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Brain Injury Australia

Policy Paper: Falls-Related Traumatic Brain Injury

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B A C K G R O U N D

- **Falls are the leading cause of Traumatic Brain Injury in Australia, accounting for 42% of hospitalisations in 2004-2005.**
- **Falls are also the leading cause of injury hospitalisations overall, accounting for 1 in every 3 - or nearly 126,800 – injury admissions in 2003-2004.**
- **Of all causes of Traumatic Brain Injury, falls are the most fatal - 63% resulted in death in 2004-2005.**
- **Australians aged 65 years and over accounted for 62% of all Traumatic Brain Injury deaths in hospital in 2004-2005 - 1 in every 6 the result of a fall.**
- **Traumatic Brain Injuries the result of a fall in Australians aged 65 and over made up 1 in every 7 Traumatic Brain Injury hospitalizations in 2004-2005, across all age groups and causes.**
- **"Head injury" was the second most common falls-related injury (after those to the hip and thigh) in Australians aged 65 and over during 2005-2006, occurring in 17% of cases.**
- **Around 70,000 Australians aged 65 and over were admitted to hospital in 2005-2006 for a falls injury - an increase of 10% over 2003-2004 admission numbers. While falls injuries to the hip and thigh in this age group have fallen, rates of head injury have risen – to almost 1 in every 5 admissions.**

1. Acquired Brain Injury (ABI), Traumatic Brain Injury (TBI)

Acquired brain injury (ABI) refers to the multiple disabilities arising from any damage to the brain that occurs after birth. Common causes of ABI include **accidents, stroke, infection, alcohol and other drug abuse and degenerative neurological disease**. **Traumatic Brain Injury (TBI)** is an ABI caused by a traumatic event, from an external force to the brain such as a **fall, a motor vehicle accident or a blow to the head.** ABI in the elderly includes the dementias (Alzheimer's disease, for example) Parkinson's disease and other neurodegenerative conditions.

ABI is common in Australia. In 2003, 432,700 people (2.2% of the population) had an ABI with "activity limitations" or "participation restrictions"[1] due to their disability[2]:

- **160,000 had "severe or profound core activity limitations[3]**
- **57,500 people with an ABI aged 65 years and above had severe or profound core activity limitations - 2.3% of the population in this age group, or almost four times the under 65 years rate[4];**
- **The prevalence rate of ABI with severe or profound core activity limitations rose from 1.4% of the population aged 65–74 years to 6.2% of all people aged 85 years or over;** and
- People aged 65 years or over with ABI had more disability groups than people of the same age with disability generally—an average of 3.2 compared with 1.9. Similarly, older people with ABI had an average 5.2 health conditions, compared with 3.8 for all older people with disability.

i. effects

The consequences of an ABI can be profound, complex and multiple. The physical problems commonly reported by people with an ABI include **headaches, fatigue, seizures, poor balance and coordination, visual and hearing disturbances, chronic pain, paralysis and epilepsy.** Many people with an ABI experience **cognitive problems, including poor memory and concentration, reduced ability to learn, plan and solve problems. Roughly two-thirds of people with an ABI exhibit shifts in behaviour post-injury, including poor impulse control and disinhibition, aggressive verbal and physical tendencies.** In that context the psychosocial-emotional problems consequent to ABI can be debilitating. **A person who has experienced an ABI has a 80% likelihood of developing a diagnosable mental illness.** (Conversely, people with psychiatric conditions are at risk of incurring a subsequent ABI.) The types of psychiatric disorders present after (or before) an ABI may include major depression, anxiety disorders, borderline and avoidant personality disorders, and bi-polar affective disorder. There are several types, or combinations, of disabilities that come under the heading of "Dual Diagnosis", one of which is ABI and mental illness. ABI is often referred to as the "invisible disability" because its consequences, even if observable, are often not associated with disability generally nor ABI specifically. (This is especially the case with people with a mild or moderate ABI). **The cognitive-psychological and psychiatric problems, while often the consequence of ABI, can also mask it.** The presentation of ABI and mental illness can be very similar. Indeed, in some clients it is impossible to separate whether a presentation is due to ABI, or mental illness, or both. **The local and international study evidence demonstrates that roughly one third of clients of a mental health service have an underlying ABI.**

The Australian Bureau of Statistics' 2003 Survey of Disability, Ageing and Carers found that **1 in 4 people with an ABI reported 4 or more disability groups, compared with 1 in 18 of all people with disability and 1 in 3 reported 5 or more health conditions, compared with about 1 in 8 of all people with disability.** The survey also provided information on people with a disability's need for assistance across 10 "life domains" - three core activities (mobility, self-care and communication) and seven "non-core activities". The area with which people with an ABI most commonly required assistance was cognitive and emotional tasks. Over 100,000 people, or more than one-third of all people with an ABI aged under 65 years, reported needing help in this area. Compared with people with disability generally, **people with ABI were more likely to need assistance with mobility, self-care, cognitive and emotional tasks, paperwork, transport, health care and meal preparation. Almost 30% of people with ABI aged under 65 years living in households needed help with at least one core activity, and 4% needed help with all three core activities. In comparison, 26% of people with disability generally needed help with at least one core activity, and 2% needed help in all three areas.**

The international literature shows that ABI is 10 times more common and produces, on average, 3 times the level of disability as spinal cord injury.

B R A I N I N J U R Y A U S T R A L I A

Brain Injury Australia is the national peak ABI advocacy organization representing, through its State and Territory member organizations and network relationships, the needs of people with an ABI, their families and carers. The major components of Brain Injury Australia's role are:

- advocacy for Australian Government program allocations and policies that reflect the needs and priorities of people with an ABI and their families, and
- the provision of effective and timely input into policy, legislation and program development through active contact with Australian Government ministers, parliamentary representatives, Australian Government departments and agencies, and national disability organizations.

2. definitions

i. falls

> "Everyone intuitively knows what a fall is; but, when asked to define it, people struggle for words."[5]
>
> "A fall is a sudden, *unintentional* change in position causing an individual to land at a lower level, on an object, the floor, or the ground, other than as a consequence of a sudden onset of paralysis, epileptic seizure, or overwhelming external force."[6]
>
> "A fall is an event which results in a person coming to rest *inadvertently* on the ground or floor or other lower level."[7]

Brain Injury Australia is not in a position to compete with the large body of local and international research into falls in the elderly by offering its own definition, except to note the following. Firstly, that if as many as 78% of falls can be "anticipated",[8] then "inadvertently" rather than "unintentionally" captures the potential for falls-related TBI to be prevented; that many of the risk factors for a person falling - environmental (extrinsic) and health-related (intrinsic) - may be known but the fall results from inattention (in the broadest sense) to them. (Many of the risk factors for falls-related TBI are detailed in what follows.) Secondly, other research indicates that fallers, health professionals and falls researchers might disagree about what constitutes a fall, let alone the "slip", "trip" or a "stumble"[9] that may immediately precede it (these 3 falls classes grouped together accounted for the overwhelming majority - 34.1%, or 22,801 - of hospitalised fall injury cases for people aged 65 years and older during 2005-06). Therefore, as one rehabilitation specialist put it to Brain Injury Australia, since "there is no accepted definition of a fall…needless to say, there is even less agreement about what constitutes a 'preventable fall.'"[10] Thirdly, if as many as 75%-80% of "non-injurious" falls are never reported to health professionals,[11] perhaps there is a similar level of disagreement between the parties, above, about what constitutes a falls *injury*. **Brain Injury Australia is genuinely perplexed by the lack of mention of TBI as a falls injury risk in Australia's falls prevention literature – when "injuries to the head" are the second most common injury from falls. Insofar as the elderly will associate an "injurious fall" only with injuries referred to in that literature (or by falls prevention practitioners) they may not associate loss of consciousness the result of a fall, for example - with or without an accompanying visible "head injury" - as an injury warranting reporting.**

These questions join the range of riders over data assembled in what follows. Rather than lessening any of the claims they make, Brain Injury Australia believes they simply serve to underscore that TBI in the elderly remains "under-recognised, under-assessed and underserviced."[12]

2. ii. the elderly, the aged

Whom Australians believe comprise the "elderly" or the "aged" may be predetermined by public policies and a government services infrastructure built almost entirely around whether a person is aged over or under 65. And this is in spite of the benefits of increased life expectancy and many years' worth of "healthy" and "active" ageing strategies - such that 65 might now be the "new" 55, 75 the "new" 65 and so on. How this could affect health and aged care services for people aged 65 and over with a TBI is referred to, below.

Brain Injury Australia also recognizes the heterogeneity of those aged over 65 – that different subgroups have varying health status, living arrangements, levels of income etc – and seeks to draw a distinction in what follows between the "young old" (those aged 65–74 years), the "middle old" (aged 75–84 years) and the "old old" (those aged 85 and over).

3. falls injury

i. incidence, cost

Unintentional falls[13] were the leading cause of all hospitalised injury during the last year for which national admissions data were collected - 2004–2005. Falls accounted for over one-third (or 126,800) of all injury admissions. While most causes of injury have a relatively young age profile (transport accidents and assaults, for example), the highest rates of hospitalised injury overall involved older Australians - "largely due to extremely high rates of fall-related injuries" in people aged 65 years and over.[14] **The number of people aged 65 years and over who were hospitalised in 2005-2006 due to a fall-related injury was 66,800.[15] It is estimated that that 1 in 3 people over the age of 65 will experience a fall each year, with 1 in 10 having multiple falls. Around 1 in every 3 falls in this age group will require medical attention.** "Slips, trips and stumbles" on the "same level" were the most common cause of hospitalised falls in 2004-05 across all age groups, accounting for 26.6% of all fall injury cases.

Except for young people aged 5–24 years, the home (or the "driveway to the home") was the most commonly specified place of occurrence for hospitalised falls injuries in 2004-2005, accounting for more than a third of admissions. The most frequent type of hospitalised fall for younger people 0–14 years in 2004–2005 was a fall from playground equipment. For teenagers and young adults aged 15–24 years, a "fall on same level due to collision with, or pushing by, another person" was the most common cause of hospitalised fall injuries. Many of these injuries occurred while playing sport. The frequency of hospitalised fall cases attributed to beds, chairs and other furniture by age had "distinctly bimodal distributions", with the highest numbers occurring in children aged 0–4 years (1,794, or 20% of admissions) and adults aged 65 years and older (4,839, or 55% of admissions). Ladder-related falls injury increases with age and was particularly common for people aged 45 years and older (2,827, or 73% of all 2004-05 admissions).[16]

Women more commonly fell at home or in residential aged care, than men – accounting for 42.4% and 14.9%, compared to 29.8% and 5.7%, respectively. Men were much more likely to injure themselves from a fall at a "sports and athletics areas" or in "industrial and construction areas". While the largest number of falls injuries in industrial and construction areas occurred in the 25-44 years age group, they still accounted for only 2.9% of their falls-related injury admissions.[17]

The Australian Institute of Health and Welfare found that between 2003-2004 and 2005-2006 both the number and the age-standardised rate[18] of fall injury cases in people aged 65 years and over has increased – by 10%, and from 2,415 to 2,295 per 100,000 population, respectively. Rates of fall injury are highest for the 95 years and older age group, and their injury rates have risen by 31.6% during the same period. "The increase in hospitalised falls injury cases overall…is puzzling. As these rates have been age-standardised, it is not likely that changes in the age composition of the older Australian population have influenced these findings. Moreover, age- and sex- standardisation (to account for the much higher proportion of females in the older population) only emphasises the increase in the rates."[19]

The cost to the heathcare system of serious fall-related injuries is considerable. **The AIHW's report into hospitalised falls in people aged 65 during 2003-2004 estimated the total cost at $566 million.[20] A study commissioned by the Department of Health and Ageing predicts that by 2051 the total health costs attributable to fall-related injury in the elderly will increase "almost threefold"[21] to $1,375 million per annum – requiring an additional 886,000 hospital bed days and 3,320 extra residential aged care places.[22]**

4. falls-related Traumatic Brain Injury

i. incidence, cost

This paper relies, in part, on the combined findings of three Australian Institute of Health and Welfare (AIHW) reports - *Hospital Separations Due to Traumatic Brain Injury, Australia, 2004–05*, *Hospital Separations Due to Injury and Poisoning, Australia, 2004–05* and *Hospitalisations Due to Falls by Older People, Australia, 2005–06*.[23] **Any count of hospital separations excludes any falls-related injury - including mild TBI, for example - thought by the faller to be either non-injurious or not of sufficient seriousness to warrant medical attention. These counts also exclude any TBI-related deaths prior to hospitalisation or after discharge. The following should be read in light of this, especially in regards to the generally poorer outcomes from even mild TBI in the elderly and the extremely high TBI mortality rates in people aged 85 and over** (see below, p.7).

Hospital Separations Due to Traumatic Brain Injury, Australia, 2004–05 is the AIHW's first attempt to aggregate national TBI incidence data since 1997-98.[24] A TBI hospitalization is "considered to be a Traumatic Brain Injury case if it has a code in the S06 range"[25] – "Concussive Injury" - of the Australian modification of Version 10 of the International Classification of Diseases, relating to length of loss of consciousness. However, the information available from the AIHW's National Hospital Morbidity Database did not include two of the standard measures for severity of TBI – scores on the Glasgow Coma Scale (GCS) or duration of Post Traumatic Amnesia (PTA). **Such hospital morbidity data is fundamentally limited as both an index of the severity of TBI and of any resulting disability, since it is unable to describe ongoing impairment, activity limitations or participation restrictions.**

In both *Hospital Separations Due to Injury and Poisoning* and *Hospitalisations Due to Falls by Older People* "injuries to the head" [26] were the second most common injury type after "injuries to the hip and thigh" in fall injuries in people aged 65 years and older (and in both the 2003–2004 and 2005-2006 series of the latter publication). While the proportion of "injuries to the hip and thigh" in people aged 65 years and older fell by 3% between 2003-2004 and 2005-2006 – from 34% to 31% of all "Principal Diagnosis injury types for fall injury incident cases" – the proportion of "injuries to the head" rose 2% - from 15% (9,092 cases) to 17% (11,560) of all "Principal Diagnoses". In both years in which this data were taken, the proportion of men who sustained head injuries was "much higher"[27] than for women.

The AIHW's *Hospital Separations Due to Traumatic Brain Injury, Australia, 2004–2005* found that:

- **"[Traumatic Brain] Injury from Falls was the External Cause that contributed the largest proportion (42.2%, or 5,974) of all *Principal Diagnosis* TBI cases."[28]** The next most common external cause was transportation (27%).

- "[Traumatic Brain] Injury from Falls was the External Cause that contributed the second largest proportion (30%, 1,787) of all *Additional Diagnosis* TBI cases"[29] (after transportation, which accounted for 42% of TBIs in the category.)

- Fall-related injuries accounted for the overwhelming majority 57% (1,472) of all *"Other TBI"* cases during 2004–2005, followed by transportation (19%).[30]

Brain Injury Australia has obtained an age breakdown on falls-related TBI from Flinders University's Research Centre for Injury Studies.[31] More than 1 in every 3 people hospitalised in 2004-2005 for a fall-related TBI - as the Principal Diagnosis – was aged 65 and over, accounting for 2,269 (38%) of cases. Just under 1 in every 5 people hospitalised in 2004-2005 for a fall-related TBI - as an Additional Diagnosis – was aged 65 and over, accounting for 1003 (17%) of cases. Across all ages, the group with the greatest proportion (12%) of falls-related TBIs as Principal Diagnosis was aged 85 and over – 728 people. Around 1 in every 20 of the 62,676 falls injury hospitalizations in 2004-2005 for people aged 65 and over had TBI as either the "Principal" or "Additional" diagnosis.[32]

The AIHW estimates the direct costs of the 26,000 episodes of inpatient care for TBI during 2004-05 - totalling nearly 206,000 hospital bed days - at $184 million.[33] All *fall*-related TBI costs during that year accounted for 34% of that total ($62.7 million - second only to transport-related TBI, at $85.7).[34] While Brain Injury Australia understands how the differences between "managed [health] care" in the United States and Australia's system of majority publicly-funded acute and sub-acute care might result in their higher TBI incidence rates, it also believes the experience of the United States - which has a *younger* demographic profile than Australia – is highly relevant to Australia's future. 7,946 people aged 65 and over died and 56,423 were hospitalised as a result of falls-related TBI in the United States during 2005 – accounting for 50.3% of unintentional fall deaths and 8.0% of all non-fatal fall-related hospitalizations. TBIs and "injuries of the lower extremities" (hip fracture, for instance) combined, accounted for 78% of fatalities and 79% of falls-related hospital costs.[35] "The numbers and rates of TBI deaths and non-fatal hospitalizations in this study were higher than those previously reported, which were based on averaged 1995-2001 data… With the ageing of the U.S. population, and without intervention, the number of these injuries will likely increase."[36] **"In 2003, the aggregate charges for treating a principal diagnosis of TBI in patients aged 65 and older exceeded $2.2 billion. If, as expected, the older population in the United States doubles from the current 35 million to 70 million by 2030, the costs of caring for older adults with TBI in monetary and human terms will be staggering."[37] It is this prospect that fundamentally informs the US Centers for Disease Control and Prevention's (CDC) current public awareness campaign "Help Seniors Live Better, Longer: Prevent Brain Injury".[38] Brain Injury Australia recommends that a similar campaign be undertaken in Australia or, as is argued throughout this paper, that in all falls prevention materials "brain injury" appears, by name, alongside other injuries as a falls risk.**

Brain Injury Australia fully supports the Australian Government's proposal for a national disability "insurance" scheme that would provide services and support to people who sustain a catastrophic TBI, regardless of *cause* – whether the TBI is the result, for instance, of a fall rather than a motor vehicle accident. While Brain Injury Australia understands that the proposal is in its early stages, the question it has asked of the scheme's consultants - about whether the scheme would provide services and support to people who sustain a catastrophic TBI, regardless of *age* – remains answered. The current – and projected – costs of falls-related TBI in the elderly makes its claim for inclusion in falls prevention policy, planning and programs all the more compelling.

Recommendation 1:

Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs - with the Department of Health and Ageing, and State and Territory departments of health – works to ensure that, in all government-funded falls prevention planning and programming "brain injury" appears , by name, alongside any other falls injuries.

4. ii. fatality

The World Health Organisation notes that "falls injuries, whether in the old or young, are not rare events. **Globally, an estimated 391,000 people died due to falls in 2002, making it the second leading cause of unintentional injury death globally after road traffic injuries.** A quarter of all fatal falls occurred in the high-income countries."[39]

3,158 Australians died as a result of falls-related injury in 2003-2004, including 106 "intentional deaths".[40] According to the Australian Bureau of Statistics, falls deaths have increased 68% over the past five years, with about two-thirds of the increase being in women, most of them aged 65 years and above. Of all deaths due to falls, 83% were in people aged 70 years or more. The median age at death due to falls in 2007 was 85 years.[41] Both local and overseas surveys report "100% mortality"[42] from TBI in the "old old" – all 15 patients aged 85 and over admitted to Victorian trauma units with a severe TBI between July 2001 and September 2005 died in hospital.

Though it is not always clear which injury to which bodily region is key in causing death, as with all falls-related *injury*, "head" injury was the second most commonly occurring falls injury resulting in death - in 16% of cases -

after those to a "lower limb". Almost 80% of falls fatalities in 2003-2004 were recorded as having sustained at least one fracture: of these, almost 73% (1,716) were hip fractures. Just over 1 in every 10 falls fatality was recorded as having sustained "intracranial injuries."[43]

During 2004-2005, 4.6% (659) of all hospitalizations with TBI as their "Principal Diagnosis"[44] resulted in death. The proportion was highest where falls were the cause (63%) - followed by transportation (27%) - largely due to falls' largely older age cohort. People aged 65 years and over accounted for 62% of all TBI deaths in hospital - 19% the result of a transportation-related TBI, 16% from falls-related TBI cases. Death was reported in 2.8% (167) of cases where TBI was an "Additional Diagnosis"[45]. Patients aged 65 years and over accounted for 46% (77) of these deaths, 58% of them due to falls. Admissions classified as "Other TBI"[46] resulted in death in 5.9% (152) of cases. Again, the leading external cause was falls (in 70% of deaths). Those aged 65 years and over accounted for 82% of all "Other TBI" deaths in hospital, with 73% of these deaths being fall-related.[47] Crucially, the AIHW's *Hospital Separations Due to Traumatic Brain Injury, Australia, 2004–05* did not include those falls-related TBIs that resulted "in immediate death, or death within minutes."[48] Neither did it include any TBI-related death that occurred after discharge from hospital.

As with other external causes of injury such as transport or assault the death rates from falls are generally declining over time, and across all age groups - by almost 9% between 1997-1998 and 2003-2004. And while the *number* of Australians aged 65 years and over who died from a fall has increased by 17% (from 2,337 to 2,735) over the same period that age group's *rates* of falls deaths fell by 10%, primarily because of Australia's ageing population but also due to improvements in trauma care.[49] And while Brain Injury Australia welcomes any reduction in fatality rates the result of TBI, it also believes that government services, and society generally, have failed to acknowledge the increase in the number of people *surviving* TBI more severely disabled.

4. iii. severity

Straightforwardly measuring the severity of TBI is complicated by when, where and who (a person's age, for instance) is being measured and with what instrument. As with other areas of healthcare, there are a variety of tools available, each of which has certain advantages over others depending on the context in which they are used, and what they are designed to measure. Furthermore, hospital injury scoring – used as clinical qualifiers for access to trauma care, for example – will not capture the severity of brain injury as it is manifested in recovery, which can take many years.

The AIHW's *Hospital Separations Due to Traumatic Brain Injury, Australia, 2004–05* states: "concussion, and the duration of concussion, are markers of severity of trauma…Duration of PTA [Post Traumatic Amnesia] is often used in conjunction with the Glasgow Coma Scale (GCS) in determining severity of TBI…Since the hospital discharge data used for this report did not include information on PTA or GCS scales, neither of these measures were utilised to determine the severity of TBI for any of the included cases."[50] In the absence of GCS – which measures *levels* of consciousness following TBI – the report offers *duration* of loss of consciousness: "a clear indication of effect on the brain. However, whether loss of consciousness has occurred, and its duration, may not be known for all cases of head injury, as there is generally a lag between the injury event and medical attention, the injury event may not have been observed by others, the injured person may be confused and unsure of the events, and/or there may be memory loss."[51] The report provides case counts and percentages broken down by case categories – "TBI as Principal Diagnosis", "TBI as Additional Diagnosis", and "Other TBI" – but not by *external cause*, for example, falls. Insofar as duration of loss of consciousness is an index of severity of TBI, 2005-2006's cases were broadly consistent with other TBI hospitalisation surveys – the majority, or 39.8%, of the 22,710 TBIs experienced a loss of consciousness "of brief duration [less than 30 minutes]".[52] For instance, recent guidelines produced by NSW Health and its Institute of Trauma and Injury Management for the *Initial Management of Adult Closed Head Injuries* estimate that: 80% of hospitalisations fall into the "Minor Head Injury" category (with a GCS of 14-15), 10% "Moderate Head Injury" (with a GCS of between 9 and 13) and 10% "Severe Head Injury" (GCS between 3 and 8). But it also notes age greater than 65 and "known coagulopathy" (use of blood-thinning medication)[53] as "Risk factors indicating potentially significant Mild Head Injury".[54]

The report also uses a "threat-to-life measure" - an International Classification of Diseases (ICD)-based "Injury Severity Score (ICISS)" which involves "calculating a Survival Risk Ratio (SRR), i.e. the probability of survival, for each individual injury diagnosis code as the ratio of the number of patients with that injury code who have not died to the total number of patients diagnosed with that code…. a patient's ICISS score can vary from 0 (most severe) to 1 (least severe)."[55] The mean ICISS score for all falls-related TBI as "Principal Diagnosis" across all age groups was 0.8443 – slightly higher than transport-related TBI but slightly lower than for assault. But mean ICISS scores for falls-related TBI decreased markedly with age.

The average length of stay in hospital is used as another "proxy for the severity"[56] of TBI in the report: stays for falls-related TBI as "Principal Diagnosis" – at 5.4 days - were longer than those for assault (3.4) but shorter than those for transport-related TBI (6.2).

Even given the limitations of hospitalisation data, these results roughly conform to other surveys – that between 70% and 90% of TBI hospitalizations fall into the "mild" (or "moderate") categories. And, of those, any cognitive or behavioural changes the result of TBI will ordinarily resolve within 3 to 6 months. But, apart from TBI *prevention*, Brain Injury Australia's interests lie largely with the roughly 1 in 5 individuals who leave hospital with a TBI resulting in permanent and/ or profound disability. Moreover, in the absence of local research – and if the international evidence into the outcomes of TBI in the elderly, detailed below, applies - it would be reasonable to expect that what might be scored a "mild" TBI in a 17 year-old will produce more than "mild" effects in someone aged 70, for example.

5. falls-related Traumatic Brain Injury in children:

i. injury death

While transportation remains the leading cause of injury for Australians aged 15-44 years **unintentional falls were the most frequent reason for injury hospitalisation in children (0–14 years) and older age groups (44 years and over), accounting for 30,984 and 81,513 cases respectively during 2004-2005.**[57] Falls accounted for about 40% of injury-related hospitalisations among children. 8% of all falls injury hospitalizations in 2004-2005 for children had TBI as either the "Principal" or "Additional" diagnosis, in 10% of falls injury hospitalizations for children aged 0-4 years.[58] The most frequent type of hospitalised fall in children was from playground equipment, where TBI is infrequent – occurring in only 2.6% of the 12,000 playground injury hospitalizations between 2002 and 2004.[59] Both the proportion of injury hospitalisations in children due to falls and the fall mechanism have remained largely unchanged over recent decades.

Flinders University's Research Centre for Injury Studies' survey of Australian Bureau of Statistics mortality unit record data found that 225 children aged 0–14 years died as a result of unintentional falls between 1979 and 1998 - accounting for 2.3% of deaths from all external causes in children.[60] **Roughly half of all deaths in children occurred in those aged 0–4 years, one-fifth in children aged 5–9 years and one-third in 10–14 year-olds. Falls "from one level to another" were the leading mechanism in those deaths, including 31 from a cliff, 19 from household furniture and 7 from playground equipment.**[61] Falls "from or out of buildings or other structures" were the second most common mechanism accounting for 26%, 18% and 36% of all of fall-related death during the survey period, in children aged 0–4, 5–9 and 10–14 years respectively. The same survey found a 60% reduction in age-standardised rates of fall-related injury and a halving of death rates due to falls in the 20-year period between 1979 and 1998. The reasons for this may include more risk-averse parenting styles and a general decline in levels of physical activity in children (in favour of "screen time", transport by motor vehicle etc.). Yet, "despite lower mortality rates for falls than adults, children carry the largest fall injury burden, with nearly 50% of the total number of 'Disability Adjusted Life Years' lost worldwide to falls occurring in children under the age of 15 years."[62]

5. ii. Injury

1 in 4 injuries during the last year of the survey (above) period – 1997-1998 – were "associated with the head or face. However, there were differences between the age groups. In children aged 0–4 years, injuries to the head and face were reported in almost half the cases…Head and face injuries decreased with increasing age from a high of 3,535 cases in the 0–4 year age group to 1,618 cases in the 5–9 and 1,222 cases in the 10–14 year age group, respectively."[63] Intracranial injury, "excluding skull fractures", accounted for 3,481 of "Principal Diagnoses" and skull fractures, 992 - the two together accounted for nearly 18% of all fall-related hospitalizations in children. Data obtained by Brain Injury Australia from Flinders University's Research Centre for Injury Studies on TBI hospitalisations during 2004-2005 indicates that the relative overrepresentation of falls-related TBI in children 0-4 continues – both their falls-related TBI incidence (544 as "Principal Diagnosis") and hospitalisation rates (per 100,000 population) were markedly higher than the two other childhood age groups. In all childhood age groups the most common type of fall resulting in TBI involved furniture. Only 10% of cases were from playground equipment.[64] It bears repeating that these numbers do not include TBI *deaths* prior to hospitalisation or after discharge.

5. iii. falls from windows and balconies

Brain Injury Australia believes the considerable body of local and international research on falls in childhood - especially "falls from height" (those above one metre) – is conclusive: children aged 0–4 years are at greatest risk of those falls; the majority of falls in that age group are from windows or balconies; and the most frequently incurred injury is a TBI. A Queensland survey of all falls from height in childhood between 1998 and 2002 found that falls from balconies and windows accounted for over 8% of all falls from over one metre, the majority (40%) of falls occurred in children aged 12-24 months and TBI was the most frequent injury (52%).[65] Brain Injury Australia is concerned about an apparent (re-)emerging trend in very young children falling from multi-storey housing.

> Girl, 5, dies in fall from third-floor unit window" (Sydney Morning Herald, February 15, 2009)
>
> "A 5-year-old girl died last night after plunging eight metres from a bathroom window in Sydney's south….The child, who neighbours said was called Lara, was found on concrete below her third-floor unit. She was lying unconscious on a bloodied flyscreen. She was taken to St George Hospital but was later transferred to The Children's Hospital at Westmead, where she was treated for serious head injuries and suspected spinal damage. Neighbour Dom Karnaby had been heading out to a friend's house when he stumbled on the girl and her distressed mother and raised the alarm. He said the mother was Russian and spoke little English. "I saw the girl lying motionless on the cold concrete floor and blood coming out of her head," Mr Karnaby said."

Brain Injury Australia notes that, during the period 1979-1983, the age-specific death rate of children from falls "from or out of buildings or other structures" for children aged 0-4 was dramatically higher than for other age groups – at 1.2 per 100,000 population - but then showed a decrease of 66% to the 1984–1988 period, remained stable thereafter and showed a further decrease of 105% between 1989 and 1998.[66] While national level death data of sufficient detail to ascertain trends since 1998 are not available, the Australian Institute of Health and Welfare's *Injury Deaths, Australia 2002* recorded 3 deaths in that year of children the result of a "fall from, out of or through building or structure"[67] and there were 302, 610 and 634 hospitalisations during 2004-2005 of children 0-4, 5-9 and 10-14, respectively, due to falls "from, out of or through building or structure."[68]

Brain Injury Australia has, however, been able to access data on falls-related TBI from Sydney's two children's hospitals - Sydney Children's Hospital at Randwick and The Children's Hospital at Westmead.[69] **Between 2003 and 2007, 23 children (14 boys and 9 girls) aged between 0 and 11 years were admitted to the Sydney Children's Hospital after falls out of a window. 19 of those children were aged less than 5 years at the time of their injury, 14 under three years. The height of the fall was greater than 2 metres in 87% of the cases and 13 of the children landed onto concrete. 11 sustained a TBI, 1 died in hospital as a result.** In 78% of cases, the child had fallen into and through a flyscreen and then out of an open window. 42% of the children had been playing or jumping on furniture placed by the window prior to falling.

Over the same period 42 children were admitted to The Children's Hospital at Westmead after falling out of windows. 35 were under the age of 5 years and of those, 83% fell from a height of at least 2 metres. 7 had fallen through a flyscreen. 26 of the children sustained a TBI and 1 child died as a result of their injuries. Brain Injury Australia has been able to obtain additional data from the Trauma Service at The Children's Hospital Westmead. During the same period, 35 children sustained a TBI as the result of a fall *from a balcony* – 25 of them aged 4 years or under. In 2008 alone, 12 children sustained a TBI from high falls – 6 from windows and 6 from balconies.

For the reasons of the limitations in the data described above, Brain Injury Australia is unable to point to a definitive national trend in these high falls in children. But Brain Injury Australia fears that the combined effect of reduced housing affordability, smaller family size and metropolitan housing policies (and environmental planning) that prefer "urban consolidation" over suburban sprawl will result in an increase in high rise living and, thus, increased "high falls" risk in children. In metropolitan Sydney, for instance, between 1991 and 2005 20% of all residential building approvals were within its inner ring, 86% of those for flats, units or apartments.

Like other falls, childhood "falls from height" are relatively common, often result in serious injury, death or profound and permanent disability but are also highly preventable – especially falls from windows or balconies. Unlike falls in other age groups and settings, Brain Injury Australia is convinced that the risk factors are readily identifiable - and removable - since they are almost always extrinsic to the child (a parent's placement of a chair or bed next to a window, for example). A large part of prevention groundwork in this area has already been prepared by Monash University's Accident Research Centre (MUARC) in work commissioned by the Australian Building Codes Board. In relation to window hazards, their 2008 report cites United States' experience – where, of the 4,700 children hospitalised for falls from windows in 1993, 90% fell "from the first or second stories".[70] Local government programs in New York City and Boston for the installation of window guards[71] - mandatory for landlords in the former, voluntary in the latter – resulted in 50% and 83% decreases in falls and 35% and the total elimination of deaths, respectively, during the initial period of implementation. **The Monash University's Accident Research Centre report states "members of the [expert] panel noted that there are regulations in place for window openings (locks, heights) around pools, but these or similar regulations have not as yet been applied to window fall hazards, which are more prevalent and have greater immediate injury consequences."[72] It recommends "the BCA [Building Code of Australia] should consider a provision for the required installation of window guards at second storey height in all domestic dwellings, irrespective of whether they exceed four metres in height. We also note that the current BCA requirement of window guards for heights over four metres offers substantial potential for injury".[73]**

The Queensland survey, above, found that falls from balconies accounted for nearly 72% of all childhood falls from height. The majority of children injured had been climbing on a balustrade railing just prior to falling, and had used adjacent structures - such as furniture - to gain access to, and over, the top railing. A qualitative study of 98 children injured in falls from buildings in Dallas, Texas found that most had slipped between a balcony's railings rather than climbing them to the top.[74] The American Academy of Pediatrics' policy on "Falls From Heights: Windows, Roofs, and Balconies" states "widely spaced rails are ineffective barriers because they permit a child's body to slip through. Virtually all children younger than 6 years can slip through a 6 inch [15.2 cm] opening, and none older than 1 year can pass through a 4 inch [10.2 cm] opening…All local building codes dealing with new construction should be made to conform with the national codes that currently recommend 4 inch openings between vertical (not horizontal) bars."[75] **The Building Code of Australia "specifies that for balustrades on balconies greater than 1 metre off the ground, any members [railings] (vertical or horizontal) should not permit a [12.5 cm] sphere to pass between them. While this prevents children from slipping through balustrade members and falling, a horizontal gap of this size does little to discourage climbing."[76] Further, "climbability of balcony and verandah railings was also considered to be unacceptable from a safety perspective and New Zealand leads Australia on this issue. The panel noted that the requirement that verandahs could be up to 1000mm from ground level before verandah railings are required by the BCA was quite high, and that severe injury was still possible from a fall of less than one metre. Members of the panel stated that railings were required at 600mm from ground level in previous versions of the BCA and that it seemed odd that this requirement has now been relaxed."[77]**

The MUARC report includes the following recommendations relating to "falls from heights": **"the BCA should consider a provision for the required installation of window guards at second storey height in all domestic dwellings, irrespective of whether they exceed four metres in height. We also note that the current BCA requirement of window guards for heights over four metres offers substantial potential for injury, particularly in comparison with the stringent guard requirements in place for windows of any height opening to provide access to domestic swimming pool areas." And "all balcony, stair and verandah balustrades, irrespective of height above ground level, should be of non-climbable design and adequate height to prevent toppling-over."[78]**

The MUARC report is quiet on the retrofitting of existing building stock, consistent with the above, but its expert panel suggests that "health care costs saved by implementing positive and preventative changes to the BCA could potentially be redirected towards possible subsidies for safer construction, and that these could be primarily directed towards businesses for the cost of retooling, or as a consumer rebate to offset increased prices (as is the case with the installation of water tanks in existing homes)."[79] **The report estimates the cost of the 343 deaths and 105,968 hospitalisations due to *falls in buildings* between July 2002 and June 2005 to be $250 million and $1.28 billion respectively.**[80] "The panel agreed that, in their collective opinion, the building industry would likely be receptive to implementing some preventative changes to construction practice or BCA regulations providing a clear public benefit could be shown and the cost of doing so was not prohibitive."[81]

Brain Injury Australia feels that the MUARC report is so comprehensive in its assessment of the falls hazards in Australia's buildings that the revisions, above, of the BCA is what is required to address many of the extrinsic high falls risks in children. Brain Injury Australia is also convinced that those revisions matched by an awareness campaign targeting parents – especially those living in high rise – will result in a radical reduction in high falls death and injury in children.

Recommendation 2:

Falls from heights in children are common, are often fatal or result in severe injury and disability, but are highly preventable. Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs pursue with the Australian Building Codes Board - and its Australian Government representative, and its "senior executives responsible for building regulatory matters from all State and Territory Governments" – the implementation, in the Building Code of Australia (BCA), the findings of the Board-commissioned 2008 Monash University study into building safety, specifically as it relates to children's falls from heights.

6. hip fracture and falls prevention

Of the 66,800 Australians aged 65 and over hospitalised in 2005-2006 due to a fall, their most common injury (for 20,769 of them, or 31%) was to the "hip and thigh" followed by "injuries to the head" (11,560, 17%) then "injuries to the abdomen, lower back, lumbar spine and pelvis" (7,327, 11%). While falls are responsible for over 90% of hip fractures,[82] only around 1% of falls have this result.[83] But the consequences in morbidity and mortality can be profound – 6% of hip fractures in the elderly result in death while in hospital, between 15% and 20% within 12 months of the fall.[84] Only around half of patients with a hip fracture regain the same degree of mobility they experienced prior to injury. Monash University's Accident Research Centre has estimated the total cost of 694,544 acute public hospital bed days between 2002 and 2005 devoted to the treatment of hip fracture at just over $694 million.[85]

Women account for 75% of hip fractures. Due to an ageing population and the concentration of falls injury in elderly women (70.8% in 2005-2006) Australia's rate of hip fracture had been expected to double by 2026 and increase four fold by 2051.[86] As a result, hip fracture has been the almost exclusive focus of injury risk in Australia's falls prevention programs. There is an emerging body of evidence that such programs are effective. A recent Cochrane Collaboration review examined the results of 111 randomised controlled trials - comprising 55,303 participants - of interventions aimed at preventing falls in older people living in the community. It found that: group exercise; Tai Chi; "individually prescribed" home-based exercise; "gradual withdrawal" of

psychotropic medication; a "prescribing modification programme" for primary care physicians; and eye cataract surgery all reduced rates of falling. But home safety interventions (installation of grab rails, repair of damaged flooring etc.) did not reduce falls. And there was "some evidence that falls prevention strategies can be cost saving."[87]

A recent Medical Journal of Australia study of admissions to New South Wales hospitals concluded that **falls prevention programs "may have had some success, as the incidence of hip fracture appears to be stabilising and even decreasing in some countries."[88] An Australian Institute of Health and Welfare analysis of trends in fall-related injury hospitalisations between 1999 and 2006 found that the age-standardised hip fracture rates had fallen by 2.2 % per year for women and 1.3% per year per year for men "and may indicate the success of falls prevention interventions.**"[89] Again, "the [age-standardised] increase in hospitalised falls injury cases overall, however, is puzzling" since "it is not likely that changes in the age composition of the older Australian population have influenced these findings." **Between 2003 and 2006, falls "injuries to the head" remained the second most common Principal Diagnosis for falls injuries, and rates rose from 15% (9,092 cases) to 17% (11,560). Rates of injuries to the head "inward transfers" (from another acute hospital) also rose – from 8% (612) to 10% (828) – during the same period, while "injuries to the hip and thigh" decreased – from 49% (3,567) to 44% (3,540).** While numbers and rates of falls-related TBI are rising in the United States, age-adjusted rates of hip fracture decreased 25% between 1996 and 2004.[90] A study from Finland of falls-related TBI in people aged 80 and over between 1970 and 2004 found age-standardised increases of 201% and 254% in women and men, respectively, while "hip, knee, ankle and proximal humerus fractures, have declined in our country since the mid-1990s."[91]

"As falls are the number one cause of TBI in the elderly, a decrease in the incidence of falls should reduce the incidence of TBI in this population."[92] The age-standardised rates for "injuries to the head" have risen alongside the 10% rise in all fall injury cases between 2003 and 2006 while rates for hip fracture have fallen. The Australian Institute of Health and Welfare trends analysis, apart from expressing its frustration with the "high proportions of 'unspecified activity' codes in the records"[93] (in 67% of falls injury cases in 2005-2006, 62% in 2003-2004), can only speculate that, given the overrepresentation of men and the greater heights from which they tend to fall, the "differences in rates for this type of injury may be exposure-related in that males may undertake riskier home maintenance tasks than females, that less protective equipment is utilised in the home than is common in occupational situations, and that the attitudes of, and/or a lack of awareness in, older men, in particular, may lead to them undertaking tasks beyond their abilities, contributing to a higher falls risk."[94] The underlying reasons for the potential increase in rates of falls-related TBI in Australians aged 85 and over – the group already with the highest rate of TBI hospitalisation, largely due to falls – is even less well understood, though one falls researcher offers that they "may fall more seriously than their predecessors: when an increasing number of less-healthy and functionally less-capable elderly persons are, among others, now surviving to old ages."[95] **Brain Injury Australia knows of one reason why the increase in falls-related TBI in the elderly is not well understood: because, as one of the nation's leading falls researchers put it, "it seems like a very under-researched area."[96] Moreover, insofar as injury prevention needs to commit to an understanding of the causes of injury, Brain Injury Australia continues to be frustrated by the resistance of health policymakers and researchers to the meaningful collection of hospital (and other) data on TBI in the elderly.**[97]

Recommendation 3:

Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs, via its Research and Analysis Branch and with the Department of Health and Ageing, via agencies like The National Health and Medical Research Council (NHMRC), encourage – and fund – research into Traumatic Brain Injury in the elderly as a matter of priority.

Brain Injury Australia feels that if falls prevention practitioners can credit the decrease in hip fracture to the efficacy of their interventions - when rates of falls injury hospitalizations are increasing – it may only be because those interventions, from the program literature made available to Brain Injury Australia, make hip fracture (and hip protection, protectors etc.) the almost exclusive focus of injury risk. And while Brain Injury Australia feels that engaging in a "competition" with any other class of falls injury would be sterile and unproductive, it would follow from the above that the increase in rates of falls-related head injury/ TBI may be due to falls prevention programs failing to reach those populations at the greatest risk of falls-related head injury and/or a knowledge gap in the risk awareness of intervention participants. Little doubt it is precisely this gap that the US Centers for Disease Control and Prevention is seeking to fill with its current campaign "Help Seniors Live Better, Longer: Prevent Brain Injury".

As part of its preparation of this paper Brain Injury Australia examined physical copies of Australian and State and Territory Governments' falls prevention program literature as well as conducted comprehensive searches of their websites with key search terms including "head injury", "brain injury", "conscious", "consciousness" and "hip". **Brain Injury Australia was unable to locate a single mention of "traumatic brain injury" or "brain injury" as a falls risk.** Every jurisdiction, with the exception of the Northern Territory,[98] named the hip as a body region susceptible to falls injury or hip fracture as a falls risk or identified hip protection/ protectors as preventive of falls injury. Queensland, New South Wales, Victoria and Tasmania named "head injury" as a falls risk, though this tended to be in the context of professional publications aimed at falls prevention practitioners rather than consumers of falls prevention programs or the general public more broadly.[99]

Brain Injury Australia also wonders about the evidence base for the following statement on the Australian and New Zealand Falls Prevention Society's website ("formed in 2006 to promote the multidisciplinary study and implementation of falls prevention in older people"); "in terms of morbidity and mortality, the most serious of these fall-related injuries is fracture of the hip." In terms of *overall* injury incidence, mortality risk and the costs of morbidity, hip fracture's contribution is beyond contest. But if a key feature of falls prevention's success is the *individual's* level of motivation to avoid specific injuries, then Brain Injury Australia is convinced that the prospect of trauma to a person's brain should play at least an equal part with fracture of their hip. A leading researcher in neurotrauma asked Brain Injury Australia to "make the point to the Falls Doctors/physios etc. that while hip fracture may not uncommonly cause death - in high risk frail adults - the outcome of hip fractures in survivors, and especially those in early intervention orthogeriatric programs [a sub-speciality that treats older people with fractures] is very good – whereas the outcome of TBI in older people is commonly incomplete with poor psychosocial recovery and rehabilitation necessarily offers limited benefit…Prevention is the go."[100] Brain Injury Australia is also convinced that, if injury prevention programmers look beyond this generation of participants to the next, the nation's 5.4 million ageing baby boomers – many of whom, having watched their parents succumb to dementia, are concerned with brain "health", brain "fitness" – are as or more likely to be motivated by the threats to their cognition, their memory, their behaviour from head trauma as the threat to their mobility and independence from hip fracture.

Even given the relative incidence of falls-related injuries to the hip and thigh versus the "head", Brain Injury Australia notes the recommendations of both Australian Institute of Health and Welfare reports that examined falls injury in the elderly: from 2007, **"these findings confirm similar results by other researchers and supports suggestions that falls prevention interventions should be designed to explicitly target these very severe, and costly, head injuries in addition to hip fractures"**[101]; and 2008, **"these findings confirm similar results by other researchers and continues to support the suggestion that falls prevention interventions should be designed to target head injuries in addition to hip fractures.**"[102]

Brain Injury Australia's predecessor organization, the Head Injury Council of Australia acknowledged the Australian Health Ministers' 1986 commitment to injury prevention and control as a "National Priority Area". And Brain Injury Australia commends the work of the Department of Health and Ageing through its National Injury Prevention Program; specifically the National Public Health Partnership's "National Falls Prevention for Older People Plan: 2004 Onwards". But it is concerned that both the Plan and (from the program literature available for review) the falls prevention initiatives funded from the $18.5 million the Australian Government has spent over the last 10 years on the "National Falls Prevention for Older People Initiative" generally fail to mention TBI (or "head injury") as a falls risk, and whether this reflects the Plan's "imperative that Australia continue to research, develop and disseminate local evidence based findings…to identify and improve the evidence on which fall related injury reduction strategies are based…monitor trends in fall-related injury and report findings to National, State and Territory stakeholders and use this information to improve and assess the quality of falls prevention activities."[103]

Brain Injury Australia understands that funding for the "National Falls Prevention for Older People Initiative" ended in 2008. Given the alarmingly low level of brain injury awareness in the community, Brain Injury Australia's (initial) ambitions are always modest: in this case, the mere mention of "[Traumatic] Brain Injury", by name, in all future iterations of Australian, State and Territory Government falls prevention planning and publications.

Research has shown that a first TBI, like a first fall, puts someone at much greater risk of subsequent TBIs, or falls - while falls rates for people with dementia, for example, have been found to be double that of similar aged populations without cognitive impairment, with between 70% and 80% falling each year.[104] They also experience a threefold increase in risk of fall-related fractures. Yet people with cognitive impairment the result of a TBI, for example, are specifically excluded from trials of falls prevention interventions. While Brain Injury Australia understands the challenges involved with delivery to this group it is more concerned that, apart from a group's failing to benefit from injury prevention, an evidence base for successful interventions will not be built precisely for those at perhaps the greatest risk of falls injury – as a result of their age alone, or previous falls-related TBIs.

Recommendation 4:

Brain Injury Australia understands that funding for the "National Falls Prevention for Older People Initiative" ended in 2008. Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs - with the Department of Health and Ageing, and State and Territory departments of health – works to ensure that, in all future government-funded falls prevention planning and programming, that "brain injury" appears - by name - alongside any other falls injuries.

7. residential aged care

While half (32,770) of all fall injuries for people aged 65 years and older hospitalised in 2005-2006 occurred in or around the home, the *rate* of falls in Australia's residential aged care facilities – given people's greater age and frailty - was more than five times higher.[105] And the age profile of residents is increasing: over half of the 156,549 residents at 30 June, 2007 were aged 85 years or older, and over a quarter were aged 90 years and over.[106] Their level of dependence is also increasing: between 1998 and 2007, the proportion of residents classified as high-care rose from 58% to 70%, while the proportion of low-care fell from 42% to 30%, the decline in the latter group the result of government policy dedicated to "ageing in place" - and an expansion in Community Aged Care Packages (CACPs), which provide the equivalent of low-care support to people still living at home. The increase of 32,000 high care places has been driven largely by residents aged 85 and over - the age group with the highest rates of falls injury, falls deaths, TBI and TBI death; their numbers have risen from 31,127 to 56,446. Around 11% of falls in residential aged care result in soft-tissue injury, severe lacerations or head injury, 2% in fracture.[107] During 2005-2006, out of a total of 13,624 falls injuries in residential aged care requiring hospitalisation, 624 were diagnosed with a TBI.

Brain Injury Australia believes from all the available evidence that the already very high rates of falls injuries in residential aged care, including TBI, will continue to increase with the "burgeoning demand for aged care services over the next 40 years"[108] and with the older age and higher dependency of residents. Firstly, the estimated prevalence of dementia in 2006 - with its increased falls risk, detailed above - was 1% in those aged 60-65, 6% in those aged 75-79, and 45% of those aged 95 or older.[109] In 2008, there were more than 200,000 Australians living with dementia - the most common being Alzheimer's disease, which accounts for between 50% and 70% of cases. A report by Access Economics predicts that the number of people with dementia will increase to over 730,000 by 2050.[110] Secondly, the demand for aged care services occurs at a time when reduced government funding per resident is being met by increasing user subsidisation. Brain Injury Australia is concerned that such policy change is taking place when private for-profit providers' investment in residential aged care is increasing (their share of beds increased from around 29% in 1998 to 32% in 2007), reflected in the decreasing numbers of smaller facilities — the share of 40 or fewer bed facilities has decreased from 53% to 34% during the same period – and in declining staff-resident ratios.[111] Thirdly, a 2008 Productivity Commission report found that staff morale was lower in aged care than in any other nursing setting and that "a contributing factor was the amount of abuse that aged care workers received from managers and their colleagues and violence from clients and their families."[112] While Brain Injury Australia is unaware of any research into the behavioural outcomes in the elderly with a TBI, problems of impatience, irritability, verbal and physical aggression can occur in more than half of all people in the first year after injury.[113] Brain Injury Australia shares the concerns of NSW Health that the "lack of residential or long term care arrangements and services for groups of people who manifest severely challenging behaviours (e.g. developmentally disabled or brain injured people) have placed residential aged care into a position of 'service provider of default'."[114] Moreover, a 2008 report of the Australian Government's Aged Care Standards and Accreditation Agency found the strongest "causal link between homes that were non-compliant with human resource management…and deficiencies in Behaviourial Management";[115] that "the needs of residents with challenging behaviours are managed effectively." During 2001-2002, the vast majority (70%) of the elderly discharged to residential aged care from hospital after a falls-related injury are *returning* there (only 7% of those admissions were for *new* residents).[116] **Brain Injury Australia believes that aged care services staff deserve more and better training in challenging behaviours the result of cognitive decline generally - and Traumatic Brain Injury specifically - necessary to meet the needs of either residents returning from hospital after a fall, or those newly admitted.**

8. Traumatic Brain Injury in the elderly

i. outcomes

Brain Injury Australia knows of only one study completed in Australia into the outcomes of TBI in the elderly.[117] Out of 428 patients aged 65 and over admitted to Victorian hospital trauma units between 2005 and 2007 with a severe TBI, the 310 who survived to discharge were followed up 6 months later. The most common cause of their TBI – in 378, or 88.7% of cases – was a fall. The study found **"older patients with serious head injury have a high mortality rate and generally poor functional outcomes at 6 months…and that the older group (aged 75 years and over) demonstrated 60% lower odds of experiencing an independent living outcome at 6-months compared to patients aged 65-74 years. The elderly take longer to recover to their pre-injury level of functioning compared to younger TBI patients, have longer length of stay and need more rehabilitation."**[118]

The findings conform to the results of two surveys of research into the outcomes of TBI in the elderly. One review of 18 studies on "geriatric TBI" published since 1986 "demonstrated that **age is the strongest clinical predictor of recovery from TBI, second only to measures of injury severity.** Advanced age is considered a negative prognostic indicator."[119] The Ontario Neurotrauma Foundation's *Evidence-Based Review of Moderate to Severe Brain Injury* reviewed 13,640 research articles and, of the 466 selected, found "Level 3 evidence that inpatient rehabilitation results in a higher rate of change on functional measures in patients aged 18-54 than patients aged 55 years or older.[120]

Goleburn and Golden's survey, referred to above, found that: falls are the leading cause of TBIs in those aged 65 and above, accounting for 50–80% of cases; their risk of intracranial bleeding was three times that of younger TBI patients; their length of hospital stay was twice as long as younger TBI patients; they experienced longer periods of post-traumatic amnesia (PTA); they could be at increased risk of developing Alzheimer's Disease (AD) or that their TBI hastened the onset of AD;[121] only between 30% and 50% returned directly home; they were at much greater risk of temporary or permanent nursing home placement; and they experienced "poorer outcome following rehabilitation…attributed to the higher incidence of general brain deterioration, reduced psychosocial and financial support, and decreased motivation and lowered expectations for recovery by staff and patient."[122]

The results of an international comparison of outcomes in 5,612 elderly TBI cases "support the hypothesis that the adult brain has a decreased capacity for repair as it ages" and that **every ten years of age at injury increases "the odds on poor outcome" by between 40% and 50%. The "optimal change points" in age at TBI were "60 years for mortality and at 29 years for unfavorable outcome."**[123]

Goleburn and Golden note that their survey "represents a miniscule percentage of the tens of thousands studies on the general topic of TBI in the literature…Thus, whereas interest has increased in this area, it [geriatric TBI] still remains an area of relative neglect for researchers."[124] Brain Injury Australia has little reason to believe that the outcomes for elderly *Australians* with a TBI would be markedly different - in the absence of local research - and its search of the Australian Government's Ageing Research Online directory, which "includes some 731 project entries from 202 research organisations and involving 1,192 different principal or co-researchers"[125] found 60 studies into falls, 34 into falls prevention, 13 on fractures (mostly hip), 108 into dementia, only 4 on the brain, none specifically on TBI in the aged.

8. ii. Traumatic Brain Injury's place in post-falls assessment and management

Brain Injury Australia is under no illusion that the effects of TBI in the elderly may not be readily distinguishable from other age-related brain failure, especially in the time-poor and resource-constrained context of acute care. This is especially the case when the majority of hospitalised falls-related TBIs in the elderly tend towards the "mild" end of the spectrum and where other falls injuries may demand more urgent attention. But Brain Injury Australia notes the following correspondence, from an author of one of the surveys described above:

> "I think that part of the problem with head injury in our elderly is that we tend to dismiss the head injury and focus on the more immediate and overwhelming fractures etc. In our own studies, we found many cases of head injury misidentified as Alzheimer's…In other cases, the impact of the head injury is misidentified as the effects of pain and other medications, while in others it is assumed to be premorbid [occurring before their injury] (cognitive decline of some kind) which caused the fall—head injury is way down the list for consideration except in dramatic cases like serious automobile accidents. It may also arise from the fact that a mild head injury (which is what we see most frequently in falls) which causes few long-lasting problems in the young has much more serious effects in the elderly long-term. But mild TBI in the elderly is dismissed because all the "literature" on recovery is based on the young."[126]

The complexities and subtleties in presentation of the elderly TBI aside, Brain Injury Australia is mystified by the lack of consistency between jurisdictions in post-fall clinical assessment. For example, New South Wales, Victoria and Tasmania offer "[loss of] consciousness" or "[altered] consciousness" as part of their post-falls assessment and management guidelines. New South Wales' Falls Prevention Program/ Clinical Excellence Commission "Post Fall Assessment and Management" guidelines classify patients according to those who "Fall and Hit Head", those who "Fall and Do Not Hit Head" and those who experience an "Unwitnessed Fall". Brain Injury Australia is not aware of any other jurisdiction that puts "head injury" and neurological observations in the prime position of post-falls assessment. The NSW Clinical Excellence Commission acknowledges that **"one of the issues that we have is in the education of staff in regards to the seriousness of a fall-related head trauma injury, and the management and care of an older person. These patients often have a longer length of stay and ongoing care needs that may precipitate the person to move to long-term residential aged care.** Often it is not possible for them to attend rehabilitation facilities, and if returning to home, require co-ordination of ongoing care services which can be challenging to put in place."[127]

Brain Injury Australia notes that, while the Department of Health and Ageing's "National Falls Prevention for Older People Plan: 2004 Onwards" promises a "collaborative and coordinated approach", there appears to be a profound lack of consistency between health jurisdictions in their approach to falls-related "head injury" and TBI. Brain Injury Australia welcomes the commitment given by the Australian Commission on Safety and Quality in Health Care - in response to representations from Brain Injury Australia along the lines of the content of this paper - that **"TBI should be more prominently noted as part of immediate post-fall management"** in the forthcoming 3rd edition of its *Preventing Falls And Harm From Falls In Older People: Best Practice Guidelines For Australian Hospitals And Residential Aged Care Facilities*[128], to be released in August 2009. Further, "this is appropriate given the structure of the guidelines into specific falls risks and interventions required to address them. The post-fall management chapter gives guidance on managing individuals in the immediate aftermath of a fall."[129] Brain Injury Australia wonders, though, how such commitments to TBI being more "prominently noted" in future editions of the *Guidelines* can be met if the Commission retains its devotion to the data set developed by the Prevention of Falls Network Europe (ProFaNE), which specifically excludes "soft tissue and organ injuries" like TBI because they "have been defined and classified in a range of ways, none of which were considered satisfactory…Peripheral fracture rate, verified using radiological evidence, was considered to be the only robust and feasible measure of injury that could be recommended. *Peripheral fractures account for the majority of cost, morbidity, and mortality generated by fall-related injury*."[130] The 2008 edition of the *Guidelines*' "definition of an injurious fall" includes "only injuries that could be confirmed accurately using existing data sources…peripheral fractures–defined as any fracture of the limb girdles and of the limbs. However, head injuries, maxillo-facial injuries, abdominal, soft tissue and other injuries are not included in the recommendation for a core data set."[131] **It is a source of ongoing frustration for Brain Injury Australia that injury prevention professionals, researchers and policymakers dismiss TBI due to the dearth of "good data" or discount it as being "not prominent"[132] when key health information bodies resist collection.**

Recommendation 5:

Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs assert, via Federal, State and Territory ministers for health, and with the Australian Commission on Safety and Quality in Health Care that current and future guidelines for the assessment and care of falls-related injury include "head injury" and/ or Traumatic Brain Injury in all healthcare data collection.

8. iii. Traumatic Brain Injury rehabilitation for the elderly - TBI-specific?

"I must have made hundreds of phone calls attempting to get some kind of help for Tom. Whether I was chasing physiotherapy, occupational therapy, continence aids, transport, help in the home, or home modifications the answer was either 'no', or 'there's no funding' or he didn't 'qualify' for assistance. As soon as I mentioned brain injury I felt that we were put in the too hard basket. I soon realised that if we used the term 'stroke' or 'brain haemorrhage' there was a more positive response from service providers, and although we never did it, the temptation to actually lie about Tom's condition became quite strong. Anything we did access was either by accident - we found a 'seniors' day group but Tom was 'sacked' after one visit because he could not find the toilet by himself - or was inappropriate: although Tom was 69 he was still 'young at heart' and not ready to sit around a room of elderly people singing 'old time songs'."[133]

Where brain injury-specific rehabilitation services are available, Australians aged 65 and over may have their access limited by strict, or de facto, age cut-offs or as a result of clinical judgment about outcome potential where bed numbers are limited. Some services indicated that clients would need to be of "working age" or "have achievable rehabilitation or return-to-work goals". One clinician said a "very small percentage" of clients were aged 65 and over while the information available to the public about his service states that only those "aged between 16-65 years with rehabilitation goals are accepted" – which probably demonstrates that bed availability gives some greater latitude to clinician judgment.

This paper is not the appropriate vehicle for argument about the artificiality of strict age-based cut-offs to service access. Neither does Brain Injury Australia have any direct evidence that cost constraints in *State and Territory Government*-funded health services have resulted in people with a TBI aged over 65 years – most of whose injuries would be non-compensable - being shifted to *Australian Government*-funded aged care services, except to note the perverse incentives therein. But, in the context of the shifting ground in policy on government health, aged care and disability services responsibility, Brain Injury Australia notes the following: firstly, Australians' increasing life expectancy – by 2047 men and women aged 65 can expect to live a further 3.7 years and 2.8 years, respectively, than their counterparts born in 2007;[134] secondly, Australia's aged dependency ratio (the proportion of people aged over 65 to those of traditional "working age" - 15-64) is projected to increase from almost 20 per cent in 2007 to over 42 per cent by 2047) and resulted in a strong public policy emphasis on encouraging older workers to remain in paid employment for as long as possible (for example, the introduction of age discrimination legislation at federal, state and territory levels, the gradual increase in the age at which women can access the Age Pension, the introduction of a Pension Bonus Scheme etc.) thus; thirdly, between 2001 and 2006 labour force participation rates for people aged 65 and over have risen by 2.7%, to 8.2%[135]. While Brain Injury Australia accepts that an enormous service infrastructure has been built around the mark of 65 years, such social change suggests it is overdue for overhaul.

Clinicians and allied health professionals Brain Injury Australia communicated with in preparation for this paper had mixed views on the amount, quality and efficacy of rehabilitation services available to people aged over 65 years. None knew of services that addressed the rehabilitation needs specific to TBI in the elderly - in challenging behaviour, for example. And Brain Injury Australia has no evidence to suggest either that Home and Community Care (HACC)-funded services (90% of clients received less than two hours of service per week in 2006-07)[136] or residential aged care staff have the relevant expertise or capacity or that dementia services provide behaviour management applicable or appropriate to TBI (some had experience of elderly patients with a TBI in need of behaviour support or help with cognitive tasks being denied access to dementia services due to eligibility criteria). Many expressed concerns about the lack of knowledge of Aged Care Assessment Teams (ACAT) about TBI; that the elderly were either assessed much too early in their recovery resulting in premature admission to residential aged care or that TBIs with complex needs were "fobbed off" – as one rehabilitation specialist put it – to any brain injury service that would take them or that the shortage of residential aged care places meant that families under the pressure of care of a complex TBI had to "prove" their loved one's low functioning to ACAT. Those clinicians and allied health professionals who thought aged care services "better resourced" or "better placed" to meet the rehabilitation needs of the elderly TBI rarely had any direct evidence of outcomes on which to base their opinions. Prevailing views included: since most TBIs in the elderly were mild, residential aged care could "manage mild TBI patients" or that since most TBIs in the "elderly happen in persons with dementia…any added TBI is seen as a dementia complication" manageable by dementia services.

Whether health or aged services should take responsibility for the elderly TBI, their care takes place in a vacuum of research evidence and in the absence of guidelines "resulting in an ad hoc approach to treatment dependent on individual or institutional experience."[137] "Although the literature is replete with well-researched models and guidelines for the rehabilitation of younger adults with TBI, it contains minimal research on the rehabilitation of geriatric TBI patients specifically. Current models of rehabilitation are often based on extrapolations from younger TBI patients and from Alzheimer's disease and stroke rehabilitation studies."[138]

Recommendation 6:

Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs pursue with the Australian Institute of Health and Welfare (AIHW) research into the *outcomes* of Traumatic Brain Injury, particularly in the elderly, as a matter of priority.

9. "secondary" Traumatic Brain Injury – antithrombotics

Stroke is the second leading cause of death in Australia after ischaemic heart disease. And while an ageing population puts more Australians at risk, deaths from stroke have declined; between 1998 and 2007, by 6.4% - from 12, 271 deaths to 11,491. A leading cause of stroke is the most common of the cardiac arrhythmias - abnormal heart rhythms - atrial fibrillation (AF). Stroke risk increases with AF because blood may pool and form clots in poorly contracting atria - the two upper chambers of the heart. The prevalence of AF rises from about 3% of the Australian population at 65 years to more than 10% by 85 years. AF accounts for about 1.5% of all strokes in people aged 50-59 years, and almost 25% of strokes in people aged 80-89 years.

Part of the reason for the decrease in stroke mortality and morbidity is the increasing use of antithrombotic medications – anticoagulants (the most common is warfarin) and antiplatelets (the most common is aspirin) – which "thin" the blood and stop it from clotting. A 2007 survey of studies comparing the efficacy of warfarin and aspirin found use of the former resulted in a 60% reduction in both disabling and non-disabling strokes and use of the latter a 13% reduction in disabling strokes and a 29% reduction in non-disabling strokes.[139]

An analysis of trends in the supply of heart medicine conducted by Australian Institute of Health and Welfare's National Centre for Monitoring Cardiovascular Disease found that **prescriptions for antithrombotics rose by 4,700% between 1995 and 2005 (the next nearest increase was in cholesterol-lowering drugs like statins – at 1,200%).[140] A report by the University of Sydney's Australian General Practice Statistics and Classification Centre into the prescribing habits of 9,875 General Practitioners between April, 1998 and March, 2008 estimated that an additional 820,000 scripts for "anti-thrombotic agents" were written nationwide during the reporting period, 300,000 for warfarin alone.[141]**

People on antithrombotic medication are especially vulnerable to Traumatic Brain Injury from intracranial bleeding the result of a fall. The Australasian Society of Thrombosis and Haemostasis' 2000 *Consensus Guidelines for Warfarin Therapy* for AF rates the "small increase in serious bleeding" risk – of "1.0% to 1.3% per annum" – outweighed by the reduction in "the annual risk of a first ischaemic stroke…by almost 70% (from 7% to 3% per annum) and mortality by 33%."[142] More recent evidence from the United States - where TBI is the fifth leading cause of death among the elderly - rates the risk of intracranial bleeding much higher: "utilizing the population base prevalent to anticoagulation for atrial fibrillation and minor TBI in the over 65 age group, and assuming a risk of approximately 10% of a spontaneous intracranial hematoma in an anticoagulated patient, **the risk of a posttraumatic intracranial abnormality in an anticoagulated patient was calculated to be increased tenfold, given the same clinical presentation, over a nonanticoagulated patient."**[143]

Brain Injury Australia knows of no Australian research systematically comparing the falls injury outcomes of anticoagulated and non-anticoagulated groups.[144] However, a recent study from the United States (where over 1 million people take warfarin) comparing such outcomes in 12,670 trauma admissions over 6 years found that **anticoagulated patients suffered from a more severe head trauma, required more neurosurgical interventions, experienced more infections, and had a higher mortality rate than the non-anticoagulated.** "In this study, almost a tenth of the trauma patients were over 65 years of age and over 60 per cent of these suffered from a closed head injury emphasizing the relevance of this clinical investigation. These patients suffer significant injury that is exacerbated by their use of anticoagulation….Maximal protection from these poor outcomes may be determined not by correction of coagulopathy after trauma, but by a careful assessment of benefit versus risk of anticoagulation, better follow-up of anticoagulated patients by their primary care physicians, as well as injury prevention strategies in this high-risk group of patients."[145]

There are clear relationships between antithrombotics use, falls and the risk of major intracranial bleeding in the "old old". All of the age-specific falls injury, falls deaths, TBI and TBI death rates are highest in those aged 85 and over.[146] The Australasian Society of Thrombosis and Haemostasis' 2000 *Consensus Guidelines* recommend that "age alone" not be "a contraindication to warfarin therapy. Although one report showed that each decade above the age of 40 raised the risk of major bleeding by almost 50%, with a maximum effect above 70 years[sic], others have found that age below 70 years has no influence."[147] **A more recent "Clinical Update" on AF in the *Medical Journal of Australia* states "warfarin use is very unlikely[sic] in patients older than 85 years, despite evidence of its safety in selected patients."[148] Of the 248,565 prescriptions for antithrombotics written during 2005-2006, 20,952 for warfarin – and 32,799 for "other antithrombotic agents" - were for Australians aged 80 years and older.** The fastest growing segment of the Australian population is aged 85 and older – increasing by 70% between 1996 and 2007. And as Australia's life expectancy continues to improve, their number is expected to more than triple by 2047. Even when adjusted for

age, rates of AF in the "old old" will also increase. Currently, one-third of Australians aged 80 and over experience AF. By 2050, it is expected to reach 50%.[149] And **prescriptions for warfarin, for instance, are rising by around 9% per annum. "Given that trauma is the fifth leading cause of death in this age group, with TBI from falls an increasingly common occurrence, it is highly likely that emergency physicians, trauma surgeons, and neurosurgeons will be confronted with the clinical scenario of a TBI in an anticoagulated patient on a regular basis**."[150]

Brain Injury Australia has a range of concerns about the widespread and increasing use of antithrombotics in populations at the greatest risk of falls, especially when the *general* awareness of TBI is so low. Firstly, Brain Injury Australia is not in a position to dispute any medical consensus on the relativities of an increase in the risk of major (and potentially fatal) intracranial bleeding versus the benefit in stroke reduction with antithrombotics use. However, it has reason to doubt whether this risk-benefit trade-off is always explained to patients, especially in those where the risk-benefit ratio, above, narrows markedly - aged 85 and over. The limited public awareness campaigning conducted in Australia on antithrombotics use teeters between trivializing bleed risk and unnecessarily alarming consumers – for example, patients "may also consider using an electric razor instead of a blade."[151]

Secondly, Brain Injury Australia is concerned that differential subsidies under the Pharmaceutical Benefits Scheme might favour warfarin over other antithrombotics with potentially better stroke-reduction and bleed-risk profile, but which are more expensive. A detailed analysis by the Australian General Practice Statistics and Classification Centre of warfarin prescribing by 89 General Practitioners in 2005 found that of the 78 patients who reported a history of AF (out of a total of 2,758 seen), the majority (69.2%) were currently taking warfarin.[152]

Thirdly, while the Australian Commission on Safety and Quality in Health Care's commitment that "TBI should be more prominently noted as part of immediate post-fall management" in the forthcoming 3rd edition of its *Preventing Falls And Harm From Falls In Older People: Best Practice Guidelines For Australian Hospitals And Residential Aged Care Facilities*[153] is to be welcomed, Brain Injury Australia is regularly notified of the failure of acute care to both conduct neurological checks in elderly "head injured" patients capable of detecting intracranial bleeding or compile a patient history sufficient to determine antithrombotic use. As one clinician put it; "A CT [Computed Tomography] of the head would probably be the last procedure ordered for an elderly patient with head injury *and* fractured neck of femur due to a fall. And if the person was agitated, disorientated…[it is] highly likely to be written off as shock, pain, delerium, dementia." Brain Injury Australia notes recently released *Guidelines for Mild Traumatic Brain Injury (MTBI) following Closed Head Injury* produced by the Motor Accidents Authority of New South Wales – Mild Traumatic Brain Injury from closed head injury comprises between 70% and 90% hospitalised TBI – and its recommendation that all "elderly patients" (65 years and over) receive "routine CT scanning…unless patient is asymptomatic with no other risk factors" due to "increased risk of significant intracranial injury". Brain Injury Australia takes "routine" to mean on admission and that "risk factors" would be eliminated, in part, by taking a patient history but clinical deterioration the result of intracranial bleeding – increasing headache, vomiting, change in responsiveness, abnormal behavior etc. – may not occur until as long as 72 hours post-trauma, and in spite of normal neurological examination on admission.[154] **Brain Injury Australia knows of a number of cases where, due to clinician inattention to fall-related TBI in an elderly patient or failure to conduct initial or follow-up neurological observations or compile a history that investigates anti-thrombotics use, has resulted in patient death from undetected intracranial bleeding.**

Fourthly, this paper has drawn attention to the apparent inconsistencies between jurisdictions in their approach to post-falls assessment, specifically as it relates to TBI. Even if a genuinely national approach were to be achieved, Brain Injury Australia is realistic about the future of acute care for falls (regardless of the setting) as it faces the confluence of an ageing population, enhanced life expectancy, increasing rates of falls injury with increasing rates of AF matched by antithrombotics use. Time poor and resource-constrained staff already demonstrate poor compliance with guideline care for falls injury, one study finding that less than 4% of fallers experienced best practice - resulting in almost 30% increase in risk of future falls injury.[155] But Brain Injury Australia believes that health and aged care staff and providers are opening themselves to allegations - and litigation – of breach of duty of care when they undertake less-than-holistic post-falls assessment, specifically when the potential for TBI, intracranial bleeding from "head injury" is overlooked or discounted.

Lastly, Brain Injury Australia is concerned that the "tail" of coagulopathy might be wagging the "dog" of best practice post-falls assessment. Whether a person of any age falls and "hits head" or not - and what that might mean – matters, or not. Brain Injury Australia believes that an initial neurological assessment should be conducted and ongoing neurological observations taken as part of post-falls care where a head injury is indicated, regardless of whether the patient is taking anti-thrombotics, or not.

Recommendation 7:

Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs request, via the Department of Health and Ageing and its National Medicines Policy/ "Quality Use of Medicine" program and the Therapeutic Goods Administration, an urgent investigation into safe prescribing of anti-thrombotics, especially warfarin, in the elderly.

Recommendation 8:

Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs refer, via the Minister for Health and Ageing, a request to the Pharmaceutical Benefits Advisory Committee (PBAC) to examine the relative subsidisation – measured against relative efficacy - of the range of anti-thrombotics available under the Pharmaceutical Benefit Scheme (PBS).

10. ladder-related Traumatic Brain Injury:

"Male, aged in his 80s, home maintenance (clearing roof gutters)…The deceased fell from the ladder suffering serious head injuries. Police inspected the ladder and reported it was made of timber, in a rickety condition, and had fallen apart."[156]

3,846 falls from ladders resulted in hospitalisation for serious injury in 2004–2005. By far the most common specified place of occurrence was the home (43.2% - falls from a ladder in an "industrial and construction area" or a "trade and service area" accounted for 4.2% and 2.4% respectively). Incidence was highest in those aged 60-84 years "and decreased only slightly for people of the oldest age groups."[157] It is perhaps surprising that the *proportion* of injurious falls from ladders in the home was higher for women (59.6%, or 393 cases) than for men (39.8% or 1,269) though this may reflect their generally older age at injury, and their risk exposure – outliving their husbands, living alone. The activity most commonly reported - in more than 1 in 4 cases - was "while engaged in other types of work" – a category which includes housework, gardening and home maintenance.

Deaths due to a fall from a ladder are rare – around 20 occur per year. Detailed analysis undertaken by the Australian Institute of Health and Welfare estimates this equates to 1 death for every 175 hospitalisations for ladder-related injury (excluding deaths prior to hospitalisation).[158] **Because of the heights involved, "injuries to the head" were common – the "Principal Diagnosis" in 12.3% of cases in 2004-05 – behind "injuries to the elbow and forearm" (19.1%) and "injuries to the knee and lower leg" (16.4%).[159] "Intracranial injury" was the Principal Diagnosis in 5.7% (219) of cases.[160] Hospitalised "head injuries" after a fall from a ladder were fourth most likely to result in "intracranial injuries" (in 42% of cases) after falls from wheelchairs, cliffs and steps or stairs.** Ladder-related TBIs also experienced lower likelihood of survival to discharge relative to other falls-related TBI.[161] Again, this is largely a function of the height of the fall, and commonly the age of the climber. Separate Australian Institute of Health and Welfare analysis of falls injury in those aged 65 and over during 2005-2006 found that men fell from ladders around 4 times as often as women and sustained a higher proportion of injuries to the "head and the trunk" (15.0% and 37.4%, respectively) than females (10.1% and 18.1%, respectively), again "suggesting falls from a greater height."[162] A Victorian survey of the 4,553 ladder-related fall injury hospitalisations between 2001 and 2005 found that 59% of emergency department presentations, and 91% of major trauma cases (with an "Injury Severity Score" greater than 15) involved falls from a height greater than 1 metre.[163]

The number of hospitalised injuries from falls from ladders is increasing, by an estimated 5.7% per year between 1999 and 2005. And the number of ladder-related injuries involving people aged 60 years and over is increasing at a much higher rate than for any other age group - by 24.2% between 1999 and 2005, more than triple the rate of increase of those aged under 60 years (7.7%, over the same period).[164] Falls "while working for income" – largely in men aged between 20 and 60 years - made up only 10% of ladder-related falls injuries cases overall in 2004-05. While Brain Injury Australia does not underestimate the significance of ladder-related TBI as an *occupational* health and safety issue, it believes that much more effort needs to be expended in falls prevention programs targeting the elderly engaging in home maintenance, "do-it-yourself (DIY)" and general housework.[165] This is especially important with an ageing population given governmental commitments to "ageing in place" (encouraging older Australians to live independently at home for as long as possible, with outright home ownership being the almost universal tenure type with this population) and to "healthy" and "active" ageing strategies. And given the relationship, described above, between fall height, TBI risk and general injury severity Brain Injury Australia believes that falls prevention programs focusing on ladder use may only get one chance at success. Brain Injury Australia agrees with the authors of the Victorian research (above) that; "there has not been a strategic approach to prevention of injuries related to falls from ladders *outside the workplace*."[166] An almost unique array of intrinsic and extrinsic risk factors as well as barriers to behaviour change needs to be addressed in the prevention of ladder-related injury in the elderly. For instance, interviews with 118 residents of Melbourne aged 60 years and over found that, alongside a desire to maintain independence and fitness, the expense involved in hiring tradespersons to undertake home maintenance - especially for those on a fixed income or pension - meant "do-it-yourself".[167] Along with medication use, alcohol is implicated in over half of all TBIs in the elderly[168] and associated with 7.5% of falls deaths.[169]

Ladder use is regularly mentioned in the Australian falls prevention program literature as a falls risk, and while some jurisdictions have undertaken awareness campaigns addressing "DIY" injury,[170] the only national level information targeting ladder use by ageing Australians has been pursued by the Australian Competition and Consumer Commission (ACCC).[171] While the ACCC's interest in an issue of public health might seem eccentric, it is one of the very few falls prevention publications produced in Australia that names TBI as a falls risk – "You don't have to fall far off a ladder to be seriously injured: 1–2 metres can be enough. Fractured limbs, spinal cord damage, severe brain injury or even death can result.

Recommendation Nine:

Falls from ladders are common, are often fatal or result in severe injury and disability, but are highly preventable. Brain Injury Australia recommends that the Department of Families, Housing, Community Services and Indigenous Affairs, alongside other Australian Government departments and agencies, fund Brain Injury Australia and other injury prevention and safety promotion organisations to conduct a national public awareness campaign devoted to ladder/ "DIY" injury.

ENDNOTES:

[1] Participation restrictions are "problems an individual may experience in involvement in life situations" such as attending school or participating in recreation. (Australian Bureau of Statistics' 2003 Survey of Disability, Ageing and Carers)

[2] Brain Injury Australia considers the Australian Bureau of Statistics' 2003 Survey of Disability, Ageing and Carers radically underestimates the real number of Australians with an ABI. The survey's sample comprised "14,000 private dwellings and 300 non-private dwelling units", covering "people in both urban and rural areas in all states and territories, except for those living in remote and sparsely settled parts of Australia. The exclusion of these people will have only a minor impact on any aggregate estimates that are produced for individual states and territories, with the exception of the Northern Territory where they account for over 20% of the population." Estimates of the prevalence of ABI in Indigenous communities generally, and in the Northern Territory specifically (where Indigenous Australians comprise 30% of the population) indicate rates up to three times that of non-Indigenous communities. The survey had no capture of the criminal justice system or the homeless where estimates of the prevalence of ABI range between 40%-80% and 10%-30% respectively. The survey's results were "based, wherever possible, on the personal response given by the respondent. However, in cases where information was provided by another person, some answers may differ from those the selected person would have provided." Brain Injury Australia considers that, given the circumstances in which many ABIs occur – especially in the young, disclosure of the nature and level of impairment, let alone ABI itself, to a government-appointed surveyor may be difficult. The survey recognises this: ""A number of people may not have reported certain conditions because of: the sensitive nature of the condition…[and] a lack of awareness of the presence of the condition on the part of the person reporting…" Also, ""The need for help may have been underestimated, as some people may not have admitted needing help because of such things as a desire to remain independent…" Given the multiplicity and complexity of disability that many people with an ABI experience, cited above, the following statements of survey are also noteworthy: "as certain conditions may not have been reported, data collected from the survey may have underestimated the number of people with one or more disabilities" and "as certain conditions may not have been reported, data collected from the survey may have underestimated the number of people with one or more disabilities." Brain Injury Australia is grateful that the July, 2008 Community and Disability Services Ministers' Conference agreed to inject $6.5 million to enhance the next iteration of ABS Survey of Disability, Ageing and Carers, including doubling the sample size.

[3] Activity limitations are "difficulties an individual may have in executing activities" such as learning to read (Australian Bureau of Statistics' 2003 Survey of Disability, Ageing and Carers)

[4] "Very few people (1,400) aged 65 years or over reported ABI as their main disabling condition, possibly because they had other significant health conditions that they saw as causing more problems. Almost all (96%) people with ABI aged 65 years or over had physical/diverse disability, and more than two-thirds (68%) had sensory/speech disability…Some of the most common health conditions experienced by people aged 65 years or over with ABI were hearing problems (54%), arthritis (44%) and hypertension (40%). About one in five (20%) older people with ABI had experienced a stroke, and one in eight (12%) had dementia." Disability in Australia: Acquired Brain Injury, Bulletin no. 55, Australian Institute of Health and Welfare, Canberra, 2007.

[5] Zecevic et al., "Defining a Fall and Reasons for Falling: Comparisons Among the Views of Seniors, Health Care Providers, and the Research Literature", The Gerontologist, Vol. 46, No. 3, pp 367-76.

[6] Mary Tinetti et al., "Reducing the risk of falls among older adults in the community", Berkeley, 2006.

[7] The World Health Organisation, Violence and Injury Prevention and Disability - http://www.who.int/violence_injury_prevention/other_injury/falls/en/index.html

[8] Morse, J. M., Tylko, S. J., and Dixon, H. A. "Characteristics of the fall-prone patient", Gerontologist, 1987; 27(4):516-522.

[9] "The question remains: Do seniors, their health care providers, and researchers speak the same language when discussing falls? The fact that the terms slips, trips, and falls are often used interchangeably shows the confusion in the current situation. When properly defined, a slip (sliding of the support leg) and a trip (impact of the swinging leg with an external object or a body part) clearly represent different events with different causes for loss of balance. Both can cause a fall. To our knowledge, no researcher has attempted to define a fall by asking seniors what they think a fall is or what they think causes it.", Aleksandra A. Zecevic et al., "Defining a Fall and Reasons for Falling: Comparisons Among the Views of Seniors, Health Care Providers, and the Research Literature, The Gerontologist, Vol. 46, No. 3, 2006, p. 368.

[10] Correspondence to Brain Injury Australia from the Department of Rehabilitation Medicine, Westmead Hospital, Westmead NSW.

[11] Age Concern, "Looking for a Fall. A Report on Falls Incidence in the United Kingdom", London, 1997.

[12] Correspondence to Brain Injury Australia from the Department of Geriatric Medicine, Hunter New England Area Health Service, New South Wales.

[13] Intentional injuries are excluded from these numbers. There were an estimated 23,900 hospitalised injury cases due to self-harm in 2004-5. 97 of those involved "self-harm by jumping from a high place". The highest age-specific rates for cases of hospitalised self-harm were for females aged 15–19 years and for males aged 25–29 years. (Bradley C and Harrison J, "Hospital Separations due to Injury and Poisoning, Australia 2004–05", Australian Institute of Health and Welfare, Adelaide, 2008.)

[14] Ibid., p.iv.

[15] Bradley C and Pointer S, "Hospitalisations due to falls by older people, Australia 2005–06", Australian Institute of Health and Welfare, Adelaide, 2008, p.vii.

[16] Ibid., p.58. (See page 23.)

[17] Ibid., p.61.

[18] A set of statistical techniques used to remove as far as is possible the effects of differences in age when comparing two or more populations.

[19] "The number of new cases of fall-related injury resulting in hospitalisation is difficult to estimate, due to certain limitations of data available at a national level. The incidence of injury events resulting in hospitalisation can be estimated from NHMD data by excluding any separation meeting the specified selection criteria which also has a mode of admission denoting 'transfer from another acute hospital. This method accounts for transfers between hospitals but not readmissions, if these are also recorded as injury cases due to a fall. Calculated in this way, the estimated number of hospitalised injury cases due to falls in people aged 65 years and over in 2005–06 was 66,784—a rise of 6,287 cases since 2003–04 (10.4%). These 66,784 fall injury cases represent 2.6% of all hospital separations for the population aged 65 years and older in 2005–06.", Bradley C and Pointer S (2008), op.cit., p.3.

[20] Claire Bradley and James Harrison, "Hospitalisations due to falls in older people, Australia, 2003–04", Australian Institute of Health and Welfare, Canberra, 2007

[21] Ibid., p.1.

[22] Report to the Department of Health and Ageing by Jerry Moller, Principal Researcher, New Directions in Health and Safety, 2003.

[23] While it is unfortunate that each issue in these series does not relate to the same year, the data source for all three publications is the Australian Institute of Health and Welfare's National Hospital Morbidity Database.

[24] P O'Connor, "Hospitalisation due to Traumatic Brain Injury", Australia 1997-98, Australian Institute of Health and Welfare, Canberra, 2002.

[25] Ibid., p.9

[26] In general, Brain Injury Australia considers the descriptor "head injury" to be so non-specific as to be unhelpful in fostering understanding of TBI: it includes everything from abrasions to the face to an "open" head injury (where an object penetrates the skull and enters the brain). "Head injury" is not always associated with loss of consciousness, let alone TBI"Head injury…is a non-specific and antiquated term, which includes clinically evident external injuries to the face, scalp, and calvarium, such as lacerations, contusions, abrasions, and fractures, and may or may not be associated with TBI. TBI injury is more properly defined as an alteration in brain function manifest as confusion, altered level of consciousness, seizure, coma, or focal sensory or motor neurologic deficit resulting from blunt or penetrating force to the head." - Bruns J and Hauser A, "The epidemiology of traumatic brain injury: a review", Epilepsia, 44:10, 2003, p. 2–10.

[27] Bradley C and Harrison J (2007), op.cit., p.5.

[28] Helps, Henley and Harrison, op.cit., p.26.

[29] Ibid., p.65.

[30] Ibid., p.77.

[31] Brain Injury Australia thanks the staff of Professor James Harrison and the staff of Flinders University's Research Centre for Injury Studies for the provision of this data.

[32] This estimate of proportion results from Brain Injury Australia's cross-referencing the Australian Institute of Health and Welfare's *Hospital separations due to injury and poisoning, Australia 2004–05* (p. 60) against the age-specific TBI data supplied by the Research Centre for Injury Studies. Note that it does not include hospitalizations for falls-related TBI where "Other TBI" was the classification. Given the fact that falls accounted for 57% of these TBIs, the proportion is bound to be greater than 1:20.

[33] Helps, Henley and Harrison, op.cit., p.viii.

[34] Ibid., p. 106.

[35] J A Stevens, P S Corso, E A Finkelstein, T R Miller, "The costs of fatal and non-fatal falls among older adults", Injury Prevention, 2006:12, p. 290–295

[36] "the percentage of TBI discharges with an unknown external cause of injury was quite high (43.7%), so the number of fall-related TBI was likely underestimated." KE Thomas et al. "Fall-related traumatic brain injury deaths and hospitalizations among older Adults - United States, 2005", Journal of Safety Research, 39, 2008, p. 270.

[37] Hilaire Thompson, Wayne McCormick and Sarah Kagan, "Traumatic Brain Injury in Older Adults: Epidemiology, Outcomes, and Future Implications", Journal of the American Geriatrics Society, 54:1590–1595, 2006.

[38] Booklets, fact sheets, posters and events planning guides are viewable at; http://www.cdc.gov/BrainInjuryInSeniors/

[39] www.who.int/violence_injury_prevention/other_injury/falls/en/

[40] Comprising 103 "suicide-related falls" and 3 falls of "undetermined intent", Henley G, Kreisfeld K and Harrison JE, "Injury deaths, Australia 2003–04", Australian Institute of Health and Welfare, Adelaide, p.28.

[41] Australian Bureau of Statistics, "Causes Of Death, 2007", p.38/39

[42] Biswadev Mitra et al., "Management And Hospital Outcome Of The Severely Head Injured Elderly Patient", Australian and New Zealand Journal of Surgery, 78, 2008, p. 588. Cagetti B, Cossu M, Pau A et al., "The outcome from acute subdural and epidural intracranial haematomas in very elderly patients", British Journal of Neurosurgery, 1992: 6, p. 227–31.

[43] Ibid., p.34.

[44] "…Principal Diagnosis is the condition considered to most completely explain the episode in hospital, these cases can be regarded, with some confidence, as being ones where hospitalisation has occurred because of TBI." Helps, Henley and Harrison, op.cit., p.9.

[45] "TBI cases in which an injury other than TBI was recorded as the Principal Diagnosis. Injury was the main explanation for these episodes of in-hospital care, and TBI was recorded as being present. TBI alone might not account for the admission, although an injury to the head was the Principal Diagnosis for a little over half of these cases." Ibid., p.58.

[46] "…cases with a TBI code that do not meet the criteria for inclusion in…Principal Diagnosis or…an Additional Diagnosis. Cases reported as being inward transfers from other acute hospitals were excluded from case counts to avoid double counting." Ibid., p.72.

[47] Ibid., p.82.

[48] Ibid., p.12.

[49] Ibid., p.30.

[50] Ibid., p.3.

[51] Ibid., p. 11.

[52] Ibid., p. 11. The next largest category – for 4,866, or 21.4% of patients – was "loss of consciousness of unspecified duration".

[53] See below, p.20.

[54] "Initial Management of Closed Head Injury in Adults" NSW Institute of Trauma & Injury Management, 2007.

[55] Helps, Henley and Harrison, op.cit., p. 11.

[56] Ibid., p. 12.

[57] Claire Bradley and James Harrison, "Hospital separations due to injury and poisoning, Australia 2004–05", Australian Institute of Health and Welfare, Adelaide, p.60.

[58] The results of cross-referencing, as above. Excludes "Other TBI" diagnoses.

[59] Yvonne Helps and Sophie Pointer "Child injury due to falls from playground equipment, Australia, 2002–04", Australian Institute of Health and Welfare National Injury Surveillance Unit, Research Centre for Injury Studies, South Australia, 2006 p.5.

[60] Malinda Steenkamp and Ray Cripps, Child injuries due to falls, Australian Institute of Health and Welfare Injury Research and Statistics Series, Adelaide, 2001, p.5.

[61] Ibid., p.10.

[62] "The Relationship Between Slips, Trips and Falls and the Design and Construction Of Buildings", Joan Ozanne-Smith, Jonathon Guy, Mary Kelly, Angela Clapperton, Monash University Accident Research Centre, 2008, p. ix.

[63] Ibid., p.35.

[64] Geoff Henley and James Harrison, op.cit., p.31.

[65] Barker, B., Hockey, R., and Miles, E., "Toddler falls from Balconies & Windows", Injury Bulletin, Queensland Injury Surveillance Unit, No. 80, February 2004, p. 1-4. (Quoted in Ozanne-Smith et al., op.cit.)

[66] Steenkamp and Cripps, op.cit., p.13. Incidence is not shown.

[67] Kreisfeld R, Newson R, Harrison J., "Injury deaths, Australia 2002", Australian Institute of Health and Welfare, Adelaide, 2004, p. 33.

[68] Bradley and Harrison (2008), op.cit., p.60.

[69] Brain Injury Australia is grateful in what follows for the data collection supplied by Dr. Kathryn Edward, Paediatric Rehabilitation Fellow at The Children's Hospital at Westmead, NSW and Kellie Wilson, Trauma Clinical Nurse Consultant at Sydney Children's Hospital Randwick, NSW, Professor Danny Cass and Patricia Manglick, Research Officer/ Data Manager, Department of Surgery, Children's Hospital Westmead.

[70] American Academy of Pediatrics, Committee on Injury and Poison Prevention, "Falls From Heights: Windows, Roofs, and Balconies", Pediatrics, Vol. 107, No. 5, 2001, p.1188.

[71] "There is a great deal of contention regarding the effectiveness of using window screens and guards for the purpose of fall prevention. Most window screens, although easily removable to allow for egress during fires, do not provide a sufficient barrier to prevent falls. Security devices such as fixed window bars, designed to keep intruders out, can also greatly hinder egress or access by fire-fighters in an emergency. The [American Academy of Paediatrics] recommends the use of operable guards for windows that can be released or removed without the need for a key or the use of excessive force. Examples of the novel designs of the guards recommended by the AAP include built in bars that appear automatically as the window is raised, guards on a hinge that swing when a pin is released, and a slide out model that requires the simultaneous depression of two pins for removal." Ozanne-Smith et al., op.cit., p.38.

[72] Ibid., p.185.

[73] Ibid., p. 189.

[74] Istre, G.R., McCoy, M.A., Stowe, M., Davies, K., Zane, D., Anderson, R.J., Wiebe, R., "Childhood injuries due to falls from apartment balconies and windows", Injury Prevention, Vol. 9, 2003, p. 351.

[75] American Academy of Pediatrics, op.cit., p.189.

[76] Ozanne-Smith et al., op.cit., p.36.

[77] Ibid., p.185.

[78] Ibid., p.xv.

[79] Ibid., p.187.

[80] "The direct cost of falls in children to the health care system in Australia has been estimated to be more than $130 million, of which $28 million was the cost of hospital inpatient care." Steenkamp and Cripps (2001), op.cit., p.1.

[81] Ibid., p.187.

[82] "Older Australia at a Glance: 4th Edition", Australian Institute of Health and Welfare, Canberra, 2007, p.85.

[83] Peel, N et al. (2008). Queensland Stay On Your Feet Community Good Practice Guidelines – preventing falls, harm from falls and promoting healthy active ageing in older Queenslanders. Queensland Health, Brisbane, p.85.

[84] "Hip fractures in Australia", Kuldeep Bhatia, Australian Institute of Health and Welfare, 2006.

[85] Ozanne-Smith et al., op.cit., p. xiii.

[86] Peel et al., op.cit., p.85.

[87] Gillespie LD et al., "Interventions for preventing falls in older people living in the community", http://www.cochrane.org/.

[88] Caroline F Finch and Stephen R Lord, "Incidence of hip fracture in New South Wales: are our efforts having an effect?" Soufiane Boufous, Medical Journal of Australia, Vol 180 21 June 2004, p.623.

[89] Bradley C and Pointer S, Hospitalisations due to falls by older people, Australia 2005–06, Australian Institute of Health and Welfare, Canberra, 2008, p.37.

[90] Centers for Disease Control and Prevention, National Center for Health Statistics, "Trends in Health and Aging" http://www.cdc.gov/nchs/agingact.htm, April, 2008, from "Hip Fractures Among Older Adults", National Center for Injury Prevention and Control (NCIPC) http://www.cdc.gov/HomeandRecreationalSafety/Falls/adulthipfx.html

[91] Brain Injury Australia correspondence with Professor Pekka Kannus, Department of Trauma, Musculoskeletal Surgery and Rehabilitation, Tampere University Hospital, Tampere, Finland. Pekka Kannus et al., "Alarming rise in fall-induced severe head injuries among elderly people", Injury, 38, 2007 81-83.

[92] Claudia R. Goleburn and Charles J. Golden, "Traumatic Brain Injury Outcome in Older Adults: A Critical Review of the Literature", Journal of Clinical Geropsychology, Vol. 7, No. 3, 2001, p. 183.

[93] Bradley C and Pointer S, "Hospitalisations due to falls by older people, Australia 2005–06", Australian Institute of Health and Welfare, Adelaide, 2008, p.38.

[93] Bradley C and Harrison JE, "Hospitalisations due to falls in older people, Australia, 2003–04", Australian Institute of Health and Welfare Adelaide, 2007, p.50.

[94] Ibid., p.14.

[95] Kannus, op.cit., p.83.

[96] Brain Injury Australia correspondence with Professor Keith Hill, Professor of Allied Health, LaTrobe University.

[97] See below, p. 18.

[98] "Staysafe for Seniors" - staysafe.nt.gov.au

[99] Publications examined and websites searched included those of; Queenland's "Stay On Your Feet", the "Falls Prevention" pages of Victoria's Department of Human Services, Tasmania's "Stand Up Right - Stay Upright!" (completed May 2005), Western Australia's Falls Prevention Health Network/ "Stay on your feet WA", and Falls Prevention South Australia's Falls Prevention in SA/ Active Ageing Australia.

[100] Correspondence with Brain Injury Australia from the Department of Geriatric Medicine, University of New South Wales, Prince of Wales Hospital.

[101] Bradley C and Harrison JE, "Hospitalisations due to falls in older people, Australia, 2003–04", Australian Institute of Health and Welfare, Adelaide, p.51.

[102] Bradley C and Pointer S, "Hospitalisations due to falls by older people, Australia 2005–06", Australian Institute of Health and Welfare, Adelaide, p.33.

[103] National Public Health Partnership, "The National Falls Prevention for Older People Plan: 2004 Onwards", Canberra, 2004.

[104] The elderly who fall once are "two to three times as likely to fall again within a year", O'Loughlin J et al. "Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly". American Journal of Epidemiology, 1993, 137:342-54. Susan Kurrle et al., "Physical Comorbidities of Dementia", National Dementia Research Forum, 2008.

[105] Bradley C and Pointer S (2008), op.cit., p.13.

[106] "Residential aged care in Australia 2006–07: a statistical overview", Australian Institute of Health and Welfare, Canberra, p.1.

[107] Rubenstein, L. Z., K. R. Josephson, et al., "Falls in the nursing home." Annals of Internal Medicine ,121, 1994, p.442-451 (cited in "The Relationship Between Slips, Trips And Falls And The Design And Construction Of Buildings", Joan Ozanne-Smith et al., Monash University Accident Research Centre, April, 2008.).

[108] Productivity Commission 2008, Trends in Aged Care Services: some implications, Commission Research Paper, Canberra, p.33.

[109] Alzheimer's Australia, 2005.

[110] Access Economics, The Dementia Epidemic: Economic Impact and Positive Solutions for Australia, (report prepared for Alzheimer's Australia, Canberra, 2003.

[111] "…the data suggest that the [residential aged care] workforce declined between 1996 and 2000 despite servicing more clients, as indicated by the reduction in employees per operational place from 1.07 to 1.02…" Productivity Commission, op.cit., p.139.

[112] Ibid., p.148.

[113] The Productivity Commission reported that 1 in every 200 residential aged care workers annually put in a worker's compensation claim in regards to each year "aggressive or resistive residents" (WorkCover Corporation, 2001), Deb S, Crownshaw T., "The role of pharmacotherapy in the management of behaviour disorders in traumatic brain injury patients", Brain Injury, 2004, 1-31.

[114] NSW Department of Health, "Summary Report: The Management and Accommodation of Older People with Severely and Persistently Challenging Behaviours", 2006, p.21.

[115] "The Standard", The Aged Care Standards and Accreditation Agency, August 2008.

[116] Karmel R, Lloyd J, Anderson P, "Movement from hospital to residential aged care", Australian Institute of Health and Welfare, Canberra, 2008.

[117] Brain Injury Australia is aware of a 3-year study (now in its final year) at La Trobe University into TBI in older adults, funded by the Victorian Neurotrauma Initiative. Interim results were not available to Brain Injury Australia at the time of writing.

[118] "Predictors of in-hospital mortality and 6-month functional outcomes in an elderly population after moderate to severe traumatic brain injury", Professor Peter Cameron et al. (unpublished). Brain Injury Australia is grateful to Professor Cameron, Belinda Gabbe and the staff of the Victorian State Trauma Outcome Registry and Monitoring group for making these results available.

[119] Goleburn and Golden, op.cit., p. 161.

[120] "Level 3" evidence includes "retrospective study comparing conditions, including historical controls." Taken from "Brain injury rehabilitation- Collecting the evidence", a presentation given by Professor John Olver, Director Rehabilitation Epworth Hospital, Melbourne to a September 2008 meeting of Australasian Rehabilitation Outcomes Centre.

[121] The Final Report Australian Government Dementia Health Priority Initiative's Dementia Research Mapping Project found the research evidence regarding TBI as a risk factor for dementia "uncertain. Several epidemiological studies have reported an increased risk of dementia in individuals who had suffered head trauma while other studies have found no association." Professor Helen Bartlett et al., Australasian Centre on Ageing, The University of Queensland, 2006.

[122] Goleburn and Golden, op.cit., p. 182.

[123] Chantal, Hukkelhoven et al., "Patient age and outcome following severe traumatic brain injury: an analysis of 5600 patients", Journal of Neurosurgery, 99, 2003, p. 666–673.

[124] Goleburn and Golden, op.cit., p.169.

[125] www.aro.gov.au

[126] Correspondence with Brain Injury Australia from Charles Golden, Professor of Psychology, Nova Southeastern University, Fort Lauderdale, Florida.

[127] NSW Clinical Excellence Commission correspondence with Brain Injury Australia.

[128] "Preventing Falls And Harm From Falls In Older People: Best Practice Guidelines For Australian Hospitals And Residential Aged Care Facilities", Australian Commission on Safety and Quality in Health Care, 2008.

[129] Brain Injury Australia correspondence with Graham Bedford, Policy Team Manager, Australian Commission on Safety and Quality in Health Care, 10 February 2009. The Commission was established in January 2006 by the Australian, State and Territory Governments "to develop a national strategic framework and associated work program that will guide its efforts in improving safety and quality across the health care system in Australia."

[130] Sarah et al. ("on behalf of the Prevention of Falls Network Europe and Outcomes Consensus Group"), "Development of a Common Outcome Data Set for Fall Injury Prevention Trials: The Prevention of Falls Network Europe Consensus", Journal of the American Geriatrics Society, 53:1618, p. 1620.

[131] "Preventing Falls And Harm From Falls In Older People: Best Practice Guidelines For Australian Hospitals And Residential Aged Care Facilities", Australian Commission on Safety and Quality in Health Care, 2008, p.viii.

[132] Falls prevention sector responses to Brain Injury Australia's request for information about falls-related TBI.

[133] Brain Injury Australia thanks Elizabeth Rix for making available her unpublished thesis "The Lived Experience Of Caring For A Person In Nsw Who Is Community Dwelling, Over 65 Years Of Age And Has An Acquired Traumatic Brain Injury".

[134] Productivity Commission, op.cit., p.33.

[135] Australian Institute of Health and Welfare, "Older Australia at a Glance", 2007, p.21.

[136] Productivity Commission, op.cit., p.12.

[137] Professor Peter Cameron et al., op.cit.

[138] Goleburn and Golden, op.cit., p. 185.

[139] Hart RG, Pearce LA and Aguilar MI, "Meta-analysis: Antithrombotic Therapy to Prevent Stroke in Patients who have Nonvalvular Atrial Fibrillation", Annals of Internal Medicine, 146:12, 2007, p. 857- 867.

[140] "Medicines for Cardiovascular Health: are they used appropriately?", Cardiovascular Disease and Diabetes Unit, Australian Institute of Health and Welfare, [undated].

[141] Britt Miller et al., "General practice activity in Australia 1998–99 to 2007–08", Australian Institute of Health and Welfare, 2008, p. 122, 124. This report forms part of the Australian Institute of Health and Welfare's Australian BEACH (Bettering the Evaluation And Care of Health) program, conducted through the General Practice Statistics and Classification Centre at the University of Sydney – "note that we excluded aspirin from the analysis because it is widely available over-the-counter and this supply is not recorded in the Pharmaceutical Benefits Data System. In addition, aspirin is indicated for other conditions outside the cardiovascular system…In our study, the group 'other antithrombotic agents' included clopidogrel, dipyridamole and ticlopidine."

[142] "Consensus Guidelines for Warfarin Therapy - Recommendations from the Australasian Society of Thrombosis and Haemostasis", Alex Gallus et al., Medical Journal of Australia, 2000, 172, p. 600-605.

[143] David B. Cohen, MD et al. "Traumatic Brain Injury in Anticoagulated Patients", The Journal of Trauma, Injury, Infection, and Critical Care, Volume 60, Number 3, 2006, p.555.

[144] A study of 156 consecutive patients admitted to Melbourne's The Alfred Hospital presenting with spontaneous intracerebral haemorrhage found 11% were on warfarin for prophylactic anticoagulation at time of presentation. "Spontaneous intracerebral haemorrhages-warfarin as a risk factor", Nathan Lawrentschuk, Sonia Kariappa and Andrew Kaye, Journal of Clinical Neuroscience, 2003, 10(5), p. 550-2.

[145] "Anticoagulation and the Elderly Head Trauma Patient", Ramesh Grandhi, M.D. et al., The American Surgeon, Vol. 74, September 2008, p. 805.

[146] Claire Bradley and Sophie Pointer, "Hospitalisations due to falls by older people, Australia 2005–06", Australian Institute of Health and Welfare, 2008, p.4, Geoff Henley, Renate Kreisfeld and James Harrison, "Injury deaths, Australia 2003–04", Australian Institute of Health and Welfare, 2007, p.4 and Yvonne Helps, Geoff Henley and James Harrison, "Hospital separations due to traumatic brain injury, Australia 2004–05", Australian Institute of Health and Welfare, p. 26, 27.

[147] Gallus et al., op.cit.

[148] "Clinical Update: Atrial Fibrillation", Caroline Medi, Graeme J Hankey and Saul B Freedman
Medical Journal of Australia, 186 Number 4, 2007, p. 201.

[149] Such an increase conforms with the findings of large scale studies from overseas. The Framingham Heart Study, which followed 3999 men and 4726 women from Massachusetts between 1968 to 1989 among showed an increase in age-standardised prevalence of AF from 3.2 to 9.1 percent in men and from 2.8 to 4.7 percent in women. ("Increased Atrial Fibrillation Mortality: United States, 1980–1998", Wendy A. Wattigney, George A. Mensah and Janet B. Croft, American Journal of Epidemiology, Vol. 155, No. 9 : 819-826) A study of heart patients in England and Wales between 1994 and 1998 found a 22% increase in the age standardised prevalence of AF in men and a 14% increase in women. (Majeed A, Moser K, Carroll K. 'Trends in the prevalence and management of atrial fibrillation in general practice in England and Wales, 1994-1998: analysis of data from the general practice research database", Heart 2001; 86(3):284-288.) These increases are largely attributable to lifestyle factors such as obesity and obstructive sleep apnoea.

[150] David B. Cohen, MD et al., op.cit., p.554.

[151] "Living with Warfarin - Information for Patients", Department of Health, Western Australian Government, 2007.

[152] Australian Institute of Health and Welfare, Australian GP Statistics and Classification Centre, "Warfarin use in patients with qualifying morbidity", Sydney, 2005.

[153] Brain Injury Australia correspondence with Graham Bedford, Policy Team Manager, Australian Commission on Safety and Quality in Health Care. See note 128, above.

[154] Mary L. Hook and Shana Winchel, "Fall-related Injuries in Acute Care: Reducing the Risk of Harm", MedSurg Nursing (The Journal of Adult Health, official journal of the Academy of Medical-Surgical Nurses), December, 2006.

[155] A. E. Salter et al., "Community-dwelling Seniors who Present to the Emergency Department with a Fall do not Receive Guideline Care and their Fall Risk Profile Worsens Significantly: a 6-month Prospective study", Osteoporos International, 2006, 17: 672–683.

[156] Cassell E. and Clapperton A., "Consumer product-related injury 3: Injury related to the use of ladders", Hazard, Edition 63, Victorian Injury Surveillance Unit, Monash University Accident Research Centre. p.4

[157] Clare Bradley, "Ladder-related fall injuries", Australian Institute of Health and Welfare National Injury Surveillance Unit, Research Centre for Injury Studies, Flinders University, Number 11, August 2007, p.2.

[158] Cf. Henley, Kreisfeld and Harrison, op.cit., p.33.

[159] Bradley, op.cit., p.3.

[160] While this conforms with separation numbers in Helps et al. ("Hospital separations due to traumatic brain injury, Australia, 2004–05") neither publication includes information about ladder-related injury in the "TBI as Additional Diagnosis" or "Other TBI" categories.

[161] Helps Y, Henley G & Harrison, op. cit., p.90, 92.

[162] Bradley C and Harrison JE, "Hospitalisations due to falls in older people, Australia, 2003–04", Australian Institute of Health and Welfare, Adelaide, 2007, p. 14.

[163] Biswadev Mitra, Peter A Cameron and Belinda J Gabbe, "Ladders revisited", Medical Journal of Australia, Volume 186 Number 1, January 2007, p.31. "Data on patients who did not seek medical attention or who were treated privately were not available. Patients who died at the scene were also not included. Absence of these patients underestimates the mortality and morbidity from ladder falls reported in our study." Also, "there is no fourth-character coding applicable to W11 so it is not possible to know which of these falls are from low heights or from the top of very tall ladders. Males, however, sustained a higher proportion of injuries to the head and the trunk (15.0% and 37.4%, respectively) than females (10.1% and 18.1%, respectively), suggesting falls from a greater height." Bradley C and Harrison JE, "Hospitalisations due to falls in older people, Australia 2003–04", Australian Institute of Health and Welfare, Adelaide p.14.

[164] Bradley, op.cit., p.11.

[165] As part of its extensive consultations in preparation of this paper, Brain Injury Australia received this response from the Brain Injury Unit of Liverpool Hospital in Sydney: "[Q:] From your experience, have you noticed any trends in the activity being engaged in by this age group [65 years and over] at the time of their fall? [A:] The numbers are too small for statistical trends but the injuries fall into a number of categories: i) work-related falls - these are usually from heights such as roofs and ladders. These can be experienced older workers or young and inexperienced. ii) PFO ["Pissed and Fell Over"] i.e. intoxicated and fell - this can be down stairs, over balconies and from bar stools - again any age but heavy alcohol consumption is the common factor. iii) others e.g. fall from a horse, home renovators etc."

[166] Mitra et al., op.cit., p.32.

[167] "Investigating the over-representation of older persons in do-it-yourself home maintenance injury and barriers to prevention", K Ashby, J Ozanne-Smith, B Fox, Injury Prevention, 2007;13:328–333. "It is recommended that the ABCB [Australian Buildings Code Board], the building industry, local councils and other stake holders investigate the possibility of limiting or removing the need to attain heights for domestic maintenance purposes. This could potentially be achieved through the provision of features such as hinged gutters and gutter guards, or *through the subsidisation of skilled trades' people for those vulnerable to fall from height injury*", "The Relationship Between Slips, Trips and Falls and the Design and Construction Of Buildings", Joan Ozanne-Smith, Jonathon Guy, Mary Kelly, Angela Clapperton, Monash University Accident Research Centre, 2008, p. xv.

[168] Roy, C.W., Pentland, B., and Miller, J. D., "The causes and consequences of minor head injury in the elderly", Injury 24, 1986, p. 318–321, cited in Golden, op.cit.

[169] W. Watson et al., "Consumer Product-Related Injuries in Older Persons", Monash University Accident Research Centre, 1999. This survey included data from the National Electronic Injury Surveillance System (NEISS) managed by the US Consumer Product Safety Commission, the Consumer Safety Institute in The Netherlands, and the Home Accident Surveillance System and the Leisure Accident Surveillance System managed by the Consumer Safety Unit at the British Department of Trade and Industry.

[170] Monash University's Accident Research Centre, with sponsorship from Esso Australia, has developed three brochures aimed at raising awareness about DIY injury and its prevention. Ladder use is mentioned as a hazard. Distribution of the brochures seems to be have been concentrated on Victoria.

[171] "Safety Alert - Using A Ladder", Australian Competition and Consumer Commission, undated.