



## Firearm-related deaths in Phitsanulok, Lower Northern Thailand

### from year 2007 to 2013: A retrospective study

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#### Abstract

**Background:** The firearm-related deaths are commonly found in forensic pathology and it is a major public health problem in the world. In Thailand, the number of gun possessed by civilians is highest in ASEAN and at eleventh in world rankings.

**Objective:** This retrospective study show aimed to examine the parameters of firearm-related deaths in lower northern Thailand investigated by the Forensic Medicine Department of Naresuan University, Phitsanulok from year 2007 to 2013 and to compare the result with those from other centers including central Bangkok and international context.

**Method:** The data of firearm-related deaths are collected from autopsy reports in Forensic Medicine Department of Naresuan University, Phitsanulok from year 2007 to 2013.

**Results:** The total firearm-related deaths comprise of 20.3% (320 cases) of total 1,580 forensic autopsy cases. The most common manners of death are homicide (92.8%), followed by suicides (5.3%), and accidental deaths (1.9%). The male to female ratio is 8.3:1, with age groups of 21–30 years in the cases of homicides and 41–50 years old in the cases of suicides. The youngest victim is 4 years and the oldest is 73 years old. The weapons of choice in crime are handguns, followed by shotgun. Outdoor incidence is most common scene of homicide and private homes are the most places in committing suicide. There is no specific site of injuries in homicide cases, while the most commonly found in suicide cases is head. Multiple entry wounds at chest are found in one case of suicide.

**Conclusion:** The annual incidence of firearm-related death in lower northern Thailand show a steady increase ever since 2007, reaching 10 times in 2013. This study reveals that a number of entrance wounds and ranges of fire are related to the manner of death.

The most common manner of deaths is homicide. Comparing the results of this study with those emerging from comparable studies conducted in other countries and in Central Bangkok reveals many parameters are similar such as male gender, young age group, and weapon of choice is handgun etc., but incidence rate of firearm-related death and homicide in lower northern Thailand are higher than in central Bangkok.

**Keywords:** Firearm-related death, Handgun, Shotgun, Homicide, Suicide, Forensic Medicine, Lower northern Thailand

#### Introduction

Firearm-related deaths and injuries are a major global public health problem that requires diligent and persistent attention. Every day, firearms or guns are deployed to kill as many as a thousand people (IANSAs, 2006). In different countries, the prevalence of this cause of death may vary greatly based on differences among local regulatory approaches, mainly because the firearms are easily

accessible in the context of social and cultural backgrounds and political conflicts (Myint, Rerkamnuaychoke, Peonim, Riengrojpitak, & Worasuwannarak, 2014). In Thailand, the numbers of guns possessed by civilians being estimated at 15.6 per 100,000 people, which is the highest in ASEAN and at the eleventh in world rankings for number of gun possessed (Karp, 2007). Out of these 10,000,000 guns, only 3,870,000 of them are registered, leaving over 6,000,000 are under illegal



possession (Alpers & Marcus, 2015). These guns are commonly used in criminal case. Some studies in Thailand of various methods of homicide cases reveal that homicide by firearm is the most common method used by both genders (Pattarapanitchai, Tiensuwan, & Riengrojpitak, 2010). According to Gunpolicy.org website, the annual rate of all gun deaths and rate of firearm homicide in Thailand is 4.12 and 3.48 per 100,000 populations, respectively (Alpers & Marcus, 2015).

The studies of firearm injuries have been reported in various countries (Amiri, Sanaei-Zadeh, TowfighiZavarei, RezvaniArdestani, & Savoji, 2003; Azmak, Altun, Bilgi, & Yilmaz, 1998; Bahebeck, Atangana, Mboudou, Nonga, Sosso, & Malonga, 2005; Davies, Kerins, & Glucksman, 2011; Fedakar, Gündogmus, & Türkmen, 2007; Hagraş & Kharoshah, 2012; Karger, Billeb, Koops, & Brinkmann, 2002; Kumar, Sachan, & Verma, 2015; Molina & Di Maio, 2008; Potwary, 2005; Shield, Hunsaker, & Hunsaker, 2005; Solarino, Nicoletti, & Di Vella, 2003; Verzeletti, Astorri, & De Ferrari, 2009; WHO, 2015) including some other regions of Thailand (Myint et al., 2014), but the incidence and pattern of firearm-related deaths in lower northern Thailand have not been studied before. The purpose of this study is to investigate the numbers of characteristics of firearm-related deaths in lower northern region of Thailand. The autopsies performed and recorded by the Forensic medicine department of Naresuan University from 2007 to 2013. The statistical patterns of the results are compared with those cases in other nations and other regions of Thailand in order to understand the characteristics of firearm-related injuries and the differences between suicidal, homicidal, and accidental firearm-related deaths.

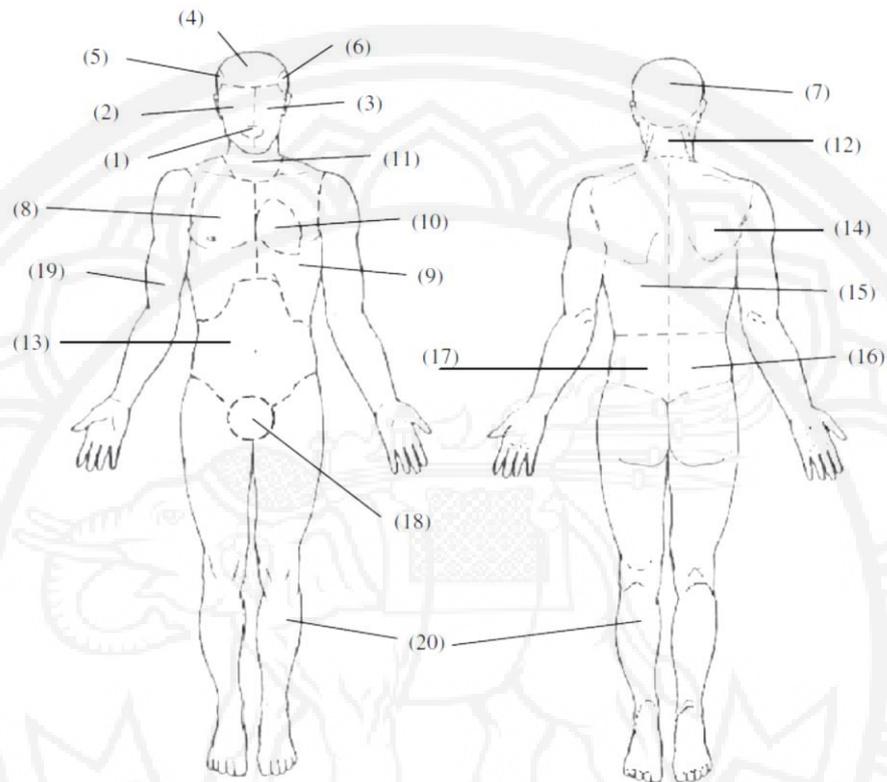
## Methods and Materials

During January 1, 2007 and December 31, 2013, the total numbers of 1580 post-mortem cases in lower northern Thailand (1426 autopsies and 154 external examinations) are examined by the Forensic Medicine Department of Naresuan University Hospital, leading to the identification of 320 firearm-related deaths (all cases autopsied), which accounted for 20.25 % of all post-mortem examinations. However explosion casualties are not included in this study. The information of these is retrieved by reviewing all pertinent documents and records used by the Department originally intended for statistical and epidemiological purposes. The following parameters are considered in the data analysis: month and year of fatal event; gender; age; province of death (Kamphaeng Phet, Phitsanulok, Nakornsawan, Phichit, Tak, Phetchaboon, Sukhothai, and Uthai Thani); scene of death; manner of death (suicide, homicide, and accident); type of firearm involved (gun, rifle, shotgun, others); numbers of gunshot wounds; site of entry wounds; and firing distance. However there are no data regarding exit wounds.

Determination of the manner of death is made by a forensic pathologist via integration of circumstantial evidence, testimony given by relatives, medical records, and police reports when available. The sites of entry of the projectiles are also analyzed by organizing a human model consisting of 20 superficial anatomy areas, in accordance with an approach adopted from several previous studies on this subject (Solomon, Burke, & Miguel, 2013). Thus, the head is divided into seven areas [mouth (1), right face (2), left face (3), forehead (4), left temple (5), right temple (6) and back of the head (7)]. The chest is divided into three areas [right anterior chest (8), left anterior chest (9) and



precordium (10)]. The other sites are: the neck (11), the nape (12), the abdomen (13), the right posterior chest (14), the left posterior chest (15), the right lumbar area (16), the left lumbar area (17), the genitals (18), and, finally, the superior (19) and inferior (20) limbs (Figure 1).



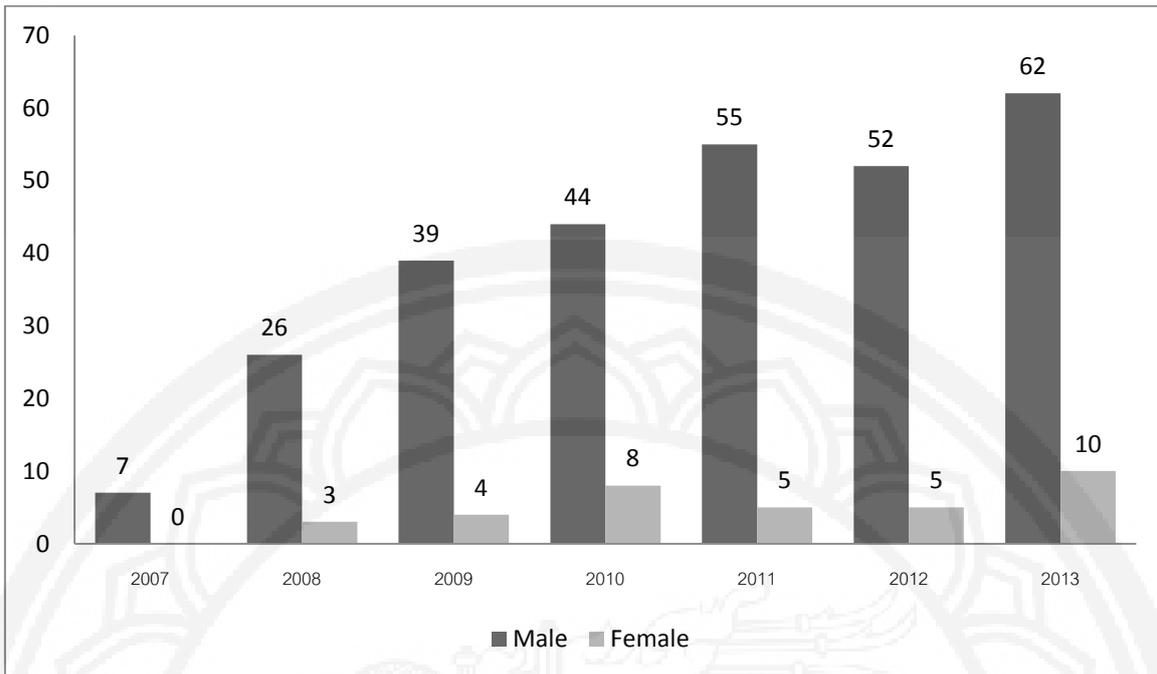
**Figure 1** Distribution of entry wounds: (1) mouth; (2) right face; (3) left face; (4) forehead; (5) right temple; (6) left temple; (7) Back of head; (8) right anterior chest; (9) left anterior chest; (10) Precordium; (11) neck; (12) nape; (13) abdomen; (14) right posterior chest; (15) left posterior chest; (16) right lumbar; (17) left lumbar; (18) genitals; (19) upper limbs; (20) lower limbs

## Results

### Demographic data

The total numbers of firearm-related deaths studies (320) represent 20.25% of all 1580 post-mortem examination performed over a 7-year period. The annual incidence of firearm-related death in

lower northern Thailand show a steady increase ever since 2007 (7 cases), reaching 10 times in 2013 (72 cases per year) (Figure 2). The highest numbers of victims of firearm are in Nakornsawan province (35.9%) and the average age is 29.22 years (29.36 for males and 28.08 for females), the most common manner of death is homicide (93.9%).



**Figure 2** Annual number of fatal firearm victims according to gender at the Forensic Medicine Department of Naresuan University Hospital (Thailand) 2007-2013

On average, most acts of 17 suicide cases take place in rainy seasons (47.1%) and cold seasons (29.4%), especially in August (4 cases), follow by October and November (3 cases, each). In homicide cases, most of incidents occur in summer (38.7 %) follow by the rainy seasons (31.7 %). The peak of homicide incidence is found on June (11.1%) whereas the least act of homicide (4 %) is found in January.

**Manners of death**

The total number of homicide cases are 297, accounting for 92.8% of all firearm deaths. The male victims account for 89.56 % (n=266) while female victims account for 10.44 % (n=31). There are 17 suicidal cases, representing 5.3% of all firearm-related deaths; 15 are males (88.24%), and two females. Only 1.9% could be classified as accident (Table 1).

**Table 1** Classification of all victims by sex and manner of death

Manner of death	Homicides	Suicides	Accidental
Females	31 (10.4%)	2 (11.76%)	2 (33.3%)
Males	266 (89.6%)	15 (88.24%)	4 (66.7%)
Total	297	17	6

In all of 297 homicide victims, 16 cases (5.4%) are dead while in extrajudicial killing by police officers. In these 16 cases, 15 are male (93.3%) and only 1 female. The most cases of dead while in extrajudicial killing by police officers is found in

Nakornsawan province (25 %) and Phetchaboon (18.75%) respectively, except there are no in-extrajudicial killing victims found in Sukhothai. All of in-extrajudicial killing victim are related to illegal drugs dealers.



### Gender and age of victims

Most of the victims (89.1%) are male, while only 35 (10.9%) are female; the male to female ratio is 8.2:1. The mean age of homicide deaths is found to be 34.4 years (34.8 years for males and 31 years for females). The youngest homicidal victim is 4 years old and the oldest is 73 years old. By contrast, the mean age of suicide victims is 51.7 years (50 years for male and 43 years for female).

The age ranges of victims are 41 to 70 years.

There are 6 accidental firearm deaths; the victims are 4 males and 2 females with mean age of 43 years. The age distribution of victims by manner is illustrated in (Table 2). The youngest victim is a 4 years old female who is murdered in her house. There are 2 male victims with the oldest age of 73 years; the first case has committed suicide by shotgun in his mouth and the second case is murder by a handgun with multiple gunshot wounds at chest, abdomen and upper extremities.

**Table 2** Classification of all victims by age

	Age								Total
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	>70	
Suicide	0	0	1	2	7	2	4	1	17
Homicide	3	55	85	48	57	40	8	1	297
Accidental	0	0	1	2	0	2	1	0	6

### Scene of death

Most scenes of deaths in homicide occur in an open-air (63.6%). The majority of suicidal death occurs in private home (66.67% in male and 100% in female), while 23.5% of suicide occur in an open-air scene and 5.9% takes place in the passenger compartment of motor vehicle. All suicidal victims in outdoor scene act in private properties with inactive activity; such as around their own house or in the woods, except one case which occurs in the temple in front of the image of Buddha.

### Types of firearms

In all groups, handguns are the most frequently used weapon. Results of analysis are shown in (Table 3). All homicide victims, 52.8% died by handgun, 45.9 % by shotgun, and 0.7% by assault rifle. In male suicides, 66.7 % of victims killed themselves using a handgun, 26.7% by a shotgun, and 6.6% by assault rifle. The sole female suicide used a handgun. The uses of mixed weapons accounted for 6 cases (1.875%); the most frequently used together were handgun with shotgun (83.3%).

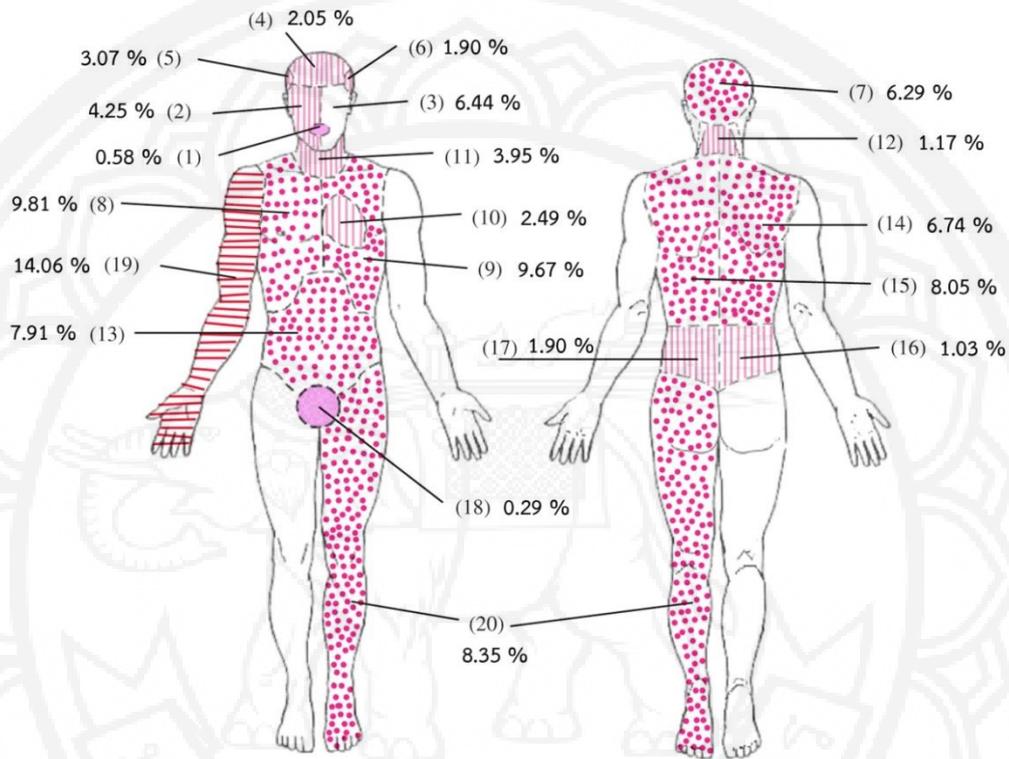
**Table 3** Firearm type

	Homicides	Suicides	Accidental
Handgun	160	12	2
Shotgun	139	4	4
Assaults rifle	2	1	0
Unknown	2	0	0

**Sites of injury and numbers of gunshots**

The examinations of 320 corpses reveal the presence of a total of 712 entry wounds. Based on their general topographical distribution in homicide victims; the head accounted for 24.6% of wounds,

the chest for 21.9% and the back of the trunk for 17.7%. A high percentage of upper and lower limbs injuries (21.4%) are associated with other lethal firearm wound (Figure 3).



**Figure 3** Homicides: distribution of entry wounds (for detail, see Figure 1)

An overview of entrance wound distributions on victim's bodies reveals head (26.1%), chest (21.9%) and limbs (21.8%). A detailed study of entrance wounds in the head identifies that the mouth (50%) is the most common site of injuries in suicides, followed by right temple (27.8 %) and the

left temple (5.5 %) respectively. The precordium is the most commonly involved area in the suicide group with thoracic wounds (16.7 %) (Figure 4), whereas in accidental deaths it is the head, left chest and limbs (Figure 5).

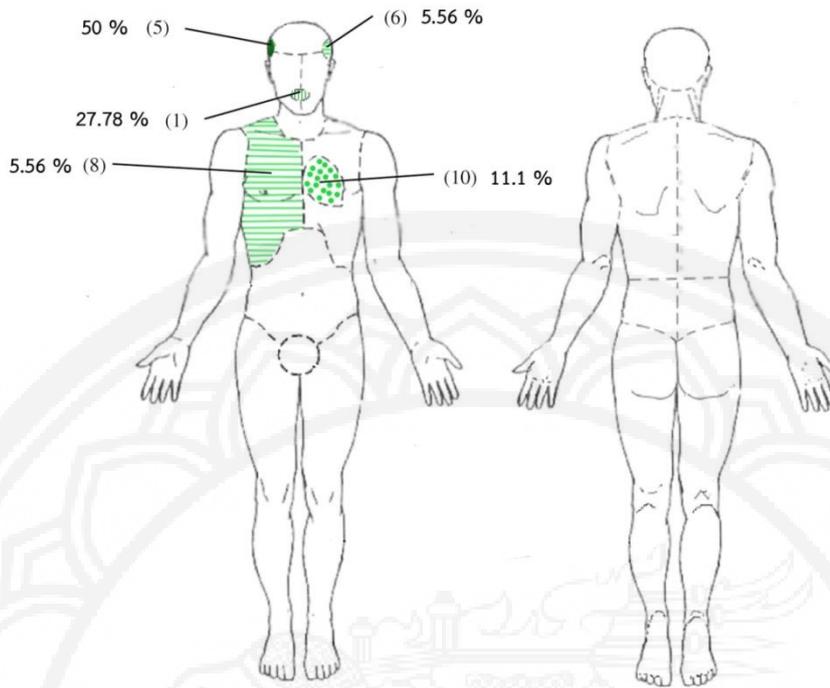


Figure 4 Suicides: distribution of entry wounds (for detail, see Figure 1)

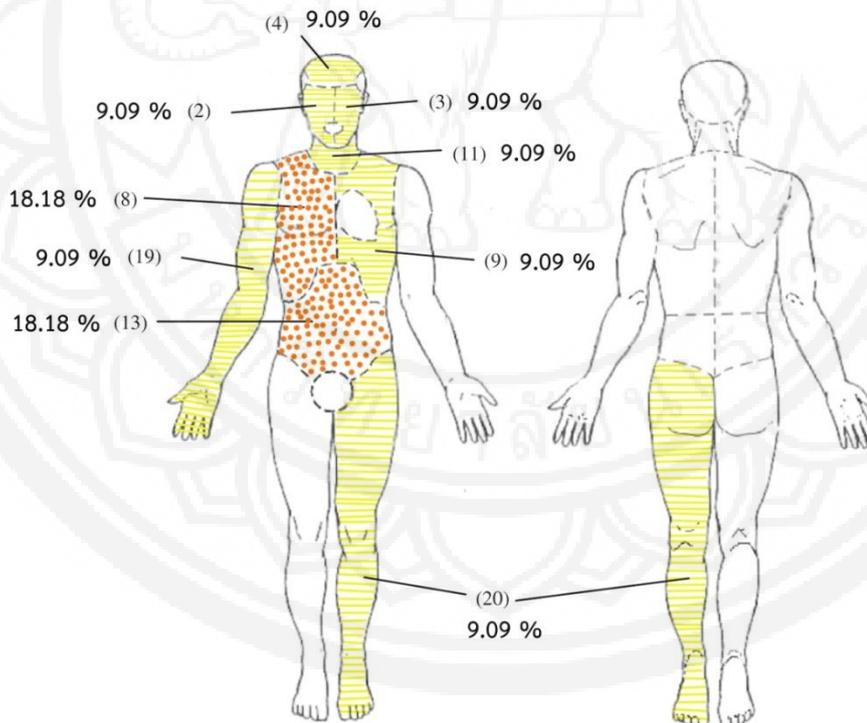


Figure 5 Accidental deaths: distribution of entry wounds (for detail, see Figure 1)

A single gunshot wound is commonly seen in this study (173 cases, 54.06%), so in suicide (94.1%) then in homicide (51.2%) (Table 4). Interestingly,

one female suicide victim (5.9%) shot herself twice at her precordium.

**Table 4** Number of entrance wound in fatalities analysis

Number of entrance wound	Homicides	Suicides	Accidental
1	152	16	5
2	60	1	1
3	30	0	0
4	24	0	0
5	14	0	0
6	6	0	0
7-10	5	0	0
11-16	6	0	0
	297	17	6

**Range of fire**

An overview of range of fire as causes of death on victim bodies shows that the long-range is the main firing range (86.1 %) followed by contact-range (7.6%) and short-range (6.3%). A detailed study of contact-range of fire confirms a 100 % cause of death while only 5 % found in homicide cases.

**Discussion****Lower northern Thailand and the central Bangkok context**

A comparison is drawn between the data collected

from this study and those conducted in central Bangkok (Myint et al., 2014) (Table 5). The overall incidence of firearm-related deaths recorded by the present study is 20.3 % more different from the report by the Autopsy unit, Faculty of Medicine Ramathibodi Hospital from the 2002 to 2011 period (2.1% of all postmortem examination). For the manners of death, homicide is the main cause of firearm-related deaths in both lower northern region of Thailand and central Bangkok, but the number of homicide in lower northern region is higher (92.8%) than central Bangkok (77%), whereas incidence of suicide in lower northern region is lower (5.3%) than central Bangkok (21.5%).

**Table 5** Comparison between the 2007-2013 in Lower northern Thailand and 2002-2011 in central Bangkok, Thailand

	Lower northern Thailand	Central Bangkok, Thailand
No. of Firearm victim <sup>a</sup>	20.25 %	2.1 %
Homicides	92.8 %	77.0%
Suicides	5.3 %	21.5 %
Accidentals	1.9 %	0.7%
Victim's gender; male to female	8.2 : 1	10.5 : 1
Most prevalent age range	21-30	21-30
Type of weapons	Handgun 54.3%	Bullet 86.8 %
Most common entry wound site (suicide)	Head/Face 26.1%	Head/Face 90.6 %
Number of entrance wound (homicide)	Single wound 51.2 %	Single wound 79.7 %
Number of entrance wound (suicide)	Single wound 94.1%	Single wound 87.5 %
Range (homicide)	Distance 87.4 %	Distance 95.4 %
Range (suicide)	Contact 100%	Contact 100 %
Place of incidence	Social activity/outdoor 90.2 %	Social activity/outdoor 65.1 %

<sup>a</sup> % of the total number of post-mortem examinations.



Nakornsawan, the biggest city in lower northern Thailand, showed distinctly highest rate of incidence of homicide by firearm (35%). While the highest rate of suicide by firearm is found in Phitsanulok. In both studies, most of victims are male in all manners of their death. The victim's gender, male to female ratio in lower northern region is lower (8.2:1) than central Bangkok (10.5:1). Most of victims accounted for by the studies in lower northern region and central Bangkok fall in between the 20 to 30 years age range, followed by 40 years and under 20 years age range in lower northern Thailand whereas in central Bangkok, it is 30 years and 40 years age range respectively.

For the suicidal cases, the data collected from this study highlight a notable predominance in the rainy month, as same as results as studies conducted in central Bangkok. But this study shows most of homicide cases occur in the summer (38.7%) which has different results from in central Bangkok. Studies in psychology document that high ambient temperatures affect human to exhibit aggressive or violent behavior toward others range from somewhat less consequential to much more serious (Solomon et al., 2013). The temperatures of lower north region in the summer are much warmer than other regions (Thaimeteopological department, 2016) therefore the aggressive behavior is easily provoked.

The studies in Thailand at hand, a handgun seems to be a weapon of choice both in homicide and suicide. This report showed the next choices to committed suicide weapons are shotgun and assaulted rifle, but the suicide cases in central Bangkok uses only handgun. In cases of suicide, most of entry wounds are on the head (lower northern region 83.3% and central Bangkok 90.6%), the right temple is the area of most frequent involvement, followed by the mouth (lower northern region: right temple 50 %, and mouth 27.8%). The ranges of fire

in all suicide cases in both studies reveal only contact range. The range of fire in both studies is associated with manners of death. In conclusion, the most places of suicide incidence occur in the open-air or social activity place, but the incidence in lower northern region was higher (90.2%) than central Bangkok (65.1%).

#### **Lower northern Thailand and the international context**

Comparing the results of this study with those emerging from comparable studies conducted in other countries, overall recurrences, all of the studies at hand seem to share the commonalities of male gender (Amiri et al., 2003; Bahebeck et al., 2005; Davies et al., 2011; Fedakar et al., 2007; Hagraş & Kharoshah, 2012; Kumar et al., 2015; Potwary, 2005; Solarino et al., 2003; Verzeletti et al., 2009; WHO, 2015), young age (Amiri et al., 2003; Bahebeck et al., 2005; Fedakar et al., 2007; Hagraş & Kharoshah, 2012; Kumar et al., 2015; Potwary, 2005; Solarino et al., 2003; Verzeletti et al., 2009; WHO, 2015). The high incidence rate of homicide by firearm are similar to others literatures (Amiri et al., 2003; Fedakar et al., 2007; Hagraş & Kharoshah, 2012; Kumar et al., 2015; Solarino et al., 2003; Verzeletti et al., 2009), but in some studies have showed suicide firearm-related death to be more common (Solarino et al., 2003). Body distribution of entrance wounds in this study does not reveal any particular pattern in homicide similar to other studies (Solarino et al., 2003). In case of suicide, the mainly specific region is head, the site of injuries are related with the gun types; most selected site of hand gun is temple and shotgun and assault rifle is mouth.

This study shows that all cases of suicide are shot by contact range, which consistent with other studies (Myint et al., 2014). Only 4.5 % of all non-suicide victims were shot by contact range (Kargar et al.,



2002). The present study also reveals the similar incidence of multiple gunshot wound in homicide cases (Myint et al., 2014). Only one suicide case in this study had multiple entry wound at the chest, consistent with previous data concerning suicide with multiple gunshot wound which is rare (Shields, Hunsaker, & Hunsaker, 2005).

#### Conclusion and Suggestion

The study concludes that homicide is the most common manner of death by firearm in lower northern Thailand. The majorities of the victims are identifiable male. The age group of 21–30 years is most affected. The most commonly targeted body part in homicide is not specific, but in suicide group is the head. Most weapon of choice in homicide is handgun. The single entry wound and contact range of fire are related to the suicide. The most common scene of death in suicide victim is at private home, but in homicide is outdoor and public area. The highest incidence of homicide by firearm is in Nakornsawan and most of suicidal cases are found in Phitsanulok.

The benefit from this study is to reflect that firearm-related death is the major problem in lower northern Thailand. It suggests that the legislation to control of the possession of firearms is likely to lower the death rate. This study is based on the information at Naresuan University Hospital Phitsanulok, one of two forensic autopsy centers in Lower northern Thailand. Further study is needed in order to gain closer representative figures of firearm-related death in the lower northern region.

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