Chapter 1

Introduction

1.1 Background and rationale

Drowning is one of the most common causes of unintentional injury deaths. It makes the 3rd leading cause of unintentional injury death globally after road traffic injuries and falls in 2004 (WHO, 2010a). Result of drowning contributes to disability or premature death in many countries (Lunetta et al, 2004a). In 2004, estimated almost 388,000 people died from drowning worldwide with 6.2 per 100,000 population or accounted for 7% of all injury related death (WHO, 2010b). The majority of drowning deaths occurred in low- and middle-income countries especially in the African, Western Pacific and South East Asia regions (International Life Saving Federation, 2007a). Drowning affects all age groups but more than half of the global death occurs among children aged less than 15 years (Peden et al, 2002a; Fang et al, 2007a; Rahman et al, 2009a). Among the various age groups, children under five years of age have the highest drowning mortality rates worldwide (Hyder et al, 2003a; Pan et al, 2006a; Hyder et al, 2008a). Most of drowning death occurs among males which higher drowning mortality rates than females of all ages and in all regions (Lunetta et al, 2002a; Sures Kumar Shetty and Shetty, 2007a; Nasrullah and Muazzam, 2010a). Drowning is also more common during the weekend (Salomez and Vincent, 2004a).

Most of developed countries, drowning death has a decreasing trend (Cumming and Quan, 1999; Lunetta et al, 2004b; Celis et al, 2008a) whereas the increasing trend occur in the developing countries (Peden et al, 2002b; Sures Kumar Shetty and

Shetty, 2007b; Kiakalayeh et al, 2008a). A study of drowning death in 69 countries reported that the first five countries with the drowning death rates were Lithuania, Latvia, Thailand, Republic of Moldova and Kyrgyzstan accounted for 9.8, 6.9, 7.1, 6.9 and 5.4, respectively (Lu et al, 2010a).

Thailand is one of the developing countries in the South East Asia Region that drowning had the important cause of public health problem. Drowning is the first five leading cause of deaths from injuries for all age group (Bureau of Non Communicable Disease, 2008). In 2009, the Bureau of policy and strategy (2009) reported that 4,090 people drowned accounted for 6.4 per 100,000 population. Drowning death rate in males was four times higher than that in females (10.2 in males and 2.8 in female per 100,000 population). Plitponkarnpim et al (1999a) reported that drowning death in Thai children aged less than 15 years was two-third of all injuries and was the 3rd leading causes of death in year 2005 (Porapakkham et al, 2010a). The trend of drowning death among Thai children has continuously increased yearly especially at the end of school semester. However, the trend of drowning death decreased in teenager (Gerdmongkolgan et al, 2009a). The majority of drowning deaths in Thailand occur in natural water bodies such as rivers, ponds, ditches and lakes (Laosee et al, 2007a).

Many past studies (Yang et al, 2005a; Laosee et al, 2007b; Fang et al, 2007b) had focused on drowning among children aged less than 15 years due to this group had the highest risk of drowning. In Thailand, The Ministry of Public Health had first initiated Child Drowning Prevention Day on 6th March 2010 and later has changed to every first Saturday of March (Bureau of Information, 2010). However, there are few studies in Thailand considered drowning death in every age group. This study in all

age groups will provide better information on burden of drowning death. The finding of this study will assist in better understanding trend and provide useful information for health planning to prevent death from drowning in Thailand.

1.2 Objectives

The objectives of this study are as follows.

1.2.1 To investigate the distribution of drowning death rates in each demographic factor in Thailand.

1.2.2 To develop statistical model for estimating drowning death rates in Thailand.

1.3 Expected advantages

1.3.1 Description of pattern of drowning death in Thailand is performed.

1.3.2 Statistical model for estimating drowning death rates in Thailand is obtained.

13.3 The results of this study will assist in better understanding of drowning trends and provide useful information for health planning to reduce drowning deaths in Thailand.

1.4 Literature reviews

Gender of drowning deaths

Worldwide, males are significantly more likely to die from drowning than females (International Life Saving Federation, 2007b). The overall drowning death rates for males were a magnitude ranging from 2 to 5 times higher than that for females in China (Yang et al, 2005b), from 2 to 20 times higher in Iran (Sheikhazadi and Ghadyani, 2009a), 6.6 times higher in United States (Browne et al, 2003a) and estimated 6 times higher in Denmark (Steensberg, 1998a). In Thailand from 1999-2008, Gerdmongkolgan et al (2009b) reported that males aged 1-9 years had higher drowning mortality rates than females.

Age group of drowning deaths

Age group is the risk factor with related to drowning death rates in many countries. The highest drowning death rate was found in children less than 5 years (Pan et al, 2006b). In Thailand, most of drowning mortality rates was in age group of 1-4 years accounted for 45.5 per 100,000 population (Laosee et al., 2007c). Gerdmongkolgan et al (2009c) reported that in year 2007 drowning death rate per 100,000 population in Thailand was highest among children aged 1-4 years followed by aged 5-9 years and 10-14 years accounted for 12.0, 11.6 and 5.3, respectively. In China in year 2006, Hu et al (2010a) found that the drowning death rate was highest among boy aged 1-4 years. In New Zealand 1980-1994, aged 0-4 and 15-24 years had the highest drowning death rates (Langley et al, 2001a). In contrast, drowning death rate in many countries was found in other age groups such as; in Xiamen city China between 2001

and 2005, found that the highest proportion of drowning death was in aged 5-9 years and 10-14 years (Fang et al., 2007c). In Iran, Sheikhazadi and Ghadyani (2009b) reported that the highest incidence rate of drowning death was in aged 15-24 years accounted for 3.0 per 100,000 population followed by aged 5-14 years and under 5 years with the equal rates of 1.8 per 100,000 population.

Places of drowning deaths

Drowning occurs from a wide variety of activities depending on the countries. Young children 0-4 years of age generally drown in bathtubs, wells, swimming pools and open water close to the home (Quan and Cummings, 2003a; Nakahara et al, 2004a). In the age group of teenagers and adults deaths were in natural waters such as rivers, ponds and cisterns (Ma et al, 2010a).

Trend of drowning deaths

Decreasing trend of drowning death was found in many countries. In United States, drowning death rate of 21 year periods in 1975 to 1995 declined by 59% (Cummings and Quan, 1999a). Nasrullah and Muazzam (2010b) reported that trend of drowning death rate increased 1.4% in 1999 and 2006. However, the overall death rate for the whole period decreased by 5%. In Finland, Lunetta et al (2004c) studied the trends of drowning death from 1970 to 2000 and found that drowning death rates decreased similar in both male (-2.86% per year) and female (-2.70% per year). In Mexico, drowning death rates in 1979-2005 decreased 65.31% (from 6.58 in 1979-1981 to 2.28 in 2003-2005 per 100,000 inhabitants) for all age groups (Celis et al., 2008b). In contrast, increasing trend of drowning death was found in Bangladesh (Ahmed et al,

1999a), China (Yang et al, 2005c), and Iran (Kiakalayeh et al, 2008b). Ahmed et al (1999b) reported deaths due to drowning of child deaths had increased from about 10% in 1983-1984 to 30% in 1995.

Modeling

Many studies (Lindholm and Steensberg, 2000a; Bener et al, 2007a; Iqbal et al, 2007; Kiakalayeh et al, 2008c) had applied various statistical methods for modeling the effects of demographical and geographical factors on drowning death rate. Linear regression is commonly used for modeling death rates. In United States, Hu and Baker (2009) and Narullah and Muazzam (2010b) had used linear regression model to describe the trends in drowning mortality. The similar study was conducted in Taiwan (Lu et al, 1998).

Several studies had applied logistic regression for identifying factors associated with drowning deaths (Ahmed et al, 1999c; Yang et al, 2007; Ma et al, 2010b). However this model is suitable for binary outcome.

Poisson regression was also used in many studies (Lunetta et al, 2002b; Pan et al, 2006c; Mitchell et al, 2010a). Cummings and Quan (1999b) had used Poisson regression to investigate the trends of unintentional drowning in the United States from 1975 through 1995. Lunetta et al (2004d) determined time trends of unintentional drowning in Finland from 1970-2000. In china, Yang et al (2005d), Fang et al (2007d) and Ma et al (2008a) used Poisson regression to identify risk factors and estimate the trend of drowning mortality. The outcome for all of these studies was the number of drowning deaths in a specific population or area. Only few studies applied negative binomial model for drowning death data. This model, an

alternative to Poisson model, is used to account for over dispersion, which is often encountered in many real situations with count outcome.