

**The Committee for Matthew H. Hoefer Certifies that this is the approved version of
the following Capstone:**

**Prevention of Childhood Drowning:
A Review of Current Community Interventions and their Effect on
Recreational Drowning Mortality in Children**

Committee:

Billy U. Philips Jr., Ph.D., M.P.H.

Dana Wiltz-Beckham, D.V.M.

Thomas K. Hughes, Ph.D.

Dean, Graduate School

**Prevention of Childhood Drowning:
A Review of Current Community Interventions and their Effect on
Recreational Drowning Mortality in Children**

by

Matthew H. Hoefer, D.O.

Capstone

Presented to the Faculty of the Graduate School of Biomedical Sciences of
The University of Texas Medical Branch
in Partial Fulfillment
of the Requirements
for the Degree of

Master of Public Health

**The University of Texas Medical Branch
August, 2006**

Dedication

To my beautiful wife Holly for keeping me on track and inspiring my life.

To Mom and Dad for giving me the tools to succeed.

Acknowledgements

I would like to thank Dr. Philips, Dr. Beckham and Dr. Hughes for their assistance in forming and sculpting this project. Also, thanks to Julie Trumble, for her invaluable skill and professionalism in the field of research of the biomedical literature.

**Prevention of Childhood Drowning:
A Review of Current Community Interventions and their Effect on
Recreational Drowning Mortality in Children**

Publication No. _____

Matthew H. Hoefer, M.P.H.
The University of Texas Medical Branch, 2007

Supervisor: Billy U. Philips Jr.

Accidents are the leading cause of mortality in American children today. Accidental death by drowning is the second-most common cause of accidental injury-related death among children ages 1 to 14 and the leading cause of accidental injury-related death among children ages 1 to 4. (1) The most disturbing thing about this fact is that many of these deaths are preventable. The exposure of a child to the risk of drowning can be moderated both by controlling access to pools and beaches, as well as providing children with the skills to avoid a drowning accident.

The consensus regarding various forms of risk reduction and other exposure limiting interventions is that they produce differing outcomes because they have differing efficacy even though they lead to the same end of reducing childhood drowning. These include laws that require secured pools and beaches; community programs that provide lifeguard surveillance, first responder training, and EMS services; and community education to ensure parents know the proper means for supervising children that are near water. Moreover, community programs can teach children swimming and drown-proofing techniques. Techniques such as clothing inflation, use of safety equipment, and

the buddy system; methods that allow them to protect or “save” themselves when put into a potential drowning situation.

This Capstone project consists of a systematic review of literature for community-based interventions that address childhood drowning. While these may work anywhere the focus of this review is on U.S. and Texas Gulf coast communities and on specific community programs developed to decrease drowning risk in children. Vital statistics, in addition to published data, were acquired to identify specific high risk groups based on sociodemographic factors, especially race or socioeconomic status. Finally, interventions were assessed and a determination made as to their appropriateness as an intervention for Galveston county and similar coastal counties in the U.S. and along the Gulf of Mexico.

Table of Contents

List of Figures	viii
Introduction	9
Chapter 1 Background of Current Drowning Mortality Data.....	12
Worldwide.....	12
United States	14
Chapter 2 Methods.....	17
Chapter 3 Review of Literature on Drowning Interventions	24
Worldwide.....	24
United States	26
Chapter 4 Assessment of Drowning Interventions	31
Conclusion	34
Appendix A Systematic Review Data Spreadsheet	35
Bibliography	110
Vita	112

List of Figures

Figure 1:	Systematic Review Flowchart.....	nn
-----------	----------------------------------	----

INTRODUCTION

The purpose of this Capstone is to review the current literature regarding community interventions on childhood drowning. Accidental drowning is a significant American health risk with drowning being the second leading cause of accidental death in one to 14-year-olds. Drowning is also the leading cause of accidental death in 14 year olds in the United States. This is especially significant because the death of a child can account for 60 to 80 person-years of life lost, in addition to the huge emotional damage to the community surrounding the death of a child. Drowning accidents which do not lead to the death of the child are also a significant community health risk. For every child under 14 who died of a drowning accident in 2004, 5 were seen were treated in American emergency rooms for drowning. (2) Children who survive drowning accidents can be a large burden on the community, with post care costs for drowning victims estimated at about \$250,000 per year for the life of the victim.

Drowning has high emotional and financial costs, but it is preventable. Communities can prevent drowning with interventions such as secured swim areas, lifeguard stations, and a promptly reactive emergency medical system. Additionally, education about the hazards of swimming and drown proofing courses for children and adults can prevent individuals from getting into a high-risk drowning situation.

This paper will encompass a comprehensive review of interventions, but the intent is to focus on how Gulf coast communities could intervene for drowning prevention. One aim will be to determine whether they are specific target groups that bear particular focus for drowning interventions, to avert potential inequalities in drowning incidents

among people of various races or socioeconomic groups. Another aim will be to review interventions made in communities for quality and determine if these interventions have any relationship to the incidence of drowning. A preliminary review to assess the feasibility of this larger capstone project showed that in the United States there is a higher incidence of drowning in black children. It is also known that white children tend to drown in private pools, and black children tend to drown in public pools, which is thought to be a matter of access. It has been shown that drowning incidence decreases in countries with mandatory swimming education for children during their primary and secondary school years.

Initial information on Galveston County shows that drowning incidence is consistent with national averages. There were four deaths (1.4 per 100,000) from accidental drowning in 2006, compared to 1.2 per 100,000 nationally. Two of these deaths occurred during a boating accident. One was an accidental drowning at home, and only the fourth death, a drowning accident in a pool, would be included for study in this paper. In the initial keyword search 302 articles were found and reviewed according to the methods described below. These articles were tracked electronically in an Excel spreadsheet and reviewed for content according to inclusion and exclusion guidelines. Interventions meeting these guidelines were discussed for viability in community programs, and finally a recommendation to Gulf coast communities was made regarding prevention of childhood drowning. Although the scope of this systematic review is meant to be comprehensive, the goal of this project is to gather information and ideas

about the prevention of childhood drowning and attempt to use that data at a local level in protecting the children of Gulf coast communities.

CHAPTER 1

Introduction and Background of Current Mortality Data

Every county and municipality in the United States collects information on the death of its citizens. Most societies and communities around world do the same, so there is a large amount of information available on drowning and mortality. Most of the literature found in the initial query for this project found statistical information on populations and their rate of recreational childhood drowning mortality. This chapter will compress that data and attempt to give note snapshot views of drowning mortality around the globe and in the United States.

Worldwide

According to the World Health Organization (WHO) 449,000 people died of drowning injury in the year 2000 worldwide. This accounted for 9% of the total injury deaths worldwide, and over half of these drowning deaths were children. Low income parts the world account for the greatest percentage of these drowning deaths. The rate in Africa is 13.1 per 100,000 people, compared to 1.0-4.0 per 100,000 in Western and higher income nations. (3) Most research on drowning prevention is done in industrialized nations where the risk is much lower, and so there is less focus on the problem. Additionally, prevention in high income nations primarily involves legislation for prevention of exposure and enhancement of medical systems for treatment of drowning injuries, interventions that historically do not work well in developing and low income nations.

Australia. In Australia the most common cause of accidental death in children less than five years is drowning. 70% of children who drown are between the ages of one

and three. Australia is second only to the Netherlands in global rates for childhood drowning. The rate of childhood drowning increased as a percentage of total drownings from 30% in 1986 to 56% in 1996, a period where private pool ownership almost doubled. Drowning events occurred primarily to boys, in the summer months, and between the hours of four to 6 p.m., although the epidemiology data is not specifically quoted in the literature. Two thirds of the drownings during the period of 1988 to 2000 occurred in private swimming pools with only three sided fencing, or fencing that covered three sides of the pool, with the fourth side consisting of a house. This is a 78% increased risk of child drowning if the pool has three sided fencing versus four. (4)

Denmark. A study 349 cases of accidental drowning from the period of 1989 to 1993 in Denmark showed common trends in age and gender. Seventy six percent of the drowning mortality was in males with the greatest incidence being in adolescence, 3.6 per 100,000 persons below the age of 24. The majority of these accidents occurred in open water with 52.7% of them occurring at open sea or in a harbor. 29% of the incidents occurred at a lake, beach, or pool. Of childhood drownings, a third occurred in garden ponds or domestic and public pools. Starting in 1974, pool fencing was required in Denmark, but after 10 years legislation was dropped because community authorities felt that fencing lead to false sense of security. (5)

New Zealand. Unintentional drowning in New Zealand compares well with that of other industrialized nations. A decade-long study from 1986 to 1995 of 15 to 19-year-olds shows the incidence is 3.6 per hundred thousand persons. The focus on teenage unintentional drowning brings to light the use of alcohol and its effect of lowering

inhibitions, increasing high-risk activity, and increasing the risk of unintentional drowning. Recent legislative changes have liberalized the availability of alcohol to minors, and so the authors believe that increased observation and monitoring of adolescents and alcohol related high-risk behaviors can prevent drowning fatalities. (6)

Bangladesh. Bangladesh is an example of a largely rural but emerging nation. A two-year study done in the late 1990s was recently unveiled in which the information for drowning fatalities on children less than five years old was reviewed. Using two separate databases, drowning was found to be the cause of death in 20-46% of the children aged one to four years old. Most of these drowning accidents were recorded as children falling into drainage ditches and ponds. (7) It is difficult to determine by the literature whether these deaths would be considered recreational or residential, but it shows an increasing threat to children in emerging nations. The challenge in these nations is not so much legislation or policy to protect children, but implementation. Finding scarce assets for community interventions and a arousing significant level of public concern is difficult in a populace struggling to survive.

The United States

The Centers for Disease Control and Prevention released a report in 2004 outlining current trends in childhood drowning in the United States. This data was based on the National Electronic Injury Surveillance System (NEISS). According to this information, 3,342 people were killed in the United States in 2001 due to unintentional recreational drowning. 75% of the emergency room visits for drowning were for children aged less than 14 years old, and there were five times more fatal drownings for males

than females across all ages. An important finding in the CDC's research is that the odds of survival are better in a pool vs. lake setting; 70% of all nonfatal drowning accidents were in pools, while 75% of all fatal accidents were in natural water settings. (8)

In another study done on childhood drowning deaths from 1995 to 1998, 678 US residents were found, aged five to 24 years, who had drowned in pools. Three quarters of those victims were male, 47% of whom were black, 33% were white and 12% were Hispanic. It was also found that black victims tended to drown in public pools (51 %) such as hotel pools, while white victims tended to drown in residential pools (55%), and Hispanic victims tended to drown in neighborhood pools such as in apartment buildings (35%). An assessment of family income level on these drowning victims also showed that the majority of them were from low income families (49%), with closer to equal numbers being from middle income (29%) and high income (22%) families. Although a logical assessment would be to assume that lower income families have less access to interventions such as drown proofing or swim programs, there were other factors involved. (9) Past studies have shown a decreased risk of childhood drowning when a lifeguard is present, an intervention which is normally not available hotel or motel pools. This poses a specific risk for black children due to their increased use of swimming areas that are unguarded.

Wisconsin. A study done by Schnake et al. at the University of Wisconsin in 2005 gives more important information regarding drowning statistics in the United States. Their data shows that most children involved in drowning accidents were preteen as opposed to teen-aged, with boys being twice as more likely to be involved in a drowning

or near drowning incident. The article, as published in the Wisconsin Medical Journal, discusses the important role of the physician in prevention of drowning but does not discuss specific interventions other than family education. (10)

Washington. A drowning study conducted in the three counties of King, Snohomish, and Pierce in Washington State echoed previous findings. The highest rates were found in children from zero to four years (3.1 per 100,000), and 15 to 19 years (3.0 per 100,000). 78% of the victims were males, and although most of the drowning victims were white (84%), the rate of young black males was more than double that of whites (3.5 versus 1.7 per 100,000). This research went further to discuss the activity in which children were engaged prior to drowning and found some interesting trends. Children aged zero to 4 were more likely to drown as part of an unsupervised activity such as falling into a swimming pool at home. Older children in the teenage years were more likely to drown as part of a swimming or boating activity, and were normally in the presence of others when the incident occurred. (11) Unfortunately, this negates the idea of a “swim with a buddy” program in which children are encouraged to have a friend with them when they swim for increased safety.

CHAPTER 2 Methods

This capstone paper is a systematic review of published material regarding the incidence of recreational childhood drowning and interventions made to decrease that incidence. A systematic review as defined by the National Health Service is, “a review of the evidence on a clearly formulated question that used the systematic and explicit methods to identify, select and critically appraise relevant primary research, and to extract and analyze data from the studies that are included in the review.” (12) Using this definition, a method of study was formulated and implemented to answer the significant question, “How do community-based interventions affect drowning mortality in children?” This method of research, adapted from the National Health Service document and shown as used in this study, is outlined in Figure 1.

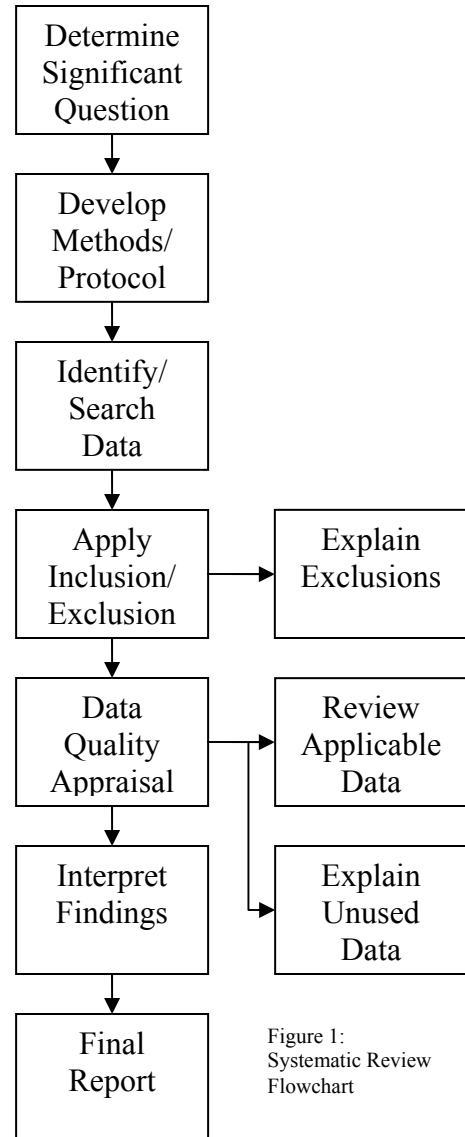


Figure 1:
Systematic Review
Flowchart

Identification of relevant work was conducted through a literature search with the assistance of the University of Texas Medical Branch, Moody Medical Library Staff (Reference Librarian). The literature search was completed using online and paper

journal publications, government and public health documents, community health and safety websites, and websites from leading child safety advocate groups. Drowning and vital statistic databases were also gathered from Galveston County, Texas. Reference sources included Medline, Cochrane, Internet websites, and Ovid (Medline). The online literature search was completed using the following key words:

Accident Prevention	Female
Accidental Falls [prevention & control]	Humans
Analysis of Variance	Incidence
Child Development	Infant
Child Drowning	Male
Child Safety	Mandatory Safety
Child Welfare	Research Support, U.S. Gov't, P.H.S.
Child, Preschool	Risk Factors
Community Interventions, Child	Safety
Community Safety Programs	Swimming
Drowning [epidemiology]	Swimming [education]
Drowning [prevention & control]	Swimming Pools
Drowning Interventions	Time Factors
Drowning Prevention	Water
Drowning Public Health	Water Safety
Drown-proofing	

The final step in the data search was to build a database to track all literature identified in the initial search. This database is included as Appendix A. The database includes information for each data point on: keywords, article summary, citation, concordance with inclusion criteria (yes/no), and relevance (yes/no).

The next step in this systematic review was to apply inclusion and exclusion criteria to each document, article, or website found through the keyword search. The data was reviewed according to the criteria below and articles to be included in the final report were annotated in the database.

Data to be included in the discussion of this topic were required to meet the following criteria:

1. Peer review sourced - Articles that had been peer-reviewed were sought due to their increased reliability regarding the possible causal relationship between interventions and decreases in mortality or incidence.

2. Focused on children aged < 18 years - The search was limited to childhood drowning because it is in youth that drowning has the greatest mortality. Additionally, there is increased difficulty in mandating some drowning interventions on adults, for example the difficulty of mandating that an adult must pass swim training as a graduation requirement (as you can in a school-age child). Finally, the author wished to focus on children in order to narrow the focus of this project.

3. Deaths confirmed as drowning - Deaths by drowning were included as opposed to drowning accidents. Because of this manner of inclusion, “deaths”, “incidence of drowning”, “mortality” and “incidence” were used as synonyms for the purpose of this paper. Deaths were used because it is thought that there is an errant underreporting of drowning accidents that do not lead to death, so it would be difficult to measure accidents. Most un-witnessed drowning accidents are not reported to civil or medical authorities and many witnessed or prevented drowning accidents are not reported, depending on their severity. If a lifeguard rescues a swimming child who is having difficulty swimming, how is it known whether that child would have suffered mortality or morbidity without the intervention? Measuring only deaths allows us to see the direct effect of an intervention since it is an unequivocal end-point.

4. English language or translation (abstract) - The inclusion of articles published in English language journals was for the ease of the researcher.

5. Published in last 10 years – This criterion was based on an assumption that data published in the last 10 years would be more relevant to current and nearer-term future applications by communities.

6. Community drowning interventions – A central theme of this paper was interventions made by communities to decrease the incidence of drowning among children. A more specific topic for discussion involved previous or future steps to be taken by Gulf coast communities. This allowed a focus on the central questions of this project:

How are community-based interventions associated with changes in drowning mortality?

How can the safety of the population in Galveston County be optimized?

7. Drowning legislation - One method of instituting community change.

8. Community drown-proofing - Synonym for Community Interventions.

In addition to the above inclusion criteria, data to be excluded from discussion in this capstone paper met the following criteria:

1. Adults > 18 years old - The focus of this review on children, less than age 18 recognizes that most drowning prevention efforts are for children and they reflect the tremendous costs in emotional and functional terms when young people are lost from society.

2. Non-recreational deaths (bathtubs, mop buckets) – Non-recreational deaths were excluded as a category of focus on swimming deaths and interventions related to reductions in public events as opposed to what would be a very different class of intervention that might focus on household safety measures or other extraneous causes.

3. Near death accidents – Excluded due to the difficulty in measuring the incidence accurately, death by drowning was used as our incident data point.

4. Multiple accidents (MVA with drowning) – Drowning as a secondary cause of death was excluded because it is assumed a drowning intervention would do nothing to limit the primary cause.

5. Suicides - Assumed that community drowning interventions would have a negligible effect on any proximate cause.

6. Homicides - Assumed that community drowning interventions would have a negligible effect on any proximate cause.

7. Deaths at sea (non-recreational) – Excluded because they would be more difficult to correlate to a specific community's intervention strategy and many of these deaths could occur in adults at work.

8. Non-English language publications – Excluded for ease of the researcher.

9. Information greater than 10 years old – Excluded to add focus on more current and possibly more applicable interventions.

The purpose of these exclusion criteria was to decrease the amount of bias and confounding in the study and attempt to focus on the primary relationship between intervention and mortality. Bias could be introduced primarily through selection, for

example, by allowing data into the study from subjects who would not be affected by drown proofing education and therefore decreasing the future effect of those interventions. Confounding also could be introduced into the study. If non-accidental deaths were included in the data their influence would lead to a decreased effect of intervention and a confounded view of the true factors of drowning mortality. Data was annotated on the database whether it met inclusion criteria or not, and an explanation given for exclusions. Data to be included was then further reviewed for applicability in the quality appraisal portion of this project.

The data quality appraisal section of this project consisted of a review of the primary source publications, reports or websites from the initial data search. A determination of the applicability of the primary source publications, reports or websites was made based on subjective factors such as the ability of an intervention to be used in another community, popularity of the intervention, and cultural and social advantages of the intervention. Objective data such as cost and lives saved were also used to assess the intervention. Interventions which met applicability were included in the discussion section. This last step is highly qualitative, and it is important to note that while the data included in the database, collected systematically, should be free from most biases and confounding factors, the data in the discussion section is subject to the author's interpretation and the quality of presentation of the primary source publications, reports or websites.

Research was conducted by Matthew Hoefer from 1 Aug 2006- 1 Jul 2007 guided by a capstone supervisory committee comprised of faculty in the Program in Preventive

Medicine and Community Health at the University of Texas Medical Branch Graduate School Of Biomedical Sciences with expertise in public health systematic reviews.

Research did not include classified or otherwise secret documents, personal or medical records with identifying information, or information with commercial or personal gain.

Reference data was collected in the excel spreadsheet in Appendix A. Data was evaluated for its validity for this study based on stated inclusion and exclusion criteria.

Pertinent data regarding community interventions was further evaluated for its validity by its effect on accidental drowning in children.

CHAPTER 3

Review of Literature on Drowning Interventions

A systematic review of literature was conducted on 309 articles as found in the keyword search. Of these articles 170 were found to have enough data available in order to make a judgment based on their inclusion or exclusion. In the process of reviewing the articles 10 were repeated in different keyword searches and were later removed from the database. Twenty nine of the articles met inclusion criteria, except for the fact that they were greater than 10 years old and so therefore needed to be excluded from this study. After all exclusion and inclusion criteria were applied, 16 of the original 309 articles met the requirements and were included in this study.

As seen by the small number of articles included, there is very little literature in the electronic database dealing with drowning interventions for children. Within the original 309 articles, there was a great deal of information regarding the incidence of drowning and community trends, but only a small selection of articles had the necessary information on interventions, and assessment of interventions, in small communities that was required for their inclusion in this paper. Further, there were virtually no research papers done on interventions in small Gulf coast communities. So the original intent of this capstone project will not be completed, and there will be no comparisons of Galveston County to other Gulf of Mexico coastal communities. The closest comparison, we can attempt are to other American coastal cities, specifically Los Angeles, Alaska and the Puget Sound area of Washington State. As in chapter 1, we will first explore interventions made globally and then in the United States.

Worldwide

Australia. Drown proofing interventions began Australia in the early 1970s. Community regulations in Western Australia required that public and private pools be enclosed by a fence on four sides and have an automatic locking mechanism included in their gate systems. Unfortunately, action on this legislation did not take effect nationwide, and most pools did not meet safety standards until in the 1990s. This delay was due to the public's unwillingness to believe that the drowning rate was increasing, especially in children. Also, there were high costs to fence building, they were aesthetically unpleasant in neighborhoods, and the legislation did not apply to previously built pools. Although the Australian experience is a success story in that all communities currently have pool construction legislation, Scott outlined the difficulties and lessons learned in Australian drowning intervention. He discussed the importance of getting the intervention right through solid research in regard to true community risk, and marketing to inform the public about the increased hazard. Interventions need to be taken as quickly as possible in order to prevent a rise in incidence, and at times lesser interventions need to be made in order to begin to stem the increased risk. Finally, Scott believed that continuous review of the issue on drowning prevention needs to be taken and adjustments to community policy be made as necessary. (13)

United Kingdom. A research project completed in the UK by Norris et al. focused on the human factors of drowning. (14) They contended that human factors and the physiological abilities of a victim can be studied to discover preventive interventions to drowning accidents. This information can be used in drowning education, but more

importantly, and the focus of their paper, is its use in the development and construction of drowning prevention systems. An example used the paper is a discussion of pool covers and their ability to truly prevent childhood drowning. There are a few concerns about the pool covers in that they are viewed by the population as more dangerous than helpful for small children. Children who accidentally fall into a pool with the pool cover can be suffocated or trapped just as easy as they can be drowned. Additionally, a pool cover can lead to an increased feeling of safety around the pool, which may decrease the parental level of vigilance. The researchers recommended using an anthropometric database to gain true knowledge of a small child's abilities and physical characteristics. This knowledge can be used to make safety equipment which ensures that broached pool covers can be lifted by the weakest child to prevent entrapment. Pool covers must also support the heaviest child and prevent the admittance of all ranges of small children through testing to determine what types of locking mechanisms give them the most difficulty. Finally, this database will keep an accurate account of swimming pool injuries in order to more quickly develop preventive strategies in pool construction. (14)

The United States

Alaska. In a cost analysis project conducted in 2003, Eduard et al. reviewed a joint venture program conducted on American Indians. The Yukon Kuskokwim health Corporation in Alaska attempted to decrease drowning mortality in residents of the area as they moved up and down the two local rivers, the primary means of transportation in the area. The selected intervention was to distribute “float coats”, lightweight summer coats that doubled as personal flotation devices. These coats also had an added benefit of

reducing hypothermia in persons who had fallen into the cold rivers. The marketing of this intervention was interesting in that the float coats were branded as outerwear as opposed to a personal flotation device, which made them more culturally acceptable. Additionally, the users were told that the float coats would help the community recover drowning victims more easily and would not require the weeklong searches that normally accompanied a drowning accident. During the five-year period starting in 1991, the area death rate due to drowning was reduced by 53%. The intervention was found to be cost effective because the float coats eventually became more popular and were marketed as a purchase item instead of being provided by the community. Also, the decrease in drownings reduced the amount of time and money spent by the community in recovery operations, estimated at 10 person days, or \$420, per incident. (15)

Seattle, Washington. A review done at the University of Washington in 2000 sought to determine if pool fencing prevented drowning in young children. Using the Cochrane collaboration search strategy, the group found three published case-control studies which reported a reduction in child drowning fatalities due to pool fencing. They found that the odds ratio for the risk of a drowning incident, for both mortality and near drowning, in a fenced pool versus unfenced pool was 0.27 95% CI (0.16, 0.47). The study also showed a decrease drowning incidents with pool fencing versus yard fencing and pool fencing on four sides versus partial pool fencing. The conclusion was that four sided fencing on public private and semi-public pools decreased drowning mortality. (16)

King County, Washington. In 1999 an evaluation was published regarding a three-year drowning prevention campaign in King County, Washington. The campaign focused on increasing life vest use in children aged one to 14 years. The subject of the literature was an evaluation conducted via telephone surveys throughout the campaign. Parents were asked about their awareness of the program, their ownership of a child sized flotation device, and their use of that device. Over the course of the evaluation, life vest use increased from 20 to 29%, and ownership increased from 69 to 75%. Among parents who are unaware of the intervention program, there was no significant change in a life vest ownership or use. (17) This evaluation is evidence of an increased life vest use over a period of time, probably due to a public information campaign. The next step would be to query childhood drowning mortality data for that same period and determine if there was a decrease in drowning mortality due to increased life vest use.

Los Angeles. Since 1967 the County of Los Angeles has had a fencing ordinance for residential swimming pools. This legislation exists for new construction of residential pools and only requires three sided fencing. The fourth side of a pool protection could include a building, with open access to windows or doors. A two phase investigation was conducted in the year 2000 to determine the factors of drowning risk in the county. Phase one was a study to determine if there was a geographic, hence socioeconomic, correlation to drowning risk. Phase two searched within these geographic regions to determine if fencing legislation had any effect on drowning mortality. Of the 146 child drowning occurring from 1990-1995, most were during the summer months. 87.7% of the incidents occurred on the property of single family dwelling and 67.8% were at the

victim's residence. There was not a pronounced drowning mortality difference between African Americans, Hispanics and whites seen until the effect of swimming pool density was controlled for. A variable of access, controlling for density once again showed a moderate increase in drowning mortality in young black men.

The authors hypothesized in phase 2 of their study that the majority of drowning would be in pools that did not need to comply with the current laws. Either built before 4-sided fencing legislation, or built at standards below code, these pools should have had a greater risk than pools with four sided fencing. Surprisingly, 81% of the pool drownings occurred at residences that were supposed to be compliant with fencing ordinances. This could be evidence of the ineffectiveness of the fencing ordinance, or it could be a result of Los Angeles County's inability to enforce those laws. (18)

Philadelphia. A major concern for researchers studying drowning mortality is the causal event leading to a drowning accident. A physicians group in Pennsylvania, PA studied the possibility of trauma as this causal event in children. They reviewed the hospital records of 143 children aged zero to 19 admitted to the emergency room for drowning or near drowning incidents. Only seven patients in this group, or 4.9%, had trauma included in the record. All seven of these patients had a cervical spine injury, and six of them were documented to have been diving prior to the incident. (19) Although this study shows that only a small number of children have trauma as a causal relationship to their drowning or near drowning experience, it exemplifies a simple intervention. We could postulate that communities with diving restrictions would have almost 5% less drowning incidents per year.

The Centers for Disease Control and Prevention. Based on the 2004 study discussed in Chapter 1, CDC made a number of recommendations for drowning intervention. There is no data in the literature regarding the efficacy of those recommendations. Recommendations include adult supervision of children, buddy swim programs, abstinence from alcohol, and swimming education. Additionally, CPR training for adults, and discontinuance of swim aids such as noodles or water wings for young children were promoted. CDC researchers also recommended increased residential swimming pool protection such as fences greater than 4 feet high, self closing and locking gates, and fences on four sides of pools. (8)

CHAPTER 4

Assessment of Drowning Interventions

There are rare occasions in the literature when specific interventions are utilized in a community and research is done to assess the intervention and assess its effectiveness. Most research regarding drowning interventions is involved around trends and differentials of childhood drowning and trying to determine which groups are affected by drowning and which interventions can be made. Most of the time, as we see it in the literature cited above, the intervention is general, such as pool fencing legislation, and increased supervision at community pools. These interventions are not generally meant to target specific subgroups within the population. Unfortunately, these generalized interventions are rarely followed up with a true assessment to determine the efficacy in the population. Throughout the 1980s and 90s, there were major movements in developed nations to improve public and private safety, and legislation to target childhood accidental death of all types. During that time, we see a decrease in stabilization of drowning mortality in children, but the literature is unable to specifically define which interventions were responsible for these positive effects.

The Alaska float coat project is one example of a specific community intervention that decreased drowning mortality. The community identified a specific risk within the population and organized funding, logistics, and marketing of an intervention to combat that risk. The greatest achievement in this intervention was its ability to change the behavior of the community, and that float coats have become the standard outerwear

while traveling on the river. While this intervention did not specifically target children, the outcome was a decrease in childhood drowning mortality in the community.

As seen in the interventions in Los Angeles County and Australia. Pool fencing is a popular intervention among communities. It is difficult to change a population's behavior, but much easier to write legislation that forces a population to comply with construction codes when they want to build pool. Generally, this intervention shows a decrease in child mortality, especially in the ages of zero to five, but literature is just starting to show data on the specific subjects of this intervention. White and Hispanic children have a decreased mortality because they generally swim in pools which are not only fenced but at least partially supervised, while pools where black children swim may meet construction codes for fencing normally do not have additional supervision to ensure the fencing is not breached. The major drawback with a fencing intervention in the community is the level of compliance. While all pool manufacturers may be forced to construct with four sided fences and locking gates, it is up to the resident or pool supervisor to ensure that these safety mechanisms are used and in place at all times to prevent childhood drowning mortality.

The last piece of literature that showed true promise in the prevention of drowning mortality wasn't actually an intervention. The trauma study done in Philadelphia showed a true drowning hazard that can be easily corrected by preventing children from diving into pools. While the author doesn't necessarily agree with restriction of diving fun, safeguards can be put into place ensuring that diving is done in supervised and appropriate depth pools, as well as instructing children in proper

techniques and hazards of diving. The next step for this project would be to introduce an intervention at local pools for diving safety and determine if this intervention showed a decrease in traumatic injury leading to drowning mortality.

The remaining articles reviewed in the previous chapter either did not show a decrease in childhood drowning mortality or were not specific enough to relate their decrease in drowning to the intervention. Additionally, none of these interventions attempted to focus on specific groups within the population. Race, socioeconomic status, and gender were not considered in the development of interventions for pool fencing, lifejacket use, or traumatic injury.

CONCLUSION

The original focus of this project, a systematic review to determine which childhood drowning mortality interventions would be appropriate to use in Gulf coast communities such as Galveston, Texas was only partially met. A systematic review was conducted of the literature, which is quite extensive when it comes to collecting information about drowning mortality. Unfortunately, the literature does not support the study of specific interventions in communities, and there is very little information regarding the effect of interventions that focus on subgroups within the community. There is data about a community focusing a specific risk for the entire population and having success, such as the float coat intervention in Alaska, but these interventions are not directly applicable to a Gulf Coast community when looking at recreational use.

Does Galveston County need an additional intervention for childhood drowning safety? As we have seen, there was one drowning death of a child in Galveston County in 2006. It occurred in a residential pool with a child less than 10 years old. The extenuating cause of the accidental death is not known from the mortality data available at this time, so it is impossible to know if there was pool fencing or adult supervision at the time. We could assume from this data that current interventions at the public beaches and pools in the county are working, and the continuation of these programs is an asset to the community. In order to properly recommend new interventions to the county, a research project with increased breadth, to include multiple years, should be done along with a cost assessment to determine if the increased cost to the community is appropriate for a new intervention.

Appendix A

Meets Inc/ Excl	Current Data	Discuss Intervention	Main Focus	Citation	Why Excluded?
Y	Y	Y	This paper presents cost-outcome analyses of five injury prevention efforts in Native American jurisdictions: a safety-belt program, a streetlight project, a livestock control project, a drowning prevention program, and a suicide prevention and intervention program. Pre- and post-intervention data were analyzed to estimate projects' impact on injury reduction. Projects' costs were amortized over the time period covered by the evaluation or over the useful life of physical capital invested. Projects' savings were calculated based on estimated reduction in medical and public program expenses, on estimated decrease in lost productivity, and on estimated quality adjusted life years saved. All projects yielded positive benefit-cost ratios. The net cost per quality adjusted life years was less than zero (i.e. the monetary savings exceeded project costs) for all but one of the projects.	Zaloshnja E. Miller TR. Galbraith MS. Lawrence BA. DeBruyn LM. Bill N. Hicks KR. Keiffer M. Perkins R. Reducing injuries among Native Americans: five cost-outcome analyses. <i>Accid Anal Prev.</i> 35(5):631-9, 2003 Sep.	
Y	Y	Y	In most industrialized countries, drowning ranks second or third behind motor vehicles and fires as a cause of unintentional injury deaths to children under the age of 15. Death rates from drowning are highest in children less than five years old. Pool fencing is a passive environmental intervention designed to reduce unintended access to swimming pools and thus prevent drowning in the preschool age group. Because of the magnitude of the problem and the potential effectiveness of fencing we decided to evaluate the effect of pool fencing as a drowning prevention strategy for young children. OBJECTIVES: To determine if pool fencing prevents drowning in young children. SEARCH STRATEGY: We used Cochrane Collaboration search strategy of electronic databases, searched reference lists of past reviews and review articles, Cochrane International Register of RCT's, studies from government agencies in the United States and Australia, and contacted colleagues from International Society for Child and Adolescent Injury Prevention, World Injury Network, and CDC funded Injury Control and Research Centers. SELECTION CRITERIA: In order to be selected a study had to be designed to evaluate pool fencing in a defined population and provide relevant and interpretable data which objectively measured the risk of drowning or near drowning or provided rates of these outcomes in fenced and unfenced pools. The completed studies meeting selection criteria employed a case-control design. No randomized controlled studies have been identified. DATA COLLECTION AND ANALYSIS:	Thompson DC. Rivara FP. Pool fencing for preventing drowning in children. <i>Cochrane Database Syst Rev.</i> (2):CD001047, 2000.	

			<p>Three published studies met selection criteria. Data were extracted by two reviewers using standard abstract form. Odds ratios with 95% CI, and incidence rates, were calculated for drowning and near-drowning. Attributable Risk percent (AR%) was calculated to report the reduction in drowning due to pool fencing. MAIN RESULTS: Case control studies which evaluate pool fencing interventions indicate that pool fencing significantly reduces the risk of drowning. Odds ratio for the risk of drowning or near drowning in a fenced pool compared to an unfenced pool is 0.27 95%CI (0.16, 0.47). Isolation fencing (enclosing pool only) is superior to perimeter fencing (enclosing property and pool) because perimeter fencing allows access to the pool area through the house. Odds ratio for the risk of drowning in a pool with isolation fencing compared to a pool with three sided fencing is 0.17 95%CI (0.07, 0.44) REVIEWER'S CONCLUSIONS: Pool fences should have a dynamic and secure gate and isolate (i.e., four-sided fencing) the pool from the house. Legislation should require isolation fencing with secure, self-latching gates for all pools, public, semi-public and private.</p>		
Y	Y	Y	<p>To investigate the causes of child drowning and determine the need for changes in the legislation as well as improvements to the inspection and enforcement of current legislation related to barriers surrounding private swimming pools. METHODS: There were 3 stages to the study: a retrospective review of coroner's data, an audit of swimming pool inspections, and in-depth interviews with swimming pool inspectors in Western Australia. The incidence of childhood drowning (per population) and compliance rates of swimming pools (per 1000 swimming pools) to the legislation were measured. RESULTS: During the 12-year observational period (1988-2000) 50 children younger than 5 years drowned in private swimming pools in Western Australia with an overall incidence of drowning of 4.4 per 100 000 children per year. Sixty-eight percent of drownings occurred in pools that did not have 4-sided fencing with an almost 2-fold increased risk (incidence rate ratio: 1.78; 95% confidence interval: 1.40-1.79) of a child's drowning in a swimming pool with 3-sided versus 4-sided fencing. The compliance rate of swimming pools (compliance to the current legislation) at first inspection was approximately 400 per 1000 swimming pools. CONCLUSIONS: Almost two thirds of the swimming pools in which children drowned had only 3-sided fencing. With a combination of a change in legislation, enhanced inspection processes, and public education, the incidence of drowning in private swimming pools in Western Australia could be reduced in the coming years.</p>	<p>Stevenson MR. Rimajova M. Edgecombe D. Vicker K. Childhood drowning: barriers surrounding private swimming pools. PEDIATRICS. 2003 Feb; 111(2)</p>	

Y	Y	Y	<p>Three hundred and forty-nine cases of accidental drowning or cooling in water occurring in Denmark from 1989 to 1993 have been studied. The incidence was highest in 0-4-year-old children, in middle-aged men, and in old people. A third of the children drowned in private pools. A quarter of all fatalities occurred during leisure boating. At least half of those that drowned in this way did not wear a life-jacket and could have been saved if they had been wearing one. Between a third and a half of the adult drownings were related to alcohol intake, and a large number of inebriated men fell into harbour basins and other water bodies. A few final remarks are made on the prospects for preventing accidental drowning in children, elderly people and adult males.</p>	<p>Steensberg J. Epidemiology of accidental drowning in Denmark 1989-1993. <i>Accid Anal Prev.</i> 30(6):755-62, 1998 Nov.</p>	
Y	Y	Y	<p>As an affluent and warm weather country, Australia faced an epidemic of drowning in children under five as the popularity of home pools increased in the late 1960s and early 1970s. In one state child drowning rose by 6.62 per 100,000 in the five years from 1968. Variation across jurisdictions in actions to regulate domestic pools has resulted in Australia representing an unfortunate natural experiment in interventions to prevent child drowning in pools. Mechanisms adopted by various authorities were analysed in detail to identify factors that contributed to success and failure in regulating domestic pools. Despite early identification of the problem and development of what were later demonstrated to be effective interventions, best practice solutions were not established in any jurisdiction until 2002, 25 years after identification of the problem. Key failures in intervention were found to be: failure to act in a timely way, flawed regulation, blockage of timely action and repeal of effective state regulation under political pressure, and blockage of effective standards. Lessons are identified as: inherent weaknesses in the standard setting process, failure of interventions to address major risk categories, failure to act before the hazard grew, failure to consider lesser interventions for tactical reasons, failure to pay attention to advocates, and the need for continuing effort. The paper argues that analysis of the identification of the problem, development of interventions and implementation of mechanisms of prevention illustrate where systemic changes are required and indicate lessons that should be applied in developing and implementing future interventions.</p>	<p>Scott I. Prevention of drowning in home pools--lessons from Australia. <i>Inj Control Saf Promot.</i> 10(4):227-36, 2003 Dec.</p>	

Y	Y	Y	<p>Injuries and deaths secondary to drowning are a significant issue for children. The risks associated with drowning change with a child's age and developmental abilities. Nationally, children under the age of 4 years and male adolescents represent the pediatric groups with the highest rates of drowning. In Wisconsin, 1998-2002, preteen children were involved in drowning or near-drowning events more often than teens, with boys being involved more than 2 times as often as girls for all childhood ages assessed. The drowning gender disparity is even greater among adults. Physicians are in a position to promote water safety for their patients and the community by educating families on age-appropriate drowning-prevention methods, supporting community safety campaigns, and advocating for "best practice" drowning-prevention legislation. Although injury prevention anticipatory guidance is important for all family members, directing the message to males is particularly important. Physicians can help children enjoy the benefits of water recreation while decreasing the risk for water-associated injury.</p>	<p>Schnake EM. Peterson NM. Corden TE. Promoting childhood water safety: the physician's role. WMJ. 104(2):45-9, 2005 Feb.</p>	
Y	Y	N	<p>OBJECTIVE: We examined circumstances surrounding swimming pool drownings among US residents aged 5 to 24 years to understand why Black males and other racial/ethnic groups have high drowning rates. METHODS: We obtained data about drowning deaths in the United States (1995-1998) from death certificates, medical examiner reports, and newspaper clippings collected by the US Consumer Product Safety Commission. RESULTS: During the study period, 678 US residents aged 5 to 24 years drowned in pools. Seventy-five percent were male, 47% were Black, 33% were White, and 12% were Hispanic. Drowning rates were highest among Black males, and this increased risk persisted after we controlled for income. The majority of Black victims (51%) drowned in public pools, the majority of White victims (55%) drowned in residential pools, and the majority of Hispanic victims (35%) drowned in neighborhood pools (e.g., an apartment complex pool). Foreign-born males also had an increased risk for drowning compared with American-born males. CONCLUSIONS: Targeted interventions are needed to reduce the incidence of swimming pool drownings across racial/ethnic groups, particularly adult supervision at public pools.</p>	<p>Saluja G. Brenner RA. Trumble AC. Smith GS. Schroeder T. Cox C. Swimming pool drownings among US residents aged 5-24 years: understanding racial/ethnic disparities. Am J Public Health. 96(4):728-33, 2006 Apr.</p>	

Y	Y	Y	<p>CONTEXT: While it is known that the risk of unintentional drowning varies with age, the manner in which drowning episode characteristics vary by age has not been well described. Such information might be useful for prevention. OBJECTIVE: To describe characteristics of drowning by age group. DESIGN: Retrospective review of the characteristics of drowning victims and their drowning incidents obtained from death certificates, medical examiner, pre-hospital, emergency department, and hospital records. SETTING: Three counties in Western Washington state. SUBJECTS: Residents who died (n=709) of unintentional drowning within the study region during 1980 through 1995. OUTCOMES: Age specific counts, proportions, and rates per million person years were estimated for and compared among six age groups. Results: Rates varied by age group: 0-4 (30.5), 5-14 (11.6), 15-19 (29.9), 20-34 (21.5), 35-64 (12.5), and 65 years or older (21.2). Among those 0-4 years, the proportions that drowned in pools, bathtubs, and open water were nearly equal. But from age 5-64 years, over 69% of deaths were in open water. Among those 65 years and older, the deaths were almost evenly divided between bathtub and open water; bathtub drowning rates were highest in this age group, 10.9. Pre-drowning activities were divided into boating, swimming, car passenger, bathing, and fell in while doing something else. Most (64/89, 76%) victims aged 0-4 years drowned while bathing or after falling in. Among those 15-19 years, most occurred while swimming (24/79, 34%) or boating (22/79, 31%). The drowning event was least often witnessed among those 0-4 years (10/36, 28%), and most often witnessed (44/58, 76%) among those 15-19 years. Medical care (pre-hospital, emergency department, or hospital) was most often involved in drownings of those 0-4 years (70/89, 79%) and least among those over 65 years (11/86, 13%). CONCLUSION: The characteristics of drowning episodes vary greatly by age. Different prevention strategies may be needed for different age groups.</p>	<p>Quan L. Cummings P. Characteristics of drowning by different age groups. INJ PREV. 2003 Jun; 9(2): 163-8. (23 ref)</p>	
---	---	---	---	---	--

Y	Y	Y	<p>The purpose of this analysis was to quantify the magnitude of death and disability from drowning and near-drowning worldwide and to provide epidemiological data on which to base prevention efforts. All data are from the Global Burden of Disease 2000 (Version 1) estimates in which deaths and disabilities are based on the WHO International Classification of Diseases. Extrapolations were made by age, sex, and WHO region. The six WHO regions of the world were further divided into high-income, and low- and middle-income based on the 1998 World Development indicators. According to the GBD 2000 data, an estimated 449,000 people drowned worldwide (7.4 per 100,000 population) and a further 1.3 million Disability Adjusted Life Years (DALYs) were lost as a result of premature death or disability from drowning. 97% of drownings occurred in low- and middle-income countries. Although 38% of drownings occurred in the Western Pacific Region, Africa had the highest drowning mortality rate (13.1 per 100,000 population). Males had higher drowning mortality rates than females for all ages and in all regions. Children under the age of 5 years had the highest drowning mortality rate for both sexes in all of the WHO regions except for Africa, where children aged 5 to 14 years had the highest mortality rate. Worldwide, for children under the age of 15 years, drowning accounted for a higher mortality rate than any other cause of injury. Drowning is a significant problem worldwide particularly for children under the age of 15 years. Low- and middle-income countries have the highest rates of drowning and account for more than 90% of such fatalities. Primary prevention efforts should thus be focused on these countries where many children who cannot swim drown in large bodies of water.</p>	<p>Peden MM. McGee K. The epidemiology of drowning worldwide. Inj Control Saf Promot. 10(4):195-9, 2003 Dec.</p>	
Y	Y	Y	<p>A number of routes can be followed towards the prevention of drowning, such as educating on water safety, installing barriers between non-intended users and water, mitigating the consequences of submersion incidents, and design. The human factor approach to safety is that design should always be the primary route. Human factors can be applied to the design of personal protective equipment such as buoyancy aids, barriers such as pool fencing, ancillary equipment such as swimming pool covers through to information and organisational factors such as safety signs and swimming campaigns. Design should consider all potential drowning scenarios and accommodate the characteristics of those at risk. A framework is presented with examples on how human factor principles can be applied to the design of potential drowning sites and products, with suggestions for methods and techniques that can be used in the key stages of predicting potential hazards and assessing risk.</p>	<p>Norris B. Wilson JR. Preventing drowning through design--the contribution of human factors. Inj Control Saf Promot. 10(4):217-26, 2003 Dec.</p>	

Y	Y	Y	<p>This study estimated the effects of local pool-fencing ordinances and other factors on the rate of childhood drowning in Los Angeles County, California.</p> <p>METHODS: Stage 1 was a retrospective dynamic cohort study of all drownings among children younger than 10 years that occurred in residential swimming pools in Los Angeles County between 1990 and 1995. Stage 2 was a matched case-control study that compared pools in which childhood drownings occurred (cases) with randomly selected pools in which drownings did not occur (controls). RESULTS: The drowning rate was relatively high among toddlers (aged 1-4 years), boys, and African Americans and in areas with a high density of residential swimming pools. Pool-fencing ordinances were not associated with a reduced overall rate of childhood drowning. CONCLUSIONS: Local ordinances enacted in Los Angeles County before 1996 do not appear to have been effective in reducing the rate of childhood drowning in residential pools. Possible reasons for this ineffectiveness are insufficient building codes for isolating pools from homes, inadequate enforcement of the ordinances, and inadequate operation or maintenance of fencing equipment by pool owners.</p>	<p>Morgenstern H. Bingham T. Reza A. Effects of pool-fencing ordinances and other factors on childhood drowning in Los Angeles County, 1990-1995. Am J Public Health. 90(4):595-601, 2000 Apr.</p>	
Y	Y	Y	<p>Injury is recognised internationally as the major threat to adolescent health. The purpose of this study was to describe the epidemiology of adolescent fatal injury in New Zealand, and to examine opportunities for prevention. National mortality data were searched to identify all 15-19 year-olds, who died from injuries in the period 1986-1995. Leading causes of injury were reviewed in light of known risk factors, injury mortality rates in other industrialised countries, and available prevention strategies. The results showed that injury accounted for 2,095 deaths (72.8 per 100,000 person years). Males comprised 77% of victims (110.6 per 100,000 person years), and there was a three-fold increase in mortality from age 15 (35.3 per 100,000 person years) to 19 years (106.4 per 100,000 person years). The leading causes of death were road traffic crashes (42.6 per 100,000 person years), suicide (16.4 per 100,000 person years), and unintentional drowning (3.6 per 100,000 person years). The Graduated Driver Licensing System addresses a range of risk factors for adolescent road traffic crashes. Despite inadequate enforcement, early indications are that it has yielded modest reductions in injury. Hazardous drinking is implicated in the high rates of road traffic crashes and drownings, and given recent liberalization of supply-side policies, proactive identification of hazardous drinkers followed by brief intervention holds promise as a prevention measure. Suicide accounts for an increasing rate of adolescent deaths in New Zealand. The effect of national policies to address a range of suicide risk factors remains to be fully evaluated.</p>	<p>Kypri K. Chalmers DJ. Langley JD. Adolescent injury mortality in New Zealand and opportunities for prevention. Int J Adolesc Med Health. 14(1):27-41, 2002 Jan-Mar.</p>	

Y	Y	Y	<p>The study focuses on children less than 5 years old and explores the epidemiological profile and correlates of drowning as a challenge to child survival in Bangladesh. Two data sources from Bangladesh, a cohort of 8,070 children followed for 2 years in a rural area and a nation-wide survey conducted in 1996-97 have been used. In addition, a systematic review of the literature has been conducted spanning the past two decades for analysis of drowning in children. Seventy drowning deaths were reported in the cohort and 726 deaths were reported in the national survey. Verbal autopsy and semi-structured interviews were conducted on all deaths. Drowning accounted for 43% of deaths in the cohort and 20% of deaths in 1-4-year-old children in the national survey. Most drowning deaths were in 12-23 month old children from falling into ditches and ponds. Communities provided valuable insights on possible interventions to reduce deaths due to drowning. Drowning is a newly recognized challenge for Bangladesh. Considerable research and programmatic work is required to understand the nature of the problem and develop appropriate interventions. This paper calls on aid agencies to create opportunities for drowning research and action in their work plans for the country.</p>	<p>Hyder AA. Arifeen S. Begum N. Fishman S. Wali S. Baqui AH. Death from drowning: defining a new challenge for child survival in Bangladesh. <i>Inj Control Saf Promot.</i> 10(4):205-10, 2003 Dec.</p>	
Y	Y	N	<p>To determine the prevalence of traumatic injuries in children involved in drowning and near-drowning accidents. DESIGN/METHODS: Ten-year retrospective medical chart review of patients at an urban tertiary care pediatric facility. Included patients had International Classification of Diseases, Ninth Revision, Clinical Modification codes for fatal/nonfatal drowning or E codes for fall into water, accidental drowning, and submersion. We recorded demographics, event characteristics, diagnostics, and outcome data. We used the chi(2) or the Fisher exact test to compare patients with and without injuries. RESULTS: One hundred forty-three patients met inclusion criteria. Of these, 95 (66.4%) were male. Median age was 3.8 years, and 30 (23.4%) of 128 had preexisting conditions. Site of drowning was the pool (70.6%), the bathtub (19.0%), or natural water (10.4%). The prevalence of traumatic injury was 4.9% (95% confidence interval, 0%-28%). The predominant mechanism of injury was diving, and all injuries were to the cervical spine. Patients with injury were more likely to be older (mean age, 13.5 vs 5.1 years; $P<.001$) and to have a history of diving (85.7% vs 2.2%; $P<.001$). The presence of injury was not associated with sex, preexisting condition, or site of drowning ($P>.05$). CONCLUSIONS: The prevalence of traumatic injury in drowning and near drowning is low. We identified only cervical spine injuries, and all but 1 patient had a clear history of diving. Use of specialized trauma evaluations may not be warranted for patients in drowning and near-drowning accidents without a clear history of traumatic mechanism.</p>	<p>Hwang V. Shofer FS. Durbin DR. Baren JM. Prevalence of traumatic injuries in drowning and near drowning in children and adolescents. <i>Arch Pediatr Adolesc Med.</i> 157(1):50-3, 2003 Jan.</p>	

Y	Y	Y	<p>Drowning is the seventh leading cause of unintentional injury deaths for all ages and the second leading cause of all injury deaths in children aged 1-14 years. Many of these injuries occur in recreational water settings, including pools, spas/hot tubs, and natural water settings (e.g., lakes, rivers, or oceans). To examine the incidence and characteristics of nonfatal and fatal unintentional drownings in recreational water settings, CDC analyzed 2001-2002 data from the National Electronic Injury Surveillance System All Injury Program (NEISS-AIP) and National Vital Statistics System (NVSS) death certificate data from 2001. This report summarizes that analysis, which indicated that, during 2001-2002, an estimated 4,174 persons on average per year were treated in U.S. hospital emergency departments (EDs) for nonfatal unintentional drowning injuries in recreational water settings. Approximately 53% of persons required hospitalization or transfer for more specialized care. During 2001, a total of 3,372 persons suffered fatal unintentional drownings in recreational settings. Nonfatal and fatal injury rates were highest for children aged < or =4 years and for males of all ages. To reduce the number of drownings, environmental protections (e.g., isolation pool-fences and lifeguards) should be adopted; alcohol use should be avoided while swimming, boating, or water skiing or while supervising children; and all participants, caregivers, and supervisors should be knowledgeable regarding water-safety skills and be trained in cardiopulmonary resuscitation (CPR).</p>	<p>Centers for Disease Control and Prevention (CDC). Nonfatal and fatal drownings in recreational water settings--United States, 2001-2002. MMWR Morb Mortal Wkly Rep. 53(21):447-52, 2004 Jun 4.</p>	
Y	Y	Y	<p>A three year drowning prevention campaign focused on increasing the use of life vests among children 1-14 years old. An evaluation was conducted to determine campaign awareness, change in ownership and use of life vests by children, and predictors of life vest use. SETTING: King County, Washington. METHODS: Four telephone surveys were conducted with parents before, during, and after the campaign. RESULTS: The campaign was recalled by 50% of families surveyed. From before to after the campaign, reported life vest use by children on docks, beaches, or at pools increased from 20% to 29% ($p < 0.01$) and life vest ownership for children increased from 69% to 75% ($p = 0.06$). Among parents aware of the campaign, reported child life vest use increased from 20% to 34% ($p < 0.001$) and ownership increased from 69% to 80% ($p < 0.01$). Among families unaware of the campaign, neither life vest use nor ownership changed significantly. Children were more often reported to wear life vests if a parent knew of the campaign, was confident fitting the vest, was younger than 40 years, felt the child could not swim well, and owned a life vest for the child. CONCLUSIONS: A community-wide drowning prevention campaign resulted in a significant, although modest, increase in reported life vest use and ownership among children.</p>	<p>Bennett E. Cummings P. Quan L. Lewis FM. Evaluation of a drowning prevention campaign in King County, Washington. Inj Prev. 5(2):109-13, 1999 Jun.</p>	

Y	Y	Y	<p>To identify the status of compliance and enforcement of New Zealand's Fencing of Swimming Pools Act (FOSP Act), 10 years after its introduction, and to identify methods for improving both compliance with the act and the process of enforcement. METHODS: A postal questionnaire was sent to all 74 authorities in New Zealand in which they were asked questions about their enforcement of the FOSP Act. Semistructured telephone interviews were conducted with 12 authorities to supplement the data obtained in the postal survey. RESULTS: Based on responses to the survey, it was estimated that there are over 59,000 domestic swimming pools in New Zealand, giving rates of 46 pools/1000 dwellings and 16 pools/1000 persons. The authorities reported that 44% of pools complied with the act, and a further 4% had been granted exemptions. Nineteen per cent of pools were reported to not comply with the act, and the compliance status of a further 33% was not known, or not stated by the authority. Only 9% of authorities had procedures for locating and inspecting pools, while 28% had a programme of reinspection to ensure that pools continued to comply. Pool owner resistance was considered to be the main difficulty with enforcing the act, and nearly half of the authorities believed publicity or education was needed to overcome these barriers. Fifty two per cent of authorities had publicized the act during the 12 months preceding the survey. CONCLUSIONS: Due to ambiguities within the legislation, and differing levels of commitment by authorities to locate pools and monitor compliance, compliance with the FOSP Act is not consistent nationally. If the act were less ambiguous, there would be greater consistency and more enforcement.</p>	<p>Morrison L. Chalmers DJ. Langley JD. Alsop JC. McBean C. Achieving compliance with pool fencing legislation in New Zealand: a survey of regulatory authorities. Inj Prev. 5(2):114-8, 1999 Jun.</p>	Unavailable
Y	Y	Y	<p>The primary objective of the study was to examine parental perceptions on the role of toddler swimming ability and pre-school swimming lessons in drowning prevention. A self-administered questionnaire was used to obtain information on toddler water safety from parents (n = 882) whose 2 - 4-year-old toddlers were either attending early childhood centres (n = 327) or who were enrolled in swim schools (n = 555). Differences in attitudes between two groups of parents were measured by frequency, with Mann-Whitney U tests used to discern significant differences between groups. More swim school parents believed that: swimming was best taught at 2 years of age or less (42% vs. 29%); swimming lessons were the best way to prevent toddler drowning (57% vs. 47%); toddlers could learn to save themselves if they fell into water (43% vs. 33%); and that it was better to develop swimming ability rather than rely on adult supervision (35% vs. 30%). Many parents have an overly optimistic view of the role of swimming ability and pre-school swimming lessons in drowning prevention. This was especially so for parents with toddlers enrolled in lessons. Swim schools in particular need to counter parental misconceptions of the protective role of swimming and reiterate the importance of close adult supervision of toddlers around water.</p>	<p>Moran K. Stanley T. Parental perceptions of toddler water safety, swimming ability and swimming lessons. Int J Inj Contr Saf Promot. 13(3):139-43, 2006 Sep.</p>	Unavailable

N	Y	N	<p>OBJECTIVES: To determine the pattern of accidental drowning and near-drowning in Denmark. DESIGN: Prospective study of all cases of accidental drowning and near-drowning during one year. SETTING: Denmark, 1995. SUBJECTS: All patients brought to Danish hospitals after incidents of unintentional near-drowning or cooling in water and all fatal cases. MAIN OUTCOME MEASURES: Number of near-drowned patients reported prospectively by hospital departments supplemented by cases reported after requests based on the National Patient Register. Number of drownings reported by public health medical officers (as medical examiners), institutes of forensic medicine, and hospitals. RESULTS: Sixty three (38%) of 167 unintentionally immersed persons died: eight (17%) of 47 children and 55 (46%) of 120 adults. The annual incidence of serious immersion events in children leading to hospital contact was 5.2/100,000; mortality was 0.7/100,000. For adult males the annual incidence of serious unintentional immersions was 4.3/100,000 and for females 1.2/100,000. For foreigners the risk was three to four times higher than for Danes. CONCLUSIONS: More attention should be paid to the risk of drowning in children, adult males, and foreigners.</p>	<p>Lindholm P. Steensberg J. Epidemiology of unintentional drowning and near-drowning in Denmark in 1995. Inj Prev. 6(1):29-31, 2000 Mar.</p>	No interventions
N			<p>To determine the prevalence and context of alcohol use in the deaths of children and youth reviewed by the BC Children's Commission. METHODS: In 489 case reviews of BC children and youth, we examined the role that alcohol may have had at the time of death or whether there was a history of alcohol use either by the deceased child or another person in the child's life. RESULTS: Alcohol is most prevalent in the lives of 15-18 year olds. It is present at the time of death in two fifths of Motor Vehicle Incidents (MVI) and one third of suicides and drownings. INTERPRETATION: Alcohol has a profound presence in the lives and deaths of children reviewed by the Children's Commission. Enhancing deterrence laws and alcohol control policies, and increasing public awareness are warranted.</p>	<p>Mitic W. Greschner J. Alcohol's role in the deaths of BC children and youth. CAN J PUBLIC HEALTH. 2002 May-Jun; 93(3): 173-5. (8 ref)</p>	Secondary Cause

Y	Y	N	<p>BACKGROUND: No one has ever reported or investigated the number of people who have been admitted to hospital for a water related incident. The purpose of this paper is to examine, the hospital activity resulting from such incidents including to length of stay, gender, age and cause. METHODS: The data was extracted from the Hospital Episode Statistics (HES) for episodes with a mention of ICD 10 (V90-94, W15-16, W65-74, X38, X92, Y21) for the years 1997/8 to 2003/4. Population based rates and relative risk were calculated using the most recent Census data for England (2001). RESULTS: The 6,793 episodes resulted in a total of 32,520 bed days with an average of length of stay of 5.0 days. Males made up 73.7% (n = 5,006) of episodes and females 26.1% (n = 1,787). Annual trends peaked in 1999-2000 at a rate of 2.4 per 100,000 and have fluctuated on alternate years there after. In terms of relative risk males are at a 2.3 to 3.0 increased annual risk of being admitted compared to females, relating to a water event. The highest annual rates were observed within the 0 - 14 age group, ranging from 3.1 to 4.2 episodes per 100,000. CONCLUSION: Based on these findings, for every one drowning that occurs per year there are three hospital episodes. Each of the age groups identified within the study reported an increase in hospital episodes between 2002 - 2003 and 2003 - 2004, when considering the fatality information available it would appear that although fatalities are decreasing in the similar time period, hospital episodes are increasing. For the 0-14 age group, the cause of the injury had changed over the years, moving away from bath tub and swimming pool, to watercraft incidents (V91 - 93). For the 15 - 59 age group there had been a decline in the frequency of watercraft and water transport episodes, however, an increase in diving and jumping injury and incidents. In the over 60 age group water transport episodes remained the most frequent, with swimming pool related episodes declining and other specified drowning and submersion increasing. More work needs to be undertaken in regard to who is admitted to hospital, when where, and how to fill gaps in knowledge and highlight information that is critical to prevention strategies.</p>	<p>Henderson H., Wilson RC. Water incident related hospital activity across England between 1997/8 and 2003/4: a retrospective descriptive study. BMC Public Health. 6:210, 2006.</p>	<p>No interventions</p>
---	---	---	--	---	-------------------------

Y	Y	Y	<p>AIMS: To identify how toddlers who drowned gained access to private swimming pools; to recommend preventive strategies to reduce the incidence of toddler drowning and near drowning. METHOD: The study reviewed critically all completed investigations into the drowning deaths of toddlers aged 1-4 years reported to the state coroner (n=33) as a result of unintentional submersion incidents in domestic swimming pools in Victoria, Australia, from 1 January 1992 to 31 December 1997. RESULTS: There was a predominance of 1 year olds, and boys. Forty six per cent of the children drowned in the three summer months. The majority of pools were in-ground; most were located on the child's home property. Over half the pools lacked fencing of any kind; of those that did have fences, only three appear to have met Australian standards. CONCLUSIONS: More than half of the children studied drowned in unfenced pools and spas. In not one case did a child gain unaided access to a pool fitted with a fully functional gate and fence that met the Australian standard. Where children gained access to fenced pools, the majority did so via faulty or inadequate gates, or through gates that were propped open. This finding highlights the need for pool owners to install Australian standard approved fences and gates, and to maintain existing fences and gates regularly. Door locks and supervision were inadequate primary prevention strategies.</p>	<p>Blum C. Shield J. Toddler drowning in domestic swimming pools. Inj Prev. 6(4):288-90, 2000 Dec.</p>	<p>Repeat data from earlier study</p>
Y	Y	Y	<p>BACKGROUND: Although the recent decline in child mortality in Bangladesh is remarkable, death from causes other than infectious diseases and malnutrition remains an important component of child mortality. Death from drowning of children can be expected to be a problem in Bangladesh given the geographical features of the country. OBJECTIVE: The objectives of this study are to determine the trend, pattern, and correlates of drowning deaths. METHODS: Data are presented on deaths of children (1-4 years) due to drowning derived from a longitudinal, population-based surveillance system in operation in a rural area of Bangladesh in 1983-1995. Moreover, a case-control study was carried out to identify the risk factors associated with drowning. RESULTS: Deaths due to drowning ranged from about 10% to 25% of child deaths during 1983-1995. The absolute risk of dying from drowning remained almost the same over the study period but the proportion of drownings to all causes of death has increased. Drowning is especially prevalent in the second year of life. Age of the mother and parity have a significant impact on drowning. The risk of dying from drowning increases with the age of mother and much more sharply with the number of living children in the family. Two socioeconomic variables did not have an influence on the risk of drowning. CONCLUSIONS: A substantial proportion of child deaths could be averted if parents and other close relatives paid more attention to the safety of children. The Child Health Programme of the Ministry of Health and Family Welfare of Bangladesh should develop health education programmes for villagers alerting them to the dangers of drowning and measures to prevent it.</p>	<p>Ahmed MK. Rahman M. van Ginneken J. Epidemiology of child deaths due to drowning in Matlab, Bangladesh. Int J Epidemiol. 28(2):306-11, 1999 Apr.</p>	<p>Repeat data from earlier study</p>

Y	Y	Y	<p>Issue addressed: Two population groups identified as having a high risk of drowning in Australia are tourists and individuals from culturally and linguistically diverse (CALD) backgrounds. The Chinese community in NSW was approached to trial a collaborative model that aimed to develop strategies to promote water safety among Chinese speakers. Methods: Five focus groups with 45 Chinese speakers and 50 intercept interviews at Sydney International Airport with Chinese-speaking tourists were conducted to identify current awareness, attitudes, and self-reported water safety-related behaviour among the Chinese community in NSW and among Chinese speakers visiting NSW. Results of the focus groups and intercept interviews were presented to a Chinese advisory group to assist with identification of appropriate water safety strategies for the Chinese community in NSW. Results: All of the focus group participants had undertaken some form of water-related activity, the most popular activities being swimming, boating/fishing and rock fishing. Around two-thirds of Chinese-speaking tourists had undertaken water-related activities while in Sydney/NSW and at least one-third had been swimming, paddling or surfing at a beach. Only one-third of Chinese-speaking tourists were aware of swimming between the red and yellow flags at the beach as a safety measure. Conclusions: The focus groups and intercept interviews were invaluable in obtaining information about awareness of water safety issues. The strategies suggested by members of the Chinese advisory group are to be implemented in partnership with the community and key water safety agencies in NSW</p>	<p>Mitchell R. Haddrill K. Working in partnership with the Chinese community in NSW to develop appropriate strategies to target water safety. HEALTH PROMOT J AUST. 2004 Apr; 15(1): 38-43.</p>	Unavailable
Y	Y	Y	<p>Issue addressed: Lack of appropriate swimming pool fencing is often found to be a causal factor contributing to the drowning of young children. Local councils are responsible for the enforcement of the Swimming Pools Act 1992 in New South Wales (NSW), yet no consistent approach to enforcement exists. Methods: A survey of local councils in NSW was conducted during June-August 2002. The survey included questions that aimed to identify what information was collected regarding backyard swimming pools, the form in which this information was stored, and barriers to the enforcement of pool fencing legislation in NSW. Results: Just over two-thirds of local councils responded to the survey. The type and format of information available regarding backyard swimming pools varied considerably between local government areas. Regular pool fencing inspections were not often conducted and minimal information was kept regarding the compliance status of backyard pool fencing with the Act. Conclusions: While the vast majority of local councils conduct educational initiatives aimed at improving pool owners' familiarity with the requirements of the NSW Swimming Pools Act 1992, ambiguities exist in the Act that can make compliance confusing. The effectiveness of the Act is further undermined by the low levels of compliance to its specifications.</p>	<p>Mitchell R. Haddrill K. Swimming pool fencing in New South Wales: who is checking compliance? HEALTH PROMOT J AUST. 2004 Apr; 15(1): 68-72</p>	Unavailable

Y	Y	Y	<p>OBJECTIVE: To describe the types of aquatic locations attended by residents of rural and remote New South Wales (NSW), to record self-reported water safety-related behaviour, and identify preferred communication mediums for water safety messages.</p> <p>METHODS: A stratified random telephone survey was conducted of 500 NSW residents aged greater than 15 years residing in moderately accessible, remote and very remote locations in NSW. RESULTS: Results indicate that around two-thirds of respondents had been in or on the water at a pool, beach, lake, river or dam in the past 6 months. The most common type of aquatic facilities used were rivers, creeks or streams (53.5%), beaches (45.7%), public pools (45.5%), private pools (40.7%), dams (40.6%) and lakes (27.0%). Time spent at each of these locations and time of day each location was visited varied. Overall, the majority of respondents reported practicing water-related safe behaviour. Preferred communication mediums for water safety messages included television, schools and newspapers. CONCLUSIONS: Water safety education, especially in relation to beach conditions, remains just as important a topic for public health authorities and key water safety agencies in regional and remote NSW as it is in coastal suburbs. Responses from the survey, along with key stakeholder advice, will be used to inform the development of appropriate strategies aimed to reduce drowning deaths in rural and remote locations in NSW.</p>	<p>Mitchell R. Haddrill K. From the bush to the beach: water safety in rural and remote New South Wales. Aust J Rural Health. 12(6):246-50, 2004 Dec.</p>	Unavailable
Y	Y	Y	<p>Issue addressed: An evaluation was conducted of the SafeWaters public awareness campaign in New South Wales (NSW) and the public's self-reported water safety-related behaviour, use of aquatic facilities, current community attitudes and awareness of water safety prevention efforts and knowledge of risk factors for drowning were described. Methods: A random sample of NSW residents was surveyed by telephone at baseline and at two periods after the televised airing of the SafeWaters campaign. Results: Prompted recall of the SafeWaters campaign at both post-campaign surveys increased significantly from baseline. Prompted recall of key water safety messages from the campaign showed a significant increase in seven of the eight messages at post-campaign survey 1, declining to two of the eight messages at post-campaign survey 2. Perceptions of risk were generally high in relation to risk factors for drowning for all three surveys. Respondents generally reported that they always or mostly practised water safety-related behaviour. Only one-third of respondents thought that all drowning in NSW could be prevented. Conclusions: The SafeWaters campaign was an effective mechanism for improving awareness of key water safety messages, especially during peak aquatic usage times during the summer school holidays.</p>	<p>Mitchell R. Haddrill K. An evaluation of the SafeWaters water safety campaign in New South Wales. HEALTH PROMOT J AUST. 2004 Apr; 15(1): 32-7.</p>	Unavailable

Y	Y	Y	<p>Injury prevention efforts often focus on reducing the risk of potentially dangerous activities, facilities or equipment, such as diving, swimming pools or flotation devices. This paper aims to clarify the concepts of risk assessment and risk perception. Statistically, risk denotes the probability of an untoward event, often expressed in terms of potential financial loss. Subjectively, though, risk denotes an individual's perception of the likelihood and the seriousness of an undesirable event. Individual perception appears to be strongly influenced by personal traits and socio-cultural parameters. Risk assessment helps to form the basis for public health interventions. The implementation and effectiveness of these are influenced by individual risk perception. Therefore, preventive efforts need to incorporate and hopefully influence the determinants of risk perception among the target populations. Considering drowning, both hazard and incidence of submersion injuries are underestimated, whereas treatment options are usually overestimated. Consequently, individual risk alertness needs to be improved--drowning remains a ubiquitous risk.</p>	<p>Michalsen A. Risk assessment and perception. Inj Control Saf Promot. 10(4):201-4, 2003 Dec.</p>	Unavailable
Y	Y	Y	<p>Injuries are a major cause of morbidity and mortality among adolescents. Adolescents routinely experiment with high-risk behaviors, increasing their risk of injury. Major modes of injury in adolescents include motor vehicle collisions, drowning, suicide and homicide. This article reviews the risk factors for fatal injuries in adolescents and discusses current prevention strategies. Previous research identifies many risk factors associated with adolescent injuries. Practitioners can help prevent teen injuries by screening all adolescent patients and identifying those at high risk of injury. Patients at high risk need preventive counseling and evaluation for possible referral to other services. Current strategies are useful in preventing many injuries; however, further research is needed to evaluate these strategies and to design new prevention programs.</p>	<p>McIntosh G. Moreno M. Fatal injuries in adolescents. WMJ. 99(9):34-8, 2000 Dec.</p>	Unavailable
Y	Y	Y	<p>Education is the key solution in drowning prevention for children. This column reviews the pros and cons of six "infant aquatic" programs.</p>	<p>Lynch DJ. Eye on the future. Advances in drowning prevention for children. ACSMS HEALTH FITNESS J. 2004 May-Jun; 8(3): 21-2.</p>	Unavailable

Y		Y	<p>INTRODUCTION: Injury prevention systems intended to prevent children from entering hazardous locations (or at least alert caregivers if that occurs) often respond to every instance of a person's presence, regardless of whether the intruder is a child. This performance results in a high nuisance alarm rate that sometimes causes adults to disable or circumvent the safety system. If a child safety system can accurately identify intruders as adults or children, nuisance alarm rates can be decreased. METHOD: This analysis selects three human factors (height, foot length, and cognition) amenable to adult/child differentiation and describes likely sensor strategies, advantages, and disadvantages. RESULTS: Preliminary testing of prototypes systems shows that simple sensor systems are capable of acquiring adequate data for adult/child differentiation. The discussion addresses requirements for discriminator systems and the effects of various sensor combinations on overall performance.</p>	<p>Butturini R. Midgett J. Designing sensor systems capable of differentiating children from adults. J Safety Res. 37(2):175-85, 2006.</p>	Unavailable
Y	Y	Y	<p>OBJECTIVE: To examine drowning deaths of young children in Victorian dams to identify common contributing factors in order to develop strategies for future prevention. DESIGN: Case records of children aged zero to five years from the State Coroner's Office Victoria were reviewed for the 13-year period 1989-2001. Cases where the child drowned in a dam were extracted for analysis. RESULTS: During the 13-year period there were 27 deaths; 11 occurred on farms, five on hobby farms and 11 on properties where it was not specified whether the property was a farm. Almost three quarters of the children were male and the majority were aged between one year and three years. Half of the incidents occurred on the weekend and nearly half occurred during the summer months. Five major factors were common among incidents: stage of the child's development; absence of carer supervision; child playing outside the house; dam within 300 metres of where the child was playing; and lack of effective barriers between the dam and the child. CONCLUSION: The coronial information examined identified patterns of behaviour by both carers and young children that contributed to these deaths. The results support the implementation of strategies such as the promotion of child safe play areas and targeted public awareness campaigns for rural and regional aquatic environments.</p>	<p>Bugeja L. Franklin R. Drowning deaths of zero- to five-year-old children in Victorian dams, 1989-2001. Aust J Rural Health. 13(5):300-8, 2005 Oct.</p>	Unavailable
Y	Y	Y	<p>Drowning is a leading cause of injury-related death in children. In 2000, more than 1400 US children younger than 20 years drowned. Most (91%) of these deaths were unintentional and were not related to boating. For each drowning death, it is estimated that at least 1 to 4 children suffer a serious nonfatal submersion event, many of which leave children with permanent disabilities. Environmental strategies, such as installation of 4-sided fences around swimming pools, and behavioral strategies, such as increased supervision of children while around water, are needed to prevent these tragedies.</p>	<p>Brenner RA. Prevention of drowning in infants, children, and adolescents. Pediatrics. 112(2):440-5, 2003</p>	Unavailable

Y	Y	Y	Drowning is a leading cause of injury-related death in children. In 2000, more than 1400 US children younger than 20 years drowned. A number of strategies are available to prevent these tragedies. Pediatricians play an important role in prevention of drownings as educators and advocates.	American Academy of Pediatrics Committee on Injury, Violence, and Poison Prevention. Prevention of drowning in infants, children, and adolescents. Pediatrics. 112(2):437-9, 2003 Aug.	Unavailable
N			Falls, poisoning, drowning, and burns comprise the four most common causes of unintentional injury death not related to motor vehicles. We examine mortality trends for these causes of injury in Wisconsin over a 10-year period (1986-1996). While national age-adjusted rates for fall mortality have remained relatively stable, Wisconsin has experienced a sharp 38% increase. The greatest increase in fall mortality was seen in the aged. Nationally, poisoning mortality rose by approximately 50% during this same period while Wisconsin saw almost no increase in mortality (3%) from poisoning. Wisconsin did experience an increase in deaths from poisoning in middle-aged adults. Mortality from drowning decreased by about 28% both in Wisconsin and in the United States, with much of the progress occurring in children and young adults. Burn mortality also declined nationally and within Wisconsin by 30% to 35%. The Wisconsin Public Health Department's "Healthier People in Wisconsin" objectives for the year 2000 will likely be met for drowning and burns, but not for falls. Overall, unintentional injury mortality in Wisconsin is decreasing. However, specific subpopulations are not reaping the benefits of this decline, suggesting a possible focus for future efforts aimed at lowering unintentional injury mortality.	Cox E. Tseng DS. Powell I. Trends in falls, poisoning, drowning, and burns Wisconsin: 1986-1996. WMJ. 100(2):39-42, 38, 2001.	No interventions
N			CONTEXT: Drowning is a frequent cause of accidental death in childhood, but the association of myocarditis and drowning has only rarely been reported. OBJECTIVE: To report 5 cases of drowning in children with coexistent myocarditis. DESIGN: A retrospective review of autopsy records of patients 0 years to 18 years of age was performed during a 6-year period (1998-2003, total cases reviewed = 1431). RESULTS: Twenty-two drownings were identified, in 14 male and 8 female children. Five patients (23%), 3 female and 2 male children, had coexistent myocarditis. The 5 patients ranged in age from 23 months to 13 years (mean, 7 years 2 months). None of the patients had antecedent symptomatology suggestive of myocarditis. In all patients, the myocarditis was focal mild or moderate, and the inflammatory infiltrate comprised lymphocytes with smaller numbers of neutrophils. All 5 patients had foci of myocyte necrosis. One patient had histologic evidence of myocardial hypertrophy but no evidence of a cardiomyopathy. Microbiologic studies, including culture, immunohistochemistry, polymerase chain reaction, and reverse transcriptase polymerase chain reaction, revealed Mycoplasma pneumoniae DNA in 1 case. CONCLUSIONS: The finding of myocarditis in a significant proportion of drowning victims in this series highlights the importance of a thorough autopsy examination in apparently straightforward cases and has clinicopathologic significance.	Somers GR. Smith CR. Wilson GJ. Zielenska M. Tellier R. Taylor GP. Association of drowning and myocarditis in a pediatric population: an autopsy-based study. Arch Pathol Lab Med. 129(2):205-9, 2005 Feb.	

N			<p>OBJECTIVES: We examined the major causes of and risk factors for death among migrants who died while making unauthorized border crossings into the United States from Mexico. METHODS: Decedents were included in the study if (1) their remains were found between January 1, 2002, and December 31, 2003, in any US county along the 650-mi (1040-km) section of the US-Mexican border from Yuma, Ariz, to El Paso, Tex; (2) their immigration status was unauthorized; and (3) they were believed to have died during transit from Mexico to the United States. Characteristics of the decedents and causes of and risk factors for their deaths were examined. RESULTS: Among the 409 decedents meeting our inclusion criteria, environmental heat exposure (n=250; 61.1%) was the leading cause of death, followed by vehicle crashes (n=33; 8.1%) and drownings (n=24; 5.9%). Male decedents (n= 298; 72.8%) outnumbered female decedents (n = 105; 25.6%) nearly 3 to 1. More than half of the decedents were known to be Mexican nationals (n=235; 57.5%) and were aged 20 to 39 years (n=213; 52.0%); the nationality of 148 (36.2%) decedents was undetermined. CONCLUSIONS: Deaths among migrants making unauthorized crossings of the US-Mexican border are due to causes that are largely preventable. Prevention strategies should target young Mexican men, and focus on preventing them from conceiving plans to cross the border, discouraging them from using dangerous routes as crossing points, and providing search-and-rescue teams to locate lost or injured migrant crossers.</p>	<p>Sapkota S. Kohl HW 3rd. Gilchrist J. McAuliffe J. Parks B. England B. Flood T. Sewell CM. Perrotta D. Escobedo M. Stern CE. Zane D. Nolte KB. Unauthorized border crossings and migrant deaths: Arizona, New Mexico, and El Paso, Texas, 2002-2003. Am J Public Health. 96(7):1282-7, 2006 Jul.</p>	
N	Y	Y	<p>BACKGROUND: While standard data on drowning reported by the World Health Organization (WHO) fails to provide a reliable picture of the burden of drowning in Finland, they suggest that the rates are much higher than those of other industrialized countries. AIM: To determine the true burden of drowning in Finland and factors related to its high rates. DESIGN: Descriptive, retrospective, population-based analysis of all deaths by drowning, among residents of all ages. SETTING: Finland, 1970-2000. MATERIAL AND METHODS: Mortality and population data furnished by Statistics Finland (SF) were used to determine age- and sex-specific drowning mortality rates using both nature- and cause-of-injury codes. Individual-level data from the death certificates were analysed and cross-linked to a nationwide postmortem toxicology database. RESULTS: From 1970 to 2000, 9279 unintentional drownings occurred (mean: 299.3/year SD 84.3, rate 6.1/100 000/year; M:F ratio = 8.6:1), accounting for 11.7% of all unintentional injury deaths. Drowning rates overall have decreased from 9.9/100 000/year in 1970-1972, to 4.5 in 1998-2000 (-2.7%/year; 95% CL: -3.0; -2.5). The most frequent activities related to drowning included boating (29.8%), falling (26.1%), swimming (25.0%), and activities on ice (12.4%). In non-boating-related drownings, 74.5% of males and 67.4% of females tested had a blood alcohol concentration (BAC) \geq50 mg/dl, while in boating-related drownings, the respective values were 78.1% and 71.4%. CONCLUSIONS: WHO statistics underestimate the true burden of drowning in Finland by up to 40-50%. Drowning rates and alcohol involvement in drowning</p>	<p>Lunetta P. Smith GS. Penttilä A. Sajantila A. Unintentional drowning in Finland 1970-2000: a population-based study. Int J Epidemiol. 33(5):1053-63, 2004 Oct.</p>	

		are much higher than in other comparable developed countries. Broad-based countermeasures to reduce alcohol use in water activities are needed as part of any strategy to reduce drowning rates.		
N		Drowning is one of the leading causes of death when the manner of death remains undetermined. In the present study, we examined the epidemiological and medico-legal profile of 276 undetermined deaths (M:F=3.4:1; mean age 41.9+/-16.0 SD) among 1,707 consecutive bodies found in water and autopsied at the Department of Forensic Medicine, University of Helsinki, from 1976 to 2000. We also describe the differences between the police investigator's initial opinion and the forensic pathologist's death certification, and the different approaches among forensic pathologists when determining the cause of death. There was considerable variation among individual pathologists in the percentage of deaths considered undetermined but these differences were not significantly related to their level of training. Medico-legal training should focus on a standardised diagnostic approach to borderline cases, in which essential factors in determining the manner of death are often ambiguous.	Lunetta P. Smith GS. Penttilä A. Sajantila A. Undetermined drowning. Med Sci Law. 43(3):207-14, 2003 Jul.	
N		The objective of this paper is to investigate and to improve understanding of the causes and circumstances of flood disaster deaths. A standardised method of classifying flood deaths is proposed and the difficulties associated with comparing and assessing existing information on flood deaths are discussed. Thirteen flood cases from Europe and the United States, resulting in 247 flood disaster fatalities, were analysed and taken as indicative of flood disaster deaths. Approximately two-thirds of the deaths occurred through drowning. Thus, a substantial number of flood disaster fatalities are not related to drowning. Furthermore, males are highly vulnerable to dying in floods and unnecessary risk-taking behaviour contributes significantly to flood disaster deaths. Based on these results, recommendations are made to prevent loss of life in floods. To provide a more solid basis for the formulation of prevention strategies, better systematic recording of flood fatalities is suggested, especially those caused by different types of floods in all countries.	Jonkman SN. Kelman I. An analysis of the causes and circumstances of flood disaster deaths. Disasters. 29(1):75-97, 2005 Mar.	

N		<p>Endogenous alcohol production can increase the blood alcohol concentration (BAC) of drowning victims following submersion and confound epidemiological studies of the role of alcohol. This study seeks to determine how soon after a drowning death a victim's BAC is influenced by post-mortem alcohol production. The drop in mean lung weight that occurs over time in the water was hypothesized to serve as a proxy for the time course of decomposition, and thus provide an empirical measure to determine how soon after death to first suspect endogenous alcohol. The autopsy lung weights of 562 previously healthy males who drowned were compared across six submersion time groups (0-11.9, 12-23.9, 24-47.9, 48-95.9, 96-167.9 and ≥ 168 h) and two times of year (winter and non-winter). The hypothesis that a drop in lung weight is sensitive to the time course of decomposition was supported by (1). a statistically significant drop in mean lung weight that occurred 12-23.9 h post-submersion in the non-winter months, but not until 96-167.9 h in the colder winter months; and (2). a significant drop in lung weight was not observed in the group of cases with zero BAC. With a parallel finding that an increase in the proportion of cases with a positive BAC first occurred at the 12-23.9 h submersion group during the warmer non-winter months, we concluded that production of alcohol can occur in bodies recovered from the water as early as 12 h after death. Because excluding drownings with submersion durations greater than 12 h would exclude almost half of our cases from epidemiological studies of alcohol and drowning, additional evidence from the forensic literature was used to develop an adjustment procedure to account for endogenous alcohol production for submersion times of up to 1 week.</p>	<p>Hadley JA. Smith GS. Evidence for an early onset of endogenous alcohol production in bodies recovered from the water: implications for studying alcohol and drowning. <i>Accid Anal Prev.</i> 35(5):763-9, 2003 Sep.</p>	
N		<p>OBJECTIVE: To determine the causes of death of individuals with developmental disabilities that occur more frequently among those with remote symptomatic epilepsy (i.e., epilepsy occurring in persons with developmental delay or identified brain lesions) than for those without. METHODS: The authors compared causes of mortality in persons with (n = 10,030) and without (n = 96,163) history of epilepsy in a California population of persons with mild developmental disabilities, 1988 to 2002. Subjects had traumatic brain injury, cerebral palsy, Down syndrome, autism, or a developmental disability with other or unknown etiology. There were 721,759 person-years of data, with 2,397 deaths. Underlying causes of death were determined from the State of California's official mortality records. Cause-specific death rates and standardized mortality ratios (SMRs) were computed for those with and without epilepsy relative to subjects in the California general population. Comparisons were then made between SMRs of those with and without epilepsy, and CIs on the ratios of SMRs were determined. RESULTS: Death rates for persons with epilepsy were elevated for several causes. The greatest excess was due to seizures (International Classification of Diseases-9 [ICD-9] 345; SMR 53.1, 95% CI 28.0 to 101.0) and convulsions (ICD-9 780.3; SMR 25.2, 95% CI 11.7 to 54.2). Other causes occurring more frequently in those with epilepsy included brain cancer (SMR 5.2, 95% CI 2.2 to 12.1),</p>	<p>Day, S M. Wu, Y W. Strauss, D J. Shavelle, R M. Reynolds, R J. Causes of death in remote symptomatic epilepsy. <i>Neurology.</i> 65(2):216-22, 2005 Jul 26.</p>	

			respiratory diseases (SMR 1.7, 95% CI 1.2 to 2.5), circulatory diseases (SMR 1.3, 95% CI 1.0 to 1.7), and accidents (SMR 2.7, 95% CI 1.9 to 3.7), especially accidental drowning (SMR 12.8, 95% CI 7.0 to 23.2). CONCLUSIONS: Remote symptomatic epilepsy is associated with an increased risk of death. Seizures, aspiration pneumonia, and accidental drowning are among the leading contributors.		
N	Y	N	<p>OBJECTIVES: To describe the epidemiology and outcomes of serious pediatric submersion injuries and to identify factors associated with an increased risk of death or chronic disability. METHODS: A retrospective database review of 1994-2000 Massachusetts death and hospital discharge data characterized demographic factors; International Classification of Diseases, Ninth Revision (ICD-9), Clinical Modification (ICD-9-CM), or ICD-10 injury codes; and outcomes for state residents 0-19 years of age identified with unintentional submersion injuries. The authors performed logistic regression analysis to correlate outcomes with risk and demographic factors. RESULTS: The database included 267 cases of serious submersion injury, defined as those requiring hospitalization or leading to death. Of these 267 patients, 125 (47%) drowned, 118 (44%) were discharged home, 13 (5%) were discharged home with intravenous therapy or with availability of a home health aide, and 11 (4%) were discharged to an intermediate care/chronic care facility. The authors observed a trend of improved outcome in successively younger age groups ($p < 0.0001$). The multivariable logistic regression analysis showed an increased likelihood of poor outcome for males compared with females (odds ratio [OR]: 2.52; 95% confidence interval [95% CI] = 1.31 to 4.84) and for African Americans compared with whites (OR: 3.47; 95% CI = 1.24 to 9.75), and a decreased likelihood of poor outcome for Hispanics compared with whites (OR: 0.056; 95% CI = 0.013 to 0.24). CONCLUSIONS: After serious pediatric submersion injuries, the overall outcome appears largely bimodal, with children primarily discharged home or dying. The observations that better outcomes occurred among younger age groups, females, and Hispanic children, with worse outcomes in African American children, suggest that injury prevention for submersion injuries should consider differences in age, gender, and race/ethnicity.</p>	Capkova M. Veleminsky M. Benesova V. Grivna M. Monitoring of drowning and near-drowning in the Czech Republic in the years 2001-2002. Int J Inj Contr Saf Promot. 13(1):43-5, 2006 Mar.	

N		<p>Adolescent and infant deaths due to home accidents pose an important social problem and can be prevented significantly by appropriate measures. The aims of this study about adolescent deaths under the age of 18 and infant deaths due to home accidents were assessment of risk factors and proposals for protective measures. Toward these aims, 414 autopsy reports (Provided by Mortuary Section, Council of Forensic Medicine, Istanbul Turkey, 1996-2000) were reviewed, as well as scene investigation data and information from eyewitnesses. Determination of risk factors, appropriate education, as well as legal regulations for manufacturers of household articles may significantly reduce the number of infant and adolescent deaths due to home accidents.</p>	<p>Airdizer M. Yavuz MS. Albek E. Canturk G. Infant and adolescent deaths in Istanbul due to home accidents. Turk J Pediatr. 47(2):141-9, 2005 Apr-Jun.</p>	
N		<p>INTRODUCTION: The aim of this study was to derive a profile of drowning victims in Singapore in the 10-year period 1992-2001 and determine if there are any patterns, trends or factors which may affect the risk profile of victims. Another objective was to recommend measures for reducing deaths from drowning through a review of some of the current literature and studies on drowning prevention. METHODS: Data for epidemiological analysis were studied and analysed. Data was primarily obtained from the annual drowning statistics reported in the annual reports of the Singapore Life Saving Society, which were in turn obtained from the Registry of Births and Deaths, and the Coroner's Court. The review of current literature and studies on drowning was concentrated on the publications of leading drowning experts and agencies and on the papers presented at two important international conferences, the International Drowning Symposium in May 1996 and the first World Congress on Drowning in June 2002. The review was done with a view to identify successful drowning prevention measures that may be adopted or enhanced in Singapore. RESULTS: The study revealed a few important findings. Firstly, Singapore had a drowning rate per 100,000 population that varied from a low of 0.88 in one year to a high of 1.72 in another in the period 1992-2001. Secondly, the male drowning mortality rate in Singapore was much higher than the female drowning mortality rate. Thirdly, persons in the age group of 20-29 years were at the highest risk. Fourthly, the sea, rivers and swimming pools were the locations with the highest number of drowning victims. The study also showed that the main measures of drowning prevention may be broadly divided into supervision, environmental design changes, legislation, swimming lessons and aquatic safety education. CONCLUSION: The situation in Singapore is generally comparable to that in high income or developed countries although there are some differences. Further studies and research need to be done to provide a better understanding of the epidemiology and prevention of drowning in Singapore. Existing drowning preventive measures should be followed or enhanced.</p>	<p>Tan RM. The epidemiology and prevention of drowning in Singapore. Singapore Med J. 45(7):324-9, 2004 Jul.</p>	Adults

N		<p>A hypothesis is generated that despite high reported rates, suicide among elderly Japanese females is substantially underestimated due to misclassification of drowning suicides (ICD-9 E954) as unintentional drownings (ICD-9 E910). Data are adapted from 1979-1981 age-, sex- and cause-specific mortality tabulations for Japan, the United States, Australia, France, New Zealand, Norway, Sweden and the United Kingdom. Between ages 55 and 74 years, unintentional drowning rates for males and females in Japan begin to diverge sharply from those of comparison countries. By ages 75 and older, the rate for Japanese females is 13.5 per 100,000, which exceeds comparison rates by 7- to 15-fold. Although drowning suicide rates in this population are also high, its ratio of drowning suicides to unintentional drownings declines precipitously beyond ages 35-44. Excess drowning suicide underestimation among Japanese females is suggested by the absence of a similar change among the males and evidence of both a lack of drowning witnesses and sex differentials in life expectancy, living arrangements and suicide methods. A preliminary test of the drowning suicide hypothesis is proposed which incorporates psychological autopsies.</p>	<p>Rockett IR. Smith GS. Covert suicide among elderly Japanese females: questioning unintentional drownings. Soc Sci Med. 36(11):1467-72, 1993 Jun.</p>	Adults
N		<p>BACKGROUND: There were 783 recreational boating fatalities in the United States in 1994. One contributor to this toll is alcohol-influenced operation of boats. Our study objective was to determine the prevalence of alcohol-influenced motor boat operation, and describe its relationship to demographic factors and other risk behaviors. METHODS: In 1994, a randomly dialed national telephone survey contacted 5238 adult respondents who reported on their operation of motor boats, alcohol use, and other potential injury risk behaviors. Data were weighted to obtain national estimates and percentages. RESULTS: Of 597 respondents who operated a motor boat in 1994, 31% (206 respondents) reported doing so at least once while alcohol-influenced. Alcohol-influenced operation of a motor boat was significantly more likely among males, individuals between 25 and 34 years of age, and those with greater than a college education. Alcohol-influenced motor boat operation was also more common among those who drove motor vehicles while alcohol-influenced, and those who drove a motor vehicle without using a seat belt. CONCLUSIONS: To decrease alcohol-influenced boating, new strategies should be developed. Strategies used to decrease drinking and driving motor vehicles may prove adaptable to preventing alcohol-influenced boating. More effective means of monitoring alcohol-influenced boating is needed. Alcohol use by passengers on boats should not be overlooked as a problem.</p>	<p>Logan P. Sacks JJ. Branche CM. Ryan GW. Bender P. Alcohol-influenced recreational boat operation in the United States, 1994. Am J Prev Med. 16(4):278-82, 1999 May.</p>	Adults
N		<p>OBJECTIVES: The aim of the present historical cohort study was to enhance the understanding of the unusual mortality pattern seen among seafarers. The main object was to describe the mortality pattern of Danish seafarers in recent years with special reference to the influence of accidents in the maritime workplace and ashore and the influence of diseases related to lifestyle. SUBJECTS: A cohort of 24,132 male seafarers of all job categories employed on a Danish merchant ship between 1986 and 1993, was followed</p>	<p>Hansen HL. Pedersen G. Influence of occupational accidents and deaths related to lifestyle on mortality among merchant seafarers. Int J Epidemiol. 25(6):1237-43, 1996 Dec.</p>	Adults

		<p>up. Mortality among those who left the occupation before the end of the follow-up period was analysed separately. RESULTS: The standardized mortality ratio was 1.43 (95% CI: 1.33-1.54) from all causes and 3.05 (95% CI: 2.62-3.52) from accidents. An excess mortality from natural causes was attributable mostly to an excess among deck and engine room crew and was mainly caused by diseases related to lifestyle. While active as seafarers, the SMR for accidents was 2.62 (95% CI: 2.12-3.20), accidents at the workplace explaining almost half the deaths. Among those who left shipping, the risk of fatal accidents increased. All categories of seafarers continued to have a high risk of fatal accidents into older age. CONCLUSION: Merchant seafarers were shown to have a higher mortality than the general population. Despite a very high risk of fatal accidents in the workplace, these accidents could only explain a proportion of the observed excess mortality. Accidents ashore and diseases related to lifestyle factors such as drinking and smoking made a major contribution to the observed excess mortality. The results indicate that people in occupations with a high risk of fatal accidents at the workplace also seem to have a high risk of accidents away from the workplace after leaving the occupation. The high risk lifestyle seems to be linked to lifestyle in general and hence the related diseases and high risk of death.</p>		
N		<p>This paper discusses characteristics of occupational traumatic deaths, caused by helicopters, during 1980-1985. Death certificate data are used to describe demographic characteristics and causes of death. Information from National Transportation Safety Board (NTSB) investigations is used to describe pilot experience and environmental circumstances surrounding the incident. During 1980-1985, 374 worker deaths involving helicopters were identified in the National Traumatic Occupational Fatality (NTOF) database. The majority of deaths resulted from trauma to body organs (including the brain). According to NTSB investigations, 59% of crashes in this study were attributed to pilot error, compared to 16.5% from mechanical failure of the helicopter. Thirty percent of deaths were related to military use of helicopters. While death due to occupational exposure to helicopters is not common, some workers (e.g., helicopter pilots) appear to be at especially high risk. This group should be studied further to develop better strategies for their protection.</p>	<p>Conroy C. Russell JC. Crouse WE. Bender TR. Holl JA. Fatal occupational injury related to helicopters in the United States 1980-1985. Aviat Space Environ Med. 63(1):67-71, 1992 Jan.</p>	Adults
N		<p>BACKGROUND: Risk factors for drowning are largely undocumented among military populations. Hypothesis: Accident report narratives will provide important information about the role of alcohol use and other behaviors in drownings among active duty male U.S. Army soldiers. METHODS: Using a case series design, we describe drowning deaths reported to the U.S. Army Safety Center (1980-1997), documenting associated demographic factors, alcohol use, and other risk-taking behaviors. RESULTS: Drowning victims (n = 352) were disproportionately young, black, and single, with less time-in-service, and no college experience. Most drownings occurred off-duty (89%). Alcohol use</p>	<p>Bell NS. Amoroso PJ. Yore MM. Senier L. Williams JO. Smith GS. Theriault A. Alcohol and other risk factors for drowning among male active duty U.S. army soldiers. Aviat Space Environ Med. 72(12):1086-95, 2001 Dec.</p>	Adults

		<p>was involved in at least 31% of the cases overall. Alcohol use was also associated with a 10-fold increase in reckless behavior (OR 9.6, 95% CI 4.5-20.7) and was most common among drownings in Europe (OR = 4.3, 95% CI 1.5-13.4). Most drownings occurred where no lifeguard was present (68%), but almost two-thirds occurred in the presence of others, with CPR initiated in less than one-third of these cases. Drownings involving minority victims were less likely to involve alcohol, but more likely to occur in unauthorized swimming areas. While most drownings did not involve violations of safety rules, over one-third of the cases involved some form of reckless behavior, particularly for those under age 21. CONCLUSIONS: Intervention programs should be tailored to meet the needs of the demographic subgroups at highest risk since behavioral risk factors vary by race and age. CPR training and skills maintenance can improve survival rates. Narrative data are important for developing hypotheses and understanding risk factors for injuries.</p>		
N		<p>OBJECTIVE: To determine the number of overseas visitors admitted to Queensland hospitals for water-related injuries over three years, the causes of their injuries, the resulting conditions treated, and the type of hospitals to which they were admitted. DESIGN: Retrospective analysis of admissions of overseas visitors to Queensland hospitals over the three financial years 1995/96, 1996/97 and 1997/98. PATIENTS: 296 overseas visitors admitted for water-related injuries, identified from hospital records by their usual place of residence. MAIN OUTCOME MEASURES: Number of admissions, causes of injuries, conditions treated, and bed days occupied by these patients at different types of hospitals (metropolitan, regional and rural public hospitals, and private hospitals). RESULTS: The 296 overseas visitors accounted for a total of 596 separate admissions, many of these the result of patients with decompression illness being admitted several times to a regional hospital hyperbaric chamber for treatment as day patients. The largest number of injuries involved the use of diving equipment. The main conditions treated were decompression illness (54.7%), fractures and dislocations (15.5%), and drowning and non-fatal submersion (14.9%). Overall, overseas visitors admitted to hospital following a water-related incident occupied 1215 bed days; 90% of these admissions were to regional hospitals. CONCLUSIONS: The main reason for admission of overseas visitors is for decompression illness, suggesting that the prevention of injuries among scuba divers requires further coordinated efforts by health and tourism authorities.</p>	<p>Wilks J. Coory M. Overseas visitors admitted to Queensland hospitals for water-related injuries. Med J Aust. 173(5):244-6, 2000 Sep.</p>	Adults
N		<p>The incidence, epidemiology, and pathophysiology of drowning and near-drowning are presented. Particular attention is paid to the neurologic and pulmonary pathophysiology indicators for monitoring and laboratory tests. Special attention to transportation of patients is given, and treatment in the field, emergency department, and pediatric intensive care unit is delineated.</p>	<p>Levin DL. Morriss FC. Toro LO. Brink LW. Turner GR. Drowning and near-drowning. Pediatr Clin North Am. 40(2):321-36, 1993 Apr.</p>	Discusses treatment not prevention

N		<p>OBJECTIVES: (a) Evaluate the presenting hemodynamic status and neurologic function of a series of warm water submersion injuries. (b) To ascertain the importance of the timing of the neurologic examination. (c) To identify risk factors that predict which patients will not return to presubmersion status. DESIGN: Retrospective review of all patients with a diagnosis of drowning/near-drowning responded to by the Children's Hospital pediatric transport service. Data were collected over a 24-month period regarding patient characteristics, submersion medium, rescue efforts, time out of sight, elapsed times to emergency department (ED) and pediatric intensive care unit (PICU) arrival, neurologic and hemodynamic status on arrival at the ED and PICU, reconstructed Conn-Modell category, and neurologic outcome. SETTING: EDs of the referring hospitals and PICU of the Children's Hospital of Orange County (CHOC), California. PATIENTS: Ninety-three submersion victims at an average age of 31 months. All patients were provided intensive care support. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Twenty-three percent (21/ 93) of patients died or survived vegetative. No patient arriving comatose and asystolic in the ED survived neurologically intact (n = 21, three patients expired in the ED). This group of patients had a mean duration of documented asystole = 41 minutes, range of 18 to 107 minutes, and time to ED arrival = 21 minutes. All patients with a detectable pulse and blood pressure (n = 72) on arrival to the ED, regardless of their neurologic status, recovered to their presubmersion status. Patients arriving comatose (decorticate, decerebrate, or flaccid posture) in the PICU (n = 18, mean arrival = 192 minutes) all died or were vegetative. All patients with non-coma (n = 72, Conn-Modell category A or B) on arrival to the PICU recovered normally. CONCLUSIONS: Hemodynamic status in the ED and neurologic status in the PICU are highly predictive of outcome. On arrival to the ED, the cardiovascular status is more predictive of abnormal outcome than neurologic status. Poor neurologic outcome appears inevitable for warm water submersion victims who are asystolic at ED arrival and remain comatose for more than 200 minutes.</p>	<p>Habib DM. Tecklenburg FW. Webb SA. Anas NG. Perkin RM. Prediction of childhood drowning and near-drowning morbidity and mortality. <i>Pediatr Emerg Care.</i> 12(4):255-8, 1996 Aug.</p>	<p>Discusses treatment not prevention</p>
N		<p>OBJECTIVE: To improve characterization and recognition of inflicted pediatric submersions. DESIGN: Retrospective case series, records review. SETTING: A regional children's hospital and the King County (Washington) Medical Examiner's office. PATIENTS: Children younger than 19 years who sustained submersion injury between 1983 and 1991 and were hospitalized or autopsied. OUTCOME MEASURES: Two pediatricians, using preestablished criteria, categorized abstracted case scenarios as either inflicted or unintentional events. The two groups were compared. RESULTS: Of 205 submersions, 16 (8%) were judged to have been inflicted. Objective physical signs of abuse and incompatibilities between the history and the child's stage of development or physical findings were common (69% and 50%, respectively). Inflicted submersion victims were likely to be young (median age, 2.1 years). They tended to be the youngest sibling in a large (three or more children)</p>	<p>Gillenwater JM. Quan L. Feldman KW. Inflicted submersion in childhood. <i>Arch Pediatr Adolesc Med.</i> 150(3):298-303, 1996 Mar.</p>	<p>Discusses treatment not prevention</p>

		household. Social and demographic attributes of inflicted and unintentional submersion victims did not differ significantly. Bathtubs were the most common site for inflicted submersions (9/16 [56%]), and submersions in bathtubs were frequently inflicted (9/34 [26%]). Compared with unintentional submersion victims, children who were inflicted submersion victims were less likely to be revived by bystanders (relative risk, 0.10; confidence interval, 0.01 to 0.72) and were more likely to die (relative risk, 4.32; confidence interval, 1.40 to 21.43). CONCLUSIONS: Enough childhood submersions are inflicted to warrant careful case evaluation. Bathtub submersion victims and children with physical and historical findings common to other forms of abuse are most likely to be the victims of inflicted submersion.		
N		BACKGROUND: Accidental drowning causes over 300 deaths annually in Australia, and many more instances of 'near drowning'. OBJECTIVE: This article outlines the management of near drowning and the general practitioner's role in drowning prevention. DISCUSSION: Cardiopulmonary resuscitation (CPR) is the mainstay of immediate management. Continuing CPR for 30 minutes if necessary is appropriate, particularly in hypothermic patients. Patients who have been successfully resuscitated and those with clinical features suggesting aspiration should be given 100% oxygen and transferred to hospital. Drowning prevention is a significant public health issue, and the GP's role in education and support of rescue services and public awareness campaigns is important. [References: 8]	Grenfell R. Drowning management and prevention. Aust Fam Physician. 32(12):990-3, 2003 Dec.	Near drowning
N		OBJECTIVE: To evaluate the Pediatric Risk of Mortality Score (PRISM score) as a tool to distinguish which patients presenting to the emergency department (ED) or pediatric intensive care unit (PICU) would survive neurologically intact from those who would die or survive with severe neurologic impairment following a submersion incident. DESIGN: Retrospective chart review. SETTING: A regional tertiary care ED and PICU. MATERIALS: Medical records of drowning and near-drowning patterns between the ages of 1 day and 18 years who were admitted to the ED or PICU from January 1986 through December 1995. MAIN OUTCOME MEASURES: For each patient, a PRISM score was calculated based on data collected at the time of arrival to the ED or PICU. A "probability of outcome" was calculated using the PRISM score. Outcomes were defined as survival with intact neurologic function, survival with severe neurologic impairment, or death, and were assessed using the Pediatric Cerebral Performance Category Scale. Scores and probabilities of outcome were compared with the actual outcome for both the ED and PICU patients using the Fisher exact test (2 tailed). RESULTS: All Ed patients with PRISM scores less than 25 or a probability of outcome less than 50% (n = 40) survived with intact neurologic function (P < .001). All ED patients with PRISM scores of 25 or greater or a probability of outcome of 50% or greater (n = 10) either died or survived with severe neurologic impairment (P < .001). All PICU patients with a PRISM score of 5 or less (n = 25) or a probability of outcome less than 4%	Zuckerman GB. Gregory PM. Santos-Damiani SM. Predictors of death and neurologic impairment in pediatric submersion injuries. The Pediatric Risk of Mortality Score. Arch Pediatr Adolesc Med. 152(2):134-40, 1998 Feb.	No interventions

			(n = 30) survived with intact neurologic function (P < .05). All PICU patients with a PRISM score greater than 20 or a probability of outcome greater than 50% either died or survived with severe neurologic impairment (P < .05). Outcomes could not accurately be predicted in PICU patients when the PRISM scores were 6 or greater and < or = 20 or less (n = 10), or when the probability of outcomes was 4% or greater and 50% or less. CONCLUSIONS: The PRISM scoring system accurately distinguished ED patients who would survive neurologically intact from those who would die or suffer neurologic impairment. There was not a specific PRISM score or probability of outcome that could distinguish PICU patients who would survive neurologically intact from those who would die or suffer severe neurologic impairment. The PRISM scoring system appeared to be more accurate in distinguishing intact survival from death or neurologic impairment in ED patients than in PICU patients.		
N	Y	N	INTRODUCTION: Immersion in cold water is compatible with long-term survival, even when the period of immersion is relatively long. Guidelines for resuscitation after immersion stress the importance of prolonged resuscitation using advanced life support techniques. METHODS: Deaths due to drowning in south-east Scotland between 1991 and 1997 were reviewed, using a variety of data sources. RESULTS: 95 deaths (69 males, 26 females) from drowning occurred in the following sites: sea, 35; bath, 15; flowing freshwater, 26; still freshwater, 19; 22 (23%) of the drowning incidents were witnessed, 73 (77%) were unwitnessed. 28 individuals were recovered within 1 h of being seen alive, 13 having had witnessed accidents, 15 having had unwitnessed accidents. Six individuals were not resuscitated at the scene by the emergency services, despite being last seen alive within the previous hour. A further five individuals were initially resuscitated, but declared dead at the scene within 1 h of being known to be alive. CONCLUSIONS: Members of the emergency services, are failing to both initiate prehospital resuscitation and to continue this to hospital for victims of near drowning. There appears to be potential to reduce the drowning death rate by improving resuscitation. The emergency services and the public should be educated about the need to resuscitate those found in water.	Wyatt JP. Tomlinson GS. Busuttill A. Resuscitation of drowning victims in south-east Scotland, Resuscitation. 41(2):101-4, 1999 Jul.	No interventions
N			Water immersion is a frequent cause of accidental death and hospital admission. This article outlines the pathogenesis and principles of treatment. Drowning is defined as death by asphyxia due to submersion in a liquid medium. Near-drowning is defined as immediate survival after asphyxia due to submersion.	Moon RE. Long RJ. Drowning and near-drowning. Emerg Med (Fremantle). 14(4):377-86, 2002 Dec.	No interventions

N	Y	N	<p>In Japan, the leading cause of death for children over 1 year old is injury, and for children aged 0-14, drowning is the second leading cause of death. The purpose of the present study was to describe the epidemiological factors of drownings and near-drowning among Japanese children and to ascertain whether there are characteristic patterns for different age groups. Epidemiologic data was obtained by questionnaire. A total of 604 cases of submersion injuries were reported from 49 hospitals located in 22 Japanese prefectures. In the present paper, victims of drowning (n = 134) and near-drowning with permanent severe brain damage (n = 51) and those of near-drowning with intact survival or mild impairment (n = 419) were investigated. Preschool-aged children, especially toddlers, are at the greatest risk of drowning and near-drowning, and for children over 2 years of age, boys have three times greater risk than girls. The bathtub is the most common place of submersion injuries in Japan, especially for children under 4 years of age. The important risk factors for the victims who died or were severely impaired were associated with duration of submersion and necessity of emergency cardiopulmonary resuscitation on arrival at hospital.</p>	<p>Mizuta R. Fujita H. Osamura T. Kidowaki T. Kiyosawa N. Childhood drownings and near-drownings in Japan. Acta Paediatr Jpn. 35(3):186-92, 1993 Jun.</p>	No interventions
N			<p>BACKGROUND: Drowning without aspiration of liquid, generally attributed to death from asphyxia while submerged and in laryngospasm, has been reported to occur in approximately 10% to 15% of drowning victims. OBJECTIVES: The occurrence of "dry-drowning" recently has been questioned and the hypothesis developed that "dry-lungs" in bodies found dead in the water could conceal more natural deaths than previously recognized. METHODS: Based on 578 selected adult victims who presumably drowned, we analyzed the correlation between the cases with a low combined lung/pleura liquid weight (< 1000 g and < 750 g) and a wide set of individual, circumstantial, and postmortem (PM) variables, using multivariate logistic regression analysis. Victims with lung weight < 1000 g were screened for long-QT syndrome (LQTS) founder mutations in KCNQ1 and KCNH2 genes. RESULTS: Of the 578 victims, 120 (20.7%) had a lung weight of < 1000 g, and 22 of these (3.8%) of < 750 g. Multivariate analysis showed a significant correlation for women (P < 0.001), for women aged 65 years or older (P < 0.001), and for men with prolonged PM submersion time (P < 0.001). "Normal" lungs were found in only 8 (1.4%) victims. Low-weight (< 1000 g), overdistended lungs with no sign of liquid penetration were seen in 11 (1.9%). No LQTS founder mutations were detected. CONCLUSIONS: The actual incidence of death of persons found in water who have normal lungs or do not have penetration of liquid into their airways, based on our study, is much lower (below 2%) than currently assumed.</p>	<p>Lunetta P. Modell JH. Sajantila A. What is the incidence and significance of "dry-lungs" in bodies found in water?. Am J Forensic Med Pathol. 25(4):291-301, 2004 Dec.</p>	No interventions
N			<p>Data on all registered deaths in children less than 15 years in the RSA (excluding Transkei, Bophuthatswana, Venda and Ciskei) were analysed for 1981-1985. Variations in age, sex and population group pattern for different causes of injury were evaluated. Injury accounted for 8% of deaths in children less than 15 years and was the leading cause of death between the ages of 5 years and 14 years</p>	<p>Kibel SM. Joubert G. Bradshaw D. Injury-related mortality in South African children, 1981-1985. SAMJ, S. Afr. med. j.. 78(7):398-403, 1990 Oct 6.</p>	No interventions

			(accounting for 43% of deaths). Motor vehicle accidents were the most important cause of injury deaths in all age groups except less than 1 year, when accidental choking and suffocation resulted in more deaths. Drowning accounted for 19% of injury deaths and burns for 11%. In 14% of injury deaths it was not determined if the injury was accidental or purposefully inflicted. In all age and population groups deaths among boys outnumbered girls. The impact and pattern of injury varied considerably between age and population groups and reasons for these findings are discussed.		
N			<p>OBJECTIVES: To describe the patterns associated with cold-water immersion and drowning in commercial fishermen in Alaska from 1990 through 2002. STUDY DESIGN: This is a retrospective study using data from the Alaska Occupational Surveillance System (AOISS), a database with records from all occupational mortalities occurring in Alaska from 1990 on. METHODS: We extracted and analyzed all records describing deaths from drowning or hypothermia to commercial fishermen in Alaska from 1990 through 2002 that were registered within AOISS. We also used a subset of records from AOISS to compare use of Personal Flotation Devices (PFDs) between the target population and survivors of fatal events. RESULTS: There were 228 deaths resulting from cold-water immersion and subsequent drowning in the target population for the time period studied. Victims were far less likely to have used PFDs than were survivors of events where cold-water drowning occurred. CONCLUSION: The strong protective association seen with the use of PFDs, particularly immersion suits, in surviving cold-water events indicates that many of the events that led to deaths in the target population could well have been survivable.</p>	Hudson D. Conway G. The role of hypothermia and drowning in commercial fishing deaths in Alaska, 1990-2002. Int J Circumpolar Health. 63 Suppl 2:357-60, 2004.	No interventions
N	Y	N	<p>OBJECTIVE: This paper describes the epidemiology of injuries sustained by children under five in the home. METHODS: Cases were selected from the New Zealand Health Information Service public hospital morbidity and mortality data, and included all 0-4 year olds where the place of injury occurrence was classified as 'home'. The circumstances of injury were coded according to the Supplementary Classifications of External Causes of Injury and Poisoning (E-codes) of the International Classifications of Diseases. Age-specific rates of death or hospitalisation due to injury were calculated using the population of 0-4 year olds in New Zealand for each year as the denominator. RESULTS: The rate of death from an injury sustained at home between 1989 and 1998 was 13 per 100,000 population per year. The main causes of death were suffocation, submersion, homicide and fire. The rate of hospitalisation in children aged 0-4 years from an injury sustained in the home between 1989 and 2000 was 737 per 100,000 population per year. The most frequently recorded causes of hospitalisation were falls, scalds, poisonings and cut/piercing incidents. CONCLUSION AND IMPLICATIONS: Although there has been an apparent decrease in the number of children hospitalised for injuries sustained in the home environment, it is not possible to determine if this is a 'real' change or a result of other factors affecting the</p>	Gulliver P. Dow N. Simpson J. The epidemiology of home injuries to children under five years in New Zealand. Aust N Z J Public Health. 29(1):29-34, 2005 Feb.	No interventions

			data. While children continue to be killed and injured as a result of preventable incidents in the home environment, injury prevention strategies should be continued and strengthened.		
N			We identified immersion injuries of New Jersey residents from mortality and hospital discharge data. The incidence rate was 2.3 immersion injuries (1.3 fatal and 1.0 nonfatal) per 100,000 population per year. Incidence rates were elevated among young children, men, blacks, and residents of counties in the southern part of the state. Case fatality ratios increased with age and were higher for men than for women from 10 to 50 years of age.	Fife D. Scipio S. Crane GL. Fatal and nonfatal immersion injuries among New Jersey residents. Am J Prev Med. 7(4):189-93, 1991 Jul-Aug.	No interventions
N			Concern that drowning is frequently considered neglectful and referred to Children's Protective Services (CPS) led us to review the frequency and associations of referral. Records of 95 childhood drowning and near drowning victims hospitalized between 1981 and 1987 were reviewed. Reactions of 14 nurses, 27 physicians, and 13 social workers to 4 case scenarios were solicited. Only 8 drownings were reported to CPS. Reporting was significantly more likely if the child was younger or nonwhite, the family poor, the injury in the bathtub, social work involved, a prior CPS report recognized or consideration of neglect documented in the chart. Reporting was not related to the child's sex or clinical outcome, the parent's marital status or drug/alcohol history, type of child supervision, or time until discovery or history of prior accidents. Only 28% of the cases had social service evaluation. Intensive care staff were least likely and emergency room staff most likely to consider drowning scenarios neglectful. Profession, age, sex, years in practice and whether one was a parent did not affect the referral decision. Judgment that scenarios were neglectful correlated closely with the decision to report. Lapse in supervision by an intoxicated father, was thought most neglectful. Judgment was split whether poor families letting infants bathe alone or with siblings were neglectful or the result of poor knowledge of hazard and infant development. A 4-year-old who wandered into a lake at a picnic was felt a victim of an unfortunate accident. Clinicians found decisions about referral stressful.	Feldman KW. Monastersky C. Feldman GK. When is childhood drowning neglect?. Child Abuse Negl. 17(3):329-36, 1993 May-Jun.	No interventions
N	Y	N	OBJECTIVE: To compare incidences of drowning for children in the Northern Territory (NT) with those in Queensland and the rest of Australia. DESIGN: Descriptive, retrospective, population-based analysis of death and hospitalisation data for drowning and near-drowning. SETTING AND PARTICIPANTS: Children aged 0-14 years resident in Australia from 1983 to 1998. MAIN OUTCOME MEASURES: Age-standardised average annual incidence of drowning (1983-1998) and near-drowning (1994-1997) in children aged 0-4 and 5-14 years in the NT, Queensland and the rest of Australia. RESULTS: The average annual incidence of drowning and near-drowning from 1994 to 1997 for children aged 0-4 years in the NT (67.82 per 100,000) was significantly higher than for Australia (24.45 per 100,000) (incident rate ratio [IRR], 2.77; 95% CI, 1.40-4.91) and for	Edmond KM. Attia JR. Deste CA. Condon JT. Drowning and near-drowning in Northern Territory children. Medical Journal of Australia. 175(11-12):605-8, 2001 Dec 3-17.	No interventions

		<p>Queensland (32.55 per 100,000) (IRR, 2.13; 95% CI, 1.05-3.94). The proportion of children aged 0-4 years drowning or near-drowning in swimming pools from 1994 to 1997 was also significantly higher in the NT (83%) than Australia (64%) (difference, 0.19; 95% CI, 0.086-0.30) and Queensland (65%) (difference, 0.18; 95% CI, 0.069-0.29). From 1983 to 1998, the incidence of drowning in NT children aged 0-4 years increased by 0.4% per year (IRR, 1.004; 95% CI, 0.994-1.070), compared with a 5.0% reduction per year (IRR, 0.950; 95% CI, 0.937-0.963) in Australian children.</p> <p>CONCLUSIONS: The incidences of drowning and near-drowning in the NT are higher than in the rest of Australia and show no significant decrease. The NT should improve its measures for prevention of childhood drowning.</p>		
N		<p>The purpose of this study was to determine the risk of submersion injury and drowning among children with epilepsy and to define further specific risk factors. In a population-based retrospective cohort study the authors identified and reviewed records of all 0-through 19-year-old residents of King County, Washington, who suffered a submersion incident between 1974 and 1990. Children with epilepsy were compared with those without epilepsy with regard to age, sex, site of incident, supervision, outcome, and presence of preexisting handicap. Relative risks were determined using population-based estimates of epilepsy prevalence. Of 336 submersions, 21 (6%) occurred among children with epilepsy. Children with epilepsy were more likely to be greater than 5 years old (86% vs 47%) and more likely to submerge in a bathtub (38% vs 11%). The relative risk of submersion for children with epilepsy was 47 (95% confidence interval [CI] 22 to 100) in the bathtub and 18.7 (95% CI 9.8 to 35.6) in the pool. The relative risk of drowning for children with epilepsy was 96 (95% CI 33 to 275) in the bathtub and 23.4 (95% CI 7.1 to 77.1) in the pool. These data support an increased risk of submersion and drowning among children with epilepsy.</p>	<p>Diekema DS. Quan L. Holt VL. Epilepsy as a risk factor for submersion injury in children. Pediatrics. 91(3):612-6, 1993 Mar.</p>	No interventions
N		<p>Unintentional preventable injury is the number one killer of our children. Each year more children die of injuries than of all childhood diseases combined. It is important for nurses to understand the epidemiology and significance of childhood injury. This article discusses developmental and environmental factors that influence the child's probability of sustaining an unintentional injury and offers suggestions for client, family, and community injury prevention efforts for nurses. Copyright (c) 1996 by W.B. Saunders Company</p>	<p>Crawley T. Childhood injury: significance and prevention strategies. J PEDIATR NURS. 1996 Aug; 11(4): 225-32. (33 ref)</p>	No interventions

N		<p>OBJECTIVES: To estimate the risk of drowning by different bodies of water in and near the home for children aged 1 to 4 years. SETTING: The Metropolitan Area of Guadalajara, Mexico. METHODS: A population case-control study. Cases (n=33) were children 1 to 4 years old who drowned at their home; controls (n=200) were a random sample of the general population. RESULTS: The risk of drowning for children whose parents reported having a water well at home was almost seven times that of children in homes without a water well (adjusted odds ratio (OR)=6.8, 95% confidence interval (CI)=2.2 to 20.5). Risk ratio estimates for other bodies of water were: swimming pools (OR=5.8, 95% CI=0.9 to 37.5), water barrel (OR=2.4, 95% CI=1.0 to 5.6), underground cistern (OR=2.1, 95% CI=0.8 to 5.2), and a basin front (courtyard pool to store water) of 35 or more litres (OR=1.8, 95% CI=0.8 to 4.4). CONCLUSION: Drowning at home is frequent in the Metropolitan Area of Guadalajara, but the causes are different from those reported in developed countries. Accordingly, the preventive strategies must also be different.</p>	<p>Celis A. Home drowning among preschool age Mexican children. Injury Prevention. 3(4):252-6, 1997 Dec.</p>	<p>No interventions</p>
N		<p>The overall prognosis for children who sustain a submersion incident is directly related to several variables including length of submersion, initial neurologic evaluation, time to first breath, initial pH, and others. Resuscitation after near-drowning is unsuccessful in terms of death and neurologic deficit in 30% of those children who are treated at our institution. Despite the fact that we have been able to present variables that are somewhat predictive of outcome, it is almost impossible to identify 100% of the time which particular comatose child will survive neurologically intact. Therefore skilled attempts at resuscitation and management are mandatory. The understanding of the sequence of events that occur during the drowning process and the pathophysiologic consequence make it possible for health care personnel to provide aggressive therapeutic interventions that will enhance the likelihood of a normal recovery.</p>	<p>Beyda DH. Childhood submersion injuries. J Emerg Nurs. 24(2):140-4, 1998 Apr.</p>	<p>No interventions</p>

N		<p>BACKGROUND: Submersion victims are frequently considered at high risk for cervical spine (C-spine) injury regardless of whether they sustain a traumatic injury. We hypothesized that C-spine injury is unlikely in submersion victims who do not sustain high-impact injuries. METHODS: The study was a cohort study of all people who submerged between January 1974 and July 1996 and received medical care or were seen by the medical examiner in King, Pierce, and Snohomish counties in Washington State. RESULTS: Eleven (0.5%) of 2,244 submersion victims had C-spine injuries. All 11 had submerged in open bodies of water; had clinical signs of serious injury; and had a history of diving, motorized vehicle crash, or fall from height. No C-spine injuries occurred in 880 low-impact submersions. CONCLUSION: Submersion victims are at risk for C-spine injury only if they have also sustained a traumatic injury. Routine C-spine immobilization does not appear to be warranted solely on the basis of a history of submersion.</p>	<p>Watson RS. Cummings P. Quan L. Bratton S. Weiss NS. Cervical spine injuries among submersion victims. J Trauma. 51(4):658-62, 2001 Oct.</p>	<p>No interventions / Adults</p>
N		<p>OBJECTIVES: New Zealand (NZ) has an unenviable track record in childhood injury mortality. We sought to describe this burden and to compare it with the United States of America (USA), with a view to taking the first step in identifying potential areas in which NZ might benefit from injury control as practiced in the USA. METHODS: We identified all children and teenagers who had died of injury for the period 1984-93 from the NZ Health Information Service mortality data files. We compared their rates of injury with previously published rates for USA. RESULTS: The age specific rates follow a J shaped distribution, with high rates in the first year of life followed by a decline to the lowest rate, among 5-9 year olds, a marginally higher rate among 10-14 year olds, and a dramatic rise among those in the 15-19 age group. The specific causes of death vary considerably by age group. NZ's overall rate of child and adolescent injury is not substantially different from that of the USA, but marked differences are apparent when examining cause specific rates. CONCLUSIONS: In terms of the theoretical potential to reduce the total injury mortality rate, priority must be given to 15-19 year olds who account for 61% of all NZ injury deaths. Priorities for this age group are: motor vehicle traffic crashes (especially those involving occupants and motorcyclists), and suicide. Among the children, priorities are: pedestrian and occupant deaths, and drownings. Among infants, the priority is suffocation.</p>	<p>Langley JD. Smeijers J. Injury mortality among children and teenagers in New Zealand compared with the United States of America. Inj Prev. 3(3):195-9, 1997 Sep.</p>	<p>No interventions, no drowning focus</p>

N		<p>OBJECTIVE: The objective of this study was to quantify and characterize the role of bath seats in infant mortality from bathtub drowning. METHOD: Risk analysis of bathtub drowning deaths for infants aged 6-10 months was performed using data available from the US Consumer Product Safety Commission (CPSC), birth and mortality data from the National Center for Health Statistics (NCHS) for US resident infants from 1990-1998, and bath seat ownership from the American Baby Group and industry sales data compiled by NPD to estimate bath seat use. The analysis computes the relative risks of infant drowning based on estimates of bath seat use with a cohort design and explores the potential confounding by a range of factors. RESULTS: In-depth analysis of the unintentional bathtub drowning deaths of American infants aged 6-10 months for the years 1994 through 1998 revealed 40 infant drowning deaths associated with bath seats and 78 deaths not associated with bath seats. Based on available data on sales and use that suggest approximately 45% of infants in this age group use bath seats, the existing data do not support a hypothesis that bath seats increase the risk of bathtub drowning for infants. Bath seats are not intended or marketed as safety devices, and analysis of the existing, albeit limited, data suggests that they either have no effect or they may provide some slight unexplained protection against unintentional bathtub drowning risks (with an odds ratio for the risk of drowning with a bath seat vs without a bath seat of approximately 0.6 [95% confidence interval (CI) 0.4-0.9]). Although all potential confounders cannot be fully explored due to incomplete data and large uncertainties remain, this analysis suggests that the US CPSC made the appropriate decision not to ban bath seats in response to petitions it received in 1994 and 2001. CONCLUSIONS: Increasing market sales and surveys of reported bath seat use were associated with decreasing unintentional infant bathtub drowning risks. Rigorous risk analyses should be conducted when considering regulating products to ensure that regulation does not inadvertently increase injury risks. Analysis of the factors associated with these deaths suggests that additional efforts are needed to ensure that caregivers do not leave infants unattended in the bathtub and to collect data that will further improve our understanding and management of these risks.</p>	<p>Thompson KM. The role of bath seats in unintentional infant bathtub drowning deaths. MedGenMed. 5(1):36, 2003 Mar 26.</p>	<p>Non recreational</p>
---	--	--	--	-------------------------

N		<p>AIMS: To investigate the problem of children drowning in bath seats by examining case reports, by looking at the epidemiology of bath drowning in children under two years of age and by reviewing the literature.</p> <p>METHODS: We describe two babies: one who drowned and one nearly drowned in the bath whilst in a bath seat. We examined the RoSPA/RLSS UK database of cases of children under two years drowning in the bath for the years 1989-2003. Cases are ascertained through a press cutting system. We conducted an all language literature search of original articles, references, textbooks and conference abstracts 1951-October 2004 in 11 standard databases.</p> <p>RESULTS: The two cases illustrate how parents can have a false sense of security with bath seats. We found six cases of babies under two years drowning in the UK associated with bath seats in the time period 1989-2003. They were all boys: five of the six were under one year of age. This compared with 47 children of similar age drowning in the bath not associated with a bath seat. The literature is sparse with only four papers since 1966.</p> <p>DISCUSSION: A baby drowning after being placed in a bath seats is a rare but definite cause of death. Bath seats appear to give a false sense of security (even if not encouraged by the manufacturers). It is unclear whether putting a baby in a bath seat represents an increased risk of drowning compared with a baby without a seat. Without knowing the numbers of mothers that use bath seats it is difficult to come to firm conclusions on the risks to babies. New research is needed to clarify this issue. Whether in a seat or not it is clear that the main risk to babies in the bath is being left unsupervised.</p>	<p>Sibert J. John N. Jenkins D. Mann M. Sumner V. Kemp A. Cornall P. Drowning of babies in bath seats: do they provide false reassurance?. Child Care Health Dev. 31(3):255-9, 2005 May.</p>	Non recreational
N		<p>OBJECTIVE: To determine the demographic characteristics and risk factors associated with death from drowning among people with epilepsy. DESIGN: Retrospective review of medical examiner's investigations into deaths from drowning from Jan. 1, 1981, to Dec. 31, 1990. SETTING: Alberta.</p> <p>MEASURES: Personal data, medical history, circumstances surrounding the death, autopsy findings and results of postmortem toxicologic analyses.</p> <p>RESULTS: Of 482 deaths from drowning in Alberta during the study period, 25 (5%) were considered by the medical examiner's office to be directly related to seizures. Fifteen (60%) of the 25 deaths occurred while the person was taking a bath, unsupervised. Only one person (4%) died while taking a shower. The remaining deaths occurred on a river or lake (16%), in a private pool (8%), in a public pool (8%) and in a jacuzzi (4%). Two people fell out of moving boats while having a seizure; neither had been wearing a personal flotation device. Nineteen (83%) of 23 people who had been receiving anticonvulsant drug therapy had undetectable or subtherapeutic levels of one or more of the drugs at autopsy. Ethanol was not a factor in any of the deaths.</p> <p>CONCLUSIONS: Seizure-related drownings represent a small but potentially preventable proportion of all drownings. Enhanced seizure control and compliance with anticonvulsant drug therapy may prevent some of these deaths. In addition, all people with epilepsy, regardless of the level of control of their condition, should be encouraged to take showers while sitting</p>	<p>Ryan CA. Dowling G. Drowning deaths in people with epilepsy. CMAJ. 148(5):781-4, 1993 Mar 1.</p>	Non recreational

		instead of baths. The presence of people in the same house who are not directly supervising the person in the bathroom does not protect against drowning. Personal flotation devices should be worn at all times during boating activities.		
N		The purpose of the study is to document the incidence of bucket-related drowning in the United States and to identify factors associated with this type of submersion injury. Analysis of Consumer Product Safety Commission data revealed 160 bucket-related drownings for the years 1984 through 1989, representing a mortality rate of 0.367 per 100,000 persons (younger than 2 years old) per year in the United States. Eighty-eight percent of bucket drownings occurred in toddlers aged 7 to 15 months old. Black children were six times more likely to drown in a bucket than white children of similar age (P less than .0001). Male toddlers were at significantly greater risk than females (P less than .01). A seasonal trend present in the data indicated that infants are more likely to drown in warmer than in colder months (P less than .01). States with the highest rates of bucket drowning were Vermont (2.1/100,000), Arizona (1.5/100,000), and Illinois (1.0/100,000). Through passive and active educational strategies, perhaps this fatal home injury can be prevented.	Mann NC. Weller SC. Rauchschwalbe R. Bucket-related drownings in the United States, 1984 through 1990. Pediatrics. 89(6 Pt 1):1068-71, 1992 Jun.	Non recreational
N		We have identified a previously unrecognized source of accidental drowning in infants and toddlers: 5-gal (19-L) industrial buckets. Twelve cases of drownings in these large-capacity buckets constituted 24% of all infant and toddler (age less than 3 years) drownings investigated by the Cook County (Illinois) Medical Examiner's Office from January 1985 to June 1989. The buckets, all with 5-gal and 18-kg capacity, are constructed of heavy, rigid plastic and are intended for industrial use. Home use, typically as mop buckets, was associated with the toddlers' death. The large size and heavy construction of these buckets as well as the toddlers' cephalad center of gravity and undeveloped coordination prohibit the toddlers from extricating themselves after peering into and falling inside the buckets. Parents and public health officials should be advised that domestic use of these containers poses a serious threat to the safety of curious toddlers. Adults should never leave toddlers unattended around even small amounts of water.	Jumbelic MI. Chambliss M. Accidental toddler drowning in 5-gallon buckets. JAMA. 263(14):1952-3, 1990 Apr 11.	Non recreational

N		<p>OBJECTIVE: A study was undertaken to look at possible risks of shared bathing in early childhood.</p> <p>METHODS: Autopsy databases were searched at the Women's and Children's Hospital and State Coroner's Office, Adelaide, Australia, from January 1963 to December 1999, the Victorian Institute of Forensic Medicine, Melbourne, Australia, from January 1991 to December 1999, and the Children's Hospital-San Diego, San Diego, USA, from January 1990 to December 1999, for all cases registered as drowning in children aged 2 years and under who were in a bath with another child around the time of death.</p> <p>RESULTS: A total of 17 cases were found. The age range of the victims was 8-22 months (average=11.8 months), with a male to female ratio of 10:7. The surviving children (who were all siblings) were significantly older, with an age range of 19-48 months (average=30.4 months), and a male to female ratio of 12:5. (The survivors were on average 18.5 months older than the victims, range=11-32 months). In every case the children had been left unsupervised for variable periods of time.</p> <p>CONCLUSIONS: These cases represented a significant component -- between 22 and 58% -- of bath drownings in the 2 years and under age group. It would appear that shared bathing for young children and infants may only acceptable if adult supervision is constant, and that a young sibling is not an appropriate person to look after an infant or toddler in the bath. While the risk of leaving an infant in a filled bath may be exacerbated if an older child is also present, further population-based studies are required to examine this hypothesis.</p>	<p>Byard R. de Koning C. Blackbourne B. Nadeau J. Krous HF. Shared bathing and drowning in infants and young children. J Paediatr Child Health. 37(6):542-4, 2001 Dec.</p>	Non recreational
N		<p>Computerized mortality data files from the National Center for Health Statistics were analyzed to describe childhood farm drowning from 1986 through 1997. Farm drowning rates were compared to the U.S. unintentional youth drowning rates for the same period. The denominator for the calculation of rates was derived from a series of farm youth estimates published by the Bureau of Census. There were 378 childhood farm drowning cases during the study period, for an average annual rate of 2.3 deaths per 100,000 farm youth resident years. This rate is comparable to unintentional drowning rates for U.S. youth (2.2/100,000 population). Fatality rates declined 28% from 1986 through 1997 (p = .0024) for farm youth and 41% for U.S. youth (p = .0001). An average 32 farm drowning incidents occur to youth annually, making drowning a legitimate concern for farm residents and visitors.</p>	<p>Adekoya N. Trends in childhood drowning on U.S. farms, 1986-1997. J RURAL HEALTH. 2003 Winter; 19(1): 11-4. (21 ref)</p>	Non recreational

N		<p>Cause- and age-specific mortality rates (MRs) were calculated for 1980 for all four population groups in the RSA for certain accidents, poisonings and violence as they are grouped in the WHO International Classification of Diseases (ICD). Cause-specific MRs of coloureds, Asians and blacks were age-adjusted to the age-distribution of whites in 1980 in order to judge the relative importance of the various causes of death. This showed that in whites and Asians motor vehicle accidents (MVAs) head the rank order of MRs; furthermore the first three MRs in the rank order, namely for MVAs, suicide and violence, are common in these two populations. A similar situation exists among coloureds and blacks in that the MRs for homicide rank first and the first four causes of death in the rank order of MRs--homicide, MVAs, violence and other accidents--are common to those two population groups. The fact that deaths from MVAs and violence rank so high in the MRs for all four population groups lends support to the contention that the RSA is a 'violent society'.</p>	<p>Wyndham CH. Cause- and age-specific mortality rates from accidents, poisoning and violence. SAMJ, S. Afr. med. j.. 69(9):559-62, 1986 Apr 26.</p>	Not drowning topic
N		<p>Trauma care is one of the major components of modern surgery. This is especially true of pediatric surgery, because injuries are by far the leading cause of death for children from early childhood through adolescence. Recently, the epidemiological model of host, agent, and environment has been applied to the study of childhood injuries to increase understanding of their causes and to provide a basis for primary and secondary prevention strategies. We now know that injury patterns vary with age, sex, race, place of residence, and family income, and that the rates of fatal injury from violence, whether interpersonal or self inflicted, are increasing. We also know that firearms are involved in an ever-increasing proportion of cases. As trauma care has improved, the key to further reductions in the toll of injuries on our children is prevention.</p>	<p>Wesson D. Hu X. The real incidence of pediatric trauma. Semin Pediatr Surg. 4(2):83-7, 1995 May.</p>	Not drowning topic
N		<p>A swimmer is often faced with medical problems such as asthma, epilepsy, skin disease, and external otitis. Adequate management of these conditions is extremely important for optimal performance by the athlete.</p>	<p>Sarnaik AP. Vohra MP. Sturman SW. Belenky WM. Medical problems of the swimmer. Clin Sports Med. 5(1):47-64, 1986 Jan.</p>	Not drowning topic
N		<p>Injury prevention is one of the most important preventive health challenges for pediatricians worldwide. A science of injury control has developed. Matching a child's skill and development age is needed for anticipatory guidance. Poor children living in rural areas are at greatest risk and require continuous reinforcement. Family function relates closely to injuries and recovery from injury. Prevention involves education, legislation, environmental modification, and engineering techniques.</p>	<p>Rivara FP. Aitken M. Prevention of injuries to children and adolescents. Adv Pediatr. 45:37-72, 1998.</p>	Not drowning topic

N		<p>Manure is an important element in the farm economy, but its storage and use are associated with risks. Major accidents related to manure exposure were analyzed using technical and demographic criteria. Of the 61 accidents, 44 were due to inhalation of manure gas, 11 involved falls into manure containers, and six were methane explosions. There were 49 fatalities, including 12 (24%) in which persons attempting to rescue primary victims died. 37 persons survived gas poisoning. Small children usually fell into the manure and drowned. There were 15 successful rescues and four cases in which primary victims saved themselves. The main danger is that of gradual or sudden manure gas intoxication, which is often fatal. However, almost a third of the accidents were due to falls into manure containers or manure gas explosions. Accidents in which victims of gas poisoning regained consciousness and saved themselves are also reported. Analysis of the accident circumstances confirms the importance of meticulous observation of existing safety guidelines with respect to both structural design and working practices. Specific measures at the scene can substantially increase the chances for survival of both primary victims and would-be rescuers.</p>	<p>Knoblauch A. Steiner B. Major accidents related to manure: A case series from Switzerland. Int J Occup Environ Health. 5(3):177-86, 1999 Jul-Sep.</p>	Not drowning topic
N		<p>Verbal autopsy (VA) is an attractive method for ascertaining causes of death in settings where the proportion of people who die under medical care is low. VA has been widely used to determine causes of childhood and maternal deaths, but has had limited use in assessing causes in adults and across all age groups. The objective was to test the feasibility of using VA to determine causes of death for all ages in Bavi District, Vietnam, in 1999, leading to an initial analysis of the mortality pattern in this area. METHODS: Trained lay field workers interviewed a close caretaker of the deceased using a combination closed/open-ended questionnaire. RESULTS: A total of 189 deaths were studied. Diagnoses were made by two physicians separately, with good agreement ($\kappa = 0.84$) and then combined to reach one single underlying cause of death for each case. The leading causes of death were cardiovascular and infectious diseases (accounting for 20.6% and 17.9% of the total respectively). Drowning was very prevalent in children under 15 (seven out of nine cases of drowning were in this age group). DISCUSSION: One month seemed an acceptable minimum recall period to ensure mourning procedures were over. A combination VA questionnaire was an appropriate instrument provided it was supported by adequate training of interviewers. Two physicians were appropriate for making the diagnoses but predefined diagnostic methods for common causes should be developed to ensure more replicable results and comparisons, as well as to observe trends of mortality over time. The causes of death in this study area reflect a typical pattern for developing countries that are in epidemiological transition. No maternal deaths and a low infant mortality rate may be the result of improvements in maternal and child health in this study area. Using the VA gave more precise causes of death than those reported at death registration. Although the validity of the VA method used has not been fully assessed, it appeared to be an appropriate method for</p>	<p>Huong DL. Minh HV. Byass P. Applying verbal autopsy to determine cause of death in rural Vietnam. SCAND J PUBLIC HEALTH. 2003 Oct; Supplement 62: 19-25.</p>	Not drowning topic

		ascertaining causes of death in the study area.		
N		<p>To evaluate the usefulness of newspapers as a surveillance tool for submersion injury, the proportion of submersion events and important details reported in Washington State newspapers was determined. It was also determined whether a letter sent to newspaper editors to encourage reporting changed the proportion and content of reported submersion events.</p> <p>METHODS: Newspaper articles regarding submersion were collected from 225 Washington newspapers from June 1993 through September 1998. Newspaper articles were linked to computerized state death and hospital records. Reporting during periods before and after a letter was sent encouraging more newspaper articles on submersion injury and preventative factors was compared. RESULTS: A total of 1,874 submersion victims were identified in the three data sources. Of the 983 victims who had a death certificate, 52% were reported in at least one news article. Of the 471 persons in hospital discharge data, 25% were reported in a newspaper. Reporting of pediatric victims who died increased from 63% to 79% ($p=0.008$); reporting of hospitalized persons increased from 23% to 27% ($p=0.3$). There were increases in reporting of swimming ability (7% to 15%, $p<0.001$), supervision (82% to 91%, $p<0.001$), and alcohol use (7% to 24%, $p<0.001$). Reporting of life vest use decreased (35% to 23%, $p<0.001$). CONCLUSIONS: Newspapers failed to report about one half of fatal submersions and three quarters of submersions that resulted in a hospitalization. An effort to improve reporting was associated with an increase in the proportion of pediatric drownings that were reported, but a consistent improvement in content was found. The usefulness of newspaper articles as a surveillance tool may be limited.</p>	<p>Baullinger J. Quan L. Bennett E. Cummings P. Williams K. Use of Washington State newspapers for submersion injury surveillance. INJ PREV. 2001 Dec; 7(4): 339-42.</p>	Not drowning topic
N		<p>Data from the Census of Fatal Occupational Injuries surveillance system from 1992 through 1996 were analyzed to allow a better understanding of exposures to harmful substances or environments that resulted in agricultural work fatalities. There were 357 fatalities as a result of these exposures in the agriculture production and agriculture services sectors, representing 10% of all work-related deaths that occurred in these industry sectors during this period. Contact with electric current represented 52.9% of these fatalities. Agricultural services reported 87 electrocutions, 50 of which occurred among tree trimmers. The events most likely to result in fatalities were contact with overhead power lines (26.3%) and drowning (17.1%). The overall fatality rate was 2.1 deaths per 100,000 workers. The development of appropriate hazard-awareness training for workers, such as that for electrical and drowning-related hazards, may help prevent future deaths in these industry sectors.</p>	<p>Adekoya N. Myers JR. Fatal harmful substances or environmental exposures in agriculture, 1992 to 1996. J Occup Environ Med. 41(8):699-705, 1999 Aug.</p>	Not drowning topic

N		<p>The purpose of this article is to review the development of the modern sciences of injury epidemiology and injury prevention and to illustrate the use of applied research in formulating effective public policy.</p> <p>SEARCH METHODS. MEDLINE searches were conducted from 1966 to 1990, and bibliographies of articles thus obtained were reviewed. Fugitive sources were identified by multiple means. MAJOR FINDINGS. Motor vehicle fatality rates on a per mile driven basis have been reduced by 50% over the past 25 years, largely through attention to the road environment and design of motor vehicles. Passive restraint systems such as air bags promise further reductions. Drowning has emerged as a leading cause of death among young children. Complete pool fencing is expected to prevent many of these events. Firearm violence, particularly among young people, is rapidly increasing. Firearms are hazardous consumer products but are not addressed as such by our current regulatory structure and intervention agenda. CONCLUSIONS. Epidemiologic and other applied research can make important contributions to the development of public policies designed to prevent injury. Such policies often address the design and performance of hazardous products and environments and consider individual behavior change as only a secondary objective.</p>	<p>Wintemute GJ. From research to public policy: the prevention of motor vehicle injuries, childhood drownings, and firearm violence. Am J Health Promot. 6(6):451-64, 1992 Jul-Aug.</p>	Not interventions
N		<p>To provide a systematic review of the details on alcohol involvement available in the coronial files to determine if there is enough evidence to estimate the role of alcohol in drowning. METHOD: We reviewed the coroner's files of persons 10 years or older who drowned in New Zealand between 1992-1994 inclusive. RESULTS: A total of 320 coroner's files were examined. Blood Alcohol Concentrations (BACs) were taken in 115 cases (36%) and positive for 50% of these. When accounting for the incomplete testing by using all the information on alcohol involvement collected, between 30-40% of the cases were estimated to have a positive BAC and between 17-24% to have a BAC 100 mg/dL or higher. CONCLUSION: The quality and completeness of current coronial information on alcohol involvement in drowning is insufficient to arrive at an accurate estimate of the percentage of drownings where alcohol was a factor. IMPLICATIONS: Coroners should test drowning victims 10 years and older for BAC. These data should be systematically recorded and processed with the goal of determining who should be targeted in drowning and alcohol prevention programs.</p>	<p>Warner M. Smith GS. Langley JD. Drowning and alcohol in New Zealand: what do the coroner's files tell us?. Aust N Z J Public Health. 24(4):387-90, 2000 Aug.</p>	Not interventions

N		<p>PURPOSE: To review the primary causes of unintentional deaths in young adult males and suggest strategies for educating young men about reducing risks for accidental death. DATA SOURCES: Selected scientific literature and Internet sources.</p> <p>CONCLUSIONS: Unintentional deaths are the fifth leading cause of death in all age groups, after heart disease, cancer, stroke, and chronic obstructive pulmonary disease. Accidental death is the leading cause of death in males 1 to 44 years of age. Motor vehicle crashes, drowning, gunshot wounds, and occupational fatalities are among the leading injuries that contribute to the unanticipated death of the young adult male. IMPLICATIONS FOR PRACTICE: The ability to make sound decisions is a developmental process that is not achieved until later in adolescence or early adulthood. Nurse practitioners must assess the adolescent developmentally to provide appropriate guidance and assistance with behavior change.</p>	<p>Stiglets C. Unintentional injuries in the young adult male. J Am Acad Nurse Pract. 13(10):450-4, 2001 Oct.</p>	Not interventions
N		<p>Along with the state, two Florida hospitals are taking aim at a sad statistic: for kids under 5, the leading cause of death is drowning -- with 65% of incidents occurring in the family's pool.</p>	<p>Sloane MM. A targeted approach to water safety. Nursing Spectrum (Florida Edition). 2005 Jul 4; 15(14): 12-3.</p>	Not interventions
N		<p>Although life vest use is thought to prevent drowning, their use by boaters has not been described. This study sought to determine the use of personal flotation devices (PFDs) in small boats. METHODS: Boaters were observed between April and June 1995 in Washington and Oregon and classified by their age, gender, PFD use, and boat type. RESULTS: Among 4181 boaters, 25% wore a PFD. Use was highest in < 5 year olds (91%) and lowest in those over 14 years (13%). Those in kayaks were most likely (78%) and those in motor boats (19%) were least likely to wear a PFD. Females were more likely to wear a PFD than males (relative prevalence 1.5, 95% confidence interval 1.3 to 1.6). When a child less than 15 years was in a boat with an adult, PFD use was 65% if no adult wore a PFD and 95% if at least one accompanying adult wore a PFD (p = 0.001). CONCLUSIONS: Generally, PFD use by boaters was low in the Northwestern US. Efforts to increase PFD use should target adolescents, adults and specific boating populations, especially those in motor boats.</p>	<p>Quan L. Bennett E. Cummings P. Trusty MN. Treser CD. Are life vests worn? A multiregional observational study of personal flotation device use in small boats. Inj Prev. 4(3):203-5, 1998 Sep.</p>	Not interventions
N		<p>Unintentional injury is the leading cause of death and disability in children 14 years and under. The NATIONAL SAFE KIDS CAMPAIGN, a nationwide organization aimed at education and prevention of unintentional injury, recently released its 10-year report that describes areas of success, areas in need of improvement, and goals for the future. The full 61-page report is worthy of reading and referencing for all those involved with children and their health care. Highlights of the report are summarized.</p>	<p>Pike-Paris A. Items of interest. National SAFE KIDS campaign releases 10-year report. PEDIATR NURS. 1999 May-Jun; 25(3): 328-30.</p>	Not interventions

N			<p>To assess pediatricians' knowledge about the epidemiology of childhood drowning, their opinions and current practices regarding its prevention, and their interest in taking on more responsibility for its prevention. DESIGN: A self-administered questionnaire was mailed to 800 pediatricians in the United States, randomly selected from the American Academy of Pediatrics' approximately 18,000 full fellows. RESULTS: A total of 560 completed surveys were returned, a response rate of 70.1%. Although 85% of respondents believe it is the responsibility of pediatricians to become involved in community and/or legislative efforts to prevent childhood drowning, only 4.1% were involved in such efforts. Only a minority of respondents provided written materials and anticipatory guidance on drowning prevention to their patients. Women were more likely than men to discuss drowning prevention with their patients. Younger physicians were more likely than older physicians to discuss drowning prevention with their patients. Physicians who received formal education on drowning prevention during their pediatric residency training were more likely to provide written materials and anticipatory guidance on drowning prevention to their patients. However, only 17.9% of respondents received formal education on drowning prevention during their pediatric residency training. Seventy-four percent of all respondents felt that further education on the prevention of childhood drowning and near-drowning would be useful to them. CONCLUSION: Although drowning is the second leading cause of death by unintentional injury in the pediatric population (aged 0 to 19 years), most pediatricians do not routinely provide information to their patients, or to their patients' parents, on drowning prevention. IMPLICATION: Pediatricians have been effective child advocates in many areas of injury prevention. If the prevention of drowning is made a priority in pediatric practice, many more children's lives will be saved.</p>	<p>O'Flaherty JE. Pirie PL. Prevention of pediatric drowning and near-drowning: a survey of members of the American Academy of Pediatrics. Pediatrics. 99(2):169-74, 1997 Feb.</p>	<p>Not interventions</p>
N	Y	N	<p>The majority of deaths from unintentional injuries in children occur in the home environment, but there has not been a comprehensive analysis of residential deaths in the United States since 1985. The objective of this study was to determine the incidence and trends of deaths from injuries that occurred in the residential setting. METHODS: Injury-related death rates of all deaths among US children and adolescents who were younger than 20 years from 1985 to 1997 were calculated using National Vital Statistics System Mortality Data from 1985 to 1997 by age group, gender, region, and race. Poisson regression or negative binomial regression was used to test for trends over time in mortality rates. RESULTS: From 1985 to 1997, an average of 2822 (55%) of 5103 annual unintentional deaths in US children with a known location of injury took place in the home environment. The annual number and incidence of fatal residential injuries decreased by >22%, from 2973 (4.2 per 100000) in 1985 to 2310 (3.0 per 100000) in 1997. The death rate as a result of residential injury was highest in children who were younger than 1 year (12.6 per 100000) and 1 to 4 years (7.9 per 100000) compared with older children, boys compared with girls</p>	<p>Nagaraja J. Menkedick J. Phelan KJ. Ashley P. Zhang X. Lanphear BP. Deaths from residential injuries in US children and adolescents, 1985-1997. PEDIATRICS. 2005 Aug; 116(2 Part 1): 454-61.</p>	<p>Not interventions</p>

		(4.9 vs 2.8 per 100000), and black children compared with white children (7.0 vs 3.3 per 100000). The highest death rates were attributable to fires (1.5 per 100000), submersion or suffocation (1.3 per 100000), poisoning (0.2 per 100000), and falls (0.1 per 100000). CONCLUSIONS: Despite a 22% decline since 1985, residential injuries remain a leading cause of death in US children and adolescents. Black children were 2 times more likely to die from residential injuries than white children.		
N		We aim to raise awareness of the burden of avoidable death and disability attributable to childhood injury in Europe in general and Croatia in particular. As formerly common causes of childhood death have declined, injuries have become the most important single cause of death in childhood in European countries. Yet, there are large differences between countries, and especially between the eastern and western parts of Europe. The existence of these differences, reflecting rapid declines in some countries, indicate the scope for prevention. But injuries are low on the policy agenda for various reasons, including their lack of visibility. We advocated the development of integrated intersectoral policies underpinned by an effective public health structure.	McKee M. Oreskovi S. Childhood injury: call for action. Croat Med J. 43(4):375-8, 2002 Aug.	Not interventions
N		To determine the prevalence of proper fencing around outdoor swimming pools among US households and to describe this fencing in relation to demographic and other household factors. To estimate the number of drownings among children <5 years of age that might be prevented by having proper fencing around all residential pools in the United States. METHODS: A 1994, randomly dialed national telephone survey contacted 5238 adults who reported demographic information and household characteristics including whether the household had an outdoor swimming pool and the fencing around the pool. Data were weighted to obtain national estimates and percentages. The number of preventable drownings was estimated with a population-attributable risk equation. RESULTS: Approximately 18.5 million American households owned or had access to an outdoor swimming pool in 1994, and 76% (13.9 million) of them appeared to have had adequate fencing. Adequate fencing was associated with household income and type of home. We estimate that 19% of pool-related drownings among children <5 years of age in 1994 (88 drownings) might have been prevented if all residential pools in the United States were properly fenced. CONCLUSIONS: Adequate pool fencing prevents a child from having access to a swimming pool if a responsible adult is not present and has been promoted as a method to prevent drowning. Our research suggests that even if all residential pools in the United States were properly fenced, most drownings among children <5 years of age would not be prevented. Thus, additional strategies to prevent drowning will be needed.	Logan P. Branche CM. Sacks JJ. Ryan G. Peddicord J. Childhood drownings and fencing of outdoor pools in the United States, 1994. Pediatrics. 101(6):E3, 1998 Jun.	Not interventions

N		<p>There are four categories of causes responsible for the majority of injuries in youth 10-19 years of age: 1) motor vehicle traffic; 2) violence (intra-familial, extra-familial, self, pregnancy-related); 3) recreational; and 4) occupational. This article presents data from the National Center for Health Statistics mortality data and the National Pediatric Trauma Registry morbidity data. Nationwide, the pediatric injury death rate is highest among adolescents 15-19 years of age. Motor vehicle-related deaths account for 41% and firearm-related deaths account for 36% of injury deaths in this age group. For youths aged 10-14 years, motor vehicle-related deaths account for 38% and; firearm-related deaths account for 26% of injury deaths. For both age groups, occupant motor vehicle-related deaths account for the majority of deaths and underscore the need for seat belt use. Using theoretical principles based on the Haddon matrix and a knowledge of adolescent development, proposed interventions to decrease injuries and deaths related to motor vehicles and firearms include graduated licensing, occupant restraint, speed limits, conflict resolution, and gun control. Occupational injuries, particularly injury associated with agricultural production, account for an estimated 100,000 injuries per year. Preventive strategies include OSHA regulations imposing standards for protective devices and further study for guidelines for adolescent work in agriculture. Injuries related to recreation include drowning and sports injuries. Preventive strategies may include proper supervision and risk reduction with respect to use of alcohol/drugs. The data presented support the use of primary prevention to achieve the most effective, safe community interventions targeting adolescents.</p>	<p>Laraque D. Barlow B. Durkin M. Prevention of youth injuries.[erratum appears in J Natl Med Assoc 1999 Dec;91(12):647]. J Natl Med Assoc. 91(10):557-71, 1999 Oct.</p>	Not interventions
N		<p>Injuries are often preventable yet remain the most common cause of death in children ages 1 to 19 years in Canada. In this retrospective case series, the authors sought to determine the proportion of injury admissions to a tertiary multidisciplinary university hospital Pediatric intensive care unit (PICU) that were preventable by known measures. Patients were a consecutive sample of 104 children, aged 99 (mean [SD] 70; range, 1-215) months, who were admitted to PICU due to injury from July 1997 to June 1998. Charts were reviewed to determine morbidity (PICU days, ventilation days, and discharge to a rehabilitation hospital), mortality, and whether the injury occurred by a preventable mechanism (as recommended by the American Academy of Pediatrics). Out of 790 admissions, 104 (13.2%) were for injury-81% unintentional and 19% intentional. Unintentional injuries occurred by diverse mechanisms, and 65/84 (77%; 95% confidence interval, 67%-86%) were potentially preventable. Unintentional injuries were especially preventable in the younger age groups (P = .009): 71% (5/7) in those <1 year; 89% (31/35) in those 1 to 4 years; 89% (16/18) in those 5 to 9 years; and 54% (13/24) in those ≥10 years. Most intentional injuries were suicide attempts in adolescents, and 88% had multiple risk factors for suicide. Patients were in PICU for 2.9 (SD 4.5) days, ventilated in 73% for 2.8 (SD 4.4) days, had a mortality of 12.5% (95% confidence interval, 6.8%- 20.4%), and demonstrated</p>	<p>Joffe AR. Lalani A. Injury admissions to pediatric intensive care are predictable and preventable: a call to action. J INTENSIVE CARE MED. 2006 Jul; 21(4): 227-34.</p>	Not interventions

		common need for rehabilitation. Thus, injuries in children resulting in admission to the PICU are common and highly preventable events with significant morbidity and mortality. Novel strategies to improve the public's perception of the cost of childhood injury are needed.		
N		Observers recorded visual scanning by four lifeguards at three indoor public swimming pools. Scanning increased as a positive function of the ratio of children to adult swimmers, i.e., scanning was greater when the ratio was high, suggesting that lifeguards became more concerned about the risks to children and the ability of nearby adult swimmers to monitor these children when the number of children significantly exceeded the number of adults. Absolute numbers of children, however, decreased number of scans, possibly because of greater number of incidents and rule violations requiring lifeguards' attention which competed with watching the pool. Lifeguards were more likely to scan a pool area when they were in elevated towers versus standing on the pool decks. Lifeguards' scanning declined later in the day, possibly due to fatigue or because of competing activities of pool maintenance.	Harrell WA. Lifeguards' vigilance: effects of child-adult ratio and lifeguard positioning on scanning by lifeguards. Psychol Rep. 84(1):193-7, 1999 Feb.	Not interventions
N		Systematic observations were made of five lifeguards at indoor public swimming pools. Scanning by lifeguards was associated with lower incidences of rule violations by swimmers. Greater numbers of lifeguards patrolling the pool areas tended to reduce violations. Rules violations tended to be fewer when adult-to-child ratios were low, suggesting that monitoring by a parent or an adult may encourage rule compliance.	Harrell WA. Does supervision by a lifeguard make a difference in rule violations? Effects of lifeguards' scanning. Psychol Rep. 89(2):327-30, 2001 Oct.	Not interventions
N		To explore the relationship between caregiver characteristics and the adequacy of domestic swimming pool fencing. SETTING: A typical metropolitan area of a large Australian capital city, Brisbane. METHODS: From a reanalysis of the dataset of the 1989 Brisbane Home Safety Survey of 1050 householders, associations between 10 caregiver factors, pool ownership, and quality of pool fencing, were analysed. Household characteristics relating to toddlers (children < or = 4 years), and socioeconomic measures were also included in the analyses. Pool fencing quality was measured on an ordinal scale derived from Australian Standards Association guidelines, confirmed through home visits by trained inspectors. RESULTS: Caregiver factors did not distinguish households with a swimming pool from those without, nor were they associated with adequacy of pool fencing among pool owners. Pool owners, with or without children, were less likely to perceive having a childproof fence as being important. Strongest correlates of adequacy of pool fencing were socioeconomic indicators of surrounding districts. CONCLUSIONS: These results do not support the arguments of opponents of compulsory pool fencing that caregiver factors are adequate to prevent toddler drownings and obviate the need for a pool fence. Pool owners do not appear to perceive their pool as a hazard for young children, and complacency about the	Fisher KJ. Balanda KP. Caregiver factors and pool fencing: an exploratory analysis. Inj Prev. 3(4):257-61, 1997 Dec.	Not interventions

		adequacy of pool fencing needs to be replaced by increased caregiver health beliefs, skills, and perceptions.		
N		Objective. To describe a significant but poorly understood public health problem, the authors compiled data on swimming pool drownings and near-drownings requiring hospitalization for California children ages 1 to 4. Methods. Data from death certificates were used to analyze swimming pool drownings, and hospital discharge data were used to analyze near-drownings. Results. Among California preschoolers in 1993, pool immersion incidents were the leading cause of injury death and the eighth leading cause of injuries leading to hospitalization. Rates per 100,000 population were 3.2 for fatalities and 11.2 for nonfatal incidents, with a fatality-to-case ratio of 1:3.5. Total charges for initial hospital stays (excluding physicians' fees) were \$5.2 million for 1227 hospital days. Conclusions. Swimming pools remain a serious hazard for young children. Primary prevention continues to be an important public health goal. Public health officials should support the adoption of laws designed to protect children from drowning and near-drownings.	Ellis AA. Trent RB. Swimming pool drownings and near-drownings among California preschoolers. PUBLIC HEALTH REP. 1997 Jan-Feb; 112(1): 73-7.	Not interventions
N		To quantify the risks of British children drowning abroad. METHODS: The numbers of British children drowning abroad were estimated for 1996-2003 using the RoSPA/RLSS press cutting database. We compared these figures with the numbers of British children going abroad from the International Passenger Survey from the Office of National Statistics. RESULTS: Sixty-eight children (45 boys-23 Girls) drowned in the eight-year period: 48 (71%) in swimming pools (mostly in hotels). Allowing for exposure, the rate was higher in North America [5.2 (CI 2.9-9.4)/million tourists] than the European Union [1.9 (CI 1.4-2.5)/million tourists] p = 0.002. DISCUSSION: On average eight British children drown each year abroad. This is therefore a rare but tragic event. Most of these episodes 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. It may be that parents have a false sense of security for their children in pools abroad. We believe that there needs to be action from the European Union on this important event.	Cornall P. Howie S. Mughal A. Sumner V. Dunstan F. Kemp A. Sibert J. Drowning of British children abroad. CHILD CARE HEALTH DEV. 2005 Sep; 31(5): 611-3.	Not interventions

N		<p>This investigation was conducted to determine the mortality rate due to drownings in Mississippi from 1992-1994. Drownings were defined as unintentional deaths from asphyxia while submerged or within 24 hours of submersion. Death certificate data including ICD-9 codes related to drownings, were received from the Mississippi State Department of Health. Variables assessed included age, age category, sex, race, death month, death day, place of drowning, and risk factors. Although drownings occurred in ages from 0-91 years, the highest mortality rates were found in the 14-17 year old age category (1 1.9 deaths per 100,000). Asian and Native American populations had the highest drowning mortality rates (23.6 and 22.6 per 100,000) when analyzed by race. However, this may be primarily due to lower populations. Males drowned five times more frequently than women. This is felt to be related to increased exposure. More drownings occurred on Saturdays and Sundays; and in the months of July, June; May, April, September, and August consecutively. Results presented here identify correlates of drowning fatalities which will enable strategic targeting of prevention programs and resources.</p>	<p>Carithers T. Higginbotham JC. Drownings in Mississippi 1992-1994: frequencies and distribution. J Miss State Med Assoc. 38(3):83-7, 1997 Mar.</p>	Not interventions
N		<p>Drowning is one of the leading causes of injury death for young children in the United States. This study examined primary care providers' knowledge of and counseling on drowning prevention. METHODS: A random sample of 465 Los Angeles County pediatricians, family physicians, and pediatric nurse practitioners who serve families with young children received mailed questionnaires; 325 (70%) responded. RESULTS: About two thirds of clinicians did not know that injury deaths attributable to drowning were more common than those attributable to toxic ingestions and firearm injuries in young children. Only one third of clinicians stated they counseled on drowning prevention. Counseling drowning prevention was positively associated with female gender (odds ratio: 1.97; 95% confidence interval: 1.64, 2.30) and negatively associated with an attitude that drowning prevention counseling was less important than other injury prevention topics (odds ratio:.73; 95% confidence interval:.61,.85). Clinician specialty, age, years out from training, proportion of well-child examinations in a typical week, having children, practice setting, and knowledge of drowning injury deaths were not significant in multivariate analysis. CONCLUSION: The belief of clinicians that it is less important to counsel on drowning prevention than other injury prevention topics poses a substantial challenge to their providing such education to families with young children.drowning, counseling, physician's role.</p>	<p>Barkin S. Gelberg L. Sink or swim--clinicians don't often counsel on drowning prevention. Pediatrics. 104(5 Pt 2):1217-9, 1999 Nov.</p>	Not interventions
N		<p>In the 3-year period 1987-1989, 219 drowning cases were submitted to medico-legal autopsy in Denmark. The demographic data including the manner of death and the external findings are reported. In 74 accident cases analysis for blood-alcohol concentration was performed. In 53% a concentration of more than 0.1% was found. In 91 drowning cases (age more than 18 years and where the time interval in the water was less than 24 h) the average weight of both lungs was 1.411 g, compared to 994 g in 20 control cases. In 7% of the</p>	<p>Kringsholm B. Filskov A. Kock K. Autopsied cases of drowning in Denmark 1987-1989. Forensic Sci Int. 52(1):85-92, 1991 Dec.</p>	Not preventive

		drowning cases the weight was less than 1.000 g, so called dry lungs. Finally the weight of the lungs and the amount of pleural transsudate in relation to the time interval in the water were registered in 198 cases. For a longer time interval in the water the weight of the lungs decreased, while the amount of pleural transsudate increased. By adding these two parameters, the combined weight was between 1.000 and 2.200 g in more than 75% of the cases as long as the interval in the water was less than 30 days.		
N		The enigma produced by a body found in water is clarified only by a total circumstantial investigation correlated with autopsy findings. Multiple factors, human, equipment and environmental, must be considered before opinions are expressed. The conclusion that death is due to drowning does not address the true needs which are to determine why a victim got into difficulty and could not escape.	Davis JH. Bodies in water. Solving the puzzle. J Fla Med Assoc. 79(9):630-2, 1992 Sep.	Not preventive
N		Epidemiologic analysis of submersion cases admitted to the intensive and respiratory care unit showed that several interrelated factors preceded submersion. Accidental submersion and traffic accidents represented one third of the causes of submersion. Other relevant causes were illness (29.9%), psychosocial causes (20.1%), alcohol (18.1%), and suicide (9.1%). Age distribution, gender, and mortality rate were different in each group. Young age, submersion during recreational activities, summer months, and normothermia were epidemiologic factors with a favorable prognosis. Our data were compared with national data. WHO-ICD code 994.1 (drowning and nonfatal submersion) is the best entrance for epidemiologic analysis. Five hundred twenty deaths and 690 hospital admissions due to submersion occur in The Netherlands each year. About 460 victims die before they reach a hospital.	Bierens JJ. van der Velde EA. van Berkel M. van Zanten JJ. Submersion cases in The Netherlands. Ann Emerg Med. 18(4):366-73, 1989 Apr.	Not preventive
N		Unintentional drownings cause over 600 deaths annually among children < or =5 years of age. Bathtubs are one of the leading sites for such drownings for children < or =2 years of age and especially for children 1 year or younger. OBJECTIVE: To determine reported levels of supervision of children while they are in the bathtub. METHODS: A face-to-face questionnaire was administered to a convenience sample of parents or guardians of children < or =5 years of age who presented to the emergency centers of 2 children's hospitals. The investigators developed a 17-point survey that included items related to general demographics and bathtub supervision. Parents and guardians were asked details concerning who supervised while the child was bathing, any unsupervised periods, length of unsupervised periods, and activities during any unsupervised periods. RESULTS: A total of 259 families participated in the survey (16% Caucasian, 79% African American, 1% Hispanic, 3% Asian, and 1% biracial). The mean caregiver age was 29.1 years (SD 7.9). The mean age of the child was 30.5 months (SD 22). Overall, 31% of the respondents reported leaving their child unsupervised for some period of time in the bathtub. The mean age of children left alone was 37.5 months, with the youngest being 5 months old. Seventeen	Simon HK. Tamura T. Colton K. Reported level of supervision of young children while in the bathtub. AMBULATORY PEDIATR. 2003 Mar-Apr; 3(2): 106-8.	Not recreational

		<p>percent of children < or =24 months of age (N = 123, mean age 12.7 months) and 15% of children < or =12 months of age (N = 60, mean age 6.7 months) were reportedly at times left unsupervised in the bathtub. Common caregiver activities when leaving the child unsupervised included getting a towel or diapers, answering a phone, and cooking. A 5-month-old child was left unsupervised for >2 minutes, and an 8-month-old child was reportedly left unsupervised for >5 minutes to cook a meal. In addition, 20 of 259 respondents (7.7%) reported that their children bathed alone before the age of 5 years, and 4 respondents (1.5%) reported that their children bathed alone before the age of 2 years. Although most primary supervisors were adults, 5 children were at times supervised by children <10 years of age. No significant differences were seen based on the hospital, race, or educational level of the families. CONCLUSIONS: Many parents reported leaving their young children at times inadequately supervised in the bathtub. This occurred in children as young as 5 months of age. Given the potential risk of drowning when their children are inadequately supervised, parents should be advised concerning proper supervision in early anticipatory guidance.</p>		
N		<p>To describe deaths due to drowning that involve the use of an infant bathtub seat or ring. DESIGN: Case series, cases reported to the US Consumer Product Safety Commission data systems. Setting. United States, 1983-1995. MAIN OUTCOME MEASURES: Death in which an infant bathtub seat or ring was in use at the time of death and the primary cause of death was drowning. RESULTS: Thirty-two drowning deaths involving bath seats/rings were identified and investigated by the Consumer Product Safety Commission over a 13-year period. The majority of deaths (84%) occurred from 1991-1995, with more than 50% occurring in the 2 most recent years. The victims' ages at the time of the incident ranged from 5 to 15 months with a mean and median age of 8 months. In more than 90% of incidents there was a reported lapse in adult supervision, with a mean reported lapse of 6 minutes and a median lapse of 4 minutes. Focus groups with parents found that while making bathing somewhat easier, bath seats/rings are useful for a relatively short time period, as the child rapidly outgrows the product. They also suggested that care givers are more likely to leave a child unattended in the tub if one of these products is in use. CONCLUSION: Bath seats/rings are associated with an increasing number of reported infant drowning deaths. The use of such products may increase the risk of drowning among infants by increasing the likelihood that an infant will be left alone in the tub. However, in the absence of exposure data in a suitable comparison group it is difficult to assess the overall risk inherent in their use. Educational efforts reinforcing the need for continuous adult supervision of infants and children around all bodies of water should now also include a reminder that bath seats/rings are not safety items and are not a substitute for adult supervision. Infants and toddlers should never be left in the bathtub unsupervised, even for brief moments.</p>	<p>Rauchschwalbe R. Brenner RA. Smith GS. The role of bathtub seats and rings in infant drowning deaths. Pediatrics. 100(4):E1, 1997 Oct.</p>	Not recreational

N		<p>Hurricane Isabel had a massive negative environmental, public health, and economic impact; Virginia bore the highest death toll (32) among nine states affected by this storm. A descriptive mortality analysis was conducted to identify modifiable risk factors and corresponding injury prevention measures that might mitigate future natural disaster-related morbidity and mortality in Virginia. METHODS: Information for the decedents, including demographic data, health status, and injury circumstances, was collected from the records of the Virginia Office of the Chief Medical Examiner and Office of Vital Records/Health Statistics. Criteria from the National Hurricane Center were used to classify deaths as direct or indirect. Storm assessments and emergency-response reports were also reviewed. RESULTS: A total of 32 deaths associated with Hurricane Isabel occurred in several densely populated localities in southeastern and central Virginia. The median age of decedents was 48 years (range: 7-85 years). A disproportionately higher mortality (21 [66%] of 32) occurred among persons older than 45 years (Virginia 2000 Census data). Twelve deaths were directly caused by environmental factors related to the storm (eg, seven drowning deaths and five traumatic head injuries from falling trees). Twenty deaths were indirectly associated with the storm and its effects: six fatal motor vehicle crashes, five related to clean-up operations, seven associated with power outages, and two stress-related (ie, myocardial infarction and suicide). The presence of alcohol or drugs was observed in 9 (28%) of 32 deaths. CONCLUSIONS: Classifying deaths as direct or indirect facilitates better target interventions on the basis of the identification of modifiable risk factors underlying hurricane-associated fatal injuries. Public education messages that reinforce avoidance of use of alcohol and drugs during natural disaster situations might reduce risk for injury.</p>	<p>Jani AA. Fierro M. Kiser S. Ayala-Simms V. Darby DH. Juenker S. Storey R. Reynolds C. Marr J Hurricane Isabel-related mortality -- Virginia, 2003. J PUBLIC HEALTH MANAGE PRACT. 2006 Jan-Feb; 12(1): 97-102. (19 ref)</p>	<p>Related to external factor - Hurricane</p>
N		<p>Due to Wisconsin's numerous lakes and rivers, tourists and residents alike frequently participate in water-related recreation. Unfortunately, drowning is a leading cause of injury-related death, especially in children and young adults. Developmental factors place children who are less than 5 years at increased risk for drowning. Teenagers also have a higher drowning mortality rate, largely due to risk-taking behaviors in this age group. This article reviews drowning mortality trends and statistics for Wisconsin and the United States, as well as current recommendations and legislation regarding water safety. We also discuss drowning prevention strategies such as patient education and legislative efforts surrounding swimming pool and boating safety.</p>	<p>Carl R. Leo H. Cox E. Recreational water safety in Wisconsin. WMJ. 100(2):43-6, 2001.</p>	<p>Repeat data from earlier study</p>

N		<p>BACKGROUND: The increased popularity of personal watercraft (PWC) has resulted in an increase in PWC-related injuries. In an effort to better understand the problem, a retrospective review of 37 victims of such injuries seen at a Level I trauma center and fatalities examined by the medical examiner were analyzed. RESULTS: Fourteen percent of the victims were passengers, two of whom were struck from behind, resulting in severe injuries. Twelve patients died of their injuries. For six victims, the cause of death was drowning; only one of these victims was wearing a personal flotation device. Two patients sustained transected aortas, 20% had brain injuries, 20% had spinal fractures, and 48% had skeletal and skull fractures. Abdominal organ injuries were present in only 13.5% of the victims, but they were significant, with liver, spleen, and kidney lacerations and aortic and renal artery injuries. CONCLUSION: In this population of victims of PWC crashes meeting preestablished trauma criteria or on-scene deaths, injuries were significant. Many of the drowning deaths may have been prevented with the use of personal flotation devices. The potential for serious intra-abdominal injury must be recognized and dealt with appropriately.</p>	<p>Shatz DV. Kirton OC. McKenney MG. Ginzburg E. Byers PM. Augenstein JS. Sleeman D. Aguila Z. Personal watercraft crash injuries: an emerging problem. J Trauma. 44(1):198-201, 1998 Jan.</p>	Secondary Cause
N		<p>Boating is a popular form of recreation in the United States. Unfortunately, many people drown due to boating-related accidents each year. Since many such drowning deaths are preventable through the use of personal flotation devices (PFDs), an observational study was conducted to quantify and evaluate the number and demographics of the individuals who choose to wear life jackets in King County, Washington. Further efforts were then directed toward evaluating the effectiveness of educational campaigns focused on increasing PFD usage and general boating safety. Highly significant increases were found in the use of life preservers overall and within various subgroups of the population. Total PFD use increased from 19.8% in 1992 to 31.3% in 1994. Future studies are needed to determine the reproducibility of this data and the feasibility of incorporating similar educational efforts into other injury prevention programs nationwide.</p>	<p>Treser CD. Trusty MN. Yang PP. Personal flotation device usage: do educational efforts have an impact?. J Public Health Policy. 18(3):346-56, 1997.</p>	Secondary Cause
N		<p>To examine age- and sex-specific mortality rates and trends in water traffic accidents (WTA), and their association with alcohol, in Finland. MATERIALS AND METHODS: National mortality and population data from Finland, 1969-1995, are used to analyse rates and trends. The mortality rates are calculated on the basis of population, per 100000 inhabitants in each age group (<1, 1-4, 5-14, 15-24, 25-44, 45-64, > or = 65), and analysed by sex and age. The Poisson regression model and chi2 test for trend (EGRET and StatXact softwares) are used to analyse time trends. RESULTS: From 1969 through 1995 there were 3473 (2.7/100000/year; M:F= 20.4:1) WTA-related deaths among Finns of all ages. In 94.7% of the cases the cause of death was drowning. Alcohol intoxication was a contributing cause of death in 63.0% of the fatalities. During the study period the overall WTA mortality rates declined significantly (-4% per year; P < 0.001). This decline was observed in all age groups except > or = 65 year olds. The overall mortality rates in WTA</p>	<p>Lunetta P. Penttila A. Sarna S. Water traffic accidents, drowning and alcohol in Finland, 1969-1995. Int J Epidemiol. 27(6):1038-43, 1998 Dec.</p>	Secondary Cause

		associated with alcohol intoxication (1987-1995) also declined significantly (-6%; P = 0.01). CONCLUSIONS: In Finland, mortality rates in WTA are exceptionally high. Despite a marked decline in most age groups, the high mortality in WTA nevertheless remains a preventable cause of death. Preventive countermeasures targeted specifically to adult males, to the reduction of alcohol consumption in aquatic settings and to the use of personal safety devices should receive priority.		
N		Personal flotation devices (PFD) are promoted and in many states are required for safe boating practices and to prevent drowning. Primary use of PFDs is associated with water sports (water skiing, tubing, etc.), boating and other water activities. Their purpose is to preserve life and prevent drowning. However, their effectiveness to prevent drowning and near-drowning has not been well established. The purpose of this investigation was to determine the effectiveness of PFDs to prevent drowning and near-drowning of individuals involved in personal watercraft (PWC) crashes. Methods include the 48-month collection of PWC crash data from the Arkansas Game and Fish Commission for 1994-1997. Information on PFD use, swimming experience, whether passengers were ejected from the watercraft and crash cause was queried. Results show that 38% were not swimmers, 98% wore a PFD and 54% were ejected from the PWC. Alcohol was a causal factor in six crashes and one death. It is estimated that PFDs saved 38 Arkansans who could have drowned. This study highlights one example of the effectiveness of PFDs to prevent mortality and morbidity.	Jones CS. Drowning among personal watercraft passengers: the ability of personal flotation devices to preserve life on Arkansas waterways, 1994-1997. J Ark Med Soc. 96(3):97-8, 1999 Aug.	Secondary Cause
N		Suicide among nonwhites was studied using the case files of the office of the Medical Examiner of Metropolitan Dade County in Miami, Florida. A total of 116 cases, during the years 1982-1986, were analyzed as to the age, sex, cultural background, cause of death, blood alcohol content at autopsy, and reason for the suicide of the victim. By analyzing the ethnic/cultural backgrounds of the victims, it was noted that the overall rate of suicide among nonwhites in Dade County was 5 per 100,000 population per year. However, the rate varies within the overall group such that black-Hispanics, American Indians, and Haitians have suicide rates of 13.9, 11, and 3.1 per 100,000 population per year, respectively. Some of these rates are higher than the U.S. national nonwhite suicide rate of 7 per 100,000 population. Interestingly, while suicide rates are variable, the reasons listed for the suicide and the high frequency of young adult victims are similar to those for whites. A discussion ensues concerning this similarity and what future work in the field remains to be done.	Copeland AR. Suicide among nonwhites. The Metro Dade County experience, 1982-1986. Am J Forensic Med Pathol. 10(1):10-3, 1989 Mar.	Suicide

N		<p>A retrospective study of cases of drowning suicide was undertaken at the Forensic Science Centre in Adelaide, South Australia for the period April 1980 to March 2000. A total of 123 cases were found, with 76 males (age, 16-88 years; average, 50.5 years; standard deviation [SD], 20.1 years) and 47 females (age, 34-88 years; average, 60.6 years; SD, 13.9 years). There were 66 fresh water drownings and 57 saltwater drownings. Female victims were significantly older than male victims for both fresh water and saltwater drownings ($P < .05$ and $P < .01$, respectively). Deaths in young women were rare. No temporal trend in drowning suicides could be shown, with annual numbers varying from 0 to 12 cases (average, 6.15; median, 7). Women preferentially chose the ocean or bath to drown themselves in, whereas males chose rivers, ditches, and lakes. Swimming pools were rarely used for suicide in this population; alcohol use was not usual; and there was often a significant history of mental illness.</p>	<p>Byard RW. Houldsworth G. James RA. Gilbert JD. Characteristic features of suicidal drownings: a 20-year study. <i>Am J Forensic Med Pathol.</i> 22(2):134-8, 2001 Jun.</p>	Suicide
N		<p>BACKGROUND: Drowning is a common, preventable problem, especially in childhood where it is the second most common cause of death by accident in Australia, with 0-4 year olds comprising 22% of all drownings. Commonest sites for drowning are nontidal lakes and lagoons; private swimming pools (especially preschool children); ocean/estuary and surfing beaches; bathtub and bucket drownings (especially in infants and toddlers with up to 10% of bucket drownings due to child abuse). OBJECTIVE: This article reviews the current information on the epidemiology, prevention and treatment of drowning. DISCUSSION: Despite prevention strategies, including pool fencing, drowning rates in young children have remained relatively static. In older children, drowning rates have declined dramatically despite the lack of prevention. The indigenous population have a much higher rate of drowning than the overall figure and their toddler rate is very high. Approximately 69% of near drowning victims will have complete neurological recovery, 28% will suffer some selective deficit, and 3% survive in a permanent vegetative state. Alcohol has been strongly implicated in drowning and banning alcohol from adjacent swimming areas has reduced drowning rates. Overseas tourists were 4.7% of all nonboating drownings in Australia with 89% of these drowning in the ocean. Further funding for drowning prevention strategies are essential, yet noticeably lacking.</p>	<p>Fenner P. Drowning awareness. Prevention and treatment. <i>Aust Fam Physician.</i> 29(11):1045-9, 2000 Nov.</p>	Treatment
N		<p>The basic pathophysiology of submersion injury has been reviewed with an emphasis on effects to the lungs and brain. Factors that affect outcome are the submersion time, the presence of immersion hypothermia and/or the "diving reflex" and the initial resuscitation. Principles of in-hospital management were discussed. In view of the accidental nature of these injuries and potentially devastating sequelae, accident prevention has been emphasized. Nurses can play a leading role in educating parents and the public at large in ways to prevent drowning and near-drowning accidents in children.</p>	<p>Skarpnes S. Near drowning in children. <i>AXON.</i> 11(1):20-1, 1989 Sep.</p>	Treatment, not prevention

N		<p>Near-drowning and immersion hypothermia are important, preventable causes of mortality and morbidity. The most important consequences of an immersion accident are hypoxia and its effects on the cardiovascular system and the CNS. The mammalian diving reflex and hypothermia may offer some protection to the CNS despite prolonged hypoxia. The initial management of a nearly drowned victim must be focused on reversal of hypoxemia and acidosis. Prompt and effective on-site CPR is of paramount importance in ensuring optimal survival. The presence of immersion hypothermia must be recognized. Hypothermic patients should be managed according to the severity and the duration of hypothermia. Active external rewarming is adequate for acute and mild hypothermia, whereas active core rewarming may be necessary for chronic and severe hypothermia.</p>	<p>Sarnaik AP. Vohra MP. Near-drowning: fresh, salt, and cold water immersion. Clin Sports Med. 5(1):33-46, 1986 Jan.</p>	<p>Treatment, not prevention</p>
N		<p>Our ability to manage the near-drowning victim at the site of the accident and in the advanced life support facility has allowed for an increased survival and a decrease in morbidity. Nevertheless, the greatest strides in the management of drowning must of necessity be in the area of preventive medicine. A greater appreciation of the epidemiology of immersion accidents will allow the development of education and surveillance programs to minimize the frequency of these devastating accidents.</p>	<p>Heiser MS. Kettrick RG. Management of the drowning victim. Clin Sports Med. 1(3):409-17, 1982 Nov.</p>	<p>Treatment, not prevention</p>
N		<p>Drowning and near drowning remain a common cause of childhood death and disability. Toddlers aged one through four drown in private swimming pools. Submersions greater than 10 minutes and lack of CPR at the scene or the need for greater than 20 minutes of resuscitation portends a poor prognosis. Management of respiratory failure without neurologic impairment has the most successful outcome. Prevention of drowning morbidity is dependent on constant parental supervision, and immediate and expert CPR.</p>	<p>DeNicola LK. Falk JL. Swanson ME. Gayle MO. Kissoon N. Submersion injuries in children and adults. Crit Care Clin. 13(3):477-502, 1997 Jul.</p>	<p>Treatment, not prevention</p>
N		<p>This study was intended to estimate the magnitude and explore the determinants of childhood drowning in rural Bangladesh. A cross-sectional survey as well as a population-based case - control study was conducted. By multistage cluster sampling 51 147 children aged 1 - 4 years were identified from 108 827 rural households. All drownings in children aged 1 - 4 years in the preceding 5 years were identified and recruited as cases and two living children of the same age group were selected from the same localities as controls. Socio-economic, demographic, environmental and other related information was collected from mothers of both cases and controls by face-to-face interview with the help of structured questionnaires. The incidence of drowning among children aged 1 - 4 years old was 156.4 per 100 000 children-year. The highest rate (328.1 per 100 000; 95% CI 254.8 - 421.7) was observed in 1 year old male children. The proportional mortality due to drowning in the children was 27.9%. Mothers' age and literacy and family income were identified as risk factors.</p>	<p>Rahman, A. Giashuddin, S M. Svanstrom, L. Rahman, F. Drowning--a major but neglected child health problem in rural Bangladesh: implications for low income countries. Int J Inj Contr Saf Promot. 13(2):101-5, 2006 Jun.</p>	

N	Y	N	During the most recent period, 1997–1998, drowning rates were similar for Native American and black males. But these drowning rates were 2 times greater than for whites. Drowning rates for Native American females were 2 times greater than black females and 2.7 times greater than white females. From 1989 to 1998, drowning rates for Native Americans decreased by 34%.	http://www.cdc.gov/ncipc/pu b-res/American_Indian_Injury_Atlas/11f-Allmaps-drowning.htm	
*	N	N	OBJECTIVES. This study described childhood drowning rates and circumstances in Harris County, a large metropolitan area in Texas, and compared case ascertainment between data sources. METHODS. Drowning rates among Harris County residents newborn through 19 years of age were calculated from death certificate data (1983 through 1989), and local childhood drowning hazards were described on the basis of medical examiner data (1983 through 1990). Cases from both sources were compared to determine sensitivity of sources. RESULTS. The drowning rate among Harris County residents newborn through 19 years of age was 3.8 per 100,000 person-years. The drowning rates among Blacks and Hispanics exceeded that of Whites by 56% and 19%, respectively. The majority of the 196 unintentional drownings occurred in swimming pools. Half of the pool drownings occurred in apartment pools and 33% in private home pools. The medical examiner logbook identified a slightly higher number of drownings than did death certificates. International Classification of Diseases external cause of death codes were of limited use in describing drowning circumstances. CONCLUSIONS. Childhood drowning hazards not previously reported were identified, specifically hazards in apartment pools and those among Hispanic children.	Warneke CL. Cooper SP. Child and adolescent drownings in Harris County, Texas, 1983 through 1990. Am J Public Health. 84(4):593-8, 1994 Apr.	Older than 10 yrs
*	N	N	OBJECTIVE: To enumerate drowning fatalities in Alaska in order to identify risk factors and areas for intervention. METHODS: Information from death certificates, state troopers' reports, and medical examiner reports were abstracted and analyzed. Rates were calculated using 1990 census figures as denominator data. RESULTS: There were 542 drowning fatalities in Alaska for the years 1988 to 1992. The 20-29 age group had the highest frequency and rate of drownings. The incidence rate for the state was 20 drownings per 100,000 population per year, almost 10 times higher than the overall U.S. rate of 2.11 per 100,000 per year. Incidence rates were highest among adolescent males (10-19), young adult males (20-29). Alaska Natives, and rural residents. Alaska Native males, ages 30-39 averaged 159 drownings per 100,000 per year, the highest drowning rates in the state. CONCLUSIONS: Drowning is a major public health concern in Alaska. People who fish commercially and young Native males are groups at high risk for drowning. Intervention efforts should be concentrated on these two populations.	Lincoln JM. Perkins R. Melton F. Conway GA. Drowning in Alaskan waters. Public Health Rep. 111(6):531-5, 1996 Nov-Dec.	Older than 10 yrs

*	N	N	Submersion injuries of children younger than 5 years in 4 urban Utah counties from 1984 through 1988 were studied retrospectively to identify associated risk factors. Infants younger than 1 year had the highest rates of both submersion injuries and deaths. The incidence of bathtub drownings was 2 to 3 times higher than reported national rates. All bathtub drownings occurred while the victim was bathing with a young sibling (10 months to 7 years of age) without adult supervision. All drownings in pools and moving bodies of water (rivers, irrigation ditches) resulted from unintentional falls into the water rather than from swimming and wading activities. Drowning prevention strategies should focus on educating parents about the risk of young children bathing with siblings in the absence of adult supervision and fencing regulations for pools and open bodies of moving water.	Jensen LR. Williams SD. Thurman DJ. Keller PA. Submersion injuries in children younger than 5 years in urban Utah. West J Med. 157(6):641-4, 1992 Dec.	Older than 10 yrs
*	N	N	OBJECTIVE: To determine the success of resuscitations performed by Queensland surf lifesavers and the factors associated with successful resuscitation. DESIGN: Retrospective case survey, using data from Surf Life Saving Association of Australia resuscitation report forms. SETTING: 54 Queensland beaches patrolled by surf lifesavers, and nearby areas, between 1973 and 1992. OUTCOME MEASURES: Reasons and success rates for resuscitation, distance from surf clubhouse, whether inside patrolled area, victim's age, sex, facial colour on presentation, occurrence of vomiting, airway difficulties and involvement of alcohol. RESULTS: 171 resuscitations were reported (80% involving males and 20% females), with a success rate of 67%. Seventy-two per cent were performed during patrol hours, 17% within patrolled areas (95% successful) and 55% outside patrolled areas (only 62% successful) (P = 0.004 for difference in success rates); resuscitation success rates fell with increasing distance from the surf clubhouse (P = 0.009). Reasons for resuscitation were: immersion, 70% (success rate, 68%); collapse, 22% (success rate, 47%); and surf or beach injury, 7% and 1%, respectively (success rate, 100% for each). Resuscitation was more likely to be successful if the victim's facial colour on presentation was normal, pale or blue, but not if grey, and if the victim did not vomit or regurgitate. CONCLUSIONS: Resuscitation by surf lifesavers was highly successful when the victim was close to the surf patrol, indicating a need for funding to expand patrol areas. Public awareness of the greater safety of "bathing between the flags" (in the delineated patrol area) should be increased.	Fenner PJ. Harrison SL. Williamson JA. Williamson BD. Success of surf lifesaving resuscitations in Queensland, 1973-1992. Med J Aust. 163(11-12):580-3, 1995 Dec 4-18.	Older than 10 yrs

*	N	N	<p>Drowning is the third most common cause of death from unintentional injury in the United States (1); in 1989, in North Carolina, drownings were the leading cause of years of potential life lost before age 65 per death (2). From July 1 through August 31, 1990, two drownings occurred in a private lake in Beaufort County (1990 population: 42,283), North Carolina. A review of data from the Office of the Chief Medical Examiner (OCME) in North Carolina identified two additional drownings at this lake during 1981-1990, and a total of 17 drownings in the county during the 10-year period. At the request of the local health director, in October 1990, the North Carolina Department of Environment, Health, and Natural Resources (DEHNR) investigated the drownings using information from OCME files, hospital medical records, and ambulance reports. This report summarizes the investigation of the four drownings in the private lake, recommendations to prevent additional drownings, and characteristics of drownings in North Carolina in 1989.</p>	<p>Centers for Disease Control (CDC). Drownings in a private lake--North Carolina, 1981-1990. MMWR Morb Mortal Wkly Rep. 41(19):329-31, 1992 May 15.</p>	<p>Older than 10 yrs</p>
*			<p>OBJECTIVE: To describe environmental and personal risk factors associated with watercraft-related drownings. This information may be useful in developing boating safety programs, regulations, and enforcement priorities. METHODS: A companion article in this issue (Unintentional Drownings Among New York State Residents, page 448) summarizes an investigation of 883 non-bathtub drownings among New York State residents for the years 1988 to 1994 using medical examiner, coroner, police, and hospital records in addition to death certificate data. This report details the environmental and personal risk factors associated with 216 watercraft-related drownings. RESULTS: Ninety-three percent of watercraft-related drowning victims were male, with the highest rate of drowning observed among males ages 15-44 years. Most commonly, the victim entered the water when the watercraft capsized (36%), the victim fell overboard (24%), or the victim intended to swim (11%). Personal flotation devices (PFDs) were known to be worn by only 9% of drowning victims, and in these cases other risks overwhelmed the effectiveness of the PFD. Of 73 individuals 15 years of age or older for whom adequate blood alcohol concentration analyses were provided, 44% were positive for blood alcohol. CONCLUSIONS: Based on this study, increased use of PFDs, avoidance of dangerous currents, and less alcohol use by operators and passengers of all types of watercraft would result in a reduction in watercraft-related drownings. In addition to continued education efforts, boating safety measures that deserve consideration include enforcement of current PFD and boating while intoxicated (BWI) regulations and expansion of BWI laws to apply to all boaters.</p>	<p>Browne ML. Lewis-Michl EL. Stark AD. Watercraft-related drownings among New York State residents, 1988-1994. Public Health Rep. 118(5):459-63, 2003 Sep-Oct</p>	

*	Y	Y	<p>OBJECTIVE: This study examines situations in which drownings occur (environmental risk factors) and the victims' personal risk factors (age, gender, use of personal flotation device, medical condition, alcohol or drug use) to provide guidance for future drowning prevention efforts. METHODS: The authors investigated 883 non-bathtub drownings among New York State residents for the years 1988 to 1994 using medical examiner, coroner, police, and/or hospital records in addition to death certificate data. RESULTS: Males, children ages 0-4 years, and African American males ages 5-14 years residing in New York State outside New York City experienced the highest rates of drowning. The majority of drownings occurred in a natural body of water for all age groups, with the exception of children ages 0-4 years. Most drownings among children ages 0-4 years occurred in residential swimming pools. The child usually gained access to the pool via inadequate fencing, an open or ineffective gate, or a ladder (to an above-ground pool) left in the "down" position. Less than 10% of victims of watercraft-related drownings were wearing personal flotation devices. Blood alcohol concentration (BAC) tests were positive for 44% of 250 persons 15 years of age and older for whom valid toxicology results were provided; 30% had BACs of 100 mg/dl or more. CONCLUSIONS: Suggested prevention efforts include stricter enforcement of fencing requirements for residential swimming pools and drowning prevention education stressing personal flotation device use while boating and the danger of mixing alcohol and water-related activities.</p>	<p>Browne ML. Lewis-Michl EL. Stark AD. Unintentional drownings among New York State residents, 1988-1994. Public Health Rep. 118(5):448-58, 2003 Sep-Oct.</p>	
*	Y	Y	<p>CONTEXT: Drowning is the second leading cause of unintentional injury death among children ages 1 to 19 years. Details about the specific site of submersion are important for implementation of primary prevention efforts, but are not routinely available from national data. OBJECTIVES: To provide national data about the specific sites of drowning among US children and to examine site-specific drowning rates by age, race, and gender. SETTING: United States, 1995. DESIGN: Information was abstracted from death certificates for unintentional drownings among children <20 years of age. The site of drowning was coded from free text on death certificates. Proportional distributions of the site of drowning by age, region, gender, and race were examined. Site-specific drowning rates were calculated by age, race, and gender. Denominators were based on US Census Bureau, June 1995 estimates of the US population. RESULTS: For 1995, death certificates were obtained for 1420 unintentional drownings among children <20 years of age, 98% of the number of drowning deaths reported by the National Center for Health Statistics for the same year. Site of drowning was specified on 1308 (92%) death certificates. Fifty-five percent of infant drownings were in bathtubs. Among children between the ages of 1 to 4 years, 56% of drownings were in artificial pools and 26% were in other bodies of freshwater. Among older children, 63% of drownings were in natural bodies of freshwater. Site-specific drowning rates varied by race. Importantly, after the age of 5 years, the risk of drowning in a swimming pool was greater among black males</p>	<p>Brenner RA. Trumble AC. Smith GS. Kessler EP. Overpeck MD. Where children drown, United States, 1995. Pediatrics. 108(1):85-9, 2001 Jul.</p>	

			compared with white males with rate ratios of 15.1 (95% confidence interval: 6.7-38.5) among 10- to 14-year-olds and 12.8 (95% confidence interval: 6.5-26.9) among 15- to 19-year-olds. CONCLUSION: The variety of sites in which children drown, even within specific age groups, emphasizes the need for a multifaceted approach to prevention. Reductions in the relatively high rates of drowning among black adolescent males will require targeted interventions to prevent swimming pool drownings among this group.		
*	Y	Y	We present the results of a residence-based study of drownings among Sacramento County, California children and adolescents ages 0-19 years for the years 1974-84. Children ages 1-3 had the highest drowning rates. The majority of drownings in this group, and one-third of all drownings in the study, occurred in residential swimming pools. Males ages 15-19 had a high drowning rate as well; at least 38 per cent of drownings in that age group were alcohol-associated. The implications for preventive efforts are discussed.	Wintemute GJ. Kraus JF. Teret SP. Wright M. Drowning in childhood and adolescence: a population-based study. Am J Public Health. 77(7):830-2, 1987 Jul.	
*	Y	Y	More than 2000 children drown each year; in some states drowning is considered the leading cause of death for children under the age of 5 years. Many survivors of near-drowning have permanent neurologic disability. There are two distinct high risk groups: children under 5 years of age and boys aged 15 to 19 years. Most drownings in the former group occur in residential pools. Among survivors, the clinical course is bimodal; intact survival and survival with severe permanent disability are the most likely outcomes. The outcome of an immersion event is determined within a few minutes of the onset of immersion, mandating an emphasis on primary prevention. A requirement for pool fencing is the most promising such strategy and could be implemented soon. Training in cardiopulmonary resuscitation and (for older children) alcohol abuse prevention programs may be valuable adjuncts.	Wintemute GJ. Childhood drowning and near-drowning in the United States. Am J Dis Child. 144(6):663-9, 1990 Jun.	
*		Y	OBJECTIVES: To determine if pool fencing prevents drowning in children (under 14 years of age). SELECTION CRITERIA: In order to be selected, a study had to be designed to evaluate pool fencing in a defined population and provide relevant and interpretable data that objectively measured the risk of drowning or near-drowning or provided rates of these outcomes in fenced and unfenced pools. The OR for the risk of drowning or near drowning in a fenced pool compared to an unfenced pool is 0.27 (95% CI 0.16 to 0.47). Isolation fencing (enclosing pool only) is superior to perimeter fencing (enclosing property and pool); the OR for the risk of drowning in a pool with isolation fencing compared to a pool with three-sided fencing is 0.17 (95% CI 0.07 to 0.44). PLAIN LANGUAGE SUMMARY: Fencing which completely encloses all sides of a swimming pool and isolates it from the home is effective in preventing drowning of young children. In most industrialized countries, drowning is one of the top killers of children, especially young children.	Thompson DC, Rivara FP. Pool fencing for preventing drowning in children. Cochrane Database of Systematic Reviews: Reviews 1998 Issue 1 John Wiley & Sons, Ltd Chichester, UK DOI: 10.1002/14651858.CD001047	
*	Y	Y	The rate of serious child trauma has not been significantly reduced in the last two decades. During this time, both infant mortality rates and the total child	Pearn JH. Current controversies in child accident prevention. An	

			death rate have fallen by 30%. Child trauma, as a relative contributor to child mortality in general, continues to increase. Effective prevention depends on a detailed understanding of causes, an appraisal of options, and cost-benefit audit of intervention programmes. Controversial themes are common in accident prevention work; controversies relating to child safety result from both an absence of data about detailed causes, and from philosophical conflicts about whose responsibility it is to prevent child trauma, and who will bear the cost. Five controversial areas have been selected and are discussed to illustrate these current problems. These are the inevitability of accidents, the loss of personal freedom that occurs in the regulation of a safe environment, "drownproofing" of infants, questions of sporting injuries involving children and the progressive upgrading of rules to make sports safer, and problems relating to the assessment of true exposure risks.	analysis of some areas of dispute in the prevention of child trauma. Aust N Z J Med. 15(6):782-7, 1985 Dec	
*		Y	Accidental injuries remain the most common cause of death in young people after 1 year of age, with no changes in overall statistics noted in the past two decades. Automobile accidents are the most frequent cause of serious injury in children and young adults, especially infants under the age of one and people from 15 to 24 years. Various approaches to preventing accidental injuries are now being assessed. The most successful approaches identified to date have been legislative, with slight impact usually found for education endeavors.	O'Shea JS. Childhood accident prevention strategies. Forensic Sci Int. 30(2-3):99-111, 1986 Feb-Mar.	
*	Y	Y	SYNOPSIS: A retrospective review of medical records in four urban Utah counties from 1984 through 1988 identified associated risk factors of submersion injuries in children. Results demonstrated that infants younger than 1 year had the highest rates for submersion injuries and deaths. The incidence of children drowning in bathtubs was 2 to 3 times higher than reported in the literature. A child who drowned in the bathtub was always bathing with a young sibling without any adult supervision. Private pools were the most frequent site of submersion injury for children between the ages of 1 and 4. All drownings in swimming pools and moving bodies of water resulted from unintentional falls rather than from wading or swimming. Two high-risk groups identified were infants or toddlers in bathtubs and preschool-aged children playing near private pools or open bodies of moving water. The absence of adult supervision was a common contributing factor related to these two high-risk groups.	Merkley K. Commentary on Submersion injuries in children younger than 5 years in urban Utah. ENAS NURS SCAN EMERG CARE. 1993 May-Jun; 3(3): 9.	

*	Y	Y	<p>The frequency of accidents in domestic swimming pools was studied retrospectively for a sample of 1123 Christchurch children. During the period from birth to five years, a total of 94 such accidents were reported. While most were trivial and readily rectified by rapid adult intervention, we found six children who clearly might have drowned in a domestic swimming pool but for adult vigilance and a certain amount of luck. These findings underline the fact that current mortality statistics merely reflect the minority of such incidents in which either parental vigilance or luck does not operate. Children with pools on their own or neighbouring properties were two and a half times more likely to be involved in accidents involving domestic pools. We reiterate our plea for the introduction of a uniform and well enforced set of domestic swimming pool safety regulations.</p>	<p>Fergusson DM. Horwood L.J. Shannon FT. Domestic swimming pool accidents to pre-school children. N Z Med J. 96(740):725-7, 1983 Sep 28.</p>	
*	Y	Y	<p>To review the circumstances of children drowning in New South Wales (NSW), 1990-1995, and to analyse trends. DESIGN: The NSW Paediatric Trauma Death Review Data Unit received coronial notification of childhood drowning deaths. Age-specific annual drowning rates per 100,000 population were calculated. SUBJECTS: Children aged 0-14 years who died of drowning. RESULTS: 132 children drowned (96[73%] aged 0-4 years). There was an overall decrease in incidence of drowning, from 2.0 to 1.5 per 100,000 population, and a decline in domestic pool drownings (from a peak of 15 in 1992 to five in 1995), and in drownings in waterways (from nine to six over the six-year period). However, drownings in baths and dams did not decrease. In general, boys were at higher risk than girls. CONCLUSIONS: Analysis of the drowning incidents indicates that, despite the decreases documented, we should not be complacent, and preventive programs are still warranted. All pools and dams should have well maintained fences between the body of water and the house. All infants aged under three and all epileptic children should be supervised in the bath by an adult. Children should be taught to swim, warned of the dangers of rivers and surf, and adequately supervised.</p>	<p>Cass DT. Ross F. Lam LT. Childhood drowning in New South Wales 1990-1995: a population-based study. Med J Aust. 165(11-12):610-2, 1996 Dec 2-16.</p>	

*		Y	<p>OBJECTIVES: To determine the effects of training in swimming and water safety on young preschool-children's ability to recover safely from a simulated episode of falling into a swimming pool. DESIGN: Randomized trial of 12 or eight weeks' duration water safety and swimming lessons for children 24 to 42 months old. OUTCOME MEASURES: Swimming ability, deck behavior, water recovery, and swimming to side after jumping into pool were measured before, during, and after the training program. RESULTS: 109 children completed the study (61 in the 12 week group, 48 in the eight week group). The average age was 34.2 months, 54% were male. Swimming ability, deck behavior, water recovery, and jump and swim skills improved over baseline levels in both groups. CONCLUSIONS: Swimming ability and safety skills of young preschool children can be improved through training. Such programs may offer some protection for children at risk of drowning and there was no indication that this program increased the risk of drowning. However, pool fencing, other barriers around water, and parental supervision still remain the most important prevention strategies to reduce drowning in young children.</p>	<p>AU: Asher KN, Rivara FP, Felix D, Vance L, Dunne R TI: Water safety training as a potential means of reducing risk of young children's drowning. SO: Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention. YR: 1995 VL: 1 NO: 4 PG: 28-33 PM: PUBMED 9346036 PT: Clinical Trial; Journal Article; Randomized Controlled Trial AD: Harborview Injury Prevention and Research Center, Seattle, WA 98104, USA.</p>	
*			<p>We test the hypothesis that there are host or environmental factors that significantly affect the likelihood of alcohol involvement in drownings. Our results are based on records of 234 drownings that meet predetermined eligibility criteria designed to exclude cases with postmortem blood alcohol concentrations (BACs) that do not reflect the BAC at the time of immersion. Cases are drawn from a total of 442 drownings occurring in Sacramento County, California, from 1974 to 1985. Overall, 41% of deaths were alcohol-associated; among these only one victim was under 15 years old. Among older persons, increasing age generally suggested a higher likelihood of alcohol involvement, and particularly of a BAC greater than 200 mg/dl. Other associated factors were male gender (OR = 2.5; 95% CI = 1.6, 3.8), activity (for land motor-vehicle occupants vs. all others, OR = 3.3; 95% CI = 2.6, 4.3), and time of year (January-June vs. July-December, OR = 2.1; 95% CI = 1.6, 2.8). A lower likelihood of alcohol involvement was seen for drownings in bathtubs (OR = .16; 95% CI = .04, .57) and swimming pools (OR = .47; 95% CI = .27, .82). Race was not a factor. Differing eligibility criteria have been used in studies of alcohol and drowning. After a critical review of the experimental literature, we propose that the following be adopted in future such studies: (i) death must occur within six hours of the onset of immersion, unless an antemortem sample is available and, unless evidence to the contrary exists, death can be assumed to have occurred within a few minutes of immersion; (ii) blood must be drawn for BAC determination within 24 hours of death.</p>	<p>Wintemute GJ. Teret SP. Kraus JF. Wright M. Alcohol and drowning: an analysis of contributing factors and a discussion of criteria for case selection. Accid Anal Prev. 22(3):291-6, 1990 Jun.</p>	

*		<p>A total population study of all serious immersion accidents is reported from the Australian Capital Territory. The annual immersion accident rate of 4-69 per 100,000 of the population at risk is low, and the fresh water fatality rate of 2-58 per 100,000 is very low. The annual fatality rate for childhood swimming pool accidents is 0-34 per 100,000 children (that is, under 16 years of age) at risk. Serious immersion accidents are not increasing in frequency, in striking contrast to the epidemic trends seen from other centres. Factors which might explain this are discussed.</p>	<p>Thompson J. Drowning and near-drowning in the Australian Capital Territory: a five-year total population study of immersion accidents. Med J Aust. 1(5):130-3, 1977 Jan 29.</p>	
*		<p>A survey of drownings in hot tubs, spas, and whirlpools in California 1960-85 suggests a person- and site-specific profile. The identified 74 deaths occurred mostly in White children, under two years of age, in Southern California, during the late afternoons, from May through August. From 1967 to 1985, the drowning rate increased tenfold. The deaths were associated with access to the water, lack of supervision, neuromotor handicaps, and entrapment by suction. Educational and environmental control efforts are required to reduce the incidence.</p>	<p>Shinaberger CS. Anderson CL. Kraus JF. Young children who drown in hot tubs, spas, and whirlpools in California: a 26-year survey. Am J Public Health. 80(5):613-4, 1990 May.</p>	
*		<p>The incidence of childhood immersion injury in a defined population is reported. The data were drawn from this Hospital's Child Injury Surveillance programme and cover the period July 1, 1984 to June 30, 1985. The overall rate of immersion injury was 26.8 per year per 100 000 children at risk and the rate for fresh-water immersions was 25.3. The magnitude of this public health problem is revealed by an annual fresh-water immersion rate of 70.2 per 100 000 at risk for the critical 0 to four years' age group. Eighty per cent of all immersions occurred in swimming-pools and the rate of pool immersion is three times that reported in the Brisbane Drowning Study (1971-1975). Eighty per cent of immersions in back yard pools were potentially avoidable by the provision of an effective safety barrier. Only 25% of the families that were involved could be described as being familiar with their pool.</p>	<p>Pitt WR. Increasing incidence of childhood immersion injury in Brisbane. Med J Aust. 144(13):683-5, 1986 Jun 23.</p>	
*		<p>An analysis of a consecutive series of 66 swimming pool immersion accidents is presented; 74% of these occurred in in-ground swimming pools. The estimated accident rate per pool is five times greater for in-ground pools compared with above-ground pools, where pools are inadequately fenced. Backyard swimming pools account for 74% of pool accidents. Motel and caravan park pools account for 9% of childhood immersion accidents, but the survival rate (17%) is very low. Fifty per cent of pool accidents occur in the family's own backyard pool, and 13.6% in a neighbour's pool; in the latter the survival rate is still low at only 33%. In only one of the 66 cases was there an adequate safety fence; in 76% of cases there was no fence or barrier whatsoever. Tables of swimming pool accidents by age, season, site and outcome are presented.</p>	<p>Pearn JH. Nixon J. Swimming pool immersion accidents: an analysis from the Brisbane drowning study. Med J Aust. 1(13):432-7, 1977 Mar 26.</p>	

*		<p>A large total population study of childhood fresh water immersion accidents is reported. The study was undertaken in the City of Brisbane over the five-year period 1971 to 1975 inclusive, and 111 fresh water immersion accidents involving children were studied and analysed. The childhood fresh water immersion accident rate, including drowning and near-drownings, of 10-43 per year per 100,000 at risk (fatality rate of 5-17) is the highest reported. If an unsupervised child gets into difficulties in fresh water and loses consciousness he has a 50% chance of dying. The immersion accident rate has doubled over the last six years. Age-specific immersion accident rates have been calculated, and have revealed that, in the toddler group (12 months to 23 months), the fresh water immersion accident rate is 50-01 per 100,000 (fatality rate of 22-55). Rates for drowning and near-drowning accidents after a fresh water immersion, by site, age and outcome (survival versus fatality), are also presented for the first time. Swimming pools produce 6-20 immersion accidents per year per 100,000 children at risk, and the domestic family bath tub produces 1-78. Possible factors explaining the high incidence are discussed, and comparisons of drowning rates from other centres are made.</p>	<p>Pearn J. Nixon J. Wilkey I. Freshwater drowning and near-drowning accidents involving children: a five-year total population study. Med J Aust. 2(25-26):942-6, 1976 Dec 18-25.</p>	
*		<p>A review of 19 consecutive serious bathtub immersion accidents (11 survivals, 8 fatalities) is presented. In all instances, consciousness was lost in the water. Unlike other childhood accidents which usually show a male predominance, the sexes are equally affected. The modal age is 11 months. Six separate causes of bath drownings and near-drownings have been identified, and in 14 of the 19 accidents, two or more causes were operating concurrently. Median estimated immersion time for survivals was four minutes, and five minutes for fatalities. The median depth of water was eight inches. An 'at risk' profile for home bathtub drownings is presented; this includes the youngest or second youngest child of a large family, a family of grade 4 to 7 sociooccupational status (congalton) and a family in which routine is temporarily broken.</p>	<p>Pearn J. Nixon J. Bathtub immersion accidents involving children. Med J Aust. 1(7):211-3, 1977 Feb 12.</p>	
*		<p>A large total population study of childhood saltwater immersion accidents is reported. A total of 49 cases (16 fatalities, 33 survivors) occurred in the five year period from 1971 to 1975 in southeastern Queensland. As a group, more children survive a potentially fatal saltwater immersion (67%) than do those who lose consciousness in freshwater (50%). The serious saltwater accident rate (loss of consciousness or death) in childhood (from 0 to 15 years inclusive, is 3.37/100,000 children per year at risk (fatality rate 1.12). This is low; comparison with freshwater data shows that although the surf presents special hazards to children, it is very much safer than other types of water. Age-specific and site-specific accident and survival rates for saltwater immersions are presented for the first time. Toddlers are disproportionately represented (33% of all children) and their survival rates are lowest. Boating and the use of surfboards, in current practice, are negligible threats to children. The saltwater immersion rate is increasing (although the absolute risk is small) and reasons for this are discussed. Childhood saltwater immersions were</p>	<p>Patrick M. Bint M. Pearn J. Saltwater drowning and near-drowning accidents involving children. A five-year total population study in south-east Queensland. Med J Aust. 1(2):61-4, 1979 Jan 27.</p>	

		unaffected by tidal state. All but one case of immersion occurred during daylight hours, and in younger children immersion occurred often on weekends.		
*		<p>A retrospective study of 1,052 unintentional drowning deaths in North Carolina during the period from 1980 through 1984 was carried out, with emphasis on the victims' activity and alcohol consumption, and the settings of the accidents. The data suggest that many drownings are preventable, and reinforce the etiologic importance of ethanol consumption in such deaths. The overall drowning rate for North Carolina residents during the period covered by the study was 3.2 per 100,000 persons. Nonwhite males had the highest rate, 8.8 per 100,000 population. The next highest rate was for white males, 4.7 per 100,000. Swimming and wading, involved in 41 percent of the drowning deaths, was the most frequently associated activity. Fishing was involved in 15 percent of the deaths, and motor vehicle accidents with 8 percent. Most occurred in freshwater settings, notably lakes and ponds, 39 percent, and rivers and creeks, 29 percent. Of the 752 victims 15 years and older tested for blood ethanol, 53 percent had positive tests and 38 percent had blood alcohol concentrations of 100 milligrams per deciliter or greater. Significant percentages of victims 15 years and older with blood alcohol concentrations greater than 100 milligrams per deciliter were found in all settings and activity groups.</p>	<p>Patetta MJ. Biddinger PW. Characteristics of drowning deaths in North Carolina. Public Health Rep. 103(4):406-11, 1988 Jul-Aug.</p>	
*		<p>House fires and drownings remain frequent causes of pediatric and young adult mortality and morbidity, yet have received less attention than other causes of injury to the young. To investigate the gender, racial and socio-economic components of these problems, as well as the contribution of chronic disabilities, all deaths in a single state over a 7-year period in the birth through 24-year-old population were studied. Females and males overall had no appreciable differences in house-fire mortality. Females from birth through age 4 were more at risk, however, than older females of dying in house fires, but did not appear at more risk than males of the same age. Nonwhite males under age 4 were much more at risk than white males. Nonwhite females compared similarly to white females, both in the birth through 4-year age range, as well as in the overall population studied. Males had more drowning deaths overall than females, with most of the difference attributable to a large male predominance in the 15-through 24-year age group. Furthermore, males in this age group were much more likely to drown than were younger males. Both males and females in this age group were at particular risk if they had a past history of seizures. No other gender or racial differences could be determined, either in the overall population or in the separate age groups, except in victims greater than 4 years of age many more deaths were found in the lower three socio-economic quintiles than in the higher two.</p>	<p>O'Shea JS. House-fire and drowning deaths among children and young adults. Am J Forensic Med Pathol. 12(1):33-5, 1991 Mar.</p>	

*		<p>A total population study of childhood fresh water drowning accidents (fatalities) for the 15 year period, 1967-1981, is reported. These data are from the ongoing Brisbane Drowning Study which has now also analysed 255 fresh water child immersions (both fatalities and near-fatalities) over the eleven year period, 1978-1981, and as such forms a consecutive unselected series for over one decade. The annual fatality (drowning) rate is 3.53 per 100,000. Details of immersion accidents by site, sex and by outcome (survivors versus fatalities) are presented. An analysis of secular trends revealed that one epidemic peak of child drownings in swimming pools and domestic baths (noted in the mid 1970s in Australia and other countries) is now passed. Evidence is presented to suggest that a vigorous education, and public awareness campaign can reduce the incidence of serious child immersion accidents by one-third. Such a campaign may have influence on all types of childhood household drownings (pools, baths, garden ponds), irrespective of site. Survival rates for unsupervised children who lose consciousness in fresh water are site-dependent, only 21% of such potential victims surviving after losing consciousness in rivers and creeks, compared with the survival rate of 65% for those in potential drowning incidents in their own backyard. Violent death continues to account for more than half of all deaths in childhood up to the age of 14 years [Gratz, 1979; Mayer, Walker and Johnson et al., 1981].</p>	<p>Nixon J. Pearn J. Wilkey I. Corcoran A. Fifteen years of child drowning—a 1967-1981 analysis of all fatal cases from the Brisbane Drowning Study and an 11 year study of consecutive near-drowning cases. Accid Anal Prev. 18(3):199-203, 1986 Jun.</p>	
*		<p>Accidental drowning accounts for 15% of all accidental deaths in Pinellas County, Florida, and this study was conducted to better understand the epidemiologic profile of the victim. The medical examiner's records of 230 drownings in Pinellas County from January 1, 1983, through December 31, 1987, were reviewed for demographic and epidemiologic data. Bodies of salt water were the most common drowning site (47%), followed by swimming pools (22%), lakes (11%), baths (7%), and canals (6%). The drowning incidence for males was more than three times that for females. Drowning was endemic among boys less than five years of age (30/100,000/year). Fifty-nine percent of young adult victims had detectable postmortem blood alcohol levels. Drowning rates were highest among children less than five years and adults more than 80 years. Epidemiologic profiles of populations at risk and contributing factors are described and public safety measures are suggested.</p>	<p>Nichter MA. Everett PB. Profile of drowning victims in a coastal community. J Fla Med Assoc. 76(2):253-6, 1989 Feb.</p>	
*		<p>We conducted a population-based study of drownings in Minnesota from 1980 through 1985. Five hundred and forty-one drownings (2.1 per 100,000 person-years) were identified from death certificates and from incident reports filed with the Minnesota Department of Natural Resources. Most drownings (334, 62 percent) occurred during summer months (May-August) and involved boating (42 percent) and swimming (35 percent) events. However, 62 drownings (11 percent) occurred during winter months (December-February)</p>	<p>Hedberg K. Gunderson PD. Vargas C. Osterholm MT. MacDonald KL. Drownings in Minnesota, 1980-85: a population-based study. Am J Public Health. 80(9):1071-4, 1990 Sep.</p>	

		and primarily involved snowmobiles and motor vehicles (71 percent) breaking through ice on lakes and waterways. The risk of drowning, estimated by the ratio of drownings to number of water-related activities, was highest during March and April, when the ice on lakes and waterway surfaces is melting, and during October and November, when lake and waterway surfaces are starting to freeze. Drowning rates were highest for males (3.7 per 100,000 person-years), persons 15 to 25 years of age (3.3 per 100,000 person-years), and children less than 5 years of age (2.5 per 100,000 person-years). These data can be used to target prevention strategies, particularly in northern climates.		
*		The results of a 4-year retrospective study on the epidemiology of drowning in greater Cape Town are presented. With rates corrected to per 100 000 population, the highest incidences of drowning were found to be in white children and adult black males. The commonest sites of drowning were the coastline and harbours of greater Cape Town. The majority of adult drownings were associated with positive blood alcohol tests (64,6%) and in the case of black men occurred while at work. The majority of drownings in children occurred in home swimming pools.	Davis S. Smith LS. The epidemiology of drowning in Cape Town--1980-1983. SAMJ, S. Afr. Med.J. 68(10):739-42, 1985 Nov 9.	
*		Drowning is a serious public health problem in Florida. It is the leading cause of death among children aged one to four years. We studied Florida drownings for 1977-1986 using data from the Florida vital statistics mortality file and found that 5,525 occurred, the greatest number in 1980 (688), the fewest in 1985 (453). The reasons for this decrease are not clear, but the greatest decrease occurred in swimming pool drownings. Nonwhite males had the highest overall drowning rates, except for those under age five or 80 and above. White males had the highest drowning rates for persons under age five; most of these occurred in swimming pools. No single approach will prevent drownings in all high risk groups. Priority should be given to foursided fencing of swimming pools and to further study of nonwhite male drownings.	Calder RA. Clay CY. Drownings in Florida 1977-1986. J Fla Med Assoc. 77(7):679-82, 1990 Jul.	
* = All criteria for inclusion were met except for publication within 10 years				

BIBLIOGRAPHY

1. Safe Kids Worldwide Fact Sheet- Drowning. Website- 13 Nov 2006.
http://www.usa.safekids.org/content_documents/Drowning_facts.pdf
2. CDC Water Related Injuries- Fact Sheet. Website- 8 Jul 07.
<http://www.cdc.gov/ncipc/factsheets/drown.htm>
3. Peden MM. McGee K. The epidemiology of drowning worldwide. Inj Control Saf Promot. 10(4):195-199, 2003 Dec.
4. Stevenson MR. Rimajova M. Edgecombe D. Vicker K. Childhood drowning: barriers surrounding private swimming pools. Pediatrics. 2003 Feb; 111(2)
5. Steensberg J. Epidemiology of accidental drowning in Denmark 1989-1993. Accid Anal Prev. 30(6):755-762, 1998 Nov.
6. Kypri K. Chalmers DJ. Langley JD. Adolescent injury mortality in New Zealand and opportunities for prevention. Int J Adolesc Med Health. 14(1):27-41, 2002 Jan-Mar.
7. Hyder AA. Arifeen S. Begum N. Fishman S. Wali S. Baqui AH. Death from drowning: defining a new challenge for child survival in Bangladesh. Inj Control Saf Promot. 10(4):205-210, 2003 Dec.
8. Centers for Disease Control and Prevention (CDC). Nonfatal and fatal drownings in recreational water settings--United States, 2001-2002. MMWR Morb Mortal Wkly Rep. 53(21):447-452, 2004 Jun 4.
9. Saluja G. Brenner RA. Trumble AC. Smith GS. Schroeder T. Cox C. Swimming pool drownings among US residents aged 5-24 years: understanding racial/ethnic disparities. Am J Public Health. 96(4):728-733, 2006 Apr.
10. Schnake EM. Peterson NM. Corden TE. Promoting childhood water safety: the physician's role. WMJ. 104(2):45-9, 2005 Feb.
11. Quan L. Cummings P. Characteristics of drowning by different age groups. INJ PREV. 2003 Jun; 9(2): 163-168. (23 ref)
12. Khalid S Khan, Gerben ter Riet, Julie Glanville, Amanda J Sowden and Jos Kleijnen. Undertaking Systematic Reviews of Research on Effectiveness. CRD's Guidance for those Carrying Out or Commissioning Reviews. CRD Report Number 4. NHS Centre for Reviews and Dissemination, University of York. March 2001

13. Scott I. Prevention of drowning in home pools--lessons from Australia. Inj Control Saf Promot. 10(4):227-236, 2003 Dec.
14. Norris B. Wilson JR. Preventing drowning through design--the contribution of human factors. Inj Control Saf Promot. 10(4):217-226, 2003 Dec.
15. Zaloshnja E. Miller TR. Galbraith MS. Lawrence BA. DeBruyn LM. Bill N. Hicks KR. Keiffer M. Perkins R. Reducing injuries among Native Americans: five cost-outcome analyses. Accid Anal Prev. 35(5):631-639, 2003 Sep.
16. Thompson DC. Rivara FP. Pool fencing for preventing drowning in children. Cochrane Database Syst Rev. (computer file) (2):CD001047, 2000.
17. Bennett E. Cummings P. Quan L. Lewis FM. Evaluation of a drowning prevention campaign in King County, Washington. Inj Prev. 5(2):109-113, 1999 Jun.
18. Morgenstern H. Bingham T. Reza A. Effects of pool-fencing ordinances and other factors on childhood drowning in Los Angeles County, 1990-1995. Am J Public Health. 90(4):595-601, 2000 Apr.
19. Hwang V. Shofer FS. Durbin DR. Baren JM. Prevalence of traumatic injuries in drowning and near drowning in children and adolescents. Arch Pediatr Adolesc Med. 157(1):50-53, 2003 Jan.

VITA

Dr. Matthew H. Hoefer

Matt was born in Fridley, Minnesota to Henry and Cynthia Hoefer. He was raised in Minnesota and attended Saint John's University, Collegeville, MN, where he received a Bachelor of Arts in Biology-Pre Medicine, with a minor in History. Having received an Army ROTC scholarship to attend college, Second Lieutenant Hoefer reported to Fort Bragg, NC, where he served for six years in various Airborne and Special Operations units as a Medical Service Corps officer.

In 2001, Captain Hoefer separated from the Army, and then re-commissioned as a Medical Corps officer to attend medical school at the Kansas City University of Medicine and Biosciences-College of Osteopathic Medicine. With a D.O. degree in hand, he reported to Dwight D. Eisenhower Army Medical Center, Fort Gordon, GA for a transitional internship year. Accepted into the Army's Residency in Aerospace Medicine, which includes an MPH year at University of Texas Medical Branch, he will complete training in June 2009.

Dr. Hoefer is married to the lovely Holly Ford of Alamo, GA.

SUPERVISORY COMMITTEE

Dr. Billy U. Philips Jr., PhD, MPH, FACE, FASHP (Chair)
Professor and Director Graduate Programs in PMCH
Director, Division of Epidemiology and Biostatistics
Department of Preventive Medicine and Community Health
University of Texas Medical Branch
301 University Blvd.
Galveston, Texas 77555-1153
Phone: 409.772.9132
Email: bphilips@utmb.edu

Dr. Dana Wiltz-Beckham, D.V.M.
Chief Epidemiologist/Veterinary Consultant
Galveston County Health District
P.O. Box 939
La Marque, TX 77568
Phone: (409) 938-2322
Email: dbeckham@gchd.org

Dr. Kley Hughes, Ph.D.
Professor and Director, Graduate Program in Microbiology and Immunology
University of Texas Medical Branch
301 University Blvd.
Galveston, Texas 77555-1019
Phone: (409) 772-6660
Email: tkhughes@utmb.edu