Modelling Emergency Demand for Injury Conditions Study

Preventable Injury Hospitalisations and Opportunities for Targeted Interventions in Hospitalisations for Child Poisoning and Fractured Neck of Femur (Hip Fracture) Injuries in Older Persons Due to Falls

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&

Monash University Accident Research Centre (MUARC)
Preventable Injury Hospitalisations Study

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Executive Summary

Context

Injury, including poisoning, has long been identified as a significant cause of death, illness and disability in Australia\(^1\). Injury prevention and control has been recognised by Australian Health Ministers as a National Health Priority area since 1986\(^2\). Over the past decade, injury has accounted annually for over 7000 deaths, 400,000 hospitalisations, and direct medical costs of $2,607 million\(^3\). In 1999, injury was the leading cause of death for people under 45 years of age, representing 51.3% of all deaths in that age group\(^1\).

It has been demonstrated that injury is preventable and that the best means of injury control is through primary prevention. Significant reductions in injury mortality and morbidity have been achieved in the road transport area through a range of road safety initiatives, i.e., compulsory seat belt wearing, random breath testing and speed monitoring; drowning deaths have significantly dropped as a result of swimming and water safety education programs and to some extent, pool fencing legislation. Other examples of successful countermeasures include roll-over protection structures on tractors, mandatory occupational health and safety regulations and codes of practice and many others. The implementation of effective and sustainable injury prevention measures can result in significant savings to the health care system, particularly in the areas of acute care and rehabilitation services\(^2\).

Background

There is increasing pressure on the Victorian public acute and emergency hospital system to meet the demand for inpatient care. To address this problem, the Victorian Department of Human Services is conducting a major project “Meeting Emergency Demand”\(^4\). The Victorian Ambulatory Care Sensitive Conditions (ACSCs) study previously analysed a set of priority conditions where hospital admissions can be reduced through improved prevention and primary care\(^5-7\).

Injury conditions were not analysed as part of the Victorian ACSC study, however, they do represent potentially preventable hospitalisations and have been analysed as such by the New Zealand Ministry of Health\(^8\). Applying this modelling methodology to injury conditions would provide the injury Prevention Program with an evidence-based argument for contributing to the Department’s flagship project Meeting Emergency Demand. This report presents the results of further analyses of selected injury hospitalisations, namely hospitalisations for child poisoning (under 5 years of age) and fractured neck of femur (hip fractures) in older persons (aged 65 years and above) caused by falls.

Purpose

The aim of this report is to identify opportunities for further targeted interventions to reduce demand on hospital services. Detailed analyses of the two injury conditions are provided, identifying trends in hospitalisations, urban/rural differentials, regional variations, and variations by the Primary Care Partnerships (PCPs).
Methods

The Victorian Admitted Episodes Dataset (VAED) was analysed from 1995/96 to 2000/01 (6 years). Rates of admission for older persons’ falls were age and sex standardised to the Victorian population (1996) using the direct method. VAED subsets and data extractions were based on the criteria outlined below:

- ICD-9-CM codes in any of the diagnoses fields of the VAED with fractured neck of femur (ICD-9-CM 820.0 to 820.9) and external cause codes (Ecodes) representing unintentional falls (E880-E886, E888 - excluding E887) in older persons aged 65 years and above;
- Unintentional poisoning external cause codes (ICD-9-CM E850-E858, E860-E869) for children aged under 5 years.

Key Findings

Child Poisoning (0-4 years)

- There were 718 admissions for child poisoning with an average of 1.14 bed days in 2000/01. Almost all (97%, n=695) of these admissions were through the emergency department.
- Latest available data estimate the direct (medical) cost of child poisoning to the Victorian health system in 1993/94 to be around $7.3 million.
- Rates of admission for child poisoning varied from 2.37/1000 in 1995/96 to 2.39/1000 in 2000/01.
- Children aged 2 years were the peak-affected individual age group for unintentional poisoning with an admission rate of 4.8/1000 in 2000/01 followed closely by 1 year olds with an admission rate of 3.6/1000.
- Poisoning by pharmaceutical agents accounted for 80% of admissions for the 0 to 4 year age group.
- The majority of unintentional poisoning occurred in the home (70%), however, coding of location was missing in 28% of admissions.
- Admission rates for child poisoning were higher for residents in rural areas compared to metropolitan areas, 3.50/1000 and 1.97/1000 respectively for 2000/01. This pattern was consistent over the six-year period.
- Residents of the Hume region had the highest rate of admission (4.42/1000) while the Eastern Metropolitan region had the lowest (1.50/1000). The Southern Metropolitan region was the only Metropolitan region with a rate ratio similar to Victoria, with the rest all being significantly lower than Victoria. On the other hand, all five Rural regions had rate ratios significantly higher than Victoria.
Residents of the four Metropolitan PCPs with the highest number of admissions for child poisoning were Frankston and Mornington Peninsula, South East, Hume/Moreland, and Outer East.

These four Metropolitan PCPs contributed about 28% (n=198) of all admissions for child poisoning in Victoria, which is 26% of total bed days.

Residents of the two Rural PCPs with the highest number of admissions for child poisoning were Barwon and Moira/Strathbogie/Greater Shepparton (Goulburn Valley) contributing approximately 11% (n=76) of all admissions for child poisoning in Victoria, which is 10% of total bed days.

There were eleven PCPs with significantly higher age-specific admission rates than Victoria.

These eleven PCPs with age-specific admission rates significantly higher than Victoria, from highest to lowest, were residents of Swan Hill/ Gannawarra/ Buloke (Southern Mallee), Moira/Strathbogie/Greater Shepparton (Goulburn Valley), Central Grampians, Wimmera, Campaspe, Alpine/Delatite/Wangaratta (Central Hume), East Gippsland, Southern Grampians-Glenelg, South Coast Health Services Consortium, Frankston and Mornington Peninsula, and South West.

These eleven PCPs contribute about 30% (n=208) of all admissions in Victoria, which is 28% of total bed days.

A thirty percent reduction in number of admissions for child poisoning would lead to a reduction of 246 bed days in Victoria in a year.

Fractured Neck of Femur Injuries due to Falls (65 years and over)

There were 5,534 admissions for older persons’ fractured neck of femur (FNOF) falls with an average of 16.3 bed days in 2000-01. More than sixty-five percent (n=3,682) of these admissions were through the emergency department.

These admissions accounted for 90,194 days in hospital over 2000/01, 71% of which were for persons aged 80 years and over.

Admission numbers increased steadily over the 6-year period with an average annual increase of around 4%.

Latest available data estimate the direct (medical) cost of falls for people aged 65 years and over to the Victorian health system in 1993/94 to be around $127 million. Further, the annual direct cost of 2000/01 hospital admissions for fractured neck of femur (hip fractures) among this age group is estimated to be at least $57.5 million (5,534 admissions in Victoria at approximately $10,392 per admission).
• There has been an increase in the rates of older persons FNOF fall admissions in both rural and metropolitan regions over the six-year period.

• Admission rates for older persons FNOF falls were slightly higher for residents in metropolitan areas compared to rural. This pattern was observed over the six-year period.

• Admission rates for females were significantly higher compared to males with an average admissions rate ratio of 2.4 to 1 over the six-year period.

• Residents of the Gippsland Region had the highest rate of admission (9.51/1000) while the Barwon South Western Region (6.80/1000) had the lowest. Compared to Victoria, only two rural regions (Gippsland and Loddon Mallee) and one metropolitan region (Southern Metro) had rate ratios significantly higher than Victoria. Rate ratios significantly lower than Victoria were found for one metropolitan region (Northern Metro) and two rural regions (Grampians and Barwon South Western).

• The four Metropolitan PCPs with the highest number of admissions for older persons’ FNOF falls were residents of Monash/Whitehorse/Manningham, Inner South, Middle South, and Outer East.

• These four Metropolitan PCPs contribute approximately thirty-two percent (n=1,766) of all admissions for FNOF falls among older persons in Victoria, which is thirty percent of total bed days.

• The four Rural PCPs with the highest number of admissions for FNOF falls among older persons were residents of Barwon, Moira/Strathbogie/Greater Shepparton, Central Highlands, and Bendigo/Loddon.

• These four Rural PCPs contribute approximately twelve percent (n=657) of all admissions for FNOF falls among older persons in Victoria, which is twelve percent of total bed days.

• There were ten PCPs with significantly higher admission rates than Victoria.

• These ten PCPs with admission rates for FNOF falls among older persons significantly higher than Victoria, from highest to lowest, were for residents of Wellington, East Gippsland, Mt Alexander/Central Goldfields/Macedon Ranges, Swan Hill/Gannawarra/Buloke, South Coast Health Services Consortium, Inner West, Moira/Strathbogie/Greater Shepparton, Outer East, Middle South, and Inner South East.

• These ten PCPs contribute thirty-seven percent (n=2,064) of all admissions for older person’s FNOF falls in Victoria, which is about thirty-eight percent of total bed days.

• A twenty percent reduction in number of admissions for older persons’ FNOF falls would lead to a reduction of 18,040 bed days in Victoria.
Recommendations

This analysis suggests that significant gains can be made in reducing the number of preventable hospital admissions for unintentional child poisoning and fractured neck of femur falls among older persons through targeted prevention strategies. This could have a substantial impact on the emergency demand for hospital services and on utilisation of hospital bed days. A general recommendation would be to conduct the same analyses for other injuries as well as analyses of the overall impact on emergency demand of injury as a whole. Further, this report has highlighted the urgent need for a cost and consequence model for injury to be developed for Victoria as latest available cost figures for injury morbidity and mortality refer to the 1993/94 period and require updating.

Child Poisoning

- This analysis has identified significant urban/rural differentials in admission rates and further analysis is needed to determine the type and magnitude of factors affecting these higher rates in rural Victoria.

- Further investigation is required to determine the type of poisoning agent by rural/metro differential and potential associated socioeconomic factors.

- Further investigation is required to determine the type of poisoning agent by place of occurrence (setting), ie, home, farm.

- Further investigation is required to determine poisoning agents by length of stay and time (days) in ICU.

- Further investigation is required to determine mechanisms and mode of access to poisoning agents, particularly those required to have child resistant packaging.

- Analysis of admission rates by PCP areas has identified significant variations over the 2000/01 period. Further analysis is necessary to monitor these rates over time to identify increasing or decreasing trends.

- Greater detail should be required to be collected on location of the injury event to provide improved specificity in coding.

- Since child resistant packaging has been shown to be the most effective intervention in childhood poisoning, this countermeasure should be implemented more widely.

Fractured neck of femur falls

- Key priorities for this issue include reducing the frequency of fractures, reducing length of stay in hospital, and reducing the number of fatal outcomes. Interventions and programs targeting these priorities will lead to a substantial reduction in emergency demand for fractured neck of femur falls as well as enormous savings to the Victorian health care system estimated at around $127 million in 1993/94.
Further analysis is needed to determine the relationship between admission to hospital, adverse effects of treatment and falls particularly for those that result in death.

Further analysis of possible socioeconomic disadvantage is needed.

Further exploration of the geographic differentials in rates within DHS Regions and PCPs by various age groups is necessary.

Further analyses of fractured neck of femur falls by place of occurrence (setting), ie, home, residential institutions by DHS region and PCP (small area analysis) to identify possible geographic differentials.

Benefits and costs of interventions that have been proven to be effective should be modelled in order to guide investment in the prevention of FNOF.

Three interventions that have been shown to be effective include hip protectors, follow-up of medical and occupational therapy for older people who have presented at hospital Emergency Departments with fall injuries, and balance and strength exercise program for older people (70+).

FNOF cases should be included in the Victorian Trauma Registry in order to monitor the effectiveness of current medical management practices.
1 Introduction

1.1 Context

Injury, including poisoning, has long been identified as a significant cause of death, illness and disability in Australia\(^1\). Injury prevention and control has been recognised by Australian Health Ministers as a National Health Priority area since 1986\(^2\). Over the past decade, injury has accounted annually for over 7000 deaths, 400,000 hospitalisations, and direct medical costs of $2,607 million\(^3\). In 1999, injury was the leading cause of death for people under 45 years of age, representing 51.3% of all deaths in that age group\(^4\).

It has been demonstrated that injury is preventable and that the best means of injury control is through primary prevention. Significant reductions in injury mortality and morbidity have been achieved in the road transport area through a range of road safety initiatives, i.e., compulsory seat belt wearing, random breath testing and speed monitoring; drowning deaths have significantly dropped as a result of swimming and water safety education programs and to some extent, pool fencing legislation. Other examples of successful countermeasures include roll-over protection structures on tractors, mandatory occupational health and safety regulations and codes of practice and many others. The implementation of effective and sustainable injury prevention measures can result in significant savings to the health care system, particularly in the areas of acute care and rehabilitation services\(^2\).

1.2 Background

Ambulatory Care Sensitive Conditions (ACSCs) are those for which hospitalisation is thought to be avoidable with the application of preventive care and early disease management, usually delivered in the ambulatory setting\(^4\). In theory, timely and effective ambulatory care can help reduce the risks of hospitalisation by: preventing the onset of an illness or condition; controlling an acute episodic illness or condition; or managing a chronic disease or condition\(^4\).

The analyses from The Victorian ACSCs provided an evidence-based platform for policies directed at reducing demand on Victorian hospital services by offering opportunities for targeted community based interventions\(^5\). This study analysed a set of priority conditions where hospital admissions can be reduced through improved prevention and primary care\(^6,7\).

Injury conditions were not analysed as part of the Victorian ACSC study, however, they do represent potentially preventable hospitalisations and have been analysed as such by the New Zealand Ministry of Health\(^8\). Applying this modelling methodology to injury conditions would provide the injury Prevention Program with an evidence-based argument for contributing to the Departments flagship project Meeting Emergency Demand.

A collaborative arrangement between Partnership Development, Health Outcomes and the Monash University Accident Research Centre (MUARC) was established to undertake the emergency demand management modelling study. The initial two injuries
to be addressed will be unintentional child poisoning and fractured neck of femur (hip fracture) in older persons falls hospitalisations. Both are examples of potentially preventable injury and/or injury where improved medical management could reduce demand.

1.3 Purpose

The aim of this report is to describe and quantify for selected injury problems:

- Hospital bed-days utilised
- Admissions through hospital emergency departments
- Trends in hospitalisations
- Urban/rural differentials
- Regional variations
- Potential reduction in demand for number of admissions and bed days used by proportion of injuries prevented
- Variations by Primary Care Partnerships

1.4 Data Sources and Methods

1.4.1 Hospital Admissions Data

Hospital admission/separation data were obtained from the Victorian Admitted Episodes Dataset (VAED). The VAED is a minimum dataset containing data on all admitted patient activity submitted by all public and private acute hospitals, including acute facilities in rehabilitation and extended care institutions and day procedure centres\(^9,10\).

Records were selected by year of hospital admission rather than separation, as this date is closer to the actual date of the injury event when compared to separation date which is when the patient’s record is entered into the electronic patient record system. Selecting records by year of separation would include, on average, 1.9% of patients admitted in the previous year\(^11\).

Clinical data are stored as International Classification of Diseases, Australian Modification (ICD-10AM), first edition codes, introduced in July 1998, in twelve diagnosis and procedure fields in the VAED and are mapped back to ICD-9-CM for comparison with previous years\(^12-14\). As of July 2000, diagnosis and procedure fields were expanded to 25 fields to accommodate changes in ICD-10-AM second edition, introduced at the same time.

Admissions for the purposes of our analysis were identified using the ICD-9-CM codes in any of the diagnoses fields of the VAED and included fractured neck of femur (ICD-9-CM 820.0 to 820.9) and external cause codes (Ecodes) representing unintentional falls (E880-E886, E888 - excluding E887) in older persons aged 65 years and above; and
unintentional poisoning external cause codes (ICD-9-CM E850-E858, E860-E869) for children aged under 5 years.

1.4.2 Trend Analysis

Data from 1995/96 through 2000/01 were used in this analysis. Prior to 1993, not all hospitals were contributing to the database and this year also coincides with the introduction of case-mix funding for hospitals. Due to technical difficulties and time constraints, the base year for analysis became 1995/96.

1.4.3 Geographic Areas

The use of individual injury admissions to hospital requires calculation of admission rates for defined geographic areas. In Victoria, there have been significant changes over the last decade to the boundaries of the geographic areas that make up Local Government Areas under the Australian Standard Geographic Classification (ASGC). Currently there are 200 statistical local areas (SLAs), which make up 78 LGAs. These boundaries have been collapsed into thirty-two Primary Care Partnership (PCP) catchment areas. Comparisons across the entire six years used in this analysis were made at the Department of Human Services Region level. Victoria is divided into nine health Regions, four of which encompass metropolitan Melbourne and five that cover the non-metropolitan areas in Victoria.

1.4.4 Admission Rates

Population figures by gender and five-year age groups were obtained by using the Estimated Resident Population (ERP) figures produced by the Australian Bureau of Statistics (ABS) and were used for calculating admission rates and 95% confidence intervals (CI). Estimates at the local government area (LGA) level were used to calculate admission rates and 95% CI for the thirty-two PCP areas in Victoria.

Where necessary, rates have been adjusted for age and sex to control for differences in the proportions of people of different ages (and different injury risks) in the populations that are being analysed. Differences in age composition are small within narrow age bands (eg. 0-4 years) and adjustment has not been applied to this age group. Rates for child poisonings (0-4 years) are crude rates and referred to as age-specific rates.

Admission rates for older persons falls (fractured neck of femur) were age and sex standardised (direct method) using the Victorian population for 1996 as the reference. Ninety-five per cent CIs for the standardised rates were based on the Poisson distribution.
1.4.5 Rate Ratios

A rate ratio is a ratio of two rates and is calculated by dividing the rate of interest (i.e. rate for a DHS region such as Gippsland) by a reference rate (i.e. Victoria) in order to describe the relationship between the two figures\textsuperscript{15}. Rate ratios were used throughout the report to compare admission rates in a defined area with a corresponding reference area or population. In this report comparisons were made between:

i. admission rates in rural areas with metropolitan areas as the reference,

ii. admission rates in DHS regions with Victorian admission rate as the reference,

iii. admission rates for PCPs with Victoria as the reference rate.

1.4.6 Rural/Metropolitan Differences

Throughout the document standardised admission rates are used providing important information on the relative impact of child poisoning and older person’s fall injuries in rural and metropolitan settings. It is, however, valuable to review the crude numbers of admissions with respect to PCP catchments in order to obtain additional information about opportunities for high yield targeted interventions. This is illustrated in tables 2 and 3 for child poisoning and tables 5 and 6 for older persons falls causing fractured neck of femur injuries, respectively.
2 Child Poisoning

2.1 Overview of child poisoning admissions

Poisoning among children under 5 years of age ranked as the second highest cause of injury-related admission in Victorian hospitals in 2000/01 and represented approximately 15% of all injury admissions in Victoria for this age group. Child poisoning rarely causes death, however, it is still a huge problem for younger children particularly when compared with unintentional poisoning admissions for other age groups. Almost 87% of admissions for child poisoning occur in the 0 to 4 year age group while the remaining 13% are aged 5 to 14 years. Within the under 5s age group, 2 year olds appear to be the peak-affected individual age group with an admission rate of 4.8 per 1000 in 2000/01 followed closely by 1-year olds with a rate of 3.6 per 1000.

![Proportion of Child Unintentional Poisoning Admissions in Victoria, 2000/01](image)

Poisoning can be grouped into two major categories. The first, unintentional poisoning by drugs, medicinal substances, and biologicals is covered by ICD9 external cause codes E850 to E858. This group accounted for 80% of 0-4 year old admissions in 2000/01. The second group is referred to as unintentional poisoning by other solid and liquid substances, gases and vapours represented by ICD9 external cause codes E860 to E869 and accounted for 20% of admissions for 0-4 year olds in 2000/01. Location of the poisoning event was most commonly the home accounting for approximately 70% of admissions on average over the six-year period (1995/96 – 2000/01) followed by a large proportion of poisoning admissions (28%) on average with an ‘unspecified’ location code.
2.2 Trends in Victoria

There were 718 admissions for poisoning among Victorian children aged under 5 years with an average of 1.14 bed days in 2000-2001. Almost all (96.8%, n=695) of these admissions were through the emergency department. The rates of admissions for child poisoning varied from 2.37/1000 (2.20-2.54) in 1995/96 to 2.39/1000 (2.22-2.57) in 2000/01 (fig 2). Gender differences were small with males representing 55% of admissions and having an admission rate of 2.57/1000 in 2000/01 which was slightly higher than the female admission rate of 2.21/1000 for the same period. Although there was some decline in the number of admissions since 1997/98, child poisoning still accounts for approximately 782 admissions each year in Victorian hospitals.

![Figure 2 Child (0-4 years) Poisoning Admission Rates for Rural and Metropolitan Regions, 1995/96-2000/01](image)

2.3 Rural and Metropolitan Differences

There was a significantly higher admission rate for child poisoning for residents of rural areas compared to metropolitan, 3.50/1000 (3.09-3.90) and 1.97/1000 (1.78-2.16), respectively, in 2000/01. Rural areas showed higher admission rates and rate ratios compared to metropolitan areas over the six-year period (fig 2 & fig 3).
2.4 Variations across DHS Regions

There were significant variations across DHS regions in Victoria. The admission rates in 2000/01 varied from a high of 4.42/1000 (3.38-5.45) for residents of Hume to a low of 1.50/1000 (1.19-1.81) in the Eastern Metropolitan Region (fig 4). Residents in the Southern Metropolitan Region had the highest admission rate of 2.28/1000 (1.93-2.64) compared to all other Metropolitan regions.
Compared to Victoria, Hume residents had the highest rate ratio while the Eastern Metropolitan Region had the lowest (fig 5). All five of the Rural regions had rate ratios significantly higher than Victoria’s. The Southern Metropolitan Region was the only region with a rate ratio of 0.96 (0.87-1.04) almost equal to Victoria, while the three remaining Metropolitan regions had rate ratios significantly lower than Victoria.

Figure 5 Child (0-4 years) Poisoning Admission Rate Ratios for Regions (Victoria=1), 2000/01
2.5 Variations across PCPs

The ranked age-specific rates of admission for child poisoning and average bed days in various PCPs for the year 2000/01 are summarised in table 1.

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<th>Primary Care Partnership</th>
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<th>Rate per 1000 persons</th>
<th>Lower 95% CI</th>
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</table>

The admission rates in 2000/01 varied from 0.83/1000 (0.22-1.45) for Boroondara residents to 6.56/1000 (3.53-9.59) in Swan Hill/Gannawarra/Buloke (Southern Mallee). The average bed days during the same time period varied from 1.00 in several PCPs to 2.41 in Bendigo/Loddon.

The number and rates of admissions for child poisoning in Metropolitan and Rural PCPs are summarised in tables 2 and 3 respectively.
Table 2: Ranked age-specific rates of admission, 95% confidence intervals, average and total bed days for Child (0-4 years) Poisoning by Metropolitan PCPs and Regions, 2000/01

<table>
<thead>
<tr>
<th>Region</th>
<th>Primary Care Partnership</th>
<th>Number of Admissions</th>
<th>Rate per 1000 persons</th>
<th>Lower 95% CI</th>
<th>Upper 95% CI</th>
<th>Average Bed days</th>
<th>Total Bed days</th>
</tr>
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<tbody>
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<td>0.22</td>
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</table>

The four Metropolitan PCPs with the highest number of admissions for child poisoning were residents of Frankston and Mornington Peninsula, South East, Hume/Moreland, and Outer East. These four Metropolitan PCPs contributed about 28% (n=198) of all admissions for child poisoning in Victoria, which is 26% of total bed days. Frankston and Mornington Peninsula was the only Metropolitan PCP with a rate ratio (1.57) significantly higher than Victoria (fig 6).
The two Rural PCPs with the highest number of admissions for child poisoning were residents of Barwon and Moira/Strathbogie/Greater Shepparton (Goulburn Valley) contributing approximately 11% (n=76) of all admissions for child poisoning in Victoria, which is 10% of total bed days. Seventeen Rural PCPs had rate ratios higher than Victoria with approximately half of these being significant (fig 6). The two remaining PCPs, namely Central Highlands and Mitchell/Murrindindi (Lower Hume) had non-significantly lower rate ratios than Victoria (fig 6).

There were eleven PCPs with rate ratios significantly higher than Victoria (fig 6). Residents of Swan Hill/Gannawarra/Buloke (Southern Mallee) had the highest rate ratio of 2.74 (2.16-3.48), while Boroondara had the lowest 0.35 (0.24-0.51).
Figure 6 Child (0-4 years) Poisoning Admission Rate Ratios for PCP's (Victoria=1), 2000/01
2.6 Key Findings

- There were 718 admissions for child poisoning with an average of 1.14 bed days in 2000/01. Almost all (97%, n=695) of these admissions were through the emergency department.

- Latest available data estimate the direct (medical) cost of child poisoning to the Victorian health system in 1993/94 to be around $7.3 million.

- Rates of admission for child poisoning varied from 2.37/1000 in 1995-96 to 2.39/1000 in 2000/01.

- Children aged 2 years were the peak-affected individual age group for unintentional poisoning with an admission rate of 4.8/1000 in 2000/01 followed closely by 1 year olds with an admission rate of 3.6/1000.

- Poisoning by pharmaceutical agents accounted for 80% of admissions for the 0 to 4 year age group.

- The majority of unintentional poisoning occurred in the home (70%), however, coding of location was missing in 28% of admissions.

- Admission rates for child poisoning were higher for residents in rural areas compared to metropolitan areas, 3.50/1000 and 1.97/1000 respectively for 2000/01. This pattern was consistent over the six-year period.

- Residents of the Hume region had the highest rate of admission (4.42/1000) while the Eastern Metropolitan region had the lowest (1.50/1000). The Southern Metropolitan region was the only Metropolitan region with a rate ratio similar to Victoria, with the rest all being significantly lower than Victoria. On the other hand, all five Rural regions had rate ratios significantly higher than Victoria.

- Residents of the four Metropolitan PCPs with the highest number of admissions for child poisoning were Frankston and Mornington Peninsula, South East, Hume/Moreland, and Outer East.

- These four Metropolitan PCPs contributed about 28% (n=198) of all admissions for child poisoning in Victoria, which is 26% of total bed days.

- Residents of the two Rural PCPs with the highest number of admissions for child poisoning were Barwon and Moira/Strathbogie/Greater Shepparton (Goulburn Valley) contributing approximately 11% (n=76) of all admissions for child poisoning in Victoria, which is 10% of total bed days.

- There were eleven PCPs with significantly higher age-specific admission rates than Victoria.

- These eleven PCPs with age-specific admission rates significantly higher than Victoria, from highest to lowest, were residents of Swan Hill/ Gannawarra/
Buloke (Southern Mallee), Moira/Strathbogie/Greater Shepparton (Goulburn Valley), Central Grampians, Wimmera, Campaspe, Alpine/Delatite/Wangaratta (Central Hume), East Gippsland, Southern Grampians-Glenelg, South Coast Health Services Consortium, Frankston and Mornington Peninsula, and South West.

- These eleven PCPs contribute about 30% (n=208) of all admissions in Victoria, which is 28% of total bed days.

- A thirty percent reduction in number of admissions for child poisoning would lead to a reduction of 246 bed days in Victoria in a year.
3 Older persons fractured neck of femur injuries due to falls (Hip Fractures)

3.1 Overview of older people hip fracture/fall admissions

Persons aged 65 years and over are most commonly admitted to hospital for fall-related injuries which in 2000/01 accounted for 21,364 admissions and represented 35% of all injury admissions for this age group. Alternatively, in 2000/01 there were 6,249 admissions to hospital for hip fracture with 5,534 (88%) recording ‘fall’ as the cause of the injury. These admissions accounted for 90,194 days in hospital over 2000/01, 71% of which were for persons aged 80 years and over.

Falls can be grouped into two major categories, namely falls from different levels covered by ICD9 external cause codes E880 to E884 and falls on the same level represented by ICD9 external cause codes E885 to E886 and E888 (excl E887). In 2000/01 FNOF admissions due to falls from different levels accounted for 14% (n=775) of admissions while FNOF same level falls comprised 86% (n=4,759) of admissions for persons aged 65 years and over.

Location of the fall event causing a hip fracture in 2000/01 was most commonly the home (45%, n=2,496) followed by health service areas which include hospitals, nursing homes and hospices (17%, n=917) and residential institutions (16%, n=866). It should also be noted that a significant proportion (15%, n=854) were allocated the ‘unspecified place of occurrence’ code.

A small proportion of these fractured neck of femur (FNOF) fall admissions resulted in the patient dying in hospital. In 2000/01, this figure accounted for 6% (n=319) of FNOF fall admissions, 60% of which were females and with 80% being persons aged 80 years and over. Seventy percent (n=221) of these admissions indicated residence in metropolitan regions and the remaining 30 (n=98) percent were from rural areas. The proportion dying from the effects of hip fracture following discharge could not be determined from the available data.

3.2 Trends in Victoria

There were 5,534 admissions for fractured neck of femur (FNOF) injuries due to falls with an average of 16.3 bed days in 2000/01. More than sixty-five percent (n=3,682) of these admissions were through the emergency department. The rates of admission for older persons FNOF falls varied from 7.93/1000 (7.70, 8.17) in 1995-96 to 8.34/1000 (8.12, 8.56) in 2000/01 (fig 7a). The number and rate of admissions has been steadily climbing over the 6-year period with an annual average of 5,070 admissions (fig 7b).
Figure 7a Older Persons (65 years and above) Unintentional Fractured Neck of Femur/Fall Admission Rates for Rural and Metropolitan Regions, 1995/96-2000/01

Figure 7b Older Persons (65 years and above) Unintentional Fractured Neck of Femur/Fall Admissions for Rural and Metropolitan Regions, 1995/96-2000/01
Admission rates for females were significantly higher than for males, ranging in value from 10.69/1000 and 4.29/1000 in 1995-96 to 10.83/1000 and 5.06/1000 respectively, in 2000/01 and representing an average female to male rate ratio of 2.4 (fig 8).

3.3 Rural and Metropolitan Differences

There has been a slight increase in the age-standardised rates of older persons FNOF fall admissions residing in rural areas as well as in metropolitan areas over six years (fig 7). There was a marginally higher admission rate for older person FNOF falls in metropolitan areas compared to rural, 8.49/1000 (8.22-8.76) and 8.01/1000 (7.63-8.40), respectively, in 2000/01. Notably, residents of rural areas show much lower admission rates and rate ratios compared to metropolitan areas over the six-year period (fig 7 & fig 9).
3.4 Variations across DHS Regions

Age-standardised admission rates in 2000/01 varied from a high of 9.51/1000 (8.53-10.50) for residents in the Gippsland Region to a low of 6.8/1000 (6.12-7.47) in the Barwon South Western Region (fig 10).
Compared to Victoria, residents of only two rural regions (Gippsland and Loddon Mallee) and one metropolitan region (Southern Metro) had rate ratios significantly higher than Victoria. Rate ratios significantly lower than Victoria were found for one metropolitan region (Northern Metro) and two rural regions (Grampians and Barwon South Western) (fig 11).

3.5 Variations across PCPs

The ranked age-standardised rates of admission for FNOF falls and average bed days in various PCPs for the year 2000/01 are summarised in table 4.
### Table 4: Ranked age-standardised rates of admission, 95% confidence intervals, average and total bed days for unintentional fractured neck of femur/ falls for older persons (65 years and above) by PCP and Region, 2000/01

<table>
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<tr>
<th>Region</th>
<th>Primary Care Partnership</th>
<th>Number of Admissions</th>
<th>Age-standardised rate per 1000 persons</th>
<th>Lower 95% CI</th>
<th>Upper 95% CI</th>
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VICTORIA  
5534  8.34  8.12  8.56  16.30  90194

PCP age-standardised admission rates for FNOF falls in older persons were highest for Wellington residents with a rate of 13.46/1000 (10.54-16.39) and lowest for Alpine/Delatite/Wangaratta with a rate of 5.87/1000 (4.40-7.34). Average bed days during the same time period varied from 10.56 in Wellington to 26.09 in Inner West.

The number and rates of admissions for FNOF falls in Metropolitan and Rural PCPs are summarised in tables 5 and 6.
Table 5: Ranked age-standardised rates of admission, 95% confidence intervals, average and total bed days for unintentional fractured neck of femur/ falls for older persons (65 years and above) by Metropolitan PCPs and Regions, 2000/01

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<th>Region</th>
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The four Metropolitan PCPs with the highest number of admissions for FNOF falls among older persons were residents of Monash/Whitehorse/Manningham, Inner South, Middle South, and Outer East. These four Metropolitan PCPs contribute approximately thirty-two percent (n=1766) of all admissions for FNOF falls among older persons in Victoria, which is thirty percent of total bed days. There were also four Metropolitan PCPs with rate ratios significantly higher than Victoria and include Inner West, Outer East, Middle South and Inner South East (fig 12).
Residents in a total of four Metropolitan PCPs were observed with significantly lower rate ratios than Victoria and included Monash/Whitehorse/Manningham, South East, North Central Metropolitan, and Brimbank/Melton.

The four Rural PCPs with the highest number of admissions for FNOF falls among older persons were residents of Barwon, Moira/Strathbogie/Greater Shepparton, Central Highlands, and Bendigo/Loddon. These four Rural PCPs contribute approximately twelve percent (n=657) of all admissions for FNOF falls among older persons in Victoria, which is twelve percent of total bed days. A total of six Rural PCPs had rate ratios significantly higher than Victoria and included Wellington, East Gippsland, Mt Alexander/Central Goldfields/Macedon Ranges, Swan Hill/Gannawarra/Buloke, South Coast Health Services Consortium and Moira/Strathbogie/Greater Shepparton (fig 12).

There were six Rural PCPs with significantly lower rate ratios than Victoria and included people residing in South West, Southern Grampians/Glenelg, Central Highlands, Indigo/Towong/Wodonga, Barwon, Central West, and Alpine/Delatite/Wangaratta (fig 12).

There were ten PCPs with rate ratios significantly higher than Victoria (fig 12). These ten PCPs with admission rates for FNOF falls among older persons significantly higher than Victoria, from highest to lowest, were Wellington, East Gippsland, Mt Alexander/Central Goldfields/Macedon Ranges, Swan Hill/Gannawarra/Buloke, South Coast Health Services Consortium, Inner West, Moira/Strathbogie/Greater Shepparton, Outer East, Middle South, and Inner South East. These ten PCPs contribute thirty-seven percent (n=2,064) of all admissions for older person’s FNOF falls in Victoria, which is about thirty-eight percent of total bed days.

The rate ratios varied from a high of 1.61 (1.44-1.80) in Wellington to a low of 0.70 (0.62-0.80) in Alpine/Delatite/Wangaratta.
Figure 12 Older Persons (65 years and above) Unintentional Fractured Neck of Femur/ Fall Admission Rate Ratios for PCPs (Victoria=1), 2000/01
3.6 Key Findings

- There were 5,534 admissions for older persons (65 years and over) fractured neck of femur (FNOF) falls with an average of 16.3 bed days in 2000/01. More than sixty-five percent (n=3,682) of these admissions were through the emergency department.

- These admissions accounted for 90,194 days in hospital over 2000/01, 71% of which were for persons aged 80 years and over.

- Admission numbers increased steadily over the 6-year period with an average annual increase of around 4%.

- Latest available data estimate the direct (medical) cost of falls for people aged 65 years and over to the Victorian health system in 1993/94 to be around $127 million. Further, the annual direct cost of 2000/01 hospital admissions for fractured neck of femur (hip fractures) among this age group is estimated to be at least $57.5 million (5,534 admissions in Victoria at approximately $10,392 per admission).

- There has been an increase in the rates of older persons FNOF fall admissions in both rural and metropolitan regions over the six-year period.

- Admission rates for females were significantly higher compared to males with an average admissions rate ratio of 2.4 to 1 over the six-year period.

- Admission rates for older persons FNOF falls were slightly higher for residents in metropolitan areas compared to rural. This pattern was observed over the six-year period.

- Residents of the Gippsland Region had the highest rate of admission (9.51/1000) while the Barwon South Western Region had the lowest (6.80/1000). Compared to Victoria, only two rural regions (Gippsland and Loddon Mallee) and one metropolitan region (Southern Metro) had rate ratios significantly higher than Victoria. Rate ratios significantly lower than Victoria were found for one metropolitan region (Northern Metro) and two rural regions (Grampians and Barwon South Western).

- The four Metropolitan PCPs with the highest number of admissions for older persons FNOF falls were residents of Monash/Whitehorse/Manningham, Inner South, Middle South, and Outer East.

- These four Metropolitan PCPs contribute approximately thirty-two percent (n=1,766) of all admissions for FNOF falls among older persons in Victoria, which is thirty percent of total bed days.

- The four Rural PCPs with the highest number of admissions for FNOF falls among older persons were residents of Barwon, Moira/Strathbogie/Greater Shepparton, Central Highlands, and Bendigo/Loddon.
• These four Rural PCPs contribute approximately twelve percent (n=657) of all admissions for FNOF falls among older persons in Victoria, which is twelve percent of total bed days.

• There were ten PCPs with significantly higher admission rates than Victoria.

• These ten PCPs with admission rates for FNOF falls among older persons significantly higher than Victoria, from highest to lowest, were residents of Wellington, East Gippsland, Mt Alexander/Central Goldfields/Macedon Ranges, Swan Hill/Gannawarra/Buloke, South Coast Health Services Consortium, Inner West, Moira/Strathbogie/Greater Shepparton, Outer East, Middle South, and Inner South East.

• These ten PCPs contribute thirty-seven percent (n=2,064) of all admissions for older persons FNOF falls in Victoria, which is about thirty-eight percent of total bed days.

• A twenty percent reduction in number of admissions for older persons FNOF falls would lead to a reduction of 18,040 bed days in Victoria.
5 Discussion

5.1 Child poisoning

Poisoning among children aged 0 to 4 years accounted for more hospitalisations in Victoria than for any other major cause except falls. Approximately 80% of these admissions were the result of poisoning by pharmaceuticals and other medicinal substances while the remaining 20% were due to poisoning by other non-medicinal substances. The direct cost of poisoning among under 5s to the Victorian health system in 1993/94 has been estimated at around $7.3 million and including other indirect costs increases this figure to a lifetime cost of $11.6 million.

Preliminary analysis of the data and reviews of the literature indicate that poisoning among 0 to 4 year olds is a complex issue. There is no single poisoning agent or group of substances that account for a significant number of cases, with the exception of paracetamol. The difference in admission rates between urban and rural regions suggests that either patient management differs between regions or a real difference in poisoning rates or poisoning severity occurs.

5.2 Fractured neck of femur falls

Falls are the leading cause of injury-related deaths, hospitalisations and emergency department presentations in Victorians aged 65 years and over. The ageing population is of major concern as this age group currently comprises 12% of the general population with projections for 2051 indicating an increase to 23%. Similarly, proportions of persons aged 85 years and over will rise from 2% to 8% of the population. The frequency of hip fractures increases dramatically with increasing age and it has been projected that the incidence of this injury among 65 year and above people will increase by 10% every 5 years to 2051.

Approximately 90,000 hospital days were required to treat hip fractures in older persons due to falls in Victoria for the 2000/01 period. These hospital days do not include days spent in nursing home care and/or other care types, nor do they account for the dramatic change in lifestyle and loss of independence that most often follows this type of injury. The direct medical treatment cost of falls for people aged 65+ years to the Victorian health system in 1993/94 has been estimated at around $127 million and the inclusion of other indirect costs increases this figure to a lifetime cost of $199.3 million. Further, the annual direct cost of 2000/01 hospital admissions for fractured neck of femur (hip fractures) among this age group is estimated to be at least $57.5 million (5,534 admissions in Victoria at approximately $10,392 per admission).

6 Recommendations

This analysis suggests that significant gains can be made in reducing the number of preventable hospital admissions for unintentional child poisoning and fractured neck of femur falls among older persons through targeted prevention strategies. This could...
have a substantial impact on the emergency demand for hospital services and on utilisation of hospital bed days. A general recommendation would be to conduct the same analyses for other injuries as well as analyses of the overall impact on emergency demand of injury as a whole. Further, this report has highlighted the urgent need for a cost and consequence model for injury to be developed for Victoria as latest available cost figures for injury morbidity and mortality refer to the 1993/94 period and require updating.

6.1 Poisoning

- This analysis has identified significant urban/rural differentials in admission rates and further analysis is needed to determine the type and magnitude of factors affecting these higher rates in rural Victoria.
- Further investigation is required to determine the type of poisoning agent by rural/metro differential and potential associated socioeconomic factors.
- Further investigation is required to determine the type of poisoning agent by place of occurrence (setting), ie, home, farm.
- Further investigation is required to determine poisoning agents by length of stay and time (days) in ICU.
- Further investigation is required to determine mechanisms and mode of access to poisoning agents, particularly those required to have child resistant packaging.
- Analysis of admission rates by PCP areas has identified significant variations over the 2000/01 period. Further analysis is necessary to monitor these rates over time to identify increasing or decreasing trends.
- Greater detail should be required to be collected on location of the injury event to provide improved specificity in coding.
- Since child resistant packaging has been shown to be the most effective intervention in childhood poisoning, this countermeasure should be implemented more widely.

6.2 Fractured neck of femur falls

- Key priorities for this issue include reducing the frequency of fractures, reducing length of stay in hospital, and reducing the number of fatal outcomes. Interventions and programs targeting these priorities will lead to a substantial reduction in emergency demand for fractured neck of femur falls as well as enormous savings to the Victorian health care system estimated at around $127 million in 1993/94.
- Further analysis is needed to determine the relationship between admission to hospital, adverse effects of treatment and falls particularly for those that result in death.
- Further analysis of possible socioeconomic disadvantage is needed.
• Further exploration of the geographic differentials in rates within DHS Regions and PCPs by various age groups is necessary.

• Further analyses of fractured neck of femur falls by place of occurrence (setting), ie, home, residential institutions by DHS region and PCP (small area analysis) to identify possible geographic differentials.

• Benefits and costs of interventions that have been proven to be effective should be modelled in order to guide investment in the prevention of FNOF.

• Three interventions that have been shown to be effective include hip protectors, follow-up of medical and occupational therapy for older people who have presented at hospital Emergency Departments with fall injuries, and balance and strength exercise program for older people (70+)\(^2\).

• FNOF cases should be included in the Victorian Trauma Registry in order to monitor the effectiveness of current medical management practices.
References


