Injury in Western Australia

The Costs of Accidental Drowning and Near Drowning in Western Australia

injury research centre

The University of Western Australia

Department of Health
Government of Western Australia

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Any enquiries or comments on this publication should be directed to:

Rex Milligan, Injury Prevention Branch, Department of Health, Perth, Western Australia.
E-mail: rex.milligan@health.wa.gov.au

Delia Hendrie, Injury Research Centre, School of Population Health, University of Western Australia, Perth, Western Australia.
E-mail: delia@dph.uwa.edu.au

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The Costs of Accidental Drowning and Near Drowning in Western Australia

Authors

Hendrie, D

Performing Organisation

Injury Research Centre
School of Population Health
The University of Western Australia
35 Stirling Highway
CRAWLEY WA 6009

Tel: (08) 9380 1302
Fax: (08) 9380 1199

Sponsor

Department of Health, Western Australia
189 Royal Street
East Perth WA 6004

Abstract

The objective of this study was to determine the costs of accidental drowning and near drowning in Western Australia in 2001/02. The number of accidental drowning-related cases was identified from emergency department, hospital morbidity and death records. A societal perspective was adopted in calculating costs, and the costing was done using an incidence-based approach that calculates the lifetime costs of incidents in a given year regardless of when the costs are incurred. Unit costs were determined for each of the main categories of outcome of drowning and near-drowning incidents: fatality, moderate or severe disability, and full recovery. Cases were allocated a cost based on their outcome status. There were 176 accidental drowning and near-drowning incidents in Western Australia in 2001/02, of which 27 were fatalities and 3 resulted in moderate or severe disability. The age group most at risk were the 0 to 4 year olds, with males at higher risk than females. The costs of accidental drownings and near drownings were $46.5 million, with an average cost of $1.598 million for a fatality, $984 700 for a case with moderate or severe disability, $6700 for a fully recovered case admitted to hospital, and $850 for a fully recovered case attending an emergency department and discharged. Ninety-eight percent of the costs of accidental drowning and near drowning resulted from productivity and quality of life losses. Accidental drowning and near drowning imposes a considerable burden on society, whether this burden is measured in terms of lives lost and near drownings or the costs of drowning and near-drowning incidents. Information on the costs of accidental drowning and near drowning provides useful data on the potential cost savings that can be achieved if the incidence of these events is reduced. It can also be used in cost-effectiveness analyses of drowning prevention programs.

Keywords

Drowning, near drowning, submersion, costs

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Methods

The number of accidental drowning and near-drowning cases was identified from emergency department, hospital morbidity and death records. A societal perspective was adopted in calculating costs, with the costs of drowning and near drowning incurred by individuals, the government and other sectors included. Categories of cost were the health system, the non-health care sector, productivity losses and loss of quality of life. For costing purposes the outcomes of drowning incidents were classified into three categories: fatality, moderate to severe neurological damage resulting in longer-term disability, and full recovery. Cases were allocated a cost of drowning or near drowning based on their outcome status. Population rates and per capita figures were calculated using data on the size of the Western Australian population in June 2002.

Results

Number of Cases of Accidental Drowning and Near Drowning

- Accidental drowning and near drowning resulted in 27 fatalities, 57 hospital admissions and an estimated 154 emergency department attendances in Western Australia in 2001/02.
- Allowing for incidents counted more than once, the number of separate accidental drowning and near-drowning cases was 176. These included 27 fatalities, 3 cases with moderate or severe disability, 49 cases that were admitted to hospital and fully recovered, and 97 cases that attended an emergency department and were discharged.
- For all severity levels of outcome the most at risk group for accidental drowning and near drowning was the 0 to 4 year olds, accounting for 30% of fatalities, 46% of hospital admissions and 63% of emergency department attendances.
- Males were more at risk than females, accounting for 78% of fatalities, 58% of hospital admissions and 58% of emergency department attendances.

Costs of Accidental Drowning and Near Drowning

- In 2001/02 the costs of accidental drowning and near drowning in Western Australia were $46.5 million.
- Average lifetime costs of accidental drowning-related incidents by severity of outcome were: fatality, $1.598 million; case with moderate or severe disability, $984 700; fully recovered case admitted to hospital, $6700; and fully recovered case attending emergency department and discharged, $850.
- Ninety-eight percent of the costs of accidental drowning and near drowning resulted from productivity losses and loss of quality of life.
- Costs attributable to the 0 to 4 year age group were 35% of the total costs of accidental drowning and near-drowning. This age group comprises 7% of the total population.
- Males accounted for 76% of the total costs of accidental drowning and near drowning.

Discussion

The costs of accidental drowning and near drowning presented in this study are higher than those found in an earlier Australian study conducted in the mid-1990s. This disparity in costs is largely a result of differences in the underlying assumptions used to estimate costs. Along with current practice at the time, the earlier study used a value of statistical life below the value currently recommended or being used in Australia. This study used a mid-range value of statistical life that is in line with current thinking on what is a realistic figure for Australia. In addition, the earlier study did not separately cost the longer term consequences of near-drowning cases with moderate or severe disability.

Accidental drowning imposes a considerable burden on society, whether this burden is measured in terms of lives lost and near drownings or the costs associated with drowning-related incidents. The challenge facing injury prevention policymakers and practitioners is to develop strategies and programs to reduce the incidence and costs of accidental drowning and near drowning. This study provides useful information on the potential cost savings that can be achieved if accidental drowning prevention programs are successfully implemented. Alternatively, it demonstrates the costs that society will incur if these programs are not implemented. In addition, the cost data produced in this study can be used to conduct cost-effectiveness analyses of accidental drowning

prevention programs, which can assist in the process of planning and prioritising injury prevention activities.

1. INTRODUCTION

Drowning and near drowning was identified in the National Injury Prevention Plan as one of four priority areas for 2001 to 2003 (Strategic Injury Prevention Partnership 2001). In Australia, drowning is the most common cause of accidental death for children less than 5 years old, and across all age groups accounted for 3.1% of injury deaths in 1998 (National Injury Surveillance Unit 2004). In Western Australia, 186 people died as a result of accidental drowning between 1995 and 2000, of which 45 were children under 5 years (Gillam et al. 2003). In addition to drowning fatalities, near drownings result in admissions to hospital that can have serious long-term consequences (Steenkamp 2002).

Only a few Australian studies have examined the costs of accidental drowning and near-drowning incidents. These studies have varied in their scope and the types of cost included, thus providing different estimates of the costs incurred.

Mathers and Penn (1999) calculated the health system costs of accidental drowning in Australia in 1993/94 as part of a study estimating the direct costs of health services attributable to a comprehensive range of diseases and injury types. The costs were calculated using a prevalence-based approach, which calculates the total cost of a condition or injury in a given year, regardless of onset or when the injuries were sustained. Mathers and Penn adopted a 'top-down' approach to costing that took known aggregate expenditures on health care and apportioned these to disease and injury categories using various sources of morbidity data. Based on this approach, the direct health system costs of accidental drowning in Australia were estimated as $5.5 million.

Watson and Ozanne-Smith (1997) calculated the costs of injury in Victoria for 1993/94 using a 'bottom-up' approach in which they collected data on the number and type of injuries in Victoria and then estimated the aggregate direct and indirect costs attributable to these injuries using an incidence-based approach. This approach assesses the lifetime costs of injuries sustained in a given year, regardless of when these costs are incurred. Direct costs consisted of the costs of treating injury, which included the cost of hospital treatment, medical consultations, pharmaceuticals, rehabilitation, attendant care and nursing home care. Indirect costs included the value of lost output due to reduced

productivity caused by injury and any resultant disability and losses due to premature death. The lifetime costs of accidental drowning in Victoria in 1993/94 were estimated as $19.5 million, of which 95% was attributable to indirect costs. The average costs per drowning-related incident was $61 866, and average costs by severity level were $470 057 for a fatality and $9100 and $317 respectively for hospitalised and non-hospitalised cases. Moller (1999) used the cost estimates produced by Watson and Ozanne-Smith, together with Australian figures on the incidence of drownings, to estimate total lifetime costs of drowning in Australia of $132.4 million in 1995/96.

The objective of this study was to determine the costs of accidental drowning and near drowning in Western Australia in 2001/02. This is the first time the costs of drowning and near-drowning incidents have been investigated in Western Australia. These costs are of particular interest because the age group most affected is young children. Section 2 of the report describes the methods used in generating the data on the incidence and costs of accidental drowning and near drowning, Section 3 presents the incidence and cost data, and Section 4 discusses the data and related issues.

2. METHODS

The methods used in this study are described under three main headings: identifying accidental drowning and near-drowning cases, valuing and measuring costs, and data analysis issues.

2.1 Identifying Accidental Drowning and Near-Drowning Cases

Three groups of accidental drowning and near-drowning cases were included in the study –

(1) Fatalities.
(2) Cases presenting to an emergency department (ED) for drowning or near drowning and with one or more related hospital admission.
(3) Cases presenting to ED for drowning or near drowning and with no related hospital admission.

The number and characteristics of accidental drowning fatalities were provided by the Royal Life Saving Society of Western Australia (RLSSWA), which obtains these data from the records of the Coroner's Office of Western Australia and the reports of non-boating aquatic deaths from the Water Police. Drowning fatalities were identified from the cause of death field and the location field. The RLSSWA provided the data in tabular form, grouped by age, gender and intent. The intent variable had codes to indicate drownings and near drownings that were intentional (e.g. suicide, homicide), unintentional and of undetermined intent. As the focus of this report was accidental drownings and near drownings, only unintentional cases were included. This is likely to provide a conservative estimate of the true number of accidental drowning incidents as the majority of cases of undetermined intent are thought to be unintentional (personal communication[1]).

Data for cases that presented to ED for accidental drowning and were admitted to hospital were obtained from the Injury Research Centre's Cost of Injury Database and

[1] Personal communication with the Royal Lifesaving Society of Western Australia

the Western Australian Data Linkage System. The linked data included a string of all hospital morbidity records for the subject in order for hospital transfers and re-admissions to be tracked. Data for each case included demographic variables (age, gender, postcode), hospital-related variables (date of admission and discharge, length of stay, where admitted from and discharged to, hospital location) and injury-related variables (diagnoses codes, external causes of injury, diagnostic related group (DRG) category). The study included drowning and near-drowning cases involving (i) accidental drowning (ICD-10 external causes W65-W74) and (ii) water transport drowning (ICD-10 external causes V90 or V92). Excluded were intentional drowning by suicide (X71), homicide (X92) and drowning for which intent was unknown (Y21).

For cases presenting to ED but not admitted, tabular data were obtained from the Emergency Department Incident System (EDIS) of the number of people who presented to ED as a result of accidental drowning or near-drowning incidents. These data were presented by age and gender, hospital type and discharge destination. Drowning and near-drowning cases were identified in EDIS by searching the text of each record in EDIS for keywords such as drown, drowning, immersed and immersion. Since EDIS only contains data for the teaching hospitals and three metropolitan non-teaching hospitals (Swan, Rockingham/Kwinana and Armadale/Kelmscott), the number and characteristics of ED attendances for these hospitals were extrapolated to all hospitals in Western Australia on the basis of the proportion of ED attendances in Western Australia presenting at EDIS hospitals. Although regional differences in the number of accidental drownings may result in this assumption not holding, no other data were available of the number of drowning and near-drowning cases presenting at hospitals not included in EDIS.

2.2 Valuing and Measuring Costs

A societal perspective was adopted in calculating costs, with the costs of accidental drowning and near drowning incurred by individuals, the government and other sectors included. The categories of cost and cost components were as follows –

(i) Health system: medical, hospital, rehabilitation, ambulance.

(ii) Non-health care sector: long-term and home care, aids and appliances and home and vehicle modifications.
(iii) Productivity losses: paid work and unpaid household and community work.
(iv) Other: loss of quality of life.

Excluded from the cost calculations were the costs of emergency services used in the search and rescue of drownings and near drownings. These costs were excluded as data on the number of searches and rescues and their corresponding costs were not available.

An incidence-based approach to costing was adopted, which calculates the lifetime costs of incidents in a given year regardless of when these costs are incurred. The outcomes of drowning-related incidents can be classified as death, moderate to severe neurological damage resulting in longer-term disability, or full recovery. This study used these categories for costing purposes. The method of costing for each category is described below.

2.2.1 Fatalities

Drowning deaths were assigned a cost based on the value of statistical life (VOSL). The VOSL is a difficult concept, but is basically the monetary value of a life lost or a life saved. Different approaches can be used to provide these values. The two main approaches are the human capital or cost of illness method and the willingness to pay method (Drummond et al. 1997). The human capital method measures ex-post costs of a condition, and more recent attempts at valuing life using this method have included resource costs, paid and unpaid productivity losses and a component to represent loss of quality of life (Bureau of Transport Economics 2000). The willingness to pay method of valuing life attempts to measure what people are willing to pay to avoid or reduce the risk of death. The willingness to pay method of determining the value of life is argued to be theoretically superior in that it better reflects what individuals are willing to spend and actually do spend to avoid death (Bureau of Transport Economics).

In Australia, no universally agreed estimate of the VOSL is in use. Road agencies have been the main users of VOSL estimates, and have used figures based on a human capital

approach (Abelson 2003). The Bureau of Transport Economics (2000) adopted $1.394 million for the value of a road fatality, which included $500 000 for lost productivity, $540 000 for loss of home and community labour and $319 000 for loss of quality of life. The latter was based on court damages in cases of extreme health impairment. The NSW Road and Traffic Authority (2002) recommended the use of a VOSL of $1.26 million.

Other values of statistical life that have been used or recommended in Australia vary widely. A study of the returns on investment in public health used a VOSL of $1 million, stating this represented a conservative valuation of the estimated willingness to pay values for human life that are used most often in similar studies (Applied Economics 2003). In contrast, the consultation draft of guidelines for the economic evaluation of environmental health planning and assessment considered that $2.5 million would be a realistic figure for the VOSL in Australia (EnHealth Council 2002). This figure was based on (i) the international findings of willingness to pay studies which suggested most likely VOSL values in the range of $3.3 to 6.6 million and (ii) a UK figure which provided the more conservative value of $2.5 million when converted from UK pounds to Australian dollars and expressed in 2001 prices.

With estimates of the VOSL used in Australia falling in the $1.0 to 2.5 million range, a mid-range VOSL of $1.5 million was selected for this study. This converts to a value of a life year of approximately $90 000, based on a life expectancy of 40 years and a discount rate of 5 per cent. The value of a life year is the constant annual sum which, taken over an average remaining life span, has a discounted present value equal to a pre-specified value of statistical life. This compares with a value of life year of approximately $60 000 derived from a VOSL of $1 million and $150 000 for a VOSL of $2.5 million.

A benchmark against which the $90 000 value of a life year used in this study can be compared is the incremental cost-effectiveness of drugs that the Pharmaceutical Benefits Advisory Committee recommends for listing on the Pharmaceutical Benefits Schedule. Conceptually the incremental cost per life year gained of drugs recommended for public

reimbursement can be interpreted as the amount society is willing to pay of taxpayer funds for an additional life year, in the context of public decision making or choices about resource allocation. George, Harris and Mitchell (2001) reviewed submissions made to the Pharmaceuticals Advisory Benefits Committee between January 1991 and June 1996. While no explicit threshold was found beyond which the Committee was unwilling to pay for additional life years gained, it appeared unlikely to recommend a drug for listing if the additional cost per life year gained exceeded $83 000 (in 2001/02 values) and was unlikely to reject a drug for which the additional cost per life year gained was less than $46 000 (2001/02 values). In making these recommendations, the Committee considered factors other than cost per life year gained such as the quality of life gained, the quality of the evidence in the submission by the pharmaceutical company, the nature of the condition and the availability of other treatments. The upper threshold of the additional cost per life year of $83 000 beyond which the PBAC was unwilling to pay for additional life years gained is broadly in line with the value of a life year of $90 000 adopted in this study.

Using the value of a life year of $90 000, the cost of each accidental drowning fatality was calculated by multiplying this figure by the discounted life expectancy of each case based on a discount rate of 5 per cent. The discounted life expectancy is the present value of the average number of additional years a person is expected to live. Life expectancy data were obtained from the Australian life table (Australian Bureau of Statistics 2001).

2.2.2 Cases with Moderate or Severe Disability

In order to cost cases with longer term disability from accidental drowning-related incidents, the incidence of this group had to be determined. Few studies have examined the long-term effects of serious near drownings. Nixon et al. (cited in Steenkamp 2002) estimated that 2 to 8 per cent of near drownings where there was loss of consciousness or altered breathing resulted in permanent brain damage. Steenkamp examined all drowning-related events in Australia in 1997/98 and identified cases with probable 'persisting morbidity'. 'Persisting morbidity' following a near drowning was defined as any loss or abnormality of psychological, physiological or anatomical structure or

function that persists over time. She found that about 5% of near-drowning hospital separations were likely to suffer persistent morbidity. In the US, Zamula (1987) estimated that 5.6% of near-drowning hospital admissions were 'severely damaged' and 0.1% were 'moderately damaged'. 'Severely damaged' was defined as the person requiring long-term intensive care and remaining in a chronic vegetative state and 'moderately damaged' as the person requiring longer term care but with less severe disability.

This study assumed 5% of hospital admissions for accidental drownings and near drownings had moderate or severe disability in the longer term. Cases not admitted to hospital were assumed to have no persistent morbidity. The lifetime costs of persistent morbidity were taken from the Injury Research Centre's Cost of Injury Database (Hendrie and Legge 2003). The main sources of cost data used in developing the Cost of Injury Database were the injury claims databases of motor vehicle personal injury insurers and occupational injury insurers. All cases with moderate or severe disability were assumed to have a cost equivalent to that of a critical head injury as measured by the Abbreviated Injury Scale (American Association for Automotive Medicine 1985), with an adjustment made to the component of cost representing quality of life loss to make it consistent with a VOSL of $1.5 million.

2.2.3 Fully Recovered Cases

Cases who fully recover from accidental near-drowning incidents require short-term care, mainly provided by the health sector. These cases include those who present to ED as a result of an accidental drowning incident and have no related hospital admission and those who present to ED and are admitted to hospital. Costs were calculated separately for each of these groups.

Cases that attended ED with no related hospital admission were assumed to incur costs for ambulance transport to the hospital, the cost of an ED attendance and a minimal amount of additional health care. The cost of ambulance transport to ED was assumed to be $437, based on current costs adjusted to 2001/02 dollars using the AIHW's total

health price index (personal communication,[2] AIHW 2002). The cost of an ED presentation was assumed to be different for teaching and non-teaching hospitals. Cases presenting at a teaching hospital were assigned the average cost of an ED attendance for Royal Perth Hospital (RPH) and Sir Charles Gairdner Hospital (SCGH). Other cases were assigned a cost equal to 80% of the average cost of an ED attendance at RPH and SCGH. The average cost of an ED attendance for RPH and SCGH was $341 in 2002/03, which was adjusted to 2001/02 dollars ($328) using the AIHW's total health price index (personal communication,[3] AIHW 2002).

Cases that were admitted to hospital and fully recovered were assumed to incur costs for ambulance transport, the costs of inpatient treatment (which included the cost of the ED attendance) and related health system costs. The cost of ambulance transport was calculated in the same way as for cases attending ED but not admitted. The cost of inpatient hospital episodes was calculated based on the Australian Related-Diagnostic Related Group (AR-DRG) code recorded in their hospital morbidity record for the initial drowning-related admission and any drowning-related subsequent admissions within 2001/02. AR-DRG costs for AR-DRG Version 4.1 were available for teaching, other public sector and private sector hospitals for 2000/01 (Department of Health & Aged Care 2000). These were adjusted to 2001/02 prices using the hospital price index produced by the Australian Institute of Health and Welfare (AIHW) (AIHW 2002). AR-DRG costs were assigned to each hospital admission on the basis of the DRG code and type of hospital.

The costs of health services other than ambulance transport, ED attendance and hospital inpatient care were assigned to cases who fully recovered from near-drowning incidents on the following basis –

(1) The costs of health services other than ambulance transport, ED attendance and hospital inpatient care have been calculated for all accidental drownings and submersions as 72% of total hospital inpatient costs (Mathers and Penn 1999).

[2] Personal communication with Finance Department, St John's Ambulance Service, WA
[3] Personal communication with Finance Department, Royal Perth Hospital

(2) Hospital inpatient costs were calculated for all cases in the study, and the total amount of 'other' health service costs for all cases was estimated to be 72% of total hospital inpatient costs.

(3) 'Other' health service costs for cases with moderate or severe disability were subtracted from the total amount of 'other' health service costs calculated in (2) above to provide an estimate of these 'other' costs for fully recovered cases. Cases that attended ED and were discharged were arbitrarily allocated $150 in 'other' health service costs. The remaining 'other' health service costs were allocated to hospital admitted cases that fully recovered on a proportional basis based on their share of hospital inpatient costs.

2.3 Data Analysis

The death and ED data for accidental drowning-related incidents were obtained in tabular form presented in Excel spreadsheets from the Royal Lifesaving Society of Western Australia and the Emergency Medicine Clinical Practice Improvement Unit respectively. The hospital morbidity records for the accidental drowning and near-drowning cases were identified and analysed using SAS Version 8.2 (SAS Institute Inc. 2003). The incidence, health service utilisation data and other cost data were entered into an Excel spreadsheet by age group and gender, and costs were calculated for fatalities, cases that had moderate or severe disability and cases that fully recovered using the methods outlined above. Population rates were calculated based on data on the size of the Western Australian population in June 2002 (Australian Bureau of Statistics 2002).

3. RESULTS

3.1 Number of Cases of Accidental Drowning and Near Drowning

Tables 3.1 to 3.3 show the number of accidental drowning-related incidents by severity level. Table 3.1 presents the average annual number of accidental drowning fatalities by age and gender for 1998 to 2002. The average annual number over a five year period was used as the basis for costing as the number of drowning fatalities by age group is relatively low and fluctuates each year, and costs are sensitive to age at death. The number of hospital admissions and ED attendances by age and gender for 2001/02 are presented in Tables 3.2 and 3.3 respectively.

Accidental drownings and near drownings resulted in 27 fatalities, 57 hospital admissions and an estimated 154 ED attendances per year. The average annual number of fatalities of 27 over the five year period was slightly above more recent years, with 26 accidental drowning deaths recorded in 2001 and 23 in 2002. Allowing for cases counted more than once, such as cases presenting at ED and then being admitted, the annual number of separate accidental drowning and near-drowning cases was 176. These included 27 fatalities, 3 cases with moderate or severe disability, 49 cases admitted to hospital that fully recovered and 97 cases that attended ED and were discharged.

For all severity levels the most at risk group for accidental drowning were the 0 to 4 year olds, accounting for 30% of drowning fatalities, 46% of hospital admissions and 63% of ED attendances. For this youngest age group the rates per 100 000 population were 6.4 for a drowning fatality, 20.6 for a drowning-related hospital admission and 77.0 for a drowning-related ED attendance. These rates were considerably higher than the equivalent population rates per 100 000 persons of 1.0 for a drowning fatality, 3.0 for a drowning-related hospital admission and 8.0 for a drowning-related ED attendance.

Males were more at risk of involvement in accidental drowning-related incidents than females, accounting for 78% of fatalities, 58% of hospital admissions and 58% of ED attendances.

Table 3.1 Number of Accidental Drowning Fatalities by Age and Gender, Annual Average 1998 to 2002

		Age groups (years)						
		0-4	5-9	10-19	20-39	40-59	60+	Total
Males	Number	6	1	2	4	6	2	21
	%	*(22.2)*	*(3.7)*	*(7.4)*	*(14.8)*	*(22.2)*	*(7.4)*	*(77.8)*
Females	Number	2	1	0	1	2	0	6
	%	*(7.4)*	*(3.7)*	-	*(3.7)*	*(7.4)*	-	*(22.2)*
Total	Number	8	2	2	5	8	2	27
	%	*(29.6)*	*(7.4)*	(7.4)	*(18.5)*	*(29.6)*	*(7.4)*	*(100.0)*

Table 3.2 Number of Hospital Admissions for Accidental Drowning and Near Drowning by Age and Gender, 2001/02

		Age groups (years)							
		0-4	5-9	10-19	20-39	40-59	60+	Missing	Total
Males	Number	9	1	4	10	1	4	4	33
	%	*(15.8)*	*(1.8)*	*(7.0)*	*(17.5)*	*(1.8)*	*(7.0)*	*(7.0)*	*(57.9)*
Females	Number	17	1	1	1	0	0	4	24
	%	*(29.8)*	*(1.8)*	*(1.8)*	*(1.8)*	-	-	*(7.0)*	*(42.1)*
Total	Number	26	2	5	11	1	4	8	57
	%	*(45.6)*	*(3.5)*	(8.8)	*(19.3)*	*(1.8)*	*(7.0)*	*(14.0)*	*(100.0)*

Table 3.3 Estimate of the Number of Emergency Department Presentations for Accidental Drowning and Near Drowning by Age and Gender, 2001/02

		Age groups (years)						
		0-4	5-9	10-19	20-39	40-59	60+	Total
Males	Number	47	6	9	9	9	9	89
	%	*(30.5)*	*(3.9)*	*(5.8)*	*(5.8)*	*(5.8)*	*(5.8)*	*(57.8)*
Females	Number	50	3	3	3	0	6	65
	%	*(32.5)*	*(1.9)*	*(1.9)*	*(1.9)*	-	*(3.9)*	*(42.2)*
Total	Number	97	9	12	12	9	15	154
	%	*(63.0)*	*(5.8)*	*(7.8)*	*(7.8)*	*(5.8)*	*(9.7)*	*(100.0)*

3.2 Costs of Accidental Drowning and Near Drowning

The costs of accidental drowning and near drowning by severity of outcome are presented in Table 3.4. In 2001/02, the total costs associated with accidental drowning-related incidents were $46.5 million, an average cost of $264 300 per case.

The vast majority of accidental drowning costs were associated with the more severe outcomes, with fatalities accounting for 93% of costs and near drowning resulting in moderate or severe disability for 6%. The estimated average lifetime costs of a drowning fatality were $1.598 million. Compared with other causes of injury, drowning has a high average lifetime cost because of the age profile of the casualties. The average lifetime costs per case with moderate or severe disability were $985 000. Cases that fully recovered incurred much lower average costs per case of $6700 for hospitalised cases and $850 for cases attending ED and then discharged.

Table 3.4 Costs of Accidental Drowning and Near Drowning by Severity of Outcome, 2001/02

Severity of outcome	Number of cases	Total costs $000	Total costs %	Average costs per case
Death	27	43 147	92.7	1 598 000
Moderate/severe disability	3	2 954	6.4	984 700
Fully recovered				
- Hospital admission	49	328	0.7	6 700
- ED attendance only	97	82	0.2	850
All cases	176	46 512	100.0	264 300

Table 3.5 shows accidental drowning-related costs by broad cost category. Accidental drowning and near drowning cost the health system $630 000, of which hospital costs including ED treatment accounted for 35%. Costs to other sectors were relatively small, and consisted largely of the costs of longer term care for drowning cases with moderate or severe disability. By far the majority of accidental drowning costs were those resulting from productivity losses and loss of quality of life due to premature morbidity. Together these losses amounted to $45.5 million or 98% of the total costs of accidental drowning and near drowning.

Table 3.5 Costs of Accidental Drowning and Near Drowning by Category, 2001/02

Cost Component	Total costs	
	$000	%
Health system	630	1.4
Other sector	356	0.8
Loss of productivity and quality of life	45 526	97.9
Total	46 512	100.0

The composition of costs by age group and gender is shown in Table 3.6. The distribution of costs reflects the age/gender incidence of accidental drowning-related incidents, most particularly of fatalities given their significant share of total costs. Costs attributable to the 0 to 4 year age group amounted to 35% of the costs of accidental drowning and near drowning. This age group comprises approximately 7% of the total population. The percentage share of costs attributable to all other age groups was less than their population share. Across all age groups, males accounted for 76% of the costs of drowning and near drowning.

Table 3.6 Costs of Accidental Drowning and Near Drowning by Age and Gender, 2001/02

		Age groups (years)						
		0-4	5-9	10-19	20-39	40-59	60+	Total
Males	Cost ($000)	11 608	1 850	3 678	7 695	8 372	1 909	35 113
	%	*(25.0)*	*(4.0)*	*(7.9)*	*(16.5)*	*(18.0)*	*(4.1)*	*(75.5)*
Females	Cost ($000)	4 693	1 867	31	1 818	2 958	33	11 399
	%	*(10.1)*	*(4.0)*	*(0.1)*	*(3.9)*	*(6.4)*	*(0.1)*	*(24.5)*
Total	Cost ($000)	16 300	3 717	3 709	9 513	11 330	1 943	46 512
	%	*(35.0)*	*(8.0)*	*(8.0)*	*(20.5)*	*(24.4)*	*(4.2)*	*(100.0)*

4. DISCUSSION

The purpose of this study was to determine the costs of accidental drowning and near drowning in Western Australia in 2001/02. A societal perspective was taken, with costs to all sectors included.

A total of 176 accidental drownings and near drownings occurred in Western Australia in 2001/02, of which 27 were fatalities and three resulted in moderate to severe disability. The costs of these accidental drowning-related incidents was $46.5 million, an average cost of $264 300 per case. Productivity and quality of life losses accounted for the vast majority of the costs. The average lifetime costs of a drowning fatality were $1.598 million. Across all severity levels the age group at most risk of being involved in a drowning-related incident was the 0 to 4 year olds, with this age group accounting for 35% of the total costs of drowning and near drowning. Males were more at risk than females, accounting for 76% of total costs.

The incidence data used in this study were primarily population-based, with cases identified from ED, hospital morbidity and death records. However, the number of ED cases for hospitals not included in EDIS and the number of cases of persistent morbidity had to be estimated, which is a limitation of the study. Also, the individual follow-up of subjects after discharge from ED or hospital was beyond the scope of this study so an alternative source had to be used as the basis for calculating resource use and associated costs for cases who survived. While the best possible source was selected, the use of a secondary source introduces some uncertainty into the results of the study. A crucial assumption underlying all cost estimates of injury is the cost assigned to the value of statistical life or the related value of a life year. This study adopted a mid-range VOSL of $1.5 million, which converts to a value of life year of approximately $90 000.

The most relevant study with which to compare the results of this study is that of Watson and Ozanne-Smith (1997), which calculated the lifetime costs of accidental drowning in Victoria for 1993/94. The other two Australian studies that have examined the costs of accidental drowning and near-drowning incidents were Mathers and Penn

(1999) and Moller (1999). Mathers and Penn only calculated health system costs, while Moller based his cost estimates on those produced by Watson and Ozanne-Smith. Table 4.1 compares the results of this study with those produced by Watson and Ozanne-Smith. Across all severity levels the average costs per drowning case in this study are considerably above those in Watson and Ozanne-Smith. The disparity in average costs per drowning case can largely be explained by differences in the underlying assumptions used in estimating the costs. Watson and Ozanne-Smith followed the then current practice in Australia of costing the VOSL based on a human capital approach that included the loss of paid and unpaid productivity but not loss of quality of life. In addition, they did not separately cost the longer term consequences of the few drowning cases with moderate or severe disability. In costing fatalities, this study selected a mid-range VOSL from values currently recommended or being used in Australia. Values of statistical life currently recommended or being used are based on both the human capital approach (including a component for quality of life loss) and the willingness to pay approach. The mid-range VOSL value of $1.5 million used in this study is in line with current thinking on what is a realistic figure for Australia, but above the value generally used in the early to mid-1990s. In addition, this study separately calculated the cost of cases with moderate to severe disability.

Table 4.1 Comparison between Studies of the Average Costs per Case of Accidental Drowning and Near Drowning by Severity of Outcome

Severity of outcome of drowning or near drowning	Average Costs per Case		
	Watson and Ozanne-Smith		Hendrie
	1993/94 $	2001/02[1] $	2001/02 $
Fatality	470 057	610 467	1 598 000
Hospital admission including moderate/severe disability	-	-	63 100
Hospital admission excluding moderate/severe disability	9 100	11 818	6 700
ED attendance only	-	-	850
Injury not requiring hospitalisation	317	412	-
All cases	61 866	80 346	264 300

[1]1993/94 cost updated to reflect 2001/2002 prices

No comparable data are available for Western Australia of the lifetime costs of other injury causes. However, in Victoria, Watson and Ozanne-Smith (1997) found that while the costs of accidental drowning and near drowning accounted for less than 1% of the

total lifetime costs of injury, the average costs per injured person was higher for accidental drowning and near drowning than all other injury causes. In the 0 to 4 year age group the costs of accidental drowning and near drowning accounted for 5% of the total lifetime costs across all causes of injury.

Accidental drowning and near drowning imposes a considerable burden on society, whether this burden is measured in terms of lives lost and near drownings or the costs associated with drowning-related incidents. Like many other causes of injury, nearly all accidental drownings and near drownings are preventable. The challenge facing injury prevention policymakers and practitioners is to develop strategies and programs to reduce the incidence and costs of accidental drowning and near drowning. With the age group most affected being children under five years, the personal costs of accidental drowning incidents are substantial. This study provides useful information on the potential cost savings that can be achieved if accidental drowning prevention programs are successfully implemented. Alternatively, it demonstrates the costs that society will incur if these programs are not implemented. In addition, these data on the costs of drowning and near drowning can be used to conduct cost-effectiveness analyses of accidental drowning prevention programs, which can assist in the process of planning and prioritising of injury prevention activities.

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