency response systems

The Bioengineering Paradigm

De Haven and Haddon championed a change in strategic focus away from accident prevention to harm minimisation through bioengineering modification to injury vectors and the environment²¹.

In 1942, Hugh de Haven²⁰ published his classic case-series of eight survivors from high falls (50-150 feet), concluding that energy from high force impacts can be effectively dissipated, thereby preventing significant injury. This key observation signalled the birth of the bioengineering paradigm of injury prevention. Engineering modification of the physical environment provided an excellent opportunity to minimize harm from an accident event. As de Haven later observed, “people knew more about protecting eggs in transit than they did about protecting heads”²⁰.

Haddon²⁸ contrasted passive engineering solutions which require no action on the part of the individual (eg automotive airbag) with active solutions which require co-operation of the individual requiring protection (eg seat belt). Active interventions are usually more difficult to maintain over extended periods of time²⁹. Calls for structural and environmental changes which avoided the need to modify people’s behaviour were frequently found in the literature^{23,30}. Legislation and enforcement were seen as major tools of social manipulation.

The System Paradigm

Harms-Ringdahl³¹ introduced the concept of Risk Analysis, which focused on addressing the inherent risks of a system, rather than focusing on an individual’s safety performance under abnormal conditions. A systems approach to safety promotion concentrates on the milieu in which individuals behave and attempts to strengthen system defences to avert errors or mitigate their effects. In this model, individuals are the inheritors rather than the instigators of an accident sequence³².

James Reason^{32,33} proposes the concept of an accident trajectory, where a critical alignment of pre-existing “upstream” of system weaknesses (latent failures) combine with local triggering factors and individual behaviour (active failures) to create an accident opportunity. Latent failures may be environmental, organisational or social, and often have their origin in decisions taken by designers, builders, procedure writers, managers and politicians. These system flaws may lie dormant for long periods, before they are unmasked by local triggering events. Active failures refer to the behaviour of individuals, often in response to a local triggering event, which create an immediate accident opportunity.

An injury event rarely occurs as a consequence of the isolated failure of an individual or system. Rather it is the combination of latent system weaknesses, triggering factors, and behavioural errors which conspire together to create an accident opportunity. While the active failure of individuals may be the last and most obvious link in this chain, it does not follow that this is the most strategic place to act. Indeed, individual behaviour is often the hardest part of the system to change^{21,24,28,32,33}. Identifying and rectifying latent weakness within the system has the potential to improve system defences, and thereby reduce harm to individuals.

The Active versus Passive Controversy

The relative merits of a bioengineering/systems approach versus behaviour modification have been an ongoing source of debate^{28,29}. There has recently been a re-emphasis of the importance of behavioural change as an injury prevention strategy. Tolsma³⁵ comments, “There seems to be a curious and unproductive debate in certain public health circles. Some advocate bioengineering approaches, others argue for educational approaches. The debate is pernicious because it rests on the false premise that we must choose between these strategies, as though they are mutually exclusive.”

Geilsen et al²³ observes that “virtually no change – in structure, design, or environment – is achievable without changing peoples’ behaviour”. Even an archetypal passive strategy (automotive airbags) requires the support of active strategies (wearing of seat belts) for maximum protection. Enactment of passive solutions often requires political advocacy for behavioural and cognitive change at an organisational, political and societal level. Sleet asserts the need for an “active approach to passive protection”^{23,36}.

There is a growing appreciation that behavioural and cognitive change is necessary at many levels within the system. While the target audience has traditionally been the host (the individual at personal risk within the system), it may be more strategic to target those with authority to control the structural determinants of system risk. Interestingly, those who hold this authority may carry little personal risk should the system fail. This, combined with the widespread belief in “individual accountability”, means they may be resistant to any proposal to reduce structural risk, particularly if there is a cost involved. Syme³⁷ observes that health behaviour change “is difficult and unlikely to be successful when many forces in the social, cultural and physical environment conspire against such change.”

The Sociological Paradigm

Recently, the importance of the social environment in the aetiology of injury has been re-emphasised^{6,38,39,40,41}. When John Snow removed the handle from the parish pump to control an epidemic of cholera in London, he was addressing a sociologically based structural determinant of illness¹⁰. There is a need for Public Health to rediscover the importance of the sociological determinants of disease.

McKinlay⁴² asserts “While still largely overlooked in epidemiological thinking, social system influences...may account for as much (if not more) of the variation in health and/or illness statistics as do environmental influences, or even the attributes and lifestyles of individuals.”

Despite this theoretical pre-eminence of the individual and their immediate physical environment, there is a lot of evidence that indicates social factors have profound influence on injury occurrence within a community.

Social indicators such as absolute income, income inequality, employment, educational attainment, social standing, social capital, political stability, and ethnicity have been shown to be important predictors of injury risk⁴⁰.

In Australia, studies have confirmed lower socio-economic status is associated with an increased risk of death, hospitalisation and emergency department presentations due to injury^{38,39}. Persons of lower socio-economic status were more likely to commit suicide, suffer death from homicide, or be injured through self-harm or assault. Those of higher socio-economic status were more likely to suffer sporting injuries, and in old age suffer significant injuries after a severe fall. Those in the mid-range socio-economic groups suffered higher rates of transport related injury.

In Queensland, the 1999 Report, “Health of Queenslanders – Status Report” identified socio-economic disadvantage, increasing rurality and Aboriginality are associated with increased risk of injury⁴³.

An Eclectic Approach to Safety Promotion

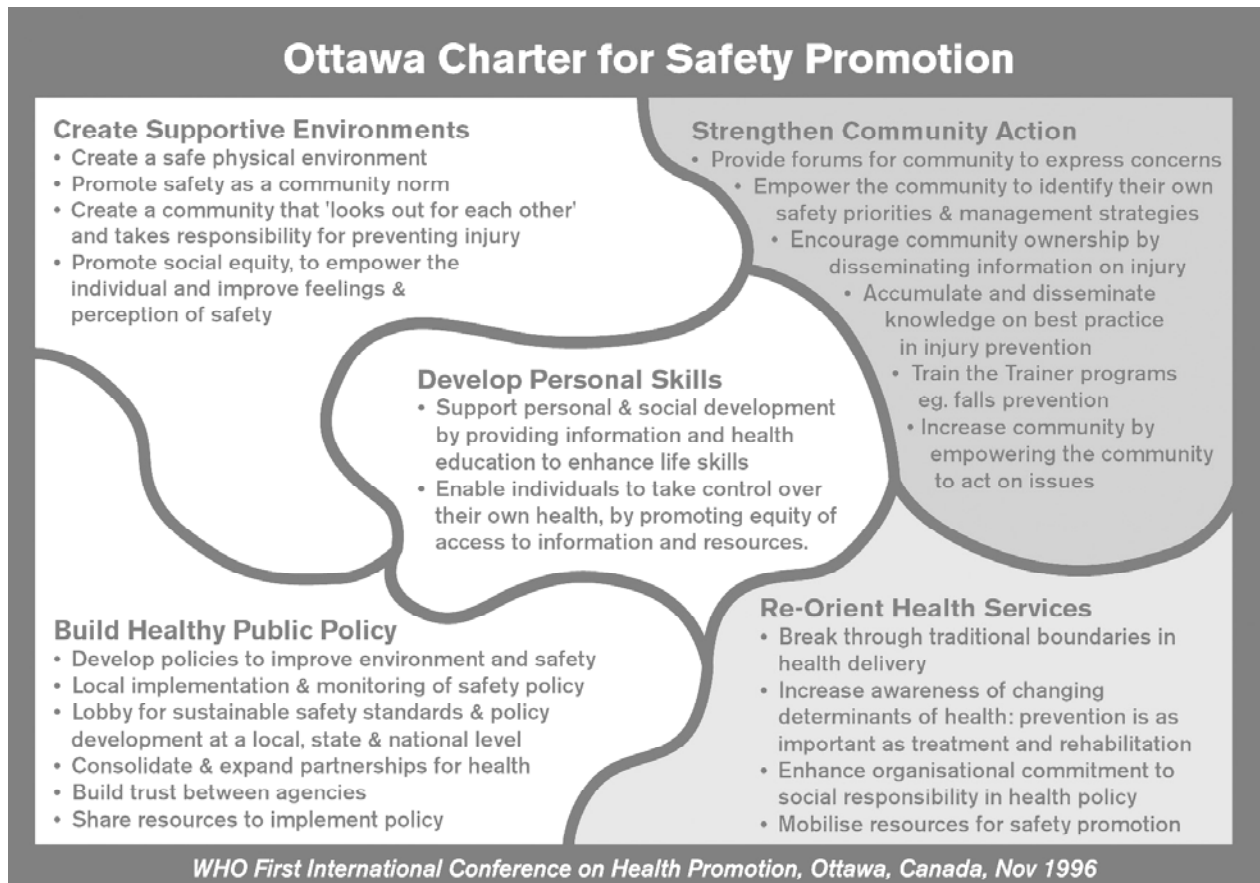
There is a need to be eclectic. Each injury paradigm has its own vocabulary and different ways of understanding reality⁶. Each can contribute to understanding, and different types of professional expertise are necessary to produce whole-of-system change. Within a problem driven context, all approaches are relevant within the confines of their theoretical framework. The challenge is to find the most strategic approach, or combination of approaches, with which to address the target issue^{29,44}.

Unfortunately, absence of a common cognitive thread between paradigms, may result in misunderstanding between professional groups and compromise the achievement of common goals⁶. There is an urgent need to synthesize key concepts from these different paradigms into a unified cognitive framework.

An Ecological Paradigm for Safety Promotion

In 1986, the First International Conference on Health Promotion held in Ottawa⁴⁵ re-emphasised the environmental and social determinants of health, redefining health promotion as the “process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social wellbeing, an individual or group must be able to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living.” The goal of Public Health is to address inequity and thereby, “reduce differences in health status and ensure equal opportunities and resources to enable all people to achieve their fullest potential.” This cannot be achieved within the health sector alone, but requires co-ordinated action by all concerned.

Figure 3. The Ottawa Charter: Five Action Areas for Safety Promotion



Focusing down on the detail of individual injury risk within a single cognitive framework leaves us less able to perceive the big picture. Despite the intense scientific scrutiny of individual risk of injury and the factors associated with this risk, it is almost impossible to predict when, if, or how a specific individual is likely to sustain an injury. The individual is, metaphorically speaking, only the “tip of the injury iceberg”. Like an iceberg, they may behave in unexpected ways if interpreted out of context.

By contrast, when we consider the rates of injury at a community level these trends become highly consistent and therefore predictable. Environmental and sociological determinants hidden “below the water line” impose significant constraints upon individual behaviour. Thus a population approach is often more enlightening and injury more effectively understood as an environmental and sociological phenomenon.

McMichael⁴⁶ observes “Modern epidemiology is thus orientated to explaining and quantifying the bobbing of corks on the surface waters, while largely disregarding the stronger undercurrents that determine where, on average the cluster of corks end up on the shoreline of risk.”

Park and Burgess first coined the term human ecology extrapolating the theoretical paradigm of plant and animal ecology to the study of human communities⁴⁷. Last⁴⁸ defines ecology as “the study of relationships among living organisms and their environment”, while human ecology refers to the “study of human groups as influenced by environmental factors, including social and behavioural factors.”^{47,48}

Green and Kreuter⁴⁷ propose a social ecological model of health promotion where health and safety are understood in the context of the whole ecological system (Figure 3).

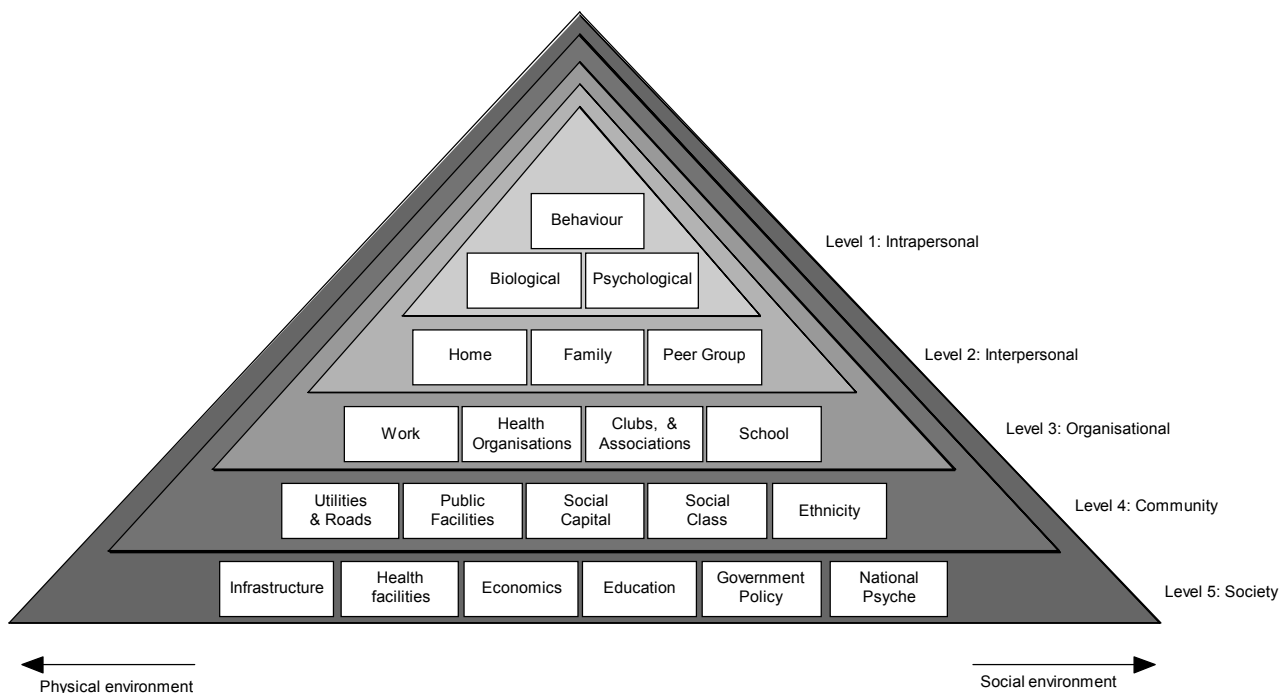
Three dimensions to this system can be identified^{29,44}:

1. The individual and their behaviour;
2. The physical environment; and
3. The sociological environment.

Each dimension can in turn be analysed across five levels^{17,44,49}:

1. Intrapersonal level;
2. Interpersonal level;
3. Organisational level;
4. Community level; and
5. Societal factors and public policy.

Figure 4. The Injury iceberg – An Ecological Model of Injury Causation



The *Intrapersonal level* is concerned with characteristics of the individual, their knowledge, skills, life experience, attitudes, and behaviours as they interface with the environment and society^{17,44}.

The *Interpersonal level* refers to the immediate physical environment and social networks in which an individual lives, their family, friends, peers and work mates^{17,44}.

The *Organizational level* refers to commercial organizations, social institutions, associations and clubs, which have formal (and informal) structure, rules and regulations operating in the pursuit of specific objectives, and to the physical environment and social networks contained within the direct control of these organizations^{17,44,49,50}.

A *Community* may be defined in both structural and functional terms^{17,44,47,49}. Structurally, a community can be defined within geographic or political boundaries. Functionally, a community may share demographic, cultural, ethnic or social characteristics such that its members “have a sense of identity and belonging, shared values, norms, communication and helping patterns.”⁵¹

Societies are larger systems, often defined along political boundaries, possessing the means to apportion resources and control the lives and development of their constituent communities^{17,44,49}.

Each level is embedded within an upstream level^{17,29}. This nested structure¹⁷ allows for influences vertically across levels or horizontally within levels⁴⁴. Upstream levels impose significant constraints upon levels embedded within them. Upstream interventions can therefore magnify the impact of a program, impact being a function of the effectiveness, reach and duration of the program⁵². Thus, a program of moderate effectiveness, which acts on the whole community (increased reach) may have a greater impact than more effective programs which can only reach a small segment of the community.

The social ecological paradigm emphasises the dynamic interface between the three dimensions - the individual, the physical environment and the social environment - acting at five levels - intrapersonal, interpersonal, organizational, community and societal. These impact on the individual maintaining them in their ecological context. Attempts to modify injury risk at one level in isolation (eg individual behaviour) will be resisted by the rest of the system, which will attempt to maintain its own internal stability (homeostasis).

It follows that to change the risk profile of the individual it is necessary to address the environmental and sociological issues “hidden beneath the water line” which determine individual behaviour. By modifying the risk profile of the whole system and thereby empowering behavioural change, interventions are more likely to be successful and outcomes sustained.

This ecological model provides a complex web of causation and creates a rich context for intervention. It can be used to map the key links in an accident sequence, identifying upstream “latent failures” along with the more obvious “active failures”. Breaking the chain at any point will reduce the risk of the accident sequence culminating in an injury. Identifying the most strategic links (leverage points) will ensure effective action. The model also accommodates the often overlooked, but extremely important, positive aspect of safety promotion - identifying and reinforcing the protective characteristics of the ecological system which minimise the occurrence and adverse effects of unsafe behaviours^{32,33}.

What are Safe Communities?

Safe Communities is a World Health Organisation (WHO) supported approach to injury prevention and safety promotion⁴¹.

The safe community model seeks to understand injury and intervene at a community level. By involving the community in finding its own solutions, it aims to be a catalyst for environmental, structural, sociological and political change that empowers the community, and ultimately individuals within the community, to change their environment and their behaviors to reduce the risk of injury and increase the perception of safety. It is therefore an ecological paradigm of injury causation and safety promotion.

Communities may apply for designation as a WHO Safe Community, through the WHO Collaborating Center for Community Safety Promotion (based at the Karolinska Institute in Stockholm, Sweden). Applications are assessed on 12 criteria⁵³ (Figure 5). However, the Safe Community approach is more a process than a program, and designation more a commitment to the ongoing process of becoming a Safe Community, than a statement of what the community has achieved at the time of designation.

WHO designated Safe Communities are demonstration communities which others can model when seeking to establish their own community safety program. There are currently 63 WHO formally designated Safe Communities, nine of these in Australia: four in New South Wales, three in Victoria and one each in South Australia and Western Australia.

Figure 5. WHO Criteria for Safe Communities⁴⁸

- | |
|---|
| <ol style="list-style-type: none">1. Formation of a cross sectoral group that is responsible for injury prevention.2. Involvement of the local community network.3. The program will address all ages, surroundings, and situations.4. The program will address the concerns of high-risk groups (such as children and the elderly), high risk environments and aim to ensure equity for vulnerable groups.5. The program should have a mechanism to document the frequency and causes of injuries.6. Program must be a long-term approach, not one of brief duration.7. The program evaluation should include indicators which show effects and provide information on the process as it advances.8. Each community will analyse its organisations and their potential for participation in the program.9. Participation of the health care community in both the registration of injuries and the injury prevention program is essential.10. Be prepared to involve all levels of the community in solving the injury problem.11. Disseminate information on the experience both nationally and internationally.12. Be willing to contribute to the overall network of "Safe Communities". |
|---|

Effectiveness of Safe Community Programs

Since its inception in Sweden the Safe Community approach has been internationally shown to be an effective means of reducing injury⁴¹.

The Falkoping Accident Prevention Program^{41,54} was the first evaluated community-based safety promotion program addressing all types of injuries, in all agents and all environments. An injury register was commenced in the city of Falkoping in 1978 followed by the intervention program the next year. After three years, total injuries had fallen by 23%, home injuries by 27%, occupational injuries by 28% and traffic injuries by 28%. Injury incidence was 113 reports per 1,000 prior to the commencement of the program in 1978, compared with 95 reports per 1,000 in 1983.

The program ceased in 1982. While the number of injuries treated in ambulatory setting remained stable, there was a rebound in injuries requiring hospital admissions, showing an increase of 8.7% for females and 4.9% for males compared with 2.3% for females and 0.5% for the rest of Sweden. The program was re-established in 1992.

In Australia, the Latrobe Valley Better Health Injury Prevention Program^{41,55} was a community based injury prevention program in regional south east Victoria (population of 75,000), targeting injuries in the home, sport and playground, and alcohol misuse in youth. Effectiveness of the program was monitored using a quasi-experimental design based on pre and post evaluation of five years of Emergency Department injury surveillance data collected in the Latrobe Valley. Age standardised Emergency Department presentation rate per 100,000 persons for all targeted injury fell from 6,594 in the first year of the program to 4,821 in the final year. There were significant reductions in home injuries, playground injuries, sporting injuries and in the number of assaults among 10-24 year olds. The direct program cost per injury prevented was \$272.

Mackay/Whitsunday Safe Communities Project

A community needs analysis conducted by the Mackay Division of General Practice in 1998 made the sentinel observation that age standardised hospital separation rates for injury and poisoning were high in the Mackay Region⁵⁶. A subsequent review by the Tropical Public Health Unit of Queensland Health confirmed that age standardised injury separation rates were more than double those observed for other Queenslanders⁵⁷.

The Mackay Injury Surveillance Network was established in 1998 as part of the Queensland Injury Surveillance Unit's Emergency Department injury surveillance network⁵⁸. This network has confirmed that Emergency Department injury presentations in the Mackay Region occur at double the rate observed in South Brisbane⁵⁸.

The Mackay/Whitsunday Safe Communities Project was launched in February 2000 in response to the excessive rates of injury observed in the region⁵⁷. The WHO Safe Communities Model was considered to be the most strategic approach to the injury problem in the region. The project aims to co-ordinate a systematic, inter-sectorial, sustained response to injury within the region^{57,59}. It seeks to build the Mackay/Whitsunday community's

capacity to address its injury problem from within its own resources, strengthening the resilience of the community system against harm through injury and creating an environment that empowers individuals to behave safely.

Conclusions

The pervasive ideology of individualism has colonised public health science, which has taken for granted a reductionist view that the individual is the basic unit of investigation. Even bioengineering with its emphasis on the interface between an individual and their environment has seen the individual as a pre-eminent source of system failure. This reinforces a societal bias of “individual accountability” allowing society to evade its collective responsibility for injury.

There has recently been a rediscovery of the need to view the individual as just one part of a system. Any attempt to understand an individual in isolation from their physical and social environment is only seeing the “tip of the injury iceberg”.

The social ecological paradigm of safety promotion emphasises the dynamic interface between three dimensions: the individual, the physical environment and the social environment. These act at five levels: intrapersonal, interpersonal, organizational, community and societal. Attempts to modify individual risk in isolation will be resisted by the system, which will try to maintain its own internal homeostasis. It follows that the most effective way to reduce an individual’s risk profile is to systematically address the environmental and sociological issues “hidden beneath the water line”, thereby modifying the risk profile of the whole system.

This paradigm provides a complex web of causation, creating a rich milieu for intervention. Looking for the most effective leverage points within the system reduces complexity and ensures strategic action. Lomas¹⁴ observes, “This is not ‘new public health’, it is a return to the ‘old public health’ of John Snow that recognised social systems as integral to public health”.

The Mackay/Whitsunday Safe Communities Project aims to understand injury and intervene at a community level. By involving key community stakeholders in finding their own solutions, it hopes to be a catalyst for structural, sociological and political change that empowers the community, and ultimately the individuals within the community, to change their environment and their behaviour to reduce the risk of injury and increase the perception of safety.

References

1. Coombes P. Cultural Development: Collaborative Benchmarking, The Australian Local Government Association and the Australian Council for the Arts, September 1997.
2. Maslow A.H. *Toward a psychology of being* (2nd ed.) Van Nostrand, New York, 1968.
3. Bootzin R.R., Bower G.H., Zajonc R.B., Hall E. *Psychology Today: An introduction* (2nd ed.), Random House, New York, 1986.
4. United Nations Development Program, Human Development Report 1994: New Dimensions in Human Development, <http://www.undp.org/hdro/94.htm>
5. Queensland Government, Budget Paper No. 6 – Budget Highlights, 2000-2001, Queensland Government 2000.
6. Maurice P., Lavoie M., Charron R.L., Chapdelaine A., Bonneau H.B., Svanstrom L., Laflamme L., Andersson R., Romer C. *Safety and Safety Promotion: Conceptual and Operational Aspects*, WHO Collaborating Centre on Community Safety Promotion, 1998.
7. Forde D.R. Perceived Crime, Fear of Crime and Walking Alone at Night. *Psychological Reports*, 1993, 73(2), 403-407.
8. Carter A., Muller R. Non –Fatal Injury Presentations to the Mackay Base Hospital Emergency Department 1998-2000, School of Public Health and Tropical Medicine, James Cook University, 2002.
9. Carter A., Muller R. Practices, Knowledge and Perceptions Towards Accident and Injury in the Mackay/Whitsunday Community, School of Public Health and Tropical Medicine, James Cook University, 2002.
10. Lomas J. Social Capital and Health: Implications for Public Health and Epidemiology, *Soc Sci Med*, 47(9), 1181-1188.
11. Engel G. The need for a new medical model: A challenge for biomedicine, *Science*, 196, 129-136.
12. White K. The Social Origins of Illness and the Development of the Sociology of Health, In Girbich C (ed), *Health in Australia: Sociological Concepts and Issues*, Prentice Hall, Sydney, 1996, 37-54.
12. Chu C. Integrating Health and Environment: The Key to Ecological Public Health, in Chu C, Simpson R. (eds). *Ecological Public Health: From Vision to Practice*, Institute of Applied Environmental Research, Brisbane, 1994.
13. *Health Promotion, Then and now: Reflections on a Quarter Century of Change*, Health Promotion, Canada, 1987, Fall issue.
14. Kickbusch I. “Good Planets are Hard to Find” – Approaches to an Ecological Base for Public Health” in Brown. V Ed, *A Sustainable Healthy Future: Toward an Ecology of Health*, LaTrobe Uni & Commission for the Future, 1989, 7-30.
16. Fawcett S. B. Some Values Guiding Community Research and Action, *J Appl Beh Anal*, 1991, 24, 621-636.
17. McLeroy K.R., Bibeau D., Steckler A., Glanz K. An Ecological Perspective on Health Promotion Programs, *Health Education Quarterly*, 1988, 15(4), 351-377.
18. Winkler R. Rights and Duty: The need for a social model. In King N., Remenyi A. *Health care: A behavioural approach*, Grune & Stratton, Sydney, 1986.
19. Gordon J.E., The Epidemiology of Accidents, *Am J Public Health*, 1949, 39, 504-515.
20. De Haven, Hugh. Mechanical analysis of survival in falls from heights of fifty to one hundred and fifty feet, *Inj Prev*, 2000, 6, 62-68.
21. Haddon William, Jr., *Advances in the Epidemiology of injuries as a Basis for Public Policy*, *Public Health Reports*, 1980, 95:5, 411-421.
22. Andersson R., *Injury to Causation, Injury Prevention and Safety Promotion – Definitions and Related Analytical Frameworks*, in Laflamme L., Svanstrom L., Schlep L., (eds), *Safety promotion Research*, Karolinska Institute, Stockholm, 1999.
23. Gielen A.C., Girasek D.C. *Integrating Perspectives on the Prevention of Unintentional Injuries*, in Schneiderman N., Speers M.A., Silva J.M., Tomes H., Gentry J.H. (eds). *Integrating Behavioural and Social Sciences with Public Health*, American Psychological Association, Washington, 2000.
24. Haddon William, Jr. A Logical Framework for Categorizing Highway Safety Phenomena and Activity. *J Trauma*, 1972, 12:8; 8-11.
25. Gibson J.J. The contribution of experimental psychology to the formulation of the problem of safety – a brief for basic research, In Association for the Aid of Crippled Children, *Behavioural Approaches to Accident Research*, 1961.
26. McGavran, E. G., The Community as the patient of public health, *Tex State Med J*. 1958, 54:719-723.
27. Barry P.Z., Individual vs community orientation in the prevention of injuries, *Prev Med*, 1975, 4:47-56.
28. Haddon W, Strategy in preventive medicine: passive vs active approaches to reducing human wastage. *J Trauma*, 1974, 14, 353-354.

29. Stokols D. Translating Social Ecological Theory into Guidelines for Community Health Promotion, *Am J Health Promotion*, 1996 10(4), 282-298.
30. Somers R.L. Injury Prevention, in Baum F Ed, *Health for All: The South Australian Experience*, South Australian Community Health Research Unit, 1995, Wakefield Press, Adelaide.
31. Harms-Ringdahl L. *Safety Analysis – Principles and Practice in Occupational Safety*. Elsevier Applied Science, London, 1993.
32. Reason, J. Understanding adverse events: human factors, *Quarterly in Health Care*, 1995, 4, 80-89.
33. Reason, J. Human error: models and management, *BMJ*, 2000, 320, 768-770.
34. Johnston I.R. Traffic safety education: Panacea, prophylactic or placebo? *World Journal of Surgery*, 1992, 16, 374-378.
35. Tolsma D.D. Health promotion approaches to occupant protection: An epidemiological framework. *Health Education Quarterly*, 1984, 11, 133-144.
36. Sleet D.A. Introduction to occupant protection and health promotion, *Health Education Quarterly*, 1984, 11, 109-111.
37. Syme S.L. Social Determinants of Disease, in Last J.M., Wallace R.B., (Ed's) *Public Health and Preventative Medicine*, Appleton & Lange, Norwalk CT, 1992, p 687-700.
38. Stokes, M., Ashby, K., Clapperston, A. The effect of socio-economic status on injury among Victoria. *Hazard*, 2002, 49, 1-20.
39. Modie, R. Reducing health inequalities: challenges to promoting health and preventing injury, *Hazard*, 2002, 49, 1-20.
40. Laflamme L. *Social Differences in Injury Risk. Knowledge accumulated and Strategies for the Future*, National Institute of Public Health, Stockholm, 1998.
41. Svanstrom L. *Evidence-based Injury Prevention and Safety Promotion – A Review of Concepts and Studies*, Karolinska Institutet, Department of Public Health Sciences, May 1999.
42. McKinlay J.B. *Bringing the Social System back in: An Essay on the Epidemiological imagination*, New England Research Institute, Boston, 1995.
43. Health Information Network, *Health of Queenslanders – status report*, Queensland Health, 1999.
44. Bartholomew L.K., Parcel G.S., Kok G., Gottlieb N.H. *Intervention Mapping: Designing Theory and Evidence-based Health Promotion Programs*, Mayfield Publishing Company, Mountain View, California, 2001.
45. World Health Organization. *Ottawa Charter for Health Promotion*, Ottawa, Canada, Nov 1986, <http://www.who.dk/policy/ottawa.htm>
46. McMichael A.J. The Health of persons, populations and planets: epidemiology comes full circle. *Epidemiology*, 1995, 6, 633-636.
47. Green L.W., Kreuter M.W. *Health Promotion Planning: An Educational and Ecological Approach*, 3rd Ed, Mayfield Publishing Company, Mountain View California, 1999.
48. Last J.M., *A Dictionary of Epidemiology* 3rd Ed. Oxford University Press, Oxford, 1995, p 45.
49. Richard L., Potvin L., Kishchuk N., Prlic H., Green L.W. Assessment of the integration of the ecological approach in health promotion programs, *American Journal of Health Promotion*, 1996, 10(4), 318-328.
50. Billings J. R. Community Development: a critical review of approaches to evaluation, *J of Advanced Nursing*, 2000, 31(2), 472-480.
51. Israel B.A. Social Networks and Social Support: Implications for natural helper and community level interventions, *Health Education Quarterly*, 1985, 12, 65-80.
52. Hawe P. Noort M., King L., Jordens C. Multiplying Health gains: the Critical Role of Capacity Building within Health Promotion Programs, *Health Policy*, 1997, 39, 29-42.
53. Sundstrom M., Svanstrom L. *Criteria for the Safe Community Network*, WHO Collaborating Centre on Community Safety Promotion, Karolinska Institute, Sweden, 1998.
54. Schlep L. Community intervention and changes in accident pattern in rural a Swedish municipality. *Health Promotion*, 1987, 2, 109-125.
55. Day L.M., Ozane-Smith J., Cassel E., McGrath A. *Latrobe Valley Better Health: Evaluation of the Injury prevention program 1992-1996*. Monash University Accident Research Centre Report No 114. July 1997.
56. Azzopardi D., McIntosh J., Cartmel G., Goodall S.M. *Community Needs Analysis 1998*, Mackay Division of General Practice, 1998.
57. Vardon P., Hanson D.W., Muller R., Miles E. *Safe Communities – an approach to Injury Prevention*, *Injury Bulletin*, Queensland Injury Surveillance Unit, 2000, 63, 1-4.

58. Hanson D.W., Hockey R., Miles E., Muller R., Pitt W. Collection of NDS-IS level 2 Injury Surveillance Data in Regional Queensland, School of Public Health and Tropical Medicine, James Cook University, 2002.
59. Hanson D.W., Vardon P., Lloyd J., Becoming Queensland's First Safe Community: Considering sustainability from the outset, School of Public Health and Tropical Medicine, James Cook University, 2002.