FACTORS ASSOCIATED WITH MORTALITY FROM TERROR-RELATED INJURY IN SOUTHERN PROVINCES, THAILAND

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FACTORS ASSOCIATED WITH MORTALITY FROM TERROR-RELATED INJURY IN THE SOUTHERN PROVINCES, THAILAND

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ABSTRACT

In the past decade, there have been multiple incidents of terrorism in the southernmost provinces of Thailand, resulting in a large number of civilian injuries and deaths. It was not until 2007 that a Violence-Related Injury Surveillance (VIS) system was established. This system combines data on terror-related injuries from several sources.

Objectives: This study aimed to determine the incidence of terror-related injuries, to examine the factors associated with terrorism-related mortality and to characterize and compare the Injury Severity Score (ISS) and the New Injury Severity Score (NISS) as predictors of such mortality in Thailand's southernmost provinces, from January 1, 2007 through December 31, 2009.

Methods: Data from the VIS were used in this research. The outcome variable was mortality from terror-related injury. Independent variables included age, gender, occupation, religion, severity of injury, character of injury, place of injury, time of injury, and duration of time transferring the injured patients. Case-fatality rates were calculated. Logistic regression was used to examine the factors associated with mortality. Receiver operating characteristic (ROC) curves were constructed for the ISS and NISS, with injury-related mortality as the "gold standard." The areas under these curves (AUCs) were calculated and compared to assess the relative accuracy of the ISS and NISS.

Result: A total of 5,502 terror-related injuries were reported. Incidences of injuries were 163.3, 109.6, and 113.2 per 100,000 population. In 2007, 2008 and 2009, respectively. The overall case-fatality rate was 24.5%. In the multiple logistic regression were factors statistically significantly associated with mortality included age 45-54 (odds ratio (OR) 1.72, 95% CI 1.17-2.55), age >=55(OR 2.27, 95% CI 1.37-3.74) as compared to age <24; being male (OR, 1.73, 95%CI 1.17-2.57); being a community leader, as compared to police (OR 5.20, 95%CI 2.36-11.47). The AUCs for ISS and NISS, expressed as proportions of total area, were 0.928 and 0.935, respectively.

Conclusion: Factors associated with mortality from terror-related injury included age, gender, occupation, religion, character of injury, place of occurrence, and time of transfer. NISS was slightly better than ISS in predicting mortality from such injury.

KEY WORDS: TERROR-RELATED INJURY / SOUTHERN PROVINCES

80 pages

ปัจจัยที่มีความสัมพันธ์กับการเสียชีวิตจากการบาดเจ็บ จากเหตุการณ์ความไม่สงบ ในจังหวัดชายแดนภาคใต้ ประเทศไทย
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บทคัดย่อ

จังหวัดชายแดนภาคใต้ของไทยต้องประสบกับเหตุการณ์ความไม่สงบมาตลอดระยะเวลากว่าสิบปี อันส่งผลให้ประชาชนจำนวนมากต้องได้รับบาดเจ็บและเสียชีวิต จวบจนกระทั่งได้มีการจัดทำเครือข่ายระบบเฝ้าระวังการบาดเจ็บจากความรุนแรงในพื้นที่สามจังหวัดชายแดนภาคใต้ Violence-Related Injury Surveillance (VIS) ขึ้น ปี 2550 ซึ่งมีการเก็บรวบรวมข้อมูลผู้บาดเจ็บจากเหตุการณ์ความไม่สงบในจังหวัดชายแดนภาคใต้ มกราคม - พฤษภาคม 2550 พบอุบัติการณ์การบาดเจ็บ 1,056 ครั้ง ต่อ 100,000 person-years อัตราบาดเจ็บเสียชีวิตร้อยละ 18.3

วัตถุประสงค์: เพื่อศึกษา อุบัติการณ์การบาดเจ็บ, ปัจจัยที่มีความสัมพันธ์กับการเสียชีวิต และเปรียบเทียบ ISS และ NISS ในการทำนายการเสียชีวิตจากการบาดเจ็บจากการก่อการร้าย จังหวัดชายแดนภาคใต้ ระหว่าง ปี 2550-2552

วิธีดำเนินการวิจัย: ข้อมูลได้จากฐานข้อมูลของเครือข่ายระบบเฝ้าระวังการบาดเจ็บจากความรุนแรงในพื้นที่สามจังหวัดชายแดนภาคใต้ Violence-Related Injury Surveillance (VIS) ที่บันทึก 1 มกราคม 2550 - 31 ธันวาคม 2552 ตัวแปรตามได้แก่อัตราการเสียชีวิตจากเหตุการณ์การก่อการร้ายพื้นที่จังหวัดชายแดนภาคใต้ ตัวแปรต้นคือ อายุ เพศ ศาสนา ระดับความรุนแรง ลักษณะของการบาดเจ็บ สถานที่เกิดเหตุ เวลาที่เกิดเหตุ และช่วงระยะเวลาในการเคลื่อนย้ายผู้ป่วยจากจุดเกิดเหตุไปยังสถานพยาบาล สถิติที่ใช้ ร้อยละ, อัตราการบาดเจ็บตาย, logistic regression, AUCs

ผลการวิจัย: 1 มกราคม 2550 - 31 ธันวาคม 2552 มีผู้ได้รับบาดเจ็บจากเหตุการณ์การก่อการร้าย จำนวนทั้งสิ้น 5,502 ราย เข้ารับการรักษาในสถานพยาบาลในพื้นที่สามจังหวัดชายแดนภาคใต้รวม 47 แห่ง อุบัติการณ์การผู้ได้รับบาดเจ็บต่อปี คิดเป็น 163.3, 109.6 และ 113.2 ต่อแสนประชากร 2550 - 2552 ตามลำดับ เมื่อทำการควบคุมตัวแปรอื่นๆพบว่าตัวแปรที่มีความสัมพันธ์กับการเสียชีวิตได้แก่ อายุ 45-54 ปี ,อายุมากกว่า 55 ปี มีอัตราเสี่ยงต่อการเสียชีวิตสูงกว่ากลุ่มอายุน้อยกว่า 24 ปี อย่างมีนัยสำคัญ (Odds ratio, 1.72, 95%CI 1.17-2.55), (Odds ratio, 2.27, 95%CI 1.37-3.74) ตามลำดับ เพศชาย มีอัตราเสี่ยงสูงกว่าเพศหญิง (OR, 1.73, 95%CI 1.17-2.57) และผู้นำชุมชนมีอัตราเสี่ยง (OR 5.20, 95%CI 2.36-11.47) สูงกว่ากลุ่มตำรวจ จากการเปรียบเทียบผลความเที่ยงตรงของ ISS และ NISS พบว่ามีความแตกต่างกัน โดยมีนัยสำคัญทางสถิติน้อยกว่า 0.001

สรุปผลการวิจัย: ปัจจัยที่มีความสัมพันธ์ กับการเสียชีวิต อย่างมีนัยสำคัญคือ อายุ เพศ อาชีพ ศาสนา ลักษณะของการบาดเจ็บ สถานที่เกิดเหตุ และช่วงระยะเวลาในการเคลื่อนย้ายผู้ป่วยจากจุดเกิดเหตุไปยังสถานพยาบาล สำหรับปัจจัยช่วงระยะเวลาในการเคลื่อนย้ายผู้ป่วยนั้นสามารถแก้ไขได้ นอกจากนี้ ยังพบว่า NISS สามารถทำนายการเสียชีวิตจากเหตุการณ์ความไม่สงบได้ดีกว่า ISS

80 หน้า

CONTENTS

CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (cont.)

CHAPTER I
INTRODUCTION

Rationale and Justification

One of the biggest problems in the world nowadays is the dispersion of terrorism. The terrorism is an illegal violent crime which threatens democracy and causes social damage. Terrorism kills many innocent people in the world every year. In the past few years, thousands of people died or injury due to terrorist attacks which occurred in Northern Ireland, the United States, Israel, Iraq, Afaganistan, Palastine, Tukey, Spain, Kuwait, Jerusalam and many other countries of the world (1-16). Terrorists in the 21st century have attacked in unexpected and violent ways, and they targeted unspecifically, with increasing numbers of injuries and deaths. From report of The Office of the Coordinator for Counterterrorism to find that incidents of terrorism worldwide in 2005 as 11,153 cases, 2006 as 14,338 cases, incidents resulting in death of at least one individual in 2005 as 5,135 cases, 2006 as 7,332 cases, Incidents resulting in the injury of at least one individual in 2005 as 3,838 cases, 2006 as 5,718 cases. In Thailand, three southern provinces: Pattani, Yala and Narathiwat. There are about 5 millions Muslims in Thailand, making up about 8% of total population. As much as 86% of Muslims live in the Southern Thailand and the rest in the different province of Thailand. There have also been suffered from terrorism. The reporting by Srisompob Jitpiromsri, since 1993 to 2003 southern provinces have violence of event 748 event, mean of event/year are 68. Now, the events increases than past. Unfortunately, the event on January 4, 2003, happened, and it is never be the same again. Around 100 men armed with guns and knives attacked the Army Force IV (Krom Narathiwat Rajanakarin Army Camp, Moo 7, Pileng village, Mareubo-ok sub-district, Joh-irong district, Narathiwat province. They seized all the weapons (343 of M-16 guns, 6 of RPG bombs, 2 of machine guns, and 13 of 11-mm guns) and they killed 4 Thai Buddhist sergeants by shooting, cutting off their heads and bodies with cruelty. All of Muslim soldiers were tied with ropes and left alive. The robbed

weapons have gone invisibly and the terrorists have not yet been arrested. The purpose for the terrorisms is to discredit the government, to put pressure on the government officers, frighten the local citizens, to force Thai Buddhists to move out from the region. They claim the actions is to retaliate for the arrest of innocent Muslims by the officers. Since the terrible events, the violence does not trend to decline and it made the government to declare and to send soldiers to the three southern provinces. Unfortunately so far the situation can not be in control, the killing continues, especially to the soldiers who have been sent there. Since the adverse situations in the Southern provinces it has caused a lot of hurt and killed. The reporting by Srisompob Jitpiromsri (17) since January 2005 to November 2007 southern provinces have witnessed 5,769 violent incidents related to the insurgency. At least 1,938 people were killed and more than 2,920 injured at that time. While, Violence-related Injury Surveillance (VIS) stated data collection on January, 1 2007 showed case fatality rate of terror-related injury in southern, Thailand. is 18.28%(data between January-May 2007). From violent situation in southern provinces to find that situation in southern provinces as caused of DALYs in Thai people up to 14,260 years. Its lose from illness , crippled and mortality prior proper age, male as value 169 and 13,713 years , respectively. During female is 188 and 351 years, respectively. If classified as age group reveal that DALYs in southern provinces is most in male 15-59 years of age and classified as proportion of male per female as 1:38:7, and proportion of accident as 1:23:7. From study to find that DALYs from crippled of terrorist in southern provinces is less when compared with DALYs from mortality prior proper age, due to most patients are dead from this situation. From mentioned as above most patient is wounded from this situation, then tools is used for predictd is important. This study is compared Injury Severity Scale (ISS) and New Injury Severity Scale (NISS). All 2 tools as mentioned was developed from abroad , then there are many person who study to properly of used in Thailand most of theses for predictd amount of mortality in group of patients from transportation or others accidents, such as fall from highland. But in southern provinces is occurred from theses events, which as hurt and mortality is different from events is studied. Therefore, researcher is required to study factor associated with mortality and compare Injury Severity Scale (ISS) and New Injury

Severity Scale (NISS) for predict mortality from terrorist in southern provinces, Thailand.

This study objective will be compared accuracy between Injury Severity Scale (ISS) and New Injury Severity Scale (NISS) to predict mortality from terrorism and to study the association of demographic (age, gender, occupational, religion), severity, character of injury, place of injury, time of injury, day of injury and time of transfer with mortality from terror-related injury in southern provinces. The results will help provide information for preparation of medical services for injured people and the proper public health administration in the future.

Research Objectives

1. To study determine incidence of terror-related injury in southern provinces.

2. To study the association of demographic (age, gender, occupational, religion), severity, character of injury, place of injury, time of injury, day of injury and time of transfer with mortality from terror-related injury in southern provinces.

3. To compare the accuracy between Injury Severity Scale (ISS) and New Injury Severity Scale (NISS) in predicting mortality from terror-related injury in southern provinces.

Research Hypotheses

1. There are association between demographic, i.e., age, gender, occupational, religion with mortality from terror-related injury in southern provinces.

2. There are association between character of injury, place of injury, time of injury, day of injury, time of transfer and severity with mortality from terror-related injury in southern provinces.

3. There are difference between Injury Severity Scale (ISS) and New Injury Severity Scale (NISS) in predicting mortality from terror-related injury in southern provinces.

Operational Definitions

Terror-related injury means damage to cells tissues and organs from energy exposure that have relatively sudden from terror in southern provinces.

Terrorism means illegal violence or threatened violence directed against human or nonhuman object cause injury and death.

Southern provinces means Yala, Pattani, Narathiwat and four Amphur in Songkhla.

Injury Severity Score (ISS) was defined as the sum of the squares of the highest Abbreviated Injury Scale (AIS) grade in each of the three most severely injured body regions. The ISS score takes values from 1 to 75.

New Injury Severity Score (NISS) was defined as the sum of the squares of the AIS scores of a patient' s three most severe injured, regardless of body region. The NISS score takes values from 1 to 75.

Selfharm was who injure oneself when, minister responsibility terrorizes to don't succeed.

Homicide is the killing of one human by terrorist.

Legal intervention and operation of war - The strategic of legal will show by government to contact or curfew for protect the people can show busy.

Event of undetermined intent - The people get the injury from terror-related injury or heart them body. So they can't know, what's happening it. They can get the injury or heart.

Expected Outcome and Benefit

1. The result of the study will development system service of patient of injury from terror-related injury in southern provinces.

2. The result of the study will be useful as information in guiding selection of appropriate mortality prediction instruments for terror-related injury.

CHAPTER II
LITERATURE REVIEW

This chapter, review the literature which is to provide the theoretical background to understand the concept for study factor association with mortality from terror-related injury and comparison between ISS and NISS as predictors of such mortality, in southern provinces, Thailand. The literature review consists of the following parts.

2.1 Definition of Terrorism

2.2 Concept of Injury and Death

- 2.1.1 Definition of injury
- 2.1.2 Mechanism of injury ballistic and blast
- 2.1.3 Scale used in measuring severity

2.3 Research regarding the epidemiology of causalities from terrorism.

2.4 Research regarding compare between ISS and NISS.

2.1 Definition of Terrorism

Terrorism is often used interchangeably with the term ‘terror’. Its first appearance was in the January 30, 1795 edition of the London Times, reporting as follow:

"There exists more than one system to overthrow our liberty. Fanaticism has raised every passion; Royalism has not yet given up its hopes, and terrorism feels bolder than ever (15)."

The meaning of terrorism is embedded in a person’s or nation’s philosophy. Accordingly, the determination of the “right” definition of terrorism is subjective (15).

It is believed that ‘terrorism’ in English is derived from the French word ‘terrere’, meaning “to tremble”. Combined with the French suffix *isme,* referencing “to practice,” the word becomes more like “to practice the trembling” or “to cause or create the trembling.” Synonyms of trembling here include fear, panic, and anxiety, which are currently called ‘terror’. Many global organizations and academics define ‘terrorism’ in over a hundred definitions. The Federal Bureau of Investigation defines it as “the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives”. Similarly, Walter Laqueur states that "terrorism constitutes the illegitimate use of force to achieve a political objective when innocent people are targeted". According to Martha Crenshaw, “terrorism is a conspiratorial style of violence calculated to alter the attitudes and behavior of multitude audiences. It targets the few in a way that claims the attention of the many. Terrorism is not mass or collective violence but rather the direct activity of small groups”. Schmid and Jongman conclude that "terrorism is an anxiety-inspiring method of repeated violent action, employed by (semi-)clandestine individual, group, or state actors, for idiosyncratic, criminal, or political reasons, where in contrast to assassination the direct targets of violence are not the main targets. The immediate human victims of violence are generally chosen randomly (targets of opportunity) or selectively (representative or symbolic targets) from a target population, and serve as message generators. Threat-based and violence-based communication processes between a terrorist (organization), (imperiled) victims, and main targets are used to manipulate the main target (audience), turning it into a target of terror, a target of demands, or a target of attention, depending on whether intimidation, coercion, or propaganda is primarily sought". L. Ali Khan views that terrorism is developed from existing aggrieved groups. According to Jack Gibbs’s interpretation, "terrorism is illegal violence or threatened violence directed against human or nonhuman objects, provided that it: 1) was undertaken or ordered with a view to altering or maintaining at least one putative norm in at least one particular territorial unit or population: 2) had secretive, furtive, and/or clandestine features that were expected by the participants to conceal their personal identity and/or their future location; 3) was not undertaken or ordered to further the permanent defense of some area; 4) was not conventional warfare and

because of their concealed personal identity, concealment of their future location, their threats, and/or their spatial mobility, the participants perceived themselves as less vulnerable to conventional military action; and 5) was perceived by the participants as contributing to the normative goal previously described (supra) by inculcating fear of violence in persons (perhaps an indefinite category of them) other than the immediate target of the actual or threatened violence and/or by publicizing some cause." David Rodin, an Oxford Philosopher, defines terrorism as the deliberate, negligent, or reckless use of force against civilians, by state or non-state actors for ideological aims and in the non-existent just legal process ". James M. Poland describes terrorism as "the premeditated, deliberate, systematic murder, mayhem, and threatening of the innocent to create fear and intimidation in order to gain a political or tactical advantage, usually to influence an audience". Differently, Robespierre explains that "terror is nothing other than justice, prompt, severe, inflexible; it is therefore an emanation of virtue; it is not so much a special principle as it is a consequence of the general principle of democracy applied to our country's most urgent needs".

In conclusion, terrorism is an illegitimate application of force or threatened violence by an existing aggrieved group against human or nonhuman objects with the purpose of achieving political or social objectives. Direct target groups are randomly selected innocent people, rather than the main targets.

2.2 Concept of Injury and Death

2.2.1 Definition of Injury

Defined broadly but comprehensively, injury is harm, hurt or damage; wound or trauma, caused by an external force to the body structure or function. It can be both physical and chemical. Moreover, it may refer to injured feelings or reputation rather than harm to the body. A severe and perhaps life-threatening injury is called a physical trauma. Injury results in relatively sudden and discernible effects. Additionally, damage from chronic low-energy exposure, such as back strain or carpal tunnel syndrome is also defined as injury. In Injury Prevention: Meeting the Challenge, the National Committee for Injury Prevention and Control (NCIPC), injury was interpreted as "any unintentional or intentional damage to the body resulting from

acute exposure to thermal, mechanical, electrical, or chemical energy or from the absence of such essentials as heat or oxygen". Two factors used to define injury include immediately obvious damage with rapid occurrence and causative agents. Insufficiency of a vital element is also a cause of injury in some cases, for instance, drowning strangulation and freezing.

2.2.2 Mechanism of injury ballistic and blast

Mechanism of Injury

The present study focuses on terrorism in Thailand's southern provinces including Pattani, Yala, Narathiwat and some parts of Songkhla. Since three years ago, the terrorists have used cellular phones to remotely activate bombs. Accordingly, the main injury mechanism in this case are weapons bullets and blasts. Different from other injuries in terms of mechanism, ballistic injury and blast injury, especially the latter which is caused by booby-trapped cellular phone, are to be explored and discussed intensively.

Mechanism of Blast Injury

An explosion is an incident occurring when a substance reacts rapidly with oxygen to release energy and produce a large volume of gaseous products. Although some energy is in the forms of heat and sound, most exist either as a blast wave (shock wave) that moves outwards from the epicenter of the supersonic blast; or as kinetic energy possessed by the gaseous products, debris, and shrapnel. A shock wave (blast wave) is generated in the surrounding air, and resulting variations in air pressure set in motion the mass movement of air (the dynamic overpressure or blast wind)(18).

With four categories of mechanism, injury inflicted by explosive devices is a result of what has been termed a "multidimensional injury". Blast injuries were classified by Zuckerman during the second world war.

1. Primary blast injuries are caused solely by the direct effect of blast overpressure on tissue. Unlike water, air is easily compressible. As a result, primary blast injuries usually affect air-filled organs and air-fluid interfaces such as the lungs, the middle ear, and the gastrointestinal tract. Rupture of

tympanic membranes, pulmonary damage, and air embolization, as well as rupture of hollow viscera, are the most important primary forms of blast injury.

2. Secondary blast injuries, like penetrating trauma and fragmentation injuries, are caused by bomb fragments and other displaced objects. Type of secondary blast injuries is penetrating ballistic (fragmentation) or blunt injuries.

3. Tertiary blast injuries are caused by the effects of structural collapse and of persons being thrown by the blast wind (penetrating or blunt trauma, fractures, traumatic amputations, closed and open brain injury).

4. Quaternary blast injuries refer to burns, toxin inhalation, exposure to radiation, asphyxiation, and inhalation of dust and include exacerbations or complications of persisting conditions (e.g., patient receiving anticoagulants, pregnant women, etc.).

Mechanism of Ballistic Injury

Ballistics is the science of the motion of projectiles. It is divided into interior ballistics, external ballistics, and terminal ballistics. Interior ballistics is the study of the projectiles in the gun; external ballistics, the study of the projectiles through air; and terminal ballistics, the study of penetration of solids by the missile. For missile injuries, there are two areas of projectile-tissue interaction, permanent cavity and temporary cavity(19).

Figure 2.1: Projectile-tissue interaction, showing components of tissue injury.

Permanent cavity is localized area of cell necrosis, proportional to the size of the projectile as it passes through.

Temporary cavity refers to transient lateral displacement of tissue, which occurs after passage of the projectile. Elastic tissue, such as skeletal muscle, blood vessels and skin, may be pushed aside after passage of the projectile, but than rebound. Inelastic tissue, such as bone or liver, May fracture in this area.

The shock (or sonic) wave (commonly mistaken for the temporary cavity), though measurable, has not been shown to cause damage in tissue.

The tissues are damaged through the dissipation of the projectile' s kinetic energy (kinetic energy = ½ mass x velocity^2). The quantity of energy released within tissues lends to classification of high-velocity and low-velocity wounds. This mainly depends on the muzzle velocity of the bullet. A low-velocity wounds is one caused by a projectile with muzzle velocity of less than 350 m/second (1,000 feet per second) and a high-velocity wound refer to injuries caused by muzzle velocity greater than 750 m/second (2,000 feet/second). Clearly, high-velocity bullets inflict more extensive damage to the body tissues.

Bullet strikes on body tissues produce strong local resistance. As a result, some bullets are flattened. A high-velocity missile cuts tissues, its kinetic energy is dissipated in the surrounding tissues and disruption causes a temporary cavity. As the mass and velocity of the bullet and the mass of the object it strikes increase. Nevertheless, strike velocity is more important than mass in determining the amount of energy available to be imparted to the tissues. The shape, deformation and degree of fragmentation of the projectile also influence the wound volume. The energy which causes the temporary cavity may break a bone without actually striking it. The trajectory of bullets tends to become unstable after striking the body and the bullets tumble within the tissues forming an erratic missile tract which causes more damage than a smooth trajectory. Bullets which slow down after contacting tissues start tumbling and produce a large entry wound and cause relatively less severe damage in deeper tissues.

2.2.3 Scale used in measuring severity

Severity Scales

The below are scales which are applied for evaluation of injury severity.

1. Abbreviated Injury Scale (AIS)

The Abbreviated Injury Scale (AIS), developed in 1969 for road injury research, is an anatomical scoring system. In 1971 its formal version was published by a joint Committee on Injury Scaling comprised of members of the American Medical Association (AMA), the American Association for Automotive Medicine (AAAM) (currently renamed Association for the Advancement of Automotive Medicine), the Society of Automotive Engineers (SAE) (20, 21), and the American Association for Automotive Medicine (AAAM) (currently renamed Association for the Advancement of Automotive Medicine). The Abbreviated Injury Scale (AIS) has since become the most widely used anatomic scale for rating severity of injuries (20-27).

Originally, the AIS was a scale which was a combination of severity and outcome. With “fatal” codes (numbered 6 through 9), it was applied when death occurred within 24 hours of injury irrespective of injury severity; whereas the lower codes (1-5) were assigned on the basis of injury severity alone. As a result, different AIS ratings could be assigned to similar injuries (depending upon whether and when death occurred) and meaningful death rates could not be calculated. In 1976 there was a revision of the AIS by a joint Committee on Injury Scaling comprised of members of the American Medical Association (AMA) and the American Association for Automotive Medicine (AAAM). The resulting separation of severity and survival information should greatly enhance the usefulness of the AIS measures.

The revised AIS adds a new code, AIS 6, to be applied to specified injuries (such as massively crushed head or transaction of the torso). In 1985, the revision of AIS is AIS 85.

Its application has been extended to epidemiological research, trauma centre studies to predict survival probability, patient outcome evaluation and health care systems research. The AIS is used to describe injuries sustained by a variety of mechanisms. Six revisions of the AIS have been published since then (1976, 1980, 1985, 1990, 1998, 2005). Recently, the AIS 2005 version has been released (28).

It is predicted that functional impairment or disability is an important consideration in the 2005 Revision of the AIS classification system. The present study will use the AIS 85(detail see to appendix), which is currently applying in Thailand (29), in assessment of injury severity which is classified into 6 levels as the following:

AIS-1 indicating minor severity
AIS-2 indicating moderate severity
AIS-3 indicating life non-threatening high severity
AIS-4 indicating life threatening high severity
AIS-5 indicating critical severity with survival uncertainty
AIS-6 indicating maximum injury; (dead case) automatically assigned ISS=75

Each injury is allocated to one of six body regions: head/neck, face, thorax, abdomen, extremities and external (detail see to appendix) (29).

The Abbreviated Injury Scale (AIS) can be used with both single and multiple injury cases. The AIS score has limitations. The AIS severity score assignment is based upon experts' consensus. Individual injuries are assigned scores from one to six, according to the relative degree of anatomic damage, but not in relation to their impact upon survival; although in many circumstances, it would be logical to infer that more destructive injuries would have the most pronounced impact on mortality.

2. Injury Severity Score (ISS)

Through the AIS, only comparisons between patients and different injuries are available. On the other hand, the system does not provide ability in comparing patients with multiple injuries. Despite the potential for solutions to the problem, comparison of only patients with similar injuries is impractical and causes the large variety of injury combinations (30, 31). The Injury Severity Score (ISS) was, hence, developed in 1974 by Baker et al. to determine the probability of survival and also provide a numerical from the Abbreviated Injury Scale (AIS) to evaluate multiple injuries (31). They found that a non-linear relationship existed between the AIS

severity and death. Applying only a single injury per body region in the calculation (31), the ISS has repeatedly shown its correlation with morbidity and mortality in trauma victims (32, 33). It was observed that the mortality increased with the AIS grade of the most severe injury. The mortality increased with regular increment when plotted against the square of the AIS grade (a quadratic relationship). When the victims with identical AIS grade for their most severe injury were compared, injuries in the second and third body regions tended to increase the risk of death. The Injury Severity Score (ISS) was, therefore, defined as "the sum of the squares of the highest AIS grade in each of the three most severely injured body regions"(4, 31, 33) . Thus, they concluded that, by summing the squares of the severity of the 3 most severe injuries in 3 separate body regions:

$$ISS = (\text{worst AIS})^2_{\text{region 1}} + (\text{worst AIS})^2_{\text{region 2}} + (\text{worst AIS})^2_{\text{region 3}}$$

To account for multiple injuries, Baker et al. devised the ISS, based on the AIS (31). After each injury is scored, the injuries are grouped by body region. The score assigned to each region is the square of the highest score in that area. The score for the three most severely injured regions are added to make the ISS. Only AIS values of 1 to 5 are used, making the highest possible score a 75. If a lethal injury (e.g., decapitation, torso transaction) is present, the patient is automatically assigned a score of 75. An ISS $\geq$ 20 is considered major trauma, and an increasing ISS is associated with increasing mortality rate. Baker et al. speculated that extrapolation of the ISS to penetrating wounds might lead to inappropriately low scores because multiple injuries in the same body region are ignored.

ISS has limitations because it cannot be accounted for multiple severe injuries within one region (e.g., liver and duodenum). However, Moore, L. et al.(34) the fact that after accounting for differing injury severity, patients with two worst injuries in different body regions have higher mortality than two worst injuries in the same region.

Table 2.1: Example of the ISS calculation

Region	Injury description	AIS	Square top three
Head or Neck	Cervical spine Fractures	3 (serious injury)	3x3=9
Face	No injury	0	
Chest	several fractured ribs	4 (severe injury)	4x4=16
Abdomen	1. Liver laceration	4 (severe injury)	
	2. Completely shattered spleen	5 (critical injury)	5x5=25
Extremities	Fractured femur	3 (serious injury)	
External	No injury	0	
	Injury Severity Score		9+16+25=50

3. New Injury Severity Score (NISS)

In 1997, Osler et al. proposed a modification of ISS that they believed would result in more accurate predictions of mortality (4, 35). They therefore tested a simple modification of the ISS, a score that they call New Injury Severity Score (NISS). The NISS is defined as the sum of the squares of the Abbreviated Injury Scale scores of each of a patient' s three most severe Abbreviated Injury Scale injuries irrespective of the body region in which they occur (4, 35). Nevertheless, two problems follow from the dependence of the ISS on body regions. First, the ISS often leaves some injuries out of the scoring process altogether, such as when a patient sustains multiple injuries to a single body region, in which case only the single worst injury contributes to the ISS. A second, related problem is that the ISS often ignores some more severe injuries in one body region in favor of less severe injuries to some other body region or regions, such as when multiple body regions are injured. NISS, by contrast, simply considers the three most severe injuries that a patient has sustained and thus avoids both of these shortcomings of the traditional ISS.

Osler et al. recommend NISS better predicts survival and is easier to calculate than ISS. Difference is highly statistically significant and practically important, because NISS better separates survivors from non-survivors. They suggest that NISS replace ISS as standard summary measure of human trauma. However, the

methodology of the study has three obviously inherent pitfalls. First, it was designed for blunt trauma. Despite attempts to improve the penetrating trauma scoring, many feel that it is still limited in this regard. Second, it does not take into account physiologic variables. Third, the ISS methodology takes into account only one injury per body region; hence, the patient' s overall anatomic injury severity is often underestimated.

An example may make the differences between ISS and NISS scoring clearer.

Table 2.2: Example Differences between ISS and NISS scoring.

Region	Injury description	AIS	ISS	NISS
Head or Neck	Cervical spine fractures	3	3x3=9	
Face	No injury	0		
Chest	several fractured ribs	4	4x4=16	4x4=16
Abdomen	1. Liver laceration	4		4x4=16
	2. Completely shattered spleen	5	5x5=25	5x5=25
Extremities	Fractured femur	3		
External	No injury	0		
	Total		**9+16+25=50**	**16+16+25=57**

2.3 Research regarding the epidemiology of causalities from terrorism

The previous part discussed on definitions of terrorism and injury; and scoring severity of injury. In this part, previous studies on injury and death caused by violent incidents (terrorism) around the world are going to be discussed. The topics are ranged from various variables existing in this current study.

1. Age

Age is a variable that must be always considered in epidemiology studies. The highest frequency of the most injuries falls into the different ages. Knowledge of

age associations is, thus, important for two reasons: firstly, study variations of injury frequency by considering the age of the injured may help to understand the factors responsible for its development. The other reason is that associations between age and injury frequency are so strong that age may produce indirect effects that must be taken account of in examination of differences in injury rates related to other variables. Differences in injury rates between populations or subgroups of populations cannot be interpreted unless consideration has first been given to the relevance of possible age differences between the two populations.

Many studies discovered relationships between the age of terrorist victims and frequency of injury. Kobi Peleg et al. (36) studied patterns of injury in hospitalized terrorist victims and found that most of them (70%) were younger than 29 years old. The greatest number of population injured by terrorist activity was between the age of 15 and 29 years old (61%), compared with 23% in this age group among the population injured by other trauma ($p < 0.001$). Similarly, the study of Kobi Peleg et al. (37) in which gunshot and explosion injuries in the Israeli were explored also revealed that there was a total 1155 terror-related injuries: 54% by explosion, 36% gunshot wounds. Over a half (n=535, 53%) of the patients were between 15 and 29 years of age, 59% in the gunshot wounds group and 48% in the explosion group. Supporting the previously mentioned studies, the findings of study of Yoram Kluger et al. (38) on the special injury pattern in terrorist bombings in Israel indicated that among 906 victims of terrorist bombing, compared with 55,033 casualties of non-terror-related trauma, 441 were between 15 and 29 years of age (49.3%), whereas, the greatest number of patients of other traumas were in the ages between 0 and 14 years. All age group in terror-related trauma group and non-terror-related trauma group were significant ($p <0.0001$), accorded with M. Sunay Yavuz et al. who investigated deaths due to terrorist bombing in Istanbul (Turkey) and discovered that the most frequent age groups of victims and terrorists was between 21 and 30 years of age (n=60; 50% of the total cases). Additionally, Kobi Peleg and Limor Aharonson-Daniel (39) studying epidemiology of terror related injuries, found that 1661 patients were recorded in the Israeli national trauma registry due to terror-related injury and 55,033 due to other traumas during 1 January 2000 to 30 June 2003. it was indicated that terror-related victims were young, with 55% between the ages of 15 and 29 years,

while there was only 22% of the injured in this age group who were suffered from non-terror traumas. Sharon Einav et al. (40) investigating in-hospital resource utilization during multiple casualty incidents in Israel discovered that there were 325 casualties from 25 multiple casualty incidents. The average age of patient was 32.3 ± 16 years. Half of the patients (n=161, 49.7%) were between 15 and 29 years of age. Similarly, the study of Nadav Sheffy et al.(41) which compared gunshot wounds versus secondary-fragments-induced injuries from explosives revealed that almost 60% of gunshot victims and 39.4% of secondary fragment victims were during the ages of 19 to 30 years. The mean ages of gunshot victims and secondary fragment victims were 27.4 (±12.9 SD) years and 28 (±14.6 SD) years, respectively.

2. Gender

Among descriptive variables, sex is also associated with injury rates, according to various supporting studies. Reported in the study of Kobi Peleg et al. [66] on patterns of injury in hospitalized terrorist victims, three-quarters of 561 injured victims of the terrorist operation in Israel were males (n=418, 75%). The other study of the same researcher also discovered the same difference; that is, males were found the major victims of gunshot and explosion injuries in Israel (n=737, 71%): 54% by explosion, 36% by gunshot wounds (37). In the same way, it was reported in the study of M. Sunay Yavuz et al. that males (n=98, 81.7%) possessed the considerably higher numbers than females (n=22, 18.3%) who were killed in terrorist bombing in Istanbul (Turkey). Not differently, Yoram Kluger et al. (38) stated that the major terrorist bombing victims in Israel were male (64.7%). According to Sharon Einav et al. (40), the male-to-female ratio of 325 casualties from 25 multiple casualty incidents was 1.35:1. Also, Nadav Sheffy et al.(41) reported that the majority of gunshot victims and slightly over half of secondary fragment victims were men.

3. Occupation

Occupation is also a significant variable of terrorist injury to be highly considered as convincingly evidenced in many studies. Lucien Abenhaim, William Dab and L. Rachid Salmi.(42) exploring civilian victims of terrorist attacks (FRANCE 1982-1987) discovered that white collar workers and executives were the most

frequently harmed. The highest percents of the occupation groups mostly injured from terrorist operation fell into male professionals and executives (40.8%) and white collar females (61.3%). At the same time, Nadav Sheffy et al.(41) discovered that the major injured occupation groups from terrorist attacks were soldiers (34.45), drivers, or hikers.

2.4 Research regarding compare between ISS and NISS

This objective, **to compare accuracy between the two of scale of sever injury (Injury Severity Score (ISS) and New Injury Severity Score (NISS) to predict mortality from terror-related injury in Southern provinces, Thailand.**

This part is a research discussion on comparison of accuracy between two injury severity measurements including Injury Severity Score (ISS) and New Injury Severity Score (NISS) in prediction of mortality from terror-related injury in Thailand's southern provinces.

Many studies on comparison of accuracy between Injury Severity Score (ISS) and New Injury Severity Score (NISS) in mortality prediction were conducted.

Many studies suggested replacement of NISS for ISS. Fedakar, R., Aydiner, A.H.and Ercan, I. (43), comparing accuracy and examining the suitability of the GCS, RTS, ISS, NISS and TRISS, discovered that ISS and NISS appeared to be the best trauma scoring systems able to be used for the decision of life threatening injury, thus application of ISS and NISS for evaluation of the life threatening injury is acceptable. Nevertheless, this research studied in Turkish. Osler, T., Baker, S. P and Long, W. (4) suggested NISS should replace ISS as the standard summary measure of human trauma. It was consistent with Jamulitrat et al.(44) from Price of Songkla Hospital under the Faculty of Medicine, Prince of Songkla University in Thailand, indicating an advantage of the NISS over the ISS in predicting mortality. Moreover, they were supported by Andre Laoie et al. (45) who discovered that NISS was a better discriminator (area under the ROC curve=0.827 and 0.819; p=0.0006) than ISS both as a whole and individual aspects: age, penetrating trauma, and injured body region. Its' calibration was also improved (Hosmer-Lemeshow better=62 vs.112). The advantage

of the NISS over the ISS was particularly evident among patients with head/neck injuries area under the ROC curve=0.819 and 0.784; p=0.0001; Hosmer-Lemeshow better=59 and 350). Accordingly, NISS was recommended as a more accurate predictor of in-hospital mortality than ISS and suggested to be chosen over the ISS for case-mix control in trauma research, especially in certain subpopulation such as head/neck-injured patients. Consistently, Andre Laoie et al.(46) studied The Injury Severity Score or the New Injury Severity Score for predicting intensive care unit admission and hospital length of stay. The results showed 32% patients were admitted to the intensive care unit (ICU). Mean length of stay (LOS) was 8.2±2.5 days. The NISS presented equivalent discrimination (area under ROC curve: NISS = 0.839 versus ISS = 0.843, p = 0.08) but better calibration (H-L statistic: 309 versus 611) for predicting ICU admission. In the subgroup patients with moderate to serious head injuries, the NISS was a better predictor of ICU admission in terms of both discrimination (area under ROC curve: NISS = 0.771 versus ISS = 0.747, p < 0.00001) and calibration (H-L statistic: 12 versus 21). The NISS explained more variation in LOS than the ISS for the whole sample (r2 = 0.254 versus 0.249, p = 0.0008) and in the sub-population with moderate to severe head injuries (r2 = 0.281 versus 0.263, p = 0.0002).They suggested NISS is a better choice for case mix control in trauma research than the ISS for predicting ICU admission and LOS, particularly among patients with moderate to severe head injuries. Also, Frederick D. Brenneman et al. (30) studied to evaluate the ISS and NISS in patients with blunt trauma, the results showed the mean ISS and NISS were 25±13 and 33±18. The two predictive score were identical and discrepant is 32% and 68% of patients. Patients with identical score had a lower mortality rate than patients with discrepant scores (10% vs. 13%; p-value<0.02). In patients with discrepant score, the area under the ROC curves was greater for the NISS than the ISS (0.852 vs. 0.799; p-value<0.001), and greater amounts of discrepancy were associated with increasing rates of mortality (p-value<0.001). They suggested NISS often increases the apparent severity of injury and provides a more accurate prediction of short-term mortality after blunt trauma. The benefit associated with using NISS rater than the ISS must be weighed against the disadvantages of changing a scoring system and the potential for still greater improvements.

Andre Laoie et al.(46) studied The Injury Severity Score or the New Injury Severity Score for predicting intensive care unit admission and hospital length of stay. The results showed 32% patients were admitted to the intensive care unit (ICU). Mean length of stay (LOS) was 8.2±2.5 days. The NISS presented equivalent discrimination (area under ROC curve: NISS = 0.839 versus ISS = 0.843, p = 0.08) but better calibration (H-L statistic: 309 versus 611) for predicting ICU admission. In the subgroup patients with moderate to serious head injuries, the NISS was a better predictor of ICU admission in terms of both discrimination (area under ROC curve: NISS = 0.771 versus ISS = 0.747, p < 0.00001) and calibration (H-L statistic: 12 versus 21). The NISS explained more variation in LOS than the ISS for the whole sample (r2 = 0.254 versus 0.249, p = 0.0008) and in the sub-population with moderate to severe head injuries (r2 = 0.281 versus 0.263, p = 0.0002).They suggested NISS is a better choice for case mix control in trauma research than the ISS for predicting ICU admission and LOS, particularly among patients with moderate to severe head injuries. In contrast, some studies discovered similarity accuracy of ISS and NISS. Seow-Yian Tay et al.[83] conducted a retrospective review of data from 6,231 consecutive patients over 3 years into the trauma registry of Mount Sinai Hospital, Chicago, Illinois, in which outcome, ISS, and NISS were investigated. The results showed misclassification rates were 3.97% for the NISS and 4.35% for the ISS. The receiver operating characteristic curve areas were 0.936 and 0.94, respectively. Neither the ISS nor the NISS were well calibrated (Hosmer-Lemeshow statistic, 36.11 and 49.28, respectively; p < 0.001). Seow-Yian Tay et al. recommended the NISS should not replace the ISS, as they share similar accuracy and calibration.

Sullivan, T. et al.(47) studied prediction of mortality in pediatric trauma patients: New Injury Severity Score outperforms Injury Severity Score in the severely injured. The resulted showed the NISS performs as well as the ISS in pediatric patients with lower injury severity and outperforms the ISS in those with higher injury severity. Bulut, M. et al.(48) studied childhood falls the fact, the head was the most frequent site of injury, and the most common type of fall was from balconies. Scores on the GCS, NISS, and ISS are significantly associated with mortality. The performance of the NISS and ISS in predicting mortality in childhood falls was similar. Inconsistently, Enrique Grisoni et al. (35) studied The New Injury Severity

Score and the evaluation of pediatric trauma, calculated for 9,151 patients treated at four regional pediatric trauma centers and compared with previously calculated ISS values. The power of the two scoring systems to predict mortality was gauged through comparison of misclassification rates, receiver operating characteristic curves, and Hosmer-Lemeshow goodness-of-fit statistics. The results showed significant differences in the predictive abilities of the ISS and NISS reported in studies of adult trauma patients, which were not discovered in this review of pediatric trauma patients. However, there was one study being the first to report that ISS has a superior ability in predicting both LOS and ICU admission. Hala Tamim et al.(49) studied The injury severity score or the new injury severity score for predicting mortality, intensive care unit admission and length of hospital stay: Experience from a university hospital in a developing country. The results showed total of 891 consecutive patients were enrolled. The ISS and NISS were equivalent in predicting survival, and both performed better in patients younger than 65 years of age. However, the ISS predicted ICU admission and LOS better than the NISS. However, these predictive abilities were lower for the geriatric trauma patients aged 65 years and above compared to the other age groups. There are conflicting results in the literature about the abilities of ISS and NISS to predict mortality. Hala Tamim et al. recommend the scoring of trauma severity may need to be individualised to different countries and trauma systems.

The this objective was to study the association of factors with mortality from terror-related injury Thailand’s southern provinces.

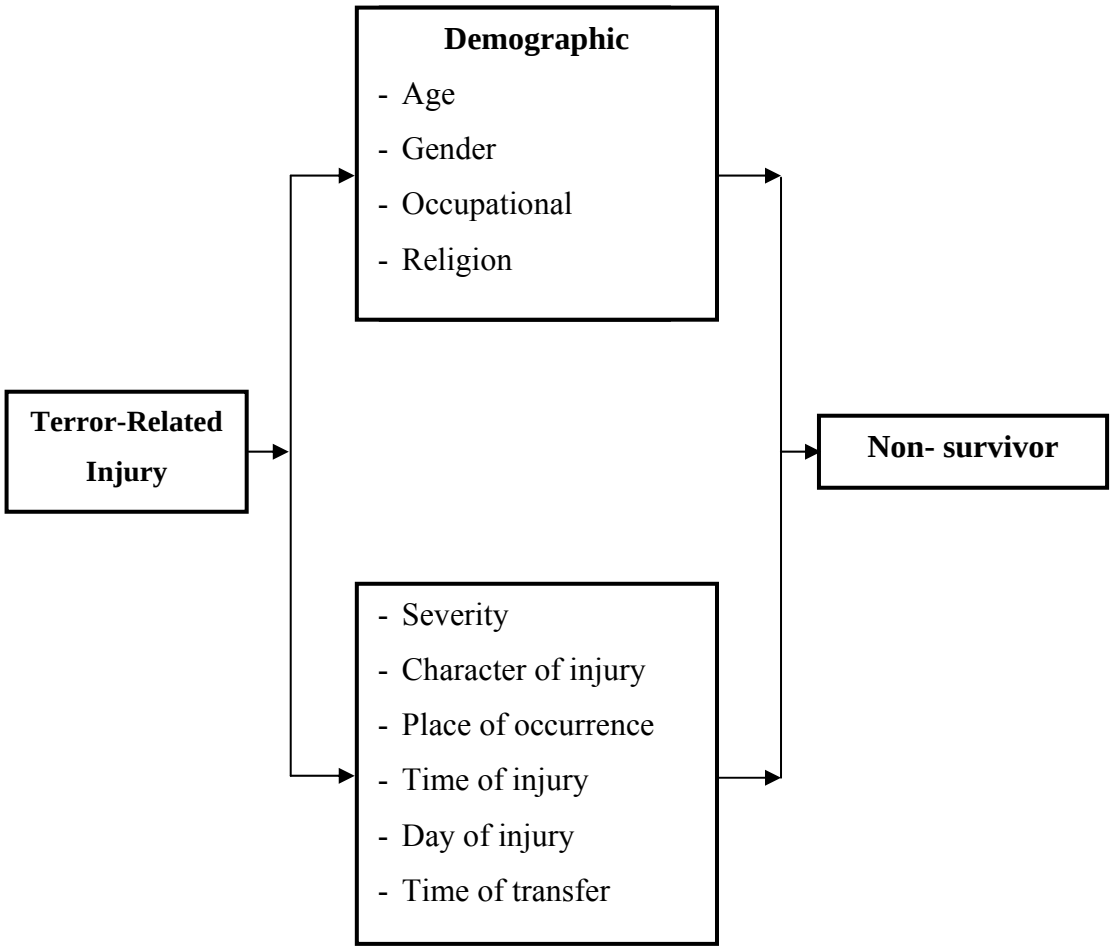

Figure 2.2 Conceptual framework

The this objective was to compare the accuracy between ISS and NISS in predicting mortality from terror-related injury in Southern provinces.

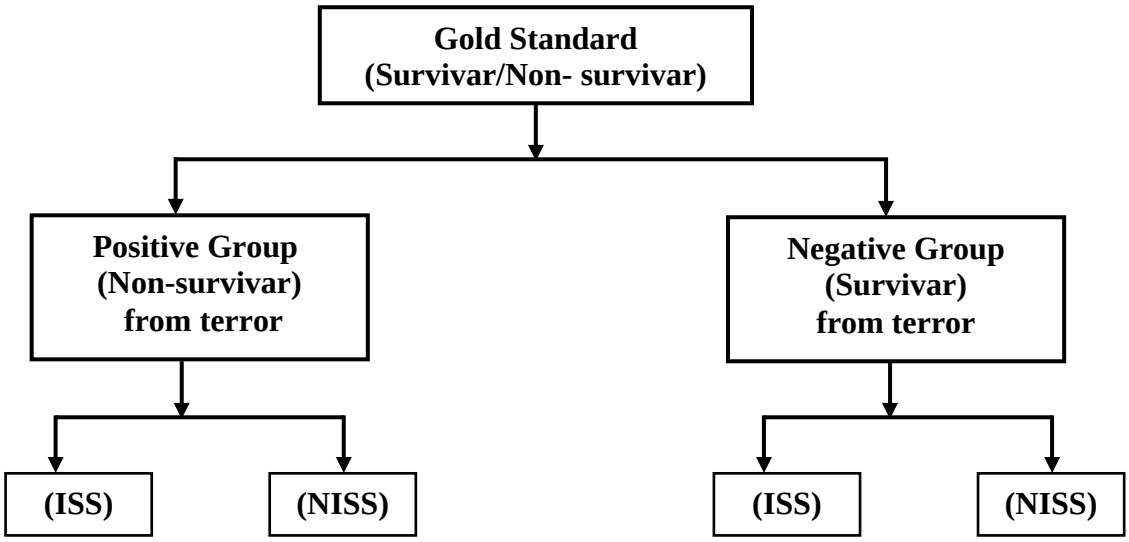

Figure 2.3 Conceptual framework

CHAPTER III
MATERIALS AND METHODS

Research Design

This research design was analysis of injury surveillance data to study the association of factors with mortality from terror - related injury and compare the accuracy of two mortality prediction instruments i.e. Injury Severity Score (ISS) and New Injury Severity Score (NISS) and This study using secondary data from The violence related injury surveillance (VIS) reporting system.

Study Population

This study using secondary data from patients who were injured from terrorism in southern provinces during the period January 1, 2007 - December 31, 2009 and treated at all (47) hospitals in southern provinces.

Sample Size

First objective:

As the second objective is to explore the associations of all factors with mortality from terror-related injury, sample size estimation is according to the following calculation. (50)

$$n = \frac{\left[Z_{1-\alpha/2}\sqrt{2P(1-P)} + Z_{1-\beta}\sqrt{Po(1-Po)+P_1(1-P_1)} \right]^2}{(P_1 - Po)^2}$$

n = Estimated sample size in each group.

Po = Proportion of dead male from terror-related injury in Thailand's southern provinces of 2007

P_1 = Proportion of dead female from terror-related injury in Thailand's southern provinces of 2007

P = $(Po + P_1)/2$

Z_α = Probability of type I error = 0.05, $Z_{1-\alpha/2} = Z_{0.025} = 1.96$

$Z\beta$ = Probability of type II error = 0.2, $Z_{1-\beta} = 0.84$

According to the theory and literature review, it was found that proportion of male and female dead victims of terror-related injury in Thailand's southern provinces are as follow (51)

Thus;

Po = 0.282

P_1 = 0.187

P = 0.235

$Z_{1-\alpha/2}$ = 1.96

$Z_{1-\beta}$ = 0.84

When replaced in the formula:

$$n = \frac{\left[1.96\sqrt{2(0.235)(1-0.235)} + 0.84\sqrt{0.282(1-0.282)+0.187(1-0.187)}\right]^2}{(0.282-0.187)^2}$$

n = 312 per group

Total = 624

Therefore, a total sample size of approximately 642 subjects is needed for the study. Base on the number of victims reported during 3 year, the actual numbers of victims of terror-related injury are 3,919. This study will include all cases during the period of 3 year (2007-2009).

Second objective: sample size needed for the study was calculated by using the software PASS2008 program.

The sample size estimation is based on comparison of area under receiver

operating characteristic curves (AUC) among the two severity scales. Previous studies reported the AUC for ISS and NISS in predicting mortality were 0.926, 0.920 respectively(43).

A sample size of 550 from the positive group (non-survivor) and 550 from the negative group (survivor) would achieve 80% power to detect a difference of 0.0060 between a ISS with an AUC of 0.9260 and NISS with an AUC of 0.9200. The correlation between the two instruments is assumed to be 0.600 for the positive group and 0.600 for the negative group.

However, the actual numbers of terror-related injury from southern provinces are 1,181 from the positive group (non-survivor) and 2,738 from the negative group (survivor) to compare ISS and NISS.

The sample size for the second objective is going to be calculated by using the PASS2008 software program.

The sample size estimation is based on comparison of areas under receiver operating characteristic curves (AUC) among the two severity scales. Previous studies reported that the AUC for ISS and NISS in predicting mortality were 0.926, 0.920 respectively [80].

A sample size of 550 from the positive group (non-survivor) and 550 from the negative group (survivor) would achieve 80% power to detect a difference of 0.0060 between an ISS with an AUC of 0.9260 and a NISS with an AUC of 0.9200. The correlation between the two instruments is assumed to be 0.600 for the positive group and 0.600 for the negative group.

However, the actual numbers of terror-related injury in Thailand's southern provinces: 1,181 from the positive group (dead) and 2,738 from the negative group (survived), will be used to compare ISS and NISS.

Data Source

Data in this study will be used from the violence related injury surveillance (VIS). The VIS was system reporting data who were injured and death from terrorism in southern provinces during the period January 1, 2007 – December 31, 2009 and

treated at all hospitals in southern provinces. The data were collected at the community hospitals, general hospitals, regional hospitals and military hospitals in southern provinces.

Data Collection Period

This study use data from VIS which, collected during the period of January 1, 2007 – December 31, 2009.

Statistical Analysis

Data analysis is to be categorized into two parts according to the research objectives.

1. Descriptive statistics will be used to describe general characteristics of the sample

1.1 Percentage will be calculated for these variables are gender, age, marital status, occupation, religion, activity during the event, character of injury, mechanism of injury, cause of injury, Provinces of injury, place of occurrence, time of injury, day of injury, month of injury, year of injury, time of transfer, body region, number of body region, AIS, ISS and NISS.

1.2 Mean, median and standard deviation will be calculated for ratio scale variable these variable are such as age, ISS and NISS

1.3 Case fatality rate (CFR) for gender, age, marital status, occupation, religion, activity during the event, character of injury, mechanism of injury, cause of injury, Provinces of injury, place of occurrence, time of injury, day of injury, month of injury, year of injury, time of transfer, body region, number of body region, AIS, ISS and NISS.

1.4 Epidemic curve for time of injury.

1.5 Bar graph for gender, age, marital status, occupation, religion, activity during the event, character of injury, mechanism of injury, cause of injury, Provinces of injury, place of occurrence, time of injury, day of injury, month of

injury, year of injury, time of transfer, body region, number of body region, AIS, ISS and NISS.

First objective, in order to explore the associations of all factors with mortality from terror-related.

2. Inferential Statistics

2.1 Chi-square test statistic was used to test for homogeneity on the basic characteristics between survivor and non-survivor of terror-related injury

2.2 logistic regression will be used to the associations of more independent variable which effect to one dependent variable and dependent variable is dichotomous variable (0=survivor, 1=non-survivor). This method will be used in order to specify which independent variables are related to of non-survivor from terror-related injury.

2.3 Odds ratio and 95% confidence interval will be calculated. The p-value < 0.05 will be considered statistical significance.

2.4 Statistical analysis will be performed with the Statistical Package for the Social Sciences (SPSS) version 11.5.

Second objective Analysis to compare the ISS and NISS

For each injured patient, ISS and NISS scores will be computed. The performance of the two scoring system will be evaluated and compared.

1. Areas under receiver operating characteristic (ROC) curves will be employed to compare the accuracy of the ISS and NISS in predicting mortality outcome from terror-related injury.

2. Sensitivity, Specificity and cut off point.

3. P-value < 0.05 will be considered statistical significant.

4. 95% confidence interval.

5. Statistical analysis will be performed with the Statistical Package for the Social Sciences (SPSS) version 11.5 was used for descriptive demographic characteristics of the study volunteers. And The MedCalc version 11.5.0.0 (demo version) was used for ROC analysis to determine AUCs, sensitivity, and

specificity of the two instruments. Then the program was used for two-tailed z test to test difference of two AUCs.

6. Programs Power Analysis and Sample Size (PASS) 7-Day Free Trial. To compute sample size.

CHAPTER IV
RESULTS

This chapter presents the results of the study which is consisted of 3 parts as follows:

4.1 Demographic characteristics

4.2 Association of demographic information (age, gender, occupational, religion) character of injury, place of occurrence, time of injury, day of injury and NISS with mortality from terror-related injury in Thailand's southern provinces.

4.3 Comparison of accuracy of Injury Severity Score (ISS) and New Injury Severity Score (NISS) from terror-related injury in Thailand's southern provinces.

Table 4.1 Incidence of terror-related injury before deleted missing

Year	Number of injury	Incident/100,000 person	CFR(%)
2007	2,327	163.3	26.3%
2008	1,562	109.6	21.8%
2009	1,613	113.2	24.4%
Total	5,502	386.2	24.5%

The original data received from the VIS system were 7,239 observations during 2007-2009. There were 1,737 observations that were repeatedly recorded, therefore, these repeated observations were deleted leaving a total of 5,502 cases for calculating of incidence of terror-related injury. In addition, there were 1,583 cases with missing data for several independent variables and 14 cases who died at scene, so these observations were also excluded from the analysis. Finally, there were a total of 3,919 included in the further analysis.

4.1 Demographic characteristics

This study consisted of two groups of subjects: 1,181 non-survivors and 2,738 survivors. The age ranged from 0 to 65 years with the mean of 34.4 years (SD=12.9 years). The mean age of non- survivor subjects was 38.0 years (SD=12.6) and that of survivor subjects was 32.9 years (SD=12.7) (Table 4.2). Most of the subjects were male (84.3%) and over three-fourth (89.7%) of non- survivor subjects were also male (Table 3). Nearly half of the subjects were married (44.6%), similarly to non-survivors (34.2%). Soldiers possessed the largest numbers of the subjects (21.4%), while the agriculturists died the most (28.3%). A half of the subjects were Buddhists (50.7%,) whereas, 58.1% of the non-survivor were Muslim.

Half the subjects were Islam (Table 4.2). The majority of both of two groups were penetrating (38.8% subjects and 59.3% non-survivors).

The largest numbers of all the patients were from Pattani (32.7%). Most of the place of occurrence were on the street and highway (55.3%) for both survivor and the non-survivors (55.1%). Most of the incidents happened during 4 a.m. to 8.30 a.m., while most of mortality of non-survivors was during 12 a.m. – 4.30 p.m. (Table 4.2). The incidents occurred on Tuesday and Saturday were the most frequent.

Seventeen point seven of day of time were Tuesday (17.7% subjects) and Saturday (18.5% non-survivors) in June 2007 (Table 4.2).

Most of case of injury were assault by other and unspecified firearm discharge(X 95) (38.7%), and by explosive material (X 96) (36%), whereas, 76.8% of non- survivor subjects were assault by other and unspecified firearm discharge(X 95) (Table 3). Most of injured patients were transferred during 11-30 minutes (24%) while the majority numbers of non-survivors were transferred within less than 60 minutes (60.6%) (Table 4.2).

Table 4.2 Description of the study population

Data group	Survivor (n= 2,738)	Non- Survivor (n= 1,181) (n=87)	Total (n=3,919)	P-value
	No. (%)	No. (%)	No. (100.0%)	
Age (years)				<0.001
<=24	813(81.0)	190(18.9)	1003	
25-34	762(73.1)	279(26.8)	1042	
35-44	552(64.0)	310(36.0)	862	
45-54	474(62.0)	290(38.0)	764	
>=55	137(55.0	112(45.0)	249	
Mean (SD)	32.9(12.7)	38.0(12.6)	34.4(12.9)	
Min, Max	(0, 65)	(0, 65)	(0, 65)	
Gender				<0.001
Female	495(80.2)	122(19.8)	617	
Male	2243(67.9)	1059(32.1)	3302	
Marital status				<0.001
Single	1038(59.3)	301(22.4)	1339	
Married	1031(58.9)	718(41.1)	1749	
Divorced	13(61.9)	8(38.1)	21	
Separate	3(75.0)	1(25.0)	4	
Widowed	15(86.5)	10(38.5)	26	
Unspecified	638(81.7)	143(18.3)	781	
Occupation				<0.001
Agriculturist	323(49.2)	334(50.8)	657	
Community leader	31(33.3)	62(66.7)	93	
Employee	239(62.2)	145(37.8)	384	
Government servant	142(67.0)	70(33.0)	212	
Housewife	61(80.3)	15(19.7)	76	
Merchant	199(73.2)	73(26.8)	272	

Table 4.2 Description of the study population (Cont.)

Data group	Survivor (n= 2,738)	Non- Survivor (n= 1,181) (n=87)	Total (n=3,919)	P-value
	No. (%)	No. (%)	No. (100.0%)	
Police	418(88.0)	57(12.0)	475	
Soldier	715(85.4)	122(14.6)	837	
Student	219(83.6)	43(16.4)	262	
No occupation	50(70.4)	21(29.6)	71	
Unspecified	341(58.8)	239(41.2)	580	
Religion				<0.001
Buddhism	1625(81.5)	368(18.5)	1993	
Christianity	7(87.5)	1(12.5)	8	
Islam	871(55.8)	689(44.2)	1560	
Unspecified	235(65.6)	123(34.4)	358	
Activity during the event				<0.001
Sport activity	41(80.4)	10(19.6)	51	
Leisure activity	122(57.8)	89(42.2)	211	
Working for income	1103(79.2)	291(20.8)	1393	
Other type of Work	97(56.4)	75(43.6)	172	
Resting	77(58.8)	54(41.2)	131	
Unspecified	1299(66.3)	662(33.7)	1961	
Character of injury				<0.001
Blunt	1137(93.3)	81(6.7)	1218	
Penetrating	824(54.1)	698(45.9)	1522	
Blunt and Penetrating	460(62.1)	281(37.9)	741	
Unspecified	317(72.4)	121(27.6)	438	
Mechanism of injury				<0.001
Self-harm	16(76.2)	5(23.8)	21	
Homicide	1494(69.0)	671(31.0)	2165	

Table 4.2 Description of the study population (Cont.)

Data group	Survivor (n= 2,738)	Non- Survivor (n= 1,181) (n=87)	Total (n=3,919)	P-value
	No. (%)	No. (%)	No. (100.0%)	
Legal intervention and operations of war	549(85.4)	94(14.6)	643	
Event of undetermined intent	636(61.3)	402(38.7)	1038	
Unspecified	43(82.7)	9(17.3)	52	
Cause of injury				<0.001
Assault by handgun Discharge(X93)	70(63.6)	40(36.4)	110	
Assault by rifle, and larger firearm(X94) discharge	15(42.9)	20(57.1)	35	
Assault by other and unspecified firearm discharge(X95)	609(40.2)	907(59.8)	1516	
Assault by explosive material(X96)	1318(93.4)	93(6.6)	1411	
Legal intervention (Y35)	533(86.5)	83(13.5)	616	
Operation of war (Y36)	91(81.3)	21(18.8)	112	
Unspecified	102(85.7)	17(14.3)	119	
Provinces of injury				0.07
Pattani	989(68.3)	459(31.7)	1448	
Yala	747(27.2)	319(27.0)	1066	
Narathiwat	925(32.7)	358(30.0)	1283	
Songkhla	76(3.0)	43(3.6)	119	
Unspecified	1(33.3)	2(66.7)	3	

Table 4.2 Description of the study population (Cont.)

Data group	Survivor (n= 2,738)	Non- Survivor (n= 1,181) (n=87)	Total (n=3,919)	P-value
	No. (%)	No. (%)	No. (100.0%)	
Place of occurrence				<0.001
Home	182(50.3)	180(49.7)	362	
Residential institution	29(96.7)	1(3.3)	30	
School, other institution and public administrative area	76(67.9)	36(32.1)	112	
Sports and athletics area	71(89.9)	8(10.1)	79	
Street and highway	1515(69.9)	651(30.1)	2166	
Trade and service area	504(83.3)	101(16.7)	605	
Industrial and construction area	13(59.1)	9(40.9)	22	
Farm	59(36.0)	105(64.0)	164	
Unspecified	289(76.3)	90(23.7)	379	
Time of injury				<0.001
08:30-12:00	589(75.4)	192(24.6)	781	
12:00-16:30	573(67.0)	283(33.0)	856	
16:30-20:00	488(63.6)	279(36.4)	767	
20:00-00:30	403(73.0)	149(27.0)	552	
00:30-04:00	18(39.1)	28(60.9)	46	
04:00-08:30	667(72.7)	250(27.3)	917	
Day of injury				0.02
Monday	474(69.5)	208(30.5)	682	
Tuesday	502(72.1)	194(27.9)	696	
Wednesday	426(68.6)	195(31.4)	621	
Thursday	421(72.1)	163(27.9)	584	
Friday	375(73.4)	136(26.6)	511	

Table 4.2 Description of the study population (Cont.)

Data group	Survivor (n= 2,738)	Non- Survivor (n= 1,181) (n=87)	Total (n=3,919)	P-value
	No. (%)	No. (%)	No. (100.0%)	
Saturday	248(63.9)	140(36.1)	388	
Sunday	292(66.8)	145(33.2)	437	
Month of injury				<0.001
January	193(71.5)	77(28.5)	270	
February	274(77.6)	79(22.4)	353	
March	256(69.9)	110(30.1)	366	
April	214(76.7)	65(23.3)	279	
May	215(67.2)	105(32.8)	320	
June	305(70.9)	125(29.1)	430	
July	172(66.7)	86(33.3)	258	
August	272(75.8)	87(24.2)	359	
September	205(65.1)	110(34.9)	315	
October	231(64.7)	126(35.3)	357	
November	195(62.5)	117(37.5)	312	
December	206(68.7)	94(31.3)	300	
Year of injury				0.015
2007	1249(70.6)	520(29.4)	1769	
2008	814(71.8)	319(28.2)	1133	
2009	675(66.4)	342(33.6)	1017	
Time of transfer				0.002
<=10 minute	403(85.2)	70(14.8)	473	
11-30 minute	710(75.4)	232(24.6)	942	
31- 60 minute	363(68.5)	167(31.5)	530	
>60 minute	1262(63.9)	712(36.1)	1974	

Most of the body region injured were at external and body surface (31.2%). The majority of patients got a wound on only 1 body region (50.4%). Nevertheless, most non-survivors had their hand/neck injured (31.3%) and had wounds on 2 body regions (23.5%). Most of all injured categorized by AIS were minor (39.9%) and most of the non-survivors were categorized of maximum injury (29.5%) as presented in Table 4.3.

Table 4.3 Description of the study population

Data group	Survivor	Non- Survivor	Total
	No. (%)	No. (%)	No. (100.0%)
Body Region	(n= 7,714)		
Head/Neck	817(43.5)	1,063(56.5)	1,880
Face	178(64.0)	100(36.0)	278
Thorax(Chest)	355(33.7)	699(66.3)	1,054
Abdomen and pelvic contents	276(43.3)	361(56.7)	637
Extremities and pelvic grirdle	986(67.4)	476(32.6)	1,462
External and body surface	1,707(71.0)	696(29.0)	2403
Number of body regions	(n= 3,919)		
1 Region	1,704(86.2)	272(13.8)	1,976
2 Regions	663(70.5)	278(29.5)	941
3 Regions	218(44.6)	271(55.4)	489
4 Regions	70(33.8)	137(66.2)	207
5 Regions	29(23.2)	96(76.8)	125
6 Regions	35(22.4)	121(77.6)	156
unspecified	19(76.0)	6(24.0)	25
AIS	(n= 7,890)		
Minor	2,703(84.5)	495(15.5)	3,198
Moderate	909(64.1)	508(35.9)	1,417
Serious	479(57.8)	350(42.2)	829
Severe	177(30.9)	396(69.1)	573
Critical	73(10.8)	606(89.2)	679
Maximum injury	38(3.5)	1,048(96.5)	1,086
Unspecified	71(65.7)	37(34.3)	108

Epidemic curve for occurrence of injury is presented in figure 4.1. This is not a uni modal epidemic curve because there were several peak dummy the days as shown in figure 4.3.

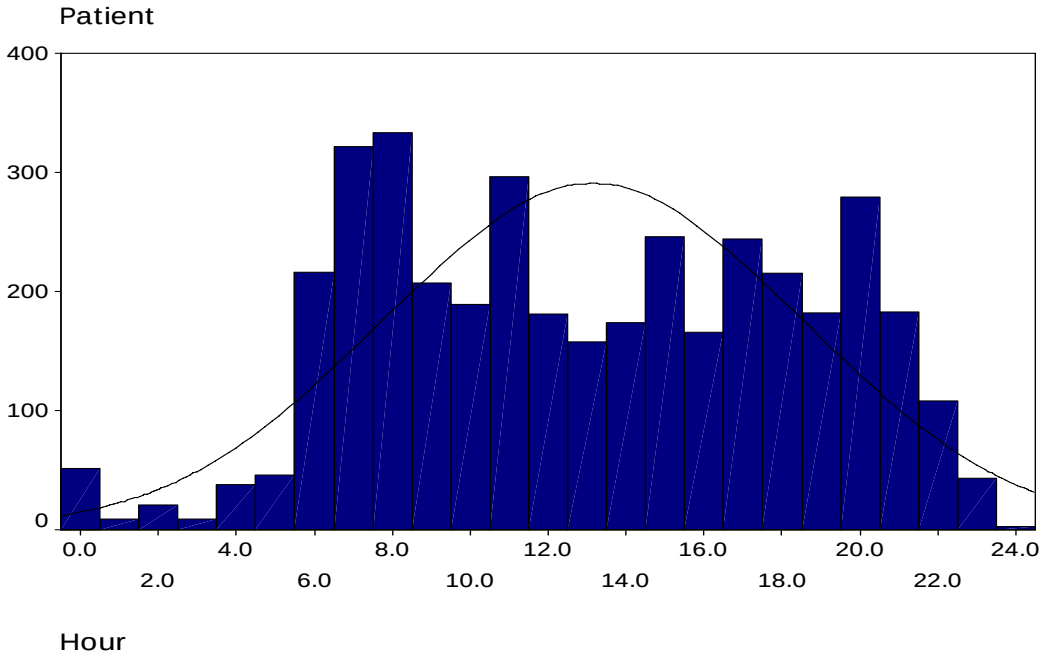

Figure 4.1 Epidemic curve of time of injury

Case fatality rate of patients of terror-related injury in Thailand's southern provinces

The case fatality rate increased for the males younger than 55 years and for the females aged 45-54 years. Moreover, the highest case fatality rate (CFR) of each variable was discovered in the married victims (Figure 4.3), community leaders (Figure 4.4) and Muslims (Figure 4.5). In addition, the victims who had been injured while doing their leisure activities (Figure 4.6) and sustained penetrating injury (Figure 4.7) possessed CFR. It was also found in undetermined intent as injury mechanism (Figure 4.8), and the injury cause resulted by other and unspecified firearms (X95) (Figure 4.9). The CFR attributions were discovered in Songkhla (Figure 4.10), in the farm as a place of occurrence (Figure 4.11), and during 0.30 – 4 a.m. as the time of injury (Figure 4.12). The most frequency of injury occurrence was

on Saturday (Figure 4.13), in November (Figure 4.14), the year of 2009 (Figure 4.15). Most of CFR at time of transfer to hospital were less than 60 minutes (Figure 4.16).

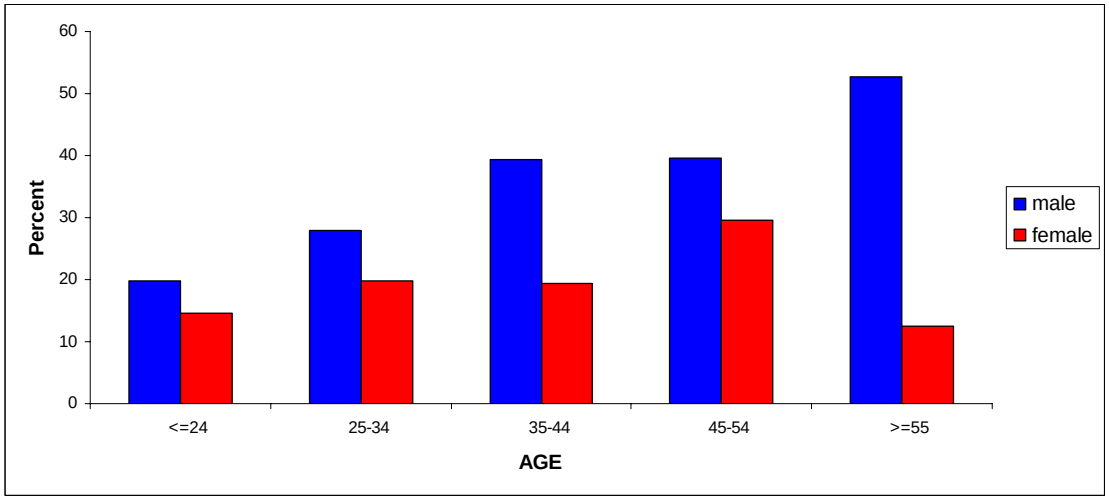

Figure 4.2 Case fatality rate with Age and Sex

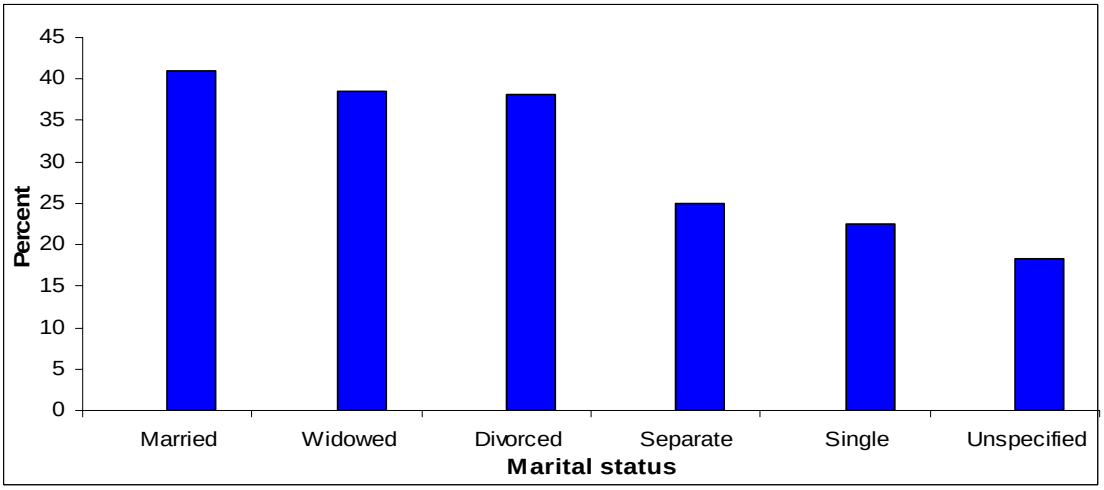

Figure 4.3 Case fatality rate with Marital status

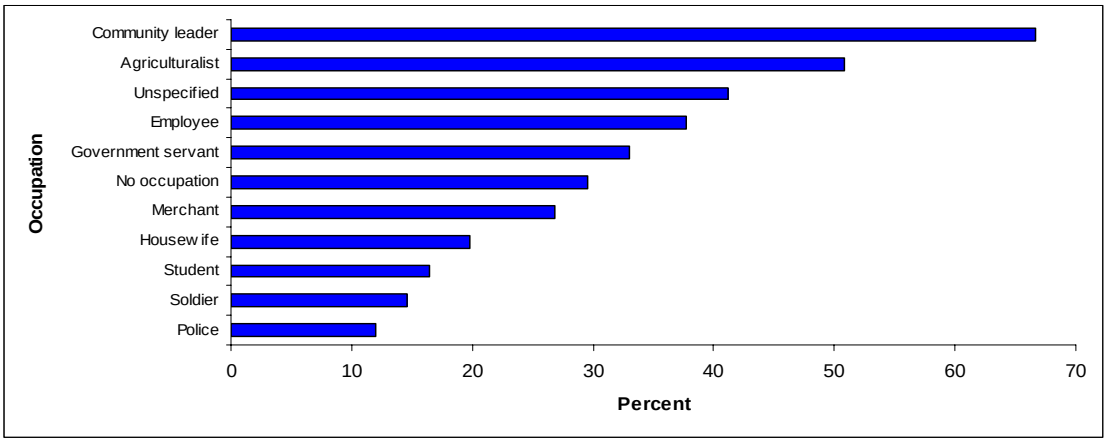

Figure 4.4 Case fatality rate with Occupation

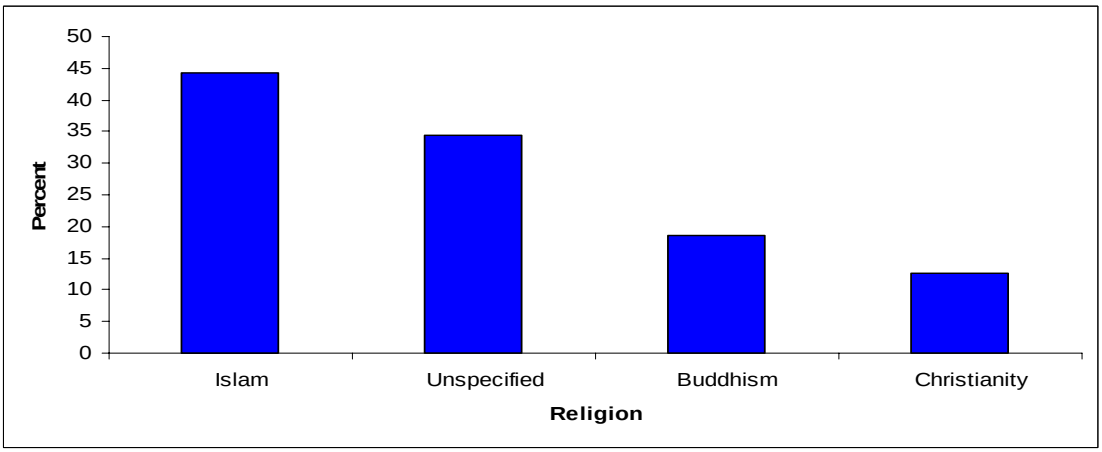

Figure 4.5 Case fatality rate with Religion

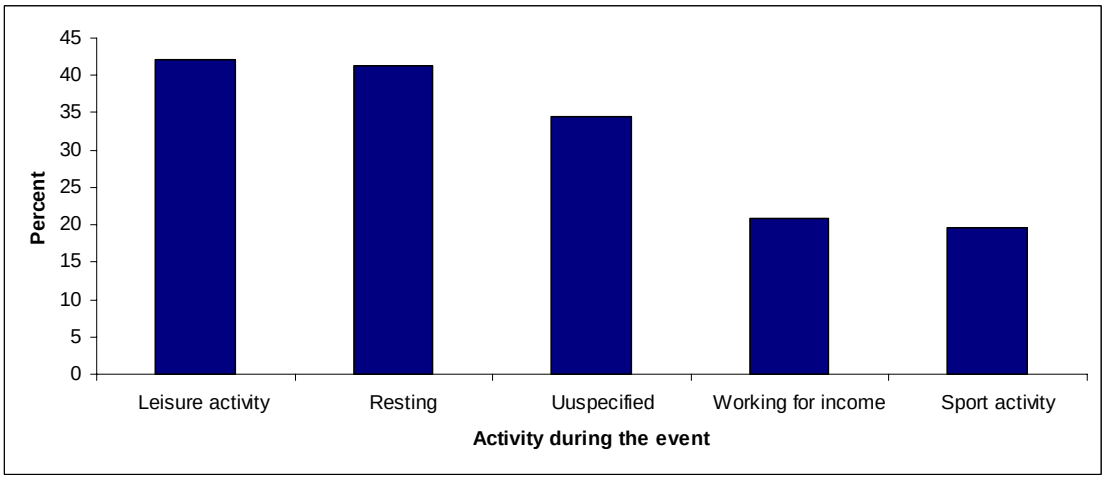

Figure 4.6 Case fatality rate with Activity during the event

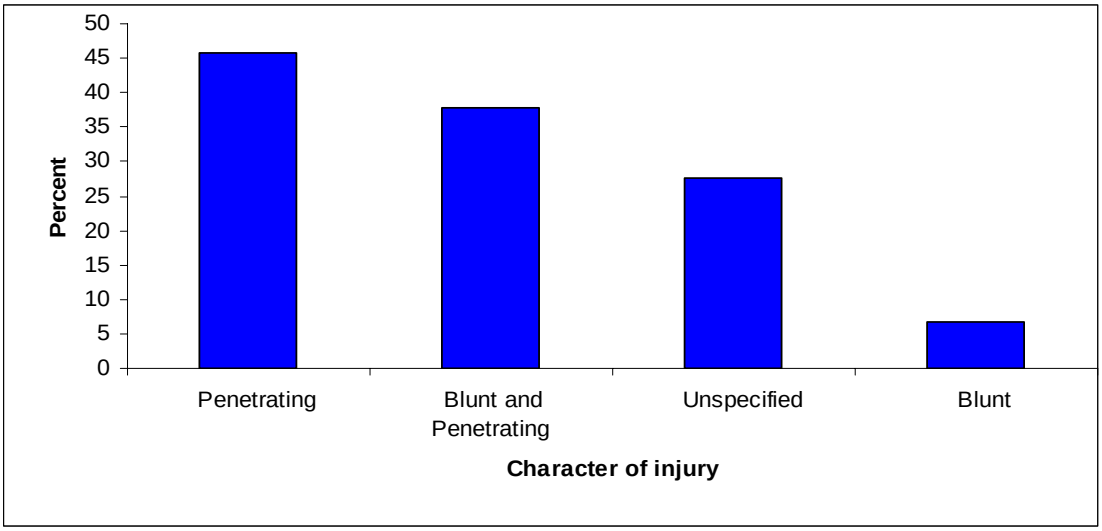

Figure 4.7 Case fatality rate with Character of injury

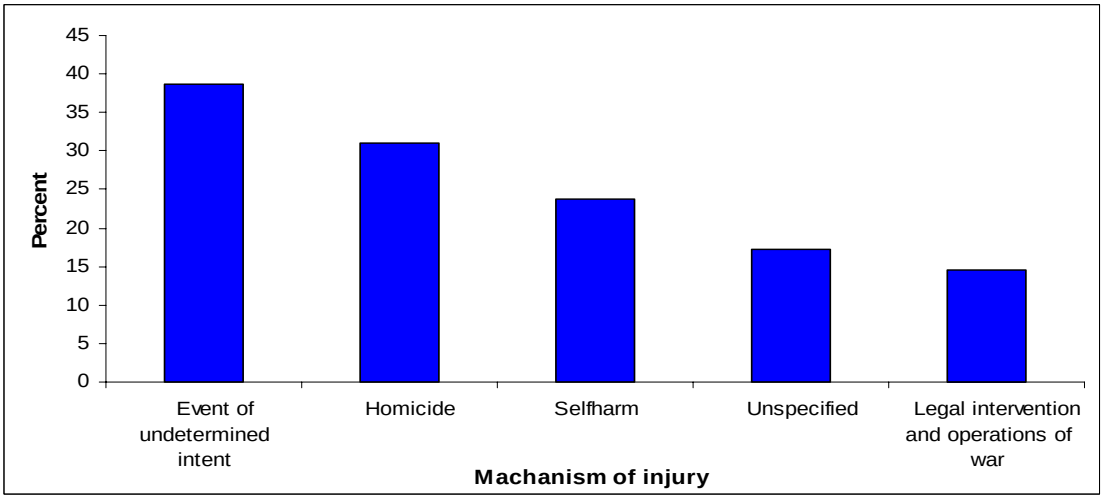

Figure 4.8 Case fatality rate with Machanism of injury

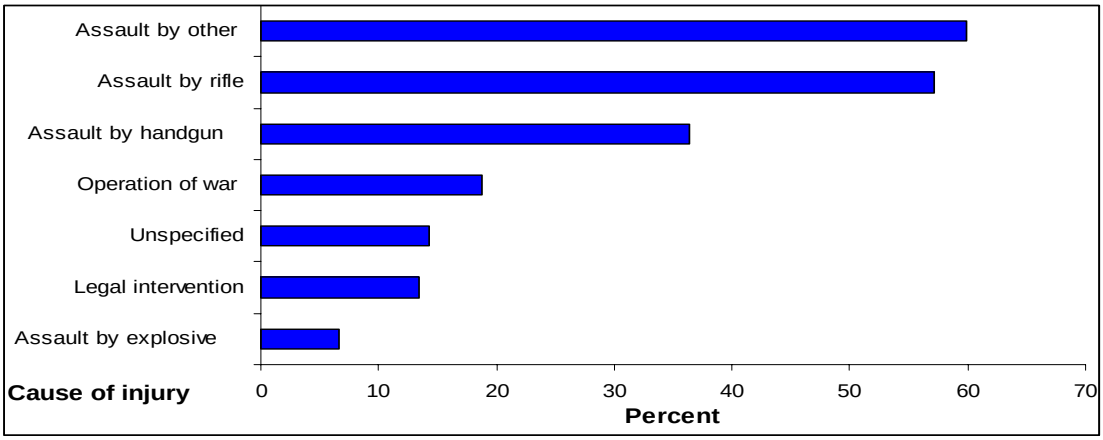

Figure 4.9 Case fatality rate with Cause of injury

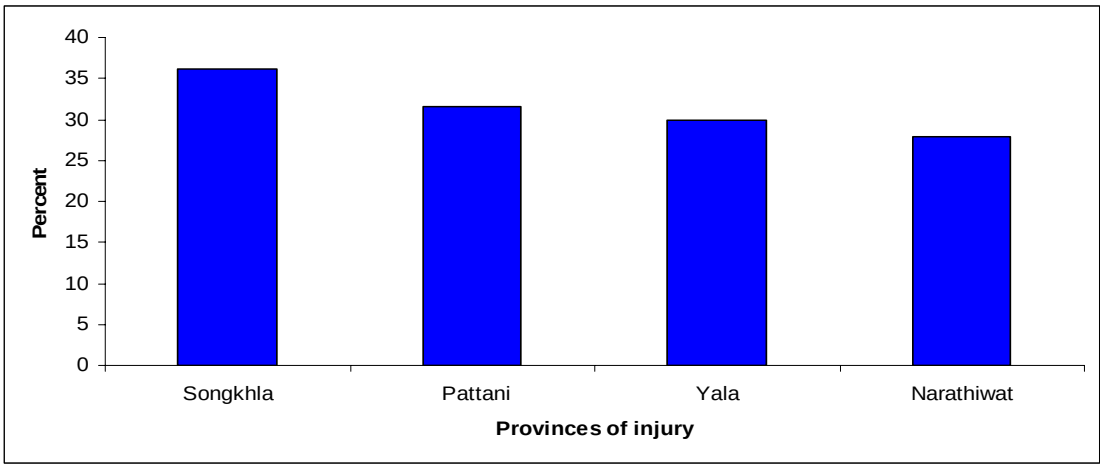

Figure 4.10 Case fatality rate with Provinces of injury

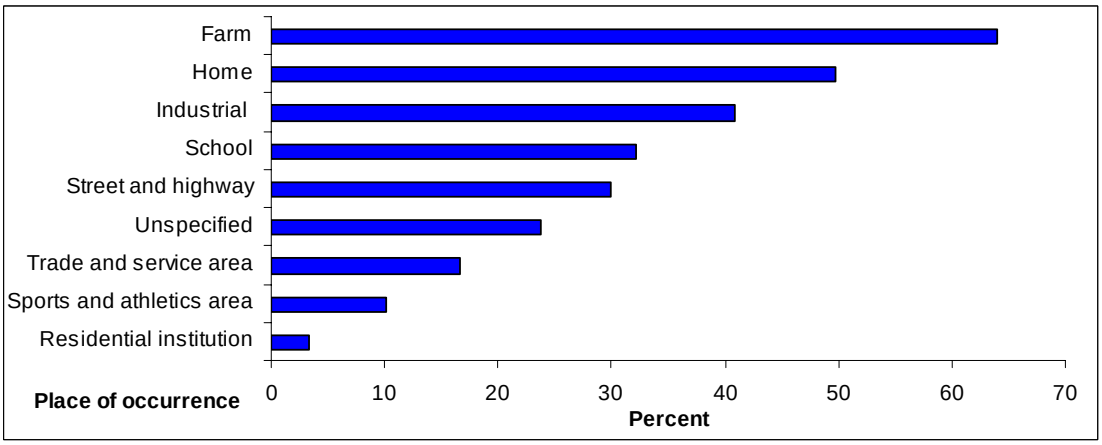

Figure 4.11 Case fatality rate with Place of occurrence

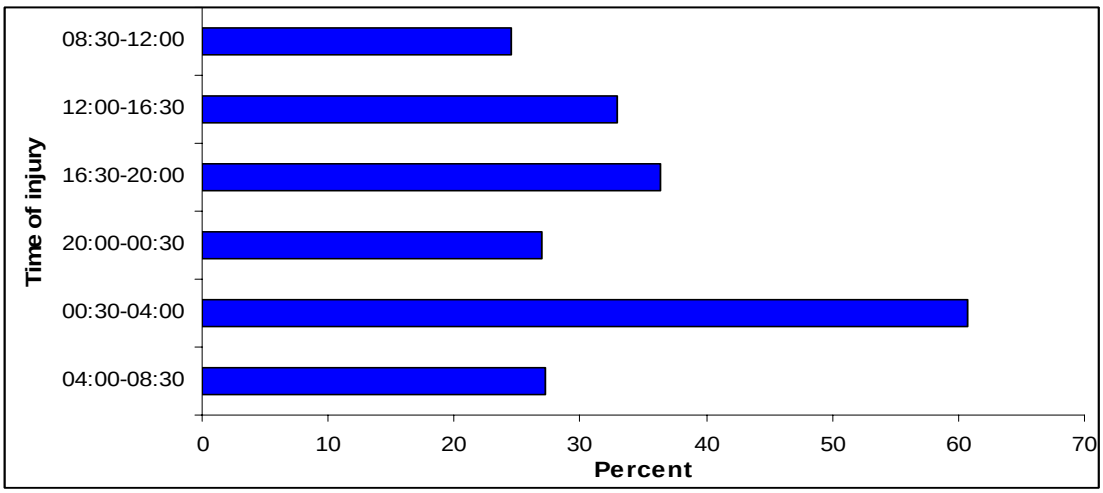

Figure 4.12 Case fatality rate with Time of injury

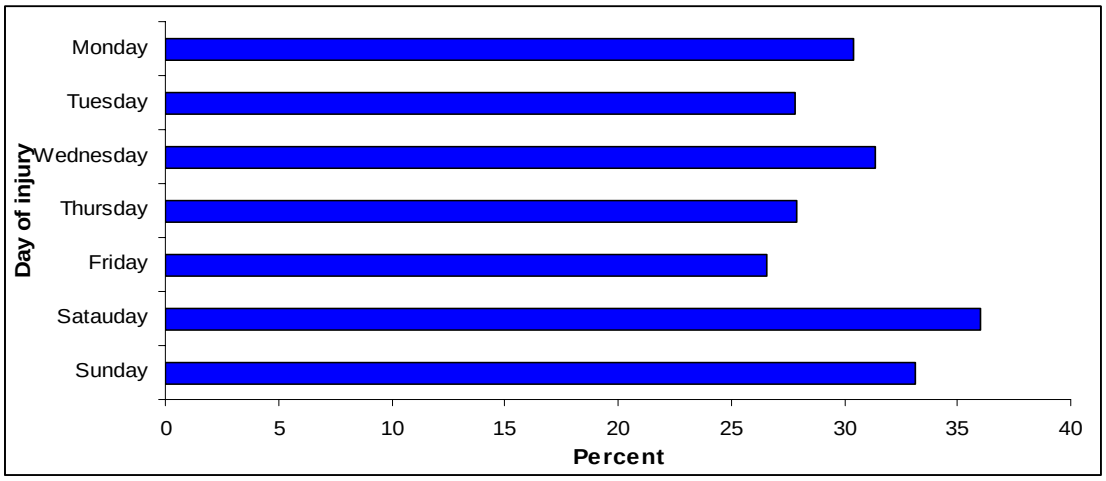

Figure 4.13 Case fatality rate with Day of injury

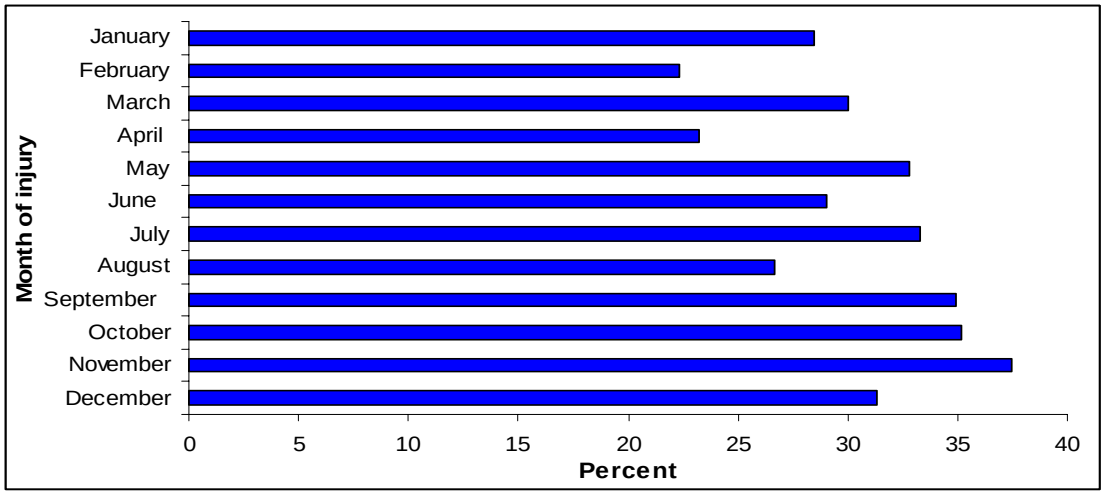

Figure 4.14 Case fatality rate with Month of injury

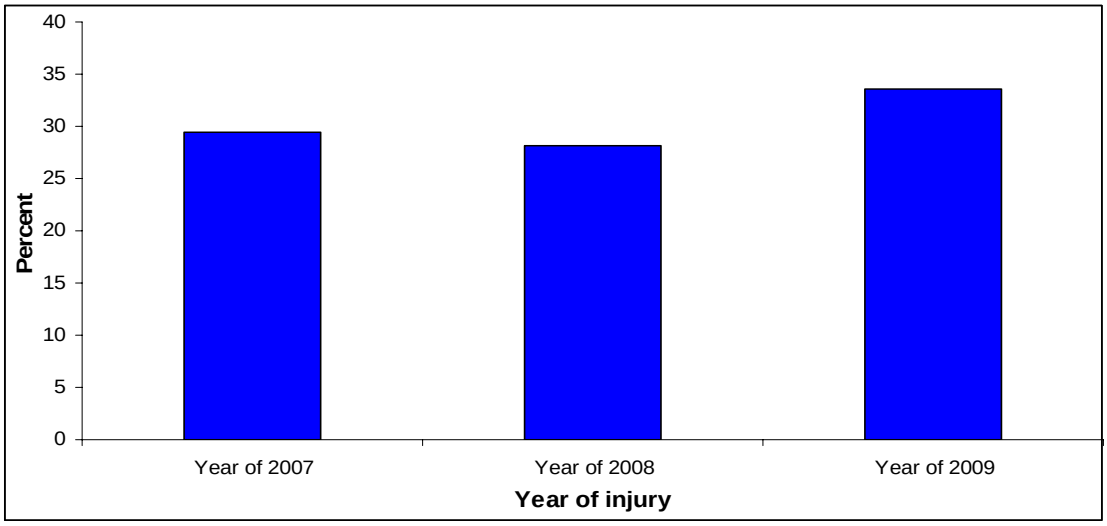

Figure 4.15 Case fatality rate with Year of injury

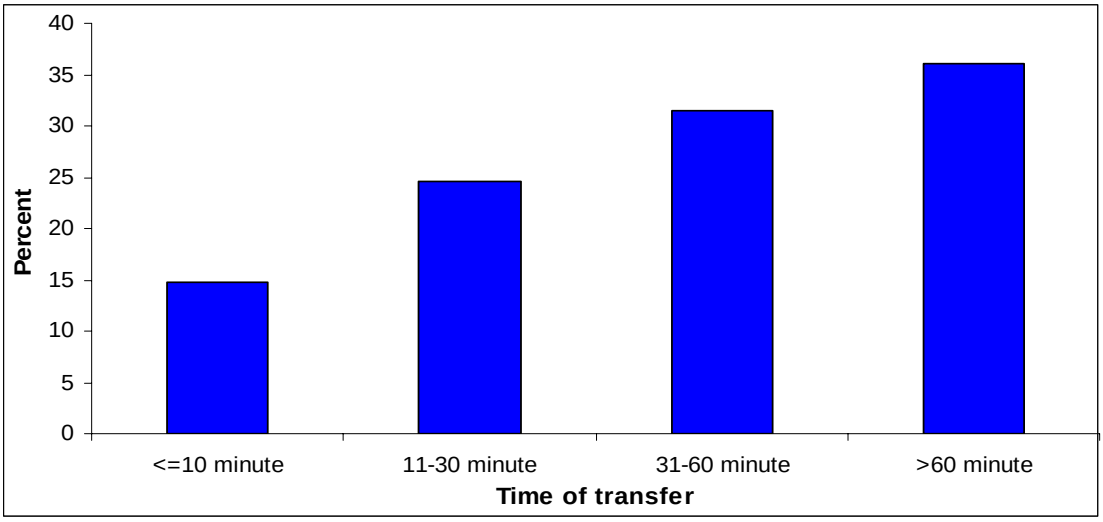

Figure 4.16 Case fatality rate with Time of transfer

4.2 Association of demographic (age, gender, occupational, religion), character of injury, pace of occurrence, time of injury, day of injury, time of transfer and severity with mortality from terror-related injury in southern provinces.

Each character of the victim of terror-related injury in Thailand's southern provinces covering age (45-54, >=55), Gender, occupation (community leader, agriculturist, employee, government servant, housewife, merchant, unspecified), religion (Islam), Character of injury (penetrating, blunt and penetrating, unspecified), place of incurrence (industrial and school other institution and public administrative area, home, street and highway, farm), time of transfer (31-30 minutes, >60 minute) and severity was considered.

Ones at the age of 45-54 year had 1.72 times of a greater mortality risk than ones younger than 24 year also, ones aging 55 or older had 2.27 times than ones aging 24 or younger.

Males had 1.73 times of a greater mortality risk than female.

Compared with the police, community leaders, agriculturists, employees, government servants, housewives, merchants, others with unspecified occupation had a greater mortality risk than the police (5.20 times, 2.62 times, 2.89 times, 3.96 times,

4.68 times, 3.17 times and 1.97 times, respectively. In addition, Muslims also had 1.69 times of a greater mortality risk than Buddhism.

Compared with patients with blunt injury, those who had penetrating injury, blunt and penetrating injury and unspecified-character injury had a greater risk of mortality (3.25 times, and 1.85 times, respectively).

Compared with patients who got their injuries in residential institution, sports and trade and service areas, ones getting their injuries in industrial and school, other institutions and public administrative areas, at home, on the street/highway and in the farm had a greater risk of mortality (2.23 times, 2.31 times, 1.57 times and 2.90 times, respectively)

Compared with the patients who had been transferred within 10 minutes or quicker, ones who were transferred within 31-60 minutes and quicker than 60 minutes had a greater risk of mortality (1.82 times and 1.62 times, respectively).

An increased one score caused the risk be 1.08 time.

Table 4.4 Association of demographic (age, gender, occupational, religion), character of injury, pace of occurrence, time of injury, day of injury, time of transfer and severity with mortality

Variables	Crude OR /95% CI	Adjusted OR /95% CI
Age		
<24	1.0	1.0
25-34	1.56(1.27-1.93)	1.23(0.84-1.80)
35-44	2.40(1.94-2.96)	1.36(0.92-2.00)
45-54	2.61(2.11-3.24)	1.72(1.17-2.55)
>=55	3.49(2.60-4.70)	2.27(1.37-3.74)
Gender		
Female	1.0	1.0
Male	1.91(1.55-2.36)	1.73(1.17-2.57)
Occupation		
Police	1.0	1.0
Community leader	14.66(8.78-24.48)	5.20(2.36-11.47)

Table 4.4 Association of demographic (age, gender, occupational, religion), character of injury, pace of occurrence, time of injury, day of injury, time of transfer and severity with mortality (Cont.)

Variables	Crude OR /95% CI	Adjusted OR /95% CI
Agriculturist	7.58(5.52-10.40)	2.62(1.54-4.44)
Employee	4.44(3.15-6.28)	2.89(1.65-5.93)
Government servant	3.61(2.42-5.38)	3.96(2.11-7.39)
Housewife	1.80(0.96-3.38)	4.68(1.67-13.12)
Merchant	2.69(1.83-3.95)	3.17(1.69-3.18)
Soldier	1.25(0.89-1.75)	1.59(0.93-2.71)
Student	1.44(0.93-2.21)	1.48(0.69-3.18)
Unspecified	4.87(3.54-6.70)	1.97(1.97-5.54)
Religion		
Buddhism	1.0	1.0
Islam	3.49(3.00-4.06)	1.69(1.27-2.23)
Unspecified	2.32(1.81-2.97)	1.33(0.87-2.02)
Character of Injury		
Blunt	1.0	1.0
Penetrating	11.89(9.28-15.22)	3.25(2.27-4.64)
Blunt and Penetrating	8.57(6.54-11.23)	2.85(1.92-4.24)
Unspecified	5.35(3.93-7.28)	1.85(1.13-3.02)
Place of occurrence		
Residential institution, Sports and Trade and service area	1.0	1.0
Industrial and School, other institution and public administrative area	2.77(1.83-4.19)	2.23(1.13-4.38)
Home	5.43(4.06-7.25)	2.31(1.45-3.69)
Street and highway	2.35(1.88-2.94)	1.57(1.09-2.27)
Farm	9.77(6.69-14.26)	2.90(1.54-5.43)
Unspecified	9.03(1.21-67.23)	0.97(0.58-1.67)

Table 4.4 Association of demographic (age, gender, occupational, religion), character of injury, pace of occurrence, time of injury, day of injury, time of transfer and severity with mortality (Cont.)

Variables	Crude OR /95% CI	Adjusted OR /95% CI
Time of injury		
04:01-00:30	1.0	1.0
00:31-04:00	3.67(2.02-6.66)	0.39(0.14-1.05)
Day of injury		
Weekday	1.0	1.0
Weekend	1.29(1.10-1.52)	1.04(0.71-1.52)
Time of transfer		
<=10 minute	1.0	1.0
11-30 minute	1.88(1.40-2.52)	1.18(0.75-1.86)
31-60 minute	2.64(1.93-3.62)	1.82(1.10-2.98)
>60 minute	3.24(2.48-4.25)	1.62(1.06-2.46)
NISS	1.09(1.08-1.10)	1.08(1.07-1.09)

Most of Injury Severity Scores (ISS) were 1 to10 (66.5%) and over a half of non-survivor subjects (54.0%) were 71-80. The ISS mean was 18.9 (SD=27.3) with median at 4. Furthermore, most of New Injury Severity Scores (NISS) were 1 to10 (63.7%) and 54.0% of non-survivor subjects were 71-80. The ISS mean was 20.1(SD=27.6) with median at 4 as presented in Table 4.5

Table 4.5 Description of ISS and NISS

Data group	Survivor (n= 2,738)	Non- Survivor (n= 1,181) (n=87)	Total (n=3,919)	P-value
	No. (%)	No. (%)	No. (%)	
ISS				<0.001
1-10	2452(94.0)	156(6.0)	2608	
11-20	156(66.9)	77(33.1)	233	
21-30	72(29.0)	176(71.0)	248	
31-40	16(24.2)	50(75.8)	66	
41-50	6(9.0)	61(91.0)	67	
51-60	3(14.3)	18(85.7)	21	
61-70	1(16.7)	5(83.3)	6	
71-80	32(4.8)	638(95.2)	670	
Mean(SD)	18.9(27.3)			
Median	4			
NISS				<0.001
1-10	2366(94.7)	132(5.3)	2498	
11-20	193(74.2)	67(25.8)	260	
21-30	80(37.2)	135(62.8)	215	
31-40	29(32.6)	60(67.4)	89	
41-50	31(24.4)	96(75.6)	127	
51-60	4(10.3)	35(89.7)	39	
61-70	3(14.3)	18(85.7)	21	
71-80	32(4.8)	638(95.2)	670	
Mean(SD)	20.1(27.6)			
Median	4			

Most of Injury Severity Score (ISS) from terror-related injury in southern provinces was 1, similar to New Injury Severity Score (NISS) as presented in Figure. 20-21

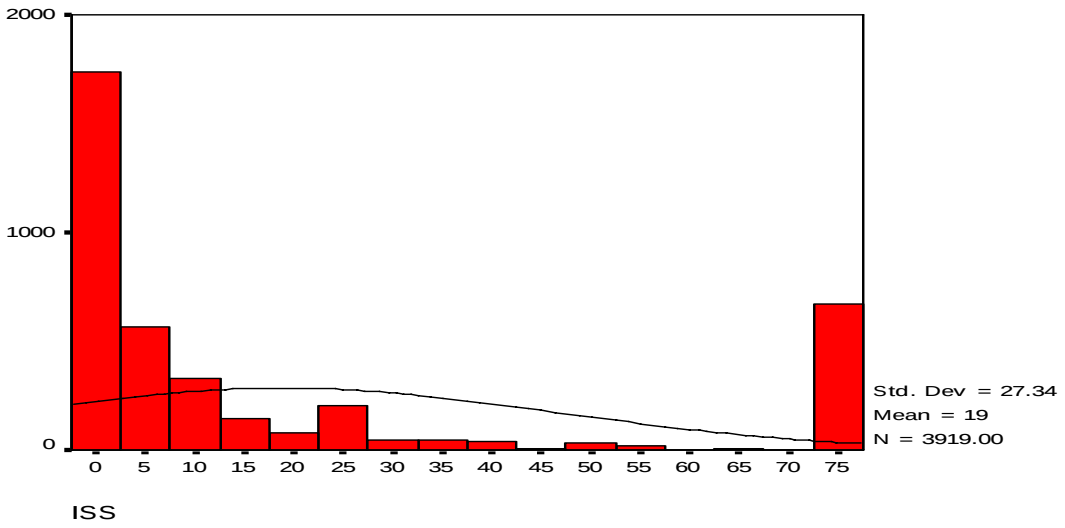

Figure 4.17 Number of patients of injury from terror-related injury in southern provinces with Injury Severity Score (ISS).

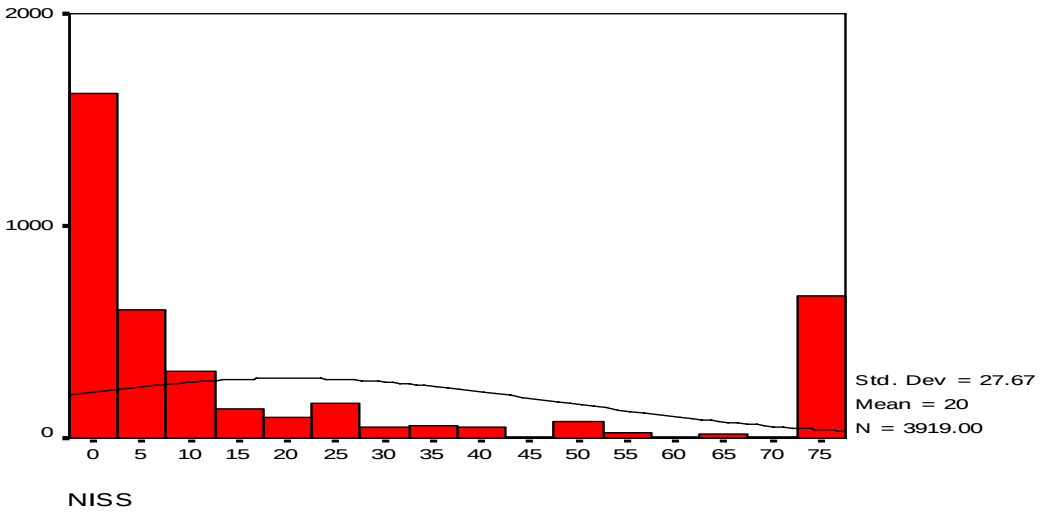

Figure 4.18 Number of patients of injury from terror-related injury in southern provinces with New Injury Severity Score (NISS).

Case fatality rate at Injury Severity Score (ISS) and New Injury Severity Score (NISS) valuably increased when the score increased.

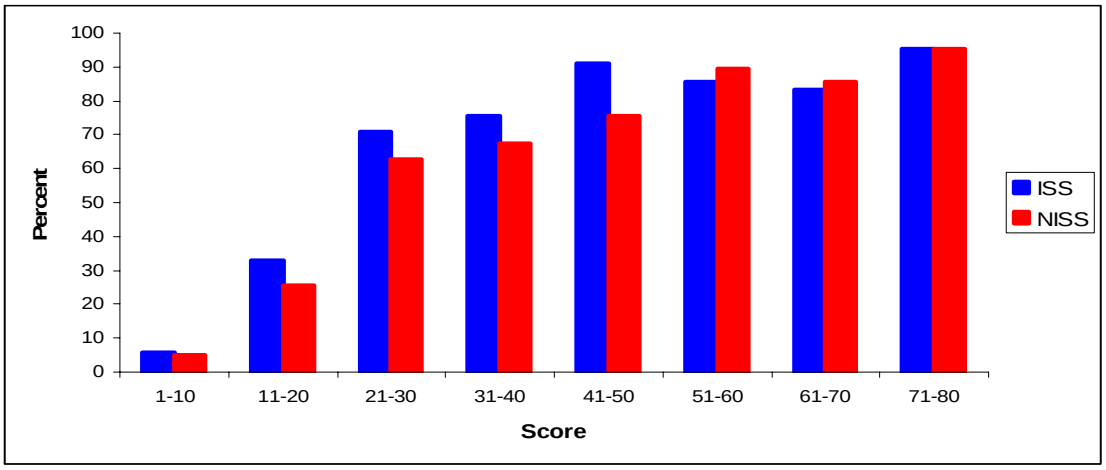

Figure 4.19 Case fatality rate with Injury Severity Score (ISS) and New Injury Severity Score (NISS)

4.3 Comparison of accuracy of Injury Severity Score (ISS) and New Injury Severity Score (NISS) from terror-related injury in Thailand's southern provinces.

The AUC is a global summary statistic of diagnostic accuracy. The AUC of Injury Severity Score (ISS) was 0.928 (SE = 0.005), while AUC of New Injury Severity Score (NISS) was 0.935 (SE = 0.005) (Table.4.6). The differences between Injury Severity Score (ISS) and New Injury Severity Score (NISS) was significant (p = 0.005) (Table 4.5).

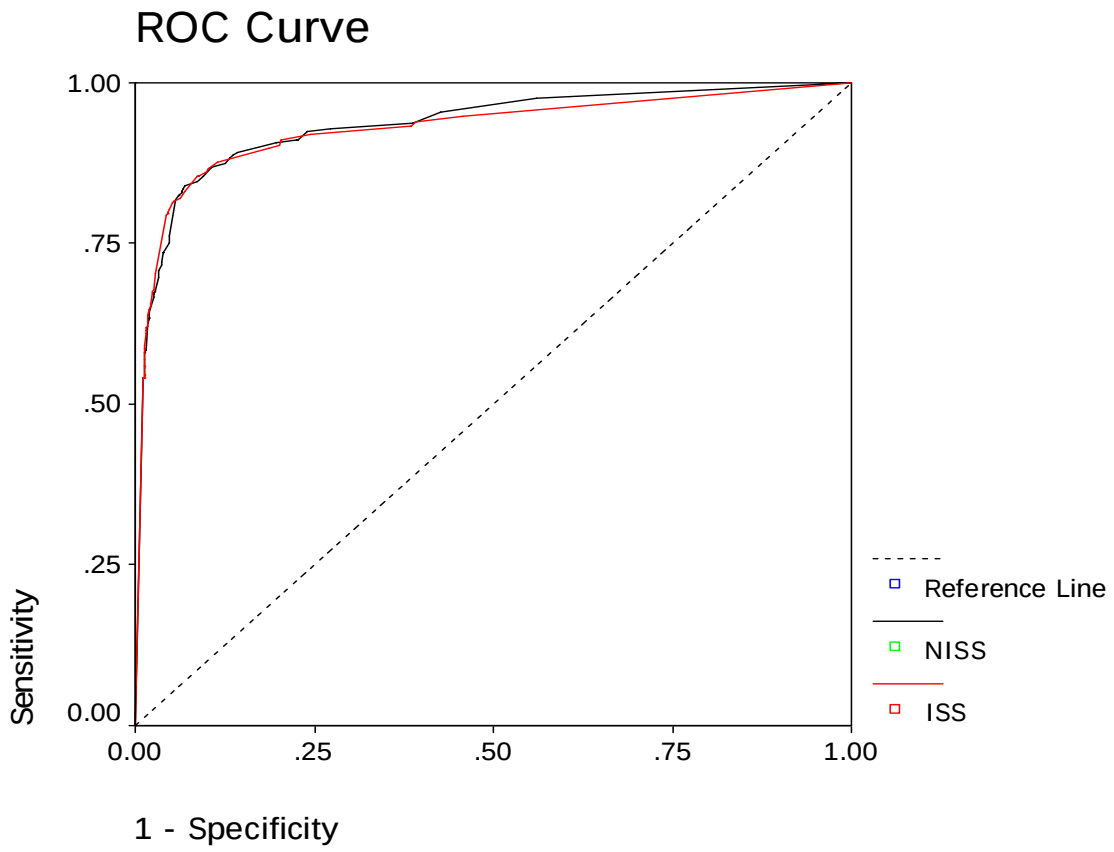

Figure 4.20 The receiver operating characteristic (ROC) curve of Injury Severity Score (ISS) and New Injury Severity Score (NISS).

Table 4.6 Area Under the Receiver Operating Characteristic Curve (AUC) for performance of Injury Severity Score (ISS) and New Injury Severity Score (NISS).

Screening Instruments	AUC	SE	95% CI	p[a]
ISS	0.928	0.005	0.920 - 0.936	<0.0001
NISS	0.935	0.005	0.926 - 0.942	

[a] Two-tailed z test for difference AUCs

The AUC of Injury Severity Score (ISS) if injury occurred in <=3 body region was 0.925 (SE = 0.007), while AUC of New Injury Severity Score (NISS) if injury occurred in <=3 body region was 0.932 (SE = 0.006) (Table 4.6). The differences

between Injury Severity Score (ISS) and New Injury Severity Score (NISS) was significant (p = 0.0001) (Table 4.7).

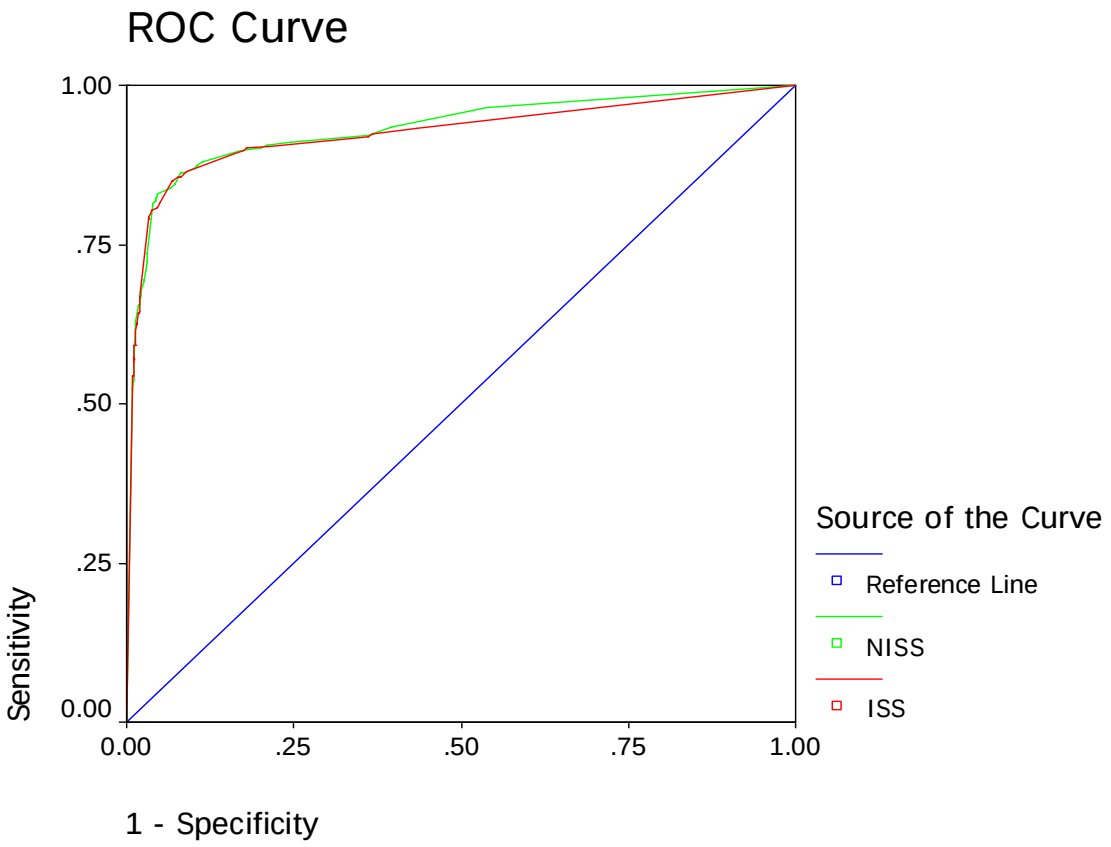

Figure 4.21 The receiver operating characteristic (ROC) curve of Injury Severity Score (ISS) and New Injury Severity Score (NISS) if injury occurred in <=3 body region.

Table 4.7 Area Under the Receiver Operating Characteristic Curve (AUC) for performance of Injury Severity Score (ISS) and New Injury Severity Score (NISS) if injury occurred in <=3 body region.

Variable	AUC	SE	95% CI	p
ISS	0.925	0.007	0.911-0.938	0.0001
NISS	0.932	0.006	0.920 - 0.944	

The AUC of Injury Severity Score (ISS) if injury occurred in >3 body region. was 0.840 (SE = 0.019), while AUC of New Injury Severity Score (NISS) if injury occurred in >3 body region was 0.825 (SE = 0.020) (Table 4.8). The differences between Injury Severity Score (ISS) and New Injury Severity Score (NISS) was significant (p = 0.0001) (Table 4.8).

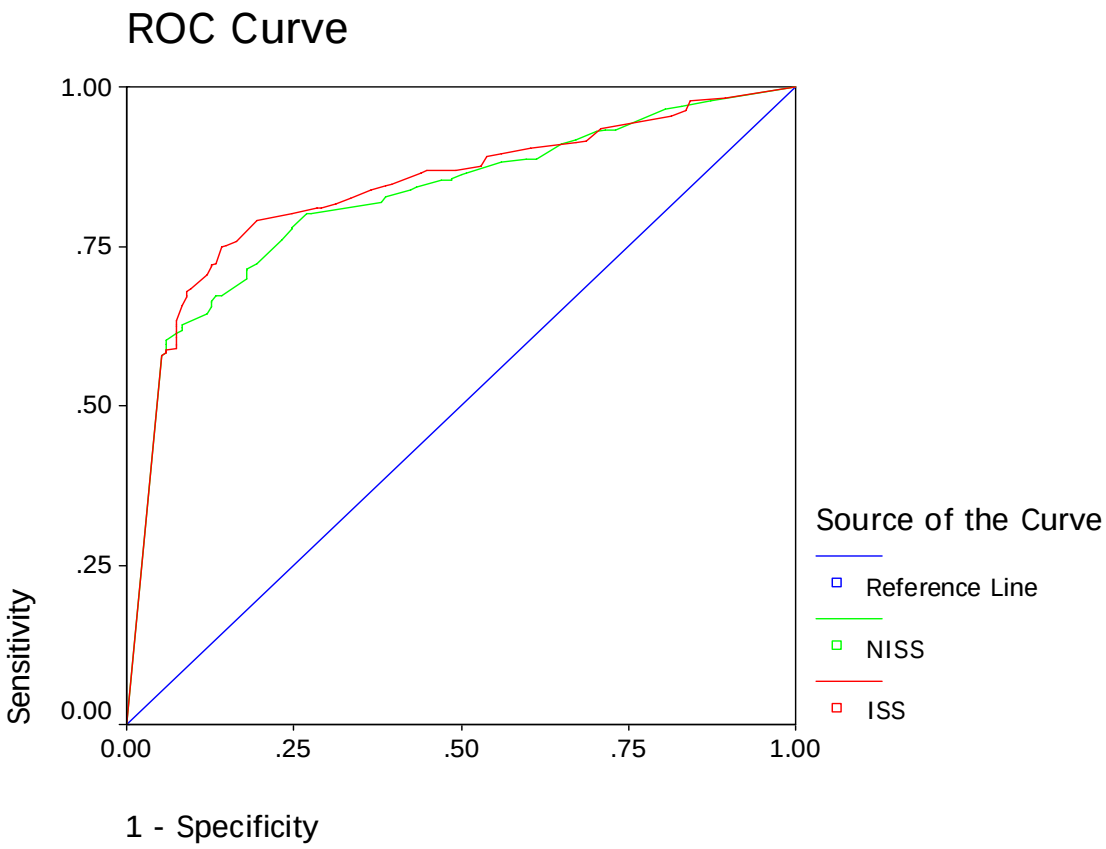

Figure 4.22 The receiver operating characteristic (ROC) curve of Injury Severity Score (ISS) and New Injury Severity Score (NISS)) if injury occurred in >3 body region.

Table 4.8 Area Under the Receiver Operating Characteristic Curve (AUC) for performance of Injury Severity Score (ISS) and New Injury Severity Score (NISS) if injury occurred in >3 body region.

Screening Instruments	AUC	SE	95% CI	p
ISS	0.840	0.019	0.802-0.877	0.0001
NISS	0.825	0.020	0.787 - 0.864	

CHAPTER V
DISCUSSION

This chapter provides conclusions and discussion of the research methodology and the research findings.

1. Research Methodology

This was an analysis of injury surveillance data study aiming studying the association of demographic data of the sample, NISS, and various aspects of injury with mortality from terror-related injury in Thailand's southern provinces. It also compared accuracy between Injury Severity Scale (ISS) and New Injury Severity Scale (NISS) in predicting mortality from terror-related injury in Thailand's southern provinces. The study population was people in Thailand's southern provinces covering Pattani, Yala, Narathiwat and 4 districts of Songkhla. The data included 7,239 victims of terror-related injuries in Thailand's southern provinces during 2007 to 2009, obtained from the Violence-Related Injury Surveillance (VIS) system. After excluding repeated data and missing data, the final data included a total of deleted cases in the analysis (Table 5.1)

Table 5.1 A total of deleted cases in the analysis

Year	Number of patients	Repeated data deleted (number/%)	Missing data deleted (number/%)	Total deleted (number/%)	Remaining
2007	2,910	583(20.0%)	558(23.9%)	1,141(39.2%)	1,769(60.7%)
2008	2,160	598(27.7%)	429(27.4%)	1,027(47.5%)	1,133(52.5%)
2009	2,169	556(25.6%)	596(36.9%)	1,152(53.1%)	1,017(46.9%)
Total	7,239	1,737(23.9%)	1,582(22.0%)	3,320(45.8%)	3,919(54.1%)

Selection bias might occurred if the characteristics of the cases in the final data were different from those excluded due to missing data. The researcher compared some characteristics eg. age, sex, and severity of injury of the injured cases included in the analysis with those excluded and found that these characteristics in both groups were similar. Therefore, the selection bias should be minimum. For, information bias, it is possible if the data were not accurately recorded by nurses who filled the record form. This issue should be further investigated.

2. Research Findings

The following paragraphs discussed about the association of the sample's demographic data (age, gender, occupational, religion), severity, character of injury, place of injury, time of injury, day of injury and time of transfer from the site of incident to the hospital with mortality from terror-related injury in Thailand's southern provinces.

1. Age

The majority of injured victims were during the ages of 25-34, which was consistent with Peleg, K et al. and Kluger, Y et al. (34-36) , because they were working-aged workmen spending the largest portion of their times outside and more highly risky be harmed by a terrorist than the other age groups due to his great opportunity when they leave their houses to work. The age group of or over 55 was at higher risk to death because they, at the elderly, easily succumbed to injury (51-54).

2. Gender

The majority of injured victims in the present study were male, This finding was consistent with the studies by Peleg, K et al. and Kluger, Y et al. (36-38)This might be the reason that they were main target of the terrorism.

3. Occupation

The majority of the injured samples of the present study were soldiers, consistent with the report by Sheffy, N.(41); however, community leaders possessed the highest case-fatality rate. They played a great deal of role in community and were specifically targetted by the terrorist. Moreover, it was possible that most of community leaders murdered were due to locally political conflict. Nevertheless, this issue required further investigation for the real reasons.

4. Religion

Most of injured victims were Buddhism but most of the non-survivor were Islam. Muslim victims of terror-related injury in the southern provinces were more at high risk than Buddhists and people of other faiths, possibly due to the reasons that; 1) Muslims were the major component of people in Southern provinces with the largest proportion of population (85.16%); 2) Almost all community leaders who work with the government were Muslims. In addition, there was a religion belief that Muslims could accept to a certain level of treatment procedure which might preclude them from receiving some life saving treatment. However, more investigation about this issue is need.

5. Character of Injury

Most the victims sustained penetrating injuries because these were characterized by high numbers of casualties, primarily caused by blast injuries and ballistic injuries. Moreover, penetrating injuries occurs when an object pierces the skin and enters a tissue of the body, creating an open wound. In blunt, or non-penetrating trauma, there may be an impact, but the skin is not necessarily broken. The penetrating object may remain in the tissues, come back out the way it entered, or pass through the tissues and exit from another area. An injury in which an object enters the body or a structure and passes all the way through is called a perforating injury, while penetrating trauma implies that the object does not pass through. Perforating trauma is associated with an entrance wound and an often larger exit wound. Injury caused by a blast can be either a primary blast effect of acceleration-deceleration of the blast wave or a secondary effect of metal fragments deliberately placed in explosives, causing severe penetrating injuries(55-57). The latter type of injury may result in severe open fractures and lost bleeding so much, to may be death(57-60). Accordingly, the patients with similar injury in the southern provinces are higher risky to death.

6. Place of occurrence

The present study found that the majority of the victims had their terror-related injuries occurred on streets and highways. Strategically, the street along which the victim always travels is a good site for attack especially by blasting and ballistic approaches and the explosion bury at street and highway order to ambush

target group. Nevertheless, the highest case fatality rate was found for incidence occurred in farms.

7. Time of transfer from the place of injury to hospital

Most victims of had been transferred to hospital within less than 60 minutes. It was found that the victims who had been transferred within 31-60 minutes and more rapid than 60 minutes were more risky to mortality than those who were transferred within 10 minutes or quicker(62) because many news reports, the victims could not be reached instantly as soon as the incidents were reported because the sites, were unsafe and must be clearly examined by the police or soldiers to ensure that there were no other weapons hidden or terrorists hiding on the way to the victims for safety of transferring officials.

8. Severity

In the present study, description of NISS variables had been classified into ordinal scales. Most terror-related injured victims had their NISS at the scale of 1-10. In addition, in logistic regression showed an increased one score caused the risk be 1.08 time mortality risk. That was, the greater severity was, the higher mortality risk became. This was consistent with the studies by Brenneman, FD. et al (28)

The comparison of accuracy of two severity instruments: Injury Severity Score (ISS) and New Injury Severity Score (NISS) indicated that there was a slightly significant difference between the two instruments. The Injury Severity Score (ISS) had been used for rating of severity for many years since its introduction in 1974. It produced sum severity scores of the three most severe injuries with consideration of one injury area per body region.

In 1997, Osler et al. modified ISS and renamed it the “New Injury Severity Score (NISS).” The NISS was improved because of limitation of ISS. It sums the severity score of the three most severe injuries, regardless of body region. Therefore, NISS is equal to or higher than ISS. Higher scores of NISS than those of ISS indicate multiple injuries in at least one body region. They believed that predictions of mortality would more accurate (4). The new system, however, is not used as widely as the previous one. Various studies have been performed to compare accuracy of ISS and

NISS in prediction of mortality caused by various injury cases. Some studies reported that ISS is more accurate than NISS and vice versa, whereas, the others found equal accuracy(35, 48, 49).

The results of the present study showed that the AUCs of ISS and NISS were 0.928 and 0.935, respectively. The area under the ROC curve ranges from 0.5 to 1.0 and the larger area indicates a better accuracy of a prediction model (42). This results that the predictive accuracy of ISS and NISS was slightly different but statistically significant. There is a question whether the number of injured body region effect the predictive mortality of ISS and NISS. Thus, this study calculated the predictive injury occurred in more than 3 body regions with less 3 body regions by AUC. The AUCs of ISS and NISS with injury occurred in more than 3 body regions were 0.840 and 0.825, respectively. Nevertheless, the AUCs of ISS and NISS with if injury occurred in less 3 body regions were 0.925 and 0.935, respectively.

The AUC of NISS with injury occurred in more than 3 body regions was lower than that of ISS with injury occurred in less than 3 body regions but the result of comparison of ISS and NISS with injury occurred in more than 3 body regions suggested slightly better performance of NISS than that of ISS.

Limitation of the Study

This study had some limitations. First, many secondary data obtained from the Violence Related Injury Surveillance (VIS) reporting system were missing variables because they were recorded based on trauma patients by ER nurses of many hospitals. Second, ISS and NISS variables were calculated from AIS and Body Region (BR) variables. Accordingly, ISS and NISS errors could exist if AIS and BR variables were recorded inaccurately. Third, this sample size is large than meaning, no there could be a difference between statistical significant and the public health statistical. Fourth, this study did not include cases who were dead at scene (14 case)

CHAPTER VI
CONCLUSION

This research was an analysis of injury surveillance data aimed at studying the association of demographic data (age, gender, occupational, religion), severity, character of injury, place of injury, time of injury, day of injury and time of transfer with mortality from terror-related injury of patients who were admitted at southern hospitals in Thailand, This research also compared the accuracy between Injury Severity Scale (ISS) and New Injury Severity Scale (NISS) in predicting mortality.

The study population was were patients injured from terror-related injury, and admitted at hospitals in southern provinces of Thailand during January 1, 2007 to December, 31 2009. The data were secondary obtained from Violence-related Injury Surveillance. In the analysis, the logistic regression was used. The factors that were associated with mortality were ages, male, community leaders, agriculturists, employees, government servants, housewives, merchants, Muslims, penetrating injury, penetrating with blunt injury, industrial and school other institution and public administrative areas, homes, streets and highways, farms, and times of transfer 31-30 minutes and more than 60 minutes. Although some factors are unpreventable, it is, at least, possible for people in those groups to be aware of the fact that they are at risk of mortality from such incidence, so that they will proceed with caution in their daily life activities in the southern provinces.

This objection was to compare Injury Severity Score (ISS) and New Injury Severity Score (NISS) in predicting mortality from terror-related injury in Southern provinces. The comparison of these was performed by AUCs. The AUCs of Injury Severity Score (ISS) and New Injury Severity Score (NISS) were 0.938 and 0.935, respectively. This result of ISS and NISS was slightly different with statistical significance ($p=0.005$). In conclusion, the New Injury Severity Score (NISS) is slightly superior to the Injury Severity Score (ISS) in prediction of mortality from terror-related injury in Southern provinces. The New Injury Severity Score (NISS) is

simple and easy for calculation. This study recommended the Injury Severity Score (ISS) and New Injury Severity Score (NISS) the similar preferred measure of tissue injury severity from terror-related injury.

Recommendations Based on the Research Findings

Based on the findings of this study, the following recommendations for medical service organizations are proposed.

1. Improvement of medical service response

Injured individual with large time period of transfer to hospital was associated with high mortality, in case of time of transfer, if a terror-related injured patient is transferred from the site of the incident to hospital quickly, he or she is more possible to be saved. However, according to many news reports, the victims could not be reached instantly as soon as the incidents were reported because the sites, were unsafe and must be clearly examined by the police or soldiers to ensure that there were no other weapons hidden or terrorists hiding on the way to the victims for safety of transferring officials.

2. Improvement of surveillance system.

There are many missing data obtained from VIS. If all the VIS forms filled by emergency room nurses are completed, the data will be more accurate. In the issue the VIS commission, however, has consistently evaluated and developed the process.

3. Injury Severity Score (ISS) and New Injury Severity Score (NISS) were excellent mortality predictors with the aim of evaluating severity of injury and the outcome of the treatment.

Recommendations for Further Research

In order to achieve more practically research findings, similar quantitative research should be conducted together with qualitative one because some variables, such as social and cultural ones, need qualitative for discussion. For example, that community leaders possessed higher CFR than the police and that the Muslims than the Buddhists need qualitative information for detailed explanation.

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APPENDIX

ISS B.R. AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
Head/ NECK (1) (In-Clued ear)	- Headache/Dizziness 20 to head trauma but awake on admission - Cervical spine strain with no fracture or dislocation - Ear injury NFS (Not further specified) - Ear Canal injury - Inner or middle ear injury	- Amnesia from accident, - Lethargic/ stupor us/Obtunded (Drowsiness): can be roused by verbal Stimuli - Unconsciousness < 1 hr - Cerebral concussion (Skull fracture) - Simple vault fracture - Thyroid contusion - Brachial plexus injury - Dislocation or fracture - Spinouts or transverse Process of c-spine - Minor compression - Fracture (<20%) c-spine	- Unconsciousness 1-6 hrs - Unconsciousness <1 hr With neurological deficit - Fracture base of skull - Comminuted, compound or depressed vault fracture - Cerebral contusion/edema Subarachnoid hemorrhage - Intimal tear/thrombosis Carotid Artery - carotid A laceration NFS - Contusion larynx, pharynx - Cervical cord contusion - Dislocation or fracture of lamina, body, pedicle or facet of C-spine - Compression fracture > 1 vertebra or > 20% anterior height - Brain swelling,Subpial hemorrhage hygroma, ischemia, infraction	- Unconsciousness 1-6 hrs - Unconsciousness <1 hr With neurological deficit	- Unconsciousness with inappropriate movement - Unconscious > 24 hrs - Brain stem injury - Intracranial hematoma > 100 cc. - Complete cervical cordLesion c4 or below

ISS B.R. AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
FACE (2) In- Clued eyes	Eye injury NFS - Corneal abrasion, NFS - Iris laceration - Sup. Tongue laceration - Nasal or mandibular Ramus* fracture - Tooth fracture/avulsion or dislocation	- Maxilla Fx NFS closed Fx - Zygoma, orbit* ,body or Subcondylar mandible* Fracture - Lefort I fracture - Scleral/corneal laceration	- Optic nerve laceration - Lefort II fracture	- Lefort III fracture	* Add AIS I if open / displace comminuted
(3) THORAX	- Rib fracture# - Thoracic spine strain - Rib cage contusion - Sternal contusion # Add AIS I if associated with h' thorax,p'thorax or H'p' mediastinum	- 2 – 3 rib fractures# - Sternum fracture - Dislocation or fracture spinous or transverse Process t – spine - Minor compression fracture (<20%) t - spine	- Lung contusion / laceration < loba - Unilateral h ' or p' Thorax - Diaphragm / rupture > 4 rib fractures # - Intimal tear /minor lac / Thrombosis subclavian or Innominate artery (cont.) - Inhalation burn, minor - Dislocation or fracture of lamina body, pedicle or facet of t – spine - Compression fracture > 1 Vertebra or more than 20% Height - Cord contusion with transient neurological signs	- Multilobar lung Contusion or laceration - H'p' mediastinum - Bilat h'p' thorax - Flail chest - Myocardial contusion - Tension p' thorax - Hemothorax >1000 cc. - Tracheal fracture (cont.) - Intimal aortic tear - Major laceration Subclavian or Innominate A. - Incomplete cord syndrome	- Major arotic laceration - Cardiac laceration - Ruptured bronchus / Trachea - Flail chest / inhalation burn requiring mechanical support - Laryngotrach. separation (cont.) - Multilobar lung lac. With tension p' thorax h' p' mediastinum, or >1,000 cc. hemothorax - complete cord lesion

ISS B.R. AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
(4) ABDOMEN AND PELVIC CONTENT	- Abrasion / contusion superficial lac. Scrotum, vagina, vulva, perineum - Lumbar spine strain - Hematuria	- Contusion / sup. Laceration stomach, mesentery, s8 bladder, ureter, urethra - Minor contusion / lac. kidney, liver, spleen , pancreas - Contusion duodenum / Colon - Dislocation or fracture spinous or transverse process L-spine - Minor compression Fracture (<20%) L-spine - Nerve root injury	- Sup. Lac. Duodenum / colon / rectum - Perforation s8 / mesentery / bladder / ureter / urethra - Major contusion / or minor lac. With major vessel invol ., or h'peritoneum > 1,000 cc of kidney /Liver / spleen / pancreas - Minor illac A. or V Laceration - Retroperitoneal hematoma - Dislocation or fracture of lamina body. Facet or pedicle of L-spine - Compression fracture > T vertebra or > 20% anterior height - Cord contus. With trans neuro signs	- Perforation stomach duodenum / colon / rectum - Perforation with tissue loss stomach / bladder / s8 / ureter / urethra - Major liver laceration - Major illac A. or v. laceration - Incomplete cord syndrome - Placental abruption	- Major laceration with tissue loss or gross contamination of duodenum / colon / rectum - Complete rupture liver / spleen / kidney / pancreas - Complete cord lesion

ISS B.R. AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
(5) EXTREMITIES AND PELVIC GIRDLE	- Contusion elbow, shoulder, wrist, ankle - Fracture / dislocation finger, toe - Sprain A.C. joint, shoulder, elbow, finger, wrist, hip, ankle, toe	- Fracture hemurus* , radius* ,ulna* fibula , tibia* , clavicle , scapula , carpals , metacarpals , rami or simple pelvic fracture. - Dislocation elbow, hand, Shoulder, A.C. joint - Major muscle / tendon Laceration - Intimal tear / minor lac. axillary, brachial, popliteal A:axillary , femoral, popliteal V.	- Comminuted pelvic fracture - Fractured femur - Dislocation wrist / ankle / knee / hip - Below knee or upper Extremity amputation - Rupture knee ligaments - Sciatic nerve laceration - Intimal tear / minor laceration femoral A. - Major laceration thrombosis axillary or popliteal A: axillary popliteal or femoral V.	- Pelvic crush fracture - Traumatic above knee amputation / crush injury - Major laceration femoral or brachial artery	- Open pelvic crush Fracture *Add AIS I to these Fractures if open , Displaced or comminuted

BLUNT INJURY

ISS B.R. / AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
(6) EXTERNAL	- Abrasion , Contusion , - Laceration, Degloving Injury NFS - Abrasion / contusions < 25 cm. on face / hand < 50 cm. on body - Superficial lacs. < 5 cm. on face / hand < 10 cm. on body - Laceration NFS - 1° burn up to 100% - 2° or 3° burn / degloving Injury < 10% total body	- Abrasions / contusions > 25 cm. on face or Hand > 50 cm. on body - Laceration > 5 cm. on face or hand > 10 cm. on body - 2° or 3° burn or degloving injury - 10-19% of total body - Avulsion NFS , < 25 cm^2 face or hand or < 50 cm^2 on body	- Avulsion (Major) - 2° or 3° burn or degloving injury 20-29% of total body	- 2° or 3° burn or degloving injury 30-39% of total body	- 2° or 3° burn or degloving injury 40-89 % of total body

AIS = 6	MAXIMUM INJURY
	AUTOMATICALLY ASSIGNED ISS = 75
HEAD / NECK	Crush fracture. Crush / laceration brain stem Decapitation
	Cord crush / laceration or total transaction with or without fracture C3 or above
THORAX	Total severance aorta
	Chest massively crushed
ABDOMEN	Torso transection

INJURY SEVERITY SCORE (I.S.S.)

	I.S.S. BODY REGION	A.I.S. SCORE
HEAT / NECK	1	----------
FACE	2	----------
THORAX	3	----------
ABDOMEN / PELVIC CONTENTS	4	----------
EXTREMITIES / PELVIC GIRDLE	5	----------
EXTERNAL	6	----------

PENETRATING INJRY

ISS B.R. / AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
HEAD / NECK (1)	PI = PENETRATING INJURY - PI to head NFS	- PI to neck NFW - PI to neck with no organ involvement	- Complex PI to neck with tissue loss / organ involvement - Minor lac. Carotid / vertebral A:internal lugular V. - Transection; segmental loss jugular V. - Thyroid laceration - Superficial lac.larynx / pharynx - Cord contusion with transient neurological signs	- Minor lac. Carotid / vertebral A. with neurological deficit - Transection Carotid / vertebral A; intimal jugular V. - Segmental loss intimal Jugular vein - Perforation larynx / Pharynx - Cord contusion with incomplete cord syndrome	- PI with entrance and exit wounds - PI of cerebrum / cerebellum - Segmental loss carotid / vertebral A. - Complex laceration larynx , pharynx - Cord laceration - Complete cord lesion
FACE (2)	- PI NFS - PI with no tissue loss	- PI with superficial tissue loss - Corneal / scleral laceration	- PI with major tissue loss		

ISS B.R. AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
(3) THORAX	- PI with no violation of pleural cavity	- Thoracic duct laceration - Pleural laceration	- Complete PI but no Violation of the Pleural cavity - Sup. Lac. innominate / Pulmonary / subclavian And other named smaller Veins - Sup. Lac. Trachea / Bronchus / esophagus - Lung laceration < 1 lobe - Unilateral h' or p' thorax - Diaphragmatic laceration - Cord contusion with transient neurological signs	- Sup. Aortic laceration - Major lac. Innominate / pulmonary / subclavian and other named smaller art; vena cava / bracheocephalic pulmonary / subclavian and other names smaller veins - T	- Major aortic laceration - Transection / segmental loss vena cava / pulmonary /

ISS B.R. / AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
(4) ABDOMEN AND PELVIC CONTENT	- PI with no peritoneal penetration	- PI with superficial tissue loss but no peritoneal penetration - Sup. lac. stomach / s8 / mesentery / bladder / ureter / kidney / liver / spleen / pancreas - Laceration throuth peritoneum	- PI with significant tissue loss but no peritoneal penetration - Sup. lac. vena / iliac and other named smaller arteries and veins - Sub. lac. duodenum / colon / rectum - Full thickness laceration s8 / mesentery / bladder / ureter - Major lac. or minor lac. with major wessel injury / < 1,000 cc. n' peritoneum : kidney / liver / spleen / pancreas - cord contusion with transient neurological signs	- Minor aortic lac. major lac. vena cava/ iliac A. & V. and other named smaller arteries and veins - Transection / segmenpal loss iliac and other named smaller veins - Full thickness lac. stomach / colon / duodenum or rectum - Tissue loss / gross contamination stomach / s8 / mesentery bladder / ureter - Cord contusion with incomplete cord syndrome	- Major aortic laceration - Transection / segmental Loss vena cana / iliac And other named Smaller arteries - Tissue loss / gross Contamination duodenum / Colon / rectum - Tissue loss kidney / Liver / spleen pancreas - Cord laceration

ISS B.R. AIS SCOE	1 MINOR	2 MODERATE	3 SERIOUS: NOT LIFE THREATENING	4 SERIOUS: LIFE THREATENING	5 CRITICAL: SURVIVAL UNCERTAIN
(5) EXTREMITIES AND PELVIC GIRDLE	- Sup. Lac. brachial and other named veins	- Simple PI with no internal structure involvement - Sup. Lac. Axillary Brachial / popliteal A; Axillary / femoral / Popliteal V. - Major lac. & segmental Loss branchial vein And other named Smaller arteries and Veins - Lac. median / radial / ulnar / femoral / tibial Peroneal N. - Major tendon / muscle lacearation	- Complex PI with Internal involvement - Sup. Laceration semeral Artery - Major lac. axillary / Popliteal A; Axillary / femoral / Popliteal V. Segmental loss axillary / Femoral popliteal V. - Scaitic nerve laceration < 1 nerve lac. in same extremity - Multiple tendon / muscle Lacerations in same extremily	- Major lac. brachial / Semoral artery - Segmental loss brachial / Axillary / popliteal artery	- Segmental loss femoral artery

INJURY SEVERITY SCORE (I.S.S.)

	I.S.S. BODY REGION	A.I.S. SCORE
HEAT / NECK	1	----------
FACE	2	----------
THORAX	3	----------
ABDOMEN / PELVIC CONTENTS	4	----------
EXTREMITIES / PELVIC GIRDLE	5	----------
EXTERNAL	6	----------

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