The Prevention of Drowning

Task Force on the Prevention of Drowning
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It is no exaggeration to say that the prime purpose of this handbook, indeed the raison d’être of all research and development in the field of drowning, is prevention. This is both prevention of any incident occurring in the first place, and also prevention of a drowning death if an incident takes place (that is, both primary and secondary safety). In the end, the only purpose for all the other contributions examining drowning is to reduce the incidence of death or other harmful consequence. In this section a number of contributions examine different aspects of prevention. We have not been able to include contributions from all approaches, but have touched on most of the main ones. For further information the reader should both examine other main sections in this Handbook and refer also to [1−8].

Following two short opening contributions from the chairpersons of the Prevention task force (▷ Chapter 3.2 and 3.3), the section has a contribution from Andrej Michalsen (▷ Chapter 3.4) on risk assessment and perception, basically making the point that in order to have any chance of sensible preventive strategies we need to understand risk and risk perception.

The next two contributions, by John Pearn and David Calabria (see ▷ Chapter 3.5), examine drowning in the context of children, including infanticide by drowning, while Ian Scott examines drowning at home and in the garden (▷ Chapter 3.6). Both make the case for a particular technical preventative strategy, namely fencing and gates around domestic pools. The first authors stress the need for such techniques to be well designed and based on good ergonomics. Scott emphasises some of these points, and makes a strong argument that any regulation and legislation must be appropriate. He also highlights the possible opposition from the community, including parents as well as others, if they feel that they might lose something by being compelled to use some technical means of prevention. However, the authors strongly argue for such a case to be made and for opposition to be overcome.

Secondary safety requires that if people are in distress in the water, some means of rescue must be on hand, whether by means of buoyancy aids, parental supervision, or official supervision. The latter is the subject of the chapter by Andrew Harrell (▷ Chapter 3.7), examining in particular the vigilance required of beach patrols. He stresses the need to understand what goes on in scanning behaviour of lifeguards, and also their decision biases and team behaviour, as well as the need for better job design, training and support.

Ruth Brenner, Kevin Moran, Robert Stallman, Julie Gilchrist and John McVan, in a joint chapter, examine the different aspects of a controversial question, namely the supposition that improving swimming ability in the population will decrease the risk of drowning. They quite cogently make the point that this is not necessarily so, since increased swimming ability might lead to people taking greater risks, and also that it is very difficult to define what we mean by ability in this context. It is probably not useful to think of swimming ability in
The Prevention of Drowning

In the final chapter, Chapter 3.9, Elizabeth Bennett has brought together fourteen contributions from many authorities from around the world, to describe community and national campaigns in their own countries or regions. The lessons drawn from these contributions are interesting, not so much in differences in approach between different authorities, but more in the common lessons which have been learned, about the implementation of such programs and about their outcomes. Bennett herself sets out common themes: the need to use multiple strategies but with specific targets, the need for multi-organisational collaboration in campaigns, the need for education and training to be implemented along with other more technical and design approaches, and also the need for better evaluation of successful programs.

Whilst, as explained above, not examining all possible routes to prevent drowning, it is hoped that the contributions in this section will whet the appetite of the reader to look for other ways of reducing the incidence and consequences of the potentially tragic event of drowning.

References

3.2
Recommendations

Wim Rogmans and John Wilson

3.2.1
The Challenges of Prevention

Of the three leading causes of unintentional injury, deaths drowning ranks third, and among infants and toddlers first. Routine hospital and other data, as well as the scarce and somewhat fragmented studies that are available at present, identify a number of suspected risk factors. Young children have a different set of risks than older persons. Childhood drowning occurs usually in bathtubs, garden ponds and swimming pools and lapses in adult supervision are one of the major causes of these incidents. For adults drownings occur more often in recreational activities such as swimming in inland or coastal waters and boating and are often associated with unfamiliarity with the risks involved in these activities or with alcohol consumption.

Unlike other public injury areas, such as car safety, pedestrian safety and fire safety, remarkably few drowning prevention programs have been formally evaluated. Those that have been evaluated appear to provide some encouragement for prevention. Also, we are observing, in at least the high income countries, a clear downward trend in fatalities due to drowning over the past century. This is certainly owing to: increased urbanisation that did not fully eliminate the dangers of surface water but at least significantly reduced exposure rates compared to rural areas; improved quality of living environments (housing and community planning); an increase in swimming abilities among the general population; and enhanced knowledge in and availability of rescue and first aid. It is doubtful, however, whether risk factors such as adult supervision at home, in the garden and at swimming pools have improved over the years. Drowning remains an issue of importance world wide and presents, in particular, a risk for vulnerable groups such as young children and ethnic minorities.

The World Congress on Drowning gives a very welcome opportunity to identify and document the state of play in drowning prevention. It highlights the gaps in knowledge and understanding of what works in drowning prevention and identifies routes for further development and for increasing the effectiveness of drowning prevention.

3.2.2
Gaps in Knowledge

Hazard identification and risk assessment are the first steps towards understanding the problem, identifying priorities in measures to be taken and continuously monitoring risks for further improvements. It is the simple structure of the plan, do, check and act cycle, which has been implemented in various environments such as safety of open water in communities, pool safety
and beach safety. This has resulted in the development of tools for risk assessment; however, their application is most fragmented. As most authorities lack the time and resources for elaborate risk assessment procedures, these tools must be kept simple in use, based on best practice and shared internationally. Much more effort should be invested in establishing world wide accepted standards for risk assessment in aquatic environments.

As regards measures to prevent drowning, much of the anecdotal evidence (and the few evaluated interventions) support the belief that the best solution remains to physically separate the person from danger or, in the case of immersion, to prevent immediate drowning. These measures include barriers around private swimming pools, creating natural barriers along surface water in communities, allowing people only to swim in sections of beaches that are professionally controlled and supervised continuously, and wearing personal floatation devices. Except for pool fencing and personal floatation devices, of which the effectiveness is well researched and proven (although only if properly installed, maintained and enforced), much less is known about the effectiveness of design changes in bathtubs, toilets, buckets and garden ponds, in pool covers and pool alarms, in water edge design and treatment, in inland and coastal beach arrangements (lay out, signs and flags). Most importantly, if better design criteria and then actual designs are to be developed, and appropriate test and evaluation programs established, we need much better understanding of the relevant human factors. Better information from structured research programs is needed on adult and child capabilities and characteristics, for example on dynamic physical characteristics of strength and movement, static and dynamic measurements related to equipment fit, perception and comprehension of information and situations and risk awareness.

There are other possible solutions that address the victim and supervisors but they are even harder to prove than the previously mentioned environmental changes. These include actions such as raising general awareness of drowning risks among the general population, educating special risk groups, ensuring adequate supervision at home, in public pools and at beaches, providing early teaching swimming skills, teaching young adults life saving techniques and implementing basic training for all in resuscitation. Most of these measures should be considered as being complementary to the primary physical prevention measures that are proven to be more effective and to provide immediate protection against danger. Nevertheless, in order to increase the complementary effectiveness of measures directed to risk groups and to get the best benefits out of limited resources, much more research is needed into the role of each of these measures in reducing drowning deaths.

A special risk that is relevant in drowning prevention is boating under the influence of alcohol. This behaviour is well researched and it becomes even more hazardous in the marine environment where elements of sun, wind and spray accelerate impairment. In spite of regulations, enforcement and communication efforts the deadly combination of alcohol and water seems to be less understood by boaters than by car drivers today: a challenge for further research.

Finally, it is not known how knowledge and experiences in successfully preventing drowning can be transferred to other settings and cultures and
in particular to low income countries. In spite of all cultural and economical diversity in today’s world we cannot be dismissive or withhold the wider application of the results achieved in one part of the world. Such knowledge transfer programs should be better documented and evaluated.

### 3.2.3 Action Needed and Major Stakeholders to Be Involved

International bodies such as the World Health Organization (WHO), the International Red Cross and Red Crescent (IRCRC), the International Life Saving Federation (ILS) and the International Lifeboat Federation (ILF) should develop guidelines and tools for risk assessment and preventive measures that can be applied in a wide range of settings. The establishment of a clearing house for collecting good practice in applying these techniques and providing the various interest groups with easy access to this information should be considered.

Intergovernmental bodies such as WHO and the International Maritime Organisation (IMO), together with their member states, should review current regulations and standards related to maritime safety and water safety. Much more effort should be invested in ensuring proper regulations for pool safety (both private and public), beach safety and safety of boating (also including compulsory use of life jackets for all passengers on vessels under 24 feet in length).

Non-governmental bodies such as IRCRC and ILS should play an important role in gearing up research and development into better understanding of the relevant psychological and physical human factors, enhanced product design and the design of physical environments in order to prevent people from drowning. This should be in partnership with the maritime industry, pool manufacturers, and building industry. Private industry should develop technologies that make better personal flotation devices available that are also more comfortable to wear and therefore better accepted by people, and pool covers and barriers more suitable for both their purpose in protection and also for child safety.

Finally, all international bodies, together with national governments, should develop a consistent program for collaboration in exchange of experience in drowning prevention through research, standards, regulation, enforcement and continuous education and training. The development of national reports on drowning prevention policies might help to make the diversity in national infrastructures, prevention efforts and their outcomes more transparent.

The following recommendation was established by the task force on the prevention of drowning.

### Preventive Strategies and Collaboration Are Needed

The vast majority of drownings can be prevented and prevention (rather than rescue or resuscitation) is the most important method by which to reduce the number of drownings. The circumstances and events in drowning vary across
many different situations and in different countries worldwide. Considerable
differences exist in the locations of drowning and among different cultures.
Therefore, all agencies concerned with drowning prevention — legislative
bodies, consumer groups, research institutions, local authorities, designers,
manufacturers and retailers — must collaborate to set up national and local
prevention initiatives. These will depend on good intelligence and insightful
research, and must include environmental design and equipment designs as a
first route, in conjunction with education, training programs and policies which
address specific groups at risk, such as children. The programs must be evaluated
and the results of the evaluations must be published.

3.3

Purposes and Scope of Prevention of Drowning

John Wilson and Wim Rogmans

3.3.1

Purpose

The purpose of this section of the book is to present some of the measures that
are relevant for prevention of drownings in the broadest sense. Unfortunately,
scientific evidence on the efficacy of measures is scant. Therefore, we have to
limit ourselves to reporting on best practices as have been developed in the
various countries that have a special concern about drowning and on particular
practices that seem to have gained some justification through qualitative
research and quasi-experimental studies.

3.3.2

Scope

Immersion and drowning can involve:

- People, and especially children, who fall into pools, bathtubs, ponds, wells or
even buckets of water
- People swimming in pools and natural bodies of water
- Boaters, sailors, windsurfers and anyone else taking part in water sports dur-
ing recreation on natural or artificial bodies of water
- Individuals standing or walking on banks of canals, lakes or rivers or who
get caught in flood waters, and
- Persons with impairment (alcohol, drugs, fatigue, seizures, heart attack or
other health problems) while bathing, swimming or standing near water

As part of the project World Congress on Drowning a new definition of drowning
was adopted: Drowning is the process of experiencing respiratory impairment
from submersion/immersion in liquid (Chapter 2.3).
By this definition drownings can be fatal or non-fatal. We therefore refer to drownings independently of the fatal or non-fatal outcome, thus including accidental submersion and immersions, since what counts for prevention is the control of all factors that may create the hazardous situation irrespective of the outcome of the event.

The predominant mechanism of injury is asphyxia, but impact injuries such as cervical cord injuries associated with diving or trauma from blades on motor boats, surf boards and so on are relevant for drowning prevention as these injuries severely handicap the person while in water and may actually lead to drowning. Attack by sharks or contact with poisonous water animals are not considered. Decompression injuries to scuba divers is dealt with in Section 11.

### 3.3.3 Causes and Prevention

For much of the history of humankind, accidental injuries have been perceived as acts of God beyond the control of people. If any injury prevention efforts have been made, these focused mainly on the assumed shortcomings of the victims, with energy directed to such educational measures as the production and distribution of pamphlets and posters. Although this emphasis has changed dramatically in past decades, and in particular in the domains of occupational safety and traffic safety, this victim-centred approach is still evident in policies addressing home and leisure safety.

The modern view of injury prevention does not eliminate personal responsibility, but assigns greater weight to the multitude of factors that also play an important role and some of which are more open for control. As with the outbreak of a disease, each injury is the product of more than one cause that relates to at least three different sources: the host (for instance a swimmer), the agent itself (a tide) and the environment (unsupervised beach) in which host and agent find themselves.

In diagrammatic form this view can be detailed along two dimensions (Fig. 3.1):

- Type of factors involved: on the one hand human factors, such as individual characteristics and social environment, and on the other hand the physical environment, such as products involved in human activity and the physical setting. These are represented in the diagram as the horizontal dimension.
- The time dimension involved: some factors may influence human interaction with the physical environment temporarily, such as impairment by alcohol, while others may have a more continuous influence such as group norms or level of education, skills and so on.
In this chapter we will focus on primary and secondary prevention, efforts to control factors that may lead to a potential hazardous situation (primary prevention) or which ensure that in case of an emergency the victim can be saved from further harm effectively through proper protective equipment or skills to cope with the emergency situation (secondary prevention). Measures that improve the efficiency of rescue through bystanders is part of this consideration, while professional rescue services, first aid and emergency services are considered to be tertiary prevention measures that are dealt with in other sections of this handbook.

We can focus on three basic routes for prevention (Table 3.1):

- Remove, reduce or change the hazard
- Change behaviour in risk taking, supervision or skills
- Prevent contact between people and the environment

However, we can go into more detail than this, and examine drowning prevention from nine inter-related standpoints. These are shown in Table 3.2.
### Table 3.1. Three basic routes for prevention

<table>
<thead>
<tr>
<th>Route</th>
<th>Means</th>
<th>Examples in natural water</th>
<th>Examples in artificial environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove, reduce or change hazard (focus: physical environment)</td>
<td>Take product/service off market</td>
<td>Drain ponds or lakes</td>
<td>Lower high diving board</td>
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<tr>
<td></td>
<td>Redesign system/product/environment</td>
<td>Clear underwater traps in fresh water recreation areas</td>
<td>Swimming pool covers</td>
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<td></td>
<td></td>
<td>Vertical distance between water surface and land surface</td>
<td></td>
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<tr>
<td>2. Change behaviour in risk taking/supervision/skills (focus: human being)</td>
<td>Raise risk awareness</td>
<td>Campaigning for beach safety</td>
<td>School swimming education programs</td>
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<td></td>
<td>Educate parents</td>
<td>Parent education centre programs</td>
<td>Safety drill in swimming pools</td>
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<tr>
<td></td>
<td>Train kids</td>
<td>Improve training in water sports</td>
<td>Parent awareness of bath drownings</td>
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<td></td>
<td>Train parents and youth in rescue</td>
<td></td>
<td></td>
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<tr>
<td>3. Prevent contact between man and environment</td>
<td>Guards</td>
<td>Separate areas for boats or surfing from bathing</td>
<td>Fence private swimming pools</td>
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<td></td>
<td>Barriers</td>
<td>Life jackets</td>
<td>Separate swimming training area from regular basin</td>
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<tr>
<td></td>
<td>Personal protective equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route</td>
<td>Means</td>
<td>Examples and comments</td>
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<tr>
<td>1. Remove hazard</td>
<td>Take hazard or related ‘system’ or product off market</td>
<td>Drain ponds, lakes – only in special circumstances</td>
<td>Close public swimming pools</td>
</tr>
<tr>
<td>2. Reduce level of hazard</td>
<td>Redesign of system, product or environment</td>
<td>Better steering and control interface for boats (power, rowing, sail)</td>
<td>Shallower swimming pools</td>
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<td></td>
<td></td>
<td>Clear underwater traps in salt or fresh water recreation areas</td>
<td>Lower height of diving boards</td>
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<td></td>
<td>Improved diving equipment fit</td>
<td>Higher lighting levels in open and public spaces</td>
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<td>Standards and legislation</td>
<td>Standards and legislation</td>
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<tr>
<td>3. Prevent access or inappropriate interaction</td>
<td>Guards, barriers</td>
<td>Fencing around open water</td>
<td>Swimming pool covers</td>
</tr>
<tr>
<td></td>
<td>Gaps</td>
<td>Separate areas for power boats, swimmers and divers</td>
<td>Walls and fences around pools</td>
</tr>
<tr>
<td></td>
<td>Place hazard out of reach</td>
<td>Standards and legislation</td>
<td>Height of bath side</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standards and legislation</td>
<td>Standards and legislation</td>
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<tr>
<td>4. Barrier around individual</td>
<td>Personal protection equipment</td>
<td>Goggles, buoyancy suits, water wings, life jackets</td>
<td>Goggles, buoyancy suits, water wings, life jackets</td>
</tr>
<tr>
<td>5. Reduce deliberate risk taking behaviour</td>
<td>Education</td>
<td>Peer or ‘hero’ advice, schools, advertising</td>
<td>Peer or ‘hero’ advice, schools, advertising</td>
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<td>Motivation</td>
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<td>Publicity</td>
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</tbody>
</table>
3.3.5 Domains of Interest

Drownings involve very different risk groups, occur in a wide variety of settings and involve a great diversity of products and physical environmental features. So the presentation of relevant measures can take different structures depending on the focus of interest one wants to underline.

For prevention measures it is relevant to take also into consideration the level of responsibility and the extent to which such responsibility is borne by public and private bodies. Following this line of reasoning there are the following domains of interest:

| Table 3.2. Cont. |
|------------------|------------------|------------------|
| **Route** | **Means** | **Examples and comments** |
| | | **Natural water** | **Artificial facilities** |
| 6. Increase incidence of safer behaviour | Education, training | Sailing, windsurfing, diving | Swimming lessons, Safety in skill development |
| 7. Improve supervision | Technical or human observation | Closed circuit TV, parental presence, lifeguards, intelligent underwater drowning detection systems | Closed circuit TV, parental presence, lifeguards, intelligent underwater drowning detection systems |
| 8. Recovery from hazard | Improve personal recovery | Coast guards, lifeguards, lifesaving equipment, First aid and lifesaving training for public | Coast guards, lifeguards, lifesaving equipment, First aid and lifesaving training for public |
| 9. Remove the person from the hazardous situation | Ensure vulnerable people do not go near or in water | Legislation (probably unfeasible) | Legislation (probably unfeasible) |
The domestic area which relates to the risk of drowning in bathtubs, buckets and garden ponds, but also to the risk of privately owned swimming pools for domestic use

- Public swimming pools, educational pools, spas and other built environments for recreational swimming
- Natural bodies of water that serve as public areas for recreation and for which public authorities have made some arrangements to accommodate people for recreation such as arranged beach settings along the coast line, lakes and rivers
- Natural bodies of water which do not have a primarily recreational function, such as unsupervised coastlines, or which serve for transportation (for example canals in urban areas as well as in rural areas) or for drainage (ditches, rivers, lakes)

For each of these settings consideration should be given to risk management strategies, including risk assessment methodologies, and to the role of legislation and standardisation in ensuring the application of proper safety technologies and equipment.

3.4 Risk Assessment and Perception

Andrej Michalsen

Risk assessment helps to form the basis for prevention. The implementation and effectiveness of prevention is influenced by individual risk perception. Considering drowning, both hazard and incidence of submersion injuries are underestimated, whereas treatment options are usually overestimated. This paper aims to clarify the concepts of risk assessment and risk perception with special attention to drowning.

Life carries risks. This truism may have very distinct meanings in different parts and populations in the world of today. Whereas some check the completeness of their water skiing gear, others try to survive volcanic eruptions or floods. Air traffic controllers, for instance, need to assess the risk of alternative flight routes to certain destinations. Physicians must clarify the risks of alternative treatment options for their patients. Parents should teach the risks of certain behaviour to their children.

Before risks can be dealt with, they must be identified, characterised, and quantified. Statistically, risk denotes the probability of an untoward event, often expressed in terms of potential financial loss. As human judgement is not only based on evidence, but also on experience and anecdotal knowledge, lay assessment of risks appear to be heavily influenced by individual risk perception. Individual perception appears to be strongly influenced by personal traits and sociocultural parameters. Thus, “risk” can both relate to an objective reality and to a subjective manner of interpretation [1]. Understanding and influencing
the individual perception may help to prevent the manifestation of the risk in question.

Specifically, the risk of drowning appears to be underestimated, although, according to the World Health Organization, approximately 500,000 annual deaths worldwide can be attributed to drowning in recent years. Over one-half of these deaths occur among children from 0 to 14 years of age. Still, drowning rarely catches the attention of the general public. Drowning occurs quickly and silently, it is rarely related to mass casualty scenarios, and immersion injuries are frequently linked to feelings of guilt for failed supervision, especially regarding children. Therefore, determining and communicating the risk of such injuries appear to be important components of reducing the toll of drowning.

### 3.4.1 Definition of Risk

Statistically, risk is the probability of an untoward event or unfavourable consequences of an event [2]. Among other things, this can refer to emotional, medical, ecological, legal, or economic consequences. In the world of insurance, for instance, risk is usually related to losses equated in financial terms. In this text, risk will specifically refer to events with medical sequelae.

### 3.4.2 Risk Assessment

To describe a certain risk epidemiologically, its distribution and determinants within a particular population need to be known. Based on the Framingham Heart Study, for example, the risk of developing coronary heart disease can be described using certain parameters or risk factors. Individual probabilities of developing defined outcome conditions within a certain time period can be calculated and compared with other cohort members, with a certain margin of confidence. Usually, such a risk assessment pertains to a specific population and may not necessarily be generalised to other populations without further modifications. Also, the individual risk of morbidity and mortality may differ from population-based patterns. Still, preventive efforts can be targeted within defined populations. Such efforts appear to be most successful in so-called high-risk subpopulations.

In risk assessment, risk has also been described as the product of exposure and hazard [3]. An exposure can be quantified through frequency and extent. Hazard denotes the characteristic capacity of an incident to adversely affect human health. Usually, such an incident denotes an interaction between man and his physical and biochemical environment, such as substances, structures, or organisms, with an ensuing energy transfer [4]. For instance, among US anaesthesia personnel, and given average seroprevalence rates and 0.42 percutaneous injuries with infectious material yearly, the estimated average risks of acquiring an occupational hepatitis C or human immunodeficiency
virus infection within 30 work years have been calculated as approximately 0.5% and 0.05%, respectively.

Prudent risk assessment, related to the populations concerned, forms the basis for public health planning and implementation. For many of the risks of life, however, epidemiological data are difficult to ascertain. And even if objective data are available, the way in which they are interpreted may differ considerably amongst various target populations.

**3.4.3 Risk Perception**

Subjective perceptions reflect the interpretation of epidemiologically derived data in personal terms. The subjective assessment of the probability of an undesirable event and its seriousness can be called perceived risk. This individually perceived risk appears to rely strongly on personal traits and socio-cultural parameters, such as education, experience, habits, political orientation, beliefs, and values. Often, peer opinion, hearsay, and media coverage substitute for insufficient personal experience or knowledge [2, 5–7].

Research by Slovic and others [5, 6] has shown that the responses of non-experts to risk are closely related to the position of the risk in a perceptual space, defined by the degree of the perceived threat, the horizontal dimension, and the perceived unfamiliarity, the vertical dimension of the risk (Fig. 3.2).
As to the examples in Fig. 3.2, nuclear reactors and DNA technology have been viewed as bearing high risks, whereas home swimming pools have been perceived as incurring small risks. The attributed positions of the risks covered do not necessarily correspond to their objective epidemiological significance. For instance, the risks of electric fields and satellite crashes appear to have been overestimated, whereas the risks of traffic accidents, handguns and swimming pools appear to have been underestimated [5].

Lay judgements of risk incorporate several aspects such as severity and controllability of the risk, willingness to be exposed and acuity of effect. Overall, such judgements have been found to be inversely related to judgements of benefit, for example the higher the perceived risk, the lower the perceived benefit, and vice versa [8]. This leads to individual acceptable risk-benefit trade-offs, where usually higher risks are accepted for voluntary activities than for involuntary hazards, and where immediate consequences are more actively avoided than late sequelae. Risks that appear obvious and controllable by the potential victims are accepted more easily than risks that appear ambiguous and uncontrollable [5, 6]. Risk perception also varies by age group, that is to say that children cannot recognise many risks in their environments, whereas adolescents often tend to seek risks, rather than to avoid them.

Individual risk-benefit trade-offs are naturally subjective and may be coloured by a number of mental biases. Recently manifested risks, such as those caused by tornadoes, are overestimated in the minds of people compared with those barely recalled, such as those caused by plague epidemics. This is called the availability or publicity bias. Also, the impact of rare risks, such as botulism or bovine spongiform encephalopathy (BSE), is often overestimated, whereas the impact of common risks, such as smoking or paediatric drowning, is underestimated. This is called compression bias. Risks leading to more fatalities per manifestation, such as ferry boat accidents, are perceived as more catastrophic than risks leading to fewer fatalities per manifestation, such as leisure boating accidents, even if the accumulated fatalities of the latter exceed those of the former [2, 6]. In fact, a considerable variation of fatality risks exists among different modes of travel. In the European Union, the fatality risks for travel with road motor vehicles, ferries, planes, or trains are 1.1, 0.33, 0.08, and 0.04 per 10^8 person-kilometres, respectively. This variation is probably not always accurately perceived by the general public.

Finally, expert risk assessment has to deal with missing evidence that may be related, among other things, to the scarcity of data, the applicability of statistical techniques or the generalisability of conclusions. Non-experts, however, may wish to be given certainty through scientific rigour and seem to be considerably troubled by the inherent and remaining uncertainty in risk assessment [6, 7]. The fact of remaining uncertainty underscores the necessity of appropriate risk communication between risk assessment experts and the populations concerned.
3.4.4 Application to Prevention

Key theories explaining health behaviour and change in health behaviour imply a central role for health education, emphasising the importance of knowledge and beliefs about health. Risk perception can be conceptualised as a set of psychosocial factors that determine whether certain situations or behaviour are viewed as risky or risk-free [9]. Efforts to modify risk perception, then, need to incorporate both the individual perceptual idiosyncrasies and the socio-economic conditions of the populations targeted. Communication and management of risk might be best structured as a process that includes conveying risk assessment data, emphasising the relevance of the risk considered to the population concerned, fostering self-responsibility, acknowledging individual concerns and personal beliefs, and striving for broad understanding through awareness and knowledge.

The majority of submersion injuries appear preventable. Yet drowning is the second leading cause of death in children aged 1–14 years in the European Union, with male toddlers being especially vulnerable. Among member states, risk fatality rates vary from 0.32 to 1.26 per 100,000 population yearly [10]. To help parents understand this rate, it can be roughly translated into “one child in a large town per year”. The only strategy shown to significantly reduce drowning in private pools is continuous poolside fencing. Case control studies evaluating pool fencing interventions indicate that the odds ratio for the risk of drowning in a fenced pool compared to an unfenced pool is 0.27 [95% CI (0.16, 0.47)] [10]. Parental risk perception, however, may be different. Parents may rely on the presumed safety of the environment, the swimming skills of their children or the effectiveness of their supervision. According to a cross-sectional study on the risk perception among parents of pre-schoolers in the US, parents that have already had an experience with injury, who see their children as difficult to manage or who are experiencing stress, seem to have better awareness of potential injuries [9]. In principle, all children in or near water are at risk of drowning. How alert, then, might parents be who have not yet had an experience with childhood injuries and who perceive their children as usually calm, sensible and reasonably compliant with orders? An important preventive task will be to alert all parents and caregivers to the actual risk and the dire prognosis once a child has suffered a submersion leading to unconsciousness due to hypoxia. In fact, the single most important factor that determines outcome of submersion is the duration of the submersion and the duration and severity of the hypoxia. Therefore, the prevention of submersion injuries is of utmost importance.

Mandatory pool fencing appears to make an important contribution towards this goal. Further measures advocated to prevent drowning, although less evidence based than pool fencing, include swimming lessons for children, wearing life jackets while boating, and training in basic life support for the general public. Furthermore, personal risk communication by victims and their families, general practitioners, paediatricians, and emergency physicians, public health specialists, and teachers may modify the perception of the risk
of drowning. Also, the media may play an important role, especially through educational material.

### 3.4.5 Conclusions

Human health behaviour is a complex and dynamic mosaic of interactions rather than a tidy set of actions and reactions. Health behaviour is influenced by the perceptions of gains and losses. The conceptualisation of risk by lay persons is more complex than conversion of human health risks to figures of morbidity and mortality by experts. Efforts to prevent diseases and injuries need to incorporate the factors that influence the risk perception of the populations targeted for interventions.

Specifically considering drowning, the populations at risk are large, because submersion is a ubiquitous risk. Both hazard and incidence of submersion injuries are widely underestimated, whereas treatment options are rather overestimated by the public. Beyond engineering and education, individual and parental alertness needs to be fostered. Submersion is a general risk in life and the principal responsibility rests with each individual or his caregivers.

**Acknowledgements.** Joanne Vincenten BPE, MA, Amsterdam, and Ralph Houston PhD, Manchester, have assisted in reviewing the manuscript. Their help is gratefully acknowledged. An extended article with a complete list of references can be found in [11].

**References**

3.5  Prevention of Drowning in the Home and Garden

John Pearn and David Calabria

All around the world, drowning in the home, family garden or its surroundings has become a leading cause of unintentional death among children under the age of 5 years. In many tropical and sub-tropical countries, drowning has replaced motor vehicle accidents as the leading cause of all childhood deaths from injury.

Children under the age of 5 years are particularly vulnerable to home drowning accidents. The sites of such incidents include family-owned swimming pools, the family bathtub, buckets and pails, fish ponds and ornamental pools (Table 3.3) [1, 2]. Child drownings at each of these sites have their individual site-specific precedents and specific approaches to prevention.

Three approaches, sequential in nature, are required if the modern epidemic of preventable child drownings is to be reduced. The first of these comprises an understanding of the site- and age-specific syndromic profiles of home drownings. The second is an analysis of preventive options; and a subsequent matching of preventative stratagems to the primary individual and specific drowning threats. Thirdly, any community in which high home-drowning rates are occurring must pursue a vigorous advocacy of prevention.

Childhood drowning fatalities do not form a spectrum of drowning incidents. They comprise a subset of quite distinct site-specific syndromes unrelated to each other except by the fact that the endpoint of drowning forms the extinction of a young life. A total of 95% of all child drownings are accidental. However, most charged with the duty of reducing child trauma eschew this adjective, and speak of unintentional child drownings. This proactive use of language is held by many to promote a non-defeatist attitude that almost all home and garden drownings involving children are completely preventable.

The primary classification of drowning trauma into unintentional child drownings and intentional child drownings, also highlights the fact that there is a subgroup, less than 2% of all infant and toddler drownings, in which drowning is the modus operandi of child homicide [5].

One generic definition of safety is that “state characterised by adequate control of physical, material or moral threats which contributes to a perception of being sheltered from danger” [6]. All approaches to the promotion of child safety are based on two underlying themes. The first of these is a fundamental philosophical and ethical stance that infants and children have a right to safety.

The second essential distinguishing feature which characterises the domain of child safety is not a philosophical one, but a pragmatic, developmental one. Young children do not have any primary or innate perception of danger. This must be taught or learned by experience.

Specifically, in the case of home drowning incidents, the peak at-risk groups, toddlers, have no perception whatsoever of the threat of water. The biggest injury killer of children, the garden in-ground swimming pool, poses no perceived threat but rather is an attractant to toddlers.
The causes, sites, survival rates and aftermath of drowning deaths all differ when child victims are compared with adult subjects. The common pattern of adult drowning incidents involving alcohol, suicide and boating accidents are rarely encountered in the case of childhood drowning victims. In drowning incidents which occur in the home or garden, the drowning times of childhood victims are always measured in minutes rather than hours [7].

Children who drown in garden swimming pools or in the waterways of canal estates are always the victims of unintentional injury. An unknown proportion, but in the range of 10%–20%, of home bathtub drowning incidents are non-accidental. In some jurisdictions the specific crime of neonaticide applies to home drownings of newborn infants, usually in the bathroom toilet. This syndrome is very specific and has long been recognised with its sad socio-familial overtones. Such mothers are always young and often young teenagers. They are almost always single and the drowning in the bathroom toilet or bathtub occurs in the context of a concealed pregnancy followed by a solitary labour and delivery.

Infanticide is the crime of unlawful killing of a child under 1 year; and, in some jurisdictions, 1 year and 1 day. Deliberate killing of an infant, or a number of children in the family, by a mother disabled by psychosis, occurs not at birth, but in the weeks or months following a birth. Under these circumstances, drowning is in one sense a non-specific modus as the means of ending the life of a child. The perpetrator of infanticide is almost always the mother [2]. Most such perpetrators are suffering either from postnatal depression or from schizophrenia. When depressed mothers kill their infants, the site is always either the family home or in the family car. The proximity of the family bathtub, washing machine, buckets or pails means that drowning is the method of infanticide. Sometimes a mother will kill one, several or all of her children, before taking her own life. Some psychotic parents have attempted to drug their children before drowning them as the final act of killing.

### Table 3.3. Relative rank order and percent of sites of drowning of children aged 0–5 years. Data typical of tropical and temperate developed nations. Older children (80% males) drown also in rivers, lakes and the sea. Data compiled from the Brisbane Drowning Study and other sources [1, 2]

<table>
<thead>
<tr>
<th>Site</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private swimming pools</td>
<td>64</td>
</tr>
<tr>
<td>Family bathtubs</td>
<td>16</td>
</tr>
<tr>
<td>Creeks</td>
<td>11</td>
</tr>
<tr>
<td>Dams, building trenches, sewers</td>
<td>5</td>
</tr>
<tr>
<td>Waterholes, fish ponds</td>
<td>4</td>
</tr>
</tbody>
</table>

#### 3.5.1 Site- and Age-Specific Home Drownings
At least 80% of childhood bathtub drownings are accidental. The syndrome of infant bathtub drowning is quite specific. Such fatalities and near-fatals occur only, or virtually only, in poorer families or in those of lower socio-economic status. Such drownings afflict infants and toddlers in a very defined, age-specific window of 8–18 months of age only; with a modal age of 9–11 months. More than half such bathtub drowning incidents occur during a specific vulnerable period when family routine is suddenly or unexpectedly broken, such as occurs during acute sickness, affecting either parents or children, or in the context of marital strife. A typical scenario is that which involves a stressed mother who is attempting to cope singly with the control, bathing and feeding of several high-spirited or fractious young children. The telephone rings, or an appliance breaks, or someone calls unexpectedly at the door; and the mother leaves an infant in the care of two or three slightly older children. These latter climb out of the bath leaving the infant to drown [8].

A small proportion of children and teenagers drown, or almost drown, in the bathtub as a result of epileptic seizures. An important preventive approach here is to counsel teenagers not to take private plunge baths in a locked bathroom but rather to shower standing up.

More than 60% of drowning deaths in the home or garden occur in private swimming pools. In the US alone there are now over 12 million plastic wading pools and over 5 million surface swimming pools, of which an estimated 2 million are of the more dangerous in-ground variety. Proportionate rates are even higher in other countries such as Australia and New Zealand and in affluent communities within the larger cities in Southern Africa.

The age spectrum of home swimming pool victims is between 12 and 40 months with a modal peak between 18 and 24 months. Children in both the richest and the poorest families in society are particularly at risk. A total of 70% of toddlers who drown do so in their own garden pools. Other at risk sites are the pools of neighbours, motels, caravan or trailer park pools and the garden swimming pools of relatives whom children are visiting.

Any approach to the prevention of drowning deaths needs to be built on the understanding that these home drowning syndromes are distinct and separate. Each requires its specific focussed and targeted preventative approach.

### 3.5.2 Home Drownings: Preventive Options

There are three time-honoured approaches to primary prevention − education, better ergonomic design and legislation. There is a fourth, important, but still potentially unexploited, approach to the prevention of drowning. This is secondary prevention in terms of better first aid training of parents.

The educational approach to the reduction of drownings in the home is a time-honoured one [9]. In general, the belief that by raising the awareness of a threat to safety, a concerned society and parents within it would take steps to reduce the risk, has proved to be naive (Table 3.4) [9].
Better ergonomic design is useful, but primarily as adjuncts to education and legislation.

### 3.5.3 Safety Legislation

As in the case of successful gun control, the reduction of poisoning fatalities and head injuries following road trauma, so too it has been found that the reduction of home drowning accidents primarily requires a legislative or regulatory approach.

The value of isolation fencing which separates the pool from the home in preventing young children from drowning death or injury has been demonstrated most effectively in Australia, where, as in other areas with warmer climates, drowning is the leading cause of accidental death among children under the age of six. Such studies have shown that the isolation fencing of swimming pools is highly effective in reducing child drownings, with the most important element being a secure, self-closing and self-latching gate [4, 10]. Legislation, therefore, is the catalyst which can reduce home pool drownings by between 40%–50%.
Safety legislation must be based upon evidence-based ergonomics data. The Australian Standard for pool fencing is one example of data which are available on which sensible legislation can be based. The alternative use of some suggested forms of protection, alarms or pool covers in lieu of fencing, are not effective in practice.

Legislation, as a stratagem for the prevention of child drownings, is never effective if used in isolation. Regular media campaigns and regular inspections with prosecutory “teeth” are needed if the continuing high rate of toddler drownings is to be further reduced.

3.5.4 Secondary Prevention: First Aid

Children who drown in the family bathtub, ornamental garden ponds or swimming pools do so with median drowning times not longer than 10 min. Under these circumstances, there is great scope for prevention — not of the drowning incident itself, but of the potential death which follows.

Many regard the approach of promoting first aid as a preventative stratagem for drowning as somewhat distasteful. Some regard it as under-emphasising the focus: the imperative of primary protection. Some feel that any compromise whatsoever of the insistence of the absolute right of young children to home safety is an abrogation of the fundamental ethical principles concerned. There is unequivocal evidence from the Brisbane Drowning Study that if the resuscitator of a child extracted from a home water hazard has received first aid training, there is potentially a 30% increased probability of achieving a save.

Bare-handed resuscitation of small children at the scene of a drowning incident is in fact easier than that performed on adult victims. The force necessary to compress the sternum, during external thoracic compression, is also much less than that required in an adult although the frequency is higher. Resuscitators thus do not become so rapidly fatigued. The flexibility of the bodies and limbs of children also makes them much less liable to injuries sustained during cardiopulmonary resuscitation. Such skills, of course, require prior training, but the rewards are very great.

3.5.5 Pursuing Prevention

The most important factor in the reduction of home drownings is neither any lack of knowledge about causes nor any short-comings concerning potentially effective stratagems. The biggest challenge is the strength of advocacy required to protect children who are at risk.

Those who work towards the reduction of childhood drownings in the home environment, embrace a task measured in decades rather than years, and years rather than months. Any review of the history of children’s welfare shows that
whereas society will act swiftly to prevent industrial trauma and deaths sustained by adults, it will not guarantee safety of life and limb as a right to be enjoyed by children. In the UK, Lord Shaftesbury and others worked for many years to overcome that most difficult obstruction of all: the indifference or hostility of parents and indeed that of the whole community to the potential suffering of children. Many countries, regions and communities still do not have such protection. In California, for instance, somewhere between 50 and 100 toddler drownings continue to occur annually.

If legislation for child safety is successfully introduced, this requires constant monitoring to ensure that the regulations are policed. The best approach to the prevention of childhood home drownings is a combination of public education and media advocacy, combined with the underpinning of an enlightened, policed, legislative framework (Table 3.5).

Children’s safety in the home, like safety elsewhere, is a relative term [3]. Not all hazards in the home can be eliminated. But hazards which can kill or leave children permanently disabled must be eliminated whenever such are identified. Safety is a dynamic state and approaches to ensure safety need to be changed,

<table>
<thead>
<tr>
<th></th>
<th>Education</th>
<th>Ergonomic or design improvements</th>
<th>Legislation or regulation</th>
<th>Secondary prevention – first aid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family bathtub</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Spa pools</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Buckets, pails</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td><strong>Garden</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming pools (in-ground)</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Swimming pools (above ground)</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Fish ponds, ornamental ponds</td>
<td>++</td>
<td>+++</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
modified, implemented or abandoned, whenever the threats to children’s welfare change.

The educational approach to reduce home drownings seems logical, indeed self-evident. Many types of home drownings, especially bathtub and bath-spa toddler drownings, are in reality susceptible only to this type of approach. A heightened awareness of the threat, achievable only by media campaigns, seems to be the only approach. However, much has been achieved to date in the reduction of this type of injury; and with resolute advocacy much more will be possible in the future.

References


3.6 Prevention of Drowning in Home Pools

IAN SCOTT

Domestic swimming pools are now recognised as a substantial drowning hazard for young children. They are primarily a hazard for children under 5 years and, in particular, those aged 14 to 24 months. As an affluent and warm weather country Australia was one of the first countries to take up domestic pools in significant numbers and among the first to show what was to be a virtual epidemic of toddler drowning.

The unfortunate Australian history of domestic swimming pool drowning is of the early identification of a growing problem, the relatively early identification of means of prevention (fences and self closing gates appeared in regulation as early as 1972) and then 20 years of dithering while preventable deaths continued to occur. The resistance to action, introduction of ineffective measures, the
adoption of effective regulation and then its abandonment were part of this history.

3.6.1 Development of Interventions

The basic components of the interventions to address the new epidemic of child drowning in swimming pools were identified and available relatively quickly.

By 1972 state-wide swimming pool regulation in South Australia required that pools be enclosed by a fence or permanent barrier not less than 1.1 m high and that every opening have a self closing and self latching gate or door. In fact at least one local government authority had started setting and enforcing fencing requirements for pools in 1960. By 1979 design guidelines were well enough advanced to be published as the Australian Standard on Fences and Gates for private swimming pools. Demonstrations of efficacy of the interventions were also available quickly. As early as January 1977 an analysis of a systematic sample of serious immersions reported a low and static rate of childhood swimming pool fatalities, noting the strong contrast to Brisbane, and attributed it to the presence and enforcement of a requirement that pools be enclosed.

One of the earliest safety measures developed was an Australian Standard for so-called safety covers for private swimming pools. The standard was developed at the request of the Victorian Minister for Consumer Affairs “to specify a means of protecting children 5 years of age and under against drowning in private swimming pools” and published in 1977.

3.6.2 Evaluation and Effectiveness

There are now a number of scientific studies attempting to assess the efficacy of the interventions to prevent child drowning in swimming pools.

The latest of these is a meta-analysis, undertaken as part of the Cochrane Collaboration, of the highest quality studies. Nearly 40 years after the first local ordinances required fencing of swimming pools, this meta-study reviewed the scientific evidence on the effectiveness of fencing as a means of preventing drowning. The authors concluded that, on the basis of the highest level of scientific quality, pool fencing significantly reduces the risk of drowning. The risk of drowning in a fenced pool is about one quarter of that of drowning in an unfenced pool. The risk of drowning in a pool that is fenced on all sides is 17% of that of drowning in a pool where there is access from the house to the pool.

The best evaluation of the effect of fencing pools is available from the Queensland experience. In 1991 new regulations required that all domestic swimming pools be fenced and have a child-resistant barrier, consistent with the Australian Standard, between the house and the pool. Pool owners were required to comply by a set date. There was substantial public discussion over the regulatory changes. Public awareness of the risk of domestic pools to young
children could not have been higher and is likely to have influenced the fall in pool drowning from 1990.

The first point to be made in interpreting the effect of the Queensland regulation is that the pool drowning rate for children under 5 years has fallen substantially. There was a reduction in the pool drowning rate of 58% between the last year before regulation and the latest data available (1999). The fall was from 6.97 per 100,000 (15 deaths) to 2.90 per 100,000 (7 deaths). The second point to note is that the number of pools rose substantially in this period – pool ownership surveys indicating that pool numbers were 70% higher in 1997 than they had been in 1990. Allowing for this rise in the number of domestic pools the drop in drowning between 1990 and 1997 was about 72%. The third factor to take into account is that the detailed incident reports on child drowning now available show that about one-third of drownings occur in the 10% of pools that are unfenced, one-third occur when the gate is defective or propped open and 10% occur in the 50% of swimming pools with complying fences and gates.

3.6.3 Lessons

It is clear from nearly 30 years of effort to prevent child drowning in domestic swimming pools that it is difficult to set and implement performance standards in a contentious area. The lobbying of anti-fencing groups, of those affected by regulation of their existing swimming pools and by the pool construction industry proved very difficult to overcome.

Weakness of Standard-Setting Process

The organisation of the anti-fencing groups was difficult to counter because standards are developed on a consensual basis. Australia has a practical rule that revised standards will not be published if 15% of the membership of the committee disagree with its provisions. A solid majority of the committee wanted the standard to specify preferred fencing configurations or, as a compromise, to note the difference in risk associated with different configurations. The four of the 15 members with entrenched views against fencing consistently spoke against all such measures and, as a result, development of an effective standard was delayed for nearly 4 years.

This highlights the problems associated with a consensual model for the development of effective standards in areas of dispute. The absence of a performance criteria for safety in the standard, such as that it should protect most children, permitted publication of a safety standard that did not address the single most significant safety issue, the location of the fence, and in fact gave standards endorsement to a dangerous and unacceptable measure.
The Need to Get the Intervention Right

The regulatory requirements for fencing pools were for many jurisdictions and for a long period below the threshold of effectiveness. Although early regulation often mentioned the measures which were demonstrated to be effective, such regulation did not require them. Later legislation that repeated this mistake was drafted in the face of the available evidence. As well as being deficient, this legislation misdirected householders by implying that the major risk was to outside children.

New South Wales (NSW) also serves as a sterling example of this failure. Having deficient legislation in place, it acted to provide effective legislation and then repealed it before it could have full impact. This experience highlights the significance of ensuring that the intervention is manageable in a political and social sense. In hindsight a requirement that extended the time over which pools had to comply could well have prevented this situation.

The Need to Act Before the Hazard Builds

A central lesson from the Australian experience with pool drowning is the significance of timely action and of the penalty of inaction. The easiest pools to regulate are new ones, and action to require fencing of existing pools is both more difficult and more likely to be resisted. By the time the major Australian states acted, the new pools being built represented about 3% of the hazard. Conversely, if the Queensland State government had permitted the 1977 City Council Ordinance to stand then Brisbane is unlikely to have become the “drowning capital of the world”.

The Need to Consider Lesser Interventions for Tactical Reasons

Both the NSW and the Queensland experiences indicate the potential value of interventions that do not represent best practice, particularly after the hazard has grown. In NSW it is thought that requiring best-practice isolation fencing for the large number of existing pools was a key factor in the over-turning of regulation in which best-practice requirements for new pools were lost.

In Queensland the reluctant acceptance by advocates of a lesser standard requirement for existing pools, in which a barrier with child-resistant door-sets were permitted, was the tactical step that allowed regulation of all domestic swimming pools. The particular efforts used by public health officials and advocates to win the debate they had lost 15 years earlier and to make the measures work are worthy of separate study.

In analysis of what requirements are acceptable, the risk of falling below the threshold of effectiveness, also needs to be taken into account.
**The Need to Pay Attention to Analysts and Advocates**

A strong lesson from the pool fencing experience is that the interventions that were later to be demonstrated to be effective were identified very early. If the requirements mentioned but not required in the South Australian regulations in 1972 or the advice proffered by the Australian Consumer Association in 1977 had been followed, then it is likely that two out of three toddler pool drownings in the next 15–20 years could have been prevented.

**The Need for Continuing Effort**

The final lesson from this experience is that the issue is not over. The Queensland drowning figures have shown that pool drownings continue. Current indications are that around 40% of current drownings occur because of poor maintenance (failure of fence or gate) or poor practice (propping open gate). Compliance checks and continuing education efforts with householders about the need for protective maintenance are required.

Experienced researchers and public health officials such as Pitt and Cass [1] attribute the failure to institute effective and uniform regulation at least partially to the absence of national data collection and collation mechanisms and strongly advocate their establishment to enable scientific analysis to build on existing success.

**Further Reading**


3.7 The Vigilance of Beach Patrols

Andrew Harrell

Since 1990 the Center for Experimental Sociology of the University of Alberta has maintained an ongoing program based on observations of lifeguards and swimmers in public facilities in Edmonton and Calgary, Alberta [1, 2]. Observations have been carried out on more than 80 indoor aquatic centres, approximately 300 lifeguards and over 20,000 children (infancy to 16 years) and adults (over 16 years). In addition to the Alberta observations, data have been gathered at outdoor lakes and ocean beaches in Florida, South Carolina and California.

A major focus in this 13-year program of research has been to chronicle the care taken by parents and lifeguards in safeguarding very young swimmers and in the prevention of drowning. A secondary focus has been to investigate the efficacy of warnings and regulatory signage in prohibiting dangerous activities that could lead to drownings.

A central issue in the program has been the determination of the adequacy of scanning swimming areas by lifeguards as a procedure for locating possible drowning victims. While various approaches to scanning are advocated in the training of lifeguards in North America, we have concluded that scanning itself is an inherently subjective act on the part of lifeguards. Only the lifeguards themselves truly know whether or not they are watching swimmers when they are scanning. It is not possible to get inside the mind of the lifeguard. The research has not attempted to measure this subjective act through lifeguard self-reports because of the obvious self-serving bias: lifeguards are unlikely to report lapses in scanning. Instead, we have relied on relatively crude external or behavioural expressions of scanning, such as head turns or duration of gaze at a given area of a swimming pool, lake or ocean. The validity of such measures as indices of visual vigilance have been found to be acceptable.

Based on the physical measures of scanning, it was found that the typical lifeguard spends a relatively small proportion of time actually observing the water or swimmers. Scanning activities often compete with other activities such as clean up or custodial work, talking to other lifeguards or attending to the needs and requests of swimmers. Major deficiencies in scanning are also likely to occur at the opening and closing times for aquatic facilities, at the end of lifeguard shifts, on weekends, and at certain times of the day, notably during late afternoon [3]. Scanning tends to deteriorate with lifeguard fatigue after 30 min.

Duration of scanning is highly predicted by principles of information theory and is a non-linear function of the number of at-risk swimmers, such as young children. In other words, scanning by lifeguards tends to increase as the information processing requirements increase with greater numbers of children. Scanning is also highly sensitive to the ratio of adults to children in the water, with more scanning taking place when ratios are low [3].

In practice, lifeguards virtually never implement some of the scanning approaches recommended in most lifeguard training courses and manuals.
such as by the Royal Life Saving Society of Canada [4]. For example, lifeguards rarely carry out head counts of swimmers as a way of checking on the safety of swimmers. The information processing demands of this procedure are too burdensome. Experienced lifeguards come to rely on schemas or cognitive shortcuts that simplify the task of vigilance. Thus, lifeguards will often pay less attention to groups of children, relying on the assumption that there is safety in these groupings. As the dispersion of swimmers increases over a pool or beach area, reducing the size of groupings, lifeguards tend to increase their scanning.

Lifeguards also make assumptions about swimmer safety that decreases safety. They assume that children over the age of 5 are less at risk and less in need of scrutiny than younger children. Lifeguards are less inclined to scan those areas of a pool or beach where adult caretakers such as parents, teachers or swimming instructors appear to be in close physical proximity to young swimmers [1].

Lifeguard vigilance is also strongly impacted by the presence of other lifeguards. Rather than increasing vigilance because of a division of labour between a number of lifeguards working as a team, it is more often the case that multiple lifeguards watching the same pool, lake or ocean engage in social loafing or the diffusion of responsibility. Lifeguards working as teams often assume that others will provide backup scanning or redundancies in scanning that compensate for lapses. Often studies have found that lifeguards have not been trained as a cooperative team. Each individual lifeguard assumes incorrectly that his fellow lifeguards will be scanning more than just their own zone so that they can relax their vigilance. It was often observed that where there are signs of a swimmer in distress, multiple lifeguards may wrongly assume that other team members will deal with it, or that the absence of rescue behaviour from other team members signifies that the emergency is less serious than it might be. Lifeguard manuals or training programs do not recognise these group dynamics and these dynamics are not built in procedures that minimise their impact.

Finally scanning is strongly impacted by the physical positioning of the lifeguard. Lifeguards who are placed in towers are more likely to scan, in part because they are less inclined to engage in competing social activities, such as talking to swimmers, or clean up and maintenance activities. Lifeguards in towers, however, are less likely to sanction negatively minor rule violations by swimmers because of the costs of implementation; to reprimand a violator or to remove him from the facility, they may have to descend from the tower and abandon scanning [3].

It has been the observation of the studies that the majority of aquatic facilities lack adequate signage that may be necessary to regulate swimmer’s conduct. Signs are frequently absent altogether, improperly placed, and lacking in signal words or pictorials that highlight the hazards for swimmers.

References

3.8 Swimming Abilities, Water Safety Education and Drowning Prevention

Ruth Brenner (Coordinating Author), Kevin Moran, Robert Stallman, Julie Gilchrist and John McVan

Competence in swimming and water safety are important life skills, especially since exposure to the aquatic environment can threaten human life. However, the relationship between swimming ability and drowning risk is unclear. The purpose of this chapter is to focus attention on specific topics for drowning prevention that should be included in swimming instructions.

3.8.1 Swimming Ability and the Risk of Drowning

Based on current literature, the relationship between swimming ability and drowning risk is unknown [1]. Some studies suggest that proficient swimmers are at lower risk of drowning while others fail to support this claim. In fact, some have suggested that proficient swimmers might actually be at greater risk of drowning due to increased exposure to the water and specifically increased exposure to high-risk situations. For example, a skilled swimmer might be more likely to swim alone or in an unguarded remote location. Research on the effects of swimming ability on drowning risk has been challenging for a number of reasons including the lack of a clear definition of swimming ability and the need to account for varying exposures to water and other contributing factors.

Currently, there is no universally accepted definition of swimming ability, particularly as it pertains to drowning prevention. Determination of what constitutes swimming ability and how much of it is necessary to prevent drowning has proved problematic. Hogg, Kilpatrick and Ruddock highlight two essential aspects of swimming: flotation to permit breathing and propulsion to provide mobility [3]. Clearly the possession of such attributes could be life-saving in many, but not all, drowning scenarios with flotation allowing maintenance of the airway and propulsion providing a means to return to safe refuge. One working definition of swimming is the ability to perform “a recognisable stroke and breathing in such a manner as to permit a reasonable distance to be covered” [3]. Such a definition is consonant with worldwide practice of swimming instruction where swimming ability is frequently evaluated in terms of distance swum, stroke used and time taken. With respect to drowning prevention, this
definition is problematic. First, the ability to swim a given distance under one set of conditions, of calm water, does not translate to the ability to swim the same distance under different conditions with currents. For young children the distance yardstick is particularly troublesome. A child may be an excellent swimmer in a controlled environment; however, the same child may not perform as well in a panic situation, for example when the child falls fully clothed into a swimming pool. Further, in this all too common scenario, it is not clear that the ability to swim a predetermined distance would be the most relevant survival skill. Interestingly, some more progressive agencies include swimming with clothes fairly early in their programs, specifically to prepare for this situation. Even among older children and adults, the ability to swim a predetermined distance may not be the critical skill. For example, a British study reported that 55% of open water drownings occurred within 3 metres of a safe refuge and many of the victims were supposedly good swimmers [4]. Unfortunately, the reliance on a distance measure has probably lead to too much emphasis on the development of these skills at the cost of de-emphasising other important water safety skills. There are notable exceptions, however, and many organisations do not rely on distance swum to measure swimming ability.

Stallman has emphasised that, from the viewpoint of drowning prevention, measures other than the ability to swim a recognisable stroke for a given distance are needed. He identifies eight motor skills that may be important in the prevention of drowning including ability to level off from vertical to horizontal position, swim on the front and on the back using any type of stroke, roll over from front to back and back to front, change direction both on front and back, rhythmic breathing appropriate for chosen stroke, stop and rest with minimal movement, simple surface diving and underwater movement, jump or dive into deep water [6]. Importantly, these eight skills have been embraced by organisations in a number of countries as the set of skills that should be used to define swimming ability.

Few would argue that under identical circumstances, a proficient swimmer is more likely to possess the skills to assure his survival than is a non-swimmer. However, examination of the relationship between swimming ability and drowning risk is complicated by the need to account for differential exposures to water between swimmers and non-swimmers and other confounding factors that may be related to both drowning risk and swimming ability, such as age. Additionally, varying water conditions, such as the presence of currents, cold water temperatures, and wave splash can also alter the relationship between swimming ability and drowning risk [2]. More proficient swimmers are likely to swim more often and in higher risk situations as in unguarded or remote sites, providing this group with more opportunities to drown. Overconfidence in abilities may lead to underestimation of conditions and failure to take reasonable precautions. For example, a proficient swimmer may be less likely to wear a life vest when boating than a non-swimmer. Should the boat capsize the non-swimmer with the life vest would probably be less likely to drown than the proficient swimmer without the vest. Failure to account for these differences in use of protective equipment, risk taking, exposure to water and other confounding
factors can lead to erroneous conclusions regarding the relationship between swimming ability and drowning risk.

3.8.2 Swimming Instruction and Development of Water Competence

Parents and others commonly measure the transition from unsafe non-swimmer to safe swimmer by the ability to propel oneself through the water for a certain minimal distance. As noted above, this view is inadequate when evaluating the skills needed to prevent drowning. Furthermore, swimming skills per se, are but one aspect of a wider field of human aquatic endeavour that has been identified as water competence and traditionally referred to as watermanship [5]. Water competence is the sum of aquatic motor skills, cognitive knowledge and affective dispositions that contribute to a person's competency and confidence in the aquatic environment.

To date, much attention has focussed on the physical skill base for water competency. Familiar fundamental motor skills include water entry, leg kick, arm action, breath control and flotation. Self-rescue techniques are an additional important, yet often neglected, component of the physical skill base. These skills, which are often a very natural part and extension of the most elementary skills, should be an integral part of swimming instruction. Just as the teaching of fundamental swimming skills needs to be tailored to the developmental level of the student, so too does the teaching of survival skills. For example, an important survival skill of a beginning swimmer might include the simple act of turning from face down to face up position. As swimmers become more advanced, teachers need to facilitate in-water survival skill exploration through positional postures (supine, prone and vertical) as well as exposure to skill combinations (changing position, finding a position of maximal buoyancy) that might better address survival across multiple aquatic environments (pools, open water) and challenges (waves, currents). As noted above, aquatic motor skills achieved in one setting (a swimming pool) are not always transferable to another (sea, lake or river). Where possible and appropriate a lesson in the natural environment should be included so that students gain a proper understanding and respect for these environments.

Cognitive skills have received far less attention in traditional swimming courses. Just as there is little known about the relationship between aquatic motor skills and drowning risk, data regarding the role of water safety knowledge in reducing drowning risk are also lacking. Still, it seems reasonable to include water safety rules as one component of swimming courses, as this is unlikely to cause harm and may prove to be beneficial. Teaching of safety rules needs to be sequential and developmentally appropriate. Whenever possible, parents and caregivers of young children need to be included in that part of the swimming lesson where safety rules are discussed or promoted. Young children might be taught simple rules: always asking permission before going in the water and never swimming alone. Older children and adults might be taught how to recognise
hazards, such as rip currents, dumping waves, offshore winds, outgoing tides, and the effect of alcohol on balance, coordination, perception and judgement.

The final component of water competence relates to the social domain and includes the development of sound water safety attitudes that are informed by the skills and knowledge acquired from the motor and cognitive domains. The establishment of healthy attitudes, especially during the formative years of childhood and young adulthood, may lead to safer behaviours in and around water throughout the lifespan. Whilst attitudes, and therefore behaviours, can also be influenced by other social factors such as perceived norms, self efficacy, perceived benefits of the action, and peer pressure, the potential contribution of instructor, teacher, and parent in developing positive water safety attitudes can be great. Modelling and teaching of positive attitudes towards water safety during swimming instruction can begin the process of lifetime development of safe affective dispositions when in or around water. Examples of teaching, modelling, and reinforcing positive behaviours might include requiring children to ask if it is OK to enter the water at the beginning of the lesson rather than the instructor telling the child to enter the water. The child who independently asks if it is OK to enter could be praised in front of the group. Parents and instructors can model positive behaviours for adolescents as well, refraining from drinking alcohol when in or around bodies of water and by wearing a life vest when boating.

Importantly, in the past, courses have promoted the notion that with proper instruction, a person could be made drownproof. There can be little doubt that children or adults, young or old, can never be considered drownproofed either as the consequence of swimming lessons or accumulated experience and wisdom. Water competence, whether expressed as swimming ability, water safety knowledge or experience, can never proscribe all the risks posed by the aquatic environment. What it can do is make people aware of their limitations in a medium that can offer much, but take entirely.

With this background, we offer the following research needs and recommendations.

3.8.3 Research Needs

- Continued development and dissemination of a concise definition of swimming ability as it relates to drowning prevention
- Increased understanding of those movements in the water that are protective in potential drowning situations so that survival skills can be more concisely defined
- Studies evaluating the relationship between self reported swimming ability and observed aquatic motor skills
- Examination of the transference of skills learned in one aquatic environment (swimming pool) to skills in other water environments (sea)
- Studies examining the relationship between aquatic motor skills and exposure to water and attitudes regarding water safety
Examination of the relationship between water competence, including aquatic motor skills, water safety knowledge, and affective dispositions and the risk of drowning

3.8.4 Recommendations of the Authors

- That the concept of swimming ability be replaced by the more encompassing notion of water competence with regards to drowning prevention
- That swimming ability be promoted as a necessary component of water competence, but with the understanding that swimming ability alone is not sufficient to prevent drownings
- That developmentally appropriate self-rescue techniques be an integral part of swimming instruction at all levels
- That water safety encompassing the acquisition of knowledge, attitudes and behaviours be promoted as a part of the critical mass of water competence
- That the term ‘swimming lessons’ be replaced by the term ‘swimming readiness lessons’ when referring to the pre-school age group
- That the concept of drownproofing be removed from the vocabulary of aquatic professionals' especially those promoting swimming lessons for young children

At the World Congress on Drowning, the following recommendation was made:

All individuals, and particularly police officers and fire fighters, must learn to swim.

Knowing how to swim is a major skill to prevent drowning for individuals at risk. International organisations such as WHO, IRCF and ILS, and their national branches must emphasise the importance of swimming lessons and drowning survival skills at all levels for as many persons as possible. The relationships between swimming lessons, swimming ability and drowning in children needs to be studied. In addition, certain public officials, such as police officers and fire fighters, who frequently come in close contact with persons at risk for drowning must be able to swim for their own safety and for the safety of the public.

References

Around the world communities are developing campaigns to prevent drowning. The programs featured here are based on data and are strategically focused. These 14 national and community level programs focus on a variety of age groups, special populations, water sites and risks. There are however common themes, which are also reflected in the final recommendations of the World Congress on Drowning:

- Drowning prevention campaigns must use multiple strategies and target specific age groups, cultural groups or water sites and risks based on data and assessments of environmental factors, policy factors, behaviours and beliefs.
- Collaboration among consumer groups, research institutions, manufacturers and retailers, organisations, agencies and national, state and local government is essential.
- Environmental measures, policy change and equipment design must be considered along with education and training.
- Evaluation is needed to identify successful programs.

Each program description includes a website at the end for more information. All of the authors welcome your questions and further interest in their programs.

### 3.9.1 National Surveillance-Based Prevention of Water-Related Injuries in Canada

**Peter Barss**

In the early 1990s, the Canadian Red Cross implemented a national drowning surveillance database. This was developed with collaboration of public health injury prevention professionals, all provincial coroners, and other water-safety organisations including the Coast Guard and Lifesaving Society. The database was funded to provide a sound research basis for national water-safety programs,
by monitoring the incidence and circumstances of all water-related injury deaths in Canada on an annual basis. It relies upon structured reviews of the mandatory coroner and police reports for all water-related deaths and includes information from 1991 to the present [1].

On the basis of information from the surveillance database, national water safety standards, a new water safety and swimming manual [2] and water-safety programs were developed using modern principles of injury control. These principles include a structured approach to assessing and managing the most important personal, equipment, and environment risk factors for pre-event, event, and post-event phases of potential injury incidents. Surveillance, programs, and training are centred on major activities. These include boating, aquatic activities such as swimming and wading, bathing, walking and playing near water and on ice, and land and ice transport.

The new training materials and programs were introduced to Canadian Red Cross staff and volunteers and are used in nearly all communities. Media publicity began in 1994 and release of the new water safety manual in 1995. Since then, annual visual surveillance reports, and periodic special reports on drowning of children, boaters, and swimmers, have been distributed to staff, and summaries to students, parents, and others. The national surveillance database is also used as a guide to programmatic activities by other organisations such as the Canadian Coast Guard and Lifesaving Society.

During the first 5 years of new surveillance-based programs, marginal savings (such as decrease over baseline) in lives were highly significant and included 25 infants, 120 toddlers, and 215 persons aged 5 and older. Assuming average direct and indirect costs of $1 million for a drowning death in the 0- to 4-year age group, marginal benefits of providing a surveillance basis for prevention programs for this age group were $145 million, for an investment of $200,000 in surveillance and research. While it is not feasible to prove a causal relationship for surveillance-based national programs, the observed decrease in the rate of toddler drowning was significantly greater than in the nearest neighbouring country without national surveillance based-programs, the United States.

National prevention programs for water-related injuries should, wherever feasible, be based upon good national surveillance data on incidence and risk factors for specific water-related activity categories and risk groups. Surveillance and prevention categories should be congruent. Program materials, training, and public policy should be regularly updated and evaluated using incidence data, and revised accordingly.

For more information visit: www.redcross.ca

References

3.9.2
Child Drowning Deaths in Garden Water Features – A Concerted Campaign to Reduce the Toll

Peter Cornall

Throughout the 1990s many TV gardening design programs included ponds and water features. The number of water features in gardens increased throughout the UK. A study by the University of Wales College of Medicine, RoSPA and the Royal Life Saving Society showed the number of garden pond deaths rose from 11 in 1988/89 to 21 in 1998/99.

There were 90 fatal drowning incidents involving children aged 5 and under between 1992 and 1999 related to the following water features:
- 62 in garden ponds
- 18 in swimming and paddling pools
- 10 in other water containers

Those most at risk were boys aged 1−2 years old with most deaths occurring during July and August. Perhaps, most surprisingly, accidents were three times more likely to happen in someone else’s garden.

RoSPA noticed a worrying trend in garden related deaths in the mid 1990s from its own collection of statistics and started to raise awareness of the problem. The situation was confirmed by the study mentioned above and another commissioned by the Department of Trade and Industry (DTI). Every summer since 1996 RoSPA issued press releases during Child Safety Week warning parents of the dangers.

In 1996, RoSPA staffed a stand at the BBC’s Gardeners’ World national gardening exhibition giving garden safety advice including pond safety. In 1999 a garden pond fact sheet was produced giving safety information and pond security design advice. This went on-line in 2001. The national press in 2000, primarily the Daily Mirror, supported the campaign. Following its research the DTI consumer safety unit produced the ‘Safer Ponds by Design’ safety leaflet that was launched by a Government minister.

Awareness of the problem has been raised and the message has reached the very top of government. When a new pond was being built in the garden of No. 10 Downing Street, RoSPA was called in to advise on safety. By installing a child-safe pond the Prime Minister led by example and the surrounding media interest raised awareness further. This campaign has also been supported by leading TV gardening presenters, who include safety advice when featuring garden ponds. We have not stopped such drownings but in the last 2 years the annual incidence has levelled off.

Our campaign snowballed because of a combination of the following:
- Providing clear and practical advice
- Our ability to respond to media requests for comment after each drowning
- Good accurate data being available
- Academic research being published
- Media interest
The cause being championed at a high level and supported by media personalities

For more information visit: www.rospa.com

3.9.3 SafeWaters Water Safety Campaign in New South Wales, Australia

Katrina Haddrill and Rebecca Mitchell

At both national and state levels in Australia the prevention of drowning have been highlighted as priority areas for injury prevention activities. On average around 300 people drown in Australia each year, around 87 of whom drown in New South Wales (NSW).

Public education campaigns can be a powerful prevention strategy when they are combined with other prevention measures that are ongoing. A public awareness campaign, entitled SafeWaters, was devised to raise water safety awareness in NSW on beaches, inland rivers, lakes and dams, and general water safety. This campaign was screened on television during the peak summer swimming season in NSW and during the Easter holiday weekend from 1998/1999 to 2002/2003. The campaign aims to increase the awareness of water safety issues and appropriate safety precautions in the general community in NSW and is coordinated by the NSW Water Safety Taskforce.

The key messages of SafeWaters include:

- Learn to swim and survive
- Always supervise children near water
- Never swim alone
- Only swim between the red and yellow flags at the beach
- Fence swimming pools
- Beware of fast flowing water, submerged objects and deep water

An evaluation of the SafeWaters campaign was conducted in 2001–2002, using pre- and two post-population-based telephone surveys. A key finding of the evaluation was an increase in the recall of water safety messages between the pre-campaign survey and the first post-campaign survey. Prompted recall of key water safety messages from the SafeWaters campaign revealed a significant increase in the recall of seven out of the eight key water safety messages in the first post-campaign survey.

Perceptions of risk in relation to water safety were generally high during all three surveys and two most common safe behaviours practised in all three surveys in relation to water safety were: ensuring that young children were constantly supervised when they were in the water; and swimming between the red and yellow flags at the beach.

Factors that contributed to the lessening recall of the Easter campaign during April included: that the campaign screened for 1 week as opposed to 3 weeks in the December-January period, other campaigns highlighting water safety
messages were run during the December-January period and uncharacteristically the campaign did not coincide with the school holiday period in April.

It can be concluded that television is an effective medium for improving awareness of water safety, especially during peak aquatic usage times during summer and school holidays.

The SafeWaters campaign continued in 2003–2004, including a particular focus on people from culturally and linguistically diverse backgrounds, with an investigation of water safety messages that have significant meaning to the Chinese community in NSW.

For more information visit: www.safewaters.nsw.gov.au

Acknowledgements. The authors acknowledge assistance from the NSW Water Safety Taskforce.

3.9.4
Community Campaign in Australia
Targeted Towards Parents and Children

Laurie Lawrence

Drowning is the greatest cause of accidental death in the under-5 age group in Australia. Every year, one child drowns each week. The Kids Alive − Do The Five program, sponsored by safety gate hardware company D&D Technologies, educates the public on the steps to take in reducing the risk of drowning. The program, started in Queensland, is now being promoted nationally through a Web site, children’s pantomime, media and public appearances. The program can be summed up by its five-point message:

- Fence the Pool
- Shut the Gate
- Teach your kids to swim, it’s great
- Supervise: watch your mate
- Learn how to resuscitate

For pool owners, owning a swimming pool is a big responsibility. It is up to owners to make sure young children are always safe in the pool. Despite the introduction of pool fencing legislation (barrier codes) in April 1992, children under the age of 5 years continue to drown in backyard pools and spas. Many of these accidents occurred because the pool fences did not comply with legislation. About a third of children who drown in pools in Australia access the pool through a gate with a faulty latch or a gate that has been propped open. Inadequate fencing or no fencing increases drowning risk as does the following:

- Lack of gate security
- Lack of effective water safety skills
- Inadequate supervision
- Lack of resuscitation skills

The message is:
Be sure that your pool gate and doors leading to the pool and other water areas are self-closing. Do not forget to check any dog or cat doors
Always shut the gate, make sure it latches properly and never prop it open
Check the latches and hinges regularly and fix them immediately if needed
Fence and gate security is not enough. Always keep your pool fence well maintained
The fence is only as good as its weakest point: the gate
Do not leave objects leaning against the fence that could be used to help a child climb over

For more information visit: www.kidsalive.com.au

3.9.5
The Approach to Promoting Water Safety in Ireland

John Leech

Ireland is an island nation with an extensive network of inland waterways. In recent years it has generated considerable income and growth as a nation and with this wealth a corresponding growth in water related sports and activities. In addition, the population of Ireland has increased and emigration decreased. A census was conducted last year and our population is now at its highest level since 1871. The promotion of water safety was first addressed by our Government in 1945 when the provision of swimming and lifesaving was formally arranged under the umbrella of the Red Cross by volunteers.
Regrettably 185 people drown in Ireland every year as a result of accidental, undetermined and suicide drowning. An average of 84 were accidental drownings, 85% were male, 15% were female, and 42% occurred at sea, while 58% occurred in inland waterways. In all, 30% of victims had consumed alcohol. Ireland is ranked 19th in the world, by the World Health Organisation (WHO) for accidental drownings.
Irish Water Safety (IWS) was established in 1999 by statutory instrument to achieve the following objectives:
The promotion of public awareness of water safety
The promotion of measures, including the advancement of education, related to the prevention of accidents in water
The provision of instruction in water safety, rescue, swimming and recovery drills
Such other services relating to water safety as the Minister may from time to time require, direct or determine

It is financed partly by the government through the Department of Environment and Local Government (DELG) and receives voluntary contributions from local authorities each year for the services which are provided to them and sponsorship from state and private concerns. There are local area committees (LAC) based
The Prevention of Drowning

in each county and for the Defence and Police Forces. They are comprised of volunteers who manage the work.

IWS is governed by a council, which is appointed by the minister for the DELG every 3 years. The council comprises 12 members appointed by the Minister, five of whom will have been elected by the volunteers nationwide and the other seven by the minister himself. The full time permanent staff located at the national office implements their policy. The Association aims at being interactive with all members of the public, state and non-governmental agencies involved in aquatic based activities, sports and employment in an effort to reduce the level of drownings and accidents throughout the country.

For more information visit: www.iws.ie

3.9.6
Community Campaign in Remote Aboriginal Communities in Western Australia

Marilyn Lyford

Despite the attention to indigenous health issues over the past decades, there has been little overall change, with the health of indigenous Australians being described as poor. Drowning is ranked the second most common cause of injury death and is three times higher than other Australian children aged 0–14 years. In remote communities, deaths have been reported to occur in aquatic surroundings including rivers, waterholes and dams.

As part of a State Government Environmental Health intervention, the Department of Housing and Works has built swimming pools in the remote Aboriginal communities of Burringurrah, Jigalong and Yandeyarra in Western Australia. The Royal Life Saving Society is managing the aquatic facilities and is committed to providing a service that will enhance the overall health status of the community. Whilst the provision of swimming pools may alleviate many health problems, community members need to be aware of not only the benefits in and around aquatic environments, but also of the associated risks of drowning and non-fatal drowning.

Strategies to address this include the implementation of a number of programs designed to encourage active community participation within the aquatic facility, providing a strong social focus for the community. Recreational, educational and social programs are being implemented and include water polo, learning to swim and survive, resuscitation and cadet and traineeships. In particular, the Swim and Survive program of the Royal Life Saving society provides a broad, balanced program of swimming, water safety and survival skills in preparation for a lifetime of safe activity in and around water. Resources include an educational video ‘Watch out for the Kids’ for community workers to educate parents and carers on the prevention of drowning and injury in and around aquatic environments.

With community involvement and appropriate management this project has the potential to enhance the overall health status by addressing the physical,
social, emotional and cultural health needs of each community. Health checks conducted by the Telethon Institute for Child Health Research indicate a reduction of ear and skin disease and a general improvement of health. Furthermore, it presents a real agenda for action for the reduction of drowning and the improvement of Aboriginal health throughout Australia.

For more information visit: www.rlss.org.au

3.9.7 Community Campaigns in New Zealand

Kevin Moran

With more than 11,000 kilometres of coastline extending over ten degrees of latitude, high exposure to the aquatic environment is inevitable in an island nation such as New Zealand. Death by drowning in New Zealand has been consistently among the highest recorded in developed nations and, with an unintentional drowning rate of 4.4/100,000, New Zealand compares poorly internationally, with drowning rates more than double that of close neighbour Australia and five times that of the USA [1].

At a national level, Water Safety New Zealand spearheads water safety education through public awareness campaigns and by supporting over 20 education programs in conjunction with other water safety organisations. Boating, the leading cause of unintentional drowning in New Zealand, is currently the focus of a major advertising campaign entitled Boatsafe that addresses issues of skipper responsibility including checking conditions and ensuring boats are well maintained and carrying appropriate safety equipment. Another campaign entitled Riversafe addresses the fact that more people drown in rivers than in any other aquatic environment in New Zealand. Because children and youth under 18 years old are over-represented in the river drowning statistics, the resource is targeted at high school students and focuses on river risk identification and crisis management skills. Riversafe is promoted as a school-based activity via pool and classroom teaching and schools are encouraged to include an experiential component of river-based activity during outdoor education camps.

At a regional level, Watersafe Auckland Incorporated conducted a community awareness campaign entitled Safe Summer 2002/3 that capitalised on the heightened interest in water recreation associated with the second New Zealand defence of the America’s Cup in Auckland. The campaign, aimed at both local residents and visitors, promoted key water safety messages for use on Auckland’s extensive harbours and surf beaches. Among its more novel approaches was the use of positive policing by on-water police and coast guard authorities during Cup racing who gave out confectionary rewards to those demonstrating good boat safety behaviour. The same organisation has also piloted a local community initiative to combat toddler drowning entitled the Water Hazard Mapping Project that includes innovative use of geographic information system (GIS) technology to map water hazards such as storm water drains, home swimming pools, and tidal waterways. The location of the hazards is disseminated via coloured
laminated maps to the public predominantly through early childhood centres, libraries and community centres. Initial results suggest an increased awareness of water safety amongst the community, and a reduction of the number of hazards as a consequence of improved local authority interventions.

For more information visit: www.watersafe.org.nz

References


3.9.8 Community Campaigns Blue Ribbon Pool and Enjoy Your Swim, Sure! in Segovia, Spain

Luis-Miguel Pascual-Gómez, Paloma Sanz, Blanca Barrio and Santiago Pinto

Thousands of public swimming facilities (PSFs) exist in Spain, the most important being leisure resorts, only surpassed by beaches in terms of numbers of users. According to WHO, between 70 and 150 people drown in Spain each year, 80% in pools and most of them are aged under 4 years. Statistics show that at least one serious water-related incident and two medical emergencies occur per 2,000 users in the province of Segovia (55,000 inhabitants, total province population: 125,000) every year.

During 2000, the Segovia Lifesaving School (ESS), inspired by the European program Blue Flag Beaches (www.blueflag.org), carried out the investigation project Blue Ribbon Pool 2000 in Segovia (approximate cost: 2000 euros). ESS analysed the overall quality standards, lifesaving service, first aid equipment and facilities and satisfaction of users of 59 PSFs, including all state-owned pools. The conclusions highlight the most important factors regarding PSF quality standards:

- Efficient management
- Age, condition and maintenance of facilities and services
- Performance, duties, responsibilities and available resources of lifeguards, including first aid equipment and facilities
- Customer service

As a result, during 2001–2002, the local public health department applied stricter opening requirements and sanitary inspections criteria (sign-posting, professional requirements of lifesavers and first aid equipment) to PSFs in the province of Segovia. In 2002, one PSF which was over 30 years old was denied an opening licence on the grounds of these new criteria. Four other PSFs, among those with the lowest standards according to the investigation, had to undergo major changes in terms of facilities and services.
With regard to PSF users, two apparent conclusions arose from the research projects:

- Users are generally uncritical of PSF overall quality standards
- Users are unaware of the importance of prevention and self-protection in water activities in order to avoid drownings and other related incidents

Consequently, during 2001 and 2002, ESS launched the campaign *Enjoy your swim, Sure!* (approximate cost: 3000 euros) throughout the PSF network in Segovia based on the following awareness-raising programs:

- On-the-spot educational programs by certified swimming instructors with all age groups in 45 PSFs
- 15,000 leaflets, 500 posters and two local television programs
- 150 lifesavers were provided with official identification T-shirts in an attempt to highlight their professional role
- Educational program specifically targeted towards 6- to 12-year-old school children in Segovia, with an overall participation of approximately 2000 children from eight different schools

The program reached 95% of PSF users and 100% of our swimming learners, particularly those under 6 years. The results show that this type of local, low-budget campaign seems to be effective in terms of data collection and awareness-raising actions towards drowning prevention (‘Think global, act local’) and easy to adapt in other countries or areas. Furthermore, these campaigns have also provided ESS with a successful communication system towards drowning prevention in our province.

For more information visit: www.sossegovia.com and www.blueflag.org

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### 3.9.9

**The Reasons People Drown**

*Frank Pia*

‘The Reasons People Drown’ is a powerful videotape used in children and adult community drowning prevention and education programs. The videotape and accompanying discussion materials shed light on the causes and misconceptions about drowning by showing actual film footage of drownings, non-fatal drownings and rescues captured by a camera situated on the most active lifeguard’s chair at Orchard Beach, Bronx, New York. Viewing the instinctive drowning response of the patrons being rescued by lifeguards, dispels many of the myths the general public has about drowning.

Viewers come to understand that drowning persons are unable to call out or wave for help, and often look as though they are playing in the water, when they are actually drowning. Contextual information illustrating that drowning is a year
round risk is provided. Using the classification of the National Safety Council for drowning: swimming, non-swimming, and boating related fatalities – viewers learn that drowning is a major cause of accidental death and injury in the US for ages 1–44. The causes of diving related spinal injuries and infant and toddler drownings are also depicted. The role of alcohol and other drugs in drowning is discussed and viewers learn that only time, not going into the water, will cancel out the effects of alcohol in the bloodstream.

After viewing the program and participating in a discussion, viewers are able to:

- Dispel common misconceptions about the behaviour of a drowning person
- Recognise a drowning person
- Identify the three drowning classifications
- List 20 rules for reducing swimming, non-swimming, and boating related drowning fatalities
- Identify various non-swimming rescue techniques
- Understand how alcohol causes drowning
- Describe the characteristics of the instinctive drowning response
- Understand the dangers of immersion hypothermia
- Identify the various types of personal flotation devices (PFD)
- Understand the risks of headfirst diving into above-ground backyard pools

Anecdotal data from lifeguards, camp counsellors and camp directors, public health sanitarians, and participants in employee safety programs have credited ‘The Reasons People Drown’ with helping them identify and rescue drowning persons when parents, bathers, and onlookers, who did not recognise the signs of drowning, were nearby.

For more information visit: www.pia-enterprises.com

3.9.10
Washington State Drowning Prevention Project and the Stay on Top of It Campaign

LINDA QUAN and ELIZABETH BENNETT

Drowning is the second leading cause of unintentional death among children and adolescents in Washington State, USA. The majority of drownings occur while swimming, boating or playing in lakes or rivers. A comprehensive drowning prevention program focused on increasing the use of Coast Guard-approved life vests.

Stay on Top of It was developed by Children’s Hospital and Regional Medical Center in 1992. Telephone surveys indicated that swimming ability and the age of a child guided the need for life vests but many parents were unaware of their usefulness. To increase use, parents suggested education, laws, trade-ins and loan programs. The main campaign message was: children, teens and adults should use life vests while boating, playing and swimming in open water, and when on docks, beaches or river banks. Additional messages addressed adult supervision, learning to swim, and water safety.
The campaign included: working with a coalition, educational resources, discount coupons, media, publicity and a life vest loan program for pools and beaches. Social marketing, social cognitive and protection motivation theories guided development. A pre- and post-telephone survey showed significant increases in life vest use and ownership among families exposed to the campaign.

In 1994, regional coalitions across the state defined needs based on local data and resources. Community indicators for education, policy, surveillance and community mobilisation were developed. Program elements included working with newspapers, life vest signs in English and Spanish at boat ramps, a *fotonovela* to educate the Latino community and a preschool kit. Loan programs were extended to boat rental shops, apartment pools, marine patrols, marinas and boat ramps. A state law requiring life vest use by children in boats was passed in 1999. Life vest observations showed significantly increased use on small boats between 1995 and 2000. Community indicators showed increasing programs and resources.

Using a teen advisor and youth groups, an adolescent program was developed in 1998 based on developmental assets, including decision-making and dealing with peer pressure and a risk and protective factor model. In focus groups, adolescents were aware of the risks of not wearing life vests and of drinking alcohol. They were unaware of the risks of swimming in lakes and rivers. The primary message was: Know the Water. Know your Limits. Wear a Life Vest. The program included a media campaign, posters, and an educational program with a life vest fashion show. Information was given to families leaving the emergency department. The loan program was adapted for adolescents. Community indicators specific to teens increased. When telephone surveyed, almost all families rated receiving drowning prevention education in the emergency department useful; 42% of families said they would buy a life vest. A state-wide drowning prevention network prioritised adolescent drowning for future activities.

For more information visit: www.kindveilig.nl

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### 3.9.11

**Community Campaign in the Netherlands by the Consumer Safety Institute**

**Monique Ridder**

In the Netherlands drowning is the leading cause of injury death among children aged 0–4 years. Each year about 24 children drown. Another 120 children are treated in hospitals. The estimation of the numbers of children that drown is at least ten times higher. Children of immigrants are considered a risk group.
The Dutch campaign *Be Water Wise* (May 2002–March 2004) concentrated on the most vulnerable group: children aged 0–4 years. They drown in bathtubs (15%), garden ponds (19%), open water (25%) and (public) swimming pools (34%). In most cases, the children were playing in or near the water and were not adequately supervised.

The campaign raised awareness of the risk of drowning. Parents often do not know that drowning happens very quickly and silently and that continuous supervision is needed at all times. The campaign also stimulated parents to create a safer environment and to teach their children swimming and safety skills.

The campaign was a mass media campaign with television commercials, radio commercials and a website combined with personal education. Nurses at child health care centres gave parents safety information by means of leaflets available in Dutch, English, French, Arabic and Turkish. A course of group sessions was developed for immigrants. The campaign was introduced to nurses and health workers by mailings and workshops. Public swimming pools distribute leaflets and, in 2003, 250 public demonstrations were given at swimming pools. Parents were taught to play safely in the water with their children. This event ‘Splash’ was a joint venture of the Dutch organisation for swimming pools and sponsored by several companies. In addition, the campaign motivated local government to make water safety in neighbourhoods a part of their policy.

In October 2002 we had already reached 65% of the target group. Altogether, 80% of the health workers participated and more than 400,000 leaflets were distributed throughout the Netherlands. The Dutch government has stated that drowning will remain a major issue in the coming years and therefore the campaign will continue.

On a European level the European Child Safety Alliance (ECSA) launched a European Drowning campaign in 2003. In the EU drowning is the second cause of death for young children. The main goal of the European campaign is to raise awareness and to influence European and national policy makers to enforce water safety policies across Europe. ECSA supports individual countries with background information, prototypes of leaflets and an English television commercial.

3.9.12 Preventing Drowning in Alaska: *Float Coats and Kids-Don’t-Float*

Marcia Rom

Two campaigns to prevent boating-related drownings are ongoing in Alaska. One is a *Float Coat* project targeting rural adult boaters, primarily natives in Alaskan villages which are only accessible by boat or plane in the summer. The second, *Kids Don’t Float*, is a personal flotation device (PFD) loaner program, targeting children in boats throughout the state in both urban and rural areas.
Most drowning fatalities in Alaska occur in open skiffs or canoes. Over 90% of fatality victims did not wear a PFD. In 1997, 22% of boating fatality victims were less than 19 years old. And over half of all Alaska drownings occur on lakes and rivers.

Both the *Kids Don’t Float* and the *Float Coat* projects are designed to increase usage of PFDs among boaters in Alaska, thereby reducing fatal drownings throughout the state.

Communities throughout the state set up standardised *Kids Don’t Float* boards near boating and swimming areas. Through multi-agency collaborations, volunteers and corporate sponsorship, PFDs in a variety of sizes are hung on pegs on the boards. They are available for boaters to borrow and then return to the board. The program also includes an educational component with high school peer teachers, manuals and curriculum.

In an observational study 75% of boating children under 17 wore PFDs at *Kids Don’t Float* sites. Only 50% wore PFDs at non-*Kids Don’t Float* sites. We found that rural areas where boating is the primary activity had lower losses of PFDs than those in urban multi-use areas.

The *Float Coat* project primarily targets rural adult boaters. The goal is to increase float-coat use by rural Alaskan boaters. A coalition was set up including rural Native members and an Indian Health Services Injury Prevention Specialist. They designed a marketing strategy to promote float-coat use including: finding a quality product; customising it for the local culture; carefully designing a targeted distribution program; marketing incentives to encourage people to purchase them (such as sales and discounts); publicity and public education about the drowning problem and the possible solutions; as well as methods to evaluate success or failure of these programs.

Village residents then ordered PFDs from the Tribal Corporation at wholesale cost.

Float-coat usage increased from an average of 53% to 91% during the evaluation phase of the project.

Both of these programs are ongoing and easily replicable.

For more information visit: www.hss.state.ak.us/dph/chems/injury-prevention/kids_don’t_float.htm

### 3.9.13 Evaluation of the *Keep Watch* Media Campaign

**Greg Tate**

An evaluation was conducted to assess the impact of the Royal Life Saving Society’s state-wide media campaign *Keep Watch* and to assess the reach of Royal Life Saving Society programs in disseminating the *Keep Watch* message to parents and caregivers with children aged 0–4 years.

Two different types of television advertisements were used during the summer months. In 2000, two advertisements utilising ‘fear appeals’ were aired and a ‘softer’ approach advertisement using a swimming celebrity was aired in
the following year. Additional public education strategies included the delivery of the **Keep Watch** message through existing Royal Life Saving Society programs to home pool owners, resuscitation participants and parents through infant aquatic programs.

A computer-assisted telephone survey was conducted for the purposes of the study in both years. A post questionnaire was developed in the year 2000 and both pre and post questionnaires were developed in 2001 to determine awareness of toddler drowning and recall of the **Keep Watch** message. Open-ended questions were included to determine the effectiveness of the message.

Evaluation demonstrated that there were high levels of awareness amongst the target group of the major issues related to both **Keep Watch** campaigns. However, the television advertisements in 2000 (using a fear appeal) had a greater recall and were rated as more effective than the 2001 advertisement (using a swimming celebrity).

The use of Royal Life Saving Society programs significantly increased the dissemination level of the **Keep Watch** message. The evaluation for 2000 indicated that 66% of the target group had accessed infant aquatic programs endorsed by the Royal Life Saving Society.

Television is an effective medium to promote awareness of toddler drowning amongst the target group. However, the type of advertisements and message delivered can impact the overall effectiveness of the campaign. The use of additional public education strategies can further enhance the retention of the message within the target group.

For more information visit: [www.rlsa.org.au](http://www.rlsa.org.au)

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**3.9.14**  
**Community Campaign in Victoria, Australia**

**Andrew Whittaker**

Between 1998 and 2002 there was a comprehensive and intensive water safety campaign, known as **Play it Safe by the Water**, to create a water safety culture and reduce drowning and water related incidents.

It was a joint project between the State Government of Victoria and all elements of the aquatic industry. This was crucial to the structure of the campaign involving coordinated planning and cooperation between the major players. It was recognised that government involvement was necessary to provide the basic funding as drowning was a social and community issue and the main water safety organisations were needed to deliver the programs and services.

A range of different target groups were identified through analysis of drowning statistics, water related incidents and rescues. These covered a complex matrix of age groups, types of activities and environments. Three main environments were used as the basis for promoting key water safety messages:

- Beach: ‘Always Swim between the Flags’
- Inland waterways: ‘Check it’s OK to swim’
- Home pools: ‘Never take your eyes off’
These messages were supported by an extensive range of educational resources to all schools, pools and community organisations, including teacher resources, video, student booklets. This was in conjunction with a high profile media campaign using television advertising, newspaper supplements and radio. Schools and educational institutions were seen as crucial to changing behaviour over the long term.

*Water Safety Week* was a major event that provided many opportunities to promote water safety. The launch of the *Water Safety Week* presented opportunities to generate media coverage and provide political benefits to government. It was also the start of the advertising campaign which was supported by a wide range of promotional material such as stickers, T-shirts, caps, posters, water bottles, and ‘Sink or swim’ booklets.

A comprehensive media and public relations plan was developed to increase public awareness and understanding of the water safety messages and topics.

Although the messages needed to be simple, the planning was complex and sophisticated, combining media and public relations with education, risk management and participation strategies. Its success is reflected in a 31% drop in drowning since the campaign began in 1998, and a high (78%) recognition rate of the water safety messages.

For more information visit: www.vaic.org.au