The Epidemiology of Child Drowning Injury in the Philippines

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ABSTRACT

Objective. This paper aims to quantify the magnitude of drowning injury related deaths among children in the Philippines, to form the evidence base for national policies for drowning prevention.

Method. Retrospective review and analysis of published data on child drowning injury (1963-2003) in the Philippines.

Results. At least 3,000 Filipinos of all ages die annually from drowning injury (0.43% of deaths), more than a third of which (35.6%) are children under 14 years. Mortality is highest among children ages 1-4 years compared to other age groups [Mortality Rate (MR) 6.4 vs. 3.8 per 100,000]. Child drowning mortality rates have remained largely unchanged from 1963 to 2003, belying its under recognition as a public health priority. There is also a paucity of local data to adequately describe the epidemiology of child drowning in the Philippines.

Conclusion. In the Philippines, drowning deaths disproportionately account for 5% of deaths for 1-4 year olds. Drowning prevention could be a 'low-hanging fruit' in the quest to meet the Millenium Development Goals (MDG's) set for 2015. There is a need for better surveillance of child drowning deaths to guide policy formulation for its prevention and treatment in the Philippines.

Key Words: drowning, Millenium Development Goals, child health, Philippines, health policy

Introduction

Drowning – defined as "a process resulting in primary respiratory impairment from submersion/immersion in a liquid medium" that may or may not result in death[1] – accounts for a significant proportion of the global burden of disease, especially among children.

The World Health Organization (WHO) estimates that 388,000 deaths (0.7% of all causes of deaths globally) in 2004 were due to drowning, more than 35% of which involved those under age 14 years [death rate 7.4 per 100,000].[2] Specifically, boys ages 1-4 years living in the WHO Western-Pacific region registered the highest mortality rates from drowning at 22.0 per 100,000 population (contributing to 0.19% of deaths globally in boys age 1-4 years). Among the causes of mortality from unintentional injury, drowning accounted for 16.8% of deaths for those below 18 years of age, ranking second to road traffic injuries.[3]

Injuries in general ranked fifth among the leading causes of mortality in the Philippines, while drowning accounted for 10% of all cases of accidents and injuries for both sexes and all age groups in 2002, ranking third to assaults and road traffic injuries, respectively.[4] Among children, injuries in general were the second leading cause of mortality among children ages 1-4 years [mortality rate 17.63 per 100,000 population] and the top cause of death among children aged 5-9 [17.82 per 100,000] and 10-14 years [15.88 per 100,000]. Drowning in particular accounted for 31% of all childhood (age <14 years) injury deaths.[5]

Mortality from drowning among children is nearly absolute, with case fatality rates reported for the Philippines at over 99 per 100 drowning incidents;[6] those who survive non-fatal drowning incidents suffer a range of sequelae from an absence of physical deficits to permanent psychiatric, neurologic or respiratory complications or disabilities of varying magnitude.[3,7,8] It is the 'return to health' that may be the most common outcome from a near-drowning incident that renders true assessment of drowning incidence and risk factors almost impossible.

Despite these alarming drowning facts, there is a paucity of Philippine data that adequately describes the epidemiology, proportionate burden and temporal trends of drowning especially as it pertains to children.

Furthermore, apart from the recommendations, published by the Philippine Pediatric Society,[9] that outlined the role of various sectors (i.e. caregivers, government, physicians, mass media, managers of recreational pools) in preventing drowning injury involving children, there currently does not exist any concrete policy or program that aims to address the burden of drowning injury among Filipino children.

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This paper aims to bridge this knowledge gap by presenting a review of available literature on drowning incidents among Filipino children, which shall form the evidence base for the formulation of national policies for drowning prevention.

Methods

Data on drowning among Filipino children was extracted from data published in the World Health Statistics Annual (1963-1995) and the Department of Health National Epidemiology Center (DOH-NEC) database (1996-2003), and a review of the results of the Philippine National Injury Survey (PNIS), a United Nations Children's Fund- (UNICEF) and The Alliance for Safe Children (TASC)-funded survey of over 90,000 households and 400,000 Filipinos conducted by the Philippine Department of Health (DOH) in 2003 as a response to the dearth of local information on injury epidemiology.[3,10]

Results and Discussion

World Health Statistics Annual and DOH-NEC database, 1963-2003 (Figure 1). In 2003, 2,822 Filipinos of all ages died from drowning injury (0.43% of all causes of death, or 1 in 250 deaths, in the Philippines for all age groups), more than a third (35.6%) were children under 14 years (3.2 % or 1 in 30 deaths among children 0-14 years).

Mortality is highest among children ages 1-4 years [Mortality rate (MR) = 6.4 per 100,000 for both sexes] (5% or 1 in 20 deaths among children 1-4 years). Compared to other age groups, their drowning mortality rate is 1.7 times that of the general population [MR = 3.8 per 100,000], and 3.0 times more than cumulative adult (>24 years) drowning rates [MR = 2.1 per 100,000] (Figure 2). In more practical terms, a toddler is thrice as likely to die from drowning compared to an adult.

The cumulative drowning mortality rates for children under five years of age is at 5.5 per 100,000, while for those

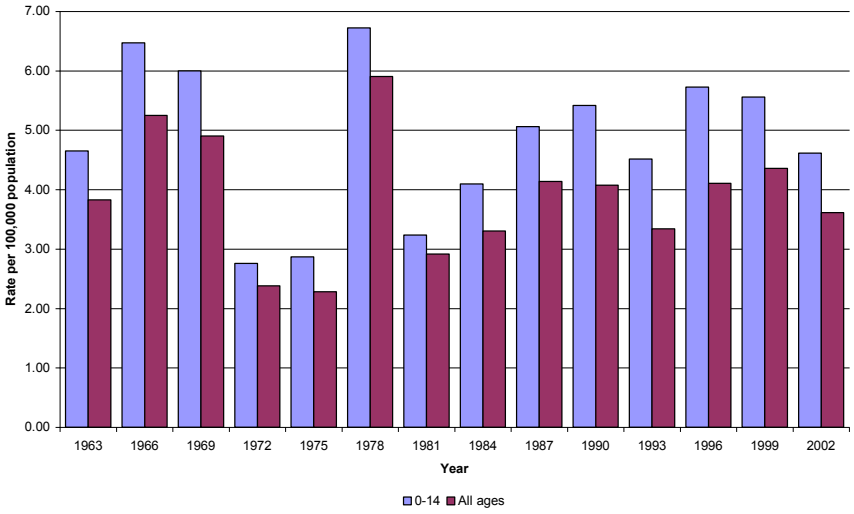

Figure 1. Fatal drowning rates per 100,000 population by age and three-year intervals (Philippines, 1963-2003)

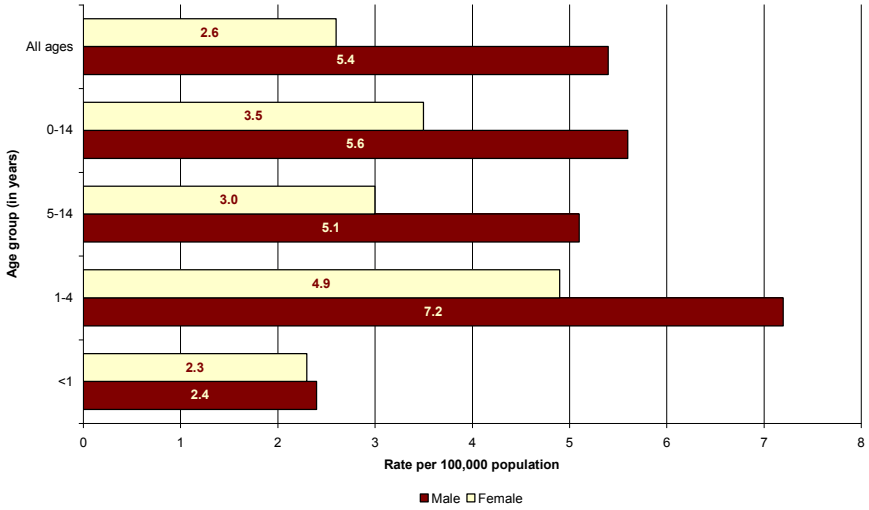

Figure 2. Fatal drowning rates per 100,000 children, age 0-14, by age group and gender, (Philippines, 1963-2003)

under 15 years, it is 4.8 per 100,000, or an annual drowning death toll of approximately 500 children under five years and 1,300 children under 15 years. Fatal drowning rates are higher among males under five years [Relative risk (RR) = 1.4] and among those under 15 years [RR = 3.5] compared to females of the same ages. This gender difference is largest for male toddlers whose relative risk for drowning death is 1.5 times that of female toddlers.

Philippine National Injury Survey, 2003 (Table 1). Among the different causes of injury, drowning, together with traffic injury, was a leading cause of mortality for all children under 18 years [MR = 9.4 per 100,000]. Specifically, drowning was a leading cause of death from injury for children ages 1-4 and 10-14 years.

Drowning rates were highest among boys and girls less than five years compared to other age groups [MR = 27.1 per 100,000], and among females when compared to males for all age groups [MR = 12.4 and 7.1 per 100,000 population, respectively].

When compared with other causes of injury considered in the survey (i.e. road traffic injuries, burns, falls and poisoning), however, drowning registered the least non-fatal outcomes (missed work or school, or sought treatment [Severity Rate (SR) = 12.8 per 100,000], hospitalization for nine days or less [SR = 6.3 per 100,000] and hospitalization for more than 10 days [SR = 6.8 per 100,000]).

The rates of drowning in children under five years and under 15 are higher when compared with adult drowning rates [RR = 2.6 and 2.3, respectively]. The rates are also higher for children if comparison with adults is made by gender.

Results are consistent with the established pattern of injury among children noted by Peden et al in which drowning constituted the leading cause of injury-related mortality among children ages 1-4 and 5-9 years, and among boys across all pediatric age groups, particularly in low-and middle-income countries.[3]

Of greatest notice is the fact that the PNIS reports drowning death rates that are 4.5 times those recorded in national health statistics.

Despite the methodological differences in data collection employed in obtaining the data sets presented, certain generalities become apparent.

First, drowning is a significant and unrecognized leading cause of mortality among Filipino children, particularly for those 1-4 years old, contributing to 5% of all causes of death (1 in 20 deaths among Filipino toddlers) and 42.8% of all deaths due to injury among this age group.

If tabulated with the leading causes of mortality for children ages 1-4 years[5] (Table 2), drowning is the 6th leading cause of death, outranking malignant neoplasms [4.88 per 100,000], meningitis [4.67], septicemia [4.54], chronic obstructive pulmonary disease and allied conditions [4.43], and other cases of protein-calorie malnutrition [4.38] (6th to 10th leading cause of morality for this age group); it will even outrank diarrhea [16.14] and measles [11.50] if PNIS rates are used.

For children ages 5-9, on the other hand, drowning is the 3rd leading cause of death, outranking malignant neoplasms [3.97], congenital anomalies [2.85], diarrheas and gastroenteritis of presumed infectious origin [2.19], other diseases of the nervous system [2.15], meningitis [2.14],

Table 1. Child mortality and injury: Summary of the Philippine National Injury Survey, 2003[1].

a. Unintentional injury mortality rates per 100,000 population, by cause, age group and sex

Cause	Boys (age in years)						Girls (age in years)					
	<1	1-4	5-9	10-14	15-17	Under 18	<1	1-4	5-9	10-14	15-17	Under 18
All unintentional	*227.4*	*74.7*	*33.8*	*40.3*	*35.2*	**57.2**	*250.8*	*81.5*	*11.4*	*30.5*	*20.7*	**49.5**
Road traffic injuries		6.8	23.6	15.1	13.2	**15.3**			5.7			
Burns	41.4					**2.4**		9.1			6.9	**5.5**
Drowning		27.2		10.1	4.4	**7.1**		27.2		12.2	6.9	**12.4**
Falls		6.8	3.4	5.1		**3.5**						
Poisoning		6.8			4.4	**2.4**						
Suffocation	164.5					**9.4**	188.1			6.1		**9.2**
Other unintentional		27.2	6.8	5.1	17.6	**17.2**	62.7	45.3	5.7	12.2	6.9	**32.4**

b. Severity rate (per 100 000 children) for unintentional injuries in children aged 0–17 years, both sexes

	Road traffic injuries	*Drowning*	*Burns*	*Falls*	*Poisoning*	*Other unintentional*
Missed work, school or sought treatment	216.8	12.8	438.8	210.9	26.4	
Hospitalization < 10 days	98.6	6.3	368.2	92.3	26.9	
Hospitalization ≥ 10 days	39.4	6.8	23.2	52.7		
Permanent disability	72.2		52.3	65.9		
Death	9.4	9.4	3.6	2.2	1.5	33.3

[1] *Adapted from Innocenti Working Papers: Child mortality and Injury in Asia. Florence, Italy: United Nations Children's Fund; 2004 and Peden M, Oyegbite K, Ozanne-Smith J, Hyder AA et al (eds.). (2008). World report on child injury prevention. Geneva: World Health Organization.*

diseases of the heart [1.87], tuberculosis [1.55], and septicemia [1.41] (3rd to 10th leading cause of mortality for this age group).

Table 2. Leading causes of child mortality (per 100,000 population) by age group (Philippines, 2000)[2]

a. 1-4 years

Cause	*Rate*
Pneumonia	37.76
Accidents[3]	17.36
Diarrheas	16.14
Measles	11.5
Congenital abnormalities	9.01
Drowning	**7.55**
Malignant neoplasm	4.88
Meningitis	4.67
Septicemia	4.54
Chronic obstructive pulmonary disease	4.43
Other protein-calorie malnutrition	4.38

b. 5-9 years

Cause	*Rate*
Accidents[4]	17.82
Pneumonia	7.03
Drowning	**5.84**
Malignant neoplasm	3.97
Congenital abnormalities	2.85
Diarrheas	2.19
Other diseases of the nervous system	2.15
Meningitis	2.14
Diseases of the heart	1.87
Tuberculosis, all forms	1.55
Septicemia	1.41

c. 10-14 years

Cause	*Rate*
Accidents[5]	15.88
Drowning	**5.01**
Malignant neoplasm	4.58
Pneumonia	4.33
Diseases of the heart	4.14
Congenital abnormalities	2.09
Tuberculosis, all forms	2.01
Other diseases of the nervous system	1.92
Meningitis	1.92
Nephritis	1.59
Septicemia	1.28

[2]Mortality rates based on the Philippine Health Statistics, 2000. Corresponding mortality rates for drowning added, as reported by the National Epidemiology Center, 2000.

[3] "Accidents" refers to all external causes of injuries. If disaggregated according to type of injury, drowning will be the 5th leading cause of mortality for this age group.

[4]If disaggregated according to type of injury, drowning will be the 2nd leading cause of mortality for this age group, followed closely by road traffic injuries [MR = 5.35].

[5]If disaggregated according to type of injury, drowning will be the leading cause of mortality for this age group. Road traffic injuries [MR = 3.81], another type of accident, will be the fifth leading cause of mortality.

Drowning is the second leading cause of death among children 10-14, outranking malignant neoplasms [4.58], diseases of the heart [4.33], pneumonia [4.14], congenital anomalies [2.09], tuberculosis [2.01], other diseases of the nervous system [1.92], meningitis [1.92], nephritis [1.59], and septicemia [1.28].

Second, lethality from drowning appears to be quite high, as was reported by Arcadio et al,[6] and as can be inferred from the low levels of non-fatal outcomes reported for drowning compared to other causes of injury reported in the Philippine National Injury Survey.

Finally, through the study period, 1963-2003, drowning mortality rates have remained largely unchanged, in the absolute, while their proportionate mortality has increased by 30%, belying its under recognition as a public health priority and the dearth of drowning prevention programs [MR_{1963} = 3.83 per 100,000; MR_{2003} = 3.48 per 100,000] (Figure 3 and Figure 4).

The information presented above, however, constitute only cases of reported fatal drowning, hence, these figures are to be taken as **the minimum drowning rates** for the Philippines, as there is a high likelihood that cases of unreported drowning injury-related deaths (e.g. instantaneous death from drowning immediately buried and not brought to the hospital, deaths from maritime disasters where bodies are not retrieved), morbidity arising from drowning injury, and drowning incidents without resulting injury are not adequately reported and recorded.[11,12] Taking cue from the PNIS, where reports of drowning injury incidents were actively solicited, the rate of underreporting could be as much as 70%.

Furthermore, there is also a paucity of local data on the circumstances surrounding drowning incidents, precluding identification of determinants (e.g. location of drowning, association of drowning to flooding or maritime disasters, etc) of drowning-related deaths among children in the Philippines, and consequently, the design of policies to address the burden of drowning in the country. More specifically, current practices of surveillance fail to yield answers to the following questions:

- Where do drowning injuries more commonly take place: in natural bodies of water, in pools, in the home (bathtub, pail, well, etc)?
- What are the circumstances surrounding the drowning injury: was there adult supervision, does the child know how to swim, etc?
- Was there adequate response from a knowledgeable lay person or medical professional after the drowning incident, i.e. resuscitative efforts, victim brought to hospital?

The World Health Organization *Injury Surveillance Guidelines* recommends core and supplementary data to be collected for injuries, which are deemed useful for, and relevant to, injury surveillance purposes.[13] These are further

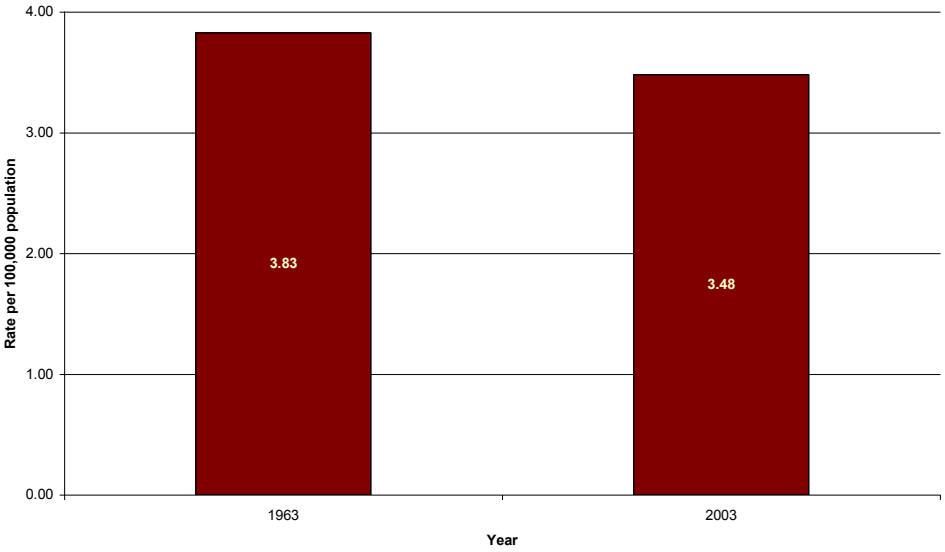

Figure 3. Comparison of fatal drowning rates per 100,000 population, all ages, 1963-2003 (Philippines)

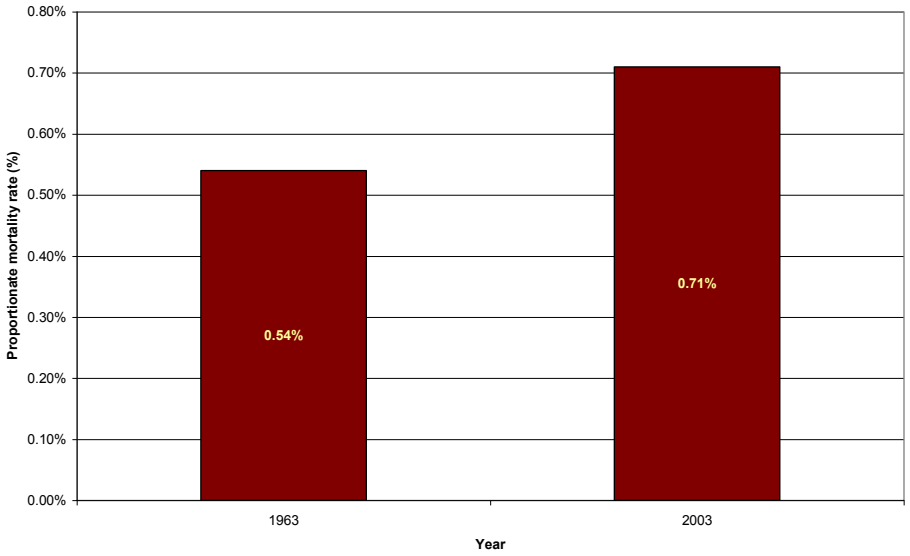

Figure 4. Comparison of proportionate mortality rates from drowning, all ages, 1963-2003 (Philippines)

divided into minimum and optional data sets, depending on the needs of the system. Core minimum data set includes identifier, age, sex, intent, place of occurrence, activity, nature of injury and mechanism of injury, while core optional data may include date and time of injury, residence, alcohol or psychoactive substance use, severity, and disposition. This model can be used as basis for a drowning surveillance program in the Philippines, and it is hoped that it will be incorporated into the National Electronic Injury Surveillance System (NEISS) being pilot tested by the DOH.[14]

While the global experience on drowning injury, as published in the *World Report on Child Injury Prevention*, provides some insights on the determinants of drowning injury, and experiences and interventions from other countries exist, there is a need to tailor such preventive measures to local context and circumstances since "proven interventions from developed countries may not be readily transferable" because of difference of pattern or cause of injury.[3]

The reported drowning injury-related deaths in the World Health Statistics Annual reviewed for this paper presented aggregate sums for the ages 15-24 years. The initial intention of this paper was to present drowning data for all children, children constituting those who are under 18 years of age as defined in the Convention on the Rights of a

Child in 1989. However, as noted by Peden et al, "there is no universally agreed age range for what constitutes childhood" hence "it has not always been possible to reflect [the WHO] age cut-off in analysing data."[3] This paper, is, therefore, constrained to limit its analysis on drowning epidemiology in children less than 15 years of age. Furthermore, Jumangit et al, in their review of pediatric trauma admissions in a tertiary care facility in the Philippines, noted that the pattern of injury for children ages 15 to 19 closely approximates that of young adults age 20 to 24 years, hence these two groups should be considered together in the analysis of risk factors and formulation of interventions.[15]

The PNIS also did not report any relevant drowning mortality among children, of either sex, under age 1 year and between ages 5-9 years, raising the question of whether this reflects either a) non-occurrence or b) non-reporting of drowning-related deaths for these age groups, both of which have extensive repercussions for formulation of conclusions from the results of the survey. The PNIS, however, still remains to be the first attempt to present a picture of drowning injury epidemiology gathered at the community level, and as was noted by Linnan, "current national information systems are mainly hospital and clinic-based and they grossly underestimate the true burden of injury, especially in children."[11]

These limitations of currently available data highlight the need for better classification, surveillance and recording of epidemiologic parameters of drowning, in particular, and injuries, in general. Each and every drowning incident must be reported within a context of a drowning surveillance program, akin to the way communicable diseases are reported and recorded. Surveillance and prevention programs must extend to, and involve, government, schools, clinics, hospitals, recreational bathing facilities, and community-based injury-prevention advocates from both the private and public sectors, and form the national and local levels. From these efforts, the evidence that will guide policy formulation for the prevention and treatment of drowning in the Philippines will arise.

The urgency for action cannot be more pronounced at this juncture when the Philippines is assessing its achievements with respect to the goal spelled out in the National Objectives for Health of reducing mortality from accidents and injuries by 2010, and the country's commitment to Millennium Development Goal 4 of reducing child mortality by two-thirds by 2015.[16] While current priority interventions for bringing about a reduction in child mortality in the country are focused on areas of immunization, management of common illnesses, nutrition, and water, sanitation and hygiene,[17] this paper has shown that a significant proportion of mortality for Filipino children ages 1-4 years old is attributable to drowning. Consequently, implementing a drowning prevention program resulting to a 50% reduction in under-five deaths due to drowning would translate to 250 lives saved annually, bringing us closer to achieving the MDG's. Honoring our commitment to social justice and human development – the essence of the Millennium Development Goals – would mean confronting drowning as a real epidemic here and now.

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