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Public Health
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Safety issue 

Delivering Accident Prevention at local level in the new public health system

Part 2: Accident prevention in practice

Fact Sheet Water safety benefits, risk and choice

Raise awareness 

Education 

Preventative measures 

Partnership working 

Reduced Risk of Injury

Delivering accident prevention at local level in the new public health system

Accident prevention in practice

Part 2 WS1

FACT SHEET: Water safety benefits, risk and choice

Introduction

Drowning is a deadly and final condition. It is extremely costly in both human and financial terms. In this chapter we consider the benefits, risks and preventative strategies associated with water related activity and injury harm.

Drowning and immersion related harm

The term drowning is often used synonymously to cover a wider injury profile. This includes impact and collision injury, hypothermia and/or swim failure scenarios. Drowning is defined as the process of experiencing respiratory impairment from submersion, or immersion in liquid. The outcomes can be classified as death, morbidity and no morbidity¹.

In many cases the victim suffers a fatal heart attack. Often it is unclear if this was resultant from the drowning process, or the prime trigger for the event. We classify these associated harms – including drowning events – as immersion or water related injury.

Immersion as a method of suicide or as part of a criminal activity is not uncommon. Unless explicitly noted we focus primarily on cases with accidental and natural cause outcomes.

Our coastal and inland waterways

Britain's inland waterways are extremely diverse and comprise a wide variety of natural and artificial watercourses and other waters. Most of the system is non-tidal and consists of canals, and rivers which have been made navigable. There are some tidal waterways – mainly naturally navigable rivers and their estuaries. At present there are approximately 5,000 kms of fully navigable inland waters in England and Wales, about 450 kms of which are tidal.²

Estuaries and coasts, with their unique features, provide great diversity of opportunities for recreation and tourism. Commercial organisations, recreational groups and individuals all use the coast for enjoyment through a wide variety of activities.³

Benefits of water related activity

In 2011 there were an estimated 12.5million participants involved in a range of water sport activity.⁴ Separate studies calculated some 1.2billion visits to inland waterways, taking part in a diverse range of leisure activities including boating, fishing, walking and cycling or visiting a pub⁵. The seaside tourism industry in England and Wales supports some 210,000 jobs, whilst the associated economic output was estimated to be £3.9billion in 2009.⁶

Less easily quantified, but nonetheless important, is the consideration of individual wellbeing. A review for English Nature in 2002 found that:

“Aspects of the physical environments can (impact) on well being...for example trust, tolerance, participation and feelings of safety, are directly influenced by environmental factors.” In particular, benefits associated with contact with nature are ‘stress recovery’ and ‘attention restoration.’⁸

As set out in the Chief Medical Officer's 2011 report Start Active, Stay Active there are considerable and well documented health benefits arising from physical activity.⁹

Well managed, convenient, safe, accessible water and green spaces contribute greatly to wider health demands.

Approaches to managing voluntary and ‘at leisure’ risks

It is important to recognise the inherent tension between the individual leisure user and the various permission givers, regulators and duty holders. Leisure, by definition, is to be free of drudgery, to enjoy freedoms, to play and relax. Consumed - paid for - leisure can trigger regulations, imposing qualified duties to manage risk.

An undesirable result can be the duty holder adopting an overly paternalistic approach, resultant from a complex mix of; misunderstanding, fear of prosecution or liability to negligence, or as a proxy for other concerns such as a lack of resources and desire for privacy.¹⁰

“Counter-intuitively, the key to challenging risk aversion... is the application of balanced risk assessment... We need to accept that uncertainty is inherent in adventure, and this contains the possibility of adverse outcomes. RoSPA sums up this approach: We must try to make life as safe as necessary, not as safe as possible.”¹¹

Challenges, and key uncertainties with immersion harm

As outlined earlier, immersion deaths and injury in water arise due to a variety of causes. These bring about a number of challenges to our understanding the true nature of the event. These are most acute when we consider fatal outcomes:

- A large number of the events are unwitnessed, with the victim not being found or recovered for several days or even months, often away from where they entered the water
- Fatal drowning events often involve a heart attack. In many cases it is unclear to what extent the medical cause of death is the prime causative or resultant factor
- The use of ICD 10 coding to classify water related incidents has been found to underestimate the extent of harm

Subsequently, determining the key contributory factors is problematic at inquest and other investigations. This leads to an underestimation of the problem, and undermines prevention approaches.

Underestimating risk: A recent Australian study found that applying standard population approaches, i.e. per 100,000 resident populations, could under estimate the risk of drowning death by as much as ten times when compared to a population ‘at-risk’ approach i.e. per 100,000 activity participants.¹² Establishing appropriate ‘at-risk’ denominators is difficult for informal leisure activity.

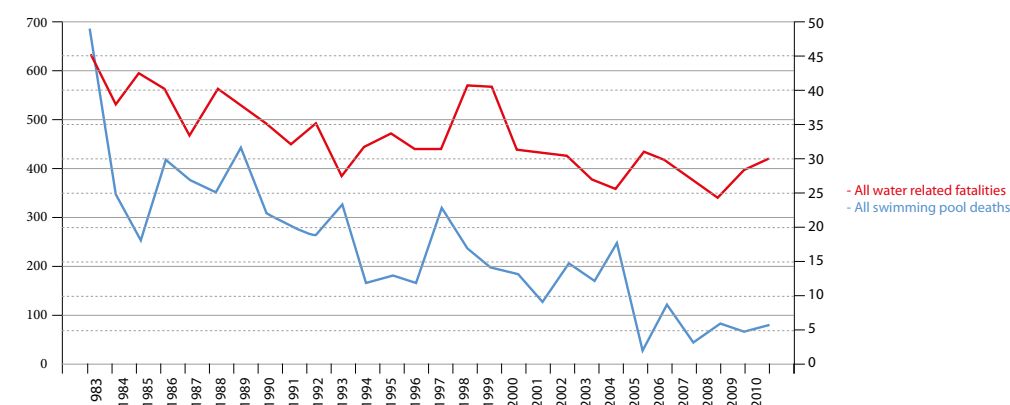
Sources of information

Due to the complexities outlined above, the National Water Safety Forum a consortium of maritime and rescue services, sporting, lifesaving and accident prevention organisations contribute and maintain the Water Incident Database (WAID) service.¹³ In the following sections of this chapter we use WAID as the primary incident data source.

Water related harm

Drowning and immersion deaths peaked in the late 1970s. Since then, the trend (Figure 1) has been one of gradual decline in the number of fatal incidents. Reductions in absolute terms are most noticeable at managed swimming pools.

Figure 1. Accidental and natural causes: water related fatalities (Various 1983–2011).¹⁴



In 2011 there were 701 water related fatalities, of which 407 were determined to be of a natural or accidental cause across the UK.¹⁵

The locations of the incidents have remained relatively stable. Inland locations range between 50-70%, coastal and sea locations 20-30%, built environments such as home baths and ponds, swimming pools and flooded land not exceeding 10% of any one year total.¹⁶

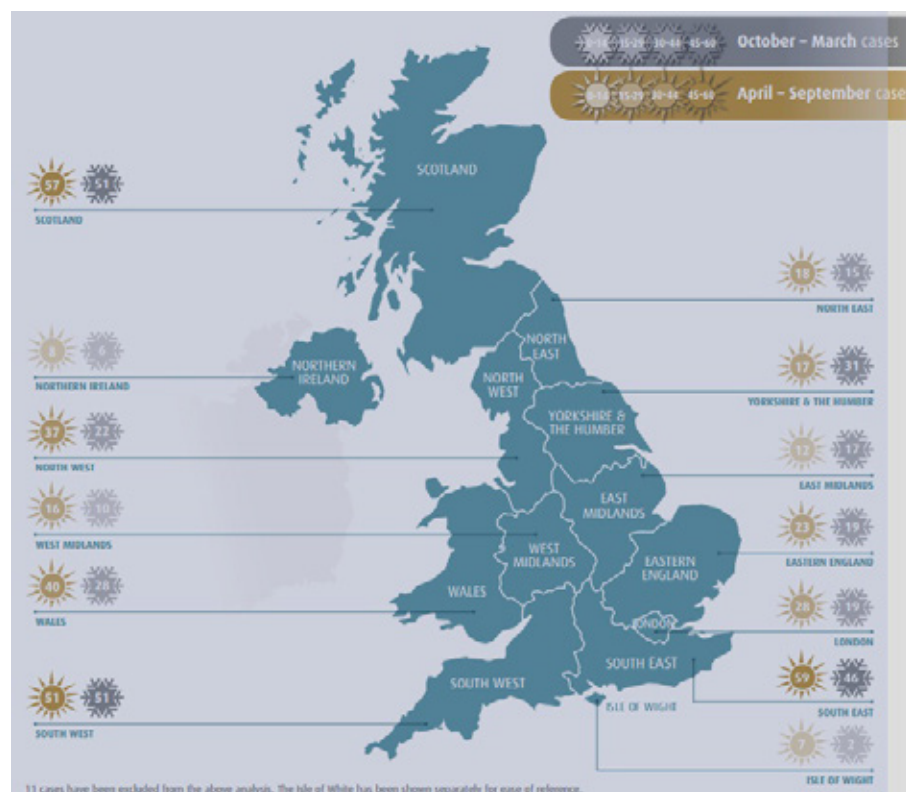
Figure 2 shows the 2011 the incident location profile:

All reported activities and locations	At sea	Coast/shore/beach	Canal/aqueduct	Dry ground	Harbour/dock/marina/port	Drain/well/pit	Lake/loch/lough	Quarry	Reservoir	River	Stream/ditch/burn	Water container	Pond	Pool(swimming)	Bath (includes jacuzzis, hot-tubs)	Total
2011	41	79	40	4	26	8	30	8	9	118	8	2	6	14	14	407
% of total	10	19	10	1	6	2	7	2	2	29	2	0	1	3	3	-

In 2011 there was 474 immersion death, of all outcomes, in England. Incidents were most frequent in the south east and west with a combined 44% of the total (n=107). However a separate analysis suggests that when adjusted for population risk, residents in the northwest are at an increased risk of drowning.¹⁷

At the time of publication a longer term geographic trend was not available. Figure 3 shows the regional profile for 2011:

Figure 3. Distribution of UK water related fatalities (2011).



June to August is traditionally the peak period, followed by the Christmas and New Year period. Daily peaks are associated with weekends and bank holidays. Whilst the hours either side of 3pm and 8pm spike during the day, incident patterns often reflect the life stage of the victim, with children drowning early in the morning, teens after school and older people in the evening.

Drowning is predominantly a male phenomenon, with one study calculating up to a three times greater male rate. In England, in 2011,

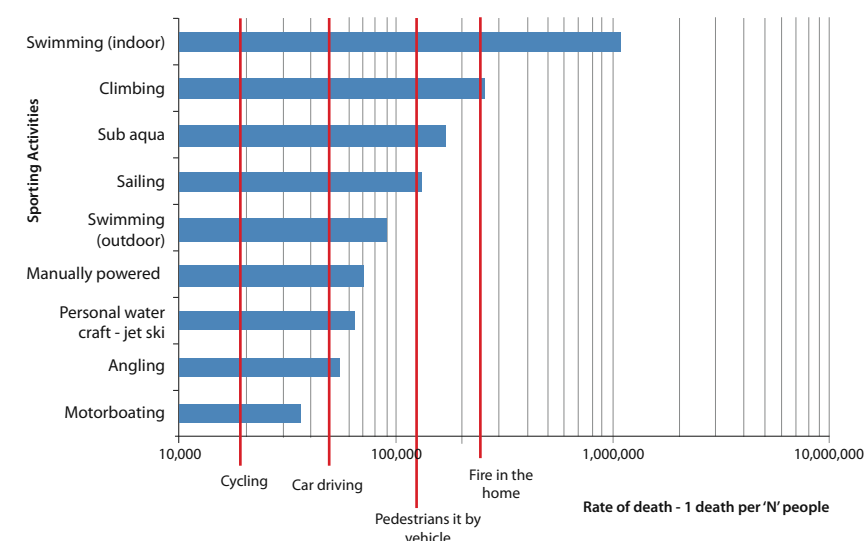
there were 280 male deaths, 25 of these were aged 0-19. Female deaths were 56 and 6 respectively out of a combined 336 total.

Based on data from 2009-12, in absolute terms the most frequently recorded activity at time of death was 'Person in water, of uncertain status' involving some 25% (n=308) of the cases; many immersion deaths are unwitnessed, with victims often missing for several days.¹⁸

The main known cases involve 'Walking/Running' at 18% (n=223), followed by 'Swimming' (n=118) at all locations/formality level 10% (ibid).

The activities of motor boating, angling and personal watercraft use result in higher rates (Figure 4) when we consider the known sporting activities and allow for populations at risk, i.e. the rate of participants.

Figure 4. Rate of death at inland water locations involving defined sporting activities (2009-11). Note for reader¹⁹.



Of interest, activities which return high instances of death, such as swimming, ranking third (8%, n=70) in absolute terms. When adjusted for risk, result in a moderate outcome, approaching a 1:100k rate.

Equally so, as indicated in Figures 1 and 4, indoor swimming is at the low rate of 1:1million. This aligns with previous work considering swimming pool admission policies which found that the annualised risk of drowning for a child under eight years old, in a managed swimming pool was 1:5.5million.²⁰

Data on non fatal outcomes is sporadic. One UK study found that for every one fatal drowning per year, there are three hospital episodes.²¹ The same study observed that the 6,793 episodes observed resulted in a total of 32,520 bed days with an average length of stay of 5.0 days.²²

A single water related loss of life was estimated to cost between £1-1.6million, in direct costs. A simple calculation of these costs and the averaged frequency of accidental and natural deaths equates to an annual cost of between £410-656 million.²³

RISK FACTORS

Gender: Immersion related deaths are predominantly a male phenomenon. One UK study found that males are at a 2.3 to 3.0 increased annual risk of being admitted compared to females, relating to a water event.²⁴ This is a common trend among developed countries. A number of studies suggest that this is associated with greater exposure to water, participation in activities such as boating, and propensity to drink alcohol before swimming, and to swim alone.²⁵

Age: This factor reflects, in the most part, the day to day activities of those involved, and is also thought to reflect the age life stage of the victim.²⁶ In one 2006 study, utilising HES data, children aged 0-14 ranged from 3.1 to 4.2 episodes per 100,000.²⁷ Separately, in a more recent UK study children aged 5-14, adults aged 15-30, males older than 85 were at an increased risk of drowning at inland water locations.²⁸

Developmental factors, such as a proportionality larger/heavier head in the youngest, mobility and visual impairment issues among those older are factors. These are compounded by relatively low upper body strength in both groups.

Alcohol is a known factor associated with immersion death and injury. One study found that boaters with a blood alcohol level of 100mg/dl (.01) had a 16 times greater risk of drowning than those with none.²⁹ A UK study found that alcohol was a contributory factor in 30% of UK drowning³⁰, whilst similar studies across Europe indicated a range of 30-50%.³¹

Epilepsy: Children with epilepsy are at a significantly greater risk of bath and pool drowning.

Access and exposure to water: A report by the CMO in 2004 found that populations whom live close to water features in north-west England are most at risk of drowning.³² A recent study indicated a positive relationship between local authorities with the greatest length of waterway and the rate of drowning.³³

Socio-economic status: There are indications of a strong link between socio-economic status and risk of death by drowning. People living in the most deprived fifth of local residential neighbourhoods are nearly three times more likely to drown than persons living in the least deprived fifth. The higher death rates observed in the most deprived areas apply not only to suicides but also to accidental drowning.³⁴

Occupation: Commercial fishing remains one of the highest risks occupations. In British waters there was on average 13 deaths per year through the period 2006-09.³⁵ Whilst a 2002 study found that all fishermen related deaths were work-related.³⁶

Flooding and climate change: According to the latest publicly available National Risk Register, coastal flooding has the potential to have the most widespread impact in a single event (Para 3.19), an equivalent event to the 1953 coastal floods, which took 307 lives and covered some 603m² of land would cost in excess of £1billion today.³⁷

Directly attributable loss of life has been restricted to less than 10 instances in each of the recent major flood events. Coastal flooding is categorised as being high risk, with between 1 in 200 and 1 in 20 chance of occurrence within the next five years.³⁸

Tourism: UK tourists continue to drown and suffer serious injuries whilst on holiday. In total, RoSPA observed 475 deaths over a five year period.³⁹

On average eight British children drown each year abroad. This is therefore a rare but tragic event. Most happen in swimming pools, and this needs to be compared to the one child that dies each year in municipal swimming pools in the United Kingdom where there is adequate lifeguarding.⁴⁰

Policy approaches

National level

The responsibility and policy tools required to address water related harm sit across several government departments. These reflect the diverse nature of the water related activity and risks. Primarily these are vested within:

Sport and education: The principal body in England responsible for developing opportunities to participate in sport is Sport England (SE). Its policy aims do not have a specific safety focus, but safety is addressed indirectly through, for example, the specification for facilities and advice on recreation management. SE provides funding to national governing bodies to assist with the development of sport and appropriate infrastructure.⁴¹

Within the National Curriculum the attainment of swimming and water safety skills is a statutory element within key stage two.^{42 43}

The regulation of outdoor and adventure activities, as defined by The Activity Centres (Young Persons' Safety) Act 1995, rests with the Health and Safety Executive.⁴⁴

Environment and communities: The management of the built environment and flood mitigation risks, water quality along with waterway navigations is addressed primarily through the Environment Agency, an executive of The Department for Environment Food and Rural Affairs (Defra).⁴⁵ This is addition to monitoring the EU Water Quality Directive standards and designation of bathing waters.⁴⁶

The Department for Communities and Local Government (DCLG) retains the ability to authorise local public health teams to manage activities such as bathing and the use of public space.

Transport and Home Office:

Maritime and Coastguard Agency (MCA) recreational safety strategy recognises the benefits of water related activity whilst aiming to address the key risk factors:

Supporting government initiatives to open up access to the UK coast and to reduce deaths from accidents and serious injury, the MCA will take every opportunity to encourage people to have fun and enjoy leisure activities at sea and at the coast, but also to plan ahead, make more informed choices and take personal responsibility for their safety...

... The MCA will focus on these...in partnership with appropriate bodies, such as the RNLI and RYA and wherever possible with the support of the National Water Safety Forum (NWSF).⁴⁷

The MCA is an executive of the Department for Transport and is responsible for civilian maritime search and rescue within the UK search and rescue region. It can call upon water rescue 'declared assets' such as those within the police and fire and rescue service, along with voluntary services such as Royal National Lifeboat Institute and mountain and cave rescue teams.⁴⁸

Police, fire and rescue authorities have the ability to respond to water rescue and flood scenarios and have developed local strategies including education campaigns.

The **National Water Safety Forum** is an association of organisations that have a wide variety of interests and responsibilities for water safety including sports governing bodies, rescue services, regulators, navigation and harbour authorities, local government, utilities, and other representative groups, numbering some 150 organisations.⁴⁹

The NWSF work has primarily focussed on developing accurate and timely information through the development of the **Water Incident Database (WAID)**.⁵⁰ At the time of drafting work is underway to produce the UK first national water incident risk assessment, to be followed by a national strategy addressing these risks.

Local level

Landowners, navigation authorities and local authorities have a range of duties and regulatory options available. Land ownership adjacent to water will afford riparian rights, and accordingly a responsibility for managing risk. The coastal zone is a patchwork of private, navigable waters and property of the Crown Estate. To date it has proved practically impossible to compile a definitive list of private landowners who are responsible for water spaces. **Equally, many of the public bodies and trusts that act as navigation or landowners, often have an obligation to develop recreational and green space opportunities.**

Approaches to prevention

As discussed earlier there is a range of benefits associated with water related activity, principally: improved health and wellbeing outcomes. When considering water safety interventions, we suggest the immediate gains are very finely balanced with the potential to cause wider harm.

Design and engineering

Within the home environment draining or removing the water from features such as baths, ponds, buckets, temporary home pools is the most effective measure that can be taken.

In warmer climates such as Australia, with a larger number of pools, isolation fencing around home swimming pools has proven to be particularly effective in reducing death rates. These measures work best in combination with education and enforcement approaches.

In the community design measures which store drain and flood water in attenuation reservoirs such as sustainable urban drainage schemes help to mitigate localised flooding risks, offering community level protection. However the unavoidable creation of standing water near to homes does require consideration of another risk being introduced.

Within built environments the use of appropriate design standards, such as those for swimming pools and appropriate barriers around pools are effective approaches.

Interventions such as the introduction of limited separation fencing at points with a highly-likely adverse consequence associated with a fall into water. Locations where self help is limited, a breakdown in supervision would be particularly harmful at hazardous features such as weirs.

Factors such as the adverse impact on other users, cost-benefit and heritage considerations may also feature in any decision taken. A uniform, non risk based approach is to be avoided.

Promote behavioural and coping strategies

Developing community-wide acquisition of swimming and water safety skills

Swimming is a key life skill that delivers direct benefits to the health, personal safety and wellbeing of the participant. The risk of accidental drowning death in a managed swimming pool is very low: a child under eight has an annualised risk of death of 1:5.5 million in this environment.⁵¹ Initial reports suggest that there were no accidental drowning deaths in managed swimming pools during 2012.⁵²

However, the relationship between swimming ability and drowning prevention is not simple. The extent of exposure to open and unsupervised water, individual perceptions and risk-taking behaviours need to be considered. Programmes directed at increasing swimming ability among older children should include advice on safe swimming practices.⁵³

The ability to swim and demonstrate water safety skills is a compulsory National Curriculum requirement at key stage two (ages 7-11). A key issue is the variable level of attainment. A report for British Swimming found that in 2011 between 26-91% of children met the KS2 criteria. Authorities with better access to facilities had higher attainment rates. In the same year some 1 in 3 children - approximately 200,000 - were unable to swim, as defined by the KS2 criteria.⁵⁴

Suggested priorities for action are:

- Ensuring adequate numbers of non swimmers, particularly children participate in lessons, either through school or community approaches
- Identifying and removing barriers to participation including access to good facilities, cost and liability concerns
- Creating opportunities for swimmers to progress beyond a basic level. Moving towards a 'functional ability' in terms of both skill and safety knowledge.

We argue that a greater understanding of which types of swimming programme and water-survival skill training are most effective in preventing drowning will further aid drowning prevention efforts.⁵⁵ Swimming skills are just one potential prevention strategy that must be considered in the context of a multifaceted approach that includes effective barriers, appropriate adult supervision and training in CPR.⁵⁶

It is clear that the numerous and wide ranging societal benefits associated with promoting swimming and water safety skills outweigh the associated risks.

Promote swimming at lifeguarded and supervised spaces

Lifeguards, when adequately staffed, qualified, repeatedly trained and equipped, appear to be an effective strategy to prevent drowning.⁵⁷

Promote the role of parental supervision

As discussed earlier, the relationship between swimming ability and drowning prevention is complex. The role of exposure to water and risk-taking behaviours are important factors among older children and adults. Therefore, developing appropriate awareness of the role of supervision is a key activity.

Provide timely, accurate and balanced information on hazards and risk

There is little evidence to clarify the effect of information signs on drowning events. The use of safety signage has multiple purposes, namely to inform or prompt an action among users, to meet legal standards, or as part of a risk mitigation (insurance liability) strategy.

We argue that balanced information which informs the user about hazards that are difficult to recognise, such as dangerous currents such as rips (beaches) or at a weir (rivers), or aid in safe action such as directing route to safety havens or rescue equipment are on balance positive interventions. Uniform approaches, which are not risk based may undermine the location management plan.

Promote activity training and education programmes

Managing safety is inherent in many technical programmes, i.e. canoeing self rescue, navigation and understanding weather conditions. Furthermore, the role of the sports national governing body (NGB) in promoting and influencing technical and good practice activity is central.

Programmes seeking behaviour changes, such as the **use of personal floatation** devices require large numbers to induce change.⁵⁸ NGBs are key partners in contacting and influencing participants, and advocating for safety and good practice.

The effectiveness of boating safety training programmes to prevent drowning is unknown due to a lack of studies. However, boating safety training has been advised as a preventive measure based on expert opinions and case studies.⁵⁹

Enforcement and regulatory options

Duties arise via a number of common law and statutory approaches. Criminal liability may arise via the Health and Safety at Work etc. Act 1974, with respect to those employed, and to members of the public who are affected.

Under the Occupier Liability Act 1984 the ownership gives rise to a qualified duty to visitors, particularly children, and to a lesser extent trespassers. Liability to common law negligence (duty of care) may also apply.

The Public Health Act 1936 enables local authorities to make bye-laws with respect to bathing and other related activity in the public realm.

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