



Child and Youth Mortality Review Committee

Te Rōpū Arotake Auau Mate o te Hunga Tamariki, Taiohi

Fifth Report to the Minister of Health Reporting mortality 2002–2008

Chapter 2 Drowning

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2 Drowning

2.1 Introduction

New Zealand has a high rate of drowning compared to other OECD countries, particularly the United Kingdom, Europe and North America (Peden et al 2008; Peden et al 2002). The site of drowning usually varies according to age, with infants predominantly drowning in buckets and baths, pre-schoolers in home pools, and adolescents in natural bodies of water, such as rivers and the sea.

Deaths under five are preventable when the double protection of adequate supervision and appropriate environmental safe guards are in place. In the older age groups increased exposure to dangerous water situations leads to a second peak of drowning in the early 20s, despite greater competence in water. In some circumstances risk-taking behaviour in young people also contributes. (See Chapter 3 for further discussion of drowning in this age group.)

Although the number of New Zealand children dying each year as a result of drowning is reducing, these deaths have a significant impact on families (Fenner 2000) and are largely preventable. During 1980–2002 the rates of drowning in 1–4-year-olds and 15–24-year-olds were 6.9 and 5.9 per 100,000 respectively (McDonald et al 2005). The data presented in this report for the period 2003–2007²¹ show a substantial improvement to 2.46 and 1.78 per 100,000, respectively (see Table 2.1).

This report does not describe non fatal submersion injuries. Many who survive submersion are severely injured for life with traumatic brain injury through asphyxia. The number of cases of permanent traumatic brain injury arising in childhood from drowning is not clear. The Injury Prevention Unit reports two cases of moderate injury for every drowning fatality (Trotter, Russell, Langley, and Casey 2005).

Despite improvement over the last 20 years, a large proportion of drownings and near drownings could have been prevented. New Zealand needs to take every step possible to reduce the number of drowning deaths and near drowning episodes. The focus of this chapter is on understanding and preventing drowning deaths in those under five years of age, with a special focus on drowning in private pools or baths, which make up 58% of cases for this age group (see Figure 2.2).

2.2 Statistics on drowning from the CYMRC database

Drowning is the second most common cause of unintentional injury death for young people under 25 years in New Zealand.²² In the five years from 2003 to 2007, inclusive, 109 children and young people between the age of 28 days and 24 years died as a result of immersion in water, at an overall rate of 1.5 per 100,000.

21 Data including 2008 is included in the appendices. 2008 data is not used for rate calculation because some cases are still awaiting the coroner's report.

22 Motor vehicle crashes are the number one cause of unintentional injury. See Chapter 3 for more information on unintentional injuries, particularly for older youth, in New Zealand.

Table 2.1 Drowning deaths in New Zealand by age and gender 2003–2007

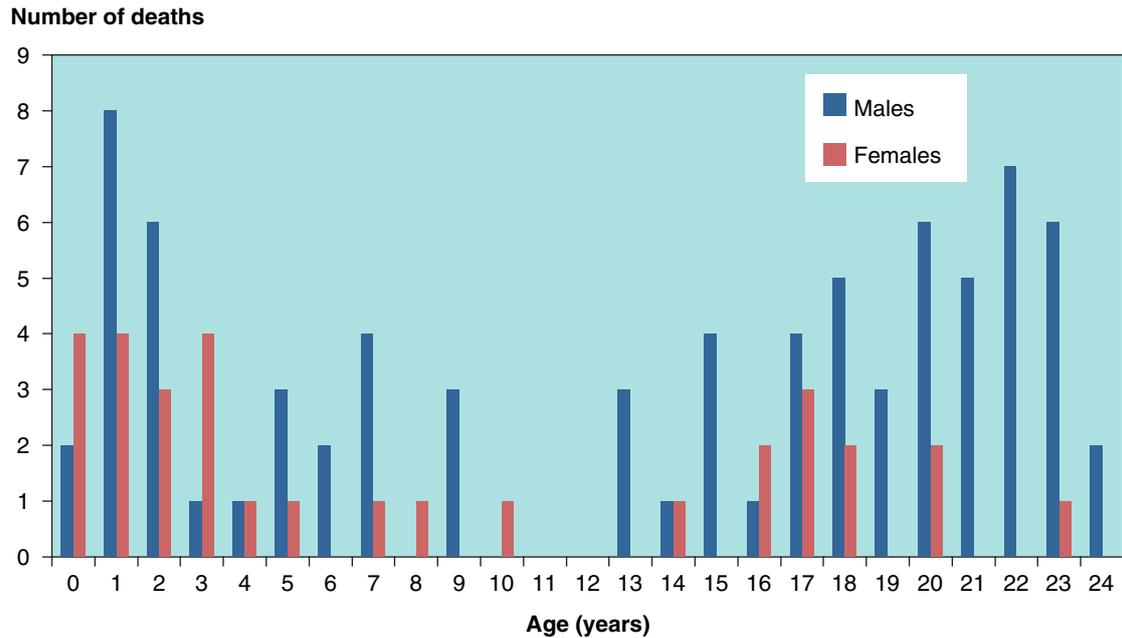
	Total drownings 2003–2007	%	Rate (per 100,000 estimated population)
All drowning deaths	109		1.47
Gender			
Male	78	71.6	2.06
Female	31	28.4	0.85
Age category			
Under 1 year	6	5.5	2.05
1–4 years	28	25.7	2.46
5–9 years	15	13.8	1.03
10–14 years	6	5.5	0.39
15–19 years	24	22.0	1.56
20–24 years	30	27.5	2.09
Ethnicity			
Māori	40	36.7	2.42
Non-Māori	69	63.3	1.20
Location			
River	31	28.4	0.42
Beach	30	27.5	0.40
Private pool	13	11.9	0.18
Bath	10	9.2	0.13
Boating	8	7.3	0.11
Lake	5	4.6	0.07
Low volume water	4	3.7	0.05
Pond	3	2.8	0.04
Public pool	3	2.8	0.04
Unknown	2	1.8	0.03

In New Zealand during 2003–2007 the rate of drowning in males was 2.4 times²³ higher than the rate in females (see Table 2.1), and the rate of drowning in Māori was 2.1 times²⁴ that of non-Māori. Drowning rates were lowest in the 10–14 years age-group (0.39 per 100,000), followed by the 5–9 years age group (1.03 per 100,000), with the highest rate of drowning deaths being in the 1–4 years age group (2.46 per 100,000) and the 20–24 years age group (2.09 per 100,000). This suggests that pre-school children and young adults are at greatest risk of drowning.

23 Males 2.4 times more likely to drown (95% confidence interval CI: 1.6–3.6).

24 Māori 2.1 times more likely to drown than non-Māori (95% confidence interval CI: 1.4–3.0).

Figure 2.1 Number of drownings in New Zealand, 2003–2007 combined



Note: No drownings occurred for the 11 and 12 years age groups during this time period.

The places where drownings occurred have been analysed into the following categories:

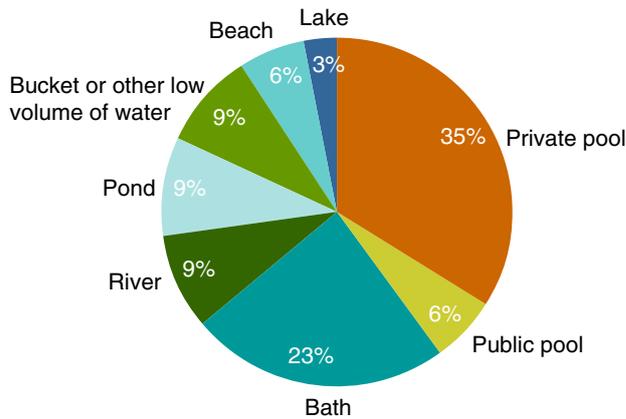
- rivers (including all freshwater waterways)
- beaches (including tidal estuaries, harbours and rocky foreshores)
- private pools
- public pools
- baths
- boating (any location, all types of boat)
- lakes
- low-volume water collections (including, but not limited to, buckets)
- ponds.

Children under five years, especially infants, are intensely vulnerable to drowning even in very small bodies of water (eg, a bucket), so a lapse in supervision can be sufficient to allow an infant or child to drown. The double protection of a safe environment and adequate supervision is, therefore, crucial. For older children through to 12 years of age it seems likely that increasing swimming skills and ongoing caregiver supervision contribute to lower rates of drowning.

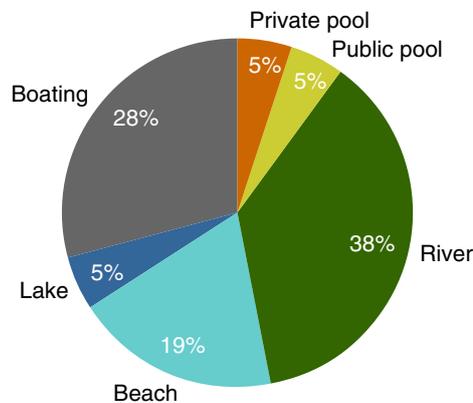
Drowning in the 15–24 year age group is considered in the next chapter along with other types of unintentional injury in this age group.

Figure 2.2 Drowning, by location and age group, 2003–2007 combined

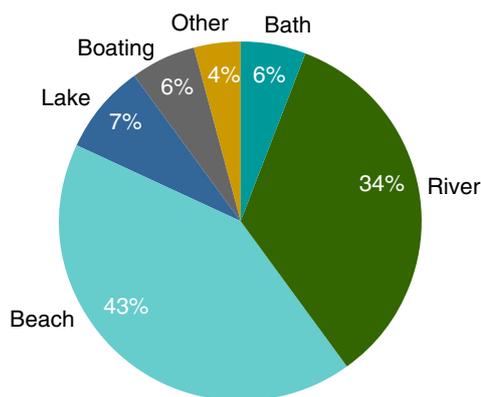
Age group 0–4 years (34 deaths)



Age group 5–14 years (21 deaths)



Age group 15–24 years (54 deaths)



The main locations of drowning for those less than five years of age were private pools (35%), baths (23%), rivers (9%), ponds (9%) and low-volume water collections (9%).²⁵

In children 5 to 9 years of age the main locations of unintentional drowning were rivers (47%), boating (27%) and the beach (20%). Locations in which children aged 10 to 14 years drowned were boating (33%), and rivers, beach, lakes, and public pools (17% each).

25 The age groups used in this section (0–4 years, 5–14 years, 15–24 years) were selected on the basis of a commonality of location of drowning within the age range, and are consistent with standard age groups used in injury epidemiology.

2.2.1 Bath drowning²⁶

The most common site of drowning in infancy (0–12 months) is the bath. During January 2002 to December 2007²⁷, nine 1–12 month-olds drowned, with four (44%) of these being in a bathtub. All of these deaths occurred when the infant was left unsupervised by an adult.

Deaths in baths also occur in older age groups, usually in association with a medical condition that predisposes to unconsciousness (such as epilepsy).²⁸ In the 1–24 years age group, during 2002–2007 (inclusive) there were 10 drownings in the bath. Three were presumed to be intentional (ie, assault) and four were associated with a medical condition. The remaining three deaths were in children aged between 1 and 2 years who were left in the bath without adult supervision.

Parents were often away from young children for a short time, often to attend to another child or to household tasks. Some children were left unattended in bath seats and subsequently fell out. These findings are consistent with other studies, which have found similar reasons for leaving children unattended. Table 2.2 describes the reasons for lack of parental supervision for drowning deaths in Ontario, Canada, from 1986 to 2006.

Table 2.2 Reasons for lack of parental supervision in drowning deaths in Ontario, Canada, 1986–2006

Reason	Number of cases	Reason	Number of cases
Telephone call	9	Answering door	2
Usual practice	7	Attending to other sibling	2
Adult fell asleep	5	Preparing food	2
Chores	3	Outside of home	2
Bedtime preparation	3	Watching TV	1
Unaware of location	3	Smoking	1
Co-bathing	2	Not given	9

Source: Paediatric Death Review Committee and Deaths Under Five Committee 2008

There have been investigations into the possible role of bath seats in drowning in infancy. Although none have been able to confirm that this is a risk factor for drowning, it appears that bath seats give parents a false sense of security, leading to infants being left unattended more frequently (Byard and Donald 2004; Lee and Thompson 2007). The European Child Safety Alliance now recommends that bath seats not be used (European Child Safety Alliance 2006; Peden et al 2008).

Research has also suggested that parents are more likely to leave a small child in the bath if an older sibling is present (Lee and Thompson 2007). Young siblings are not suitable caregivers for infants and young children in the bath.

The common factor in these drowning deaths was a lack of adult supervision. The table from Ontario gives a frightening insight into how easy it can be for a small child to drown in his or her own home while a caregiver's attention is diverted. Such an insight can be used to help families understand the risks and then plan to avoid them. Professionals need to place more emphasis on educating parents of the dangers of leaving children under the age of three years in the bath, even for a few seconds. If parents need to leave the bathroom for any reason while their child

26 The figures in this bath drowning sub-section include some deaths that were presumed to be intentional.

27 Data from 2002 is included here so these deaths occurred over a six year period.

28 The Epilepsy NZ website is <http://www.epilepsy.org.nz/main.cfm?id=49>.

is in the bath, they should take the child with them. When parents are taught to bathe children, this simple strategy to keep their children safe should be taught as well.

2.2.2 Drowning of children in private pools: children under 10 (January 2002–December 2008)²⁹

Private pools are the predominant site of drowning in children under the age of five years. Cases of drowning³⁰ in private swimming pools over the period 2002–2008 were reviewed. Eighteen children drowned in private pools, with an age range of nine months to 4.5 years. Nine were male (50%) and 10 children (56%) were less than two years of age. The mean age of drowning in private pools was 24 months.

Eleven of the pools were in the child's usual place of residence, three were at grandparents', and other cases occurred in a neighbour's pool or while visiting. None of the children who drowned were being directly supervised by an adult at the time.

No information about the way the child accessed the pool was available in one case. The figures below, therefore, relate to 17 cases, all of which occurred in fenced pools. The fences did not comply with the Fencing of Swimming Pools Act 1987 (the Act) at the time of drowning on 12 (70%) occasions. A number of these fences had previously been compliant with the Act, but deterioration of the fence or gate, or modifications to the fence or gate, had occurred, thereby leading to non-compliance. Full information about previous fence inspections and compliance was not available on the Committee's database.

On 10 (59%) occasions the child gained access to the pool via the gate. Eight of these gates were not compliant with the Act. The Act requires gates to be self-closing, open outwards, have a secure child-proof latch and have no gaps around the gate. The non-compliance of gates included problems with all of these requirements. Gate spring and latch failure due to deterioration with time or mechanical blockage of gates or catches were important issues.

On three (18%) occasions the child was able to climb over the fence. Two of the fences climbed were non-compliant with the Act. Methods used to climb the fences included using items such as chairs or toys, or the use of footholds that were present in the fence. On four (24%) occasions the child gained access through the fence where the fence was defective (eg, a hole in the fence, non-standard fence, or the fence was arranged in a non-secure way).

In some of the pools the water was heavily colonised with algae. Disused pools are just as dangerous to children and discoloured water may make the hazard less obvious and create difficulties knowing a child has fallen in. Drowning occurred in every season of the year. December was the commonest month for drowning, with five cases. Ten children drowned in the three summer months, with four in spring and three in autumn.

Data on the number of cases of permanent traumatic brain damage from near drowning in private pools was not available.

2.2.3 Discussion: Swimming pool fencing

In the seven years prior to the Fencing of Swimming Pools Act 1987, 74 children drowned in private pools (McDonald et al 2005). The data in this report is consistent with the continuing decline of drowning in private pools since the Act came into force. Over the seven-year period reported here, 18 children drowned, or 2.6 per year on average, compared with 11.5 per

29 For private pool drowning a 7 year period data collection – from the start of collection in January 2002 until the end of 2008 – was used for analysis.

30 Cases have also been included where death was not immediate but occurred later as a direct result of the injury sustained through near drowning.

year prior to the Act (Department of Building and Housing 2008), despite a greater than 30% increase in pool numbers.³¹ These improvements highlight the benefits of using a mechanical barrier in addition to the expectation of constant supervision (double protection) to prevent drowning in infants and young children.

The complete lack of a pool fence was not a contributing factor in any of the 18 cases. Seventy percent of the fences were not compliant with the Act at the time of the drowning. Mechanical deterioration, structural modifications and layout changes made over time had presumably rendered a number of compliant fences non-compliant. It is assumed, but not certain, that all the fences would have been compliant when first constructed. No mention is made in the police or coroners' reports of the pools having been constructed without the awareness of local territorial authorities.

An additional risk related to pool fences is that ongoing modifications and structural changes are frequently made to houses. Changes of ownership also occur, so the current owner may have no awareness of the original compliance process.

It seems that the current systems have failed to protect a number of children because there is variable monitoring of ongoing compliance with the Act. The situation could be compared with cars having a warrant of fitness when first registered and then assumed to be mechanically sound and safe forever more. Clearly this does not occur for either cars or pool fences. Cars have a regular monitored system to ensure safety. Similarly, the responsibility of owning a dog is enforced by annual licensing, and most local authorities use this as an opportunity for education and updates. In 2007 a survey was sent to 73 local authorities regarding compliance with and enforcement of the Fencing of Swimming Pools Act. Of the 49 returned questionnaires, only 31 had a programme of re-inspection of swimming pool fences (Gulliver et al 2009). The authors concluded "in order for pool fencing legislation to be effective, enforcement must be maintained" (Gulliver et al 2009: 132).

A regular system of checking pool fences offers not only a chance to check the fence for mechanical soundness but also a chance for some safety-related education and reminders. Checking could occur via regular visits, random visits, a mail-based questionnaire checklist process and information sharing, or a combination of these. Checks and reminders in spring would offer the best chance of pools being safe and adult supervision being in place for the spring and summer, when the greatest risks arise. Encouraging households to perform a pool fence check at a fixed time in relation to a seasonal event, such as the clocks going forward for daylight saving (as happens for smoke alarms), is a strategy that could be considered.

2.3 Local review group recommendations: drowning in under five-year-olds

Over the 2003–2008 period a number of recommendations were made by local mortality review groups to the CYMRC national committee as a result of reviews of these drowning deaths. A number of these recommendations were relevant nationally, and the following list contains common themes that emerged from local reviews.

- There was concern that infant bath seats engender a false sense of security in parents, and it was recommended that this be investigated further.

31 This is based on a January 2007 study by the University of Otago's Injury Prevention Research Unit into the compliance and enforcement of the Fencing of Swimming Pools Act 1987, commissioned by Water Safety New Zealand. The study estimated 16,600 new pools were constructed in the last 10 years from data provided by territorial authorities (Gulliver et al 2009).

- It was recommended that there be more education on the water safety sections of the Well Child book, particularly by Well Child providers.
- It was recommended that parents undertake an audit of safe play areas, particularly to identify water hazards in the children's normal play area. Water Safety New Zealand provides a checklist.
- Concerns were raised about the lack of ongoing maintenance of pool fences and the lack of checks for ongoing compliance.

2.4 Approaches taken by the CYMRC to drowning prevention

In response to the concerns raised during the process of data collection and death review, a number of CYMRC agents at the national and local level have taken steps to prevent drownings. Following the publication of the CYMRC report in 2005, safe bathing messages were placed into the Well Child book. Plunket added safety messages into their programme after local mortality review group and CYMRC action. The CYMRC has also advocated for changes to the Fencing of Swimming Pools Act 1987 to ensure pool fences remain compliant. To this end, it made a submission to inform the Department of Building and Housing's 2008 review of the Act.

Some overseas studies have suggested that for every child who dies from drowning, up to an equal number will be left with brain damage that may result in long-term disabilities, including memory problems, learning disabilities and permanent loss of basic functioning and vegetative state.³² Traumatic brain injury in infancy and childhood can result in substantial expenses to ACC over the life course – up to \$20,000,000 per case.³³

The CYMRC has been unable to obtain information on the burden of traumatic brain injury from non-fatal submersion. As discussed in the systems issues section of this report (Chapter 5), death is often the 'tip of the iceberg' of suffering, injury and cost. To ensure appropriate priority is given to preventive efforts it is important to consider morbidity from non total submersion as well as mortality. Collecting morbidity information could be a function of a system that links data about serious injuries to improve surveillance, analysis and reporting. (See also Chapter 3.)

A local swimming pool inspection programme by John Symons, Swimming Pool Safety Officer, Hastings District Council

The Hawke's Bay local review members decided to advocate for better swimming pool compliance. At the encouragement of the local review group, the Hastings District Council kicked off the swimming pool inspection programme in 2002. Initially the programme involved searching the individual property records for any sign of a swimming pool (either a historical citing from council staff or an issued building permit/consent) and compiling a swimming pool register based on those findings. A council employee then went through the latest available aerial photographs and looked for any pools that were not registered. Finally, the same researcher used Google Earth to look at the rural areas where there were either no aerial photos available or where the photos were of poor quality.

32 As an example, see Shepherd SM, Shoff WH. 2009. Drowning. URL: <http://emedicine.medscape.com/article/772753-overview>.

33 Jan White, ACC CEO, in speech to Health Select Committee on 19/8/2009.

Once the register was completed, a letter was sent to all the property owners concerned. The letters included a self-assessment questionnaire. From those assessments that were returned, pools deemed in need of immediate inspection were prioritised (ie, pools that were either unfenced or poorly fenced were looked at first). Just over 2800 letters were sent out. Property owner responses indicated that over 900 of the pools had been removed at some stage over the years. This was significant because it is essential for a local authority to have an accurate list of the pools in its area. Since 2002 better-quality aerial photos have become available, and with new pools being built the register now records just over 2500 pools.

Pools are inspected according to priority and owners are given up to four weeks to rectify any non-complying aspects. The inspectors use a one-page self-carboning checklist with enough space to write appropriate comments. The top copy is given to owners on site so they immediately get a report on what needs attention. The carbon copy is scanned onto the property file (ie, digital property records). The site report advises property owners to drain non-complying pools immediately. Follow-up inspections are ideally scheduled at the time of the first inspection; if no one is on site, a reinspection letter goes out with a date and time. Digital photos of the pool fences are taken and attached to the property records.

Once a pool is passed it is reinspected every three years. All inspections are scheduled 1 to 2 weeks ahead by letter. The inspection programme is funded by a levy on the rates, currently \$39 per year. A small portion of the costs (approximately 10%) comes from the general rate. The levy covers the costs incurred by the council in carrying out up to two site visits/inspections in every three-year cycle. If additional inspections are required, the property owners are charged a flat fee of \$112.50 (\$100 + GST). This gives property owners an extra incentive to get the work done quickly. Persistent non-compliance is dealt with via additional inspection fees. To date, no one has been prosecuted under the Fencing of Swimming Pools Act 1987 as a result of this programme. The programme currently has a compliance rate of 95%.

2.5 Recommendations by the CYMRC on drowning prevention

2.5.1 Legislation

1. The current pool fencing legislation has worked well to reduce child drowning. Any changes in legislation regarding pool fencing should ensure that the risk of drowning is further reduced through increased child safety provisions.

2.5.2 Policy

2. Local authorities should consider where systems to support ongoing compliance with the legislation on pool fencing and overall pool safety can be improved.
3. Information on the burden of disease from traumatic brain injury arising from non fatal submersion should be collected to support the prioritisation of intervention(s).³⁴

34 This could be part of an improved system that links serious injury information for surveillance, analysis and reporting as recommended in Chapter 3 and discussed in Chapter 5.

2.5.3 Good practice

4. Those with a medical condition that predisposes them to unconsciousness (such as epilepsy) should be advised to shower rather than take baths.
5. When new caregivers are taught to bath their babies, a simple safety strategy should be taught: 'if you leave the bathroom, take your baby/child with you'.

Community messages

- Never leave children, especially those under five years of age, unsupervised near water, including baths, buckets and water troughs.
- All children under the age of three years should be constantly supervised in the bath by an adult. "If you leave the room, take the child with you."
- Bath aids or young siblings are not a replacement for adult supervision.
- The safety and security of pool fences should be checked regularly, with special attention paid to the gate, which should open outwards and close automatically, with the catch fastening firmly.³⁵
- Check pool fences for gaps to crawl under, or for loose bars or planks.
- Never prop open a pool gate or have anything nearby that might block the catch (eg, clothes or towels).
- Never leave chairs or toys so that children can use them to climb over a pool fence.
- If fences are modified or houses redesigned, always check the pool fence still functions to keep children safe.
- Be especially careful with children if you are visiting someone with a pool. If you are in a group, always make sure it is clear who has the job of watching the children; otherwise everyone may assume someone else is watching them.

³⁵ Local councils can provide more information on this.
See <http://www.watersafety.org.nz/pdfs/booklets/Be%20PoolSafe%20Booklet.pdf>.