A population based study examining the impact of interpersonal violence victimisation on mental health

Report to:

The Criminology Research Council

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EXECUTIVE SUMMARY

Interpersonal violence victimisation (interpersonal violence) is a significant public health issue both in terms of its impact on the community and the health care system at a national and international level. A population-based, retrospective study of interpersonal violence in Western Australia was undertaken using the Western Australian Data Linkage System. This is a unique inter-linking system of hospital and other heath records which was developed in Western Australia. It systematically links administrative health data such as the morbidity, mortality and mental health data. The Data Linkage System was used to identify every individual in WA who was admitted to hospital or killed as a result of an injury inflicted by others. This information was linked to any past admission for a mental illness. The results of this research have provided a thorough description of the size and nature of interpersonal violence in Western Australia from 1990 to 2004. Secondly, it has aided in the identification of pertinent risk factors associated with violence victimisation, both in the population as a whole and specifically among people with mental illness. Thirdly, the health system costs of interpersonal violence victimisation were calculated and the share of these costs attributable to patients with mental illness. The main findings are as follows.

Hospitalisations due to interpersonal violence victimisation

- There were 36,934 hospital admissions due to interpersonal violence from 1990 to 2004. In 2004, the rate of violence victimisation was 135 per 100,000 with 2,668 hospitalisations in that year. This was a 1% reduction from the previous five year average.
- The hospitalisation rate due to violence victimisation was higher for males than females throughout the study period. Overall, 63% of victims were male.
- Adolescents and young adults were more likely to be hospitalised than children or older adults. Overall, 72% (n= 26,439) of hospitalisations were for people between the ages of 15 to 44 years. Within this age range those between the ages of 20 and 29 years were at greatest risk, comprising over half (52%, n=13,704) of all hospitalisations.

- Disadvantaged groups accounted for the largest number of hospital admissions for interpersonal violence- 21% from the extremely disadvantaged group and 19% from the disadvantaged group.
- Females in the extremely disadvantaged group had the highest number of hospital admissions due to interpersonal violence.
- Hospital admission for interpersonal violence was more common among persons who were never married (56%) or married (29%).
- People whose employment status was recorded as "employed" comprised the largest proportion of hospitalisations due to interpersonal violence victimisation (24.5%) followed by "unemployed" (23.3%) and "home duties" (15%).
- Thirty nine percent of victims of interpersonal violence who were admitted to hospital lived in remote Western Australia, followed by 38% in the metropolitan area and 23 % in rural Western Australia.
- A large proportion of interpersonal violence injury events were due to bodily force (42%) followed by sharp or blunt objects (29%), other specified and unspecified methods (22%) and maltreatment and rape (6%).
- There were 8,633 hospitalisations due to violence victimisation where the relationship between the victim and the perpetrator could be identified. For half these hospitalisations (50%, n=4263) the relationship code assigned to the record described the perpetrator as either an 'unspecified person' (45%, n=3875) or an 'other specified person' (5%, n=388). Of the remaining 4,370 hospitalisations in which the relationship was specified, over a quarter (28%, n=2468) of the perpetrators were either the victim's spouse or partner with females over-represented among this group (91%). A further 6% (n=541) of hospitalisations involved persons victimised by a parent, 5% (n=415) by another family member and 4% (n=310) by a friend/acquaintance.
- Over a quarter (27%) of the total number of hospitalisations due to violence victimisation during the study period (n=36,934) reported at least one other medical condition when admitted to hospital. Of this group, 93% reported two or more medical conditions when admitted to hospital.

- The most common co-morbidities were for a mental illness (27%), alcohol-related admission (20%) and diseases of the circulatory system (13%).
- The average number of co-morbidities significantly differed between male and females with females reporting more co-morbid conditions.

Indigenous people

- Indigenous people were over-represented among the victims of interpersonal violence accounting for 47% of the number of hospitalisations despite representing only 3% to 4% of the population of Western Australia during the study period.
- The overall rate of hospitalisation for Indigenous people (1922 per 100,000 population) was 26 times higher than that for non-Indigenous people (75 per 100,000 population).
- When restricted to victims aged 15 to 34 years, Indigenous people were 22 times more likely to be hospitalised due to interpersonal violence victimisation. The rate of hospitalisations for Indigenous people aged 15 to 34 years was 3549.5 per 100,000 compared to 161.9 per 100,000 population for non-Indigenous people.
- The hospitalisation rate due to violence victimisation was higher for Indigenous females than males throughout the study period. Overall, 56% of admissions were for female victims from 1990 to 2004.
- Sixty percent of both male and female Indigenous people who were admitted to hospital as a result of violence victimisation were from the extremely disadvantaged and disadvantaged group compared to 40% of male non-Indigenous people and 32% of female non-Indigenous people.
- Mental illness and alcohol related admissions were the most commonly occurring co-morbidities reported for Indigenous people.

Health care system impact (for one and repeat episodes of interpersonal violence victimisation)

- There were 25,427 cases admitted to hospital for at least one episode of interpersonal violence which resulted in a total of 36,934 hospitalisations.

- The number of admissions per individual ranged from one admission only to 24.
- The average length of stay for all hospital admissions (n=36,934) was 2.6 (SD=4.9) days with a range of one to 271 days.
- The mean length of stay significantly differed between males and females with the average length of stay for females (mean=2.7 days, SD=4.4) slightly longer than for males (mean=2.5, SD=5.0).
- Indigenous people spent an average of 2.7 (SD=4.2) days in hospital compared with non-Indigenous people (2.5 days, SD=5.5).
- The overwhelming majority of victims admitted to hospital due to interpersonal violence during the study period were discharged home (86%, n=31,634), 8% (n=2777) were discharged to another acute hospital and 6% (n=2156) against medical advice.

Repeat hospital admissions for interpersonal violence victimisation

- There were 11,507 repeat hospitalisations due to interpersonal violence during the study period. This represented 5887 cases.
- Indigenous people accounted for 74% (n=8545) of the 11,507 repeat hospital admissions for interpersonal violence with almost half (48%, n=5521) of *all* repeat hospital admission being Indigenous females.
- There was no significant difference in the average length of stay between Indigenous (2.8 days) and non-Indigenous people (2.8 days) for a repeat hospital admission for interpersonal violence victimisation.

Hospitalisations for interpersonal violence for victims with a mental illness

- The number of hospital admissions due to interpersonal violence between 1990 and 2004 for people with a mental illness was 9,846 and 27,088 for those without a mental illness. People with a mental illness accounted for 27% of the total number of hospitalisations (n=36,934).
- The overall rate of hospital admissions due to interpersonal violence for those with a mental illness was 36 per 100,000 population from 1990 to 2004. This rate decreased by 4% between 2003 to 2004.

- The rate of hospital admissions for males with a mental illness (41 per 100,000 population in 2004) decreased by 11% between 2003 and 2004. However the rate of hospital admissions for females with a mental illness increased by 6% between 2003 (30.3 per 100,000 population) and 2004 (32.2 per 100,000 population)
- The average length of stay in hospital was similar for victims with a mental illness (2.6 days, SD=5.5) and those without a mental illness (2.6 days, SD=4.7).
- Thirty-three percent of repeat hospital admissions for interpersonal violence had a history of mental illness.
- There was a significant difference in the length of stay for a repeat admission due to interpersonal violence for individuals with and without a mental illness. Victims with a mental illness stayed fewer days on average (2.6 days, SD=4.0) than those who did not report having a mental illness (2.9 days, SD=4.6).

Risk factors for a hospital admission due to interpersonal violence victimisation for victims with a mental illness *(these results are based on the index hospital admission only)*

- Of the 25,427 victims admitted to hospital due to interpersonal violence, on at least one occasion one quarter (n=6394) were admitted at least once to hospital with a principal diagnosis of a mental illness.
- Of these 6394 cases with a diagnosis of a mental illness, 55% (n=3534) were admitted to hospital with a diagnosis of mental illness **first**, followed by an admission due to interpersonal violence.
- Forty-five percent (n=2860) of cases with a mental illness were admitted to hospital for interpersonal violence **first,** followed by an admission for a mental illness.
- Women and Indigenous people were both 1.5 more likely to be admitted to hospital for interpersonal violence and a mental illness compared to males and non-Indigenous people.
- Age increased the risk of an admission for interpersonal violence and mental illness by 2%.

- The presence of co-morbidities also significantly increased the risk for a hospital admission due to interpersonal violence and mental illness by almost 50%.
- People living in remote Western Australia were less likely to be admitted to hospital due to interpersonal violence and mental illness compared with those living in the metropolitan area.
- The circumstances of the injury event were more likely to be due to other specified and unspecified methods than by bodily force for victims admitted to hospital due to interpersonal violence with a mental illness.

Risk factors for a repeat hospital admission due to interpersonal violence

- People with a mental illness were almost 50% more likely to have a repeat admission for interpersonal violence than those without a mental illness.
- Women were 30% more likely and Indigenous people 37% more likely to have a second hospital admission due to interpersonal violence than males and non-Indigenous people.
- People living in rural and remote areas of Western Australia were almost twice as likely to be involved in violence resulting in a second hospital admission than those living in metropolitan areas.
- Similarly, the presence of co-morbidities increased the relative hazard risk for a second admission for interpersonal violence by 70%.
- More affluent groups (middle, advantaged, extremely advantaged, and disadvantaged groups) were less likely to be readmitted for interpersonal violence than the extremely disadvantaged group.

Deaths due to interpersonal violence

- There were 425 deaths due to interpersonal violence during the study period.
- Indigenous people represented 20% (n=83) of deaths due to interpersonal violence with similar distribution between male (n=43) and female victims (n=40).
- Males accounted for 57% (n=271) of the number of deaths with the overall crude death rate higher for males (1.7 per 100,000 population) than females (1.3 per 100,000 population).

- The lowest crude death rate was recorded in 2004 (0.6 per 100,000 population). This represented a 25% decrease in the crude death rate since 2003 (0.8 per 100,000 population).
- The highest proportion of deaths for Indigenous and non-Indigenous people were among victims aged 30 to 34 years and 35 to 39 years respectively.

Cost of interpersonal violence victimisation with and without a mental illness

- The annual cost of interpersonal violence to the hospital system in Western Australia was between $9 million and $10 million, with a mean cost per hospital admission of $3,387.
- Males accounted for two thirds of the total cost of hospital admissions due to interpersonal violence, and they had a statistically significantly higher mean cost per admission than females ($3707 versus $2874).
- Substantially higher than average costs per admission were evident for young females in the 0 to 14 year age group ($4872), males in the 30 to 40 year age group ($4070) and females over 60 years of age ($3960).
- Indigenous victims of interpersonal violence accounted for 41% of the total cost of hospitalisation, but their mean cost per admission ($2805) was statistically significantly below that for non-Indigenous people ($3957).
- The mean cost per hospital admission for victims of interpersonal violence increased consistently as socioeconomic status increased. The mean cost per admission for the extremely advantaged group was almost 40% above that for the extremely disadvantaged group ($3949 versus $2843).
- People resident in rural and remote areas of Western Australia accounted for a higher share of hospital costs due to interpersonal violence (53%) than their share of the population (26%), but their mean cost per hospital admission was statistically significantly lower.
- Statistically significant differences were evident in the mean cost per hospital admission for the various circumstances of injury event.
- Victims of interpersonal violence with a mental illness accounted for 38% of the total hospital costs of interpersonal violence. People with and without mental illness had similar mean costs per hospital admission.

The following recommendations are based on the findings of this research.

Recommendation one

Interpersonal violence victimisation prevention programs and the provision of services should be focused on those that are more likely to be involved in these situations. Indigenous people are considerably over-represented among victims of interpersonal violence. Females, particularly Indigenous females, adolescents and young adults were at an increased risk and should be targeted for attention.

Recommendation two

The results of this study have shown that psychological harm is associated with interpersonal violence victimisation. However, the results do not indicate the specific psychiatric condition that could manifest as a result of victimisation. The linked data provide an opportunity for future research to examine in greater detail the psychological harm outcomes that might arise from each type of assault or maltreatment (i.e. physical or sexual) in childhood or adulthood. To date, there has been minimal research in this area.

Recommendation three

The study has highlighted that victims of interpersonal violence with a mental illness have extremely poor health outcomes. While public health campaigns and the introduction of new treatments for cardiovascular disease have been shown to be successful in the general population, people with a mental illness have not benefited from this progress. Strengthening general practice care for people with a mental illness would be one way of improving the health outcomes of this population. If an individual's condition could be better managed and a coordinated approach to total health adopted, the risk of being admitted to hospital may be reduced.

Recommendation four

The study identified specific risk factors for a second admission to hospital due to interpersonal violence victimisation. Indigenous people, women (both Indigenous and non-Indigenous), having a mental illness, living in remote and rural Western Australia, and the presence of co-morbidities increased the risk of a second hospital admission. It is evident that priority should be given to the primary prevention of

violence – that is measures that prevent it from occurring in the first place. In developing a response to violence and its subsequent problems such as psychological harm, different agencies and sectors of the public should be involved in prevention activities and programs should be tailored to suit different cultural settings and population groups. Evaluation should be an integral part of all programmes so that lessons can be learnt and shared regarding what may and may not work in terms of preventing violence.

Recommendation five

The results of this study have provided information on the more serious types of injuries due to interpersonal violence that result in hospitalisation. However, it is now possible to link hospital morbidity data to presentations to Perth metropolitan hospital emergency departments due to interpersonal violence. This would provide information on the less severe injuries that result from violence and consequently, a more comprehensive picture of the impact of interpersonal violence victimisation on the Western Australia population.

Recommendation six

Medical professionals should be encouraged to fully document the relationship between the victim and the perpetrator of a violent incident. Although this information is currently being coded, in 50% of hospital admissions for interpersonal violence the relationship was coded as 'unspecified person'. In addition, the location of the violent incident should also be properly coded.

Recommendation seven

Future research should be conducted to identify appropriate methods of assessing the contribution that community and societal risk factors have in relation to the risk of interpersonal violence victimisation.

Recommendation eight

Future research should also be conducted to determine the reasons why some groups who are victims of interpersonal violence have significantly higher mean costs per hospital admission. This information is required to ensure that future policy

development to address interpersonal violence is correctly targeted at areas that are causing the greatest problem and disadvantage.

In conclusion, the findings of this study have identified a number of valid indicators that provide a sense of the size and nature of death and injury (hospitalisation) due to interpersonal violence victimisation and its association with mental illness in Western Australia. The results have provided a benchmark against which to measure whether the future situation in Western Australia deteriorates, stabilises or improves. Therefore this study not only provides current estimates of the degree of interpersonal violence victimisation and mental illness, it also enables future trends to be assessed by replication of some or all of the methodology adopted in this research.

1 INTRODUCTION

Interpersonal violence victimisation (interpersonal violence) is a significant public health issue both in terms of its impact on the community and the health care system at a national and international level. Globally, interpersonal violence accounts for 10% of all deaths which translates to half a million deaths per year (Reza et al. 2001). Approximately 11% of these deaths occur in the Western Pacific Region (Peden et al. 2002). In Australia, interpersonal violence accounts for 4% of all injury deaths and ranks fifth as a primary cause of death (Harrison & Dolinis 1995; Bordeaux 1998). Every year in Western Australia between 1989 and 2000, an estimated 70,000 people were assaulted, approximately 3,000 people were hospitalised due to assault or maltreatment, and 30 people were murdered (Australian Bureau of Statistics [ABS] 1999; Fernandez & Loh 2003 Gillam et al. 2003). In terms of the cost of violence victimisation to the community, it was conservatively estimated that one third of the health system cost of injury in 2003 was attributed to interpersonal violence in Western Australia (Hendrie & Milligan 2005).

Interpersonal violence is one of three categories of violence which have been identified by the World Health Organization (WHO). The other two categories are self-directed violence (i.e. suicide) and collective violence (i.e. war). The WHO has defined interpersonal violence as '*The intentional use of physical force, or power, threatened or actual, against oneself, another person, or against a group or community, that either results in, or has a likelihood of resulting in injury, death, psychological harm, mal-development or deprivation*' (Krug et al. 2002, p. 5). This definition includes victimisation perpetrated against intimate partners, parents, siblings, children, other relatives, friends, acquaintances, colleagues and strangers (Krug et al. 2002). The World Health Organisation's definition of violence also identifies psychological harm as one of the possible outcomes of interpersonal violence victimisation (Krug et al. 2002). Past research has identified mental illness as being more prevalent among this particular group (Taft 2003) particularly among individuals who have a history of alcohol and substance misuse, self-harm and suicide, depression, phobias, schizophrenia, anxiety disorders and post traumatic stress disorder (Fergusson & Lynskey 1997; Coker et al. 2002; Briere & Elliot 2003; Coid et al. 2003; Lau et al. 2003). A recent population based record linkage study

undertaken in WA found that people with a mental illness were a high risk group for all types of injuries, particularly drug-related poisonings and injuries inflicted by others when compared to the general population (Lawrence et al. 2001). Elevated rates for hospitalisation as a result of injuries due to violence were seen for all diagnostics groups except dementia. The highest rates were seen in patients with alcohol and drug disorders (especially women), followed by patients with psychoses, personality disorders and depressive disorder.

Effective planning, implementation and evaluation of interventions to reduce the impact of interpersonal violence require accurate estimates of the size and nature of the issue. Currently, most of what is known about interpersonal violence has been obtained from victimisation surveys, crime and health data. However, as indicated by the WHO, to accurately describe the impact of interpersonal violence, estimates of the size and nature should include measures of psychological harm associated with assault and maltreatment. However, at present, none of the available estimates of assault and maltreatment in Western Australia include measures of psychological harm. Therefore the aims of this study are to:

- Describe the demographic characteristics and co-morbidities of victims who have died or been admitted to hospital in Western Australia due to interpersonal violence, and the circumstances of events in which they have been injured.
- Quantify the impact of hospitalisation due to interpersonal violence on the Western Australian health care system, using the number of hospitalisations and the length of stay associated with such hospitalisations as measures of impact.
- Estimate the prevalence of mental illness among victims who been admitted to hospital in Western Australia due to interpersonal violence.
- Identify risk factors and examine the association with reference to demographic characteristics, co-morbidities and the circumstances of the injury events among victims with and without mental illness.
- Quantify differences in the impact made on the Western Australian health care system between victims of violence with and without mental illness.

- Describe the health consequences of interpersonal violence among hospitalised victims with and without a mental illness based on their discharge destination and risk factors for a repeat admission for interpersonal violence victimisation.
- Calculate the health system costs of interpersonal violence and the share accounted for by people with and without mental illness.
- Make recommendations, where appropriate, for potential interventions to reduce the health and social impact for victims of interpersonal violence with and without mental illness.

1.1 Significance and benefits

The Western Australian Data Linkage System, which is a unique inter-linking system of hospital and other heath records, was developed in Western Australia. This facility is unique in Australia and one of only six such record linkage systems in the world. It systematically links administrative health data such as the morbidity, mortality and mental health data. The Data Linkage System was used to identify every individual in WA who was admitted to hospital or killed as a result of an injury inflicted by others. This information was linked to any past admission for a mental illness.

This study is the first Western Australian population-based study to investigate the prevalence and association between mental illness and violence from the perspective of the victims of interpersonal violence. The results of this research have provided information which may assist in reducing the burden of violence victimisation on the Western Australian community and its health care system in three ways. Firstly, it has provided a thorough description of the size and nature of interpersonal violence in Western Australia, thereby strengthening the rationale for prioritising this issue and providing a baseline for subsequent monitoring and evaluation. Secondly, it has identified pertinent risk factors associated with interpersonal violence, both in the population as a whole and specifically among people with mental illness. Effective interventions may now be developed by targeting such factors. Thirdly, the findings have provided a basis for making informed decisions on the allocation of resources to intervene in this issue. Information on the costs of interpersonal violence has shown the potential benefits of reducing the incidence of these events.

2 LITERATURE REVIEW

2.1 Introduction

Mental health and injuries are both National Health Priorities based on their burden in terms of morbidity, mortality, and disability, and therefore high cost to the Australian health care system (Department of Health and Ageing [DHA] 2006). Categorised as a significant injury condition, interpersonal violence accounts for approximately 4% of all injury deaths in Australia and is one of the leading contributors to injury costs for several age and gender groups (Harrison & Dolinis 1995; Bordeaux 1998). Mental illness is one of the leading causes of disease burden in Australia, exceeded only by cardiovascular disease and cancer. In Western Australia alone, nearly one in five individuals suffer from a diagnosable mental disorder including short-term depression and anxiety, as well as longer term illnesses such as chronic depression, anxiety disorders and schizophrenia (Australian Institute of Health and Welfare [AIHW] 2006a; Lawrence et al. 2001). Although both are significant public health issues, it is now recognised that mental illness and interpersonal violence may share a strong association.

In the last decade, epidemiological studies have established that there is a relationship between major mental disorders and violence (Link et al. 1992; Link & Stueve 1994; Stueve & Link 1998). Community surveys as well as studies of victims suggest that people who are victimised have an increased risk of psychiatric symptoms and long-term psychiatric disorders. As well, studies of clinical populations indicate high rates of lifetime victimisation among psychiatric patients (Hegarty et al 2004; Resnick, Acierno & Kilpatrick 1997; Goodman et al 2001).

2.2 The cost of interpersonal violence and mental illness in Australia

Injuries inflicted by another are one of the leading contributors to injury costs for both males and females for several age groups in Australia. Approximately 69% of the $434 million health sector costs in Western Australia were attributed to falls, interpersonal violence, and transport (Hendrie 2005). Additionally, it was conservatively estimated that in 2003, interpersonal violence accounted for one third of the health system cost of injury in Western Australia (Hendrie & Milligan 2005).

Direct costs related to the treatment of violence victimisation in Australia include hospital, medical and rehabilitative care. However, a range of indirect costs have also been identified including the value of lost output in relation to a reduction in productivity caused by injury. Additionally indirect costs relate to measures of resultant disability and loss of life due to premature death, diminished quality of life and a disruption of daily life due to fears for personal safety (Hendrie 2005; AIHW 2006a; Krug et al. 2002).

Recent research has identified that victims of violence may suffer from associated health concerns including psychiatric symptoms such as depression and anxiety (Krug et al. 2002; Mcarthy 2003). In addition, a number of studies have reported increased access to health services by victims of physical and sexual assault (Koss et al. 1991; Acierno, Resnick & Kilpatrick 1997; Koss & Heslet 1992). Koss et al. (1991) revealed that in comparison to nonvictims of violence, the cost of treatment of multiple assault victims was 2.5 times greater. In the year of an assault, a victims' use of medical services increased by 15% in comparison to a 2% increase among nonvictims in the same time period. More recently, a study conducted by McFarlane et al. 2005 found that victimisation was significantly associated with receipt of a disability support pension and number of previous psychiatric hospital admissions. Such results represent a host of indirect health care costs associated with interpersonal violence and mental health.

2.3 Association between violence victimisation and mental illness

2.3.1 Violence victimisation and increased risk of mental illness

Lau et al. (2003) found that middle school and upper secondary students who reported that they were beaten without reason by a family member in the past six months were three times more likely to have psychiatric symptoms, self-harming behaviours and substance use problems than students who had not been beaten by a family member. Briere & Elliot (2003) observed that adult men and women who experienced physical or sexual abuse in childhood reported higher psychological distress scores than adults who had not experienced childhood abuse. Additionally, Hegarty et al. (2004) explored the association between physical, sexual, and emotional abuse and depression by a partner in women attending general practice. He found that those who

scored in the probably depressed range (using the Beck depression inventory score), were significantly more likely to have experienced some form of physical, emotion or sexual abuse as a child and/or intimate partner abuse. Individuals who experienced physical victimisation during both childhood and adulthood were most likely to engage in violent behaviour, providing support for the cumulative effect association between victimisation and violence (Swanson et al. 2002). These results were also substantiated by MacFarlane et al. (2005).

Such results correlate with a literature review conducted by Resnick, Acierno & Kilpatrick (1997) suggesting a strong relationship between violence victimisation and negative mental health outcomes. They found that physical and sexual assault were linked to increased rates of substance abuse. The review also found that victims of rape may suffer long-term mental health effects. The results of the National Women's Study revealed that 30% of victims sampled had experienced at least one major lifetime depression, compared with 10% of nonrape victims (Goodman, Koss & Russo 1993; Resnick et al. 1993). Moreover, a study by Acierno et al. (1997) found there was a 300% increase in the risk of depression in lifetime victims of physical assault and a 500% increase in recent victims of physical assault.

2.3.2 Violence victimisation among psychiatric patients

A study by Goodman et al. (1997) suggests that the lifetime prevalence of violent victimisation among women with a serious mental illness may actually be as high as 97%. Further studies by Goodman et al. (2001) investigating rates of violence victimisation among a sample of men and women with a severe mental illness (SMI) revealed that 34.1% of men reported physical assault compared with 3.4% of men in the general population. Similarly, 25.6% of women reported physical assault in comparison with 1.9% of women in the community sample. More recently Butterworth (2004) found that a lifetime experience of sexual or physical violence was a better predictor of psychiatric morbidity among single mothers than the socio-demographic characteristics typically associated with mental illness. These findings highlight the adverse impact victimisation has on the resilience of a person with a mental illness.

2.4 Theoretical basis- explaining the association between violence victimisation and mental illness

Resnick, Acierno & Kilpatrick (1997) have attempted to explain the association between violence victimisation and mental illness by constructing a theoretical model that focuses on violent assault as the independent variable and physical health problems as the outcome or dependent variable. Violent assault may have the potential to produce acute injury which is an immediate result of violence victimisation and/or chronic problems which are long term, persistent outcomes which may be caused by various mechanisms. Generalised stress caused by violent assault may lead to psychologic and physiologic changes. A range of studies have shown that violence victimisation can produce acute emotional distress (Hegarty et al. 2004; Koss & Heslet 1992; Rothbaum et al. 1992). It is stated that such psychological changes lead to the increased risk of developing a major mental illness such as depression and other anxiety disorders. Additionally, Goodman et al. (2001) suggested that mental illness severity may be exacerbated by as well as contribute to recent violence victimisation. Although it must be stressed that one cannot infer causality, such a model may provide a useful framework for reviewing current research. It also aids in assessing the various stages of intervention for victims of violent assault (Resnick, Acierno & Kilpatrick 1997).

Theories that have been more widely utilised in psychiatric epidemiology have tended to focus on violent assault as the provoking agent or predisposing factor of mental illness (Angermeyer, Cooper & Link 1998). Learning theory mechanisms are often utilised to explain the development of 'post-traumatic stress disorder' (PTSD) by explaining the principle of classical conditioning. When an individual is exposed to a distressing event such as a violent assault this may constitute an unconditioned stimulus that leads to automatic physiological, cognitive and behavioural responses in certain situations that trigger memories of the initial trauma. The second component of the model explains how operant conditioning may cause an individual to avoid exposure to cues that may trigger an automatic response. Therefore the learned fear response is not extinguished and physiological and psychological symptoms may be maintained (Resnick, Acierno & Kilpatrick 1997). However, many variables may influence the risk of chronic problems associated with violence. Additionally, in some studies violence has also been utilised as the dependent variable, with mental illness

as the independent variable in combination with other factors (Angermeyer, Cooper & Link 1998). Therefore, such complex pathways to violence victimisation may be difficult to explain solely by theoretical models.

2.5 Risk factors for death and injury due to interpersonal violence

2.5.1 Individual factors

Past studies have shown that women are at an increased risk of intimate partner violence and sexual assault (Acierno, Resnick & Kilpatrick 1997; Krug et al. 2002). Additionally, women are much more likely to have been physically attacked by someone known to them, such an ex-husband, husband, partner, boyfriend, other relative, or acquaintance (Kilpatrick et al. 1997). However, men are more likely to have experienced some form of physical assault, particularly assault perpetrated by strangers (Resnick et al. 1993; Acierno, Resnick & Kilpatrick 1997). Krug et al. (2002) reported that males account for approximately three quarters of all homicide victims. Particular age groups may also be at a greater risk of experiencing interpersonal violence. The highest rate of homicide in the world occurs among men aged 15 to 29 years. Although the incidence of sexual assault cases is highest among children and youth, risk of physical assault is greatest among those aged 15 to 34 years (Krug et al. 2002; Acierno, Resnick & Kilpatrick 1997).

A range of psychological and behavioural characteristics have been recognised as underlying risk factors for many forms of interpersonal violence. These include low self-esteem, poor behavioural control, and conduct disorders. Research has shown that early life experience such as a lack of emotional bonding early exposure to violence may be significant underlying risk factors (Krug et al. 2002). Additionally, individuals who experienced physical violence during childhood were more likely to engage in violent behaviour (Swanson et al. 2002). A study by Kilpatrick et al. (1997) found that the risk of suffering a new assault among women who had previously been victims of interpersonal violence was five times greater than for women who had not previously been assaulted.

Substance misuse has also been shown to increase the risk of violence victimisation (Kilpatrick et al. 1997; Cottler et al. 1992; Breslau et al. 1991). In fact, a reciprocal

relationship has been illustrated as new assault cases among women who had no previous history of drug use has been strongly associated with an increased risk of drug use (Kilpatrick et al. 1997). These underlying risk factors demonstrate the cycle of violence that may occur within a community. Studies have also shown that alcohol-related violence is disproportionately high in Aboriginal communities (Martin 1992; Gray et al. 2000; Mouzos 1999). However, it is important to note that alcohol is not the cause of violence (Memmott et al. 2001). The integration of alcohol as a coping strategy, a certain type of drinking behaviour, and particular cultural elements have been proposed as significant contributing factors to alcohol-related violence. The 'culture' of using alcohol as a way of coping with conflict and stressors has had devastating social costs within the Indigenous community (Reser 1990).

Other factors which can increase the risk of violence victimisation among people with mental illness include co-morbid substance misuse disorders, co-morbid personality disorders, more severe symptoms, and homelessness (Brekke et al. 2001; Hiday et al. 2001; Walsh et al. 2003). Gearon & Bellack (1999) reviewed the literature on schizophrenia, substance abuse, and violent victimisation in women and concluded that schizophrenia impacts on the ability to recognise danger signals, the ability to negotiate out of dangerous situations and affects problem solving ability. Goodman et al. (1997) also explored how a mental illness can increase the risk of victimisation. They surmised that limited reality testing, impaired judgement, and planning may increase in an individual's vulnerability to abuse or coercive or exploitative sexual relationships.

2.5.2 Socio-economic factors

Early research on victimisation of persons with a mental disorder tended to look only at domestic violence while neglecting victimisation which occurred outside the home. However, the relationship between mental illness and violence victimisation is confounded by a range of factors which include socio-economic conditions which promote inequity, or which disadvantage particular groups of people (Unnithan & Whitt 1992; Pampel & Gartner 1995; Krug et al. 2002). Violence and victimisation, while found in all sectors of society are especially prevalent in poorer areas where social and economic conditions foster violence norms. Some studies have shown that disadvantaged individuals, excluded from benign sources of self-esteem and social

status (such as educational achievement and employment) may look to violence to gain recognition and respect (Messner 1988; Wilkinson et al. 1998). There is also evidence that disadvantaged communities are less likely to have the collective efficacy necessary to instil norms and maintain community controls on anti-social and violent behaviour (Cullen & Whiteford 2001). People with mental illnesses are more likely to live in disadvantaged communities where the capacity to control violence is reduced. This is because mental illness has compromised their means or because life stressors operating in disadvantaged communities have compromised their mental health or both (Cullen & Whiteford 2001).

There is strong evidence to suggest that socio-economic disadvantages reflected by measures in the health, employment, education, income and housing of the Indigenous population are underlying risk factors for high levels of violence within the community. Although there have been considerable improvements in education participation as well as attainment in recent times, statistics show that approximately 22% of males over the age of 15 are unemployed (ABS 2005; Thompson et al. 2004). Some Indigenous households, particularly in remote areas, live in overcrowded conditions which may put additional stress on basic household facilities (ABS 2005). Additionally, the life expectancy of Indigenous males and females is approximately 17 years less than the general population. Poor socio-economic status within the Indigenous population has been identified as a strong contributing factor to anger and tension within the community, contributing to the risk of interpersonal violence (Memmott et al. 2001).

2.5.3 Socio- cultural factors

The Indigenous population experiences significantly higher levels of violence than the general population. From a social learning and development theory perspective, it is suggested that interpersonal violence is a learned behaviour which may be modelled and supported by families or the broader culture (Wolfe & Jaffe 1999). In Indigenous communities where violence has been a way of life for many generations, a normalisation process may occur. There is a strong association between witnessing violence from a young age and the desensitisation and predisposition to using violence in future relationships (Memmott et al. 2001). Many experts believe there is a link between the violent methods used by Europeans to possess land and

contemporary Aboriginal violence. The disempowerment of traditional elders by mission managers has led to the destruction of Aboriginal law and processes previously used to resolve conflict have become unstructured (Memmott et al. 2001; Astbury et al. 2000). This is seen as a strong contributor to social and psychological problems that exist within the Indigenous community today (Thompson et al. 2004).

A recent Australian survey found that in 2002, approximately one-quarter of Indigenous people reported being a victim of either threatened or physical violence (ABS 2005). Although Aboriginal women only constitute a small percentage of the adult female population, some police figures show that they are up to 45 times more likely to be victims of domestic violence compared to non-Aboriginal women (Blagg 1999). They are also ten times more likely to be victims of physical violence and experience much higher rates of homicide than the general population. Additionally, a study conducted by the Criminal Justice System showed that in some Queensland communities, Aboriginal women were 16-25 times more likely to be raped than non-Indigenous women (Memmott et al. 2001). In Western Australia, Indigenous and Torres Strait Islander children are over-represented in the child protection system with a ratio of 8:1 (ABS 2005). One-on-one fighting continues to be a strong contributor to injury in Indigenous communities yet it is severely under-reported. Inter-group violence described as gang violence, particularly among young men in urban centres, is also noted as a common form of violence within the Indigenous community (Memmott et al. 2001).

The ABS (2005) reported that mental health and behavioural conditions are one of the main reasons for hospitalisation of Indigenous people. A recent epidemiological study of interpersonal violence in the Kimberly region of Western Australia found that over a five year period (1999-2003), 29% of individuals admitted to hospital due to interpersonal injury reported a mental illness. Females, Indigenous people, and those between 25 to 39 years of age with a mental illness remained at greater risk for admission to hospital as the result of interpersonal violence than those without mental illness (Cercarelli & Lester 2005). The study also found that Indigenous people with a mental illness were thirteen times more likely to be admitted to hospital due to interpersonal violence than non-Indigenous people. Similar results were also found for the Pilbara region in Western Australia (Cercarelli & Lester 2005).

2.6 Strategies for the prevention of interpersonal violence victimisation

To date, responses to violence have primarily focused on interventions following the identification of a problem. Whilst such interventions are of importance, there is now a move towards prevention approaches from a public health perspective (Carrington 2003; Wolfe & Jaffe 1999). It is now acknowledged that interpersonal violence is a public health issue, rather than a matter for the criminal justice system alone and intervention strategies utilising a public health approach may serve as a model for the development of future strategies (MacDonald 2000). Wolfe & Jaffe (1999) describe two examples of public health approaches to domestic violence which may be useful in the prevention of interpersonal violence. These include identifying the underlying causes of the problem, and recognising opportunities for the prevention of violence along a continuum of possible harm. However, it is very difficult to identify underlying causes of violence particularly if population data is not available. The development, for example, of tailored interventions for individuals with serious mental illnesses requires far more detailed examination of the characteristics of their victimisation (Goodman et al. 2001).

An additional public health model which may be useful in the development of strategies includes dividing prevention initiatives into three categories, primary, secondary, and tertiary (Lorion et al. 1994). Examples of primary prevention initiatives may include targeting community social norms and values towards violence and programs that promote healthy behaviours within relationships. Secondary prevention targets identified individuals such as interventions that work with parents of children who have witnessed violence (Ziegler & Weidner 2006). Tertiary prevention focuses more on the perpetrators of violence and includes measures such as providing disorder-based treatment for children who have been victims of violence, and punishment of perpetrators (Wolfe & Jaffe 1999). Recognising opportunities for prevention on a continuum provides a useful framework for developing interventions that may reduce the risk and impact of psychological harm associated with assault and maltreatment.

2.7 Limitations of past research

A majority of the studies previously mentioned used cross-sectional surveys of people with mental illness and compared their findings with data from existing population

surveys to obtain estimates of the prevalence of violence victimisation among people with mental illness. The samples consisted mostly of people receiving treatment for moderate to severe cases of a specific psychiatric disorder, predominantly schizophrenia (Walsh et al. 2003) making it difficult to generalise these findings to other diagnostic groups (e.g. depression) and population (e.g. non-treated). Moreover, these studies used a variety of definitions of interpersonal violence, ranging from perceived threat of assault to actual assault with varying degrees of severity of injury (Brekke et al. 2001; Silver 2001). They also generally measured violence victimisation by self-report, thus these results are liable to both under and over-reporting.

Other studies used self-reported data in combination with police or criminal records. However, crime databases are known to be vulnerable to under-reporting, consequently it is difficult to measure outcomes. For example, it is estimated that only 26% of males and 22% of females who are assaulted report the incident to police (ABS 1999). Even when the assault leads to serious injury requiring medical treatment, only 30% of incidents are reported to police in Western Australia (Ferrante et al. 1996). Marley & Buila (1999) also reported that half of a sample of victims of violent crime with mental illness did not report the crime to Police, and one-third did not report the crime to anyone including a health care provider. In addition many cases of interpersonal violence go unreported in Indigenous communities as victims may be ashamed or embarrassed to report an incident and many fear of retribution (Larson and Peterson 2001; Hegarty et al. 2000).

A review of population-based data on violence victimisation found only one source that reported psychological harm as an outcome of interpersonal violence victimisation (McLennan, 1996). The *Women's Safety Survey* was a victimisation survey in which 6300 women aged 18 years or older were interviewed about victimisation experiences. The survey found that approximately 12% of women who had ever experienced interpersonal violence from a male partner during their current relationship lived in fear as a result of their experience (McLennan, 1996). Women were more likely to report their fear if they had been victimised recently, or frequently, or by a current (rather than previous) partner, or if they had been the victim of a sexual assault. Although victimisation surveys used valid indicators of

psychological harm, they do not contain enough information to assess psychological harm as an outcome of interpersonal violence victimisation. For example, they generally do not provide any indication of the relative risk that a psychiatric condition would manifest as a result of victimisation, nor did they indicate the specific psychiatric conditions that victims might be likely to experience.

To date, only one Australian study has used a population-based data set to demonstrate the association between violence victimisation and mental illness (Lawrence et al. 2001). The study compared the health status of people with mental illness to the general population of Western Australia. It found that amongst people who had contact with mental health services, the rate of hospitalisation due to interpersonal injury was 3.4 times higher for males and 4.0 times higher for females than for the general population. The mental health disorders which most increased the risk of interpersonal injury were alcohol and other drug disorders, personality disorders and psychoses (other than schizophrenia).

2.8 Conclusion

A number of epidemiological studies have established that there is a relationship between major mental disorders and interpersonal violence. However, no study has assessed such an association in detail at the population level. It is now recognised that people who have been victimised have an increased risk of psychiatric symptoms. Additionally, individuals with a SMI are at a greater risk of lifetime victimisation. The direct and indirect costs of interpersonal violence and mental illness place a significant burden on the Australian population. Such a burden may be amplified due to a range of underlying risk factors which can contribute to a cycle of violence within communities. Although there has been a move towards prevention approaches from the public health field, a lack of data at the population level has made it difficult to develop appropriate, evidence informed initiatives. Different definitions, small sample sizes, and lack of adjustment for confounders are the major limitations in previous observational studies. The proposed population-based study will use linked data to investigate the relationship between violence victimisation and mental illnesses. Outcomes of the study will enable future planning, implementation and evaluation of interventions designed to reduce the risk of mental illness due to interpersonal violence victimisation in Western Australia.

3 METHODOLOGY

3.1 Research design

A population-based, retrospective study of interpersonal violence victimisation (interpersonal violence) in Western Australia was undertaken using linked data from the Western Australian Mortality Database, the Hospital Morbidity Data System (HMDS) and the Western Australian Mental Health Information System (MHIS) from 1990 to 2004. This data is currently held at the Western Australian Department of Health.

The study consisted of two phases. Phase 1 quantified the morbidity and mortality of interpersonal violence victimisation in Western Australia from 1990 to 2004 and examined its association with mental illness. Phase 2 quantified the health care costs of interpersonal violence victimisation and the share accounted by people with a mental illness.

3.2 The Western Australian Health Services Research Linked Database

3.2.1 Background

This research uses the linked administrative data from the Western Australian Health Services Research Linked Database, which was established by the Department of Health WA and The School of Population Health at The University of Western Australia. This database is unique in Australia and is one of only a small number of record linkage systems in the world. It records longitudinal data on the use of health services and vital events for the entire Western Australian population. The WA Linked Database currently contains in excess of seven million records with the largest component consisting of the Hospital Morbidity Data System, which contains over seven million records. The register of births contains around 400,000 entries while the register of deaths contains approximately 200,000 entries. The Mental Health Information System contains data for just over 200,000 patients of mental health services and the Cancer Registry has information on over 80,000 registered cancers. Each individual patient record has been linked by means of probabilistic matching. Name, residential address, date of birth, and sex are the principal fields used in the

probabilistic matching. The probabilistic matching technique is based on estimating the probability that any two records represent the same person (or event) while allowing for the possibility of errors or changes in the identifying information used for matching. The WA Linked Database is a dynamic system, which is constantly being revised and updated as new data are added to the system.

3.3 Phase 1: Quantification of Interpersonal Violence in Western Australia

3.3.1 Operational definitions

Interpersonal Violence Victimisation

The term '*interpersonal violence victimisation*' was defined for the purpose of this study as "*physical injury inflicted by other persons, severe enough to require hospitalisation, resulting from violence between intimate partners, family or community members (including child and elder abuse, domestic and youth violence, random acts, rape and sexual assault by strangers, and violence in institutions such as schools)* (WHO 1975; WHO 1992; Krug et al. 2002).

Mental Illness

'*Mental illness*' was defined as a diagnosable disorder that significantly interfered with an individual's cognitive, emotional or social abilities and differs from 'mental health problems' only in duration and severity (WHO 1975; WHO 1992).

3.3.2 Data extraction and case selection

The Data Linkage Unit retrieved de-identified data between 1990 and 2004. Hospital separation records in which the primary diagnosis was an '*injury*' and the external cause was '*injury inflicted by another*' was extracted from the HMDS for the study period. This dataset was externally linked to the Western Australian Mortality Database to identify deaths for the study period and the MHIS to identify all mental health service contacts from 1966 onwards.

The ICD codes used to identify hospital admissions included in the dataset are presented in Table A1 in Appendix A. The ICD codes were revised several times between 1990 and 2004. The only major change that had a significant impact on the data relating to interpersonal violence victimisation during the study period was the

introduction of codes that identified the relationship between the victim and the perpetrator in the third edition of ICD-10-AM, which was introduced into Western Australia in July 2002. The manner in which the external cause codes were mapped between the ninth and tenth versions of the ICD is set out in Table A2 of Appendix A.

3.3.3 Definition of terms and cases

Victim of violence admitted to hospital

A case was defined as a 'victim of violence' if the principal diagnosis for at least one hospital separation in the case's record was an 'injury' as designated by a diagnosis code between 800.00 and 999.99 (Chapter 17, ICD-9-CM), or between S00.0 and T98.3 (Chapter XIX, ICD-10-AM), and a primary external cause indicating that at least one injury in the case record was inflicted by another person, as designated by an external cause code between E960.0 and E969 (ICD-9-CM), or between X85 and Y09 (ICD-10-AM).

Victim of violence with mental illness (study group) admitted to hospital

A case was defined as a 'victim of violence with a mental illness' if the case met the criteria for 'victim of violence' and the case's record included at least one hospital separation for which any diagnosis is a mental or behavioural disorder, as designated by a diagnosis code between (290 to 319, Chapter V, ICD-9-AM) or F00 and F99 (Chapter V, ICD-10-AM). Cases with mental illness were categorized according to type of mental illness using ICD-9-CM and ICD-10-AM chapter sub-headings (e.g. mood (affective) disorders).

Victim of violence without mental illness (comparison group)

A case was defined as a 'victim of violence without a mental illness' if the case met the criteria for 'victim of violence' and the case's record did not include any hospital separations for which any diagnosis was a mental or behavioural disorder, as designated by a diagnosis code between 290 to 319, (Chapter V, ICD-9-AM) or F00 and F99 (Chapter V, ICD-10-AM).

Categorisation of death for victim of violence

A case was defined as 'death due to violence victimisation' if the cause of death code (COD) was designated by an external cause code between E960.0 and E969 (ICD-9-CM), or between X85 and Y09 (ICD-10-AM).

3.3.4 Definition of variables

Demographic characteristics

These included age, sex, Indigenous status, country of birth, postcode of residence, marital status, occupation and employment status as recorded in the HMDS.

Co-morbidity

This was defined as the presence of one or more specific health conditions, which were defined using the broad ICD-9-CM and ICD-10-AM chapter headings unless the condition was an injury. These classifications included:

- Infectious diseases and parasites;
- Neoplasms;
- Endocrine, nutritional and metabolic diseases and immunity disorders;
- Disease of the blood and blood forming organs;
- Mental disorders;
- Disease of the nervous system and sense organs;
- Disease of the circulatory system;
- Disease of the respiratory system;
- Disease of the genitourinary system;
- Diseases of the skin and subcutaneous tissue;
- Diseases of the muscoloskeletal system and connective tissue.

Circumstances of injury

This was defined using sub-groupings in the major injury grouping framework devised by the Centre for Disease Control and Prevention. The external cause codes for injury inflicted by another were divided into four sub-groups designating the following methods of inflicting injury: 'by bodily force' (E960.0 (ICD-9-CM) or Y04 (ICD-10-AM)), 'by sharp or blunt object' (E966, E968.2 (ICD-9-CM) or Y99, Y00

(ICD-10-AM)), 'by maltreatment or rape' (E960.1, E967.0-9 (ICD-9-CM) or Y05, Y06.0-9, Y07.0-9 (ICD-10-AM)) and 'by other methods' (all other codes between E960.0 to E969 (ICD-9-CM), or X85 to Y09 (ICD-10-AM)). For cases with more than one hospital separation due to interpersonal violence victimisation, the method used to inflict injury designated by the external cause code attached to the first hospital separation in the case's record was adopted. It was anticipated that external cause codes for place and activity at time of injury would also be analysed if sufficient cases in the data set have these codes attached to make the analysis plausible. Unfortunately this was not possible.

Repeat Victimisation

This was defined as a victim who has more than one admission to hospital due to an injury inflicted by another during the study period.

3.3.5 Health care system impact (for one and repeat victimisation admissions)

The outcome variables are: total number of hospital separations for one and repeat admissions due to interpersonal violence victimisation during the study period, and total length of stay due to violence victimisation for one and repeat victimisation during the study period.

3.3.6 Health consequences

The outcome variables were: type of destination after discharge and/or transfer, and early re-admission (as defined by readmission within 28 days of discharge). Each discharge or transfer destination for each period of hospitalization was included for each case and every re-admission that met the definition of early re-admission was also used to assess health consequences.

3.4 Statistical analysis

Plausibility checks were conducted and inconsistent data were cleaned prior to statistical analysis.

Descriptive statistics were used to describe the demographic characteristics of the sample including age, gender, locality, Indigenous status, employment status, marital status, and socioeconomic status. Population rates were calculated based on the

relevant Western Australia population data. Univariate and inferential analyses were undertaken to explore the profile of cases with and without a mental illness.

Socioeconomic status was measured using the ABS' Socioeconomic Indexes for Areas (SEIFA) (Trewin 2003). The SEIFA consists of five separate indices that are derived from responses to the census. For this study we used the Index of Relative Socioeconomic Disadvantage. These Indexes are made available at the geographical levels of collector's district (CD), statistical local area (SLA) and postcode. For the purpose of this study each hospital admission due to interpersonal violence was allocated a score by matching the postcode from the patient's residential address to the index score for each postcode. Socioeconomic status then was recorded into five categories: group 1 ($<20^{th}$ percentile for lowest socioeconomic status), group 2 (20^{th}-40^{th} percentile), group 3 (40^{th}-60^{th} percentile), group 4 (60-80 percentile) and group 5 ($\geq 80^{th}$ percentile or highest socioeconomic status).

Residential location using patient's postcodes was categorized into metropolitan, rural or remote using the Western Australian's Hospital Department zones classification.

Indigenous status was defined as being Indigenous and/or Torres Strait Islander or not.

A logistic regression model was used to examine differences between exposed (admission for a mental illness) and non-exposed (no admission for a mental illness) victims of interpersonal violence in terms of gender, age, location, SES, Indigenous status, marital status, type of assault, and the number of co-morbidities. Co-morbidities were treated as a continuous variable ranging from 0 to 7.

A multivariate Cox proportional hazard regression model was used to identify factors independently associated with a second hospital admission due to interpersonal violence victimisation (survival) and secondly to compare the time to a second admission between victims of violence with and without mental illness after adjusting for all other covariates. For the analysis, $T_{(0)}$ was the first hospital admission due to interpersonal violence victimisation for each victim during the study period. The

period of observation was from $T_{(0)}$ to December 31, 2004 or until death occurred or a second admission to hospital for interpersonal violence.

Multiple hospital admissions were handled differently depending on the objective of the analysis. When trends over time were examined, all admissions were used. When risk factors for the multivariate analyses were examined, cases who had been admitted more than once were flagged and were accounted for only once in the model. The information at the index admission for the outcome of interest was used in subsequent analyses. Any extra hospital admissions generated by transfers of a patient between hospitals (less than 28 days) were combined with the original admission into one inpatient episode.

As the WA Linked Database brings together separate records for each person the consistency of recording of fixed personal characteristics such as gender, Indigenous status, and date of birth was examined. For each of these characteristics the entire set of records for each case was examined to ensure that the field was recorded the same in all core data records regardless of the source. Overall, sex was consistently recorded across all records for 97% of the study population, Indigenous status was consistently recorded for 97%, and date of birth for 89% of the study population. When inconsistencies were found the most frequently occurring value was adopted for the analysis. Other demographic characteristics such as postcode, marital status, and employment status, may change over time. For the purpose of the multivariate analyses the marital status and employment status used was the information recorded at the index hospital admission. The index postcode was also used as an indicator of social disadvantage value based on the SEIFA package by the Australian Bureau of Statistics (ABS Cat. 2033.0.30.001).

3.5 Phase 2: Economic Analysis

The linked data was used as the basis to calculate the health system costs of interpersonal violence and the share of these costs attributable to patients with mental illness. Only the cost of hospital inpatient episodes were included in the economic analysis, which account for the major share of health system costs (Mathers & Penm

1999). Inpatient costs were based on the Australian Related-Diagnostic Related Group (AR-DRG) codes recorded in the hospital morbidity records for each admission. The unit cost of the AR-DRGs was obtained from the annual national hospital costing study hospital (Australian Government Department of Health and Ageing (AGDHA) 2003, AGDHA 2004, AGDHA 2005, AGDHA 2006). The unit cost data for earlier years were converted to 2004 Australian dollars based on the hospital price index published by the Australian Institute of Health and Welfare IAIHW 2006b). The economic analysis was conducted for the three-year period from 2002 to 2004. Unit cost data for AR-DRGs were not available for the full period of the study and a three-year period was considered sufficient to examine the cost characteristics of hospital admissions due to interpersonal violence.

3.6 Ethical implications

Ethical approval was obtained from both the Human Research Ethics Committee at Curtin University of Technology and the Confidentiality of Health Information Committee (CHIC) which is an independent committee appointed by the Minister for Health in Western Australia.

De-identified data was obtained from the Data Linkage Unit of the Western Australian Department of Health. The data was stored in a password-protected file that was only accessed by the Principal Researchers and the research assistant. All analyses were performed on the de-identified data set. De-identified files will be kept for seven years at the School of Public Health and destroyed after that period.

4 RESULTS

This section presents the results of the data analysis for each aim of the study.

4.1 *Describe the demographic characteristics and co-morbidities of victims who have died or been admitted to hospital in Western Australia due to interpersonal violence, and the circumstances of events in which they have been injured.*

4.1.1 Hospitalisations due to interpersonal violence victimisation

Table 4.1 presents the number and rate of admissions to hospital for interpersonal violence victimisation by year and gender in Western Australia from 1990 to 2004. Overall, there were 36,934 hospital admissions due to interpersonal violence victimisation during the study period. In 2004, the rate of violence victimisation was 135 per 100,000 population with 2,668 hospitalisations in that year. This was a 1% reduction from the previous five year average. Fluctuations in the hospitalisation rate during the study period was evident with the highest rate for interpersonal violence reported in 1998 (156 per 100,000 population) and the lowest in 1990 (100 per 100,000 population).

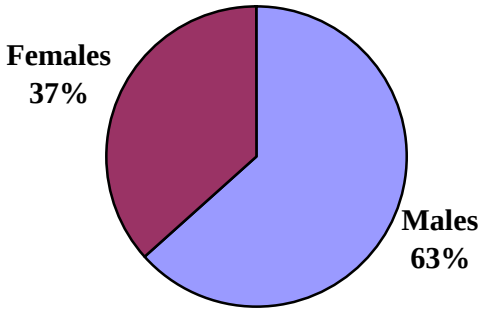
The hospitalisation rate due to violence victimisation was higher for males than females throughout the study period. Overall, 63% of victims were male (see Figure 4.1).

Table 4.1 Number and rate of hospital admissions due to violence victimisation by gender, Western Australia, 1990 to 2004.

Year	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
1990	1127	138.72	493	62.53	1620	100.43
1991	1173	142.53	588	73.42	1761	107.63
1992	1227	147.15	709	87.30	1936	116.76
1993	1473	174.57	846	102.93	2319	138.22
1994	1542	180.03	925	110.84	2467	144.86
1995	1705	195.53	842	99.11	2547	146.90
1996	1669	188.04	1003	115.90	2672	151.36
1997	1643	182.18	937	106.33	2580	143.73
1998	1758	192.12	1093	122.02	2851	156.41
1999	1644	177.15	983	108.09	2627	142.02
2000	1603	170.67	943	102.17	2546	135.82
2001	1755	184.43	977	104.21	2732	143.70
2002	1783	185.07	1064	112.06	2847	147.71
2003	1707	174.85	1054	109.55	2761	141.58
2004	1600	161.40	1068	109.54	2668	134.88
Total	23409	173.45	13525	102.41	36934	137.37

** Per 100,000 population*

Figure 4.1 Proportion of hospital admissions for interpersonal violence victimisation by gender, Western Australia, 1990-2004.



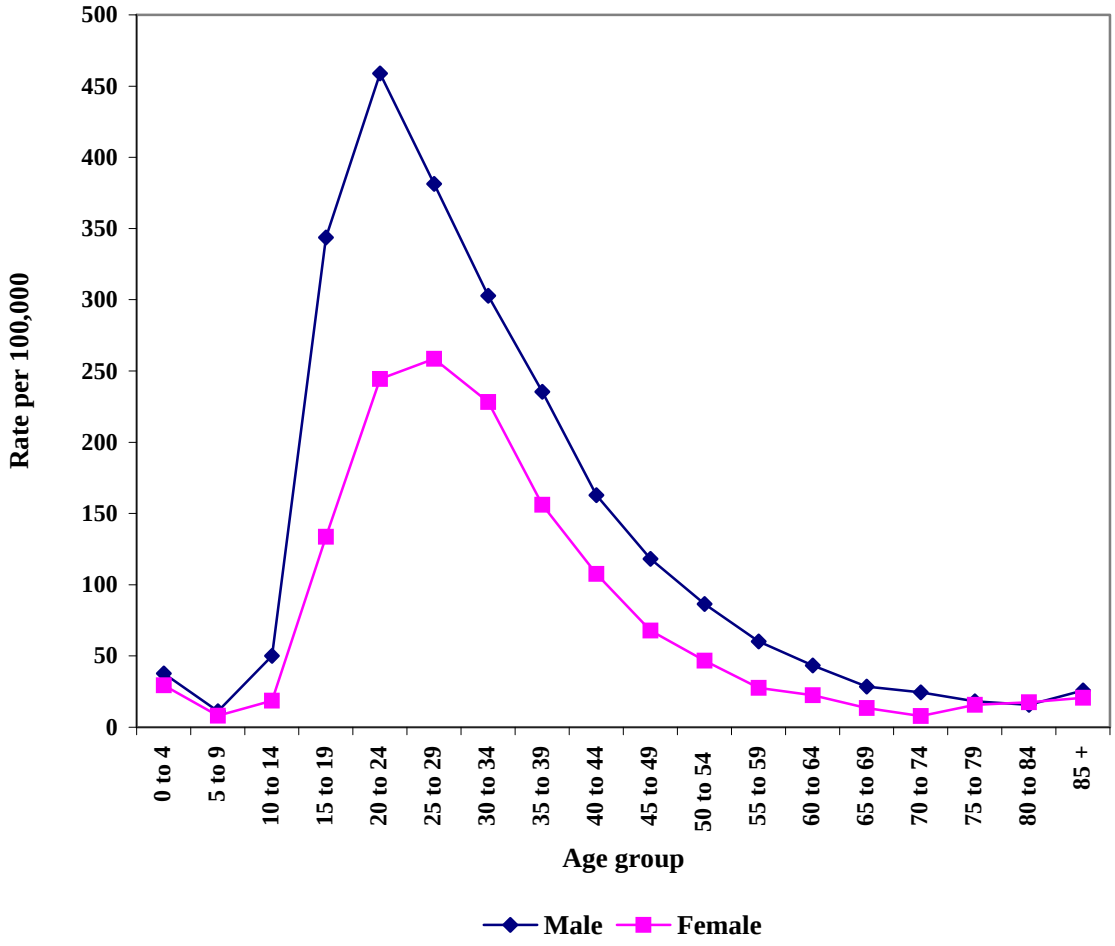
The mean age for hospitalisation among the cohort was 30.0 (SD=12.2) years with the mean age similar for both males (29.6, SD = 12.2) and females (30.7, SD=12.2). Table 4.2 presents the age distribution and rate for an admission due to violence victimisation by gender during the study period. Adolescents and young adults were more likely to be hospitalised than children or older adults (see also Figure 4.2). Overall 72% (n= 26,439) of hospitalisations were for people between the ages of 15 years and 44 years. Within this age range, those between the ages of 20 and 29 years were at greatest risk comprising over half (52%, n=13,704) of all hospitalisations. The greatest difference in the distribution of hospitalisations between males and females was in the 15 to 29 year age group with males almost three times as likely to be admitted compared to females.

Table 4.2 **Number and rate of hospital admissions due to violence victimisation by age group and gender, Western Australia, 1990 to 2004.**

Age	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
0-4	368	37.80	272	29.45	640	33.74
5-9	115	11.28	79	8.18	194	9.78
10-14	515	50.13	181	18.61	696	34.80
15-19	3509	343.70	1293	133.68	4802	241.53
20-24	4736	458.92	2402	244.29	7138	354.20
25-29	3955	381.34	2611	258.54	6566	320.75
30-34	3244	302.67	2423	228.26	5667	265.64
35-39	2520	235.49	1672	156.19	4192	195.83
40-44	1710	162.84	1118	107.59	2828	135.36
45-49	1124	118.07	623	67.72	1747	93.33
50-54	700	86.37	358	46.62	1058	67.033
55-59	389	60.22	169	27.61	558	44.36
60-64	229	43.44	116	22.50	345	33.08
65-69	126	28.54	61	13.40	187	20.85
70-74	85	24.39	31	7.89	116	15.65
75-79	44	18.15	50	15.82	94	16.83
80-84	22	15.79	39	17.45	61	16.81
85+	18	25.80	27	20.58	45	22.39

** Per 100,000 population*

Figure 4.2 Age specific injury hospitalisation rate due to interpersonal violence victimisation by gender, Western Australia, 1990-2004



4.1.2 Indigenous status

Indigenous people were over-represented among the victims of interpersonal violence, accounting for 47.1% (n=17,384) of hospitalisations despite representing only approximately 3% to 4% of the population of Western Australia. Overall, 56% of Indigenous admissions were for female victims with the rate of hospitalisation 2161 per 100,000 population compared to 1678 per 100,000 for Indigenous males during the study period. The hospitalisation rate due to violence victimisation was substantially higher for females than males throughout the study period (Table 4.3). In 2004, the rate of hospitalisation for Indigenous females was almost twice that of Indigenous males (2225.6 per 100,000 population compared to 1551.9 per 100,000 population).

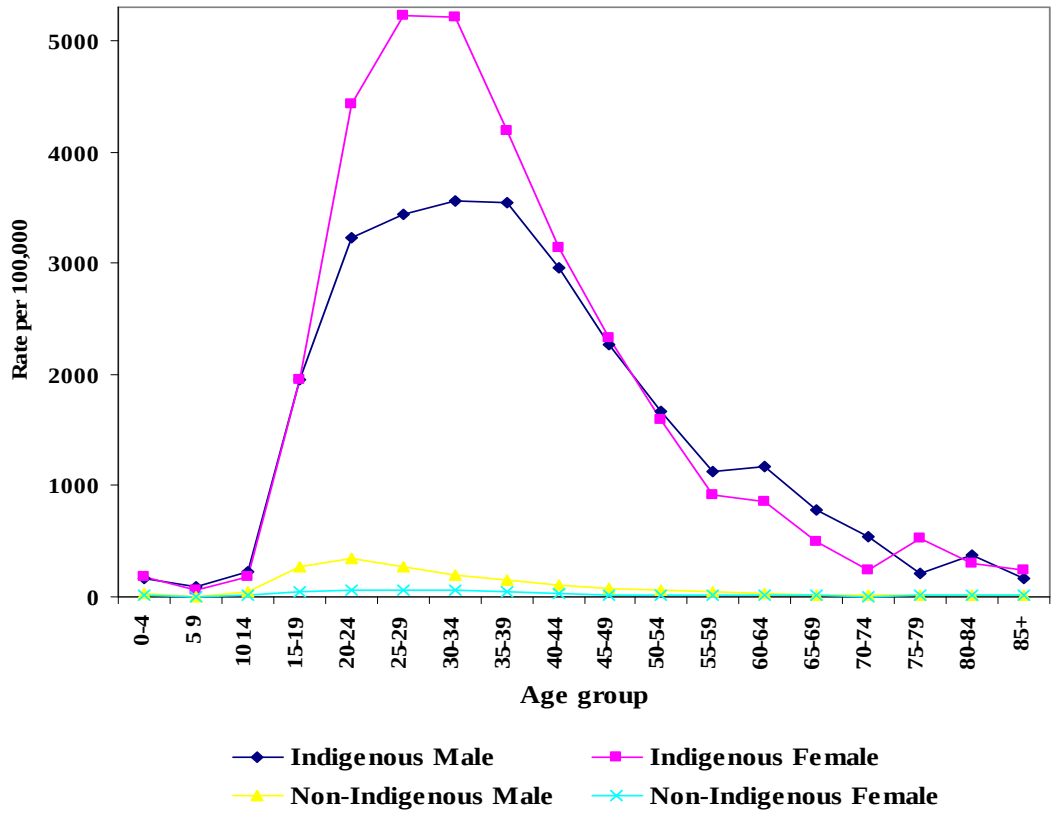
Table 4.3 Number and rate of Indigenous hospital admissions due to violence victimisation by gender, Western Australia, 1990 to 2004

Year	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
1990	304	1211.3	318	1257.6	622	1234.5
1991	309	1231.2	422	1624.1	741	1427.9
1992	394	1479.6	513	1922.1	907	1701.1
1993	529	1932.7	624	2280.6	1153	2106.6
1994	468	1667.2	650	2315.5	1118	1991.3
1995	515	1788.5	651	2261.7	1166	2025.1
1996	537	1816.7	712	2413.8	1249	2114.9
1997	560	1852.7	681	2256.5	1241	2054.4
1998	610	1972.3	784	2541.0	1394	2256.3
1999	530	1675.2	727	2301.2	1257	1988.0
2000	523	1620.3	662	2048.2	1185	1834.4
2001	555	1684.8	698	2106.9	1253	1896.5
2002	619	1843.8	780	2314.4	1399	2079.6
2003	588	1714.0	786	2283.6	1374	1999.3
2004	543	1551.9	782	2225.6	1325	1889.4
Total	7594	1678.9	9790	2161.1	17384	1920.2

** Per 100,000 population*

The overall rate of hospitalisation for Indigenous people (1922 per 100,000 population) was 26 times higher than that for non-Indigenous people (75 per 100,000 population). For both Indigenous and non-Indigenous people the age group with the greatest proportion of victims (65%) was the 15 to 34 year old age group. When restricted to victims aged 15 to 34 years Indigenous people were 22 times more likely to be hospitalised due to interpersonal violence victimisation. The rate of hospitalisations for Indigenous people aged 15 to 34 years was 3549.5 per 100,000 compared to 161.9 per 100,000 population for non-Indigenous people (Figure 4.3).

Figure 4.3 Rate of hospitalisation due to interpersonal violence victimisation by age category and Indigenous status, Western Australia, 1990 to 2004

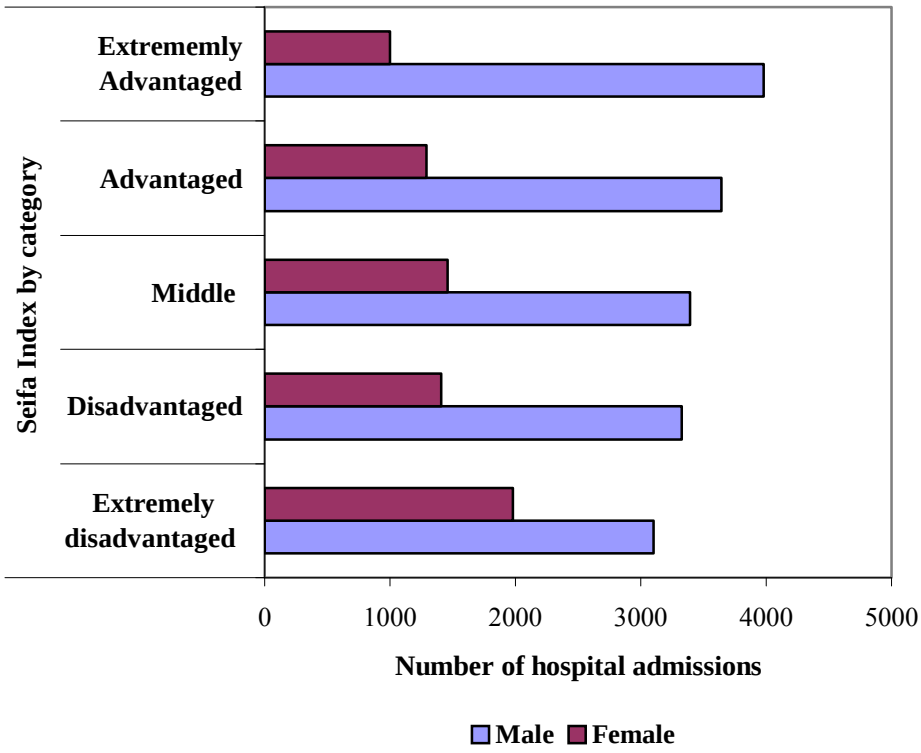


4.1.3 Socioeconomic status (SES)

Overall, the largest number of hospital admissions for interpersonal violence victimisation was from the disadvantaged groups- 21% from the extremely disadvantaged group and 19% from the disadvantaged group.

A significant difference in hospital admissions in terms of SES status across gender (χ^2 =463.429, df=8, p<0.000) was evident with females in the extremely disadvantaged group having the highest number of hospital admissions. In comparison, males from the most advantaged group had the highest number of hospital admissions amongst male victims (Figure 4.4).

Figure 4.4 Number of hospital admissions for interpersonal violence victimisation by SEIFA Index and gender, Western Australia, 1990 to 2004



The pattern of hospitalisation was also different between Indigenous and non-Indigenous people across SES status (χ^2=3642.839, df=4, p<0.00). Forty percent of Indigenous people were from the extremely disadvantaged group with a further 20% from the disadvantaged group. In contrast, 28% of non-Indigenous people were from the highest advantaged group followed by 23% from the advantaged group (Figure 4.5).

Figure 4.5 Number of hospital admission for interpersonal violence victimisation by SEIFA Index and Indigenous status, Western Australia, 1990 to 2004

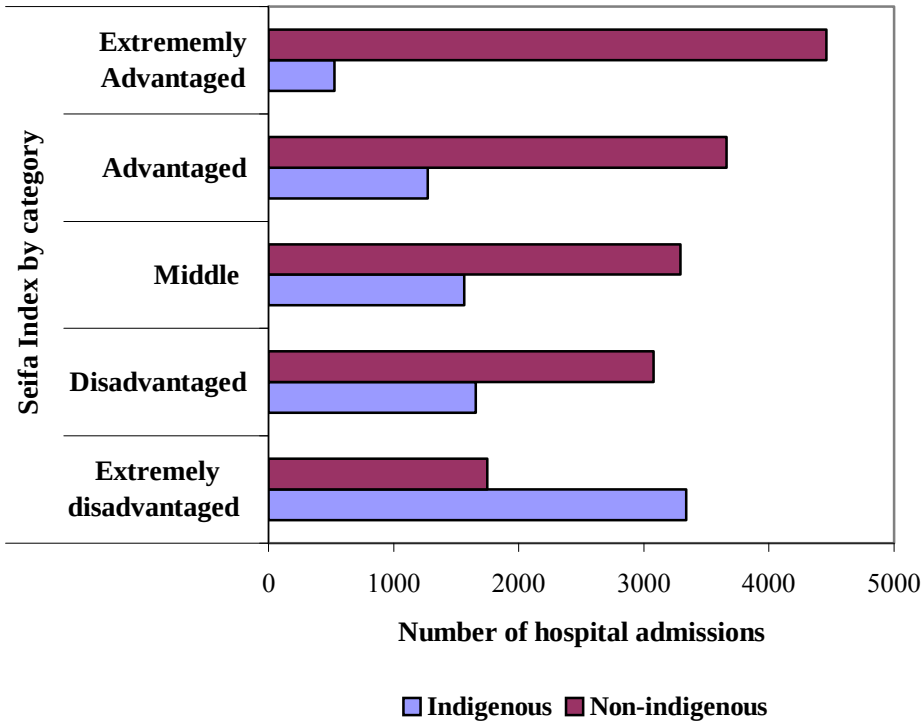


Table 4.4 shows the number and proportion of hospitalisations due to interpersonal violence by socioeconomic status, gender and Indigenous status. Sixty percent of both male and female Indigenous people were from the extremely disadvantaged and disadvantaged group which was almost double that of the non-Indigenous group. In comparison, 30% of male non-Indigenous people and 32% of female non-Indigenous people were from the extremely disadvantaged and disadvantaged group. Similar results were found at the other end of the spectrum with 21% of Indigenous males and 21% of Indigenous females from the advantaged group (extremely advantaged and advantaged) compared to 50% of non-Indigenous males and 45% of non-Indigenous females.

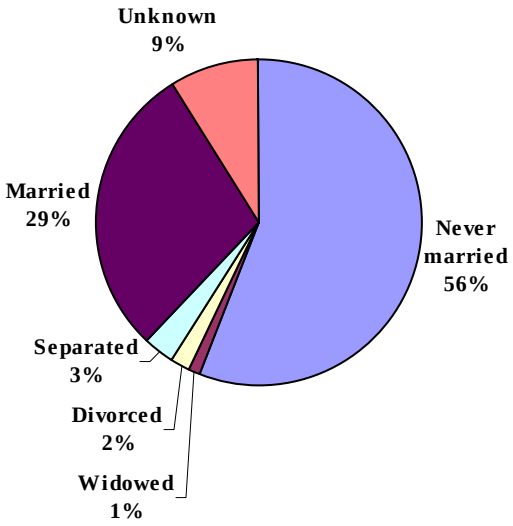
Table 4.4 Number and proportion of hospital admissions for interpersonal violence victimisation by gender and Indigenous status, Western Australia, 1990 to 2004

Age	Indigenous		Non-Indigenous		
	Male	Female	Male	Female	Total
	N (%)	N (%)	N (%)	N (%)	N (%)
Extremely disadvantaged	1708 (39)	1629 (41)	1389 (11)	358 (11)	5084 (21)
Disadvantaged	894 (21)	764 (19)	2430 (19)	647 (21)	4735 (19)
Middle	810 (19)	755 (19)	2582 (20)	708 (23)	4855 (20)
Advantaged	655 (15)	620 (15)	2990 (22)	673 (21)	4938 (20)
Extremely advantaged	271 (6)	256 (6)	3713 (28)	744 (24)	4984 (20)
Total	4338 (18)	4024 (16)	13104 (53)	3130 (13)	4596 (100)

4.1.4 Marital status

Hospital admission for interpersonal violence was more common among persons who were never married (56%) (Figure 4.6).

Figure 4.6 Proportion of interpersonal violence victimisation by marital status, Western Australia, 1990 to 2004



A significant difference in the pattern of hospitalisations between males and females in terms of marital status was reported (χ^2=2191.1, df=5, p<0.001). For males, the largest proportion of hospitalisations was among those who had never been married (64%). However for females the largest proportion was among those who were married (42%).

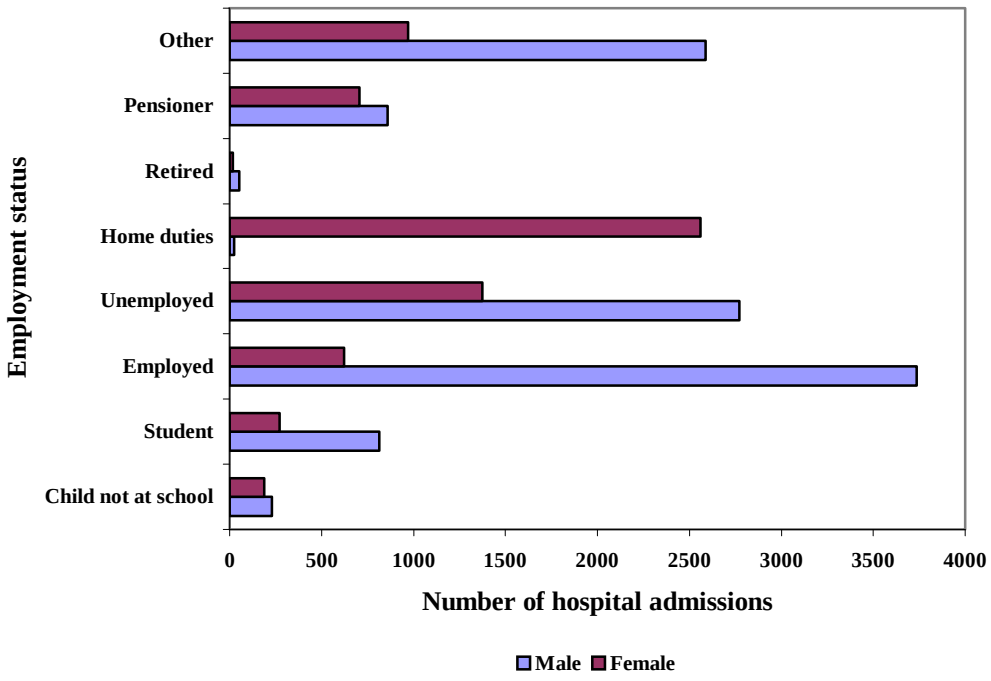
A significant difference in hospital admissions was reported between Indigenous and non-Indigenous people across marital status (χ^2=2543.7, df=5, p<0.001) with a large proportion of Indigenous people having not been married (62%) compared with non-Indigenous people who were more likely to be married (46%).

4.1.5 Employment status

Fifty-two percent (n=19,151) of the data fields for this category were reported as missing so the analysis was conducted on the remaining 17,783 cases. People whose employment status was recorded as "employed" comprised the largest proportion of hospitalisations due to interpersonal violence victimisation (24.5%) followed by "unemployed" (23.3%) and "home duties" (15%).

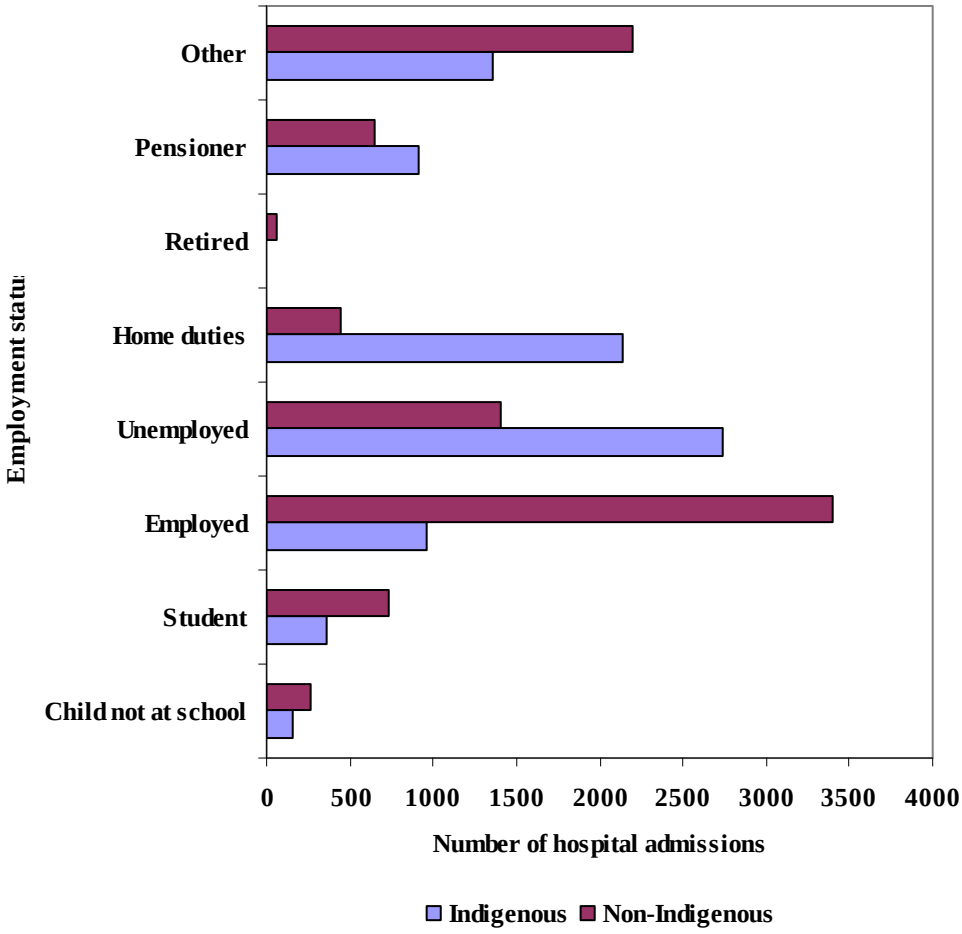
A significant difference was found in the distribution of hospital admissions between males and females across employment status (χ^2=2191.135, df=7, p<0.001). For males, the largest proportion of hospitalisations was among those who were employed (64%). However for females, the largest proportion was among those who were engaged in home duties (42%) (Figure 4.7).

Figure 4.7 Number of hospital admissions due to interpersonal violence victimisation by employment status and gender, Western Australia, 1990 to 2004



A significant difference was reported relative to employment status between Indigenous people (n=8,628) and non-Indigenous people (n=9,155) (χ^2=2289.680, df=7, p<0.000). Indigenous people were more likely to be unemployed (32%) or involved in home duties (25%). In comparison the large majority of non-Indigenous people (n=9155) were employed (37%) or involved in "other" activities (24%).

Figure 4.8 Number of hospital admissions due to interpersonal violence victimisation by employment status and gender, Western Australia, 1990 to 2004



4.1.6 Area of residence

Thirty nine percent of victims of interpersonal violence who were admitted to hospital lived in remote Western Australia, followed by 38% in the metropolitan area and 23% in rural Western Australia (Table 4.5).

Table 4.5 Distribution of hospitalisations due to interpersonal violence victimisation by residential location, gender and Indigenous status, Western Australia, 1990 to 2004

Residential Location*	Indigenous		Non-Indigenous		
	Male	Female	Male	Female	Total
	N (%)	N (%)	N (%)	N (%)	N (%)
Metropolitan	1375 (18)	1189 (12)	9259 (60)	2025 (55)	13848 (38)
Rural	1673 (22)	2278 (24)	3343 (22)	959 (26)	8253 (23)
Remote	4456 (59)	6228 (64)	2846 (18)	686 (19)	14216 (39)
Total	7504 (21)	9695 (27)	15448 (43)	3670 (10)	36317 (100)

** 617 cases with missing information*

There was a significant difference in the distribution of hospital admissions between Indigenous and non-Indigenous people in terms of residential location (χ^2=9027.80, df=2, p<0.000). Non-Indigenous people were more likely to be from metropolitan (59%) and rural areas (23%). However, an overwhelming proportion of Indigenous people lived in remote Western Australia (62%).

A significant difference in the distribution of hospital admissions between males and females in terms of residential location was evident (χ^2=1976.80, df=2, p<0.001). Males were more likely to be from the metropolitan (46%) area whereas females were from remote Western Australia (52%).

4.1.7 Circumstances of injury event

A large proportion of interpersonal violence injury events were due to bodily force (42%) followed by sharp or blunt objects (29%), other specified and unspecified methods (22%) and maltreatment and rape (6%) (Table 4.6).

Table 4.6 Circumstances of injury by gender and Indigenous status, Western Australia, 1990 to 2004

Method*	Indigenous		Non-Indigenous		
	Male	Female	Male	Female	Total
	N (%)	N (%)	N (%)	N (%)	N (%)
Bodily force	3135 (41)	2955 (30)	8031 (51)	1443 (39)	15564 (42)
Sharp or blunt object	2981 (39)	3624 (37)	3672 (23)	578 (16)	10855 (29)
Rape & maltreatment	189 (3)	1167 (12)	342 (2)	659 (18)	2357 (6)
Other methods	1289 (17)	2044 (21)	3770 (24)	1055 (28)	8158 (22)
Total	7594 (21)	9790 (27)	15815 (42)	3735 (10)	36934 (100)

There was a significant difference in the distribution of hospital admissions between males and females in circumstances of the injury event (χ^2=2190.545, df=4, p<0.001). Males were more likely to be involved in events using bodily force (72%), sharp or blunt objects (61%) and other specified and unspecified methods (62%). Overall, females were more likely to be involved in events of maltreatment and rape (78%).

There was also a significant difference in hospital admissions in the circumstances of the injury event between Indigenous and non-indigenous people (χ^2=1461.855, df=4, p<0.001). Non-Indigenous people were more likely to be involved in events where bodily force (61%) and other specified and unspecified methods were used (60%). However, Indigenous people were more likely to be involved in events using sharp or blunt objects (61%) followed by maltreatment and rape (58%).

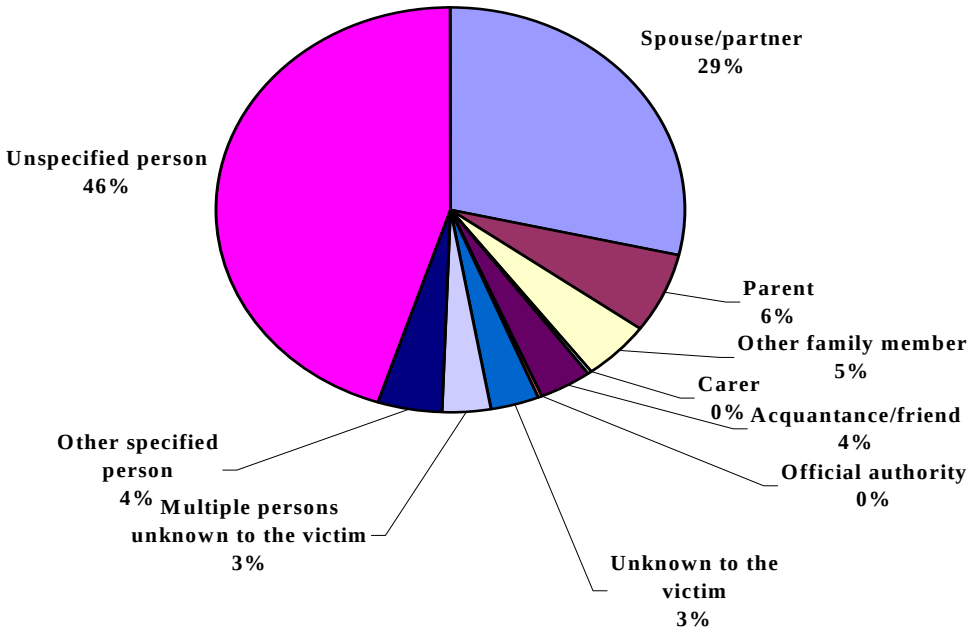
4.1.8 Relationship of victim to the perpetrator

The relationship of victims was identified in the data set using the fifth digit classification of the external cause of injury codes. Only those cases hospitalised in the months between July 1, 2002 and December 31, 2004 could be analysed due to the limitation of identifying this relationship prior to 2002 (could only be identified in limited cases prior to 2002).

In the 30 months between July 1, 2002 and December 31, 2004 there were 8,633 hospitalisations due to violence victimisation. For half of these hospitalisations (50%, n=4263) the perpetrator was described as either an "unspecified person" (45%, n=3875) or an "other specified person" (5%, n=388) using the relationship code (Figure 4.9).

Of the remaining 4,370 hospitalisations in which the relationship was specified, over a quarter (28%, n=2468) of the perpetrators were either the victim's spouse or partner with females over-represented among this group (91%). A further 6% (n=541) of hospitalisations involved persons victimised by a parent, 5% (n=415) another family member and 4% (n=310) a friend/acquaintance.

Figure 4.9 Distribution of interpersonal violence victimisation hospitalisations by relationship to the perpetrator, Western Australia, July 1, 2002-December 31, 2004



4.1.9 Co-morbidities for victims of violence victimisation

Table 4.7 presents the major co-morbidities sustained by the cohort for each individual patient and the total number of hospital admissions for interpersonal violence during the study period. Over a quarter (27%) of the total number of hospitalisations due to violence victimisation (n=36,934) during the study period reported at least one other medical condition when admitted to hospital. Of this group 93% reported two or more medical conditions when admitted to hospital.

The most common occurring co-morbidities for individual patients were mental illness, diseases of the circulatory system and endocrine disorders. The average number of co-morbidities significantly differed between male and females (t=-5.64, df=6850.03, p<0.001) with females reporting more co-morbid conditions.

Table 4.7 Number of hospital admissions and patients with other causes of admission by gender, Western Australia, 1990-2004

Other Causes of Admission*	Males		Females	
	Admissions	Patients	Admissions	Patients
	n=23,409	n=18,025	n=13,525	n=7,402
Circulatory disease	2843	2501	2008	1433
Respiratory disease	819	769	505	450
Mental illness	6379	4010	3467	2385
Infectious disease	341	320	305	277
Nervous system and sense organs	919	821	382	329
Digestive disorders	527	497	272	238
Endocrine disorders	731	591	839	556

** Patients may have reported more than one medical condition*

The average number of co-morbidities significantly differed between Indigenous and non-Indigenous people (t=31.943, df=13369.756, p<0.000). Ninety-eight percent of Indigenous people reported more than one co-morbid condition compared to 88% of non-Indigenous people.

The number of Indigenous people with a reported co-morbid condition was larger for all diseases compared to non-Indigenous people except for respiratory diseases and diseases of the nervous system and sense organs. Mental illness and circulatory diseases were the most common occurring co-morbidities reported for both groups (Table 4.8). Indigenous people had more endocrine related hospital admissions whereas non-Indigenous people had more admission for diseases of the nervous system and sense organs

Table 4.8 Number of hospital admissions and patients with other causes of admission by Indigenous status, Western Australia, 1990-2004

Other Causes of Admission*	Indigenous		Non-Indigenous	
	Admissions	**Patients**	**Admissions**	**Patients**
	n=17,384	n=8,673	n=19,550	n=16,754
Circulatory disease	2916	2060	1935	1874
Respiratory disease	629	539	695	680
Mental illness	5201	2698	4645	3697
Infectious disease	404	353	242	244
Nervous system and sense organs	595	476	706	674
Digestive disorders	412	352	387	383
Endocrine disorders	1228	798	342	349

** Patients may have reported more than one medical condition*

4.1.10 Deaths due to interpersonal violence victimisation

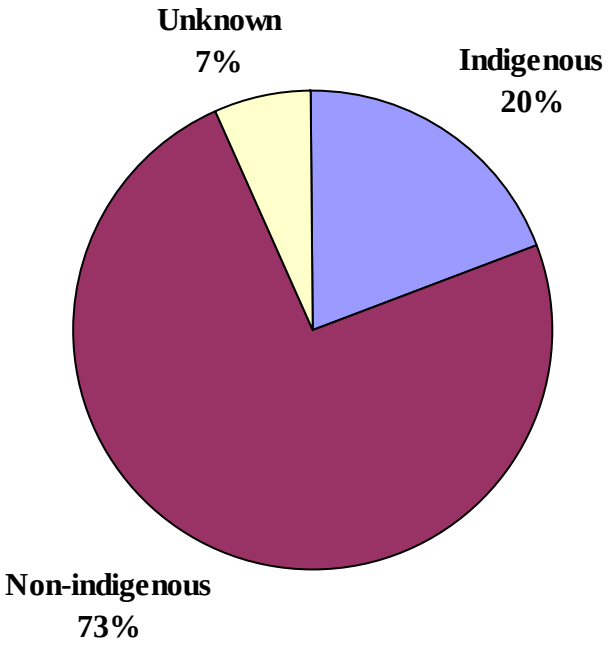
There were 425 deaths due to interpersonal violence during the study period. Males accounted for 57% (n=271) of the deaths with the overall crude death rate higher for males (1.7 per 100,000 population) than females (1.3 per 100,000 population) (see Table 4.9). Overall, the highest death rate was recorded in 1993, 1994 and 1995 (2.2 per 100,000 population) and the lowest in 2004 (0.6 per 100,000 population). A 60% decrease was reported from 2002 (1.5 per 100,000 population) compared to the death rate in 2004 (0.8 per 100,000 population).

Table 4.9 Number and rate of deaths due to interpersonal violence victimisation by gender, Western Australia, 1990 to 2004

Year	Male		Female		Total	
	Number	Rate	Number	Rate	Number	Rate
1990	13	1.6	15	1.9	28	1.7
1991	10	1.2	15	1.8	25	1.5
1992	16	1.9	19	2.3	35	2.1
1993	23	2.7	15	1.8	38	2.2
1994	20	2.3	19	2.2	39	2.2
1995	25	2.8	14	1.6	39	2.2
1996	15	1.6	7	0.80	22	1.2
1997	18	1.9	10	1.1	28	1.5
1998	14	1.5	14	1.5	28	1.5
1999	17	1.8	11	1.2	28	1.5
2000	21	2.2	11	1.1	32	1.7
2001	15	1.5	9	0.9	24	1.2
2002	14	1.4	15	1.5	29	1.5
2003	13	1.3	4	0.4	17	0.8
2004	7	0.7	6	0.6	13	0.6
Total	241	1.7	184	1.3	425	1.5

Indigenous people represented 20% of deaths due to interpersonal violence and non-Indigenous people 73% (Figure 4.10).

Figure 4.10 Distribution of deaths due to interpersonal violence victimisation by Indigenous status, Western Australia, 1990-2004



Due to small numbers only the number and proportion of deaths will be reported for Indigenous people. There were a total of 83 Indigenous deaths with the number of deaths similar for males and females (43 males; 40 females). The number of deaths has fluctuated with the highest number reported in 1993 and 1994 (10 deaths each) and the lowest in 1996 and 2004 (2 deaths). A 150% decrease in the number of deaths was reported in 2004 compared to 2003.

Table 4.10 Number and proportion of Indigenous deaths due to interpersonal violence victimisation by gender, Western Australia, 1990 to 2004

Year	Male		Female		Total	
	Number	%	Number	%	Number	%
1990	0	0	4	10	4	5
1991	2	5	5	13	7	8
1992	4	9	4	10	8	10
1993	7	16	3	7	10	12
1994	4	9	6	15	10	12
1995	3	7	1	3	4	5
1996	2	5	0	0	2	2
1997	1	2	3	7	4	5
1998	1	2	2	5	3	4
1999	1	2	2	5	3	4
2000	6	14	3	7	9	11
2001	5	12	2	5	7	8
2002	1	2	4	10	5	6
2003	5	12	0	0	5	6
2004	1	2	1	3	2	2
Total	43	52	40	48	83	100

Table 4.11 shows the number and proportion of deaths due to interpersonal violence victimisation by gender, age group and Indigenous status from 1990 to 2004. For both Indigenous and non-Indigenous people, the 25 to 39 year age group had the greatest proportion of victims (35%). The highest proportion of deaths for Indigenous people was among victims aged 30 to 34 years (19%) compared to non-Indigenous people aged 35 to 39 years (15%).

Table 4.11 Number and proportion of deaths due to interpersonal violence victimisation by gender, age group and Indigenous status, Western Australia, 1990 to 2004

Age	Indigenous		Non-Indigenous	
	Male	Female	Male	Female
	N (%)	N (%)	N (%)	N (%)
0-4	0 (0)	1 (3)	4 (2)	12 (9)
5-9	2 (5)	0 (0)	12 (7)	5 (4)
10-14	0 (0)	1 (3)	3 (2)	4 (3)
15-19	1 (2)	7 (18)	12 (7)	7 (5)
20-24	1 (2)	6 (15)	25 (14)	17 (13)
25-29	6 (14)	5 (13)	23 (13)	11 (9)
30-34	9 (21)	7 (18)	15 (8)	11 (9)
35-39	7 (16)	7 (18)	28 (15)	20 (15)
40-44	8 (19)	1 (3)	14 (8)	9 (7)
45-49	6 (14)	2 (5)	11 (6)	12 (9)
50-54	1 (2)	0 (0)	9 (5)	5 (4)
55-59	1 (2)	0 (0)	9 (5)	2 (2)
60-64	0 (0)	2 (5)	7 (4)	2 (2)
65-69	0 (0)	1 (3)	4 (2)	5 (4)
70-74	0 (0)	0 (0)	2 (1)	2 (2)
75-79	1 (2)	0 (0)	3 (2)	0 (0)
80-84	0 (0)	0 (0)	1 (1)	4 (3)
85+	0 (0)	0 (0)	2 (2)	2 (2)
Total	43 (100)	40 (100)	184 (100)	130 (100)

** 28 cases are missing information*

4.2 *Quantify the impact of hospitalisation due to violence victimisation on the Western Australian health care system, using the number of hospitalisations due to violence victimisation and the length of stay associated with such hospitalisations as measures of impact.*

There were 36,934 hospital admissions due to interpersonal violence from 1990 to 2004, which represented 25,427 victims. Of these 25,427 victims, 5,887 (23%) were admitted to hospital for more than one episode of interpersonal violence victimisation. These 5,887 victims accounted for the additional 11,507 hospital admissions during the study period. The number of admissions for interpersonal violence per individual ranged from only one admission to 24.

The average length of stay per hospital admission (n=36,934) was 2.6 (SD=4.90) days with a range of one day to 271 days. The mean length of stay significantly differed between males and females (t=-2.28, df=36932, p=0.02) with the average length of stay for females (mean=2.66 days, SD=4.77) slightly longer than for males (mean=2.54, SD=4.97).

When examining the length of stay per hospital admission by Indigenous status a significant difference was found between the two groups (t=4.263, df=36932, p<0.000). Indigenous people spent an average of 2.70 (SD=4.15) days in hospital compared to non-Indigenous people (2.48 days, SD=5.47).

4.2.1 Repeat hospital admissions for interpersonal violence victimisation

Seventy-four percent (n=8545) of the 11,507 repeat hospital admissions for interpersonal violence victimisation were Indigenous people with almost half (48%, n=5521) of *all* repeat hospital admissions being Indigenous females (Table 4.12).The majority of Indigenous people who had a repeat admission for interpersonal violence were females (65%), while the majority of non-Indigenous people with a repeat admission were males (79%).

There was no significant difference in the average length of stay between Indigenous (2.8 days) and non-Indigenous people (2.8 days) (t=-0.32, df=3984.95, p=0.74) for a repeat hospital admission for interpersonal violence.

Table 4.12 The number and proportion of a repeat hospital admission for interpersonal violence victimisation by gender and Indigenous status, Western Australia, 1990 to 2004

	Indigenous	Non-Indigenous	Total
	N (%)	N (%)	N (%)
Male	3024 (35)	2347 (79)	5371 (47)
Female	5521 (65)	615 (21)	6136 (53)
Total	8545 (74)	2962 (26)	11507 (100)

4.3 *Estimate the prevalence of mental illness among victims who been admitted to hospital in Western Australia due to interpersonal violence.*

The total number of hospital admissions for interpersonal violence between 1990 and 2004 for people with a mental illness was 9,846 (27%) and 27,088 (73%) for those without a mental illness.

Table 4.13 shows the number and crude rate of admissions to hospital for interpersonal violence victimisation for those with and without a mental illness (a hospital admission for a diagnosed mental illness). The overall rate of hospital admissions due to interpersonal violence for those with a mental illness was 36.6 per 100,000 population compared to 100.7 per 100,000 population for those without a mental illness from 1990 to 2004. The rate decreased between 2003 and 2004 for those with a mental illness (4%) and for those without a mental illness (5%).

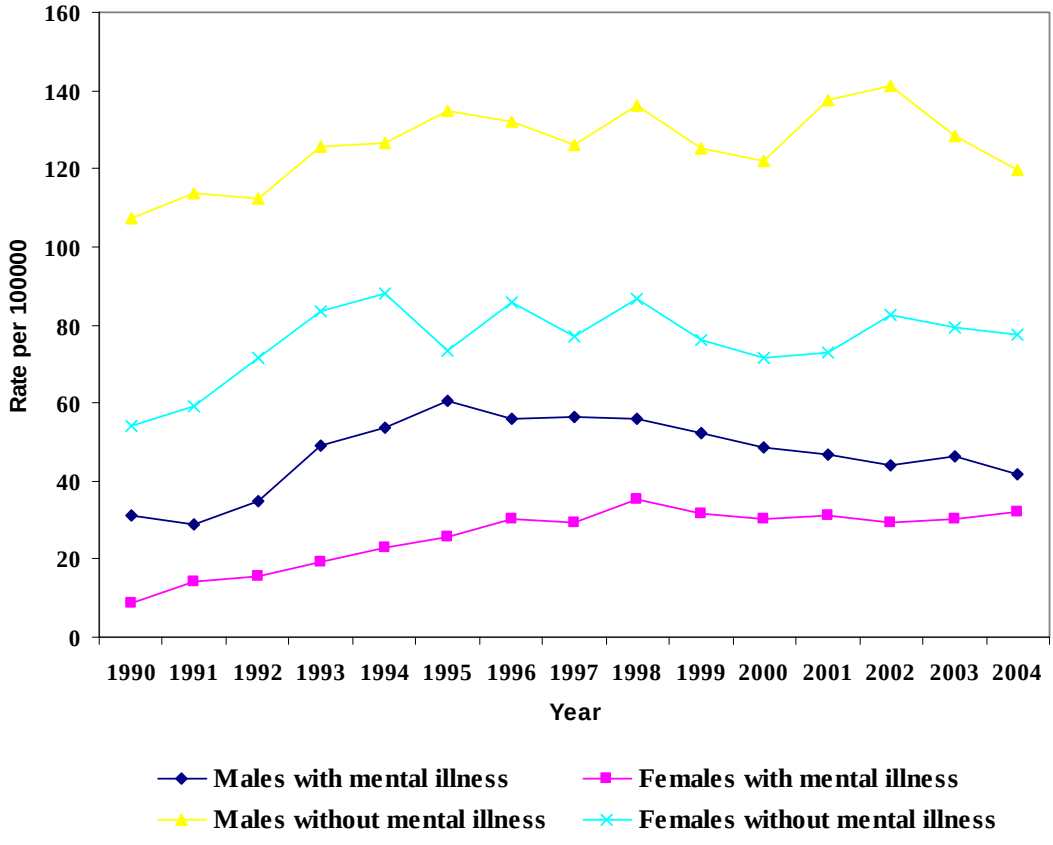
Table 4.13 Number and rate of hospitalisations for interpersonal violence victimisation for individuals with and without a mental illness, Western Australia, 1990 to 2004

Year	Mental illness		No mental illness	
	Number	Rate*	Number	Rate*
1990	322	19.9	1298	80.4
1991	354	21.6	1407	85.9
1992	419	25.2	1517	91.4
1993	571	34.0	1748	104.1
1994	650	38.1	1817	106.6
1995	747	43.0	1800	103.8
1996	760	43.0	1912	108.3
1997	768	42.7	1812	100.9
1998	828	45.4	2023	110.9
1999	772	41.7	1855	100.2
2000	738	39.3	1808	96.4
2001	741	38.9	1991	104.7
2002	702	36.4	2145	111.2
2003	745	38.2	2016	103.3
2004	729	36.8	1939	98.0
Total	9846	36.6	27088	100.7

**Per 100,000 population*

Figure 4.11 shows the rate of hospital admission for interpersonal violence for those with and without a mental illness by gender. The rate of hospital admissions for males with a mental illness (41 per 100,000 population in 2004) and males without a mental illness (119 per 100,000 population in 2004) and females without a mental illness (77 per 100,000 population in 2004) decreased in 2004 compared to 2003 by 11%, 7% and 2% respectively. However the rate of hospital admission for females with a mental illness increased in 2004 (32.2 per 100,000 population) compared to 2003 (30.3 per 100,000 population) by 6%. The rate for females with a mental illness showed an increasing trend which peaked in 1998 (35.2 per 100,000) and has remained stable until 2004. Admissions for males with a mental illness peaked in 1995 (60.5 per 100,000) but have steadily declined since that time.

Figure 4.11 Rate of hospitalisation for interpersonal violence victimisation with and without a mental illness by gender, Western Australia, 1990 to 2004



Fifty-three percent of the 9,846 hospitalisations due to interpersonal violence victimisation with a mental illness were for Indigenous people (n=5201). The overall rate of Indigenous hospitalisations for interpersonal violence victimisation with a mental illness was 574.5 per 100,000 population. The rate of hospitalisations for female Indigenous victims showed an increasing trend since 1995. From 1998 onwards the rate of hospitalisations for females has been consistently higher than male Indigenous victims. In 2004, the highest rate of hospitalisation was reported for Indigenous females (717 per 100,000 population) since 1998 (797 per 100,000 population) (Table 4.14).

Table 4.14 The number and rate of Indigenous hospitalisations for Interpersonal violence victimisation with a mental illness by gender, Western Australia, 1990 to 2004

Year	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
1990	57	227.1	47	185.5	104	206.4
1991	78	301.1	85	327.1	163	314.1
1992	91	341.7	86	322.2	177	331.9
1993	151	551.6	120	438.5	271	495.1
1994	146	520.1	138	491.6	284	505.8
1995	191	663.3	174	604.5	365	633.9
1996	194	656.3	195	661.1	389	658.7
1997	209	691.4	195	646.1	404	668.8
1998	225	727.5	246	797.3	471	762.3
1999	194	613.1	231	731.2	425	672.1
2000	208	644.4	228	705.4	436	674.9
2001	182	552.5	237	715.3	419	634.1
2002	195	580.8	228	676.5	423	628.7
2003	192	559.6	243	706.1	435	632.9
2004	183	523.1	252	717.2	435	620.3
Total	2496	551.8	2705	597.1	5201	574.5

** Per 100,000 population*

4.4 *Identify risk factors and examine the association with reference to demographic characteristics, co-morbidities and the circumstances of the injury events among victims with and without mental illness.*

4.4.1 Risk factors of interest (based on index case only)

Of the 36,934 hospitalisations due to interpersonal violence 25,427 victims were admitted to hospital for at least one episode of violence victimisation. Of these 25,497 victims, one quarter (n=6395) were admitted at least once to hospital with a principal diagnosis of mental illness. Table 4.15 shows the breakdown by gender, age, location, marital and Indigenous status, type of assault and presence of co-morbidities during the study period based on the 25,497 victims. The associated differences between the two groups with and without mental illness (p-value) are also reported based on the index hospital admission for interpersonal violence.

There were significant differences between those with and without a mental illness in terms of the various characteristics. The average age for those with a mental illness was slightly older (32 years, SD =12.41) than those without a mental illness (28 years, SD=12.93). Whilst the large majority of those with a mental illness were male (63%), the proportion of females (37%) with a mental illness was higher compared with females without a mental illness (26%). Almost half of all people without a mental illness (47%) were from the metropolitan area compared to 57% with a mental illness who were from rural (23%) and remote (34%) Western Australia. The socio-economic status for victims of violence with and without a mental illness was similar and was not significantly different. The circumstances of injury for individuals with a mental illness were more likely to be due to bodily force (42%) or other specified and unspecified methods (26%) compared to bodily force (45%) and other methods (23%) for those without a mental illness. The presence of co-morbidities was higher among those with a mental illness (0.86, SD=1.07) compared to those without (0.47, SD=0.80). In particular, the prevalence of alcohol related admissions and circulatory illnesses were higher than those without a mental illness. A larger proportion of those with a mental illness were more likely to be separated, divorced or widowed (11%) than victims without a mental illness (6%).

Table 4.15 Characteristics of victims of interpersonal violence victimisation with and without a mental illness, Western Australia, 1990 to 2004

	Mental illness (n=6395) N (%)	No mental illness (n=19032) N (%)	P-value
Age Mean in years (S.D.)	31.98 (12.41)	28.14 (12.93)	<0.001
Co-morbidities**			
Alcohol	2253 (35%)	3561 (19%)	<0.001
Circulatory	1556 (24%)	2378 (12%)	
Respiratory	427 (7%)	792 (4%)	
Infectious	202 (3%)	395 (2%)	
Digestive	307 (5%)	428 (2%)	
Endocrine	409 (6%)	738 (4%)	
Nervous system	466 (7%)	684 (4%)	
Gender			
Male	4010 (63%)	14015 (74%)	<0.001
Female	2385 (37%)	5017 (26%)	
Indigenous status			
Non-Indigenous	3697 (58%)	13057 (69%)	<0.001
Indigenous	2698 (42%)	5975 (31%)	
Marital status*			
Married	1665 (29%)	4580 (26%)	<0.001
Not-married	3477 (60%)	11810 (68%)	
Separated	332 (6%)	68 (3%)	
Divorced	245 (4%)	342 (2%)	
Widowed	88 (1%)	195 (1%)	
Type of assault			
Bodily force	2654 (42%)	8609 (45%)	
Sharp or blunt object	1679 (26%)	4918 (26%)	<0.001
Maltreatment and rape	349 (6%)	1118 (6%)	
Specified/unspecified methods	1713 (26%)	4387 (23%)	
Residential Location*			
Metropolitan	2725 (43%)	8725 (47%)	<0.001
Rural	1482 (23%)	3978 (21%)	
Remote	2115 (34%)	5960 (32%)	
SES* Mean (SD)	952.20 (93.31)	954.76 (104.01)	p=0.069

**Missing information ** Total can be greater than 100% as presentations may occur for more than one condition*

Three different logistics regression models were undertaken to examine the association of significant risk factors among victims with and without a mental illness. The first model utilised all cases with a mental illness admission as the outcome variable; the second model used only those cases who were admitted to hospital with a mental illness admission first followed by an admission for interpersonal violence. The last model used only cases who were admitted to hospital first for interpersonal violence followed by an admission for a mental illness diagnosis. Of these 6394 cases with a diagnosis of a mental illness, 55% (n=3534) were admitted to hospital with a diagnosis of mental illness **first**, followed by an admission due to interpersonal violence. Forty-five percent (n=2860) of cases with a mental illness were admitted to hospital for interpersonal violence **first,** followed by an admission for a mental illness.

The results of the first logistic regression using the index hospital admission for cases with a mental illness diagnosis either before or after an admission for interpersonal violence are presented in Table 4.16. There were 25,497 cases of which 6,395 cases (25%) had a diagnosis for a mental illness at some point during the study period. The outcome of interest was 0= hospital admission for interpersonal violence; 1=mental health admission ***and*** an admission for interpersonal violence.

Factors associated with an increased risk for a patient to be admitted to hospital for interpersonal violence and a mental illness were age, residential location, indigenous status, and circumstances of injury, marital status and the presence of co-morbidities. Women were 1.5 times more likely (95% CI 1.40-1.63) to be admitted to hospital due to interpersonal violence and a mental illness compared to males. Indigenous people were also at a similar increase risk (OR=1.47, 95% CI 1.34-1.57). The presence of co-morbidities increased the risk for a hospital admission due to interpersonal violence and mental illness by almost 50% (OR=1.49, 95% CI 1.44-1.54). However, people living in remote Western Australia were less likely to be admitted to hospital with an associated mental illness compared to those living in the metropolitan area (OR=0.85, 95% CI 0.78-0.93) while rural residents were at a slightly increased risk compared with metropolitan residents (OR=1.01, 95% CI 0.92-1.09). The circumstances of the injury event were more likely to be due to other specified and unspecified methods than by bodily force (OR=1.17, 95% CI 1.08-1.27). Age was also significant

(OR=1.02, 95% CI 1.01-1.02). Lastly, separated/divorced/widowed victims were almost 40% more likely to be admitted (OR=1.39, 95% CI 1.23-1.57) for interpersonal violence victimisation and a mental illness.

Table 4.16 Factors associated with the risk of an individual with a mental illness being admitted to hospital for interpersonal violence victimisation

Variable	%	Coefficient	Standard error	Odds ratio	Confidence Interval	P-value
Age (29.10 mean , SD 12.94 years)		0.02	0.01	1.02	1.01-1.02	<0.001
Gender						
Male[a]	71%					
Female	29%	0.43	0.04	1.54	1.40-1.63	<0.001
Residential location*						
Metropolitan[a]	46%					
Rural	22%	0.01	0.05	1.01	0.92-1.09	0.795
Remote	32%	-0.16	0.05	0.85	0.78-0.93	<0.001
Indigenous status						
Non-indigenous [a]	66%					
Indigenous	34%	0.38	0.04	1.47	1.34-1.57	<0.001
Type of assault						
Bodily force[a]	44%					
Sharp or blunt object	26%	-0.01	0.04	0.99	0.92-1.07	0.907
Rape and maltreatment	6%	-0.10	0.74	0.91	0.78-1.04	0.175
Other methods	24%	0.16	0.04	1.178	1.08-1.27	<0.001
Marital status*						
Not-married[a]	66%					
Married	27%	-0.18	0.04	0.83	0.76-0.90	<0.001
Separated/divorced/ Widowed	7%	0.33	0.06	1.394	1.23-1.57	<0.001
Co-morbidities (mean=0.57, SD=0.89)		0.40	0.02	1.49	1.44-1.54	<0.001

*[a] baseline level, * missing information*

A subsequent logistic regression analysis was performed to examine the risk factors for a mental health admission first followed by a hospital admission for interpersonal violence (see Table 4.17). There were 21,800 cases (index admission) of which 3534 cases (16%) had a mental illness diagnosis first, followed by an admission for interpersonal violence. The outcome of interest was 0= hospital admission for interpersonal violence; 1=***mental health admission first*** followed by an admission for interpersonal violence.

The risk factors for a mental health admission followed by an admission for interpersonal violence were slightly different than those mentioned previously. Age, residential location, Indigenous status, marital status and the presence of co-morbidities were significantly associated with a mental illness diagnosis first followed by an admission for interpersonal violence. Women were still at a 50% increased risk (OR=1.52, 95% CI 1.39-1.67) for a mental health admission first, followed by an admission for interpersonal violence. Being Indigenous increased the risk by 22% increase (OR=1.22, 95% CI 1.10-1.35) and comorbidities increased the risk by 49% (OR=1.49, 95% CI 1.42-1.55). Age was also significant (OR=1.03, 95% CI 1.02-1.03). However living in remote Western Australia had a protective effect compared to living in the metropolitan area (OR=0.84, 95% CI 0.76-0.96). The circumstances of the injury event were no longer significant.

Table 4.17 Factors associated with the risk of an individual being admitted to hospital with a mental illness followed by an admission for interpersonal violence victimisation

Variable	Distribution	Coefficient	Standard Error	Odds ratio	Confidence Interval	P-value
Age (mean 29, SD 13 years)		0.03	0.01	1.03	1.02-1.03	<0.001
Gender						
Male[a]	72%					
Female	28%	0.41	0.04	1.52	1.39-1.67	<0.001
Indigenous status						
Non-indigenous [a]	68%					
Indigenous	32%	0.20	0.05	1.22	1.10-1.35	0.01
Type of assault						
Bodily force[a]	45%					
Sharp or blunt object	26%	0.01	0.05	1.01	0.90-1.10	0.98
Rape and maltreatment	6%	0.04	0.09	1.03	0.86-1.24	0.70
Other methods	23%	0.03	0.05	1.03	0.93-1.14	0.54
Marital status						
Not-married [a]	66%					
Married	27%	-0.19	0.05	0.83	0.75-0.91	<0.001
Separated/divorced	7%	0.49	0.07	1.62	1.41-1.87	<0.001
Residential location						
Metropolitan [a]	46%					
Rural	22%	-0.02	0.05	0.94	0.88-1.09	0.76
Remote	32%	-0.15	0.05	0.84	0.76-0.96	0.01
Presence of co-morbidities (mean=0.53, SD=0.85)		0.39	0.02	1.49	1.42-1.55	<0.001

*baseline level * missing information*

A third logistic regression analysis was performed to examine the risk factors for a hospital admission for interpersonal violence followed by an admission for a mental health diagnosis (see Table 4.18). There were 21,893 cases of which 2860 cases (13%) were admitted to hospital for interpersonal violence victimisation followed by an admission for a mental illness. The outcome of interest was 0= hospital admission for interpersonal violence; 1=***admission for interpersonal violence first*** followed by a mental health admission.

The risk factors for an admission for interpersonal violence first followed by an admission for a mental health diagnosis were similar to the results of the first logistic regression model. Age (OR=1.01, 95% CI 1.00-1.01), being female (OR=1.42, 95% CI 1.29-1.57), and the presence of co-morbidities (OR=1.47, 95% CI 1.41-1.54) increased the risk for an admission for a mental illness after being admitted to hospital for interpersonal violence victimisation. These were similar to the results of the first logistic model which included all index cases with a mental illness. However being Indigenous increased the risk by almost 82% (OR=1.82, 95% CI 1.63-2.03). Victims living in remote Western Australia were less likely to be admitted than their metropolitan counterparts (OR=0.82, 95% CI 0.73-0.93). Victims were also 37% times more likely to be involved in assaults due to other methods than bodily force (OR=1.37, 95% CI 1.23-1.53). Being married was a protective factor (OR=0.86, 95% CI 0.77-0.96) for a mental health admission after an admission for interpersonal violence victimisation.

Table 4.18 Factors associated with the risk of an individual being admitted to hospital for interpersonal violence victimisation followed by an admission for a mental illness

Variable	Distribution	Coefficient	Standard error	Odds ratio	Confidence Interval	P-value
Age (mean 29, SD =12.8 years)		0.01	0.01	1.01	1.00-1.01	0.151
Gender						
Male[a]	72%					
Female	28%	0.35	0.05	1.42	1.29-1.57	<0.001
Indigenous status						
Non-indigenous [a]	66%					
Indigenous	34%	0.60	0.05	1.83	1.63-2.03	<0.001
Type of assault						
Bodily force[a]						
Sharp or blunt object		-0.19	0.06	0.98	0.87-1.09	0.73
Rape and maltreatment		-0.30	0.11	0.75	0.60-0.91	0.01
Other methods		0.32	0.05	1.36	1.23-1.53	<0.001
Marital status*						
Not-married[a]	68%					
Married	26%	-0.15	0.06	0.86	0.77-0.96	0.01
Separated/divorced	6%	-0.01	0.10	0.99	0.81-1.21	0.94
Residential location*						
Metropolitan[a]	46%					
Rural	21%	0.02	0.06	1.01	0.90-1.15	0.79
Remote	33%	-0.19	0.06	0.83	0.73-0.94	0.01
Presence of co-morbidities (mean 0.52, SD=0.86)		0.39	0.02	1.47	1.41-1.54	<0.001

[a] *baseline level * missing information*

4.5 *Quantify differences in the impact made on the Western Australian health care system between victims of violence with and without mental illness.*

As previously mentioned, the total number of hospital admissions for interpersonal violence between 1990 and 2004 for people with a mental illness was 9,846 and 27,088 for those without a mental illness. There was no significant difference in the length of stay between victims of violence with and without a mental illness (t=-0.27, df=15405.31, p=0.78) based on all hospital admissions (n=36,934). On average, victims with a mental illness stayed 2.6 days (SD=5.5) in hospital and those without a mental illness also stayed 2.6 days (SD=4.7).

4.5.1 Repeat admissions due to interpersonal violence victimisation

There were 11,507 repeat admissions for interpersonal violence during the study period. Sixty-seven percent (n=7677) of these repeat admissions for interpersonal violence did not involve patients with a mental illness and 33% did involve patients with a mental illness. There was a significant difference in the length of stay between victims of violence with and without a mental illness (t=3.5, df=11505, p<0.001). Victims with a mental illness stayed on average less (2.6 days, SD=4.0) than those who did not have report a mental illness (2.9 days, SD=4.6).

4.6 *Describe the health consequences of violence victimisation among hospitalised victims with and without a mental illness based on their discharge destination and risk factors associated with a repeat admission for interpersonal violence victimisation.*

The overwhelming majority of victims admitted to hospital due to interpersonal violence during the study period were discharged home (86%, n=31,634), 8% (n=2777) to another acute hospital and 6% (n=2156) discharged him/herself against medical advice.

A Cox proportional hazards regression model was undertaken to examine risk factors for time to a repeat hospital admission due to interpersonal violence. The outcome variable was the time from the index hospital admission discharge date to the date of a repeat admission for interpersonal violence. The results of the multivariate Cox regression found that factors that were associated with the risk for a subsequent admission due to interpersonal violence were age, the presence of a mental illness, gender, Indigenous status, residential location, presence of co-morbidities, type of assault, marital and SES status (Table 4.19).

People with a mental illness were almost 50% (HR=1.47, 95% CI 1.37-1.54) more likely to have a subsequent admission for interpersonal violence than those without (Figure 4.12 and Table 4.21). Women were 31% (HR=1.31, 95% CI 1.23-1.39) and Indigenous people (HR=1.37, 95% CI 1.28-1.46) were 37% more likely to have another hospital admission due to interpersonal violence than males and non-Indigenous people (Figure 4.13 & Figure 4.14 respectively and Table 4.21). People living in rural (HR=1.48, 95% CI 1.36-1.61) and remote parts (HR=1.75, 95% CI 1.61-1.89) of Western Australia reported almost twice the rate for a repeat admission than those living in the metropolitan area. Similarly, the presence of co-morbidities (HR=1.70, 95% CI 1.65-1.73) increased the relative hazard for a second admission for interpersonal violence by 70%. Younger people were also less likely to have a repeat admission for violence. The more affluent groups (middle, advantaged, extremely advantaged and disadvantaged) were less likely to be readmitted compared to the extremely disadvantaged group.

Table 4.19 Multivariate Cox proportional hazards regression model of risk factors for time to a repeat hospital admission for interpersonal violence victimisation

Variable	Distribution	Hazard Ratio	Confidence Interval	Coefficient (S.E)	P-value
Age (mean 29.1 years, SD 12.9)		0.99	0.98-0.99	-0.01 (0.01)	p<0.001
Mental illness					
No mental illness[a]	75%				
Mental illness	25%	1.46	1.37-1.54	0.37 (.03)	p<0.001
Gender					
Male[a]	71%				
Female	29%	1.31	1.23-1.39	0.27 (0.03)	p<0.001
Indigenous status					
Non-indigenous [a]	77%				
Indigenous	23%	1.37	1.28-1.46	0.31 (0.03)	p<0.001
Type of assault					
Bodily force[a]	44%				
Sharp or blunt object	26%	1.07	1.01-1.15	0.08 (0.04)	0.032
Rape and maltreatment	6%	0.73	0.64-0.83	-0.31 (0.07)	p<0.001
Other methods	24%	0.95	0.88-1.03	-0.05 (0.04)	0.20
Marital status					
Not-married[a]	66%				
Married	27%	1.17	1.10-1.26	0.16 (0.04)	p<0.001
Separated/divorced	7%	1.04	0.91-1.18	0.04 (0.06)	0.55
Soceconomic status					
Extremely disadvantaged[a]	21%				
Disadvantaged	19%	0.80	0.74-0.87	-0.22	p<0.001
Middle	20%	0.88	0.80-0.96	-0.13	0.01
Advantaged	20%	0.79	0.73-0.86	-0.22	p<0.001
Extremely advantaged	20%	0.69	0.62-0.76	-0.37	p<0.001
Residential location*					
Metropolitan[a]	46%				
Rural	22%	1.48	1.36-1.60	0.39 (0.04)	p<0.001
Remote	32%	1.75	1.61-1.89	0.56 (0.04)	p<0.001
Presence of co-morbidities (mean=0.57, SD=0.89		1.70	1.65-1.73	0.052 (0.01)	p<0.001

*[a] baseline level * missing information*

Figure 4.12 Cumulative hazard of time to a repeat hospital admission for interpersonal violence victimisation for victims with and without a mental illness

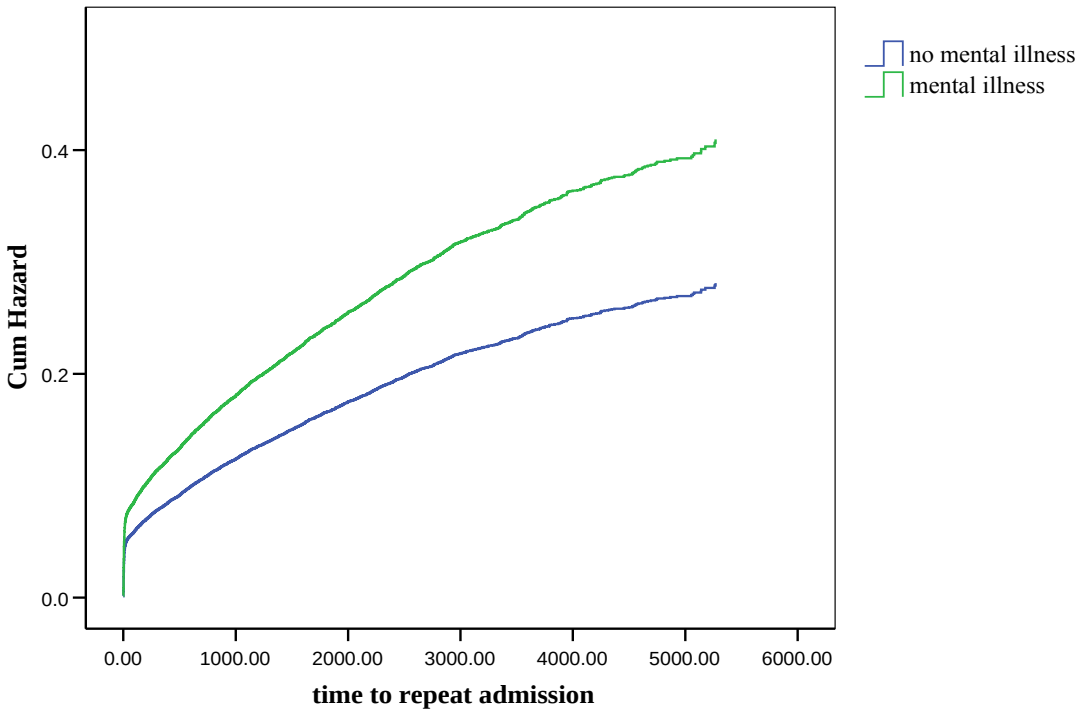


Figure 4.13 Cumulative hazard of time to a repeat hospital admission for interpersonal violence victimisation for Indigenous and non-Indigenous people

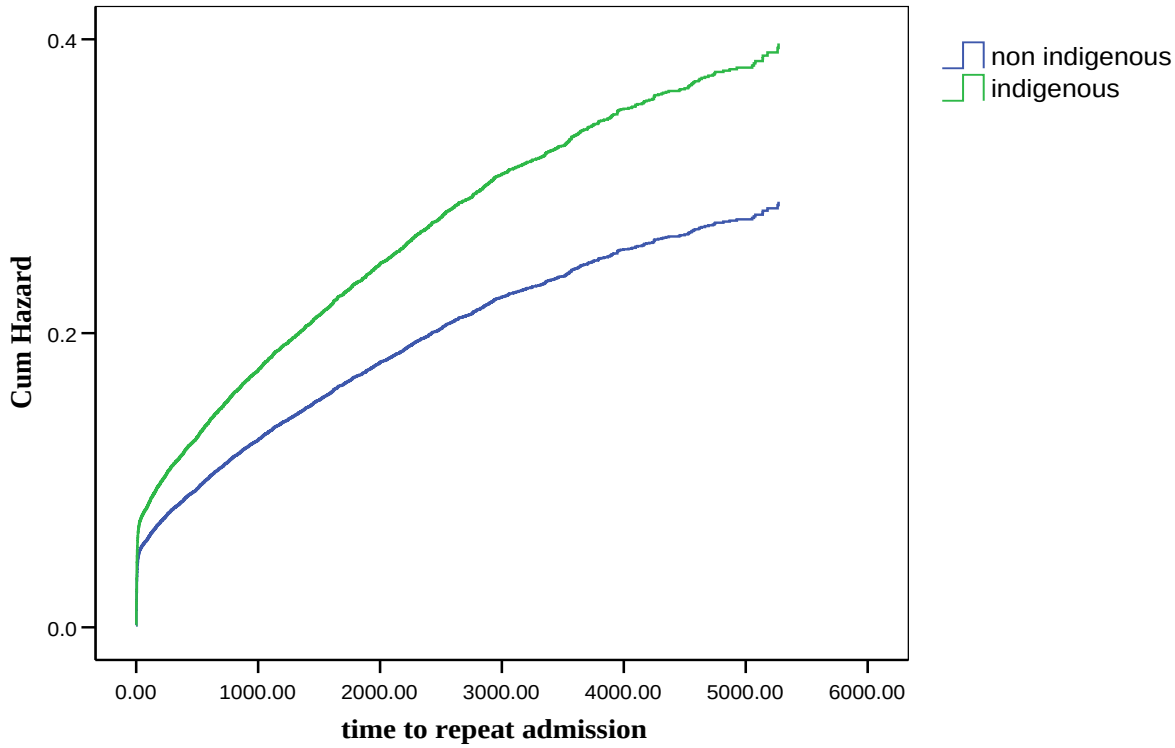
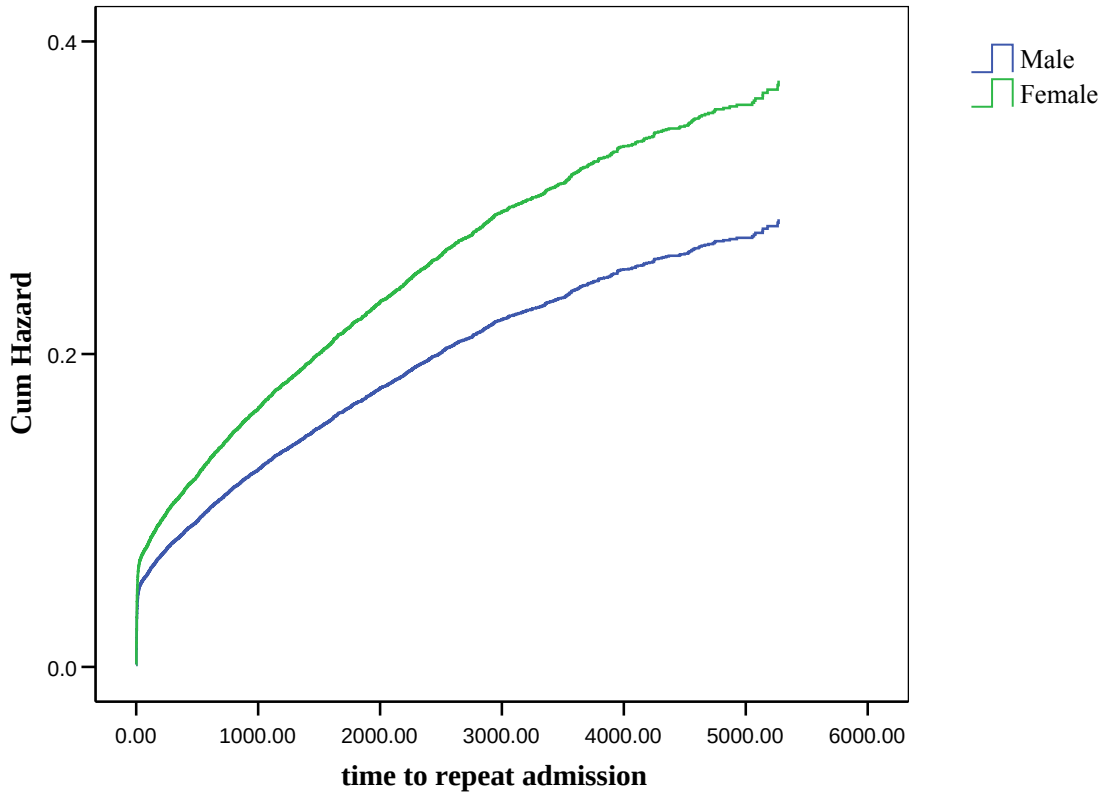


Figure 4.14 Cumulative hazard of time to a repeat hospital admission for interpersonal violence victimisation for males and females



4.7 *Calculate the health costs of interpersonal violence and the share accounted for by people with and without mental illness.*

For the period 2002 to 2004, the average cost of interpersonal violence to the hospital system in Western Australia was between $9 million and $10 million per year (Table 4.20). The mean cost per hospital admission for these years, expressed in constant 2004 dollars, was $3,387, with little year-to-year variation.

Table 4.20 Mean cost per hospital admission and annual total hospital costs due to interpersonal violence by year, 2002 to 2004, constant 2004 dollars

Year	Number	Mean cost per hospital admission ($)	Annual total hospital costs ($000m)
2002	2847	3417	9728
2003	2761	3358	9271
2004	2668	3383	9026
2002 - 2004	8276	3387	28031

Males accounted for approximately two thirds of the total cost of hospital admissions due to interpersonal violence in Western Australia, above their share of hospital admissions during the period (62%) (Table 4.21). This was a consequence of their higher mean cost per admission, which was statistically significantly above ($3,707) the mean cost per admission for females ($2,874) ($p < 0.001$).

Two age groups, the 15-29 year olds and the 30 to 44 year olds, accounted for over 80% of the total cost of hospital admissions (Table 4.21). No significant differences were evident in the mean cost per admission by age group, although when gender was taken into account some groups had considerably higher than average costs per admission. In particular, young females in the 0 to 14 year age group had a very high mean cost per admission ($4872), and males in the 30 to 40 year age group and females over 60 years of age also had higher than average admission costs.

Table 4.21 Mean cost per hospital admission and total hospital costs due to interpersonal violence by age and gender, constant 2004 dollars

Gender	Age group (years)	Number	Mean cost per hospital admission ($)	Total hospital costs ($000)	(%)
Male	0-14	209	2639	552	2.0
	15-29	2529	3552	8983	32.0
	30-44	1709	4070	6956	24.8
	45-60	519	3771	1957	7.0
	>=60	124	3405	422	1.5
	All ages	5090	3707	18869	67.3
Female	0-14	141	4872	687	2.5
	15-29	1266	2697	3414	12.2
	30-44	1379	2780	3834	13.7
	45-60	320	2826	904	3.2
	>=60	80	3960	317	1.1
	All ages	3186	2874	9157	32.7
Total	0-14	350	3539	1239	4.4
	15-29	3795	3267	12398	44.2
	30-44	3088	3494	10789	38.5
	45-60	839	3410	2861	10.2
	>=60	204	3622	739	2.6
	All ages	8276	3387	28031	100.0

Evidence of cost differences based on Indigenous status, socio-economic characteristics, area of residence and circumstances of injury event were found (Table 4.22). Given their higher over-representation among victims of interpersonal violence, Indigenous people accounted for a substantially higher share of hospital costs (41%) than their share of approximately 3% to 4% of the Western Australian population. However, their mean cost per admission was significantly below that for non-Indigenous people ($p < 0.001$).

The more advantaged groups accounted for a higher share of total hospital costs due to interpersonal violence than their share of hospital admissions over the period. For example, the extremely advantaged group accounted for 23% of total hospital costs compared with their share of hospital admissions of 20%. In contrast, the extremely disadvantaged group accounted for 22% of hospital admissions but only 18% of total hospital costs. This reflected differences in the mean cost per admission by

socioeconomic status, which was statistically significant ($F_{4,7985} = 6.670$, $p < 0.000$). Mean costs per admission for victims of interpersonal violence increased consistently as socioeconomic status increased, with the mean cost for the extremely advantaged group almost 40% above that for the extremely disadvantaged group ($3949 versus $2843).

People resident in rural and remote areas of Western Australia accounted for a higher share of hospital costs due to interpersonal violence (53%) than their share of the population (26%), reflecting a higher rate of hospitalisation for interpersonal violence. However, their share of hospital costs (53%) was lower than their share of hospital admissions (63%), a result of a lower mean cost per hospital admission. The mean cost per hospital admission for victims of interpersonal violence living in the metropolitan area was $4162, compared with $2966 and 2741 respectively for people living in rural and remote Western Australia respectively. These differences in mean cost per hospital admission by area of residence were statistically significant ($F_{2,8085} = 38.541$, $p < 0.001$).

Statistically significant differences were also evident in the mean cost per hospital admission by circumstance of injury event ($F_{3,8241} = 63.326$, $p < 0.001$). The 'other methods' category had a mean cost per admission ($8049) that was substantially higher than the mean for other circumstances of injury events, while the mean cost per admission for rape and maltreatment victims was lower.

No statistically significant differences were found in the mean cost per hospital admission of victims of interpersonal violence with and without a mental illness. Victims of interpersonal violence with a mental illness accounted for 38% of the total hospital costs of interpersonal violence, similar to their share of hospital admissions (40%). However, the finding discussed earlier (section 4.6) that mental illness was a risk factor for a repeat admission for interpersonal violence victimisation raises the possibility that the total cost of hospitalisation for people with mental illness, across all their hospital admissions, may be higher than the corresponding cost for those without mental illness.

Table 4.22 Mean cost per hospital admission and total hospital costs due to interpersonal violence by selected characteristics, constant 2004 dollars

Variables	Number	Mean cost per hospital admission ($)	Total hospital costs ($000)	(%)
Indigenous status				
Indigenous-	4098	2805	11495	41.0
Non-indigenous	4178	3957	16532	59.0
Socioeconomic status				
Extremely disadvantaged	1708	2843	4856	18.3
Disadvantaged	1833	3040	5572	21.0
Middle	1255	3380	4242	16.0
Advantaged	1592	3546	5645	21.3
Extremely advantaged	1562	3949	6168	23.3
Area of residence				
Metropolitan	3025	4162	12590	46.9
Rural	1616	2966	4793	17.9
Remote	3447	2742	9452	35.2
Circumstances of injury event				
Bodily force	4467	3050	13624	48.9
Sharp or blunt object	2843	3359	9550	34.3
Rape and maltreatment	530	2724	1444	5.2
Other methods	405	8049	3260	11.7
Mental health status				
Mental illness	3282	3274	10745	38.3
No mental illness	4994	3461	17284	61.7

5 DISCUSSION

The main purpose of this research was threefold. Firstly, it provided a thorough description of the size and nature of interpersonal violence victimisation in Western Australia. Secondly, it identified the pertinent risk factors associated with interpersonal violence specifically among people with a mental illness. Thirdly, information presented in relation to the costs of interpersonal violence has demonstrated the need for interventions which may have an impact on the incidence of these events. The results show the considerable burden and cost of interpersonal violence to the health care system and highlight where the burden of risk and the majority of the hospital costs lie. It is anticipated that such results will provide the basis for making informed decisions on the allocation of resources to intervene in this significant issue.

Victimisation surveys which are undertaken by the Australian Bureau of Statistics provide the most comprehensive data on injury due to interpersonal violence. It is estimated that approximately 178,000 Australian adults were injured due to interpersonal violence during 2002 (ABS 2003). The results of this study found that in Western Australia, there were 36,934 admissions to hospital due to interpersonal violence which represented 25,427 individuals over a fifteen year period. Overall, the rate of hospitalisation for interpersonal violence was 137 per 100,000 population with male victims accounting for 63% of these hospitalisations. The rate fluctuated during the study period with a decease reported in 2004 (135 per 100,000 population) compared to the previous five year average. This is consistent with previous research in Western Australia which found the rate of hospitalisations due to interpersonal violence was 138.7 per 100,000 population from 1995 to 2000 which was a decrease of 43% from 1989 to 2000 (Gillam et al. 2003).

5.1 Patterns and risk factors for interpersonal violence victimisation

One of the useful findings to emerge from this study is support for the understanding that interpersonal violence victimisation is not equally spread throughout the population. The results have shown that injuries due to interpersonal violence victimisation vary across social groupings. With respect to the burden of risk, the study found that adolescents and young adults were more likely to be hospitalised for

interpersonal violence than children or older adults. Both male and females aged 20 to 29 years were at greatest risk. This is consistent with recent research undertaken in Western Australia (Moorin & Hendrie 2005).

Indigenous people were also over-represented among the victims of interpersonal violence accounting for 47% of hospitalisations despite representing approximately 3% to 4% of the Western Australian population during the study period. The rate of Indigenous hospitalisations for interpersonal violence victimisation was 26 times higher than for non-Indigenous people. In particular, Indigenous females were an extremely vulnerable group with the rate of hospital admissions consistently higher than for Indigenous males throughout the study period. Indigenous adolescents and young adults were also 23 times more likely to be admitted to hospital than their non-Indigenous counterparts. Again, these results are comparable with previous research (Trewin & Madden 2003; Gillam et al. 2003).

Additionally, regional differences in the distribution of interpersonal violence were observed in the study. These were largely, but not entirely attributable to Indigenous status. Non-Indigenous people were more likely to be from metropolitan areas whereas a greater number of Indigenous people were from remote areas of Western Australia. This is an important finding because to be effective, services and preventive efforts need to be appropriately focused on groups and areas identified as being at high risk.

In general, this study highlighted that injuries due to interpersonal violence were highest among lowest socio-economic group. Women, Indigenous people, and particularly Indigenous women (of the disadvantaged group) were more likely to be victims of interpersonal violence victimisation. Indigenous people were also more likely to be unemployed compared to non-Indigenous people. These results add support to evidence that shows interpersonal victimisation rises as area level disadvantage decreases (Acierno et al. 1997). Conversely, it is also possible that violence can lead to economic disadvantage. Unfortunately, it was not possible to explore this issue in more detail due to the nature of the data but it warrants further attention.

Previous research has reported increased access to health services by victims of violence which is substantiated by this study (Acierno et al. 1997; Cercarelli & Lester 2005). Twenty-three percent of hospital admissions due to interpersonal violence victimisation were a repeat admission with Indigenous people accounting for 74% of such cases. People with a mental illness were almost 50% more likely to have a repeat admission than those without. Both women and Indigenous people had an increased risk of 31% and 37% respectively. Additionally, living in rural/remote areas of Western Australia was a significant risk factor for a repeat hospital admission for interpersonal violence. The presence of co-morbidities increased the risk by 70% and low SES, in particular the extremely disadvantaged group, was more likely to be involved in a repeat episode of violence.

Bodily force was more likely to be used by non-Indigenous people whereas sharp or blunt objects were the predominant methods used to inflict injury to others by Indigenous people. Unfortunately, it was not possible to identify the location where the violent episode occurred due to missing information. However, previous research has found that residential premises are the most common location in which interpersonal violence takes place (Fernandez & Loh 2003). This may explain the high incidence of these methods as they are readily available in the residential setting.

Over a quarter of the total number of hospitalisations reported at least one other medical condition when admitted to hospital. Of this group, 92% reported two or more medical conditions. This finding is consistent with a growing body of research which shows that interpersonal violence victimisation has wide ranging consequences for both the victim's physical and mental health that may transcend the specific effects of the violent event itself (Krug et al. 2002; McCarthy 2003; Lawrence et al. 2001; McFarlane et al. 2005)

Interpersonal violence was shown to be a considerable burden on the health system, costing annually between $9 million and $10 million. Some groups were found to be particularly disadvantaged due to interpersonal violence. In some cases, this finding reflected the over-representation of these groups as victims of interpersonal violence, such as for the Indigenous population and people living in rural and remote Western Australia. However, some groups also had a significantly higher mean cost per

hospital admission than others. For example, young females had a mean cost per admission that was 40% above the mean cost across all admissions for interpersonal violence, and victims of violence inflicted by 'other methods' (i.e. other than bodily force, a sharp or blunt object, or rape and maltreatment) had a mean cost per admission of more than double the mean cost. While the data analysis does not enable the causes of these higher than average costs to be determined, this finding may suggest these groups are at particularly high risk of more severe injury and warrant greater attention with regards to preventive action.

A similar situation may apply to the more advantaged groups and those living in the metropolitan area, both of whom also had higher than average mean costs per hospital admission. However, an alternative explanation of the higher than average costs for these particular groups could be the better availability and access to health services. If this was indeed the case, then the question of equity towards victims of interpersonal violence arises and would need to be addressed in future policy targeting interpersonal violence victimisation.

5.2 Patterns and risk factors for interpersonal violence for those with mental illness

The results of this population based study provide estimates of the proportion of victims of interpersonal violence victimisation with a mental illness in Western Australia. The overall hospitalisation rate for victims of violence with a mental illness was 36.6 per 100,000 population during the study period and a small but steady decrease was evident since 1998. However, a small increase in the rate of hospitalisation for Indigenous females with a mental health admission was demonstrated since 2003 (706 per 100,000 population in 2003 to 717 per 100,000 population in 2004). These findings are of considerable interest and builds upon the information provided by victimisation surveys undertaken by the Australian Bureau of Statistics. As previously mentioned, they provide population based estimates regarding the magnitude of violence in Australia (ABS 2003). These estimates do include some information about the psychological harm victims of violence may experience. Yet alone, they are insufficient to assess psychological harm as an outcome of interpersonal violence victimisation. For example, they do not provide any indication of the risk that a psychiatric condition could manifest as a result of

victimisation, nor do they indicate the specific psychiatric conditions that victims may be likely to experience.

It is important to note that there is rarely a simple cause-and-effect relationship between violence and its impact, particularly where psychological harm is concerned. However, due to the nature of the administrative hospital data it was possible to undertake an examination of the temporal sequence between abuse and mental illness and to examine the differences between them. The results highlighted different risk factors depending on whether an interpersonal violence admission was ***preceded*** by a mental health admission or ***followed*** a mental health admission. Of the 25,427 victims admitted to hospital for at least one episode of violence victimisation irrespective of whether it occurred before or after the violent incident, one in four were admitted at least once to hospital with a diagnosis of a mental illness over the fifteen year study period. Factors associated with an increased risk for interpersonal violence ***and*** a mental illness were age, being female, Indigenous status, being separated/divorced/widowed, and the number of co-morbidities. Living in remote areas of Western Australia as well as being married decreased the risk compared to living in metropolitan areas and being unmarried.

Previous epidemiological research has demonstrated that there is a relationship between major mental disorders and violence (Link et al. 1992; Link & Stueve 1994; Stueve & Link 1998). The results of this study provide further evidence of this. Within psychiatric epidemiology interest has concentrated on violent trauma as a provoking agent of mental illness (Angermeyer et al. 1998). It is known that early victimisation may have serious long term effects on mental illness and on subsequent violent behaviour (Meuser et al. 1998). However such studies are often prevalence studies, making it difficult to assert whether psychological harm is a direct outcome of interpersonal violence victimisation. Interestingly, when examining risk factors for victims (13%, n=2796) who were admitted to hospital for interpersonal violence victimisation ***first*** followed by an admission for a mental health admission, a similar pattern emerged as mentioned above. However, being Indigenous increased the risk for a mental health admission following an incident of interpersonal violence victimisation by almost 82% (95% CI 1.63-2.03) whereas marital status was protective (95% CI 0.77-0.96) compared to being unmarried. These results suggest

that, at least for some victims, interpersonal violence victimisation precedes the emergence of psychological harm.

Risk factors for a mental health admission ***first*** followed by interpersonal violence victimisation presented a slightly different picture. Firstly, the prevalence of cases that had a mental illness diagnosis followed by an admission for interpersonal violence was higher (3448 cases or 16%) than when a mental health admission preceded a hospitalisation for interpersonal violence victimisation. Secondly, the results found increasing age, being a women (OR=1.52, 95% CI 1.39-1.67), being Indigenous (OR=1.22, 95% CI 1.10-1.35) and the number of comorbidities increased the risk (OR=1.49, 95% CI 1.42-1.55). However living in remote Western Australia had a protective effect compared to living in the metropolitan area and the circumstances of the injury event were no longer significant.

Goodman et al. (2001) suggested that mental illness may be exacerbated as well as contribute to violence victimisation. Our results provide evidence for both propositions. However, what is evident is the considerable impact that being Indigenous and the presence of co-morbidities may have on a person who has a mental illness and is a victim of violence regardless of the temporal sequence of events. The results substantiate that greater levels of ill health may result in higher levels of disability and reduced quality of life for people with a mental illness, particularly for Indigenous people. Alcohol and circulatory illnesses constituted a large proportion of other health conditions in people with mental illness and is consistent with previous research completed in Western Australia (Lawrence et al. 2001). Non-communicable, chronic and notifiable diseases all contribute to the greater burden of ill health experienced by Indigenous people (ABS 2005). High rates of established behavioural health risk factors such as smoking, substance abuse, exposure to violence in the home and in the community and lack of exercise are also well documented in Indigenous populations (ABS 2005). These findings have implications in terms of the economic costs to the community of providing ongoing health care to people with mental illness.

5.3 Limitations

The record linkage methodology is powerful in that it makes available comprehensive information on a total population. The extent of the information allows an overview of the health experience of the population of interest under study. It has the advantage of detecting small differences due to its increased statistical power by including a large number of cases and the provision of reliable and valid information. However there are several limitations when using linked data.

The current availability of relationship classification codes for interpersonal violence victimisation from 2002 onwards is an advance on the data that was previously unavailable. However it was evident that this still did not provide sufficient information to determine the relationship between the victim and the perpetrator, with 50% of these cases coded as an "*other specified person*" or "*unspecified person*". Furthermore, the location variable was rarely recorded which limits the utility of this information. The databases used in this study covered only those that sought treatment at a hospital. Clearly there are individuals who have been involved in a violent altercation who do not seek treatment as a result of an injury. It is well known that many events, especially those involving domestic situations, are never reported (Gavin & Gillam 2005). Additionally, the Mental Health Information System (MHIS) does not cover all patients who have a mental illness. At any one time approximately 8% of the WA population is recorded on the MHIS (Lawrence et al. 2001). However the 1997 Survey of Mental Health and Well-Being found that almost 20% of the WA population had a diagnosable mental illness. Many victims of violence with and without a mental illness do not seek treatment and some may be treated only by general practitioners or private psychiatrists on an outpatient basis. Since these patients may have less severe injuries as a result of interpersonal violence or less severe forms of a mental illness these cases would not be captured by the HMDS or the MHIS databases. Therefore the results of this study cannot be generalised to the entire population without taking into account that the cases studied are likely to represent those at the moderate to severe end of the illness spectrum. However, the results of the data substantiate that when serious injury is involved hospital records can be very useful indicators of interpersonal violence victimisation in the community.

Another limitation of the study is that no information is available on lifestyle factors such as smoking status, alcohol and drug usage, living conditions or individual measures of SES other than those based on area-based measures. Our indicators of SES were based on measures that used an individual's postal code. For example, assuming that an individual is of high socioeconomic status simply because he/she lives in an area of high SES may be misleading. The problem could be addressed by using detailed SES data at an individual level but such data is not routinely or easily available. Because the analysis was based on hospital records when examining co-morbidities it was limited to illnesses which usually require hospitalisation again representing more serious forms of illness. Despite these limitations the results of this study provide some insights into the relationship between mental illness and interpersonal violence victimisation.

A few final limitations relate to the economic analysis. Only hospital costs were included in the analysis of the costs of interpersonal data due to lack of availability of data relating to the resource use and unit cost of most other health services. National hospital unit cost data were used to cost all hospital admissions relating to interpersonal violence in Western Australia during the study period. In reality, the cost of hospital admissions will vary by type of hospital (for example, teaching versus non-teaching, metropolitan versus non- metropolitan, public versus private), but the data were not available to cost every hospital type separately. While some of these unit cost data were available (for example, public versus private hospitals), the task of adjusting unit costs for hospital type was beyond the scope of this project. Lastly, the data analysis did not enable the causes of the cost differences between different groups to be investigated. Despite these limitations, the economic analysis provided some useful findings relating to the costs of interpersonal violence that will be useful both in future policy development targeting interpersonal violence and to guide future research in this field.

6 RECOMMENDATIONS AND CONCLUSIONS

The following recommendations are based on the findings of this research.

Recommendation one

Interpersonal violence victimisation prevention programs and the provision of services should be focused on those that are more likely to be involved in these situations. Indigenous people are considerably over-represented among victims of interpersonal violence. Females, particularly Indigenous females, adolescents and young adults were at an increased risk and should be targeted for attention.

Recommendation two

The results of this study have shown that psychological harm is associated with interpersonal violence victimisation. However, the results do not indicate the specific psychiatric condition that could manifest as a result of victimisation. The linked data provide an opportunity for future research to examine in greater detail the psychological harm outcomes that might arise from each type of assault or maltreatment (i.e. physical or sexual) in childhood or adulthood. To date, there has been minimal research in this area.

Recommendation three

The study has highlighted that victims of interpersonal violence with a mental illness have extremely poor health outcomes. While public health campaigns and the introduction of new treatments for cardiovascular disease have been shown to be successful in the general population, people with a mental illness have not benefited from this progress. Strengthening general practice care for people with a mental illness would be one way of improving the health outcomes of this population. If an individual's condition could be better managed and a coordinated approach to total health adopted, the risk of being admitted to hospital may be reduced.

Recommendation four

The study identified specific risk factors for a second admission to hospital due to interpersonal violence victimisation. Indigenous people, women (both Indigenous and non-Indigenous), having a mental illness, living in remote and rural Western

Australia, and the presence of co-morbidities increased the risk of a second hospital admission. It is evident that priority should be given to the primary prevention of violence – that is measures that prevent it from occurring in the first place. In developing a response to violence and its subsequent problems such as psychological harm, different agencies and sectors of the public should be involved in prevention activities and programs should be tailored to suit different cultural settings and population groups. Evaluation should be an integral part of all programmes so that lessons can be learnt and shared regarding what may and may not work in terms of preventing violence.

Recommendation five

The results of this study have provided information on the more serious types of injuries due to interpersonal violence that result in hospitalisation. However, it is now possible to link hospital morbidity data to presentations to Perth metropolitan hospital emergency departments due to interpersonal violence. This would provide information on the less severe injuries that result from violence and consequently, a more comprehensive picture of the impact of interpersonal violence victimisation on the Western Australia population.

Recommendation six

Medical professionals should be encouraged to fully document the relationship between the victim and the perpetrator of a violent incident. Although this information is currently being coded, in 50% of hospital admissions for interpersonal violence the relationship was coded as 'unspecified person'. In addition, the location of the violent incident should also be properly coded.

Recommendation seven

Future research should be conducted to identify appropriate methods of assessing the contribution that community and societal risk factors have in relation to the risk of interpersonal violence victimisation.

Recommendation eight

Future research should also be conducted to determine the reasons why some groups who are victims of interpersonal violence have significantly higher mean costs per

hospital admission. This information is required to ensure that future policy development to address interpersonal violence is correctly targeted at areas that are causing the greatest problem and disadvantage.

In conclusion, the findings of this study have identified a number of valid indicators that provide a sense of the size and nature of death and injury (hospitalisation) due to interpersonal violence victimisation and its association with mental illness in Western Australia. The results have provided a benchmark against which to measure whether the future situation in Western Australia deteriorates, stabilises or improves. Therefore this study not only provides current estimates of the degree of interpersonal violence victimisation and mental illness, it also enables future trends to be assessed by replication of some or all of the methodology adopted in this research.

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APPENDIX A

Revisions, versions and editions of the International Classification of Diseases coding scheme used in Western Australia during the study period

Coding Scheme	Revisions, versions and editions	Period of application
Death Data	ICD-9 ICD-10	January 1979-December 1998 January 1999-present
Hospitalisation Data	ICD-9-CM 1st edition ICD-9-CM 1st Australian edition ICD-9-CM 2nd Australian edition ICD-10-CM 1st edition ICD-10-CM 2nd edition ICD-10-CM 3rd edition ICD -10-CM 4th edition	January 1988-June 1995 July 1995-June 1996 July 1996-June 1999 July 1999-June 2000 July 2000-June 2002 July 2002-June 2004 July 2004-June 2007