CHAPTER ONE
INTRODUCTION

There is a growing realization that one of the biggest challenges for contemporary governments is resolving highly complex and intractable social problems, such as poverty, unemployment, homelessness, drug abuse, and social dislocation that continue to plague many communities despite concerted efforts. These "messy problems" or "wicked issues" present a special challenge to government because they defy precise definition, cut across policy and service areas, and resist solutions offered by the single-agency or "silo" approach (Keast et al, 2004, p 363).

1.1. IDENTIFYING THE LOCAL ISSUE

In 1998 the Mackay Division of General Practice conducted a community needs analysis which identified that age standardised hospital separation[1] rates for injury and poisoning in the 1995/96 financial year were high in the Mackay Region (Azzopardi et al., 1998). This sentinel finding prompted a review of age standardised injury hospital separations in Mackay from 1993 until 2000 and Emergency Department (ED) injury presentations from 1997 to 2000 which suggested that rates of injury in Mackay were double the Queensland average (Vardon, et al., 2000; Hanson, et al., 2002a). This increased risk of injury appeared to involve all age groups and types of injury (Carter and Müller, 2002a). To reduce this global increase in injury risk it was necessary to design a comprehensive safety promotion strategy that addressed multiple injury issues simultaneously (Coggan and Bennett, 2004; Moller, 2004). It would involve collecting, analysing and interpreting injury surveillance data from the region, using this data to set priorities, designing effective safety promotion programs to address these issues, and then mobilising sufficient expertise and resources to implement these programs (McClure et al., 2004).

[1] As hospital admissions are formally counted and coded when the patient is discharged they are technically described as "hospital separations".

1.2. IDENTIFYING THE ESSENTIAL PROBLEM

These sentinel studies had identified a population health problem. The Mackay population as a whole appeared to experience an increased incidence of injury. There is ongoing controversy regarding the key determinants of population health and, by implication, how population health problems can be strategically addressed.

Rose (1985) draws a critical distinction between “sick individuals and sick populations”. The tools of modern epidemiology most often adopt a case oriented approach, “Why did this patient get this disease at this time?” Rose argues there is another equally important question, “Why does this population have a high incidence of disease at this time?” Failure to draw a clear distinction between the causes of individual cases and population incidence has been the source of ongoing confusion. Known as the “ecological fallacy”, it is a failure to appreciate that an association between variables observed at a population level does not imply a similar association at an individual level and vice versa (Last, 1995). The two different levels of analysis require different kinds of investigation and do not necessarily provide the same answer even when studying the same health issue (Keys, 1962; Rose, 1985).

Arguably this ongoing confusion is the predictable outcome of a polarised discourse regarding the determinants of health. Modern biomedicine with its reductionist epistemology attempts to explain the health of population in terms of the health of individuals (Engel, 1977; McMichael, 2001; Schneiderman and Speers, 2001). By identifying and targeting at risk individuals, it is argued that the health of the population can be improved. However, in the post-modern era (Abercrombie et al., 1994) the pre-eminence enjoyed by the biomedical paradigm has increasingly been challenged. Proponents for a “New Public Health” (Ashton and Seymore, 1988; McPherson, 1992) and “Population Health” (Dunn and Hayes, 1999; Friedman, 2003; Szreter, 2003) argue the need for a more wholistic approach that ascribes equal importance to individual, social and environmental determinants of health.

This is not just an academic debate, but one of central importance to the design of any intervention targeting a population health problem. If the problem is essentially one of at risk individuals, investigative techniques and interventions must target the individual. In contrast if the problem is one of an at risk population, investigative techniques and interventions must target the social and physical environment in which people live and work. To plan an appropriate response to the excess injury risk experienced by the people of Mackay it was necessary to reach an understanding of what the underlying determinants of this problem might be so that the appropriate investigative and management techniques could be employed to target the strategic issues.

Historical approaches to population health were reviewed to identify the most strategic response to the Mackay problem.

1.3. THE PRE-MODERN ERA: A FATALIST ECOLOGICAL PERSPECTIVE.

The pre-modern era viewed disease and injury from a fatalistic ecological perspective. Helpless against the onslaught of war, plague, pestilence, famine and disaster, man was at the mercy of the forces of nature and subject to the whims of “the gods” (McMichael, 2001). Injury, in particular, was perceived to be the result of an accident, “an unfortunate event that is without apparent cause” (Moore, 1997, p8).

1.4. THE MODERN ERA: THE ENLIGHTENMENT AND THE GENESIS OF EMPIRICAL SCIENCE

The enlightenment brought the advent of empiricist science and a shift away from ecological dependency towards a reductionist positivist approach to disease (Schneiderman and Speers, 2001). René Descartes (1640) advocated a mechanistic approach. Humans were likened to a machine that could be understood by systematically investigating the function of their component parts.

> *“And so that the reader will have from the beginning a general notion of the whole machine which I have to describe, I shall say here that it is the heat of the heart which is … the mainspring and origin of all the movements of the body; and that the veins are the pipes which*

> *carry the blood from all parts of the body towards the heart, where it serves as nourishment"* (Descartes, 1640, p226-7).

Importantly, Descartes also argued the separation of mind and body, thought and matter:

> *"The knowledge that 'I think therefore I am' is the first and most certain of all items of knowledge which anyone will arrive at if they philosophise in the right order. This is also the best approach for understanding the nature of mind, and its distinction from body" (Descartes, 1644, Principles 1.7 and 1.8.).*

Descartes' philosophical thinking laid the conceptual foundation of the modern biomedical paradigm (Engel, 1977) in which thought, emotions and social interaction are separate from bodily processes. Disease could be explained in terms of physical processes that could be understood and manipulated by modern scientific investigation (Schneiderman and Speers, 2001).

1.5. THE INDUSTRIAL REVOLUTION: ECOLOGICAL PUBLIC HEALTH AND SOCIAL REFORM

Scientific positivism fostered increasing confidence in man's ability to understand and control his environment. This provided fertile soil for the development of the "social hygiene" movement in the 19th century (McMichael, 2001; Szreter, 2003).

The industrial revolution precipitated massive population shifts away from the country into the burgeoning cities in early 19th century Europe. Living conditions in the industrialised cities of Europe were appalling, especially in England (McMichael, 2001; Szreter, 2003). The link between living conditions and poor health was widely recognised. The utilitarian Edwin Chadwick drove social reform in Britain. Appalled at the living conditions of the working class which rendered them unhealthy, impoverished and a financial burden on society, he championed the landmark Public Health Act of 1848 that sought to ensure the supply of clean water to Britain's increasingly urban society (Szreter, 2003).

The public health movement of the 19th century promulgated a radical new idea that survives to this day - the health of populations can be protected by attacking disease and poverty at the population level and, most importantly, governments

have some responsibility for maintaining community health (O'Connor and Parker, 1995).

1.6. GERM THEORY, INDIVIDUALISM AND BIOMEDICINE

Late in the 19th century, a radical new theory of disease causation gained credence that shifted scientific attention away from the social environment towards the individual and their immediate biological environment. The last two decades of the 19th century saw an explosion of scientific discoveries by Koch, Pasteur, Jenner and others, which resulted in the positive identification of a plethora of micro-organisms with a clear causal link to disease (McMichael, 2001). The idea that environmental contextual factors, whether natural, man-made or social, could impact on the health of whole populations (ecological public health) was eclipsed by a reductionist biomedical paradigm with its focus on the individual and their immediate biological and biochemical environment.

> *The empirical power and specificity of the germ theory dominated ideas about health and disease in the early twentieth century. Individuals got infected by agent X and duly contracted disease Y. That theory brought a type of simple determinism which … helped spawn the century long dominance of the so called biomedical model, with its emphasis on the specificity of agent and effect (McMichael, 2001, p319).*

The advent of effective clinical treatments in the 20th century meant clinical therapeutics assumed precedence over disease prevention. Physicians and the general public alike came to believe that the health of populations could be ensured by effective health systems delivering best clinical practice to the population (McKinlay and McKinlay, 1977; McKeown, 1979; Matzen and Lang, 1993; McMichael, 2001).

1.7. FROM ACCIDENT PREVENTION TO INJURY PREVENTION

In the 20th century, the science of injury prevention followed a similar shift away from ecological fatalism toward biomechanical determinism. In 1942 De Haven (2000) published his classic case series of eight survivors from high falls (50-150 feet), concluding that energy from high force impacts could be dissipated,

thereby preventing serious injury. This key observation precipitated the birth of the bioengineering paradigm of injury prevention.

Gordon (1949) hypothesised that the epidemiological concepts of infectious disease could be generalised to an injury event, which resulted from the interaction between host (human), agent (hazard) and the environment. Gibson (1961) refined the concept, proposing that the agent of injury was energy. Haddon (1963, 1980) further developed this idea, proposing that the injury vector (for example, a motor car) was the carrier of the agent (energy). Haddon demonstrated the application of this epidemiological framework, developing Haddon's Matrix (Haddon, 1972 & 1980).

Haddon precipitated a major paradigm shift from accident prevention to injury prevention. Injury was defined as "any unintentional or intentional damage to the body resulting from acute exposure to thermal, mechanical, electrical, or chemical energy or from the absence of such essentials as heat or oxygen" (NCIPC, 1989, p. 4). By preventing, or dissipating the adverse release of energy, it was thought possible to minimise the chance of injury without necessarily preventing the accident. Descartes' separation of the physical from the psychosocial is striking in this definition. The possibility that an individual's behaviour or social situation may place them in an environment where energy was likely to be released, was neither acknowledged or addressed in this definition. Practice reflected the epistemology**:**

> *On the whole, effective countermeasures are those that do not require any action by individuals intended to be protected by them. This principle first articulated in the 1960s but recognised to have particular resonance for the practice of injury prevention focuses on the extent to which an intervention is 'built into the environment', having an effect regardless of human activation. (Stevenson et al., 2004, p37)*

"Passive" interventions - those that require no action by the individual being protected (for example, occupant protection zones used in modern automotive engineering) were preferred over "active" interventions - those that required an active behavioural response (for example, buckling a seatbelt).

This deterministic biomechanical approach to injury prevention was extremely successful in the second half of the 20th century, especially in the field of road trauma (ATSB, 2004). Substantial advances were made through engineering innovations, better car design (impact absorption, occupant protection, shatter proof windscreens), protective equipment (seat belts, air bags) and better road design.

1.8. THE POSTMODERN ERA: PUBLIC HEALTH TURNS FULL CIRCLE, A RETURN TO ECOLOGICAL CONSTRUCTS OF HEALTH

The late 20th century saw the advent of postmodernism and an increasing scepticism about the benefits of modern scientific "progress" (Baum, 1998). While reductionist science, industrialism, free market economics and interventionist government had delivered social benefits, there was growing evidence of unexpected costs (McMichael, 2001). The adverse environmental effects of unchecked industrialism and population growth meant that for a whole generation it was conceivable that mankind would either destroy itself or, just as disastrously, outstrip the carrying capacity of the earth (Wright, 2004). It was necessary to take a more wholistic, ecological view of society and the environment, in which all components of the ecological environment were seen as important, interrelated and mutually dependant (Ackoff, 1974; Harmon and Mayer, 1986).

In the health domain, the benefits of rapid decline in infectious disease had been outstripped by an equally rapid increase in the incidence of "lifestyle diseases" (McKinlay and McKinlay, 1977; James, 2002). These diseases, characterised by a "complex aetiology and multifactorial causation" (AIHW, 2000), were unlikely to be solved by a single reductionist "magic bullet" approach (Doyle, 2001). Causal models become an increasingly complex tapestry of genetic predisposition, biochemical mediators and physiology, unmasked by individual lifestyle factors.

At the same time the perceived association between reduced mortality and morbidity in developed nations and clinical biomedicine was increasingly being challenged. In the 1940's Morris and Titmuss demonstrated that the incidence of

juvenile arthritis, rheumatic heart disease and peptic ulcer were related to social conditions (Morris and Titmuss, 1942, 1944a; 1944b; Oakley, 1991). In 1979 McKeown conducted a review of the changing patterns of mortality and morbidity in England and Wales during the 19th and 20th centuries concluding that:

> *the improvement of health during the past three centuries was essentially due to the provision of food, protection from hazards, and limitations of numbers (McKeown, 1979, p197).*

The limitations of clinical preventative medicine and lifestyle behavioural approaches were becoming increasingly apparent. Public health researchers and practitioners renewed their interest in the contextual determinants of health and behaviour at a population level. Kickbusch argued:

> *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. It has individualised cultural patterns by concentrating on disease categories and risk factor causation principles (Kickbusch, 1989, p266).*

In 1986, the First International Conference on Health Promotion held in Ottawa gave expression to these ideas (WHO, 1986). The Ottawa Charter redefined health promotion as "the process of enabling people to increase control over, and to improve their health" and identified five important domains of activity:

- develop healthy public policy,
- create supportive environments,
- strengthen community action,
- develop personal skills,
- reorient health services.

In this new system of practice, behavioural change, "the development of personal skills", was only one of five domains of activity. Syme and Balfour (1998) observe:

> *It is difficult to expect that people will change their behaviour easily when many forces in the social, cultural and physical environment conspire against such change. If successful behaviour modification programs are to be developed to prevent disease, more attention will need to be given not only to the behaviour and risk profiles of individuals, but also to the environmental context in which people live (Syme and Balfour, 1998, p796).*

If healthy behaviours were to be effectively promoted, these behaviours needed to be firmly grounded in supportive social and physical environments. Healthier choices had to become easier choices (Milio, 1987).

Increasing concern over mankind's adverse impact on the natural environment suggested that environmental degradation could of itself become a serious challenge to public health (WCED, 1987; Brown et al., 1992; Wright, 2004). As a result, a discourse on ecological health promotion, which articulated the need to think about the health of populations and individuals in the terms of their social and environmental context, while emphasising the need to maintain a healthy environment for current and future generations, became popular.

If the Ottawa Charter was the public expression of this "New Public Health" (Ashton and Seymore, 1988; Holman, 1992; McPherson, 1992), the WHO Healthy Cities program (Ashton, 1992) and later the WHO Safe Communities Program (Welander et al., 2004; Spinks et al., 2005) were its practical expression. Here populations (i.e. cities or communities) were the locus of public health planning, rather than individuals.

1.9. FROM INJURY PREVENTION TO SAFETY PROMOTION

Similarly, the simple biomechanical determinism of modern injury prevention, was increasingly challenged in the late 20th century (Sleet, 1984; Tolsma, 1984, Johnston, 1992; Bonnie et al., 1999; Gielen and Girasek, 2001; Gielen and Sleet, 2006). There was increasing evidence that behavioural, social and economic

factors had a profound impact on the occurrence of injury. (Bonnie et al., 1999; Laflamme, 2001; Petridou and Tursz, 2001; Stokes et al., 2002; Gielen and Sleet, 2006).

Even archetypal "passive" interventions needed to be reinforced by an "active" behavioural response to achieve their full safety potential. Child resistant caps on medication had to be replaced after use. Smoke alarm batteries needed to be changed. Swimming pool fences had to be maintained (Gielen and Sleet 2006; Cunningham et al., 2002). Finally and most importantly, enactment of "passive" solutions required a behavioural response from politicians, bureaucrats and manufacturers, who needed to support these innovations. Sleet (1984) asserted the need for an "active approach to passive protection".

During the second half of the 20th century an important parallel discourse on injury causation was developing outside public health. In 1943 psychologists from the US Army Air Force invented "Critical Incident Analysis" (Flanagan, 1954). In this system analysis model, injury is the predictable outcome of a sequence of predisposing and precipitating environmental determinants that create an injury opportunity. James Reason (1995, 2000) called this an "accident trajectory" in which a critical alignment of pre-existing "upstream" system weaknesses (latent failures), combined with a local "triggering event" and individual behavioural failures (active failures) to create an accident opportunity. In this model, latent failures could be environmental, organisational or social, and usually had their origin in decisions taken by designers, builders, managers and politicians. These system flaws lay dormant for long periods, before they were unmasked by local triggering events. Humans could abort the accident trajectory by detecting the potential hazard and responding in ways that overcame the immediate risk, or reinforced the accident trajectory by counter-productive (active failure) behaviours that increased the chance of an injury event. In this model, individuals were the inheritors rather than the instigators of the accident trajectory.

To focus solely on the biomedical concept of *"injury prevention"* is to underestimate the wholistic nature of human experience, and consequently how the positive state of *"safety"* is achieved. Maurice et al. (2001) defined 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 (Maurice et al., 2001, p. 237).*

It was as much concerned with the subjective dimension – the perception of safety, as it was with the objective dimension – the absence of injury; as much concerned with the community in which individuals reside, as it was with the individuals that make up the community. Safety was thus a psychological, sociological and environmental phenomenon, rather than just a physiological phenomenon.

1.10. THE NEW MILLENNIUM: COMING TO TERMS WITH COMPLEXITY

The key insight of the ecological paradigm was that the health and safety of individuals must be understood and promoted in the context of their physical, natural and social environment. However, there was potential danger in this wholistic way of thinking. Green and Kreuter (1999) warn:

> *If the ecological credo that everything influences everything else is carried to its logical extreme, the average health practitioner has good reason to do nothing, because the potential influence of or consequences on other parts of the ecological system lie beyond comprehension, much less control (Green and Kreuter, 1999, p25)*

Ackoff (1974, p 21) observed that "no problem ever exists in complete isolation" and coined the term "messy problems" to describe a system of complex interrelated problems (Ackoff, 1974, Chisholm, 1996; Hill, 2002; Keast, 2004).

> *In the machine age messy problematic situations were approached analytically. They were broken down into simpler discrete problems that were often believed to be capable of being solved independently of one another. We are learning that such a procedure not only usually fails to solve the individual problems that are involved, but often intensifies the mess. The solution to a mess can seldom be obtained by independently solving each of the problems of which it is composed (Ackoff, 1974, p21).*

Rittel and Webber (1973) independently coined the term “wicked problems” to describe the same idea.

> *“We are calling them ‘wicked’ not because these properties are themselves ethically deplorable. We use the term ‘wicked’ in a meaning akin to that of ‘malignant’ (in contrast to ‘benign’) … or ‘tricky’ (like a leprechaun) or ‘aggressive’ (like a lion). (Rittel and Webber, 1973, p160).*

The tools of modern science struggle to address “wicked issues” because the problem itself defies clear scientific definition. The importance ascribed to the different sub-components of the problem is more a matter of perspective than knowledge and it is frequently unclear where the causal chain begins or ends. Rittel and Webber (1973, p159) suggest that ”one of the most intractable problems is defining the problem”. Overly simplistic solutions may unleash a chain of secondary and tertiary effects that may either compound the original problem or create a totally new problem.

Ackoff (1974) and Rittel and Webber (1973) precipitated an important discourse in governance and organisational literature regarding the importance of complex “messy problems” and “wicked issues” to contemporary society (Harmon and Mayer, 1986; Chisholm, 1996; Clarke and Stewart, 1997; O’Toole, 1997; Agranoff and McGuire, 2001; Keast et al., 2004). This core idea has profound implications for the ecological practice of public health. The complex nature of modern population health problems may render them resistant to investigation and management using modern reductionist scientific techniques (Kickert et al., 1997; McMichael, 2001; Lasker and Weiss 2003; Lewis, 2005).

> *At a practical level, many of the problems that affect the health and well-being of people in communities – such as substance abuse, poverty, environmental hazards, obesity, inadequate access to care, and terrorism – cannot be solved by any person, organisation, or sector working alone. These problems are complex and interrelated, defying easy answers (Lasker, 2003, p14).*

A new approach is required.

1.11. PARTNERSHIPS, COLLABORATIONS AND NETWORKS: THE THEORETICAL IMPERATIVE

Contemporary literature on societal governance and public health argues that the complex nature of social problems has profound implications for the way in which they should be addressed (Rittel and Webber, 1973; Clarke and Stewart, 1997; Jones et al., 1997; O'Toole, 1997, Agranoff and McGuire, 2001; Hill, 2002; Mandell and Steelman, 2003; Keast et al., 2004). The complex, dynamic, multi-causal, multi-level, multi-sectoral nature of contemporary problems mean they are resistant to interventions designed by any one profession or government agency (Rittel and Webber, 1973; Clarke and Stewart, 1997; Kickert et al., 1997; O'Toole, 1997). Keast et al. (2004) comment:

> *There is a growing realization that one of the biggest challenges for contemporary governments centres on resolving highly complex and intractable social problems, … These 'messy problems" or "wicked issues" present a special challenge to government because they defy precise definition, cut across policy and service areas, and resist solutions offered by the single-agency or "silo" approach (Keast et al., p 363).*

It has been proposed that partnerships, collaborations and networks are better suited to this sort of operational environment. They are more innovative, more responsive and better positioned to rapidly generate comprehensive solutions than mono organisational "silo" approaches (Lasker et al., 2001; Agranoff and McGuire, 2001; Keast et al., 2004). O'Toole and Montjoy (1984) observe:

> *Converting policy intention into action requires that those charged with execution cooperate toward the achievement of policy. … Implementation is essentially a problem of cooperation (O'Toole and Montjoy, 1984, p 492).*

1.12. PARTNERSHIPS, COLLABORATIONS AND NETWORKS: THE POLITICAL AND ECONOMIC IMPERATIVE

After the Second World War most liberal democratic states enlarged government services to ensure the social and physical welfare of their citizens. Egalitarian policies were considered desirable and achievable (Baum, 1998). Public health practitioners, bureaucrats and politicians embraced an era of ambitious public

health policy. In 1978, all World Health Organisation (WHO) member countries endorsed the Alma Alta Declaration "Health for All by the year 2000" which advocated the provision of comprehensive, universal, equitable and affordable health care for all (WHO, 1978; Hall and Taylor, 2003). However, the optimism of the mid 20th century was soon confronted by economic reality. The 1970s Middle East oil crisis put increased financial pressure on the global economy (Baum, 1998; Kickert et al., 1997). As national and international debt escalated, communities and politicians questioned the effectiveness and affordability of interventionist government policy (Kickert et al., 1997). Lead by the conservative Thatcher government in the United Kingdom and the Reagan Administration in the United States, the 1980s saw reduced government involvement in all aspects of society and privatisation of many government services (Kickert et al., 1997). International donors insisted that the governments of developing countries adopted market driven economic reform as a condition of foreign aid relief (Hall and Taylor, 2003). Governments and aid agencies sought to share responsibility for service provision with the communities themselves (Gray and Lawrence, 2001). Collaborative solutions to community problems were favoured because they aligned well with the political rhetoric of "shared responsibility" and "community engagement" but, just as importantly, they became an economic necessity as governments reduced long term financial investment in the community (Gray and Lawrence, 2001).

The convergence of academic theory proposing that networks were a potential solution to complex social problems, political philosophy that advocated small government and community engagement, and the economic reality of reduced community investment, created a social environment in which partnerships, collaborations and networks have become a favoured organisational form in the postmodern era (Lipnack and Stamps, 1994). Agranoff and McGuire (2001) observe that:

> *Just as the bureaucratic organisation was the signature organisational form of the industrial age, the emerging information or knowledge age gives rise to the network. … The world is characterised by extreme complexity and diversity, where power is*

> *dispersed, not centralised; tasks are becoming dedifferentiated, rather than subdivided and specialised; and society worldwide demands greater freedom and individuation, rather than integration. In such a world, an organisational forms based on individuation, dispersed power and dedifferentiation is necessary; the network structure is that form (Agranoff and McGuire, 2001, p22.).*

1.13. ADDRESSING THE COMPLEXITY OF THE INJURY ISSUE IN THE MACKAY WHITSUNDAY COMMUNITIES:

In light of the above, it is now appropriate to return to the population health issue identified in Mackay. Data from two local surveillance systems (*Emergency Department Presentations* and *Hospital Separations*) suggested that the incidence of injury in the Mackay community was unacceptably high. The key epidemiological question was "why does this population appear to have a high incidence of injury at this time?"

It would be a fallacy, indeed an "ecological fallacy", to conclude, on the basis of our sentinel observations that the Mackay Whitsunday injury problem could be simply explained by risk factors detected at the level of the individual. The question, "Why did this individual suffer an injury at this time?" may be important, but it cannot be assumed that it would in itself explain the population risk. Population issues such as the physical environment (for example infrastructure and the natural environment) and the social milieu had to be considered and addressed if the problem was to be solved. The Mackay injury problem was also likely to be complex with multiple inter-related causes acting at multiple levels of the community ecological system. There was, therefore, an urgent need to develop theoretical models, research tools, forms of community safety promotion practice, and evaluation tools, that assisted researchers and practitioners involved in the project to achieve some conceptual clarity as they attempted to address the problem of injury in Mackay.

In keeping with contemporary wisdom Mackay Whitsunday Safe Communities (MWSC) responded by forming a collaborative network in an attempt to mobilise sufficient expertise and resources to enable it to adequately address the communities' injury problem.

This thesis describes the coalition, the theoretical foundations of its research and intervention program, the collaborative social methodology used to address the problem, and a novel sociological methodology used to assess the growth and function of the network. Social network analysis (SNA) is a quantitative sociological tool used to describe and model social systems, or "networks" (Scott, 2000; Borgatti and Forster, 2003). In light of the theoretical and political prominence given to network solutions in solving complex contemporary problems, it is timely to assess whether practice matches rhetoric, and investigate if SNA has the potential to describe and analyse the structure, function and growth of a community-based safety promotion coalition.

1.14. AIMS OF THESIS

This thesis aims to address three critical issues necessary for future development of effective community safety promotion research and practice.

1. **Develop a relevant theoretical model to describe and explain the causes of injury in a community ecological system.**

   Given the apparent complexity of community ecological systems, it would be helpful to develop an ecological model of injury causation that provides some descriptive clarity to this area. Such a model could provide a conceptual framework that would allow researchers and practitioners to describe and understand the dynamic interface between causal factors acting within a community ecological system. This would allow adequate problem definition and facilitate the design of suitable solutions.

2. **Describe and critique the use of community collaborative networks as a vehicle to address public health issues.**

   Given the complexity of the injury issue, no single organisation, professional group or governmental sector has the resources, expertise or skills necessary to adequately address this issue. Thus Mackay Whitsunday attempted to form a sustainable collaborative

network, which aimed to develop local social capital which could in turn could be used to promote community safety. While concepts such as sustainability, collaboration, networks and social capital, figure prominently in contemporary discourse on health and safety promotion, it must be acknowledged that they are themselves contested theoretical constructs whose practical application is yet to be clearly documented. It was therefore considered critically important to clarify what they meant and explore how they could be practically applied.

3. **Test the validity and utility to public health of Social Network Analysis.**

   Mackay Whitsunday used a social process, the collaborative network, as an engine to achieve its public health objectives. It was therefore important to identify, develop and test a tool with the ability to document how the social system worked.

1.15. OVERVIEW OF THESIS

Chapter Two: The Genesis, Rationale and Development of Mackay Whitsunday Safe Communities.

This chapter describes the genesis, rationale and history of Mackay Whitsunday Safe Community. The coalition was launched in February 2000 in response to high non-intentional injury rates observed in the region. It sought to reduce injury in the region by being a catalyst for the development of a sustained, systematic, inter-sectorial, community-based safety promotion network by mobilising existing community resources and expertise.

Chapter Three: Collection of NDS-IS Level 2 Injury Surveillance Data for Developing a Community Safety Promotion Program in Regional Queensland.

The research conducted in this chapter was published in:

- Hanson, D, Pitt, WR, Hockey, R, Miles, E & Müller R 2002a, 'Collection of NDS-IS level 2 injury surveillance data in regional Queensland', in R Müller (ed.) *Reducing injuries in Mackay, North Queensland*, Warwick Educational Publishing, Warwick, Queensland, pp. 17-34.
- Hanson, D, Hart, K, McFarlane, K, Carter, A, Hockey, R & Miles, E 2003, 'Addressing childhood injury in Mackay: a safe communities initiative', *Injury Bulletin*, no. 77, pp. 1-6, see Appendix 20.

This chapter describes the development and implementation of a local Emergency Department Injury Surveillance System in the Mackay and Moranbah Health Service District under the auspices of the Queensland Injury Surveillance Unit.

The surveillance system was used to:

1. Identify the determinants and distribution of injury in the Mackay and Moranbah Health Service Districts
2. Identify strategic areas for intervention
3. Monitor the impact of interventions.

Chapter Four: Safe Communities, an Ecological Approach to Safety Promotion

The research conducted for this chapter was published in:

- Hanson, D, Vardon, P & Lloyd J 2002b, 'Safe communities: an ecological approach to safety promotion', in R Müller (ed.), *Reducing injuries in Mackay, North Queensland*, Warwick Educational Publishing, Warwick, Queensland, pp. 35-52.

- Allegrante, JP, Marks, R & Hanson, DW 2006, 'Ecological models for the prevention and control of unintentional injuries', in AC Gielen, DA Sleet & RJ DiClemente (eds), *Injury and Violence Prevention*, Jossey Bass, San Franscisco, pp 105-126, see Appendix 21.

After providing a brief description of the different injury prevention paradigms used in current injury prevention and safety promotion research and practice, this chapter argues that a more comprehensive approach is necessary. "Safety" is an ecological concept, determined by the relationships between individuals and their physical and social environments. The paper proposes a social ecological model – "the injury iceberg" - as a unifying cognitive framework for developing a Safe Communities Project. The proposed model emphasises the dynamic interface between these three dimensions acting at different levels of the ecological system. It can accommodate and describe a complex web of causation and creates a rich context for planning community safety interventions.

Chapter Five: The Injury Iceberg, an Ecological Approach to Planning Sustainable Community Safety interventions

The analysis conducted for this chapter was published in:

- Hanson, D, Vardon, P & Lloyd J 2002c, 'Becoming Queensland's first safe community: considering sustainability from the outset', in R Müller (ed.) *Reducing injuries in Mackay, North Queensland*, Warwick Educational Publishing, Warwick, Queensland, pp. 17-34, see Appendix 22.
- Hanson, D, Hanson, J, Vardon, P, McFarlane, K, Lloyd, J, Müller, R & Durrheim, D 2005, 'The Injury Iceberg: an ecological approach to planning sustainable community safety interventions', *Health Promotion Journal of Australia*, vol. 16, no. 1, pp. 5-10.

This chapter based on a paper published in the Health Promotion Journal of Australia in 2005 argues that sustainability is an ecological concept determined by the human, environmental and social resources available within an ecological system. While project sustainability is a mandatory piece of politically correct rhetoric, it is less often achieved. Interventions dependent on external resources are vulnerable. To reduce a community's risk of injury and sustain this improvement, the community "ecological system" must have access to the resources necessary to maintain the desired outcome and the ability to mobilise these resources. One potential solution: build sustainability from the outset by maximising a community's capacity to maintain safety initiatives within their own resources.

Chapter Six: Social Networks, from Metaphor to Methodology

This chapter describes the history and scientific foundations of SNA, a quantitative sociological technique used to describe and analyse the pattern of relationships with a social system. The standard approach of epidemiology or sociology is to define a population and then study a representative sample of individuals within this population. A key assumption is that the attributes, or behaviour, of individual actors are independent. SNA takes exception to this assumption. Behaviour is not solely influenced by the beliefs, attitudes and capabilities of an individual, but also by their socio-ecological context. In particular, SNA takes a structural perspective of social interactions. It is not just the interactions between individuals within a social system that determine the function of a social system, but the social structure in which they interact.

Chapter Seven: Social Network Analysis of Mackay Whitsunday Safe Communities, Methodology

This chapter reviews important methodological aspects of the use of SNA to study this community based coalition. A snowballing recruitment methodology was used to allow the identification of external relationships that may be important for the mobilisation of resources. The chain of relationships identified by respondents was progressively followed up though three survey cycles, beginning with the Network Support Group.

Chapter Eight: Structure and Function of Mackay Whitsunday Safe Communities, a Social Network Analysis

This chapter describes and quantifies important structural characteristics of MWSC and its Support Network (SN). SNA has the unique capacity to simultaneously observe the contribution of individuals and groups to network activities. Contrastingly, population health surveys typically collect results at an individual level, aggregate them and analyse them at a population level. In these types of surveys, the contribution of individuals to the process of community safety promotion may be obscured. SNA therefore provided unique insights regarding the structure and function of MWSC. The complimentary contribution of cohesive action groups facilitated by a small number of key individuals who link these groups was clearly observed. The advantages, disadvantages and validity of the snowball sampling method used to collect data was also reviewed.

Chapter Nine: Documenting The Development Of Social Capital In A Community Safety Promotion Network Using Social Network Analysis

The research in this chapter was presented as:

- Hanson, D, Muller, R & Durrheim D 2005, 'Documenting The Development Of Social Capital In A Community Safety Promotion Network Using Social Network Analysis', *International Conference on Engaging Communities*, Brisbane, August 15 to 17th, 2005.
- Hanson, D, Durrheim, D, 'Documenting The Development Of Social Capital In A Community Safety Promotion Network Using Social Network Analysis', *8th World Injury Prevention and Safety Promotion Conference*, Durban, South Africa, April 2 to 4th, 2006

Robert Putnam (2000) defined social capital as, "the features of social organisation, such as networks, norms and trust that facilitate co-ordination and co-operation for mutual benefit." There are two parallel literatures on social capital. One argues social capital is an emergent quality of cohesive social systems that facilitates more effective social exchange between all members of the network, while the other argues social capital is a source of individual competitive advantage enjoyed by particular individuals who develop strategic relationships that cross social boundaries. Both types of social capital were observed in MWSC and its SN. The chapter argues that these different types of social capital are complimentary rather than contradictory and that both types of social capital are necessary to facilitate productive social relationships.

Chapter Ten: Measuring the Sustainability of Mackay Whitsunday Safe Communities using Social Network Analysis

For an ecological system to be sustainable the system must have access to enough financial, physical, human and social resources to maintain productive outputs. This chapter seeks to document the exchange of

resources within MWSC and its SN to assess the sustainability of the networks activities.

The paper argues on both theoretic and empirical grounds that MWSC is an open ecological system. Open systems can never achieve equilibrium, a theoretic state in which the resources produced by the system are sufficient to maintain system function, rather, open systems are stable in steady state, a state in which the net flux of resources into and out of the system are sufficient to sustain system function. This key observation has profound implications for the design and maintenance of sustainable safety promotion networks. The social process by which these resources are exchanged is therefore a critical determinant of network sustainability.

Chapter Eleven: Conclusion

In keeping with contemporary theory and practice in community health and safety promotion, a community coalition was mobilised to address the apparently high incidence of injury observed in the Mackay Whitsunday region. This is a community population health problem which must therefore be addressed at a community level. It is by definition an ecological issue.

The injury iceberg is offered as an ecological model of injury causation in the hope of providing some conceptual clarity when describing the multi-causal, multi-level, multi-sectoral determinants of community safety.

Coalitions, partnerships and networks are frequently advocated as important social tools to address local population health problems. However, studies documenting the social process used by collaborative networks are lacking. SNA, a novel quantitative sociological tool, has demonstrated utility as a tool to document, analyse and quantify the structure and function of MWSC a community safety promotion collaborative network.

Glossary Of Terms

This thesis has drawn from theory and research from many different social and health disciplines, each utilising their own professional language. As a consequence a number of terms may be either unfamiliar to the reader or may carry a precise scientific definition not immediately obvious from general usage. In particular, a number of terms used in SNA have a precise mathematical definition intended to quantify terms commonly used to describe social systems. This extensive glossary is therefore provided to assist the reader.

Appendices

A number of key documents concerning MWSC and publications arising from this thesis are provided for the reader's perusal:

- Appendix 1: Project Plan MWSC Project – March 2000
- Appendix 2: Operating Structure MWSC, 2004
- Appendix 3: Network Support Group - Orientation Guide
- Appendix 4: Working Groups
- Appendix 5: MWSC Progress Update 1 – June 2000
- Appendix 6: MWSC Annual Report Feb 2000 to Feb 2001
- Appendix 7: MWSC Progress Update 2 – June 2001
- Appendix 8: MWSC Annual Report Feb 2001 to Feb 2002
- Appendix 9: MWSC Progress Update 3 – March 2002
- Appendix 10: Designation Application – 2002
- Appendix 11: MWSC Progress Update 4 – June 2003
- Appendix 12: MWSC Annual Update 2002 to 2003
- Appendix 13: MWSC Progress Update 5 – December 2003

- Appendix 14: Designation Update, 2004
- Appendix 15: MWSC Progress Update 6 – July 2005
- Appendix 16: MWSC Progress Update 7 – December 2005
- Appendix 17: MWSC Progress Report – March 2006
- Appendix 18: MWSC Progress Report – March 2006
- Appendix 19: MWSC Designation – August 30th 2004
- Appendix 20: Addressing Childhood Injury in Mackay: A Safe Communities Initiative. Hanson, D., Hart, K., McFarlane, K., Carter, A., Hockey, R., & Miles, E. *Injury Bulletin, 77,* 1–6, 2003.
- Appendix 21 : Ecological Models For The Prevention And Control Of Unintentional Injury, John P. Allegrante, Ray Marks, Dale W. Hanson in Gielen A, Sleet DA, DiClemente R, eds. *Handbook of Injury Prevention: Behavior Change Theories, Methods, and Applications*, Jossey-Bass, New York, 2006
- Appendix 22: Becoming Queensland's First Safe Community: Considering Sustainability from the Outset. Hanson, D., Vardon, P., & Lloyd, J. in R. Muller (Ed.), *Reducing injuries in Mackay, North Queensland* (pp. 35-52). Warwick, Queensland, Australia: Warwick Educational Publishing, 2002c
- Appendix 23: Sample Survey Form
- Appendix 24: Triad Census
- Appendix 25: 8th World Conference on Injury Prevention and Safety Promotion

CHAPTER TWO:

THE GENESIS, RATIONALE AND DEVELOPMENT OF MACKAY WHITSUNDAY SAFE COMMUNITIES

2.1. THE MACKAY WHITSUNDAY REGION

Mackay is a major regional centre in Tropical Queensland, 1200 km north of the state capital Brisbane and 360 km north of the Tropic of Capricorn. It serves the Mackay Statistical Division, a region of over 90,000 square kilometres with an estimated population of 141,458[1] and supports diverse industries including coal mining, engineering, sugar cane, cattle, fishing and tourism (OESR, 2005).

The Mackay Statistical Division is comprised of eight local government areas: Belyando Shire, Broadsound Shire, Bowen Shire, Mackay City, Mirani Shire, Nebo Shire, Sarina Shire and Whitsunday Shire (see Figure 2.1).

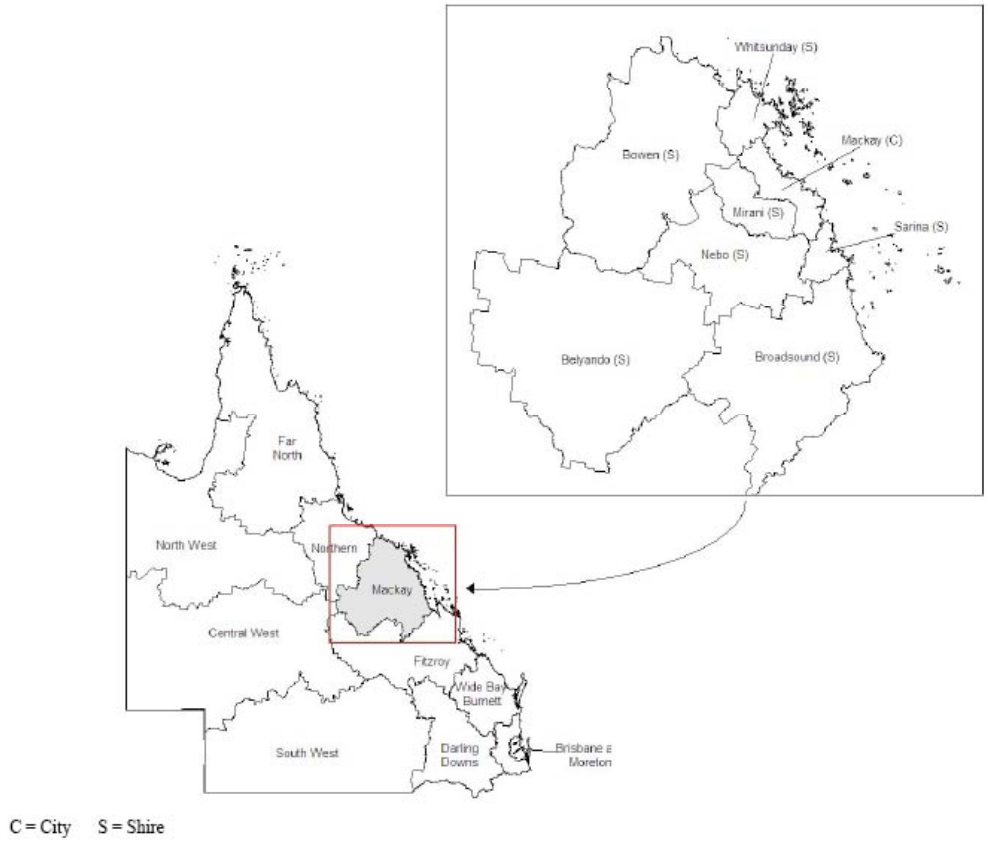


Figure 2.1 The Mackay Statistical Division (OESR, 2005)

[1] on June 30th 2003 (OESR, 2005).

2.2. DEMOGRAPHICS OF THE MACKAY STATISTICAL DIVISION

The age profile of the Mackay Statistical Division is younger than that of the state of Queensland as a whole ($p<0.001$, χ^2). Figure 2.2 highlights the differences between the age profiles of the Mackay Statistical Division and Queensland (OESR, 2005). There were proportionally:

- more children: 22.6% of the population were aged between 0 and 14 years compared with 20.9% in Queensland.
- fewer young adults: 13.2% were aged between 15 and 24 years compared with 14.1% in Queensland.
- 30.5% of the population were aged between 25 and 44 years compared with 29.3% in Queensland
- Fewer seniors: 9.7% were 65 years or older when compared with 11.9% in Queensland.

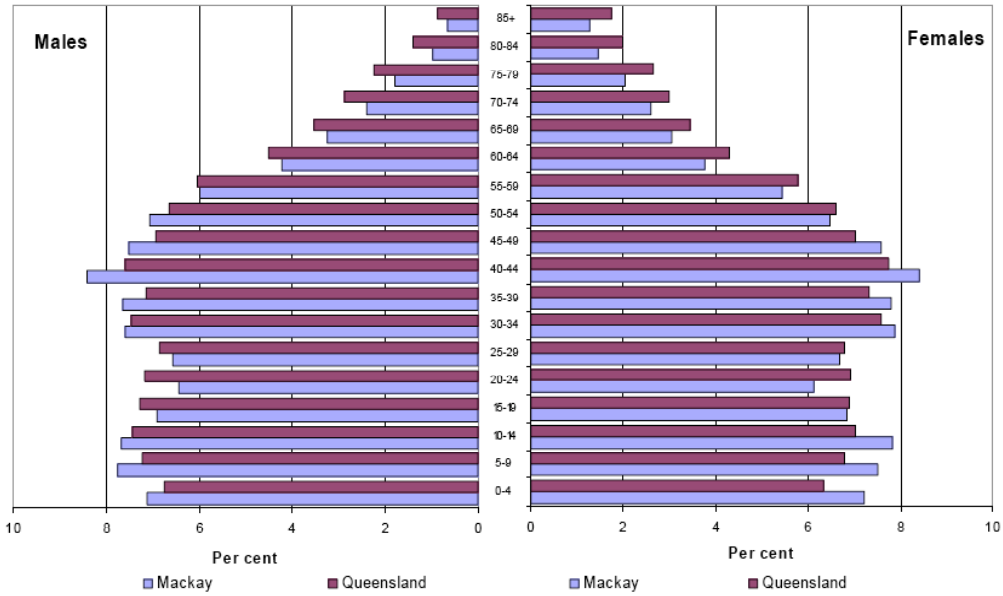


Figure 2.2 Population by age group – Mackay Statistical Division compared with Queensland June 30th, 2003 (OESR, 2005)

Four thousand six hundred and ninety-eight people (3.3% of the population of the Mackay Statistical Division) identify as Aboriginal or Torres Strait Islander (OESR, 2001). However, it is generally believed Indigenous people are not accurately counted in census data (OESR, 2001, ABS, 2005). Mackay also has the largest South Sea Islander population in Australia, estimated at approximately 6,000 people (Mackay City Council, 2006).

2.3. INJURY IN AUSTRALIA

There were 7,802 injury deaths reported in Australia in 2002. The age standardised injury mortality rate was 56.5 per 100,000 (Kreisfeld et al., 2004). Injury and poisoning were the most common causes of death from early childhood through to middle age. In 2002, 3,828 deaths were reported in people aged between 1 and 44 years, accounting for 50% of all deaths (n=7,714) in this age group (Kreisfeld et al., 2004).

In the 2001-2002 financial year there were 333,449 hospital separations due to injury in the community, accounting for 5.2% of all hospitalisations. Age standardised hospital separation rates were 1,718 per 100,000 (Berry and Harrison, 2006).

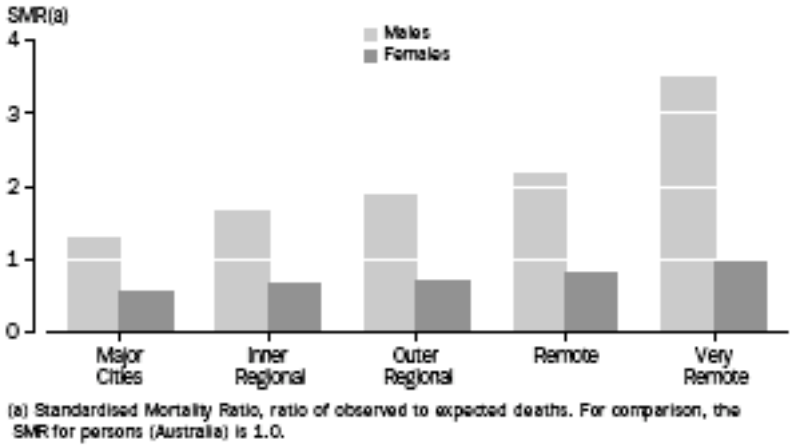


Figure 2.3 Standardised injury mortality ratio by degree of remoteness, Australia 1998 to 2002 (ABS, 2004)

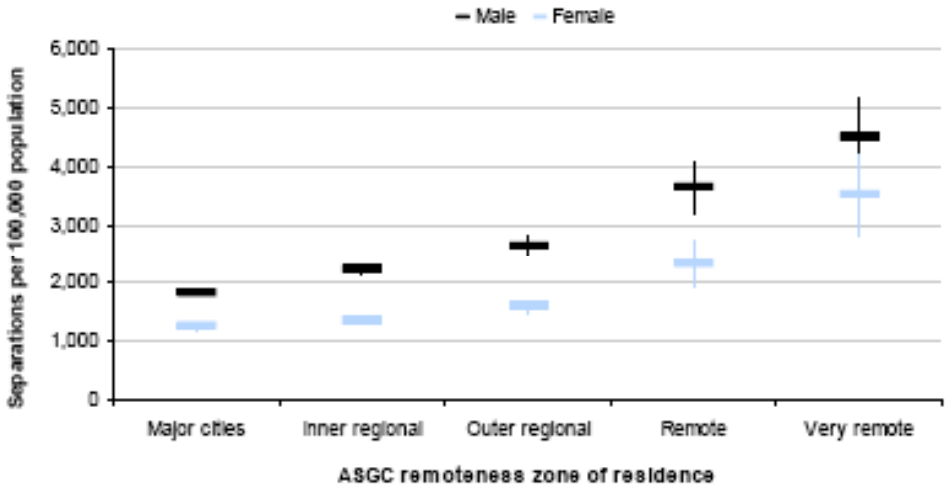


Figure 2.4 Age standardised hospital separations by degree of remoteness, Australia 2001/2002 financial year (Berry and Harrison, 2006)

Regional and remote communities experience high rates of injury mortality (Figure 2.3) and morbidity (Figure 2.4) compared with urban communities (ABS, 2004; Berry and Harrison, 2006).

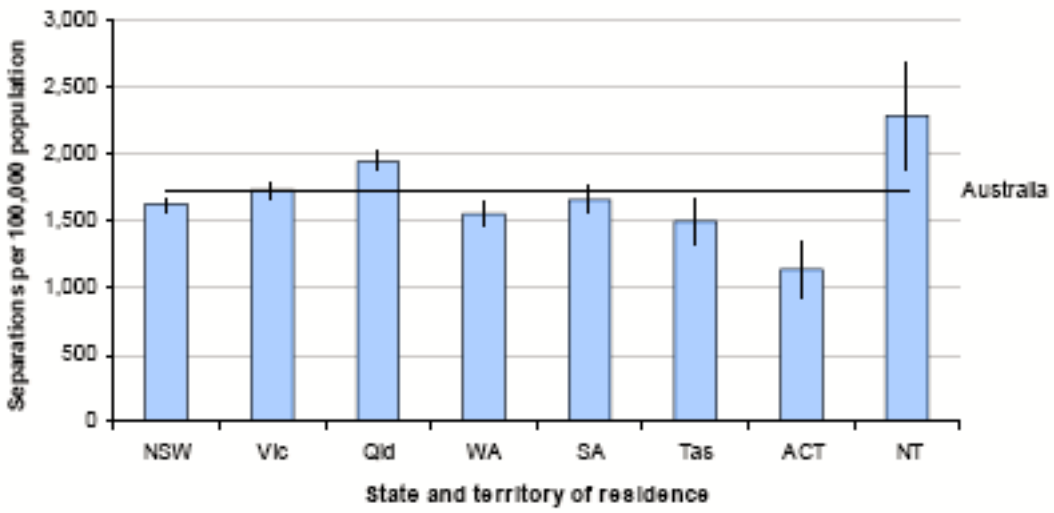
In the 2001 National Health Survey 12% of respondents reported having sustained an injury in the previous month, which either required treatment or resulted in a reduction of normal activities (ABS, 2003). The study estimated 2,256,300 people living in Australia (12% of the Australian Population) were suffering from a long-term medical condition at the time of the study as the result of a previous injury (ABS, 2003).

Moller (2003) estimated the total cost of injury in Australia at $13 billion in the 1995/96 financial year. The direct cost (actual expenditure related to injury) was estimated at $4.3 billion, while the indirect cost (loss of productivity) resulting from injury related deaths was estimated at $5.0 billion and injury related morbidity at $4.1 million.

2.4. INJURY IN QUEENSLAND

Figure 2.5 Age-standardised mortality rates for injury in Australian states and territories 2001/2002 financial year (Kreisfeld et al., 2004)

Queensland's injury mortality (Figure 2.5), and morbidity (Figure 2.6) rates are higher than the national average exceeded only by the Northern Territory and Tasmania (Kreisfeld et al., 2004; Berry and Harrison, 2006).



Note: The thick horizontal line shows the rate for Australia.

Figure 2.6 Age-standardised morbidity rates for injury in Australian states and territories 2001/2002 financial year (Berry and Harrison, 2006)

Of the 22,230 deaths reported in Queensland in 1998, 1,507 (6.8%) were due to injury. Injury was the fourth leading cause of death (after cancer, ischaemic heart disease and cerebrovascular disease). Injury was the leading cause of death in people younger than 45 years of age who accounted for 58.5% of all injury deaths (Pike et al., 2000). Reflecting the profound health impact injury has on young people, injury resulted in 32 potential years of life lost (PYLL) per death, compared with 3.4 PYLL for cardiovascular disease and 8.0 PYLL for cancer. Injury accounted for 27% of all PYLL in Queenslanders under 74 years of age.

There were 97,365 hospital separations due to injury in Queensland in the 1998/99 financial year, accounting for 9.0% of all hospital separations. The injury separation rate was 2,816 separations per 100,000 persons. However, hospital separations only represented a fraction of injury events. In 1998, only 12.8% of Emergency Department (ED) injury presentations were admitted (Pike et al., 2000). The direct cost of inpatient hospital care was estimated at $289.6 million in the 1997/98 financial year (Pike et al., 2000).

2.5. INJURY IN THE MACKAY WHITSUNDAY REGION

In 1998 the Mackay Division of General Practice conducted a community needs analysis which identified that age standardised hospital separation rates for injury and poisoning in 1995/96 were high in the Mackay and Moranbah Health Service Districts[2] (Figure 2.7). A direct age standardised rate for injury and poisoning of 5,458 per 100,000 was observed, accounting for 15.4% of all hospital separations in the district (Azzopardi et al., 1998). This compared with an average Queensland morbidity rate of 2,832 per 100,000, accounting for 8.5% of all hospital separations (Azzopardi et al., 1998). The population of the Mackay region contributed 6.6% of all injury and poisoning separations in Queensland while only representing 3.1 % of the total Queensland population in the 1996 Australian Census (ABS, 1997).

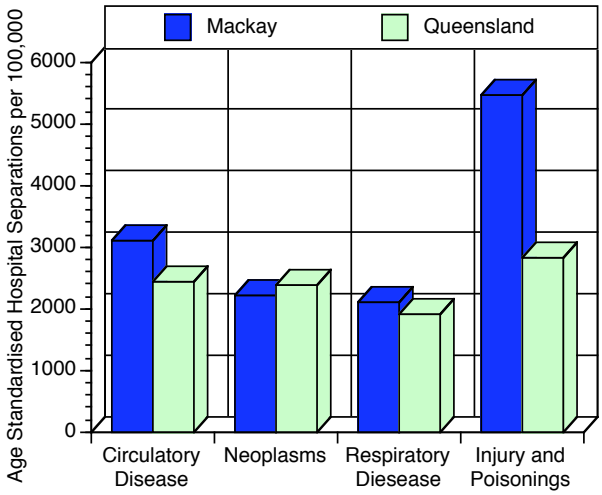


Figure 2.7 Age standardised hospital separation rates for major diagnostic groups 1995/96 in Mackay and Queensland (Azzopardi et al., 1998)

Figure 2.8 shows age standardised hospital separation rates from injury and poisoning in 1997/98 by Queensland region. The Mackay Statistical Division[3] had an injury rate of 4,535 per 100,000 which compares with rates of 2,808 per 100,000 in Rockhampton, 2,755 per 100,000 in Gladstone, 2,705 per 100,000 in Cairns and 2,035 per 100,000 in Townsville (AIHW, 1999).

[2] Mackay and Moranbah Health Service Districts include seven Local Government Areas: Belyando, Broadsound, Mackay, Mirani, Nebo, Sarina & Whitsunday (but not Bowen). See Figure G.2 in the Glossary for detailed geographical definition.
[3] Mackay Statistical Subdivision includes Bowen Shire which is not within the Mackay & Moranbah Health Service Districts.

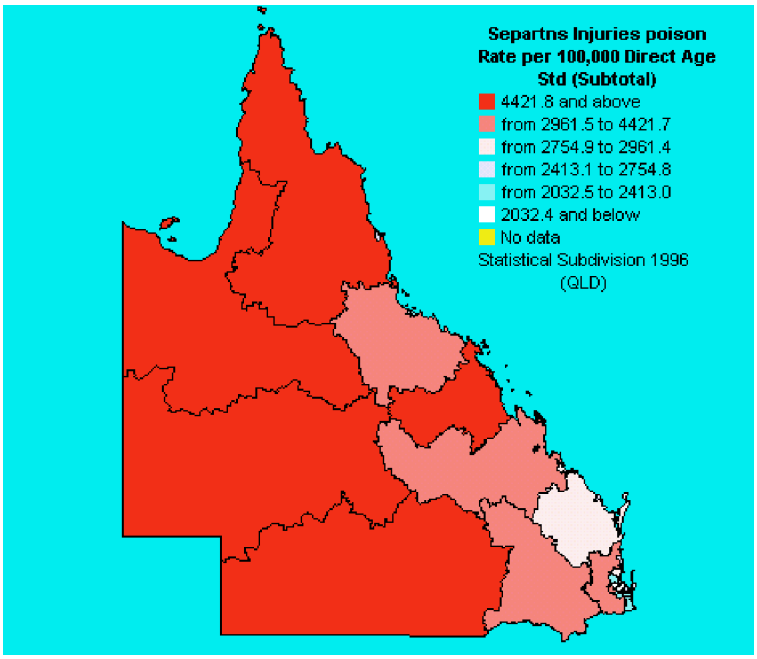


Figure 2.8 Age standardised hospital separation rates from injury and poisoning by Queensland Statistical Subdivision for 1997/98 (AIHW, 1999)

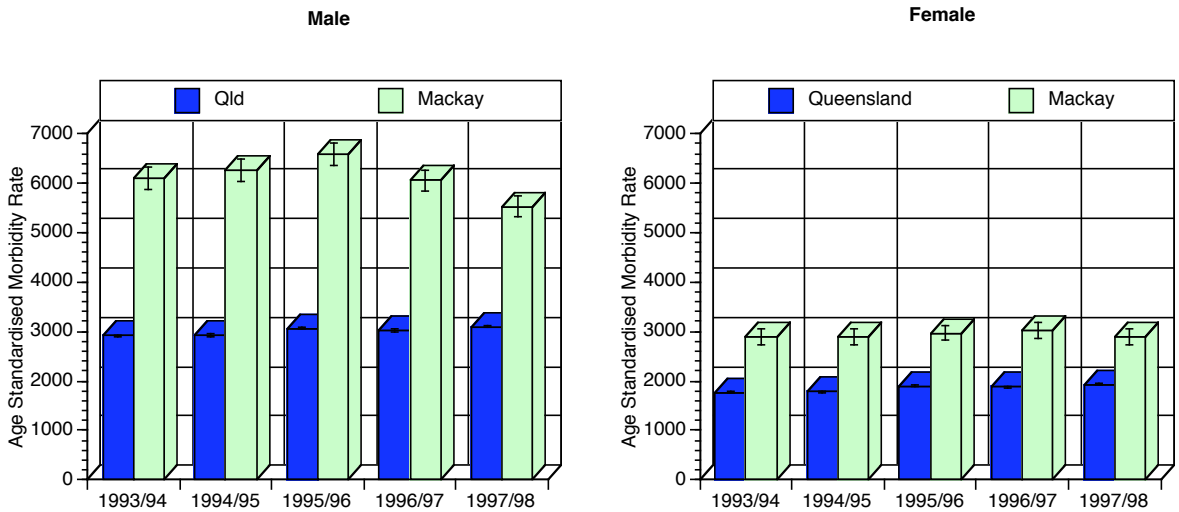


Figure 2.9 Age standardised injury hospital separation rates per 100,000 with 95% confidence intervals for Queensland and Mackay (TPHU, 1999)

The Mackay manager of the Tropical Population Health Unit (TPHU) of Queensland Health (QH) followed up the Mackay Division of General Practice Community Needs Analysis by commissioning a further study of regional injury hospital separations to ascertain if the apparent excess in injury morbidity could be confirmed. Injury hospital separations from July 1993 to June 1999 were reviewed (TPHU, 1999) and confirmed that over this period reported hospital injury separations were double those observed for the rest of Queensland (Figure 2.9).

ED staff, in response to the high injury rates experienced at Mackay Base Hospital (MBH), commenced collection of injury surveillance data[4] in September 1997, providing a regional sample for the Queensland Injury Surveillance Unit (QISU) network (Hanson et al., 2002a). EDs from all six public hospitals in the Mackay and Moranbah Health Service Districts (Clermont, Dysart, Mackay Base, Moranbah, Proserpine and Sarina Hospitals) have collected injury surveillance data on behalf of QISU since that time. The Mackay Mater Private Hospital's After-hours Medical Clinic was added in September 2000.

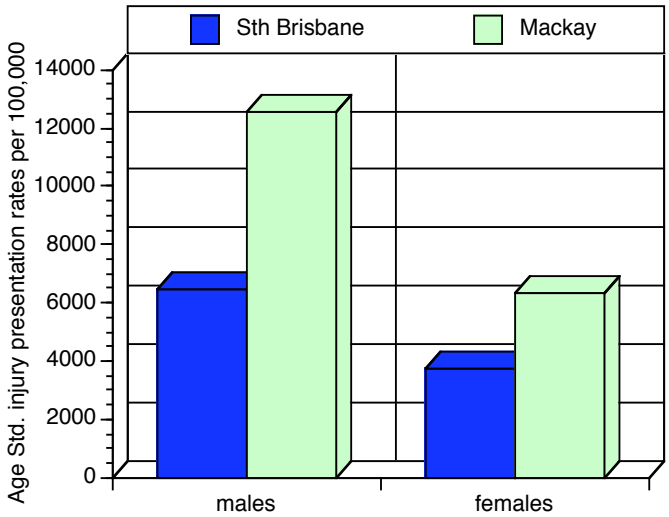


Figure 2.10 Age-standardised ED injury presentation rates by gender: Mackay Base Hospital and South Brisbane: 1998 and 1999 (Vardon et al., 2000)

Review of ED injury presentation data at MBH appeared to confirm excess injury morbidity. MBH reported an average of 8,700 injuries per annum constituting one quarter of its caseload (Vardon et al., 2000). ED age-standardised injury presentation rates were double those observed in South Brisbane (Vardon et al., 2000). Age-standardised ED injury presentation rates were 12,584 per 100,000 for males and 6,319 per 100,000 for females. This compared with rates of 6,446 per 100,000 for males and 3,727 per 100,000 for females in South Brisbane (Figure 2.10). Based on the above information, it appeared injury morbidity rates in the Mackay Region were high and that injury was an issue of population health importance to the Mackay Community.

[4] National Data Standards for Injury Surveillance (NDS-IS) Level 2 data (NISU, 1998).

2.6. THE RATIONALE FOR THE MACKAY WHITSUNDAY SAFE COMMUNITIES

Injuries are preventable. Australia has achieved significant reductions in injury morbidity and mortality in areas where concerted efforts have been made. Road transport related deaths have reduced from 11 per 100,000 in 1992 to 9 per 100,000 in 2000 (AIHW, 2002). The suicide rate in males has reduced from 23.4 per 100,000 in 1997 to 19.4 per 100,000 in 2000 (AIHW, 2002). Hospital admission of children due to poisoning has reduced from 302 per 100,000 in 1991-1992 to 267 per 100,000 in 1999-2000 (AIHW, 2002).

The Mackay community had recognised this problem and begun responding with a number of activities (Table 2.1) but a local needs analysis conducted by the TPHU found that:

> "Injury control activities in the Mackay and Moranbah Health Districts areas have been extensive but largely uncoordinated. … With many of the above programs based on similar principles and strategies a co-operative, systematic and inter-sectoral approach would be more productive (Repper and Vardon, 1999, p3)."

Domain of Activity	Organisations Involved
Farm Safety	TPHU Mackay Division of General Practice FarmSafe Queensland
Falls prevention in Seniors	Home and Community Health Unit (Aged Care) Mackay Health Service District
Water and Alcohol Safety Safety in Licensed Premises	Alcohol, Tobacco and Other Drugs Service (ATODS) Mackay Health Service District
Toddler Drowning Prevention Child Scald Prevention	TPHU Child and Adolescent Health Mackay Health Service District
Road and Vehicle Safety	Queensland Transport Home and Community Health Unit (Aged Care)
Pedestrian Safety	Mackay City Council
Electrical Safety	Mackay Electricity Board
Injury Surveillance	MBH ED Mackay Health Service District

Table 2.1 Injury prevention activities in Mackay prior to 2000 (Repper and Vardon, 1999)

There is a rich tradition of community-based intervention for injury prevention and health promotion (Coggan and Bennett, 2004; Gielen and Sleet, 2006). At the time that the Mackay injury problem was recognised the World Health Organisation (WHO) was beginning to promulgate a systematic, all injury, all age group, all situation, community-based approach to injury prevention and safety promotion (WHO Collaborating Centre, 2005). Their goal was to designate Safe Communities as demonstration sites in community safety promotion. To achieve designation, communities are reviewed based on 12 criteria (Coggan and Bennett, 2004):

1. The existence of a cross-sectoral group responsible for injury prevention.
2. Involvement of the local community network.
3. A program covering all ages, environments and situations.
4. Concern for high-risk groups and high-risk environments, and ensuring justice for vulnerable groups.
5. Documentation of the frequency and causes of injury.
6. Long-term program rather than short-term.

In addition, the community was also required to:

7. Utilise appropriate indicators to evaluate process and the effects of change.
8. Analyse the community's organisations and their possible participation in the program.
9. Involve the health care organisations in registration of injuries and the prevention program.
10. Be prepared to involve all levels of the community in solving the injury problem.
11. Disseminate experiences both nationally and internationally.
12. Be prepared to contribute to a strong network of "Safe Communities".

This simultaneous multiple domains approach sought to create a critical mass of community safety promotion activity that would address local social and physical determinants of injury and ultimately impact the risk behaviour of community members (Hanson et al., 2002b; Hanson et al., 2002c; Hanson et al., 2005).

Early studies in Scandinavia and Australasia have been promising, suggesting that up to a 30% reduction in injury is achievable using this approach (Coggan and Bennett, 2004, Spinks et al., 2005).

The local health promotion manager of the TPHU attended the 1st Pacific Rim Safe Communities Conference held in New Zealand in 1999, was inspired, and facilitated local visits by Professor Leif Svanstrom from the WHO Collaborating Centre on Community Safety Promotion at Karolinska Institute Sweden and members of the Shore Regional Organisation of Councils (SHOROC), a coalition of city councils in North Sydney that achieved WHO designation in 1998.

The Safe Communities approach was endorsed by Mackay City Council (MCC). A project officer was appointed by the TPHU, the scope of community consultation expanded and potential strategic partners identified culminating in the formation of the Network Support Group (NSG) in September 1999. Initial project partners included Queensland Health (TPHU, MBH), MCC, Queensland Transport (QT) , Queensland Police Service (QPS) and James Cook University (JCU). In late 1999, Whitsunday Shire Council (WSC) expressed an interest in the project and subsequently joined the NSG.

The Mackay Whitsunday Safe Communities (MWSC) was launched in February 2000 with a focus on people living within Mackay and Whitsunday Local Government Areas. At this stage the project consisted of the NSG and four action groups: Senior Safety, Road Safety, Childhood Safety (Whitsunday) and Injury Research.

2.7. BASELINE SURVEY OF HOUSEHOLD PRACTICES, KNOWLEDGE AND PERCEPTION INFLUENCING INJURY IN THE MACKAY WHITSUNDAY REGION

The School of Public Health, Tropical Medicine and Rehabilitation Sciences (SPHTMRS) at JCU conducted a survey of household injury prevention practices, knowledge and perception of injury risk factors in the Mackay Region in 2000 (Carter and Müller, 2002b). A standardised telephone survey was developed and administered to a random sample of 1,510 telephone numbers in the Mackay Region during July and August 2000. Contact was

established with 1,005 of the potential survey sample of whom 970 potential respondents were eligible for inclusion in the study and 461 agreed to participate.

The survey was conducted six months after the launch of MWSC. At this stage only 11.5% of respondents were aware of any accident prevention or safety promotion programs in the Mackay Region and just 6.7% had heard of the MWSC.

Ninety-seven percent of respondents agreed that injuries were preventable and 87.7% believed injuries commonly resulted in people attending hospital. However, the externalisation of this perceived risk was striking. While half believed injury was the most common cause of hospital attendance only 22% believed that an injury would result in their own presentation to hospital in the next 12 months, and ninety percent believed they did not behave in a way that placed them at risk of injury.

Just over half (54.7%) of respondents indicated compliance with three or more household safety practices (Table 2.2). Use of electrical safety switches (82%) and smoke detectors (73%) were the most common household safety practices utilised. Only 18% of households used handrails in the bathroom or toilets. However, there was a significant association between the age of respondents and use of handrails (chi-square, $p < 0.001$). Thirty-five percent of respondents greater than 55 years of age had handrails fitted. Older respondents were more likely to report using three or more household safety practices (Chi-square, $p < 0.05$).

Household Safety Practices	Total compliance	18-29 yoa compliance	30-54 yoa compliance	≥ 55 yoa compliance	Chi-square result
Smoke Detectors / Alarms	72.7%	61.4%	77.5%	70.0%	p=0.333
Fire extinguishers / Blankets	43.0%	34.9%	43.4%	47.5%	p=0.084
Handrails in bathroom or toilets	18.2%	18.1%	10.5%	35.0%	p<0.001
Safety switches / circuit breakers	82.0%	75.9%	85.7%	78.3%	p=0.903
Hot water system tempering valve	44.3%	45.8%	41.9%	49.2%	p=0.518
Three or more of the above	54.7%	47.0%	53.9%	61.7%	p=0.036

Table 2.2 Utilisation of household safety practices in the Mackay Region (Carter and Müller, 2002b)

Location	Perceived location of injury greatest injury risk (Carter and Müller 2002b)	Observed location of injury presentations to MBH ED (Carter and Müller 2002a)
Street	29.5%	12.5%
0Home	27.3%	41.1%
Work	21.7%	17.3%
Sport or recreation facility	15.4%	16.5%

Table 2.3 Perceived location of injury compared with observed (Carter and Müller, 2002a; Carter and Müller, 2002b)

Thirty percent of respondents believed that the street or a motor vehicle were the most likely place they would be injured (Table 2.3). Thirty-eight percent believed that regular speeding was likely to result in injury to others. However only 15% believed that it was likely to result in their own injury.

Males correctly perceived that they were most likely to sustain an injury at work.

There was poor awareness that many preventable injuries occur at home. While 41% of injuries presenting to MBH's ED occurred at home (Carter and Müller, 2002a), only 12% of respondents identified the home as an important preventable source of injury. In particular, respondents older than 55 years incorrectly believed that they were most likely to be injured in the street, whereas they were four times more likely to be injured at home. Similarly, females of all ages perceived their motor vehicle to be their greatest source of risk. However, they were four times more likely to present after an injury sustained at home (Carter and Müller, 2002a).

2.8. BASELINE INJURY EPIDEMIOLOGY STUDY

The SPHTMRS also conducted a baseline epidemiological study using injury surveillance data collected in the MBH ED (Hanson et al., 2002b) to identify patterns and causes of non-fatal injury in the Mackay Whitsunday Region (Carter and Müller, 2002a).

From 1998 to 2000 there were a total of 73,509 ED presentations to MBH. Of these 26,104 (24%) were due to injury, resulting in a direct standardised ED injury presentation rate of 8,218 per 100,000 per year.

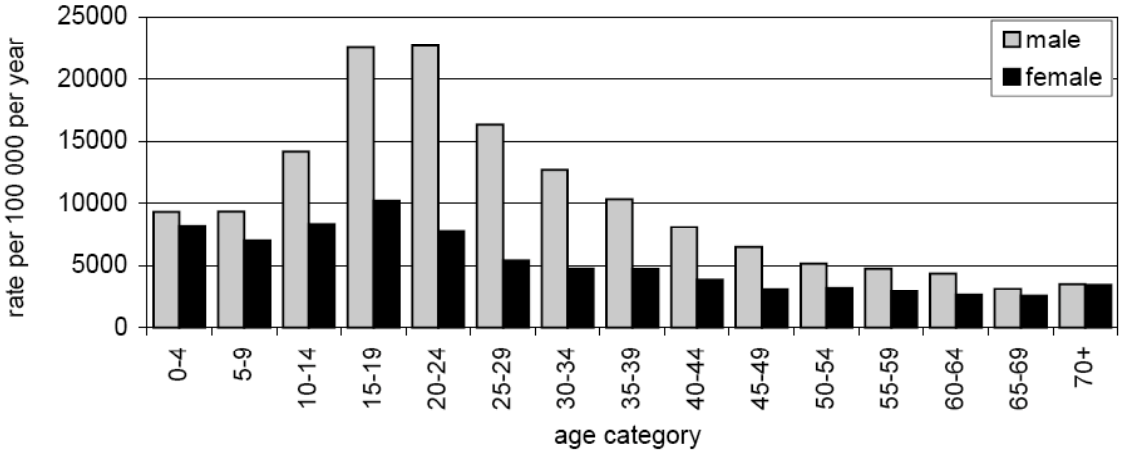


Figure 2.11 Age standardised ED presentation rates Mackay Base Hospital - 1998 to 2000 (Carter and Müller, 2002a)

Males were twice as likely to present to MBH ED with an injury (male to female ratio 2.1:1). Young males were especially at risk. Males aged 15 to 29 years had an ED injury presentation rate of 20,317 per 100,000 per year, nearly three times higher than females whose ED presentation rate was 7,608 per 100,000 per year (see Figure 2.11).

Eleven percent of ED injury presentations resulted in admission, with a direct standardised injury admission rate of 964 per 100,000 persons per year.

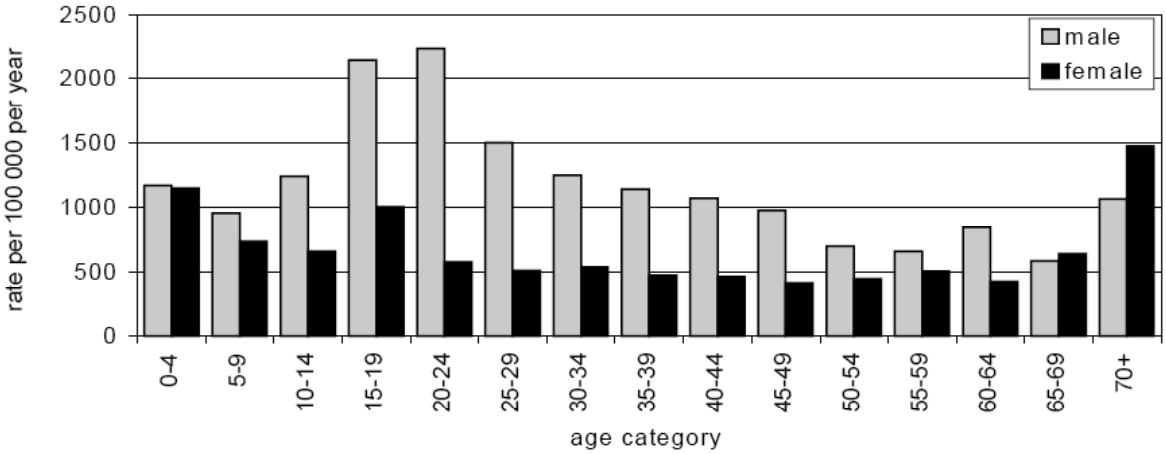


Figure 2.12 Age standardised ED admission rates to Mackay Base Hospital - 1998 to 2000 (Carter and Müller, 2002a)

Category	Variable	Percentage
Gender	Male	67.8%
	Female	32.2%
Triage Category	Resuscitation (to be seen within 1 minute)	0.2%
	Emergency (to be seen within 10 minutes)	2.5%
	Urgent (to be seen within 30 minutes)	22.2%
	Semi-urgent (to be seen within 60 minutes)	71.4%
	Non-urgent (to be seen within 120 minutes)	3.7%
Separation status	Admitted	11.1%
	Transfered to another hospital	0.4%
	Discharged home	86.4%
	Did not wait	2.1%
Intent	Unintentional	92.4%
	Alleged assault / maltreatment	5.3%
	Self-harm	1.4%
	Other /unspecified	0.9%
Diagnosis	Wound/bruise	38.9%
	Sprain/strain	22.0%
	Fracture/dislocation	16.4%
	Chemical/thermal effect	4.6%
	Other	18.1%
Activity	Personal / other work	26.0%
	Leisure	21.5%
	Work for income	17.3%
	Sport	11.0%
	Other / unspecified	24.3%
Place	Home	41.1%
	Trade / industrial / mine / farm	18.0%
	Sport / recreation	16.5%
	Street	12.5%
	Other / unspecified	12.0%
External Causes	Contact with object (not a person)	33.6%
	Fall	24.9%
	Contact with person	11.4%
	Transport	10.6%
	Other / Unspecified	19.5%
Mechanism	Contact with object (not a person)	27.4%
	Fall	27.0%
	Cut / crush / pierce	19.0%
	Contact with person	11.0%
	Chemical / thermal	5.2%
	Other / unspecified	10.5%
Main Injury Factor	Natural object	24.8%
	Furnishings / appliances / personal items	19.3%
	Transport	12.6%
	Materials	12.5%
	Tools	9.1%
	Food / chemical	5.1%
	Sports equipment	5.0%
	Other / unspecified	11.6%

Table 2.4 All ED injury presentations to Mackay Base Hospital 1998 to 2000 (Carter and Müller, 2002a)

Admission rates for children aged 0 to 4 years were 1,167 per 100,000 per year for males and 1,145 per 100,000 per year for females (see Figure 2.12). Falls (males 32% and females 30%) and poisonings (males 29% and females 35%) accounted for approximately two-thirds of admissions in this age group.

The admission rate for females in the 15 to 19 years age category was 1,000 per 100,000 per year, nearly double that for females in the 10 to 14 (653 per 100,000 per year) and 20 to 24 year age categories (574 per 100,000 per year). Approximately one third of these admissions resulted from self-harm (29.9%) or were caused by poisoning with drugs (33.7%).

There was a substantial increase in admission rates for females in the "over 70 years" category (1,475 per 100,000 per year). Over half (56.8%) of these admissions were due to falls of less than one meter.

The following patterns of injury were identified:

- Forty-one percent of all injuries occurred in the home. This was most evident in children less than 5 years of age (males 7,581 per 100,000 per year, females 6,908 per 100,000 per year) and in people 55 years or older (males 2,072 per 100,000 per year, females 1,789 per 100,000 per year).
- Injury while working for income was the most likely injury activity for males in the 15 to 29 years (5,283 per 100,000 per year) and the 30 to 54 years age categories (3,205 per 100,000 per year).
- Sporting injuries were most frequent in 15 to 29 year old males (3,751 per 100,000 per year).
- Falls were the most frequently identified cause of injury for females of all age categories.

The study identified five strategic issues for the MWSC to consider when planning its prevention programs:

- Injuries in 15 to 29 year old males;
- Injuries in over 55 year old females;
- Fall injuries in the home in 0 to 4 and over 55 year olds;
- Workplace injuries in 15 to 54 year old males;
- Sport and recreational injuries in 5 to 29 year old males.

2.9. IMPLIMENTATION OF THE MACKAY WHITSUNDAY SAFE COMMUNITIES PROJECT

The baseline survey of community perception and injury epidemiology facilitated a strong population health foundation for project planning.

Table 2.5 provides a timeline of key events in the development of MWSC. The initial objective of the NSG was to consolidate currently existing relationship and safety promotion activities in the region. In keeping with WHO Safe Communities Criteria One (see section 2.6 earlier this chapter), it was hoped the formation of a cross-sectoral coordination group would enhance development and effectiveness of the network.

The NSG in collaboration with the TPHU developed initial marketing material and a vision that the project would create a collaborative safety promotion network that would promote an ethic of safety within the Mackay Whitsunday Region.

Three broad objectives were agreed:

1. Establish a coordinated, community based, long term safety promotion network in the Mackay Whitsunday Region.
2. Develop existing community networks while directly addressing injury prevention issues.
3. Reduce injury by 30% over five years.

After the concept of establishing a collaborative safety promotion network was formally endorsed by MCC and WSC, the coalition was launched in February, 2000 aspiring to achieve WHO designation within five years. It was hoped that submitting the coalition to a process of external accreditation based on the 12 WHO criteria would provide a meaningful interim goal that would help to engage local partners, facilitate best practice in safety promotion and enhance the credibility of the network, thereby creating further opportunities to engage government, local organisations and business in the network.

1997	• Collection of Injury Surveillance Data began in EDs within the Mackay and Moranbah Health Service Districts including, Mackay Base, Proserpine, Sarina, Clermont, Dysart and Moranbah Hospitals.
1998	• Mackay Division of General Practice needs analysis tabled highlighting injury as a significant health issue in Mackay.
1999	• Local manager TPHU of Queensland Health attends 1st Pacific Rim Safe Communities Conference in NZ. • Professor Leif Svanstrom from the WHO Collaborating Centre on Community Safety Promotion, Karolinska Institute, Sweden visits suggesting Mackay "can become a Safe Community" to key local stakeholders. • Members of SHOROC, a coalition of councils, health and stakeholders in North Sydney who achieved WHO designation in 1998, share their experience of instigating and working within a Safe Communities framework. • MCC endorses the Safe Communities framework. • NSG forms involving MCC, WSC, QT, QPSs and Queensland Health. • Mackay Injury Research Collaboration Group established. • WSC endorses the Safe Communities framework.
2000	• Launch of Mackay / Whitsunday Safe Communities. • Working groups established including; Senior Safety Working Group (Mackay), Child Safety Working Group (Whitsunday) and the Road Safety Working Group. • "Linked partnerships" established with the Community Crime Prevention Partnerships Mackay (CCPAT), Building Safer communities Action Team Whitsunday (BSCAT) and the Schoolies Week Organising Committee Whitsunday. • Collection of Surveillance Data begins at the Mackay Mater After Hours Service. • JCU conducts a community consultation on practices, knowledge and perception of injury in the region.
2001	• Alcohol and Injury Working Group established. • JCU conducts an analysis of local ED injury surveillance data.
2002	• Department of Emergency Services engaged as a new stakeholder and represented on the NSG. • Child Injury Prevention (ChIPP) Working group established in Mackay. • Andergrove Neighbourhood Watch Community Injury Prevention Project established in association with the Department of Emergency Services. • Designation Application prepared and submitted to WHO. • WHO Conduct site visit with a view to possible designation by the WHO.
2003	• Occupational Health and Safety Working Group established
2004	• Barlink (Coalition of Licensees) in Mackay established as a joint project between the Alcohol and Injury Working Group and the Community Crime Prevention Partnership. • Updated Designation Application prepared and endorsed by the WHO. • MCC and WSCs are designated WHO Safe Communities on the 31st August during the Local Government Association of Queensland Conference, by Associate Professor Carolyn Coggan from the Injury Prevention Research Centre, University of Auckland, NZ representing the WHO Collaborating Centre for Community Safety Promotion. • Mackay Whitsunday's Safe Communities hosts the 2nd Pacific Rim Safe Communities Conference and the 7th Australian Injury Prevention Conference from the 15th to 17th of September.

Table 2.5 Timeline, Mackay Whitsunday Safe Communities

Figure 2.13 NSG, MWSC Launch February 2000

The existing domains of injury prevention and safety promotion were consolidated to form four initial action groups:

- Road Safety, facilitated by a full-time transport safety officer employed by QT (Appendix Four).
- Seniors Safety, facilitated by the manager of community development, MCC.
- Child Safety (Whitsunday) facilitated by TPHU of QH.
- Injury Research facilitated by an Emergency Physician from MBH (Appendix Four).

Organisations represented on initial working groups included: JCU, QISU, Liquor Licensing Division of Queensland, Department of Main Roads, Whitsunday Neighbourhood Centre, Education Queensland, Mackay Division of General Practice and a number of community representatives.

Queensland Health representation included the TPHU, MBH ED and a number of Community Heath Services, including the Aged Care and Disability Unit, Child Youth and Family Health Service and Alcohol Tobacco and Other Drugs Service (ATODS).

Subsequently, action groups were formed on the basis of perceived need, results of local epidemiological studies and most importantly the availability of a sponsoring organisation able to coordinate and facilitate the action group.

In 2001, the Alcohol and Injury Working Group was established facilitated by a health promotion officer employed by the ATODS (Appendix Four).

In 2002, the Department of Emergency Services (DES) was engaged as a new strategic partner which enabled the formation of two new action groups:

1. The Child Injury Prevention Project Mackay (ChIPP) was jointly sponsored by the DES and QH. A full time health promotion officer was funded and appointed to facilitate this group in Mackay (Appendix Four).
2. The Andergrove Neighbourhood Watch Injury Project was jointly supported by the DES in collaboration with QPS. This pilot project sought to broaden the focus of three Queensland Neighbour Watch Community Groups beyond crime prevention to incorporate community safety initiatives of DES. Under the auspices of this state project the Andergrove Neighbourhood Watch conducted a number of community safety awareness programs in 2002.

In addition, the coalition developed strategic links with other groups and projects working in the domain of Community Safety in the Mackay Whitsunday Region. While these groups remained autonomous, MWSC worked collaboratively with these “linked projects” to develop and maintain joint initiatives.

Linked projects included:

- Building Safe Communities Action Team (BSCAT) working in the domain of community crime prevention and facilitated by a full time crime prevention officer employed by the Department of Communities. Mackay & Whitsunday have separate BSCAT committees. In Mackay this group is known as the Community Crime Prevention Action Team (CCPAT) to avoid confusion with MWSC.

- Whitsunday Schoolies Week Committee. In November over 1,500 senior school students come to the Whitsundays to celebrate the end of their schooling. The Whitsunday Schoolies Committee aims to provide a safe and fun environment for these students.
- Healthy Island Resorts. QH facilitated the development of a web-based resource to promote a healthy and safe environment at island resorts in the Mackay Whitsunday Region.

The Road Safety Working Group evolved into an inter-sectoral reference group that provided strategic direction to a number of smaller action groups including (Appendix Four):

- Bicycle Education Working Group. Facilitates Bike Education initiatives in the region, in particular the Bike Ed program hosted at the Police Citizens Youth Club.
- Road Accident Action Group (RAAG) which was formed in 2002 to develop initiatives and countermeasures to reduce the number of road accidents caused by driver fatigue
- Young Drivers Group, an informal network between QT, QPS and community youth representatives in 2003 to raise awareness and promote safe driving practices in young adults.

In 2002 MWSC drafted and submitted its Designation Application to the WHO Collaborative Centre for Community Safety Promotion at Karolinska Institute in Sweden addressing the 12 WHO Criteria (Appendix Ten). A site visit was conducted in November 2002 by Moa Sundstrom representing the WHO, who concluded that the MWSC was progressing well towards WHO designation subject to fulfilling Criteria Eleven and Twelve (Contribution to the National and International Safe Communities Movement) with the staging of the 2nd Pacific Rim Safe Communities Conference and 7th Australian Injury Prevention Conference in Mackay in 2004.

The Occupational Health and Safety Working Group was established in late 2003 in collaboration with the Department of Workplace Health and Safety (Appendix Four).

The Alcohol and Injury Working Group in collaboration with the CCPAT formed Barlink, a network of licensees in Mackay formed to promote safe drinking practices and a safe entertainment precinct in the Mackay City Heart.

In late 2002 the WHO simplified its 12 designation criteria to six "indicators" for International Safe Communities. Safe Communities should have:

1. An infrastructure based on partnerships and collaborations, governed by a cross-sectional group that is responsible for safety promotion in their community.
2. Long-term, sustainable programs covering both genders and all ages, environments and situations.
3. Programs that target high-risk groups and environments and programs that promote safety for vulnerable groups.
4. Programs that document the frequency and causes of injury.
5. Evaluation measures to assess their programs, processes, and the effects of change.
6. Ongoing participation in national and international Safe Communities Networks.

A Designation Update (Appendix Fourteen) was prepared and submitted to the WHO Collaborating Centre for Community Safety Promotion in May 2004 addressing the six new indicators with the detailed plans for staging the 2nd Pacific Rim Safe Communities Conference.

MCC (Appendix Nineteen) and WSC (Appendix Nineteen) were designated WHO Safe Communities on the 31st of August 2004 at the Local Government Association of Queensland Conference held in Mackay by Associate Professor Carolyn Coggan, Director of the Injury Prevention Research Centre, The University of Auckland, representing the WHO Collaborating Centre for Community Safety Promotion.

In collaboration with the Australian Injury Prevention Network (AIPN), QH and DES, MCC and WSC, MWSC staged the 2nd Pacific Rim Safe Communities Conference and the 7th Australian Injury Prevention Conference in Mackay from the 15th to 17th September, 2004.

Figure 2.14 NSG members display the WHO Safe Communities Flag

2.10. CONCLUSION

The Mackay Whitsunday Safe Communities Project was launched in February 2000 in response to comparatively high non-intentional injury rates observed in the region. It sought to reduce injury in the Mackay Whitsunday region by being a catalyst for developing a sustained, systematic, inter-sectoral, community-based safety promotion network using existing community resources and expertise.

A community-based response in association with the World Health Organisation International Safe Communities Network was considered to be the most strategic approach. Submitting to an external audit based on the World Health Organisation Designation Indicators was considered worthwhile for engaging local partners, facilitating best practice in safety promotion and enhancing the credibility of the network, thereby creating further collaborative opportunities with government, local organisations and business in the network.

The baseline survey of community perception and injury epidemiology studies conducted by the School of Public Health, Tropical Medicine and Rehabilitation Sciences of James Cook University facilitated a strong evidence base on which to develop its interventions.

After a process of external review Mackay Whitsunday Safe Communities became the 81st Internationally Designated World Health Organisation Safe Community on the 31st August 2004.

CHAPTER THREE

COLLECTION OF NDS-IS LEVEL-2 INJURY SURVEILLANCE DATA FOR DEVELOPING A COMMUNITY SAFTY PROMOTION PROGRAM IN REGIONAL QUEENSLAND

The body of this chapter was published in "Reducing Injuries in Mackay, North Queensland" edited by Reinhold Müller (2002), Warwick Educational Publishing, Warwick, Queensland, Australia (Hanson et al., 2002a). This monograph sought to describe the rationale and epidemiological basis of Mackay Whitsunday Safe Communities.

Three types of Injury surveillance data are collected in the Mackay and Moranbah Health Services Districts:

- Hospital Separation ICD & E Codes, all regional hospitals.
- Emergency Department NDS-IS – Level 2 Injury Surveillance Data, all regional public hospitals September 1997, Mackay Mater Private Hospital since September 2000.
- Queensland Trauma Registry, Mackay Base Hospital since 2001.

This chapter was co-authored with Robert Pitt, Director of the Queensland Injury Surveillance Unit (QISU), Richard Hockey, Data Analyst QISU, Elizabeth Miles, Manager QISU and Reinhold Müller my doctoral supervisor. It described the Emergency Department (ED) Injury Surveillance System established in the Mackay and Moranbah Health Service Districts in 1997. The original manuscript was drafted by myself and submitted to my co-authors for comment. The revised manuscript was published in the monograph.

QISU publishes monthly injury bulletins using data collected by its state ED injury surveillance system. QISU also provides dedicated reports on request to interested parties, including Mackay Whitsunday Safe Communities. The immediacy, accessibility and high degree of local relevance of ED injury surveillance data collected in the Mackay and Moranbah Health Service District

has meant that Mackay Whitsunday Safe Communities Action Groups frequently access surveillance data from QISU. This data has proved to be an important advocacy tool to empower the coalition to engage local community leaders and the media.

The Queensland Government Human Services Chief Executive Officers' Committee established the Child Injury Prevention Project (ChIPP) in 2002 and project officers were appointed in Mackay and Mt Isa in 2003 because Mackay ED Injury Surveillance Network data had been used to extensively profile childhood injury patterns in the Mackay and Moranbah Health Service Districts. It enabled the project to identify priorities, develop solutions and evaluate outcomes.

In 2003, I conducted an epidemiological analysis of all ED injury presentations in children under 15 years of age over a five year period from 1998 to 2002 in the Mackay and Moranbah Health Service Districts using the Mackay ED Injury Surveillance Data Set . This analysis was published by QISU in June 2003 in collaboration with Kelly Hart, the newly appointed ChIPP project officer and Kathryn McFarlane, Senior Health Promotion Office with the Tropical Population Health Unit in Mackay to ensure that the local facilitators of the project had an intimate knowledge of the underlying epidemiology and, just as importantly, to ensure that the report was drafted in a way that made it accessible and understandable to non health professionals engaged in the ChIPP action group, the local media, and the general Mackay Community (Hanson et al., 2003). See Appendix 20.

PUBLICATIONS:

Hanson, D, Pitt, RW, Hockey, R, Miles, E & Müller, R 2002, 'Collection of NDS-IS level 2 injury surveillance data in regional Queensland', in: R Müller (ed.), *Reducing injuries in Mackay, North Queensland,* Warwick Educational Publishing, Warwick, Queensland, pp. 17-34 (included in this chapter).

Hanson, D, Hart, K, McFarlane, K, Carter, A, Hockey, R, & Miles, E 2003, 'Addressing childhood injury in Mackay: a safe communities initiative', *Injury Bulletin,* no. 77*,* pp. 1–6, see Appendix 20.

Collection of NDS-IS Level 2 Injury Surveillance Data in Regional Queensland

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Abstract

Injury is an important public health issue in the Mackay Region. Hospital separations due to injury occur at double the rate observed for the rest of Queensland.

The Mackay Injury Surveillance Network was established in 1997 as part of the Queensland Injury Surveillance Unit's network. This population based network collects data from all public Emergency Departments in the region.

The Emergency Department of the Mackay Base Hospital collects data using the EDIS computer database. All other Emergency Departments use a paper based system.

The Mackay Injury Surveillance Network reported 35,211 Emergency Department presentations due to injury from January 1, 1998 to December 31, 2000. This represents an age standardised rate of 12,584 per 100,000 for males, 2.0 times the rate observed in South Brisbane; and a rate of 6,319 per 100,000 for females, 1.7 times the rate observed in South Brisbane.

High ascertainment rates have been achieved. The Mackay Base Hospital Emergency Department has achieved a case ascertainment rate of 93.5%, with 85% of records complete. Injury Surveillance reports have been stable throughout this study. This combined with the high ascertainment rate highlights the significant advantages of computerised Emergency Department injury surveillance systems.

Annual injury reports from peripheral hospitals have increased over the period as ascertainment rates improve. An overall ascertainment rate of 75% has been achieved in regional hospitals in 2000. Ascertainment rates varied considerably between peripheral hospitals ranging from 48% to 95% in 2000.

The collection of injury surveillance data finds strategic focus in the context of the prevention programs they are designed to inform. The Mackay/Whitsunday Safe Communities Project is a community based safety promotion project which aims to reduce injury in the Mackay Region by 30% over five years. Timely and detailed local injury surveillance data identifying the determinants and distribution of injury in the community are an important tool to enable the project to target strategic areas for intervention and monitor effects of interventions.

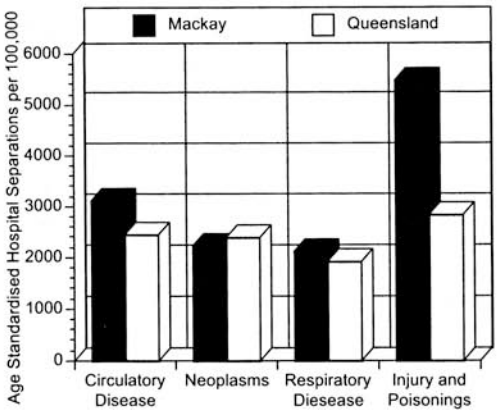
Introduction

Injury is one of five national health priority areas identified by Ministers for Health[1] with an estimated direct cost to the health care system of $2.6 billion per year[1,2]. Queensland's death rate for injuries is higher than the national average[3,4].

The Mackay Region has a population of 125,000 and supports a diverse range of industries including sugar cane, grazing, coal mining, fishing and tourism.

In 1998 the Mackay Division of General Practice conducted a community needs analysis which identified that age standardised hospital separation rates for injury and poisoning in 1995/96 were high in the Mackay Region (Figure 1)[5]. A direct age standardised rate for injury and poisoning of 5,458 per 100,000 was observed, accounting for 15.4% of all hospital separations in the district[6]. This compares with an average Queensland morbidity rate of 2,832 per 100,000, accounting for 8.5% of all hospital separations[6]. The population of the Mackay Region produced 6.6% of all injury and poisoning separations registered in Queensland[6] while representing 3.1% of the total Queensland population in the 1996 Australian Census[7].

Figure 1. Age Standardised Hospital Separation Rates for Major Diagnostic Groups 1995/96 [5,6] in Mackay and Queensland



Subsequent review of Age Standardised Injury Separation Rates by the Tropical Public Health Unit (TPHU) of Queensland Health confirmed that injury separations in Mackay were more than double those observed for the rest of Queensland (Figure 2)[8].

Figure 2. Age Standardised Morbidity (Hospital Separation) Rates per 100,000 with 95% Confidence Intervals for Queensland and Mackay [8]

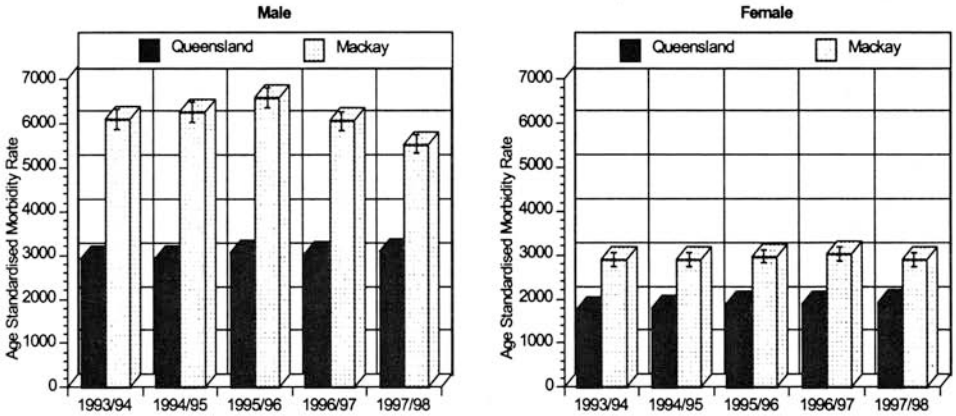
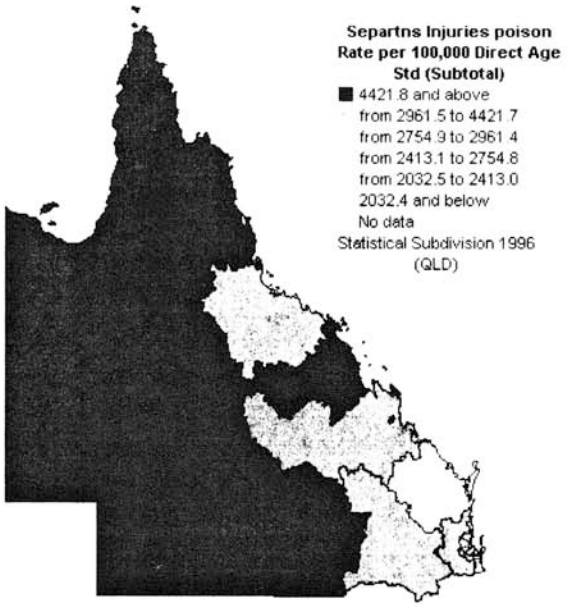


Figure 3 shows age standardized hospital separation rates from injury and poisoning in 1997/98 by Queensland region. The Mackay injury rate of 4,535 per 100,000, compares with rates of 2,808 per 100,000 in Rockhampton; 2,755 per 100,000 in Gladstone; 2,705 per 100,000 in Cairns; and 2,035 per 100,000 in Townsville[6].

Figure 3. Age Standardised Hospital Separation Rates from Injury and Poisoning by Queensland region for 1997/98[6]



National Injury Surveillance Systems

Meeting national injury control targets[9,10,11] requires the collection, analysis and timely distribution of local surveillance data regarding the determinants and distribution of injury. Hospital Emergency Departments (EDs) are an excellent source of injury surveillance (IS) data and effective collection systems have been progressively developed in Australia commencing in 1988 with the Injury Surveillance Information System (ISIS)[12].

Computerisation of Australian ED patient management systems in the early 1990's offered a unique opportunity to establish injury data as part of the routine medical record[12,13,14,15,16]. In order to integrate IS into ED computer systems, the original ISIS coding system was revised to produce the current National Data Standards for Injury Surveillance (NDS-IS) in 1995[17]. Two levels of detail are possible. Level 2 coding is preferred over Level 1 because it allows more detailed coding. For example, Level 1 coding of a sporting injury just records that the injury occurred playing sport, whereas Level 2 coding also records the type of sport.

The Queensland Injury Surveillance Unit (QISU) collects Level 2 injury surveillance data from a sample of Queensland Hospitals. In a number of major urban and regional ED's QISU has successfully trailed the computerised collection of Injury Surveillance data using EDIS (Emergency Department Information System). EDIS is a computerised ED patient tracking and management system, marketed by Hospital Administrative Systems (HAS) and initially developed in Queensland[18].

The number of participating hospitals has grown from the original collection based on the former Brisbane South Health Region to include hospitals in rural and remote Queensland[18].

The Mackay Injury Surveillance Network (MISN)

ED staff in the Mackay Region, concerned at the apparent high rates of injury, commenced collection of NDS-IS Level 2 data in September 1997, providing a regional sample for the QISU surveillance network. Emergency Departments from all 6 public hospitals in the Mackay Region ie. in the Mackay and Moranbah Health Service Districts (Clermont, Dysart, Mackay Base, Moranbah, Proserpine and Sarina Hospitals) collect IS data on behalf of QISU. The Mackay Mater Private Hospital's After-hours Medical Clinic was added in September 2000.

In 1999 the TPHU sought to establish a community-based safety promotion network in the Region. The Mackay/Whitsunday Safe Communities Project (MWSCP) was launched in February 2000.

In 1999, an academic research arm was added when the James Cook University Injury Research Group (JCUIRG) founded, together with the Mackay Health Service District and QISU, the Mackay/Whitsunday Injury Research Collaboration.

The Injury Research Collaboration aims to collect and analyse high quality Level 2 NDS-IS data from all public hospitals in the Mackay Region and to:

- Study the impact of injury on a regional Queensland community;
- Identify risk factors that predispose to injury;
- Elucidate the chain of events culminating in an injury;
- Identify strategic areas for injury prevention programs for the community; and
- Evaluate the impact of injury prevention strategies in the community.

Data Collection

All patients who present with an injury to an ED in the Mackay Region are asked to complete a questionnaire to describe how their injuries occurred. At the Mackay Base Hospital Emergency Department (MBHED) the IS data is coded directly into EDIS. Every month the EDIS database is queried for all ED presentations with an ICD-9 diagnosis[19] for injury and poisoning, to ensure that an IS report has been registered for any new presentation caused by injury. This audit process ensures a high ascertainment rate for IS data reported through MBHED. Data, without any personal identifying information, is electronically forwarded to QISU at the end of the month.

Data is collected manually at all other hospitals in the Mackay Region and forwarded to QISU for coding. This manual system uses standardised IS forms provided by QISU which are self-carbonated, allowing a copy to remain as part of the medical record. The forms contain:

- Self reported demographic and injury event data, and
- Diagnosis and separation status completed by medical or nursing staff.

Completed forms are sent to QISU weekly or fortnightly, checked for completeness and then coded and entered into the QISU database. Incomplete forms are returned to the sites for completion.

Figure 4. Collection and Processing of Injury Surveillance Data in the Mackay Region.

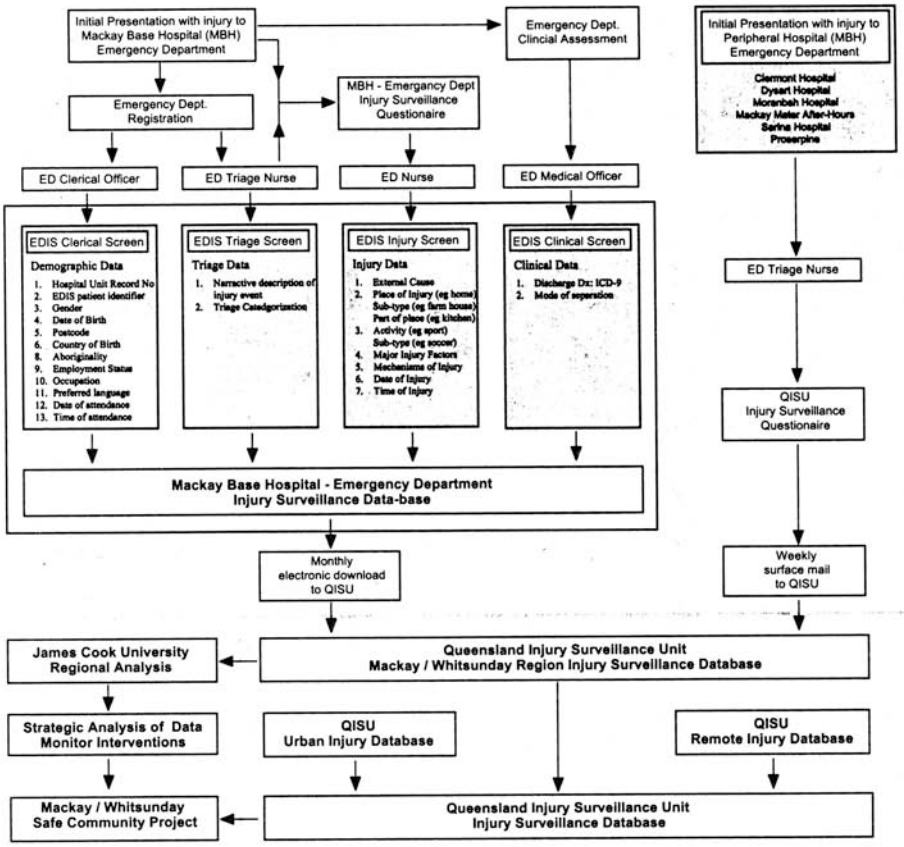


Figure 4 gives an overview of the regional data collection system. Appendix 1 details data fields contained in the IS data-base and the source of this information. Only the first presentation relating to any injury event is registered. All data is audited to ensure consistent quality before being added to the data-base. Paper forms are stored in a locked filing cabinet until data is entered and are then destroyed. No identifying information is entered into the QISU database. A back-up of the entire database is made daily and stored separately while copies of each month's data from each hospital are also maintained. The QISU database is part of a secure network accessible only by QISU staff. QISU conducts regular data audits of all EDIS collection sites to ensure quality and completeness of IS data.

Data Quality

The MISN reported 35,221 presentations due to injury between January 1, 1998 and December 31, 2000. 32,989 (94%) reports concerned residents of the District. After an initial rapid increase in the number of injury reports between 1998 and 1999, reflecting the increase in reports from peripheral hospitals, reports have now stabilized at approximately 12,200 reports per annum (Figure 5).

Figure 5. Annual Injury Surveillance Reports from ED's in the Mackay Region

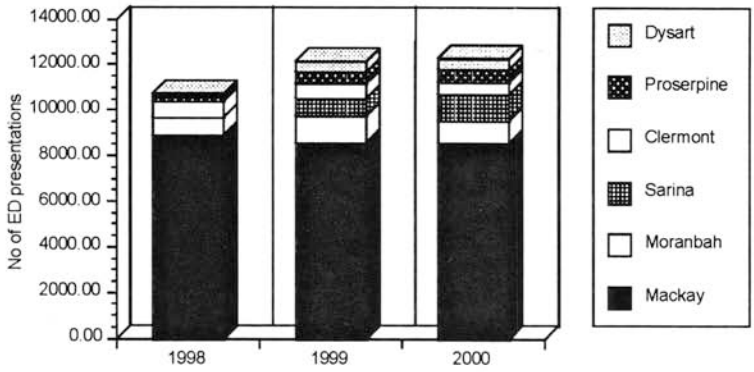


Table 1. Annual Injury Surveillance Reports from ED's in the Mackay Region

	1998	1999	2000	Total
Mackay	8,904	8,626	8,574	**26,104 (75%)**
Moranbah	768	1,168	1,010	**2,946 (8%)**
Sarina	41	723	1,166	**1,930 (5%)**
Clermont	677	675	508	**1,860 (5%)**
Proserpine	241	487	572	**1,300 (4%)**
Dysart	119	456	429	**1,004 (3%)**
Total	**10,750**	**12,135**	**12,259**	**35,221**

MBHED, which generates 75% of regional reports, has been a reliable source of IS data since inception, generating approximately 8,600 reports per annum, with a stable ascertainment rate of approximately 85% (Figure 6). Initial presentations for injury represent 25% of MBHED's caseload. Over the study period MBHED has shown a 2% per annum decline in injury presentations.

Figure 6. Injury Ascertainment Rates: Mackay, Logan & Mt Isa, 1998-2000[18]

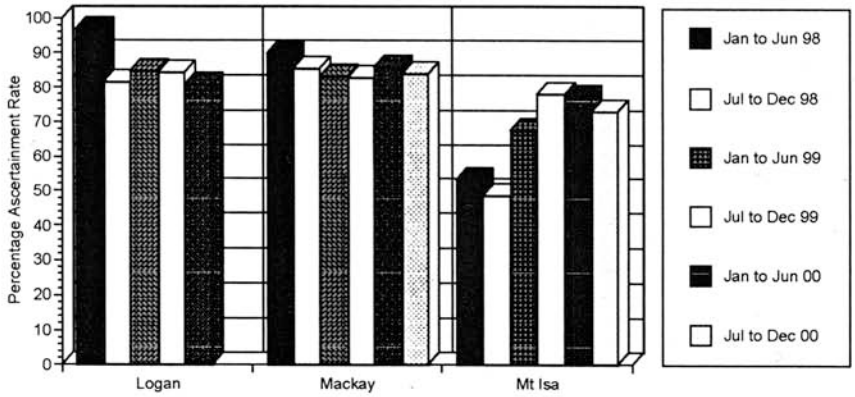
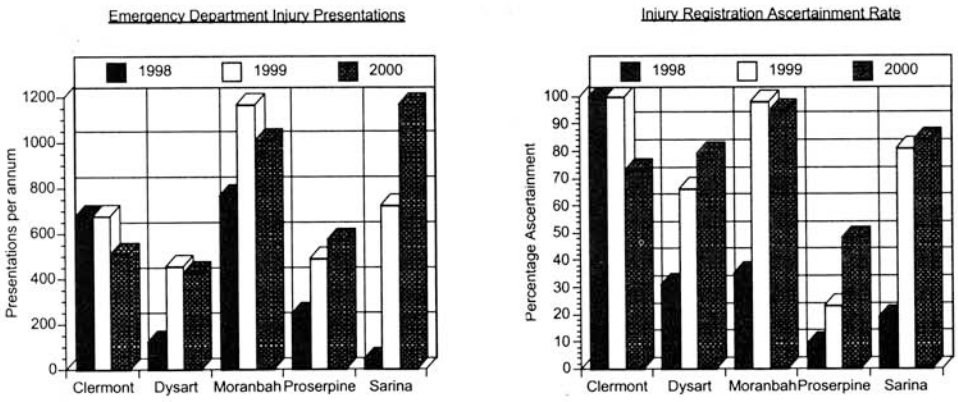


Figure 7 shows Emergency Department injury registrations and percentage ascertainment rates for peripheral hospitals in the Mackay Region from 1998 until 2000. Progressive increase in injury reports over this time period reflect improving ascertainment rates from these hospitals.

Figure 7. Injury Registrations and Ascertainment Rates: Peripheral Hospitals Mackay Region 1998-2000



In 1999 QISU performed a validation study of the entire data collection process[20] which showed a case ascertainment rate of 93.5% at MBHED, and an overall ascertainment rate of 85% when missing data is taken into account (see also Figure 6).

Emergency Department injury presentations

The Age Standardised Morbidity Rates (ED injury presentations) were 12,584 per 100,000 for males and 6,319 per 100,000 for females. This compares with rates of 6,446 per 100,000 (males) and 3,727 per 100,000 (females) in South Brisbane (Figure 8).

Figure 8. Age Standardised ED Injury Presentation Rates: Mackay Region and South Brisbane 1998 to 2000

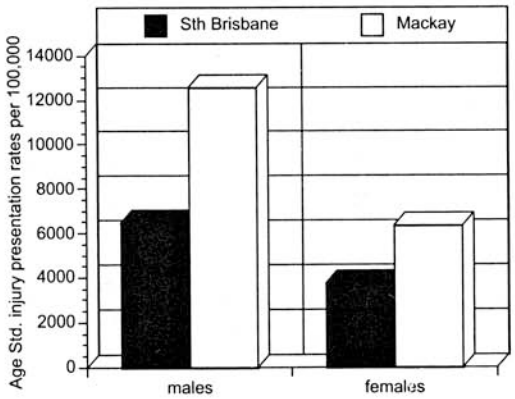


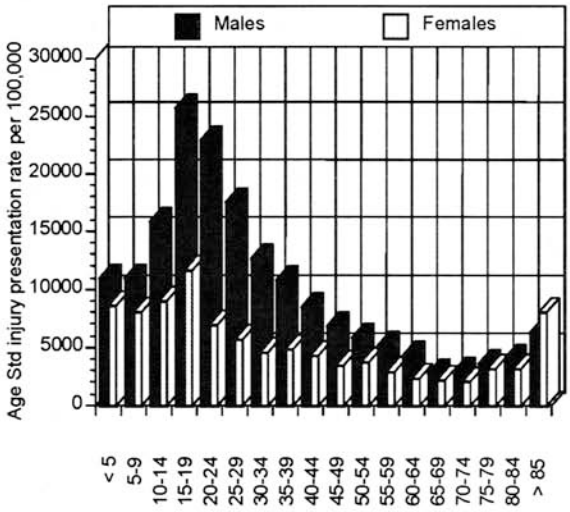
Figure 9 shows ED injury presentations per 100,000 by age and gender. Males are especially at risk of injury. 22,546 (68%) injury presentations were reported in males compared with 10,443 (32%) in females. Males aged 10 to 29 years accounted for 34% of injury presentations.

Nine thousand four hundred and eight injury presentations were reported in children under 15 years, accounting for 29% of all injury presentations. Fifty five percent of these injuries occurred in the home. In children under 5 years, 83% of injuries occur in the home.

There were 1,480 injury reports for patients older than 60 years (5% of injury presentations), 45% of injuries resulting from falls, with 62% of falls occurring at home.

Figure 9. Age Standardised ED Injury Presentation Rates by Age and Gender

Mackay Region: 1998 to 2000



Discussion

The strength of the MISN is that it is a population based network. All ED's in the Mackay Region contribute to the database. It is therefore possible to calculate population-based ED injury presentation rates for the Mackay Region. In the three year period 1998 to 2000,the network reported 35,221 ED presentations due to injury, an age standardised rate of 12,584 per 100,000 for males and 6,319 per 100,000 for females. This is 2.0 times the rate reported to QISU in South Brisbane for males, and 1.7 times the rate for females. The Mackay Region generated 21% of all injury reports to the QISU over this period.

The high ascertainment rate (85%) in MBHED database from inception corroborates the advantages of electronic collection of IS data. Advantages include immediacy of data collection and the ability to audit the database for injury ICD-9 codes to ensure an IS report has been registered. Electronic data collection elsewhere has delivered ascertainment rates from 75% to 100%[14,18,19,20]. By comparison, ascertainment rates from the Mackay Region's peripheral hospitals, which use a paper-based system, varied from 48% to 95%. This is comparable to a validation study of a paper-based system in Canada which documented the ascertainment rates ranged from 30 to 91% depending on the hospital[21,22].

Other authors have highlighted the limitations of ED IS databases[23,24]. ED utilisation depends on a number of factors including: availability and cost of alternate medical services, gender, ethnic status, socio-economic factors, health insurance status and geographic location[23,24]. Comparison of ED presentations between rural, regional and urban areas may be biased by different patterns of ED utilisation. Even within a region there is the potential for changing patterns of ED utilisation to affect injury registrations over time. Australia has a compulsory and universal national medical insurance scheme and Queensland has a free public hospital system so Emergency Department utilisation is relatively stable.

It has been suggested that ED surveillance systems are biased by "minor" injuries[23,24]. Most injuries reported to EDs heal rapidly, have limited long term sequelae and few require admission. In the context of limited resources some authors advocate IS systems that monitor more "significant" injuries (eg. injuries requiring admission, with an injury severity score[25] of greater than or equal to three)[23,24]. However, so called minor injuries may occur as a result of the same, or similar, chain of events that result in a more severe injury. The bigger body of data available to analyse the cause of minor injuries may generate improved understanding of the causes of more severe injuries. More importantly, emergency department based systems, which collect data from all levels of severity, may be better positioned to identify factors that determine why in some circumstances an injury mechanism will result in "minor" injury, yet in others the same mechanism results in "severe" injury. Finally, the large numbers of "minor" injuries mean that the overall cost of managing these injuries is significant and comparable to that of more "severe" injuries[26,27]. It is important not to underestimate the social burden of "minor" injury. Many injuries, while not requiring admission have a significant social and financial impact on the community.

Different types of injury may be caused by a similar chain of events. For example, a fall from low height may result in a spectrum of injury ranging from soft tissue contusion, ankle sprains and "minor" fractures to more serious long bone fractures. Alternately, the same injury (eg fractured neck of femur) may be caused by a number of different mechanisms, such as: trip and fall, slip in the bath, gait disturbances, orthostatic hypotension or adverse effects of

medication. While it may be useful to observe a change in the number and type of injury occurring within a community to identify strategic areas for intervention, it is not possible to make assumptions regarding the underlying cause of target injury, and therefore identify strategies to minimize the risk of this injury. As Vimpani[28] points out, the purpose of an IS database "*is not simply to count injury-causing events, but to facilitate the control of the injury epidemic by providing the data needed to plan, implement and evaluate injury control programs*"[29]. Epidemiological data describing the type and incidence of injury is necessary but not sufficient to control the injury epidemic. IS systems must therefore monitor the chain of events that culminate in injury, as much as they monitor injury outcomes. The crucial question becomes, "*Why was this person injured at this time, in this place, in this way, in these circumstances?*"[28]. We propose that a critical characteristic of IS systems is that they have the capacity to identify environmental and sociological predisposing factors and elucidate the chain of events that culminate in an injury. Electronic ED-IS data-bases, because of their immediacy, their practicality, their use of first-hand patient description of the circumstances resulting in injury and their high ascertainment rates, are excellent sources of IS data that identify the underlying mechanisms resulting in injury.

State Mortality and Hospital Separation databases provide excellent population based epidemiological data. However, because data is retrieved retrospectively based on second hand information (a clinician's description of an injury event based on their interpretation of the patient's history), the insight gained into the underlying mechanisms of injury is poor. On occasion, clinical staff fail to record any description of the injury event, and it is not possible to reliably E-code[19] the injury.

ED based IS does not measure long-term severe disability as a consequence of injury[31], yet clearly these patients impose a significant financial and social burden on their family and society. The Queensland Trauma Registry (QTR)[32] has been established to study the effectiveness of emergency medical treatment provided in Queensland Hospitals compared with national and international benchmarking standards, and the long term manifestations of disability due to injury. QTR is essentially a database designed to study the effectiveness of clinical care (tertiary prevention). The QTR may be better positioned to identify the long-term impact of injury.

IS databases find their strategic focus in the context of the intervention programs they are intended to inform. The Mackay/Whitsunday Safe Communities Project (MWSCP) was established in February 2000 in response to the observed excess of injury in the district. It aims to reduce injury in the region by 30% over 5 years. Safe Communities is a World Health Organisation (WHO) supported approach to injury prevention and safety promotion. There are currently 62 WHO Safe Communities, nine of these in Australia. The MWSCP aims to be the first WHO Safe Community accredited in Queensland.

The Safe Communities 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 behaviours to reduce the risk of injury. Since its inception in Sweden the Safe Community approach has been shown to be an internationally effective means of reducing injury[33,34]. The Latrobe Valley Better Health Injury Prevention Program demonstrated the utility of this model in Australia, producing a 28% reduction in injury over a five year period[35].

Setting priorities for a safety promotion program is dependant on identifying the behavioural, environmental and situational factors that produce injury. Local IS data is a critical tool to inform public debate, advocate on behalf of the program, strategically focus interventions, monitor effectiveness of programs and feedback progress to the community.

The sentinel observation that hospital separation rates for injury were high in the region was made in a Community Needs Analysis commissioned by the Mackay Division of General Practice (Figure 1)[5]. These observations triggered a decision to develop a locally based injury prevention program in Mackay. Hospital Separation data proved to be an excellent tool for advocacy and to engage potential network partners during the consensus building phase of MWSCP. However, this data provided poor insight into the underlying situational and environmental factors that produced injury. Therefore, it was not useful for identifying strategic areas for intervention.

The availability of locally-based, high quality EDIS data has proved to be a highly important tool for MWSCP. Local data has empowered the project to identify strategic issues for intervention and provided some insight into the underlying situational and environmental factors that predispose to injury. Strategic issues identified include; falls, especially in children and the elderly; bicycle injuries; injuries in young males and elderly females; home, sport and workplace injuries[36,37]. Local IS data has proved to be an excellent vehicle for engaging the local media.

While the effectiveness of the Safe Community Model in reducing injury has been well established, it is less clear why it works. Identifying the key characteristics of effective intervention is a major focus for further research. The strong links between the Mackay Injury Research Collaboration, QISU, WHO Injury Research Collaboration's and the MWSCP provide an excellent opportunity to research the links between injury research and injury prevention programs and to monitor the impact of interventions.

As the major improvement in injury mortality and morbidity in the Mackay Region are likely to be achieved through primary and secondary prevention strategies,[27,28,31,33,34,35] the importance of EDIS data capable of identifying the chain of events that produce injury cannot be understated.

The implementation of the QTR at Mackay Base Hospital in 2001 will further compliment the strengths of the regional injury database, providing a clearer picture of the severity and long-term disability caused by injury in the Mackay Region.

Conclusions

Injury is an important public health issue in the Mackay Region. The MISN and the MWSCP have been established to address this significant health problem. These projects rely on population based, high standard IS data with high ascertainment rates. The MISN affords an excellent opportunity to study the causes and impact of injury in a regional Queensland community.

The MISN reported 35,211 ED presentations due to injury from January 1, 1998 to December 31, 2000. This represents an age standardised rate of 12,584 per 100,000 for males, 2.0 times the rate observed in South Brisbane, and a rate of 6,319 per 100,000 for females, 1.7 times the rate observed in South Brisbane.

High ascertainment rates have been achieved. The Mackay Base Hospital ED has achieved a case ascertainment rate of 93.5%, with 85% of records complete. IS reports have been stable throughout this study. This, combined with the high ascertainment rate highlights the significant advantages of computerised ED injury surveillance systems.

Injury reports from peripheral hospitals increased during the study as ascertainment rates improved. An overall ascertainment rate of 75% was achieved in regional hospitals in 2000. Ascertainment rates varied between peripheral hospitals, ranging from 48% to 95% in 2000.

The collection of injury surveillance data finds strategic focus in the context of the prevention programs they are designed to inform. Timely and detailed local injury surveillance data identifying the determinants and distribution of injury in the community is an important tool to enable the MWSCP to target strategic areas for intervention and monitor effects of interventions.

The strong links between the Mackay Injury Research Collaboration and the MWSCP provide an excellent opportunity to explore the links between public health research and intervention projects, and to test the impact of the Safe Communities model of safety promotion on injury outcomes in a regional Queensland community.

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Table 3.2 Data-fields injury surveillance data-base
Mackay Base Hospital Emergency Department

Description	EDIS Screen	Completed by	When
Injury Data			
1. Narrative of Injury Event	Triage	Triage Nurse	At presentation
2. External Cause	Injury	Registered Nurse	Transcribe form*
3. Place of Injury	Injury	Registered Nurse	Transcribe form*
a.. sub place	Injury	Registered Nurse	Transcribe form*
b. part of place	Injury	Registered Nurse	Transcribe form*
4. Activity when injured	Injury	Registered Nurse	Transcribe form*
a. sub-type of activity	Injury	Registered Nurse	Transcribe form*
5. Principle Discharge Dx	Clinical	Medical Officer	At ED discharge
6. Major Injury Factors	Injury	Registered Nurse	Transcribe form*
7. Mechanism of Injury	Injury	Registered Nurse	Transcribe form*
8. Date of Injury	Injury	Registered Nurse	Transcribe form*
9. Time of Injury	Injury	Registered Nurse	Transcribe form*
General Data			
1. Hospital Unit Record No	Clerical	Booking Clerk	At presentation
2. EDIS patient identifier	Clerical	Booking Clerk	At presentation
3. Gender	Clerical	Booking Clerk	At presentation
4. Date of Birth	Clerical	Booking Clerk	At presentation
5. Postcode	Clerical	Booking Clerk	At presentation
6. Mode of Separation	Clinical	Medical Officer	At ED discharge
7. Country of Birth	Clerical	Booking Clerk	At presentation
8. Aboriginality	Clerical	Booking Clerk	At presentation
9. Employment Status	Clerical	Booking Clerk	At presentation
10. Occupation	Clerical	Booking Clerk	At presentation
11. Preferred language	Clerical	Booking Clerk	At presentation
12. Date of attendance	Clerical	Booking Clerk	At presentation
13. Time of attendance	Clerical	Booking Clerk	At presentation
14. Triage category	Triage	Triage Nurse	At presentation

* Patient or accompanying adult completeS Injury Surveillance Form at presentation – Registered Nurse Transcribes onto EDIS Injury Screen at a later date

Table 3.3 Number of injury surveillance records received by hospital and year, 1994-2000.

Hospital	Year 1994	1995	1996	1997	1998	1999	2000
URBAN							
Mater Children's	4000	3491	3222	3814	4338	4396	5254
Royal Children's	-	-	-	446	3488	4536	4714
Mater Adult	934	2024	3655	3121	4170	4500	3798
Mater Private	1098	2165	2630	2229	1249	410	-
Logan	1772	2093	3039	3608	10905	10931	6132
Redland	3167	6070	6145	6221	5695	6365	6685
Princess Alexandra	1044	1455	156	2916	7723	7775	9577
Queen Elizabeth II	2291	2941	4435	4176	2204	-	-
Total Urban	14,306	20,239	23282	26,531	39,772	38,913	36,160
REGIONAL							
Mackay	-	-	-	1166	8904	8626	8574
Clermont	-	-	-	14	677	675	508
Moranbah	-	-	-	-	768	1168	1010
Proserpine	-	-	-	-	241	487	572
Sarina	-	-	-	-	41	723	1166
Dysart	-	-	-	-	119	456	429
Mackay Mater (commenced Sept 2000)							77
Total Regional	-	-	-	1180	10,750	12,135	12,336
REMOTE							
Mt Isa	-	-	-	-	3607	6983	6869
Total	**14,306**	**20,239**	**23,282**	**27,711**	**54,129**	**58,031**	**55,365**

POSTSCRIPT: REVIEW OF MACKAY HEALTH SERVICE DISTRICT HOSPITAL SEPARATIONS, 1986 - 2004

Initially the epidemiological evidence concerning injury in the Mackay Region seemed straightforward. A five year review of injury hospitalisations from July 1993 until June 1998 indicated that the age standardised hospital separation rates were double the Queensland average and higher than rates observed in regional communities of comparable size (Figure 2). The perception that the incidence of injury was high in the Mackay Region was supported by the observation that ED injury presentation rates to Mackay Base Hospital were double those observed in South Brisbane (Figure 8).

Subsequent review of injury hospitalisations in the Mackay Health Service District from 1986 to 1999 by the Tropical Population Health Unit challenged this interpretation of the available epidemiological data (Queensland Health, 2001; TPHU, 2006a). A sudden doubling of Injury Hospital Separation was observed in the 1992/93 financial year (Queensland Health, 2001), corresponding to the employment of a professional coder at Mackay Base Hospital. Review of admission rates for Injury Diagnosis Related Group X60C (injuries in people aged < 65 years) in the 2003/2004 financial year suggested that injury admission rates for injury were high in the Mackay Health Service District while the average length of stay was low when compared with other regional centres, suggesting a selection bias towards relatively low acuity injury admissions in the Mackay Health Service District (TPHU, 2006b).

Health Service District	Episodes of care (DRG X60C: Inj. people < 65yoa)	Patient days	Average Length of Stay
Mackay	968	1006	1.0
Townsville	294	474	1.6
Cairns	283	349	1.2

Table 3.4 Episodes of care DRG X60C (injuries in people aged < 65 year) 2003/04 financial year: Mackay Health Service District compared with Townsville and Cairns Health Service Districts (TPHU, 2006b)

The apparent excess in admissions was, at least in part, attributed to better statistical capture of ED short stay admissions in the Mackay Health Service District. ED short stay admissions refer to episodes of ED care that require more intensive treatment or a period of extended observation, that are eligible for day surgery admission under federal funding agreements. Typically they include minor surgical procedures performed in the ED (for example, fracture and dislocation reductions or suturing of large deep wounds). The implementation of DRG case-mix funding provided a financial incentive for hospital administration systems to record all ED procedural admissions eligible for day surgery funding. This finding called into question the conclusion that the comparatively high rates of injury hospitalisations observed in the Mackay Health Service District indicated a higher incidence of injury in the region.

While hospital separation data is favoured by injury researchers for national injury surveillance systems (Stone et al., 1999; Langley and Cryer, 2000), local administrative issues may confound interpretation of this dataset in Mackay. While ED injury surveillance systems are generally believed to be more vulnerable to confounding by local administrative and service utilisation issues (Stone et al., 1999; Langley and Cryer, 2000), the Queensland ED injury surveillance (QISU) system appears to provide a more robust representation of the local injury problem. Unfortunately, because ED injury surveillance was not universal in Queensland (or indeed Australia) it was not possible to compare Mackay's ED injury presentation rates with other regional centres of similar size.

Epidemiologically, the ability to generate robust statistics allowing comparison of the incidence of injury between communities is critical as it facilitates the monitoring of national disease patterns and thereby the setting of public health priorities. However, this may make the issue unnecessarily complex from a community perspective for whom an "age standardised hospital separation rate" is an opaque concept. What is a hospital separation? What is a rate? What does age standardised mean? Absolute numbers of injury events are more understandable and meaningful to the lay public. The ability to compare Mackay with similar regional communities was of interest but only of secondary

importance to members the Mackay Whitsunday Safe Community. From their perspective the key epidemiological question was more straight forward, “was there sufficient evidence to indicate injury was an important public health issue in Mackay?”

Every year there were approximately 8,700 ED injury presentations to Mackay Base Hospital. On average, every year 1 in 8 males and 1 in 16 females attended an ED seeking treatment following an injury event. Furthermore, Mackay ED injury presentation rates were higher than observed in South Brisbane. Despite the uncertain significance of the comparatively high incidence of injury hospital separations compared with other regional centres, these observations were consistent with the general finding that Australian regional centres had relatively high rates of injury compared with urban centres (ABS, 2004; Berry and Harrison, 2006) and that Queensland experienced an unacceptably high incidence of injury (Pike et al., 2000). Against a backdrop of the best available local, state and national evidence there was convincing evidence that Mackay, like other Queensland Regional Centres, had an important injury problem. While epidemiologists might prefer more accurate and consistent local surveillance data, such data was not necessary to justify the need to intervene. Given growing community resolve to address the problem in Mackay, it would have been unethical to stall this program in the hope of obtaining better baseline epidemiological data.