



# Fatal and non-fatal unintentional drownings in swimming pools in Italy: Epidemiological data derived from the public press in 2008–2012<sup>☆</sup>



Emanuele Ferretti<sup>a,\*</sup>, Stefania De Angelis<sup>a</sup>, Giancarlo Donati<sup>a</sup>, Marina Torre<sup>b</sup>

<sup>a</sup> Unit of Inland Water Hygiene, Department of Environment and Primary Prevention, Istituto Superiore di Sanità, Rome, Italy

<sup>b</sup> Bureau of Statistics, National Centre for Epidemiology, Surveillance and Health Promotion, Istituto Superiore di Sanità, Rome, Italy

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## ABSTRACT

Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid; outcomes are classified as death, morbidity and no morbidity. In most of the developed countries, drowning is the second or third cause of accidental death for children aged <15 after road accident and fires and, according to the World Health Organization, the third leading cause of death in children aged 1–5 years. Males are especially at risk of drowning, with twice the overall mortality rate of females. Not all drownings are correlated to recreational water use, and the percentage that is attributable to swimming pools and similar environments is expected to vary from country to country.

In order to analyze unintentional injury events occurring in swimming pools in Italy, Italian websites and newspaper were browsed for the period January 2008–December 2012. A search was performed using the web search engine Google and the keywords “drowning” and “risk of drowning”. On the basis of the collected information, the recorded events were split up for geographical location of the sport facility, age and gender of the injured person, leading cause of the event and assistance received. Chi-square test was used to compare data by gender. The analyses were performed using the statistical software STATA 9.2.

Data on 198 events were collected corresponding to an average of *ca.* 40 events/year. 67% of unintentional injury events were related to children aged 0–15 years.

Our results confirms a higher incidence (87%) in summer, however this might be due not only to the higher number of people attending the swimming pools in that season, but also to the higher sensibility of the media in such period for this type of unintentional injury events. The same can be applied when the geographical area is considered: the higher number of events occurred in the North of Italy can be related both to a greater diffusion of swimming pools in these regions and to a higher sensibility of the media of these regions to the theme. In agreement with the international literature, males are more likely to drown than females. This is generally attributed to higher exposure to aquatic environment and riskier behavior such as swimming alone, drinking alcohol before swimming alone and boating.

The “≤4” and “5–15” age classes showed the highest incidence of injuries. The mortality rate we found in these classes is in accordance with the data reported in the literature referring to swimming pool.

Most of the incidents that didn't receive any kind of assistance (64%) occurred in domestic pools where the highest mortality rate (42%) was measured. For this kind of pools lifeguard assistance was never provided.

Our investigation highlights the severity of the fatal and non-fatal unintentional drownings occurring in swimming pools in Italy. Most of unintentional drownings involve children aged <15 and are a public health problem that might be prevented if correct strategies would be adopted by decision-makers.

This is the first study performed in Italy that analyses data concerning fatal and non-fatal unintentional drownings occurred in swimming pools and stratifies them for place and month of occurrence, age and gender of the involved people as well as leading cause to the injury.

The final scope of this study is to promote the research and public health initiatives to determine the burden and risk factors for unintentional drowning worldwide and to highlight the need of guidelines and regulations that improve the swimmers' safety.

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\* Corresponding author. Tel.: +39 06 49902553; fax: +39 06 49903115.

E-mail address: [emanuele.ferretti@iss.it](mailto:emanuele.ferretti@iss.it) (E. Ferretti).

## 1. Introduction

The injury chart book of the global burden of injuries published by the World Health Organization (WHO) showed that 450,000 worldwide people were estimated to have drowned in 2000 (7.4 per 100,000

population); 97% of drownings occurred in low- and middle-income countries although the majority of available data relate to developed countries. Moreover 13,263,000 Disability Adjusted Life Years (DALYs) were lost as a result of premature death or disability from drowning [1].

According to WHO, drowning is a major cause of death, the third leading cause of death in children aged 1–5 years and the leading cause of mortality due to injury. The mortality rates in male children are almost twice as high as those in female children; not all drownings are related to recreational water use, and the percentage that is attributable to swimming pools and similar environments is likely to vary from country to country [2].

In the United States, an analysis performed by the Center for Disease Control and Prevention (CDC) on data from the National Vital Statistics System and from the National Electronic Injury (2005–2009) showed that death rates and non-fatal injury rates were highest among children aged  $\leq 4$  years; these children most commonly drowned in swimming pools and the drowning death rate among males was approximately four times that for females [3]. A literature search performed on the available databases and on the web showed that in the countries where the use of public and domestic swimming pools is widespread, epidemiological analyses of the physical risks are carried out routinely. Most swimming personal injuries and deaths occur because of the negligence of owners and users or of those charged with supervision of swimmers. Furthermore, many swimming incidents that result in injury, fatal or non-fatal drowning involve children. These cases often involve backyard pools that don't have proper safety features, namely a fence to keep children away [4].

In the last years, water related activities have been practiced also as a good lifestyle aiming at preventing diseases and improving wellness and quality of life. The role that water plays in the performance of physical activity in Italy is constantly increasing. Data collected in 2006 by the Italian National Institute of Statistics (ISTAT) show that among the recreational sports, water related sports are placed in the third position after the practitioners of "gymnastics, aerobics, fitness and physical culture" and those of "football". About 23% of the interviewed sample was involved in water related sports resulting in about 4 million of practitioners, with an increase of more than 6% in 5 years [4]. Moreover, while from one hand competitive sport in general is undergoing a downturn, sport intended as entertainment, research and care of the physical body is rising. Furthermore it is interesting to note that swimming is one of the sports most performed by children [5]. Due to this increased attendance of recreational water environments, occurrence of unintentional injury events becomes more and more frequent.

In Italy clinical and mortality analyses are routinely carried out on the basis of the information collected in the Hospital Discharge Records (HDR) and in the Vital statistics on causes of death databases respectively. Procedures and diseases are coded using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD9-CM) in the HDR database and, since 2003, ICD10 in the Vital statistics on causes of death database. Considering the non-fatal drowning and submersion (ICD9-CM code 994.1) a decrease in the number of events from 451 (0.95 per 100,000 inhabitants) to 321 (0.55 per 100,000 inhabitants) was measured in the period from 2000 to 2005 in the HDR database. However the HDR database doesn't collect information about the place where the incident happened and statistics about swimming pool related deaths have not been published yet [6]. Then, in order to cover this lack of information, an analysis of the fatal and non-fatal drowning events occurred in swimming pools and published in the Italian press and/or available in the web from 1 January 2008 to 31 December 2012 was performed. Our research question was the following: are unintentional injury events currently occurring in Italian swimming pools a public health problem? The aim of this paper is to highlight several aspects of fatal and non-fatal injuries, analyzed by age classes, gender and kind of swimming pool.

## 2. Methods

Italian newspaper websites and websites closely related to the swimming pool topic were browsed. A search was performed using the web-search engine Google and the keywords "drowning" and "risk of drowning". This last term was selected, instead of the more technical "non-fatal drowning" adopted by WHO [7], due to the more colloquial wording used in the web newspaper. The period from the 1st January 2008 until the 31st December 2012 was investigated. On the basis of the collected information, the recorded events were split up for geographical location of the sport facility, age and gender of the injured people, leading cause and assistance received.

Based on the description given in the web newspaper, the following leading causes were selected: Child left alone, Illness, Downfall, Play and Unknown. The category Child left alone includes all the articles with a specific reference to the fact that children escaped from the vigilance of their parents or there was an inadequate supervision. The category Illness includes all the news reporting the occurrence of an illness in general, often without a specific description. Alcohol related injuries were included in this category. The term illness is usually referred in the Italian web newspaper when the medical diagnosis is not known and might include congestion (often related to diving after a meal), heart attack, faintness, and seizures. Under the category Downfall, all the articles clearly referring to people that unintentionally fell into water or dived inappropriately were included. The category Play includes all those situations in which children lose their own sense of danger and push themselves beyond their swimming abilities. All the articles not reporting a specific description of the leading cause were classified in the Unknown category.

Chi-square test was used to compare data by gender. The analyses were performed using the statistical software STATA 9.2 (StataCorp. Stata Statistical Software: Release 9.2 College Station, TX: StataCorp LP).

## 3. Results

In the investigated period, data on 198 injuries, fatal and non-fatal unintentional drownings, were collected corresponding to an average of about 40 events/year. The monthly incidence of the events and their geographical distribution in Italy is shown in Table 1. The highest incidence was measured in July and the highest number of events was measured in the North of Italy.

The gender and age distribution of the injured people is shown in Table 2. In the observed period males were always at higher risk of fatal and non-fatal drownings than females (about four times), with a significant difference between the two genders ( $p < 0.0001$ ). The " $\leq 4$ " and "5–15" age classes showed the highest rate of injuries; fatal drownings occurred in these categories accounted for 42% and 28%, respectively. On the other hand, drowning rate in people aged  $> 15$  was 74%.

Fig. 1 shows the distribution of the unintentional injury events according to the leading causes: Illness, Child left alone, Downfall, Play, and Unknown. The highest incidences were measured for the categories "Illness" and "Child left alone".

The first category included the highest number of injured people (103 of 198) with 57 fatal drownings (55%) and involved all the age categories. The 5–15 age class included 44 events, 14 of which were fatal drownings (32%). Most of the web articles used only the generic term "Illness" without any additional information. When additional information was provided, the leading causes reported were stomach cramps after eating (congestion), disorders after diving, alcohol consumption and seizures.

The "Child left alone" category included children without parental/caregiver supervision, whose age ranged from 1 to 7 years old; all the reported events were fatal drownings (100%).

The "Downfall" group included 20 events referred to people of all age classes; 40% were fatal drownings.

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