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Drowning and near drowning in children in the United Kingdom: lessons for prevention

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Abstract

***Objectives*—To determine the pattern of drowning and near drowning of children in Britain and identify means of prevention.**

***Design*—Study of drowned and nearly drowned children under 15 years old.**

***Setting*—United Kingdom, 1988 and 1989.**

***Subjects*—Children under 15 years either drowning or admitted to hospital after a submersion incident.**

***Main outcome measures*—Number of nearly drowned children, obtained from consultant paediatricians returning monthly notification cards through the British Paediatric Surveillance Unit. Number of drowned children notified by the Office of Population Censuses and Surveys and other national epidemiological offices; information from coroners.**

***Results*—306 children had confirmed submersion incidents: 149 died and 157 survived after near drowning. The annual incidence in England and Wales was 1·5/100 000, and mortality 0·7/100 000. Mortality was lowest in public pools 6% (2/32) and highest in rivers, canals, and lakes (78%, 56/73). Most of the children (263, 83%) were unsupervised at the time of the accident. 208 (68%) children were under 5 years old.**

***Conclusions*—Drowning and near drowning of children are problems in the British Isles. Appropriate supervision and safety barriers seem important for preventing such accidents. Improving information on dangers of drowning given to parents through the child surveillance programmes, encouraging fencing or draining of garden ponds and domestic swimming pools, and increasing supervision of swimming in lakes, rivers, and beaches should reduce the number of accidents.**

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Introduction

Drowning is the third commonest cause of accidental death in children in Britain after road traffic accidents and burns.[1] Drowning has been responsible for an average of 72 childhood deaths annually for the past 10 years in the United Kingdom.[2] The subject has been well researched in the water oriented societies of Australia,[3] the United States,[4,5] and Canada[6] but not in Britain. A study in Wales suggested that all United Kingdom data would be required before useful conclusions could be drawn.[7] Not only is there high mortality after submersion incidents but some children sustain severe neurological deficit: we identified a 5·3% incidence of such problems in children admitted to hospital.[8]

We present an integrated study of drowning and near drowning of children in the United Kingdom for the years 1988-9. We outline the extent of the problem, the details and sites of the accidents, and the children affected. We identify particular hazards and areas where preventive measures might be taken.

Methods

We studied children under 15 years of age from the United Kingdom who had drowned or nearly drowned between 1 January 1988 and 31 December 1989. We used the term nearly drowning to describe children who were admitted to hospital after asphyxia due to submersion in water. We excluded children who were discharged from the accident department after minor submersion incidents. The term drowning deaths included children who died of suffocation by submersion in water or of its complications. Cases of near drowning were notified through the British Paediatric Surveillance Unit inquiry system, to which consultant paediatricians throughout the British Isles return monthly notification cards for a series of rare conditions. Details of each case were obtained from a questionnaire completed by the admitting paediatrician and from retrospective analysis of hospital case records.

Deaths from drowning were ascertained from the Royal Society for the Prevention of Accident's press cutting survey on a quarterly basis; the final statistics were received from the Office of Population Censuses and Surveys for England and Wales, the Scottish Government Record Office, and the Northern Ireland Office (ICD (ninth revision) E910). Case details were extracted from coroners' and procurator fiscal reports.

We classified the incidents according to accident site. Swimming pool incidents were subclassified according to location: a domestic pool refers to a family swimming pool in a garden or indoors; a private pool includes those in hotels, caravan sites, and schools; and a public pool describes a pool run by a local authority.

Results

The table shows the sites where the children had submersion incidents. Each accident site was associated with a typical accident description and age group. In addition to the 48·7% mortality after such accidents, 10 children sustained severe neurological deficit.[8] The overall male to female ratio was 3:1. In all, 263 (86%) of the children were unsupervised by an adult; 208 (68%) children were under 5 years old.

Bath—Bath drownings occurred mainly in babies and young toddlers, both sexes being equally affected. Four out of five of the cases occurred when the child was left in the bath alone or with a slightly older sibling, the mother having left the bathroom briefly. For five of the children drowned in the bath the coroner's verdict was one of unlawful killing. Two toddlers had been left alone in the bath by teenage baby-sitters for a considerable time. Three babies slipped out of parents' hands while being bathed and had brief uncomplicated submersions. A 13 year old died after his first epileptic fit in the bath and one baby died when his mother had a convulsion.

Garden pond—In a typical incident a toddler wandered away from adult supervision and was found later floating face down in the pond. In over half the cases the pond was in a neighbour's garden; two incidents occurred at garden centres. In none of the incidents was there a barrier around the pond.

Domestic swimming pool incidents occurred among toddlers and mortality was high (50%). In 18 cases the child crawled on to or under the pool cover and disappeared into the swimming pool. The pool was located in friends' or neighbours' gardens in half the cases and in the family's garden in the remainder. A few pools had some form of barrier erected around them, but none incorporated a self locking gate.

Private swimming pool—Five incidents occurred at caravan sites, seven at hotels or holiday camps, and three in school pools used by parent groups during school holidays. Two handicapped children suffered submersion incidents in hydrotherapy pools, and two children nearly drowned during pool parties.

Public pool—Most children admitted to hospital after nearly drowning in public baths had been effectively resuscitated at the poolside. The mortality was low (6%). Nine of these children had medical disorders: six had epilepsy, five of whom nearly drowned as a direct result of a fit; one child had severe learning difficulties; one was profoundly deaf; and another severely myopic.

Open waterway—Twenty two accidents occurred in canals, 21 in fresh water lakes, and 30 in rivers. Two thirds of these cases were notified during the summer of 1989, which was considerably warmer than 1988. There was a high male to female ratio of 6:1 and a high mortality of 78%. Twenty four of the older children (mean age 11 years 2 months) were either swimming at the time of the accident (two of whom were part of youth organisation swimming parties) or had fallen from boats or homemade rafts (seven cases). Twenty nine children (mean age 5 years 9 months) had fallen into the water while playing on the banks, four of whom had been fishing. Fourteen of the younger children (mean age 4 years 6 months) had gone missing from home and were later found drowned.

Salt water—Seven submersions followed a fall into the sea. Twenty incidents occurred when children were playing or swimming in the sea and were swept out by the current: in one incident the child was on a raft, in four children were attempting to rescue a dog or toy, and in three children drowned while playing in industrial dock waters.

Other sites included six incidents in farmyards involving a sheep dip, animal drinking trough, slurry pit, and septic tank. The remaining sites included a garden pail, twin tub washing machine, nappy bucket, swing bin, manhole, and roadside ditches.

The annual incidence in England and Wales of submersion accidents for children under 15 years of age was 1·5 per 100 000 with a mortality of 0·7 per 100 000. Boys under 5 had the highest incidence of submersion, 3·6 per 100 000.

Cases of drowning in children under 15 years of age in United Kingdom 1988-9 grouped according to site of incident (141 notified in 1988, 165 in 1989)

	Survivors near drowning	Drowning deaths	Total	Mean age
Bath	19 (1)*	25	44	1 year 2 months
Garden pond	48 (4)*	11	59	1 year 10 months
Domestic pool	15 (2)*	18	33	2 years 4 months
Private pool	10	8	18	5 years 9 months
River, canal, lake	17 (2)*	56	73	6 years 10 months
Public pool	30 (1)*	2	32	7 years
Sea	9	20	29	7 years 10 months
Other	9	9	18	4 years 2 months
Total	157 (10)*	149	306	

*Survivors who sustained severe neurological handicap.

Discussion

We have confirmed that drowning and near drowning remain significant problems for children in the United Kingdom, resulting in both death and handicap. There is a strong correlation between lack of adult supervision and drowning deaths in children. We believe that if the safety agenda outlinded in the box is introduced in the United Kingdom many of these drowning incidents could be prevented. There should be an ongoing national system of recording drowning incidents in children in the detail necessary for useful analysis and evaluation of any preventive measures introduced in the future.

Our methods of case ascertainment gave us near total coverage of drowning deaths through national statistics offices. Nine out of ten consultant paediatricians respond to the British Paediatric Surveillance Unit

monthly correspondence, so it is therefore possible that there was some underreporting of near drowning cases. However, at least one consultant in virtually all paediatric departments responds to each monthly survey. The unit has been invaluable to this research and underreporting for this study is probably small.

The British drowning death rate of 0·7 per 100 000 children under 15 years is less than that found in the United States (2·3 in Washington State, 3·1 in Honolulu, 3·2 in Georgia) and in Brisbane (5·2).[8-11] Water exposure is higher in these places due to a warmer climate and higher number of domestic pools. Our overall mortality of 48·7% compares with 50% quoted in Washington[8] and Brisbane studies.[11]

BATH AND GARDEN PONDS

No serious submersion was notified in a child who was supervised while bathing. A few children are deliberately drowned in the bath and child abuse should be considered in incidents where the story is other than that of the "typical accident description."

Families should be discouraged from having ornamental ponds in their gardens. The ponds should be fenced, particularly in parks and garden centres. A sturdy grid placed just under the water surface may prove an effective safety feature and needs ergonomic evaluation. Modification of the Building Act 1984 could be considered in the future to bring safety in garden ponds under the building regulations.

Although in accident prevention as a whole environmental change is more effective than education,[12] there is evidence that health visitors can persuade families to make their home safer.[13] Mothers should therefore be told about the dangers of drowning in baths, garden ponds, and other receptacles as part of the child surveillance programme.

SWIMMING POOLS

Domestic swimming pools were shown to be a significant problem in England and Wales in 1982,[14] and regrettably this continues. Many fewer children are exposed to domestic pools than public pools, where mortality is remarkably low. Pool covers played a part in many of the accidents in domestic pools. Covers are required to prevent heat loss and reduce pool debris but they are often opaque, hug the water surface, and are non-weight bearing. A review of their design and use is essential.

There is good evidence from Australia,[15,16] New Zealand,[17] and the United States[18] that fencing 1·5 metres high including specially designed self locking gates can prevent drowning in domestic pools. Fencing has been introduced by regulation in parts of these countries. We still await any such legislation in the United Kingdom, and no official records are kept of domestic pools by either water companies or district councils

The high level of supervision insisted on by the Code of Practice on Safety in Swimming Pools introduced under the Health and Safety at Work Act 1974[19] is probably responsible for the low mortality in public pools.[20] More children died in private pools than in public pools, suggesting that safety standards are not as high there. Environmental health officers recently highlighted their concerns regarding the level of supervision in these pools.[21]

OPEN WATERWAY AND SALT WATER

It is good sense to believe that teaching children to swim would prevent some of these accidents. We were unable to confirm this as most of the children in the study were too young to swim. Swimming proficiency gained in a heated pool is likely to be considerably less effective in the cold open waters of Great Britain. We believe water safety advice should be included when teaching children to swim and in the national curriculum.

In Australia lifeguards are present on all major beaches.[22] The Royal Life Saving Society survey of 51 British beaches judged over half to have inadequate provisions for beach safety.[23] We endorse the listed safety recommendations made by the society.[24] These recommendations, which outline clear lifeguard initiatives, should be extended to inshore areas advertised for sport and recreation. If this is not possible local councils should consider restricting swimming access. Youth organisations should avoid having swimming parties at lakes and rivers.

Proposed safety agenda to reduce drowning and near drowning in children

GENERAL
- Maintain an ongoing national system of collecting information on drowning deaths

BATH
- Inform parents of the dangers in child surveillance programme

GARDEN POND
- Encourage fencing or draining of garden ponds
- Evaluate safety grids
- Consider placing safety requirements under building regulations
- Inform parents of dangers in child surveillance programme

PUBLIC POOL
- Maintain high level of surveillance under Health and Safety at Work Act 1974

PRIVATE POOL
- Extend high level of surveillance required for public pools to these pools

DOMESTIC POOL
- Install fences (1·5 m) and self locking gates around pools, if necessary by legislation
- Review pool cover design
- Keep register of pools

OPEN WATER
- Supervise or restrict access for swimming in lakes and rivers
- Youth organisations not to organise swimming parties in lakes and rivers
- Extend lifeguard control to main beaches
- Include water safety in the national curriculum and in swimming programmes
- Enforce wearing of life jackets and buoyancy aids in boats and crafts

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Predicting psychiatric admission rates

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Abstract

***Objective*—To determine the numbers of actual and expected psychiatric admissions for the residents of the district health authorities of England and to develop a model to indicate which social, health status, and service provision factors best explain the variation of the actual from the expected psychiatric admissions; to use this model to predict psychiatric admissions for district health authorities as an aid to resource allocation.**

***Design*—The actual psychiatric admissions for district health authority residents were extracted from data of the 1986 Mental Health Enquiry. Expected admissions were calculated using the age, sex, and marital status structure of each district health authority and the national psychiatric admission rates related to age, sex, and marital status. Standardised psychiatric admission ratios were calculated as the ratios of the numbers of actual to expected psychiatric admissions. A wide range of social, health status, and service provision data were used as the explanatory variables in regression analyses to determine which combination of factors best explained the variation between districts of standardised psychiatric admission ratios.**

***Setting*—The 168 652 psychiatric admissions recorded for the 1986 Mental Health Enquiry, after exclusion of mental handicap and psychogeriatric admissions.**

***Results*—The actual number of psychiatric admissions varied from 79% above to 54% below the expected number of admissions from age, sex, and marital status for the districts of England. The most powerful variables to explain this variation were the rate of notification of drug misusers, standardised mortality ratios, and levels of illegitimacy in each district. A complex model was developed which could be used to predict district psychiatric admissions as an aid to resource allocation. A simpler model was also developed (which was less powerful than the more complex model) based on the underprivileged area score. One advantage of this model was that it could be used at the level of electoral wards as well as district health authorities.**

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Introduction

In their report on bed norms and resources the Working Party of the Royal College of Psychiatry found a high correlation of social and demographic factors based on national census data to psychiatric admission rates for the populations within electoral wards of the former health district of South Hammersmith and within the districts of the North West Thames Regional Health Authority.[1] In reviewing previous work the working party found many reports suggesting that the prevalence of psychiatric disorders correlates with various social and demographic variables.[2-7] Most of this work found that the prevalence of specific disorders such as schizophrenia[8-10] and alcoholism,[9] suicide,[11 12] and parasuicide[13 14] was strongly related to various social and demographic factors. The working party also identified five studies, then unpublished, that showed a relation between admission rates and rural or urban status of the population served, poverty, isolation, ethnicity, unemployment, and owner occupied housing.

Initially the aim of the royal college's working party was to explain the large variation in provision of psychiatric beds among health districts by studying 20 psychiatric units in district general hospitals with high, medium, and low bed turnovers. A significant factor that affected bed use was length of stay, but variations in length of stay could not be explained by differences in the amount or type of service available. Their finding of a correlation of 0·67 between underprivileged area scores[15 16] and psychiatric admission rates across the electoral wards of South Hammersmith and a similar correlation of 0·76 between underprivileged area scores and admission rates for the health districts of the North West Thames Regional Health Authority suggested that social factors could be powerful predictors of psychiatric hospital use; this would be of importance if confirmed for larger and more extensive population groups.

If a strong relation between social and demographic factors and admission rates holds for other population groups, theoretical issues arise regarding the direction of causality. Equally important are the implications for health care planning. The relation between actual service use and the need for services is difficult to determine because of the problems in defining need and the paucity of accurate and reliable data regarding the prevalence of psychiatric illness in each district health authority. A study in district health authorities of standardised mortality ratios for suicide plus other unspecified injury, averaged from 1982 to 1986, showed a correlation coefficient of 0·51 with the crude psychiatric admission rate of district residents.

The royal college's report suggests that admission rates may be taken as a proxy for service need. Their relation to the underlying social characteristics of the population may be used to estimate the expected service requirements, which can be compared with service provision.

We report here a total population study of psychiatric