

Reducing drowning deaths: the continued challenge of immersion fatalities in Australia

Richard C Franklin, Justin P Scarr and John H Pearn

Much has been achieved in the reduction of drowning deaths in Australia — both absolute numbers and the per-capita risk of drowning have been reduced in the past decade.^{1,2} Since 1920, when reliable national data were first published, drowning fatality rates have decreased from 8.76³ to 1.32 deaths per 100 000 people in 2007–08.² These are crude population-risk data; the true denominator, reflecting swimming or water exposure, cannot be determined. Nevertheless, detailed analysis of population data helps guide advocacy for future drowning prevention strategies.

A decade has passed since the Journal published a study by the late Dr Ian Mackie¹ describing the patterns of drowning in Australia for the period 1992–1997. That study and earlier research^{4–10} led to the development of the first National Water Safety Plan,¹¹ published in 1998 by the then newly formed Australian Water Safety Council. The current Australian Water Safety Strategy 2008–2011 (AWSS) was published in 2008 and advocates that unintentional drowning fatalities in Australia can be further reduced by 50% by the year 2020.¹² This aspirational goal is admirable, but is it realistic?

Our experience of successful injury prevention indicates that reductions are best achieved through specific targeted interventions using the four-portal approach to aquatic incidents of education, improved design (eg, of environments, safety barriers and safety equipment), legislation and rescue-resuscitation.¹³ In this context, we present an examination of drowning patterns in Australia for 1 July 2002 to 30 June 2007, compare the findings with the earlier study,¹ and assess the feasibility of the aim to reduce drowning deaths by 50% by 2020.

METHODS

Case information was extracted from the National Coroners Information System (NCIS)¹⁴ for the period 1 July 2002 to 30 June 2007 for all open and closed cases using the search criteria of mechanism (“threats to breathing” and “drowning and immersion”) and keywords (“drown” and “immersion”) in findings, police reports,

ABSTRACT

Objective: To explore 5 years of drowning deaths in Australia compared with a previous Australian study a decade earlier, and to assess the feasibility of achieving a 50% reduction in unintentional drowning deaths by 2020.

Design and setting: An audit of all unintentional drowning deaths in Australia using data from the National Coroners Information System for 1 July 2002 to 30 June 2007.

Main outcome measures: Number and rate of drowning deaths, by age, sex, location, activity, place of birth, visitor status, and involvement of alcohol or drugs.

Results: There were 1452 drowning deaths during the study period (76.4% male). The age-adjusted rate per 100 000 people ranged from 1.61 in 2002–03 to 1.23 in 2006–07. Children aged 0–4 years had the highest rate (2.63 per 100 000 people), and 29% of deaths were of people aged 55 years or older. Over half of all deaths occurred in rivers (20.3%), at beaches (18.3%), or in swimming pools (13.3%). Alcohol was involved in 21.6% of all drowning deaths, although this varied by age.

Conclusions: This audit suggests that a 50% reduction in drowning fatalities by 2020 may be achievable using current knowledge and preventive systems in certain types of immersions. However, further research and new initiatives will be required, particularly to prevent drowning deaths in rivers and of older people.

MJA 2010; 192: 123–126

autopsy reports, cause of death, and for deaths at aquatic locations.

All cases that were not drowning (eg, natural causes, shark or crocodile attack) were excluded where this was known at the time of analysis. Cases where no body was recovered or only skeletal remains were found that did not have a coronial ruling but were likely to have been a drowning death were included. Cases identified as self-inflicted harm or assault in the NCIS database were excluded if: the intent notification and/or intent completion identified the case as self-inflicted harm or assault AND information available in the autopsy report, finding document or police report also identified the case as self-inflicted harm or assault OR information included details of the deceased person's history of mental illness, depression, previous suicide attempts or conversations with friends or family about taking his or her own life.

For some included cases, information was incomplete or unknown because:

- the case was open (15.9%) (ie, the Coroner was still enquiring into the death);
- the person was alone at time of drowning;
- the Coroner was unable to make a ruling on circumstances surrounding the death;
- the body was heavily decomposed or not located; or

- residential address was not applicable (eg, due to homelessness).¹⁵

All identified cases were matched with information from the Royal Life Saving Society – Australia (RLSSA) National Drowning Reports for the financial years 2002–03 to 2006–07.¹⁶ For 15 cases from Queensland that could not be matched, separate information was obtained from the Queensland Office of the State Coroner that allowed these cases to be matched and included.

Australian Bureau of Statistics (ABS) population projections for the period 2006–2101¹⁷ were used to estimate the size and growth of Australia's resident population. A visitor was defined as a person who drowned in a postcode other than the postcode of their residential address.

Data from identified cases were entered into a spreadsheet, and analysis was undertaken using SPSS for Windows, release 15 (SPSS Inc, Chicago, Ill, USA). Financial years (1 July–30 June) were used for analysis to allow examination of data for summer, Australia's peak drowning period.

RESULTS

During the 5-year study period, 1452 people drowned in Australia, of whom 76.4% were male (sex was unknown in four cases) (Box 1). Annual drowning deaths declined

1 Number and rate of drowning deaths in Australia, 1 July 2002 to 30 June 2007

	Male	Female	Total	Adjusted rate*
Financial year				
2002–03	250	68	318	1.61
2003–04	221	75	297 [†]	1.49
2004–05	215	74	289	1.43
2005–06	244	46	291 [†]	1.40
2006–07	180	75	257 [†]	1.23
Total	1110	338	1452[†]	
Age group (years)[‡]				
0–4	107	62	169	2.63
5–9	27	15	42	0.63
10–14	17	15	32	0.46
15–19	62	10	72	1.04
20–24	82	19	101	1.44
25–29	75	13	88	1.28
30–34	98	17	115	1.52
35–39	74	19	93	1.25
40–44	80	14	94	1.23
45–49	90	25	115	1.60
50–54	79	23	102	1.54
55–59	73	14	87	1.46
60–64	70	19	89	1.96
65–69	59	14	73	1.97
70–74	38	19	57	1.81
75–79	34	15	49	1.81
80–84	25	13	38	2.00
≥ 85	13	12	25	1.70
Total	1103	338	1441	

* Rate per 100 000 people, adjusted for age and sex.

† Totals include four cases where sex was unknown.

‡ Figures exclude seven cases where age was unknown and four cases where sex was unknown. ♦

from 318 in 2002–03 to 257 in 2006–07. The age-adjusted rate per 100 000 people dropped from 1.61 in 2002–03 to 1.23 in 2006–07. Of the three “life stages” defined in the AWSS as the population groups who are at greater risk of drowning,¹² children aged under 5 years represented 11.7% ($n = 169$) of all drowning deaths in the 5-year period, men aged 18–34 years comprised 20.1% ($n = 290$), and people aged 55 years or older comprised 29.0% ($n = 418$). Children aged 0–4 years had the highest rate of drowning (2.63 per 100 000 people).

Over half of all drownings occurred in rivers (20.3%), at beaches (18.3%) or in private or public swimming pools (13.3%) (Box 2). The most common activities undertaken immediately before drowning were swimming/leisure activities (21.2%), fishing (11.4%) and watercraft use (10.4%). Unintentional water entries (ie, falling in) accounted for 19.4% of drowning deaths. Activity was unknown in 18.0% of cases. Activities varied with location: 48.1% of people who drowned at beaches were swimming or undertaking leisure activities, whereas falls accounted for 53.4% of drowning deaths in swimming pools.

Location of drowning varied across age groups (Box 3). Young people aged under 18 years commonly drowned in swimming pools, whereas adults aged 18–49 years most often drowned in rivers.

More than half of drowning deaths (53.7%) were of visitors to the location (Box 4). Thirty-six per cent of drowning deaths occurred in New South Wales. The Northern Territory had the highest crude rate of drowning, nearly three times higher than the national rate (4.22 v 1.44 per 100 000).

Information on country of birth was missing in 30.7% of cases; where this was known ($n = 1006$), most drowning victims (70.4%) were born in Australia, including 17 Indigenous victims.

Alcohol was present in 21.6% of drowning victims, but information regarding the involvement of alcohol was missing in 35.4% of cases (Box 5). Alcohol involvement varied by age group — it was a factor for 5.1% of children under 18 years of age (14/274, four of whom were involved in a single incident in a car where the driver was under the influence), compared with 34.8% in the 40–49-years age group. The youngest person with a positive blood alcohol reading was 8 years old. Drugs were involved in 6.7% of cases. There was little variation in the number of drowning deaths with alcohol present between the years studied, but there appeared to be an increase in the proportion of drowning deaths where drugs were present, from 5.3% in 2002–03 to 10.1% in 2006–07.

DISCUSSION

Our findings show that drowning continues to be a significant problem in Australia, with an average of 290 drowning deaths each year. However, this is a reduction of 23% compared with Mackie's earlier study, which found an average of 376 unintentional drowning deaths each year for the period 1992–1997.¹

The AWSS aim of reducing the number of drowning deaths by 50% by 2020¹² (ie, from 290 to 145; a drop of about 12 each year) may be achievable if reduction continues at the same rate seen in this study (from

2 Location of drowning deaths in Australia, by activity, 1 July 2002 to 30 June 2007

Activity	River	Beach	Swimming pool	Ocean	Lake/dam/lagoon	Bathtub	Harbour/bay/estuary	Other*	Unknown	Total
Swimming/leisure	52 (17.6%)	128 (48.1%)	69 (35.8%)	15 (8.9%)	28 (19.4%)	5 (4.7%)	3 (4.1%)	0	8 (4.8%)	308 (21.2%)
Fall	61 (20.7%)	5 (1.9%)	103 (53.4%)	9 (5.4%)	56 (38.9%)	7 (6.5%)	16 (21.9%)	21 (53.8%)	3 (1.8%)	281 (19.4%)
Fishing	18 (6.1%)	41 (15.4%)	0	55 (32.7%)	14 (9.7%)	0	21 (28.8%)	3 (7.7%)	13 (7.8%)	165 (11.4%)
Watercraft use	42 (14.2%)	34 (12.8%)	0	36 (21.4%)	16 (11.1%)	0	10 (13.7%)	1 (2.6%)	12 (7.2%)	151 (10.4%)
Bathing	0	0	0	0	0	94 (87.9%)	0	0	2 (1.2%)	96 (6.6%)
Diving/snorkelling	1 (0.3%)	13 (4.9%)	2 (1.0%)	34 (20.2%)	2 (1.4%)	0	9 (12.3%)	1 (2.6%)	6 (3.6%)	68 (4.7%)
Attempting a rescue	6 (2.0%)	10 (3.8%)	0	5 (3.0%)	4 (2.8%)	0	2 (2.7%)	0	0	27 (1.9%)
Other [†]	55 (18.6%)	2 (0.8%)	1 (0.5%)	4 (2.4%)	11 (7.6%)	0	3 (4.1%)	10 (25.6%)	8 (4.8%)	94 (6.5%)
Unknown	60 (20.3%)	33 (12.4%)	18 (9.3%)	10 (6.0%)	13 (9.0%)	1 (0.9%)	9 (12.3%)	3 (7.7%)	115 (68.9%)	262 (18.0%)
Total	295 (100%)	266 (100%)	193 (100%)	168 (100%)	144 (100%)	107 (100%)	73 (100%)	39 (100%)	167 (100%)	1452 (100%)

* Includes bucket, cattle dip, trough, drain, irrigation channel, water tank, esky, fish pond, septic tank, well, quarry and duck bath. † Includes collecting water, driving a car, working near water, using a flying fox, and collecting seaweed. ♦

3 Location of drowning deaths in Australia, by age, 1 July 2002 to 30 June 2007

Location	Age group (years)*								Total
	0-4	5-17	18-29	30-39	40-49	50-59	60-69	≥ 70	
River	15	29	51	48	54	39	26	33	295
Beach	0	17	49	46	39	45	35	35	266
Swimming pool	78	14	20	14	17	7	13	30	193
Ocean	0	4	29	30	34	26	30	13	166
Lake/dam/lagoon	25	20	15	20	19	20	10	15	144
Bathtub	29	5	18	12	11	12	13	7	107
Harbour/bay/estuary	0	5	7	15	8	16	14	8	73
Other	15	0	2	4	8	2	1	7	39
Unknown	7	11	39	19	20	24	20	22	162
Total	169	105	230	208	210	191	162	170	1445

* Age was unknown in seven cases.

4 Country of birth of people drowning in Australia and state of coronial case, by visitor status, 1 July 2002 to 30 June 2007

	Not a visitor	Visitor	Unknown*	Total
Country of birth				
Aboriginal or Torres Strait Islander	14 (82.4%)	2 (11.8%)	1 (5.9%)	17 (1.2%)
Australia	364 (52.7%)	317 (45.9%)	10 (1.4%)	691 (47.6%)
Overseas	78 (26.2%)	213 (71.5%)	7 (2.3%)	298 (20.5%)
Unknown	153 (34.3%)	247 (55.4%)	46 (10.3%)	446 (30.7%)
State/territory of coronial case				
Australian Capital Territory	8 (61.5%)	5 (38.5%)	0	13 (0.9%)
New South Wales	211 (40.6%)	293 (56.3%)	16 (3.1%)	520 (35.8%)
Northern Territory	24 (55.8%)	18 (41.9%)	1 (2.3%)	43 (3.0%)
Queensland	146 (44.5%)	157 (47.9%)	25 (7.6%)	328 (22.6%)
South Australia	41 (36.9%)	70 (63.1%)	0	111 (7.6%)
Tasmania	18 (40.9%)	25 (56.8%)	1 (2.3%)	44 (3.0%)
Victoria	83 (35.2%)	133 (56.4%)	20 (8.5%)	236 (16.3%)
Western Australia	78 (49.7%)	78 (49.7%)	1 (0.6%)	157 (10.8%)
Total	609 (41.9%)	779 (53.7%)	64 (4.4%)	1452 (100%)

* Information missing from case record.

318 in 2002–03 to 257 in 2006–07). However, this finding should be interpreted with caution, as drowning figures for 2007–08 were higher than those for 2006–07^{2,16} and the target does not take into account population growth or other societal influences such as levels of alcohol consumption, use of aquatic locations or swimming skills.

Children aged under 5 years remain the most vulnerable group, although drowning rates in this group have decreased from 4.6 per 100 000 in Mackie's study¹ to 2.63. Significantly, the proportion of total drowning deaths accounted for by this age group

has decreased from 22% to 12%, and the average annual number of drowning deaths decreased from 59 to 34.¹

Drowning in home swimming pools has nearly halved since Mackie's study, from about 28 to 16 each year. Further reductions will be underpinned by improvements in fencing^{13,18-20} (particularly entry through a gate, which has been found to be 2.88 times safer than entry directly from the house)²⁰ and associated legislation.¹³ Drowning prevention strategies must be maintained, including promoting adult supervision,²¹⁻²³ water familiarisation,^{24,25} expanding public

awareness campaigns such as RLSSA's Keep Watch program,^{19,26} and improving early basic life support,²⁷ which must be stressed to new parents and pool owners. Farm drowning deaths (in dams, irrigation channels, troughs and tanks) accounted for 12% of all drowning deaths in this study, indicating a need for greater emphasis on safe play areas on farms.^{21,28}

Although people aged 55 years or older represented 29% of all drowning deaths in this study, the issue of drowning in this age group has received little attention. Contributing factors include a reliance on skills (eg, swimming) gained earlier in life, overestimating current abilities, reduced fitness, greater exposure through increased aquatic activities and time spent near water (due to both increased leisure time and living near the water), and impact of medical conditions.²⁹ With the ≥ 55-years age group likely to grow by 38% by 2020,¹⁷ drowning deaths are likely to increase without immediate intervention. This age group's inclusion in the AWSS targeted life stages is a call to action for a greater focus on reskilling, increased safety systems in a diverse range of locations and further research.

Analysis of drowning by location has been a significant limitation in previous studies, with ABS death data (used by Mackie¹) lacking differentiation between aquatic location categories. We found that over half of all drowning deaths occurred at rivers, beaches and swimming pools. Although much work has been undertaken in Australia to make public swimming pools³⁰ and beaches³¹ safer, little is known about drowning deaths or effective prevention strategies in rivers. Geographical disbursement, weather factors and the diversity of activities undertaken before drowning make further research into river drowning deaths imperative.

Unintended entry, where the person drowned after falling into the water, was a common scenario in this study, and drowning prevention strategies for this, especially the use of personal flotation devices, need to be explored in greater detail.

Mackie found that 7% of drowning deaths involved international tourists,¹ and although our study did not separate visitors by intrastate, interstate or international, it is interesting to note that people born overseas were more likely to be a visitor to the location in which they drowned than those born in Australia. Information in the NCIS about Aboriginal and Torres Strait Islander status was poor, and it was thus not possible to

5 Alcohol and drug involvement in drowning deaths in Australia, by financial year and age, 1 July 2002 to 30 June 2007

	No alcohol or drugs	Alcohol only	Drugs only	Alcohol and drugs	Unknown	Total
Financial year						
2002–03	109 (34.3%)	49 (15.4%)	12 (3.8%)	5 (1.6%)	143 (45.0%)	318
2003–04	118 (39.7%)	54 (18.2%)	11 (3.7%)	6 (2.0%)	108 (36.4%)	297
2004–05	117 (40.5%)	61 (21.1%)	7 (2.4%)	10 (3.5%)	94 (32.5%)	289
2005–06	121 (41.6%)	61 (21.0%)	13 (4.5%)	7 (2.4%)	89 (30.6%)	291
2006–07	100 (38.9%)	46 (17.9%)	14 (5.4%)	12 (4.7%)	85 (33.1%)	257
Age group (years)*						
0–17	232 (84.7%)	14 (5.1%)	3 (1.1%)	0	25 (9.1%)	274
18–29	47 (20.4%)	48 (20.9%)	17 (7.4%)	12 (5.2%)	106 (46.1%)	230
30–39	51 (24.5%)	52 (25.0%)	20 (9.6%)	13 (6.3%)	72 (34.6%)	208
40–49	52 (24.8%)	64 (30.5%)	9 (4.3%)	9 (4.3%)	76 (36.2%)	210
50–59	55 (28.8%)	44 (23.0%)	5 (2.6%)	2 (1.0%)	85 (44.5%)	191
60–69	56 (34.6%)	33 (20.4%)	1 (0.6%)	4 (2.5%)	68 (42.0%)	162
≥ 70	72 (42.4%)	16 (9.4%)	2 (1.2%)	0	80 (47.1%)	170
Total	565 (39.1%)	271 (18.8%)	57 (3.9%)	40 (2.8%)	512 (35.4%)	1445

* Age was unknown in seven cases.

determine whether there have been changes in this group since Mackie's study.¹ Future detailed study of drowning deaths in both visitors and Indigenous people is warranted.

Although over a third of cases in this study were missing information on alcohol or drug involvement, data collection appears to be improving, with the number of "unknown" cases decreasing each year. Information about alcohol and drugs would be greatly improved if blood analysis was undertaken in all drowning cases.

This is the first time that both open and closed cases in the NCIS have been used as the primary source of information for a study into drowning deaths. Although the information provides great detail for some drowning deaths, particularly where a coronial investigation has been conducted, other cases are missing a significant amount of information. Some categories, such as country of birth and alcohol involvement, were more likely to be missing information, and where the person was alone at the time of death it was not possible to ascertain his or her activity. Linking with ABS data, as is now occurring, will improve the information available, particularly cause of death, for international comparisons.

This detailed audit suggests that the aimed-for reduction in drowning fatalities may be achievable with current knowledge and preventive systems for certain types of immersions, if reductions follow past trends. However, in some scenarios, such as drowning deaths in rivers, people from overseas

and older people, further research and new initiatives will be required.

COMPETING INTERESTS

None identified.

AUTHOR DETAILS

Richard C Franklin, BSc, MSocSc, PhD, National Manager Research and Health Promotion¹

Justin P Scarr, BEd, MBA, Chief Operating Officer¹

John H Pearn, MD, FRACP, FRCP, Medical Director,¹ and Paediatrician²

¹ Royal Life Saving Society – Australia, Sydney, NSW.

² Royal Children's Hospital, Brisbane, QLD.

Correspondence: rfranklin@rlssa.org.au

REFERENCES

- Mackie IJ. Patterns of drowning in Australia, 1992–1997. *Med J Aust* 1999; 171: 587–590.
- Royal Life Saving Society – Australia. The National Drowning Report 2008. Sydney: RLSSA, 2008.
- Mackie I, Tebb N, Eady T. National drowning study, Parts 1 to 4. Sydney: Royal Life Saving Society – Australia, 1993.
- Pearn J, Nixon J, Wilkey I. Freshwater drowning and near-drowning accidents involving children: a five-year total population study. *Med J Aust* 1976; 2: 942–946.
- Pearn J. Drowning in Australia: a national appraisal with particular reference to children. *Med J Aust* 1977; 2: 770–771.
- Pearn J, Nixon J. Prevention of childhood drowning accidents. *Med J Aust* 1977; 1: 616–618.
- Pearn JH, Thompson J. Drowning and near-drowning in the Australian Capital Territory: a five-year total population study of immersion accidents. *Med J Aust* 1977; 1: 130–133.
- Nixon JW, Pearn JH, Dugdale AE. Swimming ability of children: a survey of 4000 Queensland chil-

dren in a high drowning region. *Med J Aust* 1979; 2: 271–272.

- Patrick M, Bint M, Pearn J. Saltwater drowning and near-drowning accidents involving children: a five-year total population study in south-east Queensland. *Med J Aust* 1979; 1: 61–64.
- Pearn J. Safety legislation and child mortality [editorial]. *Med J Aust* 1991; 154: 155–156.
- Australian Water Safety Council. National Water Safety Plan. Sydney: AWSC, 1998.
- Australian Water Safety Council. Australian Water Safety Strategy 2008–2011. Sydney: AWSC, 2008.
- Pearn JH, Nixon JW, Franklin RC, Wallis B. Safety legislation, public health policy and drowning prevention. *Int J Inj Contr Saf Promot* 2008; 15: 122–123.
- Driscoll TR, Harrison JE, Steenkamp M. Alcohol and drowning in Australia. *Inj Control Saf Promot* 2004; 11: 175–181.
- National Coroners Information System Coding Manual and User Guide. Version 3. Melbourne: Victorian Institute of Forensic Medicine, 2007.
- Royal Life Saving Society – Australia. The National Drowning Report 2007. Sydney: RLSSA, 2007.
- Australian Bureau of Statistics. Population projections, Australia, 2004 to 2101 (Series B). Canberra: ABS, 2005. (ABS Cat. No. 3222.0.) <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3222.0Explanatory%20Notes12004%20to%202101> (accessed Oct 2006).
- Thompson DC, Rivara FP. Pool fencing for preventing drowning in children (Cochrane Review). The Cochrane Library, Issue 2, 2001. Oxford: Oxford Update Software.
- Stevenson MR, Rimajova M, Edgcombe D, Vickery K. Childhood drowning: barriers surrounding private swimming pools. *Pediatrics* 2003; 111: E115–E119.
- Barker R, Heiring C, Spinks D, Pitt R. Domestic pool immersion in Queensland children under 5 years of age. *Injury Bulletin* 2008; (104): 1–8.
- Bugeja L, Franklin R. Drowning deaths of zero- to five-year-old children in Victorian dams, 1989–2001. *Aust J Rural Health* 2005; 13: 300–308.
- Mack KA, Sogolow E, Strouse D, Lipman PD. The role of supervision of children in injury prevention. *Salud Publica Mex* 2008; 50 Suppl 1: S112–S114.
- Morrongio BA, Klemencic N, Corbett M. Interactions between child behaviour patterns and parent supervision: implications for children's risk of unintentional injury. *Child Dev* 2008; 79: 627–638.
- Rahman A, Shafinaz S, Linnan M, Rahman F. Community perception of childhood drowning and its prevention measures in rural Bangladesh: a qualitative study. *Aust J Rural Health* 2008; 16: 176–180.
- Brenner RA, Taneja GS, Haynie DL, et al. Association between swimming lessons and drowning in childhood: a case-control study. *Arch Pediatr Adolesc Med* 2009; 163: 203–210.
- Cass DT, Ross FI, Grattan-Smith TM. Child drownings: a changing pattern. *Med J Aust* 1991; 154: 163–165.
- Marchant J, Cheng NG, Lam LT, et al. Bystander basic life support: an important link in the chain of survival for children suffering a drowning or near-drowning episode. *Med J Aust* 2008; 188: 484–485.
- Fragar L, Gibson C, Henderson A, Franklin R. Farnsafe farms for kids: evidence based solutions for child injury on Australian farms. Moree: Australian Centre for Agricultural Health and Safety, 2003.
- Franklin RC, Mathieu E. Older Australians: aquatic safety. Sydney: Royal Life Saving Society – Australia, 2006.
- Royal Life Saving Society – Australia. Guidelines for Safe Pool Operation (GSP0). Sydney: RLSSA, 2006.
- Surf Life Saving Australia. Australian Coastal Public Safety Guidelines. 1st ed. Sydney: SLSA, 2007.

(Received 25 Jul 2009, accepted 2 Nov 2009)