Statistical Modeling for Incidence Rate of Victims from Conflict Situation in Southernmost Provinces of Thailand

Ahamapeesee Duereh

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Research Methodology

Prince of Songkla University

2023

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I hereby certify that this work has not been accepted in substance for any degree, and is not being currently submitted in candidature for any degree.

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ชื่อวิทยานิพนธ์ ตัวแบบทางสถิติของอุบัติการณ์ผู้ได้รับผลกระทบจากเหตุการณ์ความไม่สงบจังหวัดชายแดนใต้

ผู้เขียน นายอาหามะปีซี ดือเระ

สาขาวิชา วิธีวิทยาการวิจัย

ปีการศึกษา 2565

บทคัดย่อ

สถานการณ์ความไม่สงบที่ยืดเยื้อมายาวนานถึง 19 ปี ตั้งแต่ปี 2547 จนถึงปัจจุบัน (2565) ในพื้นที่จังหวัดชายแดนภาคใต้ ได้แก่ ปัตตานี ยะลา นราธิวาส และบางส่วนของจังหวัดสงขลา ส่งผลกระทบต่อชีวิตประจำวันของประชาชนในพื้นที่ ในขณะที่ตัวเลขที่สะสมมาตั้งแต่แรกเริ่ม ไม่ว่าจำนวนเหตุการณ์ การเสียชีวิต การบาดเจ็บ หญิงหม้าย และเด็กกำพร้ามีจำนวนค่อนข้างมาก ดังนั้น การศึกษานี้จึงมีวัตถุประสงค์เพื่อวิเคราะห์ข้อมูลอัตราการบาดเจ็บเสียชีวิตด้วยแบบจำลองทางสถิติและเพื่อนำเสนอข้อมูลอัตราการบาดเจ็บเสียชีวิตในจังหวัดชายแดนภาคใต้ของประเทศไทย การศึกษานี้ใช้ข้อมูลทุติยภูมิช่วงปี พ.ศ. 2547 ถึง พ.ศ. 2563 ซึ่งได้รวบรวมข้อมูลจากศูนย์ประสานงานวิชาการให้ความช่วยเหลือผู้ได้รับผลกระทบจากเหตุความไม่สงบจังหวัดชายแดนภาคใต้ (ศวชต. ปัตตานี) มหาวิทยาลัยสงขลานครินทร์ วิทยาเขตปัตตานี พื้นที่การศึกษา คือ จังหวัดปัตตานี ยะลา นราธิวาส และสี่อำเภอของจังหวัดสงขลา มีจำนวนผู้ได้รับบาดเจ็บและเสียชีวิตทั้งหมด คือ 26,938 คน การศึกษานี้ทำการจัดการข้อมูลให้อยู่ในรูปแบบของจำนวนนับ ดังนั้นจำนวนค่าสังเกตที่ใช้ในการวิเคราะห์ คือ 8,975 รายการ ตัวแปรตามคือ อัตราการบาดเจ็บเสียชีวิตต่อแสนประชากร และตัวแปรอิสระคือ ปี ตำบล เพศ และอายุ สถิติที่ใช้ในการวิเคราะห์ข้อมูลเชิงพรรณนา ได้แก่ ความถี่ ร้อยละ ค่าต่ำสุด ค่าสูงสุด ค่าเฉลี่ย ค่ามัธยฐาน และส่วนเบี่ยงเบนมาตรฐาน สถิติที่ใช้เปรียบเทียบความแตกต่างของค่าเฉลี่ยระหว่างอัตราการบาดเจ็บเสียชีวิตและตัวแปรอิสระแต่ละตัว คือ การวิเคราะห์ความแปรปรวน (Analysis of variance: ANOVA) ตัวแบบทางสถิติที่ใช้คือ การถดถอยเชิงเส้นในรูปแบบล็อกการิทึม (Log-linear regression) ผลการวิจัยพบว่า อัตราการบาดเจ็บเสียชีวิตลดลงอย่างเห็นได้ชัดในช่วงปี 2550 ถึง 2563 โดยลดลงถึงร้อยละ 48 อัตราการบาดเจ็บเสียชีวิตเฉลี่ยโดยรวมอยู่ที่ 64.45 รายต่อแสนประชากร เพศชายวัยหนุ่มมีอัตราการบาดเจ็บเสียชีวิตมากกว่าผู้หญิง พื้นที่ปัตตานีเป็นพื้นที่ที่มีอัตราการบาดเจ็บเสียชีวิตมากกว่าจังหวัดอื่น ๆ โดยที่ครึ่งหนึ่งของตำบล (ร้อยละ 53.91) ในจังหวัดปัตตานีมีอัตราการบาดเจ็บเสียชีวิตสูงกว่าค่าเฉลี่ยรวม อย่างไรก็ตามมากกว่าร้อยละ 60 ของตำบลในทุกจังหวัดมีอัตราการบาดเจ็บเสียชีวิตสูงกว่าค่าเฉลี่ยรวม ส่วนใหญ่เกิดขึ้นในพื้นที่ชนบทของทุกจังหวัดยกเว้นจังหวัดสงขลา ข้อมูลจากการศึกษานี้จะเป็น

ประโยชน์แก่หน่วยงานรัฐหรือหน่วยงานอื่น ๆ ในการเตรียมความพร้อม วางแผน และกำหนดนโยบายในการดูแลสุขภาพ การเยียวยา และการพัฒนาเศรษฐกิจในจังหวัดชายแดนภาคใต้ของประเทศไทยต่อไป

Thesis Title Statistical Modeling for Incidence Rate of Victims from Conflict Situation in Southernmost Provinces of Thailand

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ABSTRACT

The 19 years prolonged period of conflict situation from 2004 until the current year (2022) in the southern provinces of Thailand including Pattani Yala Narathiwat and parts of Songkhla has been affecting on the daily life of people in the area. The cumulative number of incidents, deaths, injuries, widows, and orphans is going to be large. Therefore, this study aimed to investigate the statistical modelling of the injury-date rate and to visualize the injury-date rate in the Deep South provinces of Thailand. The secondary data between 2004 and 2020 were obtained from the Deep South Coordination Center (DSCC), Prince of Songkla University, Pattani Campus. The study areas were sub-districts in Pattani, Yala, Narathiwat, and four districts of Songkhla. The total number of individual observations was 26,938. After managing the individual data into counted data, there were 8,975 observations. The outcome of this study was the injury-death rates per 100,000 population and determinants were year, sub-district, gender, and age. In descriptive analysis, frequency, percentage, minimum, maximum, mean, median and standard deviation were used. In univariate analysis, the ANOVA test was used to test the association between outcome and each determinant. A log-linear regression model was used to investigate the adjusted mean of the injury-death rate by its factors. The results found that the injury-death rate declined sharply from 2007 to 2020 by 48%. The overall mean of injury-death rate was 64.45 cases per 100,000 population. The young males were more vulnerable than the females. Pattani was a riskier area than other provinces. Half of the sub-districts (53.91%) in Pattani had an injury-death rate above the overall mean. More than 60% of the sub-districts, that showed the injury-death

rate higher the overall mean, occurred in rural areas of all provinces, except Songkhla, which had no red area. The information from the current study would be useful to the government or other sections for preparing and planning the readiness of health care, compensation, and economic development in the southernmost provinces of Thailand.

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First of all, I am extremely grateful to my major advisor, Asst. Prof. Dr. Mayuening Eso, for her inspiring guidance and kind gestures in every single way, and my co-advisors Asst. Prof. Dr. Rhysa McNeil chose for their valuable suggestions and constant encouragement throughout this research work. I also express my gratitude to Emeritus professor Don McNeil for assisting with data management and statistical analysis.

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CHAPTER 1

Introduction

1.1 Background and Rational

Conflicts, violence, and unrest have been reported in a number of countries around the world, including the Ukraine crisis, the Afghanistan war, and even Myanmar, which is Thailand's neighbor. Koop (2021) said that “Around 80% of the world’s current conflicts are concentrated in Asia and Africa”.

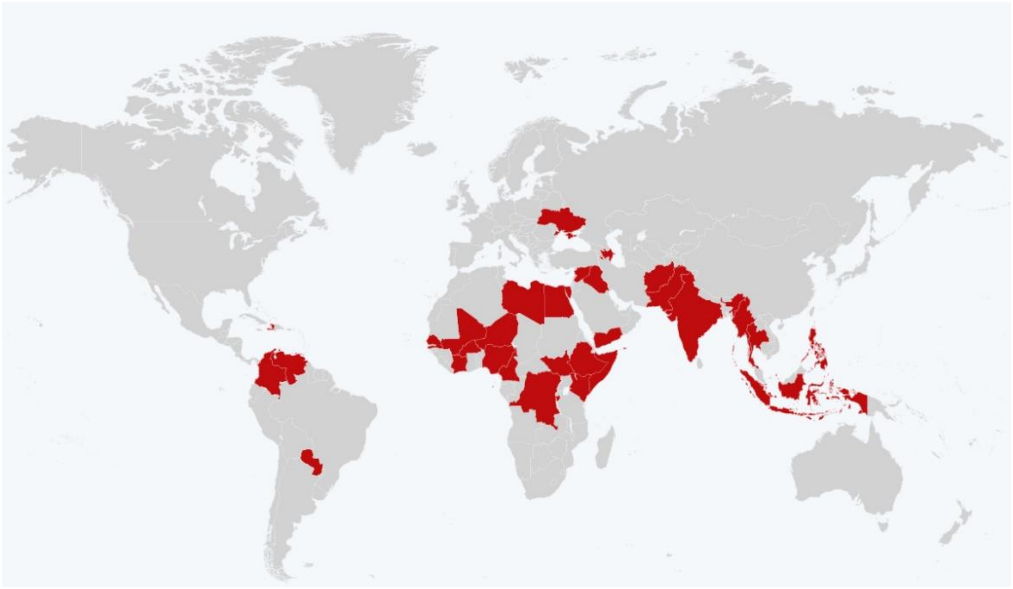


Figure 1.1 Armed clashes between state forces and/or rebels around the world in 2022, Source: https://cdn.statcdn.com/Infographic/images/normal/21652.jpeg

In 2002, as a result of data collection by the Armed Conflict Location and Event Data Project (ACLED), shown in Figure 1.1, the map reported about armed clashes involving state forces and/or rebel groups globally (Armstrong, 2022). It seems to show that the conflicts appeared in the low-income countries.

The effect of war are widely spread and can be long term and short term and causes the loss of people's lives including disproportionate proportions of women and children. The previous studies of the impact of war on the health of people such as the war in Palestine killed the children. Most of them were in

malnutrition, physical illness, mental and emotional problems (Qouta and Odeb, 2005). The war in Afghanistan had affected the woman resulting in depression, anxiety, and mental disorders (Cardozo *et al*., 2005).

The 19 years prolonged period of conflict situation from 2004 until the current year (2022) in the southern provinces of Thailand including Pattani Yala Narathiwat and parts of Songkhla has been affecting on the daily life of people in the area. During 2004 to 2022, there were 21,751 incidents, 7,414 deaths, 13,746 injuries (Deep South Watch, 2022), 3,075 widows, and 6,575 orphans (BBC NEWS, 2019). Those victims were including military, police, teacher, government staff, woman, children, and other civilians. More than 360 schools and about 50 hospitals were attacked by terrorist (Isranews Agency, 2015).

Figure 1.2 Incidents in Deep South Provinces of Thailand,
Source: https://deepsouthwatch.org/en

Even though the number of incidents had decreased sharply from 2012 to 2022 (Figure 1.2), the conflicts are still affecting the quality of life of people in the area, whether in health, economic growth, tourism, or education. Chongwilaikasaem and Ingviya (2020) reported that when the conflict escalates, it will result in a statistically significant decrease in the size of economic activities. However, at the end of the year 2022, a petrol and a 7-Eleven were damaged from explosions with no one was killed or seriously injured.

The Office of the National Economic and Social Development Board (NESDB) reported that from 2007 to 2018 people in Pattani, Yala, and Narathiwat were in the top ten of the highest poverty ranking for each year compared to other provinces of Thailand (NESDB, 2018). The United Nations Development Program (UNDP) reported that in Yala, Pattani, and Narathiwat in the year 2011, occupied the

lowest average score of the ordinary national educational test (o-net) (UNDP, 2014). Ford *et al*. (2018) reported that at times youths were afraid to go to school because of violence in the area and some parents could not afford the school fees due to economic depression in the area.

Furthermore, there are the effects on the tourism business not only in the three Deep South provinces but also in the area nearby like Hat Yai district in Songkhla province, which is mostly Malaysian and Singaporean traveling to the place. It is found that fewer tourist arrivals to HatYai after 2004 (Thongsavang and Tochaiwat, 2011). Especially, the effect in the relationship between people of different religions, they no longer trust each other, unlike in the past where all religions stayed at peace. Visiting relatives and friends was limited (Ford et al., 2018).

Due to the violence, the antenatal care was not received properly. The maternal death rate at delivery in Pattani Province Yala and Narathiwat accounted for 9%, three times higher than the national standard. The rate doubled between 2003 and 2006. The infant mortality rate was 30% higher than the national average and some children lacked of vaccines and malnutrition. The unrest also led to a shortage of health workers in the area. With more than 9,000 transfer requests and 1,300 remaining public sector nurses in the country's five southernmost provinces (Pattani, Yala, Narathiwat, Songkhla, and Satun) (Wikipedia, 2022). In 2005, the government approved the project of producing 3,000 nurses who had the residence in the three southern border provinces of Thailand in order to increase the number of nurses in the area, called Nurse 3,000.

The worst impact from the situation is the impact on the physical of victims, death, injury, and disabled, and mental health problems for long term. It might also affect the increasing number of orphans and widows in the area. However, throughout the 16 years, the government had spent more than 313,792.4 million Baht and continued provided 30,886.6 million Baht by 2020 for solving the problems in the area (BBC NEWS, 2019).

Human safety was important, so this study focused on the effects of unrest on humans. In order to monitor these areas with multiculturalism, this study would like to show the magnitude of the problem classified by year, age, gender, and the sub-districts of Pattani, Yala, Narathiwat, and a part of Songkhla, Thailand. The

current study might provide useful information for making the policy to solve the problems and planning to settle with the problems as well as support the information for peace talk and peacebuilding.

1.2 Research Questions

1. How high is the injury-death rate of victims in the Deep South provinces of Thailand?
2. What factors are associated with the injury-death rate of victims in the Deep South provinces of Thailand?

1.3 Objective of Research

1. To investigate the injury-death rate of victims in the Deep south provinces of Thailand.
2. To examine the factors associated with the injury-death rate of victims in the Deep South provinces of Thailand.

1.4 Expected Advantages

The results from this study might provide useful information to the government and civil society organizations for supporting, planning, and making the policy in order to solve the problems in the southernmost provinces of Thailand for sustainable development. Particularly, the involved organizations can provide the planning in term of the compensation and healing for the victims from the unrest in both physical and mental effects.

1.5 Literature Review

1.5.1 Global trends of fatality rates

Between 2006 and 2016, the global rate of unrest situation has fluctuated with no apparent trend (Backer *et al*., 2016). The death rate continued to decline, dropping from 1.61 per 100,000 population in 2015 to 1.32 in 2016. In 2015 to 2016, Nigeria, Syria, and Yemen accounted for nearly two-thirds of the global

decrease in direct conflict deaths, but in contrast, Somalia has 36 percent more war fatalities (McEvoy and Hideg, 2017).

In 2006, Pakistan found 749 violent incidents that killed 1,887 people by various forms of violence include from politics and elections, terrorist attacks, security operations against terrorist groups and armed insurgents, ethno political tensions, and sectarian cleavages. The overall number of violent incidents fell by 32 percent from 2015 to 2016, and fatalities fell by 46 percent in the same period. However, terrorist activities were spreading from terrorism in the border region to many parts of the country (PIPS, 2017). Dhaka which is the capital city of Bangladesh had one of the deadliest terrorist attacks. Foreigners, secular journalists and bloggers, and religious minorities had been the primary targets of terrorist attacks in the country (The Asia Foundation, 2017). However, the United Nations Assistance Mission in Afghanistan (UNAMA) indicated that violence was growing in Afghanistan. It was estimated that over 100,000 people lost their lives between 2001 and 2016. Civilian casualties hit a record high in 2016, with 3,498 dead and 7,920 injured (UNAMA, 2017), the number of civilian casualties in 2017 is 916 and 1,751 in 2018 (UNAMA, 2019).

The reported of the Nepal conflict published by the United Nations Office of the High Commissioner for Human Rights (UNOHCHR), the government had estimated that a total of 12,686 individuals, including security forces, Maoist rebel fighters, and civilians, were killed between February 1996 and November 2006 (UNOHCHR, 2012). The Uppsala Conflict Data Program estimated that annual fatalities peaked in 2002 with 4,433 deaths. Civilians killed by both security forces and the Maoist rebels, accounted for around 20 percent (Melander *et al*., 2016; Eck and Hultman, 2007) of all fatalities over the ten years.

In Southeast Asia, many countries have encountered conflict and violence along with Myanmar, Indonesia, Philippines, and Thailand (Keling *et al*., 2009). Since 2012 in Myanmar, almost 120,000 people were internally displaced. The 192 people were killed, 265 people were injured, and over 8,500 houses were destroyed. In 2016, over 100,000 people resided in long-term camps in Thailand, and a further 100,000 were internally displaced within Shan and Kachin States (Barron, 2017). Indonesia had experienced a large-scale ethnoreligious conflict in several

provinces and a surge in the civil war with separatist insurgents in Aceh. From 1998 until the signing of the peace accord, an estimated 10,613 people lost their lives. The damages and losses from the conflict exceeded USD 10.7 billion (World Bank, 2009). The western Mindanao of the Philippine in September 2013, the fighting lasted for three weeks, leaving 218 dead and hundreds more wounded. Over 100,000 residents fled to evacuation centers (The Asia Foundation, 2017). The study gathering data between 2004 and 2005 of Marohabout *et al.* (2009) had considered the time of incident occurring in the southernmost provinces of Thailand, they revealed that the most frequent violent periods were between 8 and 9 pm and the most likely days occurred were Wednesdays and Thursdays. The period effects showed a steadily increasing trend in the rate during 2004 stabilizing in 2005. The district effects revealed that terrorism incidences had expanded to the adjacent districts in Songkhla, Thailand.

1.5.2 Factors associated with fatality rates

There are several of the previous studies that showed the association between incidence rate and its factor. McEvoy and Hideg (2017) reported that during 2004 – 2016 the global violent death rate in each type of violence was homicide and conflict. Moreover, they realized in terms of gender, there was a significant association between gender and being victims. The study of Peleg *et al*. (2003) in Israel, death and injury resulting in from acts of terrorism had escalated in 15 months, In the period extending from September 29, 2000, to December 31, 2001, terrorist acts claimed over 250 lives, and caused 2,022 injuries. The population injured by terrorist activity was young, with 61% between the age of 15 and 29 years There was a male predominance in the population (n = 418, 75%). In the southernmost provinces of Thailand, the study of Khongmark et al. (2013) found that the rural regions of non-Muslim residents were more likely in risk situations than Muslim residents. Regarding gender, Chirtkiatsakul et al. (2014) found that in the period 2004 to 2011, males were 2.32 times more likely to die than females. Meanwhile, Muslim residents were 1.45 times more likely to die than non-Muslim residents. Police or military had a lower risk of mortality than other occupations. Concerning the type of weapon used, the

results showed that the occasion of death victims from gunshot and other weapons had higher than a bomb blast.

1.5.3 Statistical modeling for counted data

Due to the outcome of the current study is a counted data and convert to be a rate. Therefore, the previous studies have conducted an analysis on the counted data that would be review here.

The study of violent crime in Columbia, Castro Torres and Urdinola (2018) was studied to find the association between the Colombian Armed Internal Conflict (AIC) and fertility for women using individual-level data collection from the Colombian Demographic and Health Surveys from 2000 to 2010 and novel information with Poisson model incorporates spatial and temporal information with data and the trend was double-checked with the point estimates from a linear regression analysis between the performance indicators and violence levels. The results from the study showed that the Akaike Information Criteria (Akaike) had a significant positive association with fertility and nonsignificant relationship in urban areas. Obasanjo (2018) had studied how social conflicts impact on maternal mortality in 43 Sub-Saharan African countries, the data were collected from the Social Conflict in African Database (SCAD). Linear regression was used in the analysis. The results found that the form of social conflict associated with maternal mortality.

A cross-sectional study described the health consequences of complex emergency from the armed conflict in different age groups, time periods, and health facilities. The data were collected from Surveillance in Post Extreme Emergencies and Disasters (SPEED) in Zambuanga, Philippine. Poisson regression was used to compare the rate (Salazar *et al*., 2018).

Khongmark *et al*. (2013) described the risk rate of a terrorist event occurring in southernmost provinces of Thailand depends on specific place and time during 2001 to 2010. The study had compared the incidence rates of the civilian victims of terrorism classified by gender, age group (<25, 25-44 and 45 or more), district of residence, and year. Poisson distribution, negative binomial distribution, and log-normal distribution were considered in analysis to compare which model was the most appropriate with the data. It seems to show the poisson model was not

satisfactory while the negative binomial model gave a statistically acceptable. However, the log-normal model was extremely good.

Marohabout *et al*. (2009) had analyzed data from the Police Region 9 between 2004 and 2005. The outcome of the study defined as the terrorism incidents at any location in the provinces of Narathiwat, Pattani and Yala, together with the four districts of Songkhla Province. The determinants were time, date, month, year and sub-district where the event took place were recorded. Negative binomial regression was applied as a statistical method.

1.6 Scope of the Research

This study focuses on number of death and injury from unrest in the deep south of Thailand including Pattani, Yala, Narathiwat and four districts of Songkhla namely Chana, Na Tawi, The Pa, and Saba Yoi between 2004 and 2020.

CHAPTER 2

Methodology

This chapter is going to present the study area, data source, data management, and statistical analysis.

2.1 Data source and data management

Study area

This study focused on all sub-districts in Pattani, Yala, Narathiwat, and sub-district in four districts of Songkhla (Figure 2.1). Those areas had appeared conflicts since 2004-2020.

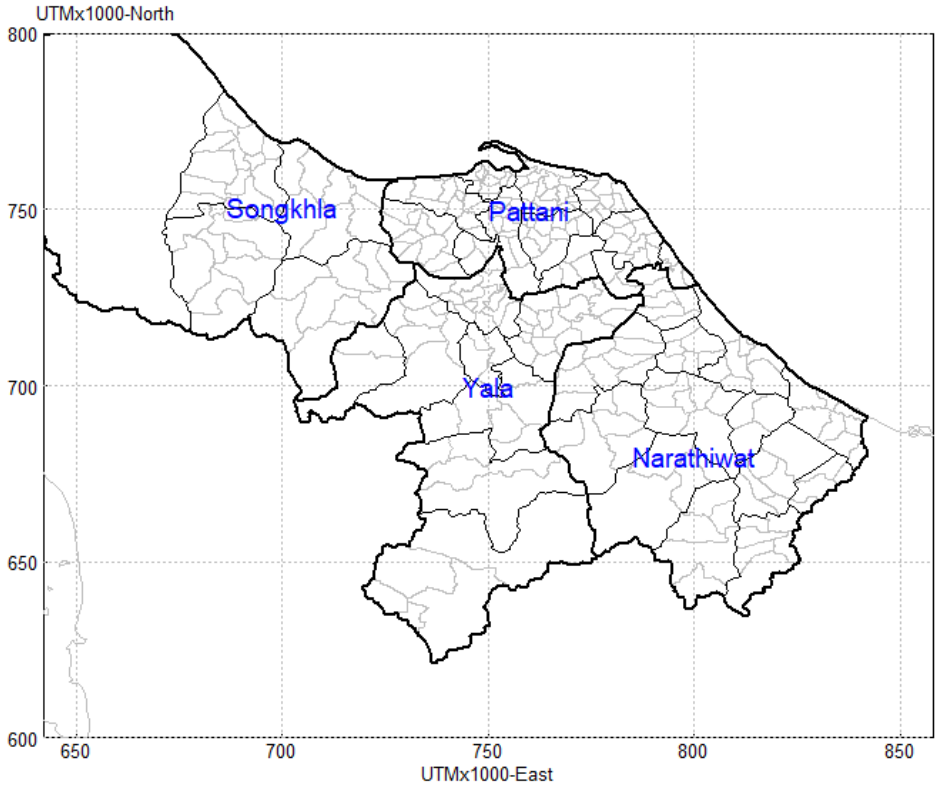


Figure 2.1 Map of study areas

Data source

The secondary data were conducted by the Deep South Coordination Center (DSCC), Prince of Songkla University, Pattani Campus. They are collecting the daily data of event characteristics and its victim charactheristics. For the current study focusing on the data between 2004 and 2020, there were 288 sub-districts in four provinces of the study area. The data structure that obtained from DSCC database was shown in Figure 2.2.

A	B	C	D	E	F	GA	GB	GC	GD	GE	GF	GG	GH
losofperid	evnid	evnnme	evndte	evntme	evnplcid	summlosbody	numchi_c	numaffect	summlost	age_new	agen_new	occ_new	evntyp_new
36135	25550	เหตุระเบิด1	25620426	0900	940708	ทรัพย์สินเสียหาย		1	5	64.0	64.0	ประชาชน	ระเบิด
36326	25677	เหตุปิดล้อม	25620610	0125	950402	ปลอดภัย		1	6	68.0	68.0	คนร้าย	จับตัวผู้ต้องหา
36345	25706	เหตุปิดล้อม	25620214	0305	950108	ปลอดภัย		1	6	64.0	64.0	คนร้าย	จับตัวผู้ต้องหา
36346	25706	เหตุปิดล้อม	25620214	0305	950108	ปลอดภัย		1	6	27.0	27.0	คนร้าย	จับตัวผู้ต้องหา
36868	26087	เหตุทะเลาะ	25630801	1700	950501	บาดเจ็บ		1	2	18.0	18.0	ประชาชน	ยิง
36869	26087	เหตุทะเลาะ	25630801	1700	950501	ปลอดภัย		1	6	23.0	23.0	ประชาชน	ยิง
36872	26090	เหตุทะเลาะ	25630807	0810	900404	เสียชีวิต		1	1	57.0	57.0	ประชาชน	ทำร้าย
36873	26090	เหตุทะเลาะ	25630807	0810	900404	บาดเจ็บ		1	2	60.0	60.0	คนร้าย	ทำร้าย
36880	26096	เหตุทำร้าย	25630813	0900	961001	เสียชีวิต		1	1	28.0	28.0	ประชาชน	ทำร้าย
36897	26104	เหตุพบศพ(	25630825	0900	960801	บาดเจ็บ		1	2	38.0	38.0	ประชาชน	ยิง
36898	26104	เหตุพบศพ(	25630825	0900	960801	ปลอดภัย		1	6	48.0	48.0	คนร้าย	ยิง
36899	26105	เหตุฟันนาย	25630825	1750	960509	เสียชีวิต		1	1	40.0	40.0	ประชาชน	ทำร้าย
36900	26105	เหตุฟันนาย	25630825	1750	960509	ปลอดภัย		1	6	31.0	31.0	คนร้าย	ทำร้าย
36916	26129	เหตุยิงยิงภ	25630910	1800	940903	ปลอดภัย		1	6	36.0	36.0	คนร้าย	ยิง
36927	26145	เหตุกลุ่มวัย	25630917	1830	950110	บาดเจ็บ		1	2	48.0	48.0	ประชาชน	ยิง
36930	26147	เหตุยิง นาย	25630921	1900	961104	เสียชีวิต		1	1	50.0	50.0	ประชาชน	ยิง
36931	26147	เหตุยิง นาย	25630921	1900	961104	ปลอดภัย		1	6	40.0	40.0	คนร้าย	ยิง
36945	26160	เหตุยิง อส.	25631005	1520	961103	เสียชีวิต		1	1	27.0	27.0	อื่นๆ	ยิง
36946	26160	เหตุยิง อส.	25631005	1520	961103	ปลอดภัย		1	6	35.0	0.0	อื่นๆ	ยิง
36947	26161	เหตุพบศพ(	25631006	1438	961103	เสียชีวิต		2	1	35.0	0.0	อื่นๆ	ยิง
36963	26180	เหตุทะเลาะ	25631024	2030	940101	บาดเจ็บ		1	2	0.0	0.0	ประชาชน	ยิง
36964	26181	เหตุยิงนาย	25631025	2320	950501	เสียชีวิต		1	1	16.0	16.0	ประชาชน	ยิง
36967	26186	เหตุยิงนาย	25631031	1820	941002	บาดเจ็บ		1	2	20.0	20.0	ประชาชน	ยิง
36968	26186	เหตุยิงนาย	25631031	1820	941002	บาดเจ็บ		1	2	16.0	16.0	ประชาชน	ยิง

Figure 2.2 The data structure of victim before handling

The number of the populations for each year, subdistrict, and gender were collected from the website of the Department of Provincial Administration (DOPA). Users can access the website at "https://stat.bora.dopa.go.th/new_stat/webPage/statByYear.php". The example of original data structure (Pattani) was shown in Figure 2.3. The data consisted of 13 columns and needed to manage for combining with the unrest data. The data were downloaded by each year, sub-district. For the variable of gender was shown in column term which was the number of population of male and female separately.

A	B	C	D	E	F	G	H	I	J	K	L	M
ปีเดือน	รหัสจังหวัด	ชื่อจังหวัด	รหัสสำนักทะเบียน	ชื่อสำนักทะเบียน	รหัสตำบล	ชื่อตำบล	รหัสหมู่บ้าน	ชื่อหมู่บ้าน	จำนวนประชากรชาย	จำนวนประชากรหญิง	จำนวนประชากรทั้งหมด	จำนวนบ้าน(หลังคาเรือน)
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	0	-	0	-	43,606	47,795	91,401	31,646
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94010400	ตำบลบานา	0	-	10,468	10,848	21,316	9,304
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94010500	ตำบลตันหยงลุโละ	0	-	3,478	3,562	7,040	1,610
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94010600	ตำบลคลองมานิง	0	-	1,921	2,026	3,947	787
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94010700	ตำบลกะมิยอ	0	-	2,485	2,523	5,008	928
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94010800	ตำบลบาราโหม	0	-	1,640	1,700	3,340	761
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94010900	ตำบลปะกาฮะรัง	0	-	3,151	3,139	6,290	1,388
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94011000	ตำบลรูสะมิแล	0	-	8,550	11,685	20,235	9,760
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94011100	ตำบลตะลุโบะ	0	-	4,281	4,388	8,669	3,105
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94011200	ตำบลบาราเฮาะ	0	-	3,825	4,047	7,872	1,985
6412	94	ปัตตานี	9401	อำเภอเมืองปัตตานี	94011300	ตำบลปุยุด	0	-	3,807	3,877	7,684	2,018
6412	94	ปัตตานี	9402	อำเภอโคกโพธิ์	0	-	0	-	30,466	31,887	62,353	17,994
6412	94	ปัตตานี	9402	อำเภอโคกโพธิ์	94020100	ตำบลโคกโพธิ์	0	-	3,661	3,797	7,458	2,120
6412	94	ปัตตานี	9402	อำเภอโคกโพธิ์	94020200	ตำบลมะกรูด	0	-	2,865	3,017	5,882	2,086
6412	94	ปัตตานี	9402	อำเภอโคกโพธิ์	94020300	ตำบลบางโกระ	0	-	1,283	1,408	2,691	852
6412	94	ปัตตานี	9402	อำเภอโคกโพธิ์	94020400	ตำบลป่าบอน	0	-	2,135	2,251	4,386	954
6412	94	ปัตตานี	9402	อำเภอโคกโพธิ์	94020500	ตำบลทรายขาว	0	-	1,978	2,212	4,190	1,394
6412	94	ปัตตานี	9402	อำเภอโคกโพธิ์	94020600	ตำบลนาประดู่	0	-	2,986	3,219	6,205	1,800

Figure 2.3 The example of data structure of number of populations before handling

Data management

The total number of individual observations was 26,938. The variables were year, sub-district, gender, age, and damaging from the unrest were chose from that dataset. The year consisted of 2004 to 2020. The gender consisted of male and female. The age was recorded as a number (a discrete variable). The damaging from the unrest consisted of safety, injury, and death. The observations of safety were excluded from the dataset. The age was handled as a categorical variable, with a span of 10 years in each group. Then, the data were managed to be counted data by counting the number of injury and death classified by year (17 groups), sub-district (288 groups), gender (2 groups), and age-group (9 groups). Finally, The dataset contained 8,975 observations.

The populations dataset were managed from wide format of gender (male, and female) into long format. Finally, the dataset contained the variable of year, sub-district, and gender.

A	B	C	D	E	F	G
id	year	sub	gen	ageGr	deadinj	pop
1	2004	900301	1	2	3	3896
2	2004	900301	1	3	2	3896
3	2004	900301	1	4	1	3896
4	2004	900301	1	5	4	3896
5	2004	900301	1	6	1	3896
6	2004	900302	1	3	1	2153
7	2004	900304	1	4	1	3753
8	2004	900314	1	5	1	4376
9	2004	900502	1	4	1	4131
10	2004	900504	1	2	1	6587
8965	2020	960706	1	2	1	2779
8966	2020	960706	1	3	1	2779
8967	2020	960905	1	2	5	2762
8968	2020	960905	1	3	3	2762
8969	2020	960905	1	4	1	2762
8970	2020	961204	1	4	1	4287
8971	2020	961204	1	5	1	4287
8972	2020	961302	1	0	1	9354
8973	2020	961302	1	2	1	9354
8974	2020	961302	1	3	2	9354
8975	2020	961302	1	4	2	9354

Figure 2.4 The data structure after combining of two data sources

The dataset of number of injury-death and populations were combined together using the variable of year, sub-district, and geder as a primary key for each dataset. The final dataset structure was shown as an example in Figure 2.4, which consisted of the variables id, year, sub-district (sub), gender (gen), age-group (ageGr), number of injury and death (deadinj), and number of population (pop). The step of data management was shown in path diagram, Figure 2.5.

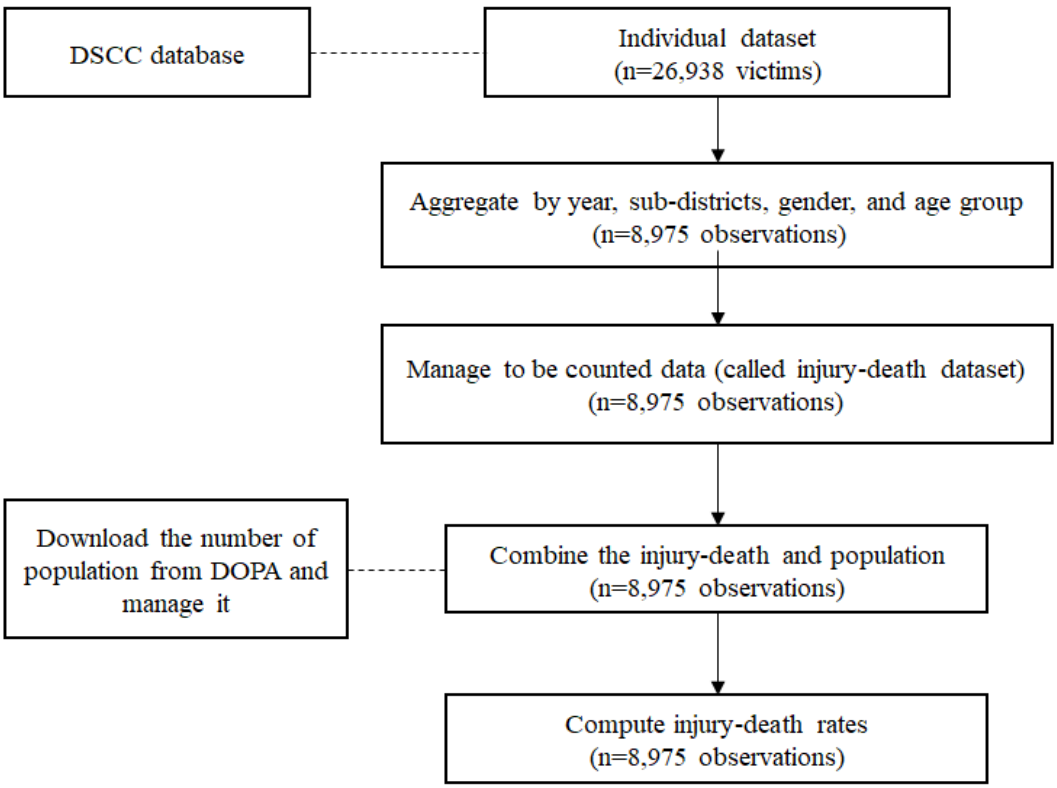


Figure 2.5 Path diagram of data management

Lastly, injury-death rates of each year, sub-district, and gender were computed using the formula below (Equations 1).

$$\text{Injury-death rate} = \frac{\text{Number of injury and death}}{\text{Number of population}} \times 100{,}000 \quad (1)$$

Variables

Based on the preliminary analysis, Figure 2.6 demonstrates that the injury-death rates for males and females in some age group, such as 21–30, 31–40, and 41–50 years, were different.

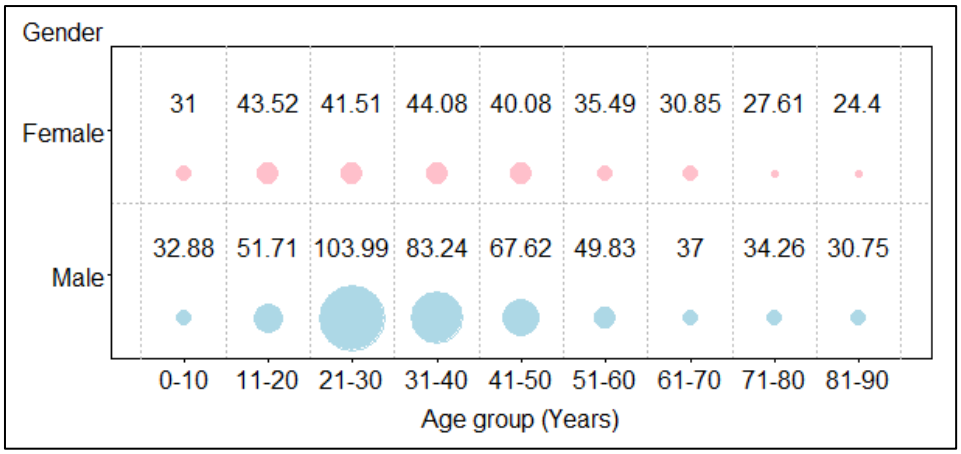


Figure 2.6 The average of injury-death rates of gender and age group

Thus, the variables of gender and age group were combined, called gender-age group, in order to eliminate the problem of interaction between those variables in the analysis. The gender-age group consisted of 18 groups, nine for each male and female. There were three interesting determinants and one outcome. The determinants were gender age-group, year, and sub-district and the outcome was the injury-death rate (Figure 2.7). The details of those variables were explained in Table 2.1.

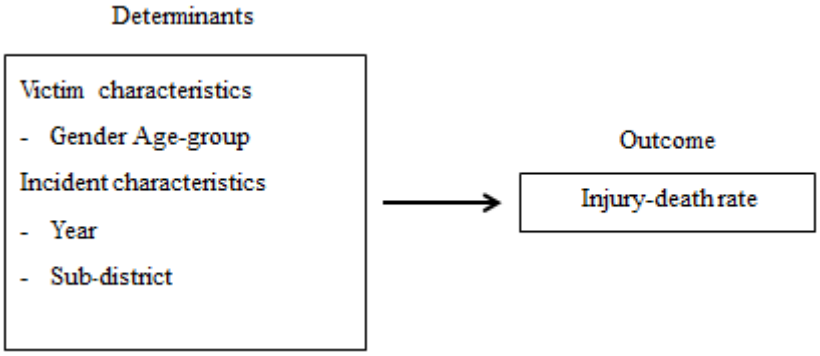


Figure 2.7 Part diagram of the determinants and outcome

Table 2.1 Description of variables

Variable	Description		
Gender Age-group	18 groups;		
	Male: 0-10	Male: 31-40	Male: 61-70
	Male: 11-20	Male: 41-50	Male: 71-80
	Male: 21-30	Male: 51-60	Male: 81-90

Variable	Description		
	Female: 0-10 Female: 11-20 Female: 21-30	Female: 31-40 Female: 41-50 Female: 51-60	Female: 61-70 Female: 71-80 Male: 81-90
Year	Year of incident from 2004 to 2020		
Sub-district	Sub-district of occurring incident including 115 sub-districts of Pattani, 77 sub-districts of Narathiwat, 56 sub-districts of Yala and 40 sub-districts of Songkhla		

2.2 Statistical analysis

Start with a descriptive analysis, the frequency and percentage were used to explore a preliminary distribution of variables. For injury-death rates (cases per 100,000 population), outcome, were examined using mean, median, standard deviation (S.D.), minimum (min.), and maximum (max.). For data visualization, bar chart and pie chart were used to show the information of categorical variables. Histogram, bubble plot, and dot plot were used to illustrate the information of continuous variables. The analysis of variance (ANOVA) test was performed to compare the average injury-death rate of each group of determinants.

Linear regression is generally conducted to find the relationship between determinants, can be categorical or continuous, and continuous outcome. For this study, there were the multiple determinants, and then a multiple linear regression with the following equation (Equation 2) was used.

$$y = \alpha + \sum_{i=1}^{k} \beta_i x_i + \varepsilon \quad (2)$$

Where y is the injury-death rate, α is the intercept value of regression, β is regression coefficient or slope value of regression which the rate of changing of y when x change to 1 unit. The x is independents variables (age group, gender, year, and sub-district). The k is a number of determinants. The last term, ε is error term or residual from the model.

However, the linear regression model cannot be directly applicable to the current study outcome. Due to the distribution of the injury-death rates, was right-skewed histogram was detected. Therefore, the outcome was transformed by a logarithm term, log (injury-death rate). Lastly, the log-linear regression was used in this study formulated by the following form (Equation 3)

$$\log(y) = \alpha + \sum_{i=1}^{k} \beta_i x_i + \varepsilon \quad (3)$$

The log-linear model, the literal interpretation of the estimated coefficient β is that a one-unit increase in x will produce an expected increase in log(y) of β units.

A sum contrast was used to calculate the upper and lower bound of 95% confidence interval (95%CI) (Tongkumchum and McNeil, 2009). The overall goodness-of-fit of the model was assessed using R-squared. If the R-squared led to -1 or 1, then the determinants explained the variation in outcome well. The appropriate R-squared depends on the study field and the experience of the researcher. Similarly, a normal quantile-quantile plot was used to assess the model. A thematic map was used to show the magnitude of the injury-death rate. In addition, urban and rural area was considered to show the color shade of injury-death rate. All analysis and visualization were conducted using R program (R Core Team, 2020).

CHAPTER 3

Preliminary Analysis

This chapter is going to present the result of the preliminary analysis, and univariate analysis.

3.1 Descriptive analysis

Start with the frequency of injury and death was examined before converting the injury and death to be continuous outcome which was injury-death rate per 100,000 population by its factors, i.e. age group, gender, year, and sub-district. From the year 2004 to 2020, the total number of injury and death from the unrest in southernmost provinces of Thailand was 22,267 cases.

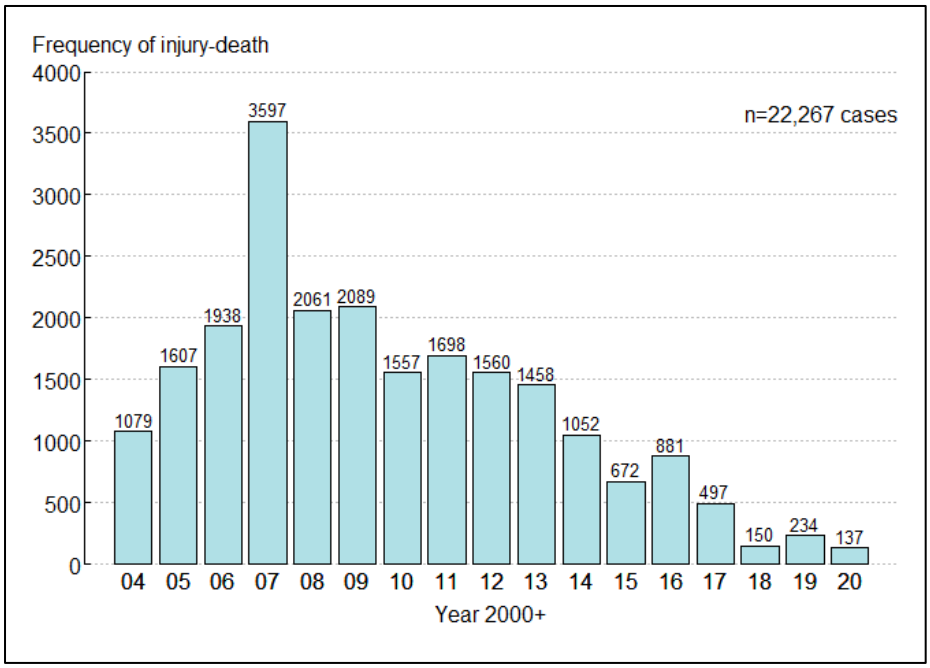


Figure 3.1 The frequency of injury and death during 2004 to 2020

Figure 3.1 show that the number of injury and death reached the highest number in the year 2007 with the frequency of 3,597 (16.15%). From the year 2004 to 2014, the number of injury and death were greater than 1,000 cases for each year. After the year 2015 until 2020, the number of injury and death were lower than 1,000 cases. However, the number of injury and death in the year 2016 went up to 881

cases. The last year of the current study, the number of injury and death was the lowest number, 137 cases (0.62%).

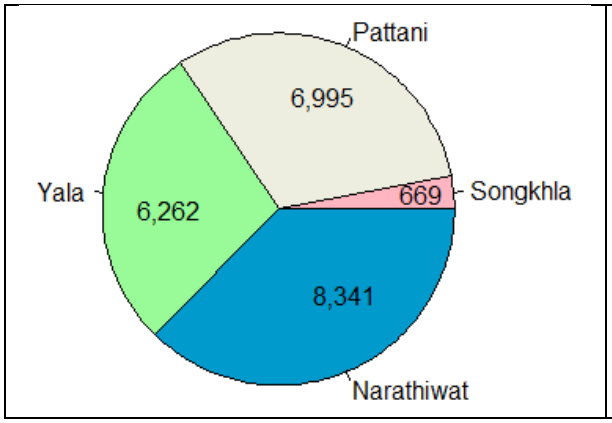


Figure 3.2 The frequency of injury and death of four southernmost provinces

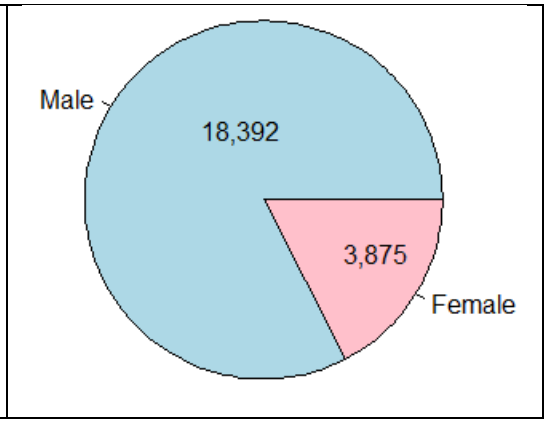


Figure 3.3 The frequency of injury and death classify by gender

During 17 years, the province of Narathiwat had the highest number of injury and death, 8,341 cases (37.46%). Pattani and Yala had the number of injury and death more than 6,000 cases which were 6,995 cases (31.41%) in Pattani and 6,262 cases (28.12%) in Yala. Lastly, there were 669 cases (3.00%) in Songkhla (see Figure 3.2). Four-fifths of the injuries and deaths were male, 18,392 cases (82.60%) and 3,875 cases (17.40%) were female (see Figure 3.3).

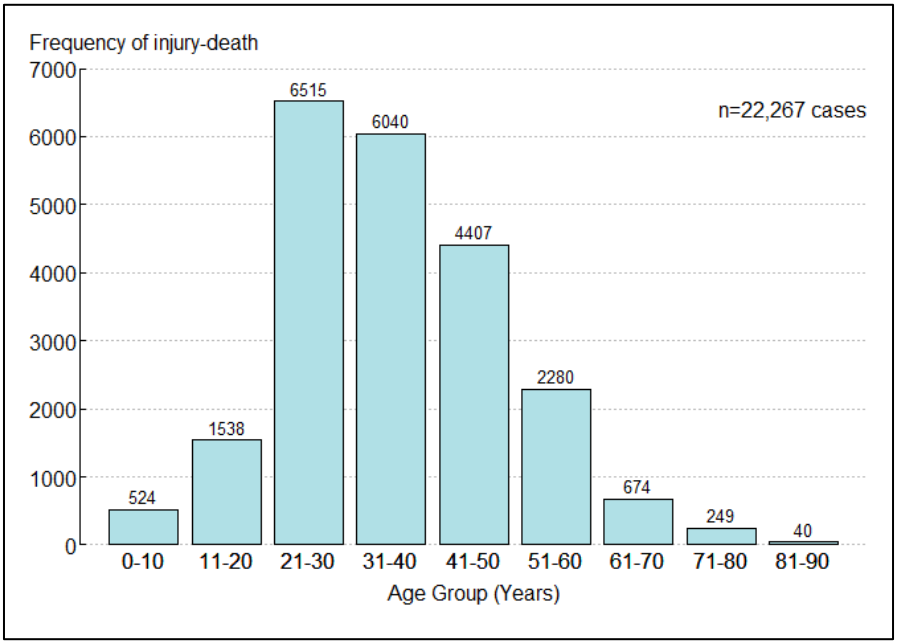


Figure 3.4 The frequency of injury and death classified by age group

Figure 3.4 illustrates that the victims aged 0-10 years, 524 cases (2.35%), experienced with the unrest. The 1,538 cases (6.91%) was aged 11-20 years. However, more than 50% of the victims were in age group 21-40 years as shown that the age group 21-30 years had 6,515 cases (29.26%) and the age group 31-40 years had 6,040 cases (27.13%). Meanwhile, the age group 41-50 years and 51-60 years had 19.79% and 10.24%, respectively. The rest 4.32% (963 cases) was an elderly.

Due to the population size for each gender and each sub-district was different. To avoid bias in the data analysis, the injury-death rates were computed for further analysis by dividing the number of injury and death by the population size of each gender and each sub-district in each province and multiplying by 100,000.

3.2 Injury-death rates

The histogram of the injury-death rate shown in Figure 3.5 clearly shows that the injury-death rates were skewed to the right. The parametric inferential statistics were used in the current study, and one of the main assumptions of these statistics is that the data have to have a normal distribution. Thus, the transformation of the logarithm led to this outcome. The result is shown in Figure 3.6; the logarithm of injury-death rates was normally distributed.

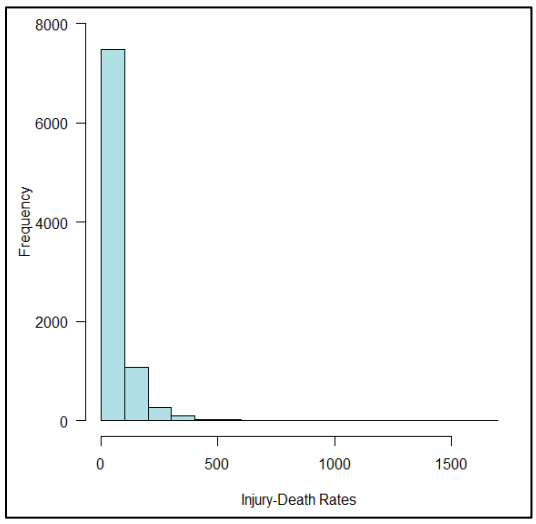


Figure 3.5 A histogram of the distribution of injury-death rates

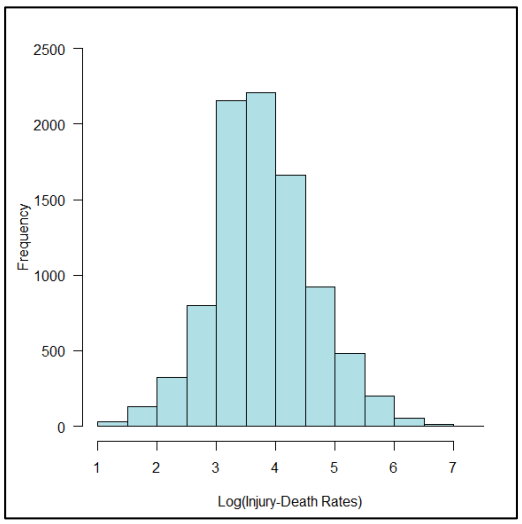


Figure 3.6 A histogram of the distribution of logarithmic injury-death rates

Table 3.1 The injury-death rates summary

Min.	1st Qu.	Median	Mean	SD	3rd Qu.	Max.
2.85	26.15	40.53	64.45	2.52	73.69	1,610.24

The average of injury-death rate was 64.45±2.52 cases per 100,000 population and its median was 58.64 cases per 100,000.

Table 3.2 The injury-death rates (cases/100,000 population) classified by its factors

Variables	Mean	Median	S.D.	Min.	Max.
Year					
2004	60.53	40.72	2.40	2.84	587.37
2005	59.93	41.51	2.33	2.94	571.82
2006	60.89	40.56	2.35	3.23	619.64
2007	81.34	48.31	2.61	4.89	904.16
2008	80.05	46.16	2.65	4.80	1610.24
2009	70.19	45.11	2.48	3.02	715.31
2010	60.44	39.33	2.39	3.02	411.38
2011	62.17	40.97	2.44	3.06	835.20
2012	59.99	39.08	2.47	4.62	1335.76
2013	67.97	39.18	2.75	3.08	691.44
2014	51.80	36.43	2.39	3.10	351.96
2015	51.87	35.15	2.56	3.10	542.64
2016	49.72	34.07	2.33	4.57	397.35
2017	56.70	34.27	2.41	6.48	455.01
2018	48.17	31.11	2.73	3.13	280.02
2019	44.01	28.96	2.24	3.47	245.20
2020	46.42	28.94	2.91	3.16	232.17
Gender-age group					
Male: 0-10	35.22	36.38	2.19	3.23	217.16
11-20	53.99	51.92	2.35	3.06	779.30
21-30	105.66	101.61	2.69	3.42	904.16
31-40	89.02	88.12	2.43	5.13	1610.24
41-50	74.32	66.88	2.26	3.42	1032.20
51-60	57.31	53.95	2.07	3.44	578.03
61-70	41.32	42.51	2.12	3.23	266.13
71-80	38.89	41.82	2.12	5.07	117.88
81-90	32.22	39.07	2.53	3.37	81.97
Female: 0-10	33.12	36.70	2.27	3.16	116.96
11-20	39.92	39.00	2.35	3.02	1335.76
21-30	45.59	43.95	2.21	3.13	254.24
31-40	48.17	45.56	2.15	3.10	389.86
41-50	44.70	45.32	2.13	2.84	428.85
51-60	38.02	37.34	2.23	3.08	233.92
61-70	31.20	35.82	2.57	2.94	106.16
71-80	28.31	32.72	2.45	2.94	106.16
81-90	27.80	31.91	2.11	4.56	52.85

Variables	Mean	Median	S.D.	Min.	Max.
Province					
Songkhla	41.14	27.23	2.05	11.38	344.49
Pattani	69.29	48.36	2.25	7.75	837.40
Yala	61.61	38.96	2.63	2.84	800.58
Narathiwat	63.74	35.93	2.70	4.56	1610.24

Table 3.2 demonstrates that the injury-death rates from 2004 to 2013 were more than 60 cases per 100,000 population. The highest injury-death rate occurred in the year 2007 which was 80.68 cases per 100,000 population, respectively. While the injury-death rates from 2014 to 2020 decreased and showed with the rates almost less than 55 cases per 100,000 population.

Among males, the age group 21–30 years had the highest injury-death rates at 105.66 cases per 100,000 population, followed by the age group 31–40 years at 89.02 cases per 100,000 population, and the age group 41–50 years at 74.32 cases per 100,000. Other age groups, on the other hand, had injury-death rates ranging between 30 and 60 cases per 100,000 people. For females, the highest injury-death rate showed up at the age of 31–40 years, with an average of 48.17 cases per 100,000 population, followed by the age groups 21–30 and 41–50 years, with an average of 45.59 and 44.70 cases per 100,000 population, respectively. For others, the injury-death rate ranged between 27 and 40 cases per 100,000 population.

Pattani had the highest injury-death rates at 76.51 cases per 100,000 population, followed by Yala and Narathiwat with injury-death rates of 60.18 and 57.99 cases per 100,000 population, respectively.

3.3 Univariate analysis

As shown in Figure 3.7-3.12, the ANOVA results show that the average injury-death rate was statistically different for each year, gender-age group, and sub-district with a p-value less than 0.0001. The p-values in Figures 3.9–3.12 were from a one-way ANOVA; the graphs were separated for clarity.

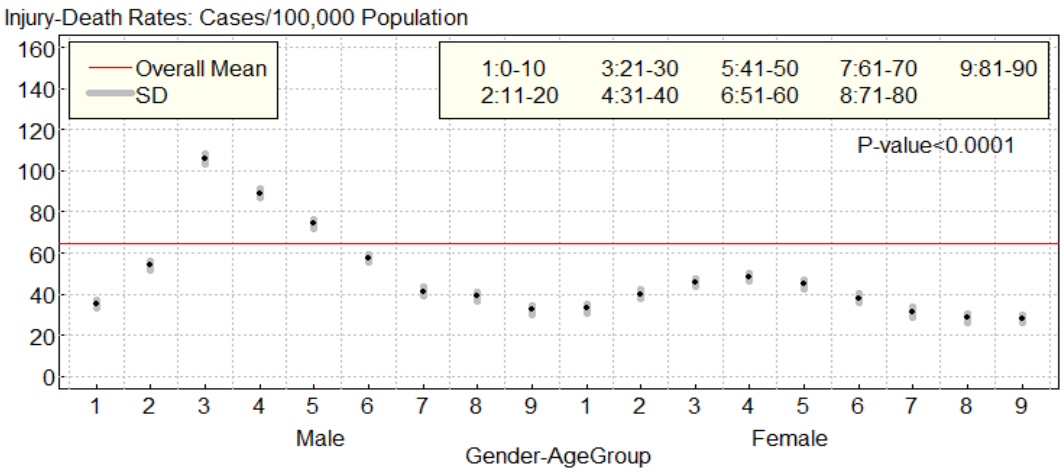


Figure 3.7 The average of injury-death rates by each gender-age group

When the injury-death rates for each gender and age group were compared, the results revealed that males were at a higher risk of becoming victims than females across all age groups. Males face the greatest risk between the ages of 21 and 30, while females face the greatest risk between the ages of 31 and 40.

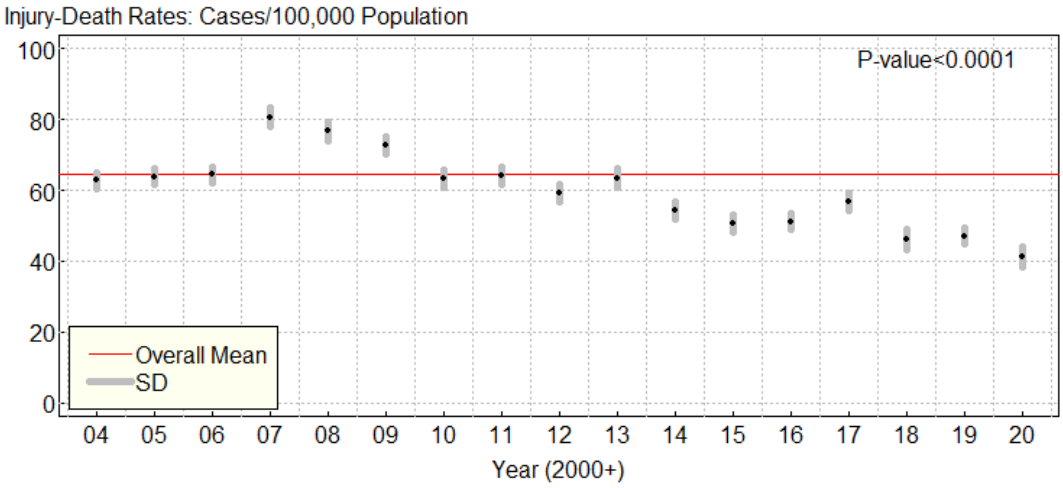


Figure 3.8 The average of injury-death rates by each year

Figure 3.8 shows that the injury-death rate was higher than the overall mean (64.45 cases per 100,000 population) during the three years of unrest (2007–2009). Six years (2004–2006, 2010–2011, and 2013) showed the injury-death rate around the overall mean, and eight years (2012, 2014–2020) had the injury-death rate below the overall mean.

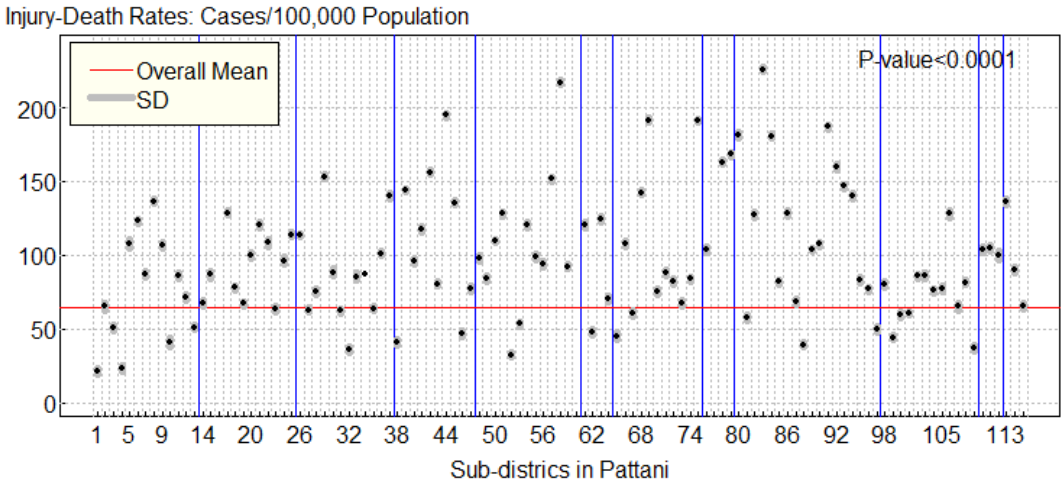


Figure 3.9 The average of injury-death rates of each sub-district of Pattani province

Table 3.3 The name of sub-districts of each ID in the graph Figure 3.9 for Pattani province

ID	Name of Sub-districts (Sub-district, District, Province)	ID	Name of Sub-districts (Sub-district, District, Province)
1	Sabarang, Mueang Pattani, Pattani	61	Talo Mae Na, Thung Yang Daeng, Pattani
2	Ano Ru, Mueang Pattani, Pattani	62	Phithen, Thung Yang Daeng, Pattani
3	Chabang Tiko, Mueang Pattani, Pattani	63	Nam Dam, Thung Yang Daeng, Pattani
4	Bana, Mueang Pattani, Pattani	64	Paku, Thung Yang Daeng, Pattani
5	Tanyong Lulo, Mueang Pattani, Pattani	65	Taluban, Sai Buri, Pattani
6	Khlong Maning, Mueang Pattani, Pattani	66	Tabing, Sai Buri, Pattani
7	Kamiyo, Mueang Pattani, Pattani	67	Pase Yawo, Sai Buri, Pattani
8	Barahom, Mueang Pattani, Pattani	68	Bang Kao, Sai Buri, Pattani
9	Paka Harang, Mueang Pattani, Pattani	69	Bue Re, Sai Buri, Pattani
10	Ru Samilae, Mueang Pattani, Pattani	70	Tro Bon, Sai Buri, Pattani
11	Talubo, Mueang Pattani, Pattani	71	Kadunong, Sai Buri, Pattani
12	Baraho, Mueang Pattani, Pattani	72	Lahan, Sai Buri, Pattani
13	Puyut, Mueang Pattani, Pattani	73	Manang Dalam, Sai Buri, Pattani
14	Khok Pho, Khok Pho, Pattani	74	Paen, Sai Buri, Pattani
15	Makrut, Khok Pho, Pattani	75	Thung Khla, Sai Buri, Pattani
16	Bang Kro, Khok Pho, Pattani	76	Sai Thong, Mai Kaen, Pattani
17	Pa Bon, Khok Pho, Pattani	77	Mai Kaen, Mai Kaen, Pattani
18	Sai Khao, Khok Pho, Pattani	78	Talo Krai Thong, Mai Kaen, Pattani
19	Na Pradu, Khok Pho, Pattani	79	Don Sai, Mai Kaen, Pattani
20	Pak Lo, Khok Pho, Pattani	80	Talo, Yaring, Pattani
21	Thung Phala, Khok Pho, Pattani	81	Talo Kapo, Yaring, Pattani
22	Tha Ruea, Khok Pho, Pattani	82	Tanyong Dalo, Yaring, Pattani
23	Na Ket, Khok Pho, Pattani	83	Tanyong Chueng-nga, Yaring, Pattani
24	Khuan Nori, Khok Pho, Pattani	84	Tolang, Yaring, Pattani
25	Chang Hai Tok, Khok Pho, Pattani	85	Ta Kae, Yaring, Pattani
26	Ko Po, Nong Chik, Pattani	86	Tali-ai, Yaring, Pattani
27	Kholo Tanyong, Nong Chik, Pattani	87	Yamu, Yaring, Pattani
28	Don Rak, Nong Chik, Pattani	88	Bang Pu, Yaring, Pattani
29	Dato, Nong Chik, Pattani	89	Nong Raet, Yaring, Pattani

ID	Name of Sub-districts (Sub-district, District, Province)	ID	Name of Sub-districts (Sub-district, District, Province)
30	Tuyong, Nong Chik, Pattani	90	Piya Mumang, Yaring, Pattani
31	Tha Kamcham, Nong Chik, Pattani	91	Pula Kong, Yaring, Pattani
32	Bo Thong, Nong Chik, Pattani	92	Baloi, Yaring, Pattani
33	Bang Khao, Nong Chik, Pattani	93	Saban, Yaring, Pattani
34	Bang Tawa, Nong Chik, Pattani	94	Manang Yong, Yaring, Pattani
35	Pulo Puyo, Nong Chik, Pattani	95	Rata Panyang, Yaring, Pattani
36	Yabi, Nong Chik, Pattani	96	Charang, Yaring, Pattani
37	Lipa Sa-ngo, Nong Chik, Pattani	97	Laem Pho, Yaring, Pattani
38	Panare, Panare, Pattani	98	Yarang, Yarang, Pattani
39	Tha Kham, Panare, Pattani	99	Sadawa, Yarang, Pattani
40	Ban Nok, Panare, Pattani	100	Prachan, Yarang, Pattani
41	Don, Panare, Pattani	101	Sano, Yarang, Pattani
42	Khuan, Panare, Pattani	102	Rawaeng, Yarang, Pattani
43	Tha Nam, Panare, Pattani	103	Pitu Mudi, Yarang, Pattani
44	Khok Krabue, Panare, Pattani	104	Wat, Yarang, Pattani
45	Pho Ming, Panare, Pattani	105	Krado, Yarang, Pattani
46	Ban Klang, Panare, Pattani	106	Khlong Mai, Yarang, Pattani
47	Ban Nam Bo, Panare, Pattani	107	Mo Mawi, Yarang, Pattani
48	Mayo, Mayo, Pattani	108	Kolam, Yarang, Pattani
49	Thanon, Mayo, Pattani	109	Khao Tum, Yarang, Pattani
50	Trang, Mayo, Pattani	110	Karubi, Kapho, Pattani
51	Krawa, Mayo, Pattani	111	Talo Due Raman, Kapho, Pattani
52	Lubo Yirai, Mayo, Pattani	112	Plong Hoi, Kapho, Pattani
53	La-nga, Mayo, Pattani	113	Mae Lan, Mae Lan, Pattani
54	Kra So, Mayo, Pattani	114	Muang Tia, Mae Lan, Pattani
55	Ko Chan, Mayo, Pattani	115	Pa Rai, Mae Lan, Pattani
56	Pado, Mayo, Pattani		
57	Sakho Bon, Mayo, Pattani		
58	Sakho Tai, Mayo, Pattani		
59	Sakam, Mayo, Pattani		
60	Panan, Mayo, Pattani		

79.13% (91 sub-districts) of sub-districts in Pattani had injury-death rates above the overall mean (64.45 cases per 100,000 population) and 52.61% (49 sub-districts) had rates greater than 100 cases per 100,000 population. The maximum injury-death rate showing in Mai Kaen, Mai Kaen district, was 259.44 cases per 100,000 population. The minimum injury-death rate showing in Sabarang, Mueang Pattani district, was 21.15 cases per 100,000 population.

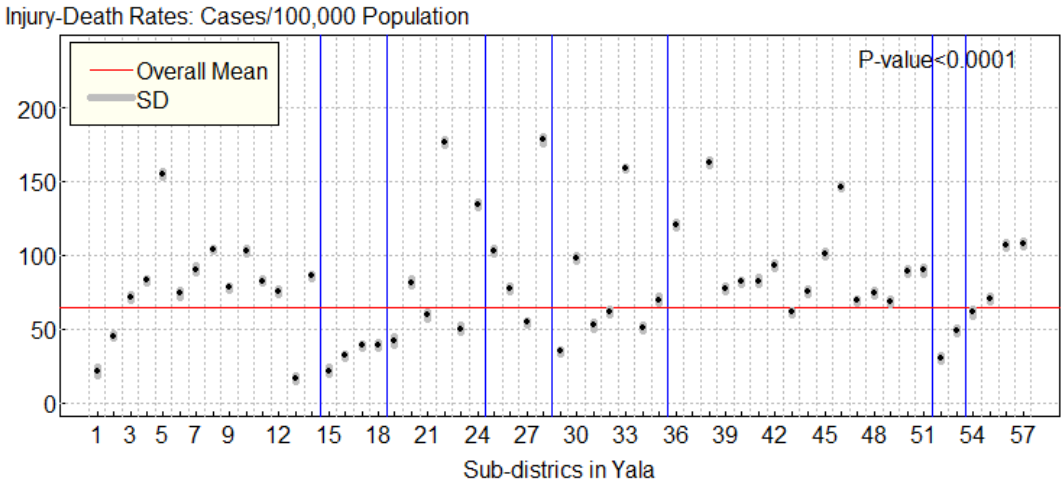


Figure 3.10 The average of injury-death rates of each sub-district of Yala province

Table 3.4 The name of sub-districts of each ID in the graph Figure 3.10 for Yala province

ID	Name of Sub-districts (Sub-district, District, Province)	ID	Name of Sub-districts (Sub-district, District, Province)
1	Sateng, Mueang Yala, Yala	29	Yaha, Yaha, Yala
2	Budi, Mueang Yala, Yala	30	La-ae, Yaha, Yala
3	Yopo, Mueang Yala, Yala	31	Patae, Yaha, Yala
4	Lidon, Mueang Yala, Yala	32	Baro, Yaha, Yala
5	Yala, Mueang Yala, Yala	33	Ta Chi, Yaha, Yala
6	Tha Sap, Mueang Yala, Yala	34	Ba-ngoi Sinae, Yaha, Yala
7	Lam Mai, Mueang Yala, Yala	35	Ka Tong, Yaha, Yala
8	Na Tham, Mueang Yala, Yala	36	Kayu Boko, Raman, Yala
9	Lam Phaya, Mueang Yala, Yala	37	Kalupang, Raman, Yala
10	Po Seng, Mueang Yala, Yala	38	Kalo, Raman, Yala
11	Phron, Mueang Yala, Yala	39	Koto Tuera, Raman, Yala
12	Bannang Sareng, Mueang Yala, Yala	40	Kota Baru, Raman, Yala
13	Sateng Nok, Mueang Yala, Yala	41	Kero, Raman, Yala
14	Ta Se, Mueang Yala, Yala	42	Cha-kwa, Raman, Yala
15	Betong, Betong, Yala	43	Tha Thong, Raman, Yala
16	Yarom, Betong, Yala	44	Noen Ngam, Raman, Yala
17	Tano Maero, Betong, Yala	45	Balo, Raman, Yala
18	Aiyoe Weng, Betong, Yala	46	Ba-ngoi, Raman, Yala
19	Bannang Sata, Bannang Sata, Yala	47	Buemang, Raman, Yala
20	Bacho, Bannang Sata, Yala	48	Yata, Raman, Yala
21	Tano Pute, Bannang Sata, Yala	49	Wang Phaya, Raman, Yala
22	Tham Thalu, Bannang Sata, Yala	50	Asong, Raman, Yala
23	Taling Chan, Bannang Sata, Yala	51	Talo Halo, Raman, Yala
24	Khuean Bang Lang, Bannang Sata, Yala	52	Kabang, Kabang, Yala
25	Than To, Than To, Yala	53	Bala, Kabang, Yala
26	Ban Rae, Than To, Yala	54	Krong Pinang, Krong Pinang, Yala
27	Mae Wat, Than To, Yala	55	Sa-e, Krong Pinang, Yala
28	Khiri Khet, Than To, Yala	56	Huai Krathing, Krong Pinang, Yala
		57	Purong, Krong Pinang, Yala

66.67% (38 sub-districts) of sub-districts in Yala had injury-death rates above the overall mean, and 26.32% (15 sub-districts) had more than 100 cases per 100,000 population. The maximum injury-death rate showing in Kalupang, Raman districts, was 273.19 cases per 100,000 population. The minimum injury-death rate showing in Sateng Nok, Mueang Yala districts, was 16.51 cases per 100,000 population.

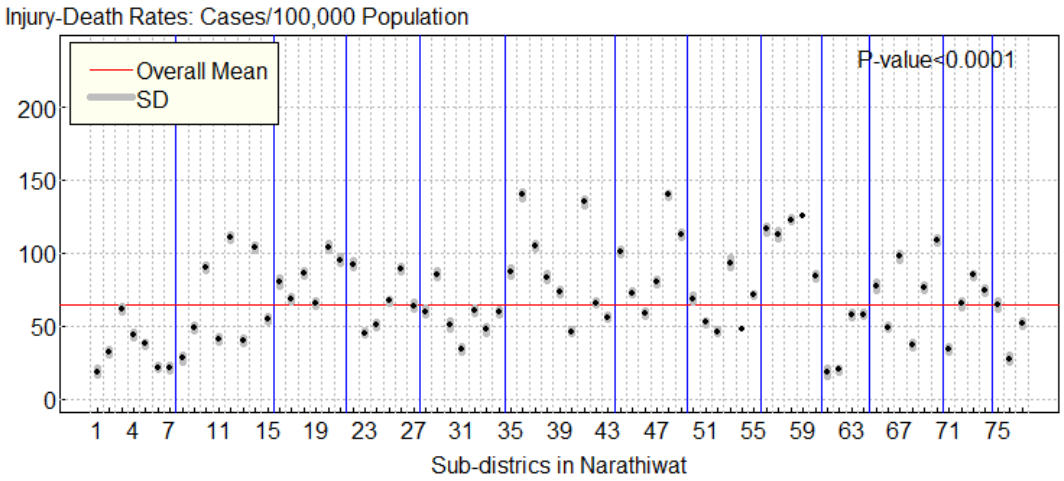


Figure 3.11 The average of injury-death rates of each sub-district of Narathiwat province

Table 3.5 The name of sub-districts of each ID in the graph Figure 3.11 for Narathiwat province

ID	Name of Sub-districts (Sub-district, District, Province)	ID	Name of Sub-districts (Sub-district, District, Province)
1	Bang Nak, Mueang Narathiwat, Narathiwat	42	Khok Sato, Rueso, Narathiwat
2	Lam Phu, Mueang Narathiwat, Narathiwat	43	Suwari, Rueso, Narathiwat
3	Manang Tayo, Mueang Narathiwat, Narathiwat	44	Sako, Si Sakhon, Narathiwat
4	Bang Po, Mueang Narathiwat, Narathiwat	45	Tamayung, Si Sakhon, Narathiwat
5	Kaluwo, Mueang Narathiwat, Narathiwat	46	Si Sakhon, Si Sakhon, Narathiwat
6	Kaluwo Nuea, Mueang Narathiwat, Narathiwat	47	Choeng Khiri, Si Sakhon, Narathiwat
7	Khok Khian, Mueang Narathiwat, Narathiwat	48	Kalong, Si Sakhon, Narathiwat
8	Chehe, Tak Bai, Narathiwat	49	Si Banphot, Si Sakhon, Narathiwat
9	Phrai Wan, Tak Bai, Narathiwat	50	Waeng, Waeng, Narathiwat
10	Phron, Tak Bai, Narathiwat	51	Kayu Khla, Waeng, Narathiwat
11	Sala Mai, Tak Bai, Narathiwat	52	Kholo, Waeng, Narathiwat
12	Bang Khun Thong, Tak Bai, Narathiwat	53	Lochut, Waeng, Narathiwat
13	Ko Sathon, Tak Bai, Narathiwat	54	Mae Dong, Waeng, Narathiwat
14	Na Nak, Tak Bai, Narathiwat	55	Erawan, Waeng, Narathiwat
15	Khosit, Tak Bai, Narathiwat	56	Mamong, Sukhirin, Narathiwat
16	Bacho, Bacho, Narathiwat	57	Sukhirin, Sukhirin, Narathiwat
17	Lubo Sawo, Bacho, Narathiwat	58	Kia, Sukhirin, Narathiwat

ID	Name of Sub-districts (Sub-district, District, Province)	ID	Name of Sub-districts (Sub-district, District, Province)
18	Kayo Mati, Bacho, Narathiwat	59	Phukhao Thong, Sukhirin, Narathiwat
19	Paluka Samo, Bacho, Narathiwat	60	Rom Sai, Sukhirin, Narathiwat
20	Bare Nuea, Bacho, Narathiwat	61	Su-ngai Kolok, Su-ngai Kolok, Narathiwat
21	Ba Re Tai, Bacho, Narathiwat	62	Pase Mat, Su-ngai Kolok, Narathiwat
22	Yi-ngo, Yi-ngo, Narathiwat	63	Muno, Su-ngai Kolok, Narathiwat
23	Lahan, Yi-ngo, Narathiwat	64	Puyo, Su-ngai Kolok, Narathiwat
24	Chobo, Yi-ngo, Narathiwat	65	Paluru, Su-ngai Padi, Narathiwat
25	Lubo Baya, Yi-ngo, Narathiwat	66	Su-ngai Padi, Su-ngai Padi, Narathiwat
26	Lubo Buesa, Yi-ngo, Narathiwat	67	To Deng, Su-ngai Padi, Narathiwat
27	Tapoyo, Yi-ngo, Narathiwat	68	Sako, Su-ngai Padi, Narathiwat
28	Tanyong Mat, Ra-ngae, Narathiwat	69	Riko, Su-ngai Padi, Narathiwat
29	Tanyong Limo, Ra-ngae, Narathiwat	70	Ka Wa, Su-ngai Padi, Narathiwat
30	Bo-ngo, Ra-ngae, Narathiwat	71	Chanae, Chanae, Narathiwat
31	Kalisa, Ra-ngae, Narathiwat	72	Dusong Yo, Chanae, Narathiwat
32	Ba-ngo Sato, Ra-ngae, Narathiwat	73	Phadung Mat, Chanae, Narathiwat
33	Chaloem, Ra-ngae, Narathiwat	74	Chang Phueak, Chanae, Narathiwat
34	Maruebo Tok, Ra-ngae, Narathiwat	75	Chuap, Cho-airong, Narathiwat
35	Rueso, Rueso, Narathiwat	76	Bukit, Cho-airong, Narathiwat
36	Sawo, Rueso, Narathiwat	77	Maruebo Ok, Cho-airong, Narathiwat
37	Riang, Rueso, Narathiwat		
38	Samakkhi, Rueso, Narathiwat		
39	Batong, Rueso, Narathiwat		
40	Lalo, Rueso, Narathiwat		
41	Rueso Ok, Rueso, Narathiwat		

53.25% (41 sub-districts) of sub-districts in Narathiwat had injury-death rates above the overall mean, and 18.18% (14 sub-districts) had more than 100 cases per 100,000 population. The maximum injury-death rate showing in Sukhirin, Sukhirin district, was 139.86 cases per 100,000 population. The minimum injury-death rate showing in Kaluwo Nuea, Mueang Narathiwat district, was 18.21 cases per 100,000 population.

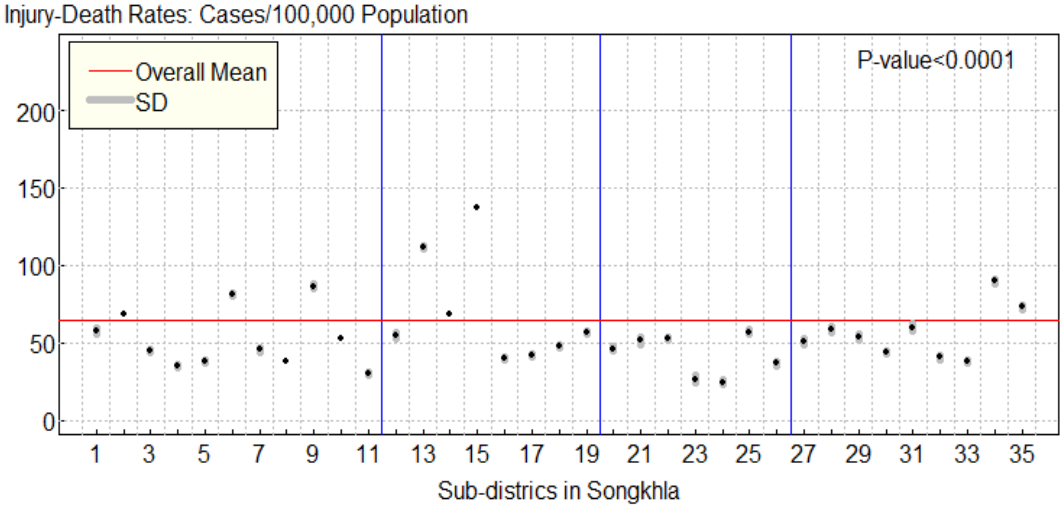


Figure 3.12 The average of injury-death rates of each sub-district of Songkhla province

Table 3.6 The name of sub-districts of each ID in the graph Figure 3.12 for Songkhla province

ID	Name of Sub-districts (Sub-district, District, Province)	ID	Name of Sub-districts (Sub-district, District, Province)
1	Ban Na, Chana, Songkhla	20	Thepha, Thepha, Songkhla
2	Pa Ching, Chana, Songkhla	21	Pak Bang, Thepha, Songkhla
3	Saphan Mai Kaen, Chana, Songkhla	22	Ko Saba, Thepha, Songkhla
4	Sakom, Chana, Songkhla	23	Lam Phlai, Thepha, Songkhla
5	Na Wa, Chana, Songkhla	24	Tha Muang, Thepha, Songkhla
6	Nam Khao, Chana, Songkhla	25	Wang Yai, Thepha, Songkhla
7	Tha Mo Sai, Chana, Songkhla	26	Sakom, Thepha, Songkhla
8	Chanong, Chana, Songkhla	27	Saba Yoi, Saba Yoi, Songkhla
9	Khae, Chana, Songkhla	28	Thung Pho, Saba Yoi, Songkhla
10	Khlong Pia, Chana, Songkhla	29	Pian, Saba Yoi, Songkhla
11	Taling Chan, Chana, Songkhla	30	Ban Not, Saba Yoi, Songkhla
12	Na Thawi, Na Thawi, Songkhla	31	Chanae, Saba Yoi, Songkhla
13	Na Mo Si, Na Thawi, Songkhla	32	Khuha, Saba Yoi, Songkhla
14	Plak Nu, Na Thawi, Songkhla	33	Khao Daeng, Saba Yoi, Songkhla
15	Tha Pradu, Na Thawi, Songkhla	34	Ba Hoi, Saba Yoi, Songkhla
16	Sathon, Na Thawi, Songkhla	35	Than Khiri, Saba Yoi, Songkhla
17	Thap Chang, Na Thawi, Songkhla		
18	Prakop, Na Thawi, Songkhla		
19	Khlong Kwang, Na Thawi, Songkhla		

The average injury-death rates of Songkhla sub-districts are shown in Figure 3.12. The graph shows that the majority of sub-districts were lower than the overall mean. There were eight sub-districts (22.86%) where the injury-death rates were higher than the overall mean. Two sub-districts had the highest injury-death rate over 100 cases per 100,000 population: Tha Pradu and Na Mo Si, both in Na Thawi district, with 136.75 and 111.55 cases per 100,000 population, respectively.

The statistical modelling is going to investigate in the next chapter.

CHAPTER 4

Statistical Modelling

This chapter is going to illustrate the result from statistical modelling, model assessment, and thematic map of injury-death rates.

4.1 Multiple log-linear regression model

The multiple log-linear regression model (one model) was fitted to the injury-death rates using the following equation;

log(injury-death rate) = gender-age + year + sub-district

Where gender-age was 18 groups, year was 17 groups, and sub-district was 284 groups. The result for the effect of year, gender-age, and sub-district into the injury-death rates from log-linear regression were shown in Table 4.1-4.6 and graph 95% confidence intervals were shown in Figure 4.1 – 4.7. The y-axis was the injury-death rates (cases per 100,000 population) presenting in log-scale. The red horizontal line was overall mean which was 64.45 cases per 100,000 population, the green dots were the crude mean, and the black plus sign were the adjusted mean and its 95% confidence interval. The average of injury-death rate in logarithm term before transform back (exp(injury-death rate)) to true value was displayed in Appendix Table A. The explanation of abbreviation of some header name of Table 4.1-4.6 given as follows; Estimate represented the coefficients of each group of the determinants, SE was standard error, t-value was the value of a statistical test of t-test, Mean was the adjusted mean, CILB was the lower bound of 95%CI, CIUB was upper bound of 95%CI, and P-value was a value to reject a null hypothesis that was lower than 0.05.

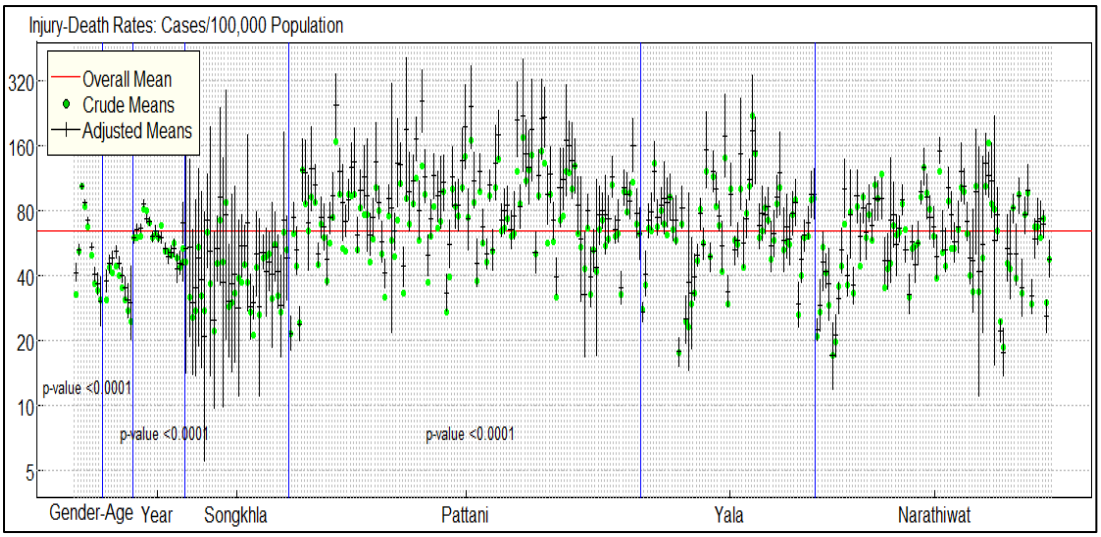


Figure 4.1 The 95% CI of the injury-death rates from log-linear regression

Figure 4.1 displays a 95% confidence interval for the injury-death rates for all determinants, including gender-age group, year, and sub-district. There was a statistically significant association between each factor and the injury-death rate. Male had a higher injury-death rate than female. Comparing the sub-districts of four provinces, it appears clearly that most of the injury-death rates of sub-district in Pattani were higher than the other provinces. For more clarity, the graphs of the 95% CI of the adjusted mean of the injury-death rate for each determinant and the sub-districts for each province were extracted and given in Figure 4.2–4.7 and Table 4.1–4.6.

Table 4.1 The results from multiple log-linear regression of gender-age

Gender: Age group	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
(Intercept)	3.472	0.020	175.738				<0.0001	
Male: 0-10	-0.399	0.044	-9.167	41.55	37.83	45.64	<0.0001	***
Male: 11-20	-0.184	0.026	-7.040	52.67	49.79	55.72	<0.0001	***
Male: 21-30	0.433	0.015	29.664	103.71	100.50	107.02	<0.0001	***
Male: 31-40	0.281	0.014	19.713	87.76	85.10	90.49	<0.0001	***
Male: 41-50	0.101	0.015	6.875	72.06	69.80	74.39	<0.0001	***
Male: 51-60	-0.151	0.018	-8.410	54.58	52.51	56.74	<0.0001	***
Male: 61-70	-0.418	0.030	-13.771	40.71	38.13	43.46	<0.0001	***
Male: 71-80	-0.508	0.051	-9.896	36.85	32.99	41.17	<0.0001	***
Male: 81-90	-0.681	0.120	-5.684	30.46	23.53	39.45	<0.0001	***
Female: 0-10	-0.481	0.053	-9.129	37.98	33.91	42.55	<0.0001	***
Female: 11-20	-0.314	0.043	-7.289	45.63	41.59	50.07	<0.0001	***
Female: 21-30	-0.256	0.034	-7.641	48.63	45.24	52.27	<0.0001	***
Female: 31-40	-0.198	0.029	-6.815	51.86	48.72	55.21	<0.0001	***
Female: 41-50	-0.312	0.030	-10.432	45.71	42.85	48.76	<0.0001	***
Female: 51-60	-0.426	0.038	-11.144	40.36	37.17	43.83	<0.0001	***
Female: 61-70	-0.554	0.058	-9.536	35.03	30.90	39.71	<0.0001	***

Gender: Age group	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
(Intercept)	3.472	0.020	175.738				<0.0001	
Female: 71-80	-0.673	0.081	-8.321	30.74	25.82	36.59	<0.0001	***
Female: 81-90	-0.690	0.180	-3.845	30.16	20.48	44.42	<0.0001	***

***Significant at p-value <0.0001 **Significant at p-value <0.001 *Significant at p-value <0.05

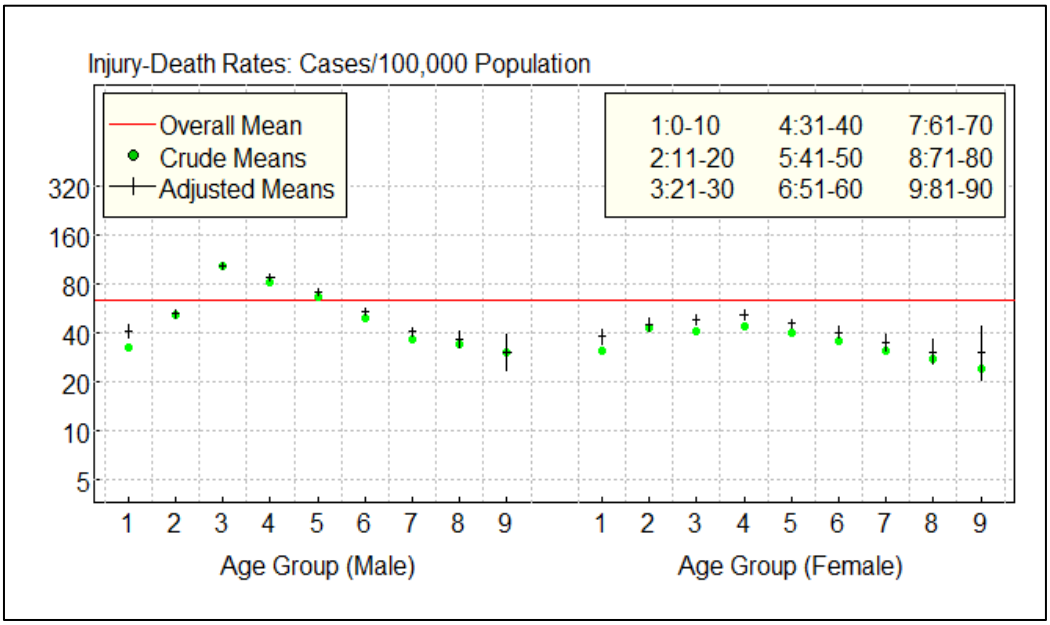


Figure 4.2 The 95% CI of the injury-death rates for the effects of gender-age

The results from Figure 4.2 showed that male aged 21-50 years had the injury-death rates (cases per 100,000 population) higher than overall mean. The adjusted means for the male aged 21-30, 31-40, and 41-50 years were 103.71 with a 95%CI of 100.50 and 107.02, 87.76 with a 95%CI of 85.10 and 90.49, and 72.06 with a 95%CI of 69.80 and 74.39, respectively. The other age groups of male and all age groups of females were below than the overall mean. However, the maximum injury-death rate (cases per 100,000 population) of female was age group 31-40 years with the average of 51.86 and its 95%CI of 48.72 and 55.21, followed by the age group 21-30 years with the average of 48.63 and its 95%CI of 45.24 and 52.27.

Table 4.2 The results from log-linear regression of year

Years	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
(Intercept)	3.472	0.020	175.738				<0.0001	
2004	-0.058	0.029	-1.991	60.47	56.78	64.39	0.0465	*
2005	0.020	0.024	0.839	65.90	62.57	69.40	0.4017	
2006	0.026	0.021	1.244	66.35	63.39	69.45	0.2137	
2007	0.269	0.017	15.441	86.68	83.48	90.00	<0.0001	***
2008	0.122	0.022	5.610	73.74	70.35	77.29	<0.0001	***
2009	0.090	0.021	4.249	71.18	67.99	74.52	<0.0001	***
2010	-0.055	0.023	-2.344	60.70	57.73	63.82	0.0191	*
2011	0.004	0.024	0.188	64.77	61.56	68.15	0.8505	

Years	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
(Intercept)	3.472	0.020	175.738				<0.0001	
2012	-0.049	0.025	-1.973	61.07	57.88	64.43	0.0485	.
2013	-0.062	0.025	-2.520	60.20	57.08	63.48	0.0117	*
2014	-0.170	0.028	-6.135	53.49	50.39	56.77	<0.0001	***
2015	-0.249	0.033	-7.462	49.04	45.64	52.69	<0.0001	***
2016	-0.203	0.030	-6.742	51.56	48.32	55.02	<0.0001	***
2017	-0.166	0.044	-3.794	53.72	48.90	59.02	0.0001	***
2018	-0.362	0.072	-5.034	43.29	37.07	50.55	<0.0001	***
2019	-0.308	0.055	-5.567	45.94	40.77	51.75	<0.0001	***
2020	-0.329	0.079	-4.163	44.87	37.84	53.21	<0.0001	***

***Significant at p-value <0.0001 **Significant at p-value <0.001 *Significant at p-value <0.05

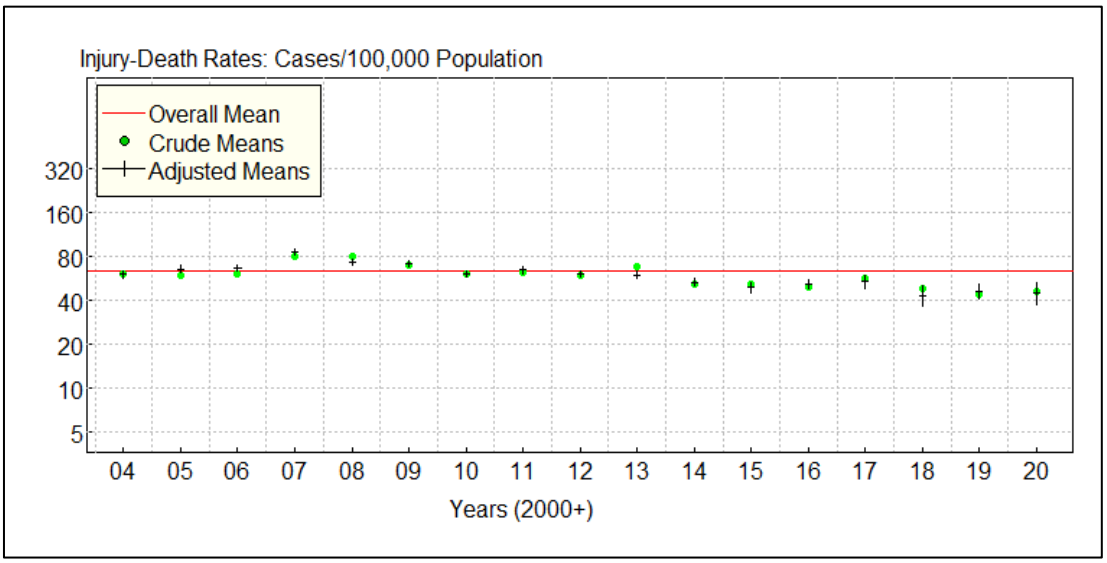


Figure 4.3 The 95% CI of the injury-death rates for the effects of year

Figure 4.3 shows that three years (2007-2009) of injury-death rate were upper than the overall mean. The injury-death rate (cases per 100,000 population) reached its peak in the year 2007 with an average of 86.68 and a 95%CI of 83.48 and 90.00. Furthermore, the injury-death rates in the year 2004-2013 were greater than 60 cases per 100,000 population. The injury-death rates in the year 2014-2020 were greater than 40 cases per 100,000 population.

The injury-death rate increased by 43.35% ((60.47-86.68)/60.47x100) between 2004 and 2007. After that, the injury-death rate plummeted from the year 2007 to 2020 by 48.23% ((86.68-44.87)/86.68x100).

Table 4.3 The coefficients from log-linear regression of sub-district in Songkhla

Districts in Songkhla	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value
	(Intercept)	3.472	0.020	175.738				<0.0001
Chana	1:Ban Na	0.076	0.100	0.761	70.09	56.47	87.00	0.4466
	2:Pa Ching	-0.172	0.616	-0.279	53.33	14.12	201.39	0.7799

Districts in Songkhla	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	3:Saphan Mai Kaen	-0.160	0.436	-0.367	54.05	21.10	138.46	0.7138	
	4:Sakom	-0.688	0.356	-1.934	30.25	14.05	65.13	0.0532	.
	5:Na Wa	-0.546	0.436	-1.251	35.37	13.82	90.54	0.2108	
	6:Nam Khao	-0.255	0.436	-0.585	48.71	19.05	124.57	0.5589	
	7:Tha Mo Sai	-0.468	0.436	-1.074	38.52	15.06	98.54	0.2827	
	8:Chanong	-1.022	0.616	-1.660	20.94	5.55	79.00	0.0970	
	9:Khae	0.101	0.233	0.433	72.01	43.58	118.98	0.6652	
	10:Khlong Pia	-0.198	0.617	-0.322	51.81	13.71	195.79	0.7476	
	11:Taling Chan	-0.859	0.436	-1.972	25.05	9.79	64.08	0.0486	.
Na Thawi	12:Na Thawi	-0.166	0.159	-1.039	53.72	38.09	75.75	0.2987	
	13:Na Mo Si	0.335	0.436	0.768	93.15	36.39	238.47	0.4425	
	14:Plak Nu	-0.499	0.616	-0.810	37.24	9.87	140.51	0.4181	
	15:Tha Pradu	0.161	0.616	0.262	76.95	20.39	290.41	0.7936	
	16:Sathon	-0.674	0.276	-2.443	30.72	16.96	55.67	0.0146	*
	17:Thap Chang	-0.503	0.436	-1.156	37.05	14.49	94.76	0.2478	
	18:Prakop	-0.417	0.436	-0.956	40.75	15.92	104.29	0.3389	
	19:Khlong Kwang	-0.745	0.436	-1.710	28.41	11.11	72.67	0.0874	
Thepha	20:Thepha	-0.139	0.155	-0.899	55.33	39.65	77.20	0.3689	
	21:Pak Bang	-0.144	0.101	-1.422	55.00	44.20	68.45	0.1552	
	22:Ko Saba	0.080	0.437	0.183	70.37	27.40	180.71	0.8551	
	23:Lam Phlai	-0.729	0.159	-4.578	28.90	20.50	40.74	<0.0001	***
	24:Tha Muang	-0.697	0.080	-8.685	29.93	25.17	35.59	<0.0001	***
	25:Wang Yai	-0.224	0.206	-1.089	50.36	32.31	78.50	0.2760	
	26:Sakom	-0.737	0.437	-1.687	28.66	11.18	73.50	0.0917	
Saba Yoi	27:Saba Yoi	-0.202	0.085	-2.389	51.61	43.00	61.93	0.0169	*
	28:Thung Pho	-0.397	0.218	-1.823	41.65	26.04	66.61	0.0684	
	29:Pian	-0.296	0.145	-2.040	46.54	34.04	63.64	0.0414	*
	30:Ban Not	-0.422	0.356	-1.185	40.53	18.82	87.30	0.2360	
	31:Chanae	-0.152	0.171	-0.890	54.52	37.71	78.81	0.3733	
	32:Khuha	-0.391	0.179	-2.186	41.94	28.53	61.65	0.0288	*
	33:Khao Daeng	-0.723	0.252	-2.873	29.11	16.92	50.06	0.0041	**
	34:Ba Hoi	0.105	0.436	0.242	72.38	28.28	185.24	0.8090	
	35:Than Khiri	-0.260	0.205	-1.265	48.43	31.10	75.41	0.2058	

***Significant at p-value <0.0001 **Significant at p-value <0.001 *Significant at p-value <0.05

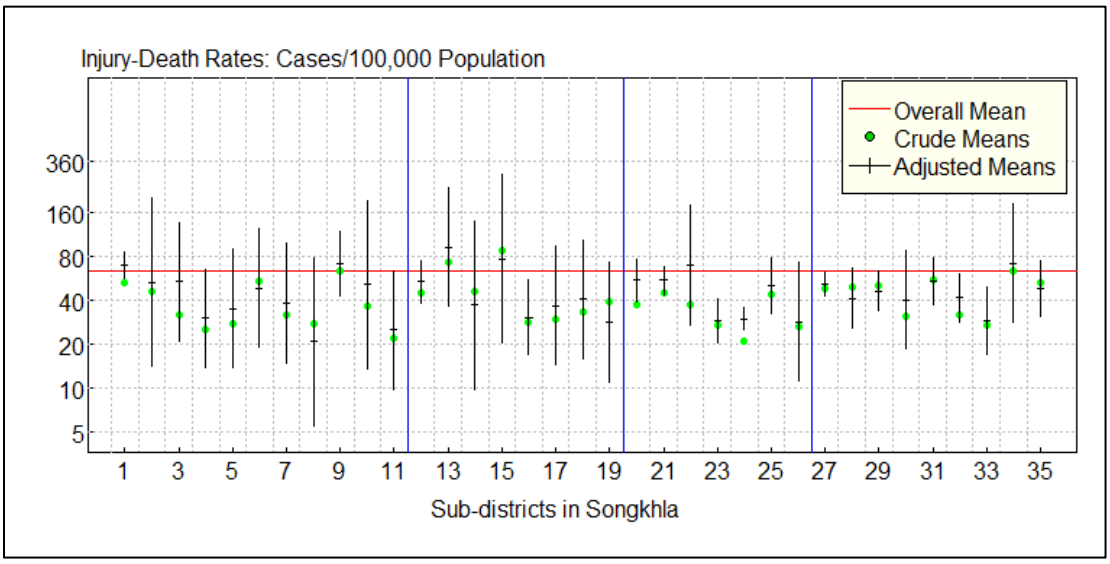


Figure 4.4 The 95% CI of the injury-death rates for the effects of sub-district in Songkhla

Figure 4.4 presents the injury-death rates of sub-district in Songkhla, province most sub-districts in district of Chana and Na Thawi showed injury-death rates that were not different from the overall mean. Most sub-districts in Thepha and Saba Yoi showed injury-death rates that were statistically significant below the overall mean. For those sub-districts in Thepha, a 95%CI of injury-death rates ranged between 11.18 (Sakom: ID=26) and 180.71 (Ko Saba: ID=22) cases per 100,000 population and those sub-district in Saba Yoi ranged between 16.92 (Khao Daeng: ID=33) and 185.24 (Ba Hoi: ID=34) cases per 100,000 population.

However, in Chana district showed that a 95%CI of injury-death rate (case per 100,000 population) raged between 5.55 (Chanong: ID=8) and 201.39 (Pa Ching: ID=2). In Na Thawi district, a 95%CI of injury-death rate (case per 100,000 population) raged between 9.87 (Plak Nu: ID=14) and 290.41 (Tha Pradu: ID=15).

Table 4.4 The coefficients from log-linear regression of sub-district in Pattani

Districts in Pattani	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	(Intercept)	3.472	0.020	175.738				<0.0001	
Mueang	1:Sabarang	-0.993	0.085	-11.736	21.63	18.03	25.96	<0.0001	***
	2:Ano Ru	0.134	0.074	1.818	74.69	63.71	87.55	0.0691	
	3:Chabang Tiko	-0.183	0.117	-1.570	52.69	40.97	67.77	0.1165	
	4:Bana	-0.900	0.084	-10.756	23.94	19.99	28.68	<0.0001	***
	5:Tanyong Lulo	0.593	0.154	3.846	123.76	88.76	172.58	0.0001	***
	6:Khlong Maning	0.572	0.154	3.717	120.94	86.78	168.55	0.0002	***
	7:Kamiyo	0.079	0.233	0.339	70.30	42.55	116.15	0.7346	
	8:Barahom	0.604	0.205	2.940	125.26	80.43	195.07	0.0033	**
	9:Paka Harang	0.453	0.095	4.764	106.05	86.40	130.16	<0.0001	***
	10:Ru Samilae	-0.225	0.058	-3.876	50.33	44.41	57.04	0.0001	***
	11:Talubo	0.134	0.100	1.343	74.69	60.23	92.62	0.1793	
	12:Baraho	0.045	0.113	0.402	67.74	53.14	86.35	0.6880	
	13:Puyut	-0.276	0.123	-2.237	47.60	36.49	62.08	0.0253	*
Khok Pho	14:Khok Pho	0.131	0.077	1.702	74.43	63.06	87.84	0.0887	
	15:Makrut	0.341	0.117	2.928	93.83	72.97	120.64	0.0034	**
	16:Bang Kro	1.216	0.154	7.874	245.51	175.98	342.51	<0.0001	***
	17:Pa Bon	0.574	0.117	4.925	121.15	94.24	155.75	<0.0001	***
	18:Sai Khao	0.280	0.186	1.507	87.71	58.75	130.96	0.1318	
	19:Na Pradu	0.099	0.078	1.274	71.90	60.76	85.09	0.2028	
	20:Pak Lo	0.305	0.101	3.013	90.14	72.46	112.12	0.0026	**
	21:Thung Phala	0.613	0.126	4.872	126.52	96.45	165.97	<0.0001	***
	22:Tha Ruea	0.668	0.171	3.895	134.32	92.82	194.37	0.0001	***
	23:Na Ket	-0.031	0.087	-0.361	62.27	51.63	75.10	0.7183	
	24:Khuan Nori	0.397	0.103	3.868	99.72	79.93	124.40	0.0001	***
	25:Chang Hai Tok	0.522	0.154	3.388	114.41	82.08	159.47	0.0007	***
Nong Chik	26:Ko Po	0.347	0.276	1.260	94.44	52.13	171.07	0.2076	
	27:Kholo Tanyong	-0.034	0.103	-0.334	62.07	49.76	77.43	0.7381	
	28:Don Rak	0.132	0.092	1.442	74.54	61.17	90.84	0.1495	
	29:Dato	0.675	0.195	3.468	135.48	89.02	206.19	0.0005	***
	30:Tuyong	0.277	0.081	3.400	87.37	73.32	104.13	0.0007	***
	31:Tha Kamcham	-0.101	0.100	-1.014	57.67	46.51	71.50	0.3104	
	32:Bo Thong	-0.411	0.068	-6.048	41.03	35.45	47.50	<0.0001	***

Districts in Pattani	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	(Intercept)	3.472	0.020	175.738				<0.0001	
	33:Bang Khao	0.311	0.071	4.381	90.74	77.86	105.74	<0.0001	***
	34:Bang Tawa	0.230	0.616	0.373	82.98	21.98	313.19	0.7093	
	35:Pulo Puyo	-0.004	0.088	-0.042	64.19	53.12	77.58	0.9667	
	36:Yabi	0.663	0.218	3.037	133.61	83.46	213.90	0.0024	**
	37:Lipa Sa-ngo	0.642	0.109	5.903	130.65	103.33	165.20	<0.0001	***
Panare	38:Panare	-0.345	0.099	-3.491	44.08	35.62	54.56	0.0005	***
	39:Tha Kham	0.983	0.356	2.759	189.95	88.13	409.41	0.0058	***
	40:Ban Nok	0.382	0.195	1.955	98.10	64.38	149.46	0.0506	.
	41:Don	0.490	0.129	3.811	110.46	83.73	145.74	0.0001	***
	42:Khuan	0.891	0.109	8.184	171.80	135.84	217.27	<0.0001	***
	43:Tha Nam	0.205	0.145	1.408	80.71	59.02	110.38	0.1590	
	44:Khok Krabue	1.261	0.155	8.159	257.96	184.87	359.96	<0.0001	***
	45:Pho Ming	0.529	0.131	4.032	115.37	86.93	153.12	0.0001	***
	46:Ban Klang	-0.232	0.099	-2.348	49.95	40.37	61.80	0.0189	**
	47:Ban Nam Bo	0.119	0.096	1.239	73.47	59.73	90.37	0.2153	
Mayo	48:Mayo	0.538	0.111	4.852	116.45	91.70	147.88	<0.0001	***
	49:Thanon	0.339	0.126	2.693	93.54	71.33	122.68	0.0071	**
	50:Trang	0.378	0.178	2.124	97.66	66.56	143.31	0.0337	*
	51:Krawa	0.472	0.138	3.431	108.35	80.53	145.79	0.0006	***
	52:Lubo Yirai	-0.598	0.091	-6.589	33.39	27.45	40.60	<0.0001	***
	53:La-nga	-0.124	0.114	-1.080	56.26	43.96	72.00	0.2800	
	54:Kra So	0.528	0.145	3.636	115.21	84.24	157.57	0.0003	***
	55:Ko Chan	0.255	0.114	2.228	85.28	66.66	109.09	0.0259	*
	56:Pado	0.249	0.126	1.979	84.72	64.62	111.09	0.0479	.
	57:Sakho Bon	0.690	0.160	4.325	137.71	97.61	194.27	<0.0001	***
	58:Sakho Tai	1.012	0.205	4.928	196.17	126.00	305.43	<0.0001	***
	59:Sakam	0.114	0.150	0.763	73.07	52.93	100.86	0.4457	
	60:Panan	1.202	0.206	5.847	241.84	155.24	376.75	<0.0001	***
Thung Yang Daeng	61:Talo Mae Na	0.492	0.138	3.571	110.70	82.26	148.97	0.0004	***
	62:Phithen	-0.308	0.119	-2.599	45.93	35.57	59.30	0.0094	**
	63:Nam Dam	0.575	0.092	6.262	121.25	99.49	147.76	<0.0001	***
	64:Paku	0.038	0.086	0.443	67.22	55.83	80.92	0.6575	
Sai Buri	65:Taluban	-0.216	0.073	-2.956	50.82	43.41	59.50	0.0031	**
	66:Tabing	0.443	0.079	5.639	104.96	88.60	124.36	<0.0001	***
	67:Pase Yawo	-0.179	0.101	-1.771	52.92	42.55	65.82	0.0766	
	68:Bang Kao	0.663	0.186	3.566	133.62	89.50	199.50	0.0004	***
	69:Bue Re	0.932	0.123	7.569	179.67	137.77	234.30	<0.0001	***
	70:Tro Bon	0.108	0.082	1.321	72.62	60.84	86.69	0.1866	
	71:Kadunong	0.196	0.111	1.770	79.94	62.98	101.46	0.0768	
	72:Lahan	0.255	0.093	2.748	85.32	69.85	104.21	0.0060	**
	73:Manang Dalam	0.017	0.093	0.180	65.65	53.75	80.18	0.8570	
	74:Paen	0.152	0.116	1.303	76.15	59.25	97.86	0.1926	
	75:Thung Khla	1.083	0.186	5.828	212.08	142.08	316.57	<0.0001	***
Mai Kaen	76:Sai Thong	0.240	0.109	2.203	83.89	66.35	106.06	0.0277	*
	77:Mai Kaen	1.121	0.276	4.068	221.26	122.13	400.86	<0.0001	***
	78:Talo Krai Thong	0.753	0.165	4.565	147.59	103.41	210.64	<0.0001	***
	79:Don Sai	0.619	0.178	3.478	127.28	86.74	186.76	0.0005	***
Yaring	80:Talo	0.983	0.252	3.905	189.91	110.40	326.69	0.0001	***
	81:Talo Kapo	-0.212	0.101	-2.094	51.06	41.05	63.50	0.0363	*
	82:Tanyong Dalo	0.544	0.126	4.325	117.18	89.37	153.64	<0.0001	***
	83:Tanyong Chueng-nga	1.085	0.195	5.570	212.65	139.71	323.68	<0.0001	***
	84:Tolang	1.104	0.150	7.359	216.97	157.03	299.79	<0.0001	***
	85:Ta Kae	0.351	0.145	2.410	94.77	69.26	129.69	0.0160	*
	86:Tali-ai	0.547	0.138	3.970	117.66	87.41	158.38	0.0001	***
	87:Yamu	0.106	0.090	1.173	72.39	59.62	87.91	0.2410	
	88:Bang Pu	-0.438	0.093	-4.727	39.80	32.59	48.61	<0.0001	***

Districts in Pattani	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	(Intercept)	3.472	0.020	175.738				<0.0001	
	89:Nong Raet	0.419	0.195	2.150	102.22	67.14	155.63	0.0316	*
	90:Piya Mumang	0.502	0.150	3.354	111.95	81.08	154.59	0.0008	***
	91:Pula Kong	0.880	0.276	3.189	169.57	93.57	307.31	0.0014	**
	92:Baloi	0.825	0.123	6.697	159.67	122.43	208.23	<0.0001	***
	93:Saban	0.685	0.186	3.683	136.88	91.67	204.37	0.0002	***
	94:Manang Yong	0.636	0.134	4.733	129.77	97.12	173.40	<0.0001	***
	95:Rata Panyang	0.252	0.138	1.830	85.06	63.19	114.49	0.0673	
	96:Charang	-0.073	0.308	-0.237	59.48	30.59	115.65	0.8130	
	97:Laem Pho	-0.612	0.308	-1.988	32.87	16.92	63.86	0.0469	.
Yarang	98:Yarang	0.196	0.084	2.338	79.92	66.73	95.71	0.0194	*
	99:Sadawa	-0.446	0.145	-3.072	39.46	28.86	53.97	0.0021	**
	100:Prachan	-0.189	0.104	-1.815	52.37	41.85	65.54	0.0696	
	101:Sano	-0.356	0.436	-0.817	43.58	17.03	111.49	0.4141	
	102:Rawaeng	0.155	0.145	1.070	76.46	55.91	104.55	0.2847	
	103:Pitu Mudi	0.200	0.089	2.255	80.31	66.33	97.23	0.0242	*
	104:Wat	0.163	0.195	0.836	77.10	50.64	117.40	0.4034	
	105:Krado	0.114	0.114	0.996	73.05	57.10	93.45	0.3193	
	106:Khlong Mai	0.530	0.101	5.237	115.39	92.79	143.50	<0.0001	***
	107:Mo Mawi	0.014	0.069	0.197	65.43	56.37	75.93	0.8438	
	108:Kolam	0.105	0.103	1.019	72.32	57.95	90.24	0.3082	
	109:Khao Tum	-0.544	0.080	-6.796	35.45	29.84	42.12	<0.0001	***
Kapho	110:Karubi	0.423	0.086	4.905	102.61	85.21	123.57	<0.0001	***
	111:Talo Due Raman	0.361	0.104	3.467	95.83	76.58	119.92	0.0005	***
	112:Plong Hoi	0.295	0.090	3.291	89.18	73.50	108.21	0.0010	**
Mae Lan	113:Mae Lan	0.833	0.129	6.462	161.06	121.99	212.63	<0.0001	***
	114:Muang Tia	0.173	0.123	1.403	77.95	59.77	101.65	0.1605	
	115:Pa Rai	-0.028	0.129	-0.215	62.53	47.39	82.50	0.8300	

***Significant at p-value <0.0001 **Significant at p-value <0.001 *Significant at p-value <0.05

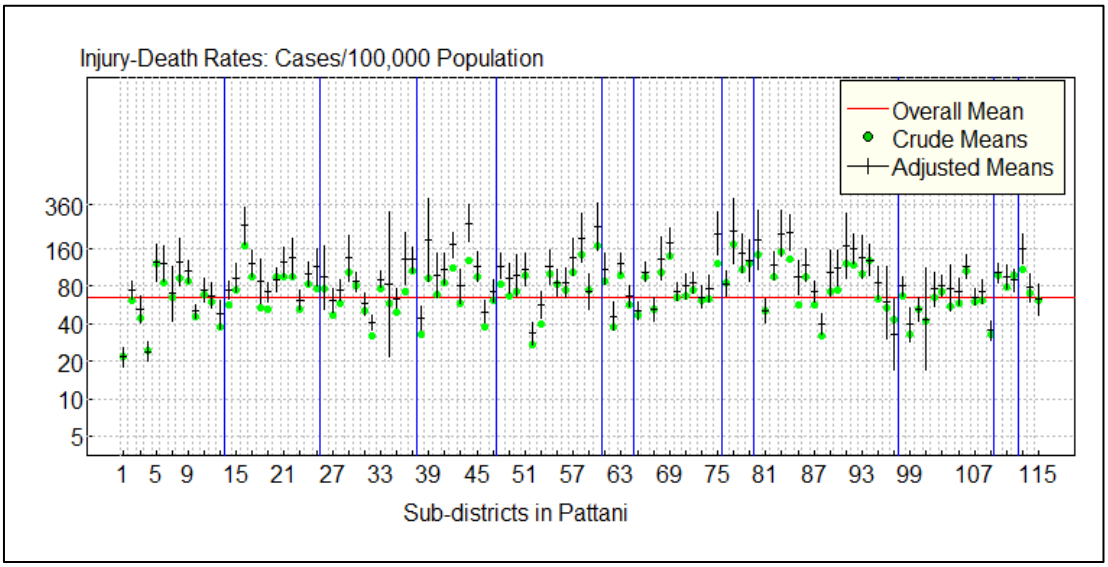


Figure 4.5 The 95% CI of the injury-death rates for the effects of sub-district in Pattani

In Pattani province, the districts of Mai Kaen and Kapho showed that their entire sub-district experienced an injury-death rate higher than the overall mean. There were 46 sub-districts that appeared in every district with an injury-death rate

greater than 100 cases per 100,000 population. Seven sub-districts seemed to have an average of more than 200 cases per 100,000 population. The sub-district of Bang Kro (ID=16), Kho Pho district showed an injury-death rate (cases per 100,000 population) of 245.51 with a 95%CI of 175.98 and 342.51. The sub-district of Khok Krabue (ID=44) in Panare district had an injury-death rate (cases per 100,000 population) of 257.96 with a 95%CI of 184.87 and 359.96. The sub-district of Panan (ID=60) in Mayo district had an injury-death rate (cases per 100,000 population) of 241.84 with a 95%CI of 155.24 and 376.75. The sub-district of Thung Khla (ID=75) in Sai Buri district had an injury-death rate (cases per 100,000 population) of 212.08 with a 95%CI of 142.08 and 316.57.

In Yaring district, Tanyong Chueng-nga (ID=83) indicated an injury-death rate (cases per 100,000) of 212.65 with a 95%CI of 139.71 and 323.68. Tolang (ID=84) presented an injury-death rate (cases per 100,000 population) of 216.97 with a 95%CI of 157.03 and 299.79.

Table 4.5 The coefficients from log-linear regression of sub-district in Yala

District in Yala	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	(Intercept)	3.472	0.020	175.738				<0.0001	
Mueang	1:Sateng	-0.781	0.047	-16.774	27.29	24.68	30.17	<0.0001	***
	2:Budi	-0.416	0.111	-3.757	40.80	32.14	51.79	0.0002	***
	3:Yopo	0.103	0.083	1.246	72.20	60.39	86.33	0.2129	
	4:Lidon	0.190	0.089	2.143	79.46	65.62	96.22	0.0321	*
	5:Yala	0.578	0.149	3.871	121.77	88.23	168.06	0.0001	***
	6:Tha Sap	0.132	0.085	1.565	74.54	62.13	89.44	0.1176	
	7:Lam Mai	0.247	0.090	2.756	84.57	69.71	102.60	0.0059	**
	8:Na Tham	0.322	0.178	1.809	91.83	62.58	134.78	0.0705	
	9:Lam Phaya	0.281	0.122	2.313	87.83	67.57	114.17	0.0208	*
	10:Po Seng	0.333	0.114	2.910	92.95	72.64	118.94	0.0036	**
	11:Phron	0.113	0.104	1.085	72.97	58.32	91.31	0.2778	
	12:Bannang Sareng	0.106	0.121	0.875	72.44	55.77	94.10	0.3813	
	13:Sateng Nok	-1.168	0.071	-16.456	17.84	15.31	20.79	<0.0001	***
	14:Ta Se	0.230	0.104	2.202	82.96	66.26	103.86	0.0277	*
Betong	15:Betong	-0.852	0.117	-7.270	25.25	19.61	32.51	<0.0001	***
	16:Yarom	-0.490	0.436	-1.125	37.59	14.69	96.19	0.2606	
	17:Tano Maero	-0.602	0.275	-2.186	33.24	18.35	60.19	0.0288	*
	18:Aiyoe Weng	-0.447	0.112	-3.974	39.43	30.94	50.25	0.0001	***
Bannang Sata	19:Bannang Sata	-0.240	0.053	-4.496	49.51	44.13	55.54	<0.0001	***
	20:Bacho	0.169	0.077	2.199	77.61	65.77	91.58	0.0279	*
	21:Tano Pute	-0.123	0.079	-1.553	56.29	47.45	66.78	0.1205	
	22:Tham Thalu	0.790	0.186	4.240	153.60	102.81	229.47	<0.0001	***
	23:Taling Chan	-0.254	0.073	-3.456	48.77	41.63	57.12	0.0006	***
	24:Khuean Bang Lang	0.584	0.100	5.843	122.52	98.77	151.98	<0.0001	***
Than To	25:Than To	0.408	0.077	5.273	100.99	85.46	119.33	<0.0001	***
	26:Ban Rae	0.146	0.075	1.953	75.72	64.42	89.01	0.0508	.
	27:Mae Wat	-0.149	0.124	-1.202	54.73	41.92	71.45	0.2292	

District in Yala	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	28:Khiri Khet	0.926	0.205	4.507	178.44	114.59	277.89	<0.0001	***
Yaha	29:Yaha	-0.584	0.077	-7.540	33.92	28.71	40.08	<0.0001	***
	30:La-ae	0.351	0.154	2.275	94.83	67.99	132.27	0.0229	*
	31:Patae	-0.188	0.072	-2.594	52.43	44.86	61.28	0.0095	**
	32:Baro	-0.084	0.084	-0.999	58.79	49.09	70.41	0.3177	
	33:Ta Chi	0.750	0.276	2.719	147.06	81.13	266.55	0.0066	**
	34:Ba-ngoi Sinae	-0.111	0.126	-0.877	57.06	43.44	74.94	0.3807	
	35:Ka Tong	0.118	0.095	1.242	73.40	59.79	90.11	0.2141	
Raman	36:Kayu Boko	0.496	0.100	4.966	111.20	89.66	137.92	<0.0001	***
	37:Kalupang	0.970	0.275	3.522	187.34	103.46	339.22	0.0004	***
	38:Kalo	0.780	0.165	4.734	151.98	106.54	216.78	<0.0001	***
	39:Koto Tuera	0.049	0.109	0.453	68.05	53.82	86.03	0.6503	
	40:Kota Baru	0.172	0.134	1.280	77.88	58.28	104.08	0.2007	
	41:Kero	0.153	0.090	1.703	76.25	62.84	92.52	0.0886	
	42:Cha-kwa	0.242	0.092	2.637	84.08	69.01	102.45	0.0084	**
	43:Tha Thong	-0.144	0.123	-1.166	55.03	42.18	71.78	0.2437	
	44:Noen Ngam	-0.019	0.114	-0.168	63.11	49.33	80.75	0.8670	
	45:Balo	0.335	0.104	3.220	93.16	74.45	116.57	0.0013	**
	46:Ba-ngoi	0.562	0.206	2.733	119.57	76.76	186.26	0.0063	**
	47:Buemang	-0.084	0.159	-0.529	58.75	41.70	82.79	0.5966	
	48:Yata	0.046	0.159	0.291	67.82	48.12	95.58	0.7711	
	49:Wang Phaya	-0.083	0.126	-0.659	58.84	44.87	77.16	0.5102	
	50:Asong	0.171	0.109	1.570	77.77	61.51	98.33	0.1164	
	51:Talo Halo	0.282	0.114	2.463	87.87	68.66	112.46	0.0138	*
Kabang	52:Kabang	-0.711	0.109	-6.535	29.48	23.31	37.28	<0.0001	***
	53:Bala	-0.275	0.116	-2.357	47.66	37.07	61.26	0.0184	*
Krong Pinang	54:Krong Pinang	-0.043	0.076	-0.568	61.48	52.23	72.37	0.5699	
	55:Sa-e	0.077	0.080	0.965	70.17	59.05	83.38	0.3343	
	56:Huai Krathing	0.351	0.114	3.073	94.86	74.14	121.38	0.0021	**
	57:Purong	0.361	0.126	2.871	95.85	73.10	125.67	0.0041	**

***Significant at p-value <0.0001 **Significant at p-value <0.001 *Significant at p-value <0.05

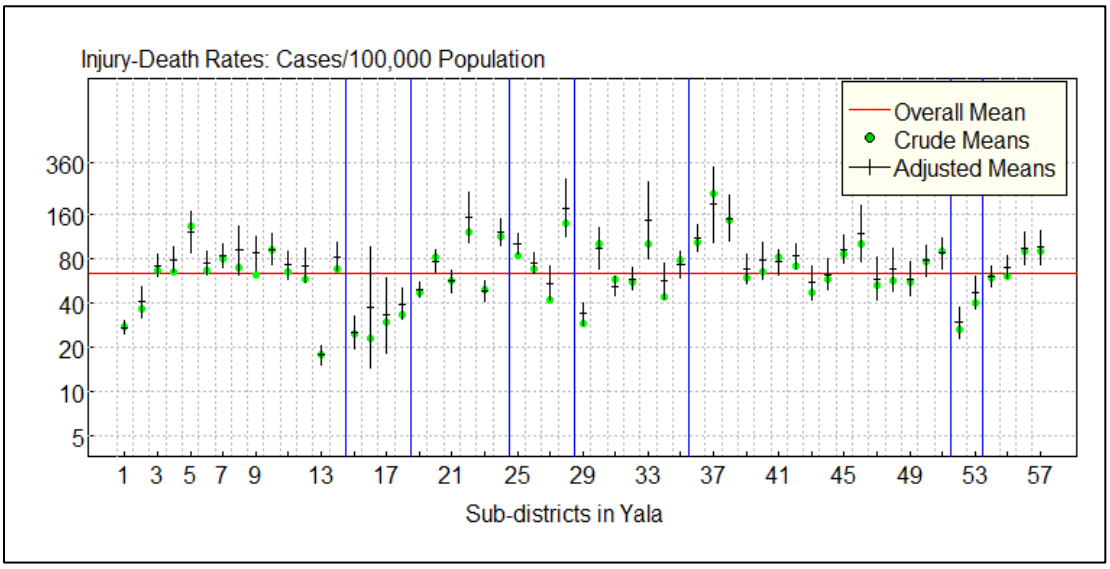


Figure 4.6 The 95% CI of the injury-death rates for the effects of sub-district in Yala

In Yala province, it seems that most districts faced an injury-death rate higher than the overall mean, except for two districts, Betong and Kabang, where the

rate was lower than the overall mean. There were more than 100 injury-death cases per 100,000 population people in ten sub-districts. The injury-death rate (cases per 100,000 population) in the Yala (ID=5) sub-district of Mueang Yala district was 121.77, with a 95% CI between 88.23 and 168.06. Ta Chi (ID=33) sub-district in Yaha district had an injury-death rate (cases per 100,000 population) of 147.06 with its 95%CI of 81.13 and 266.55.

In Bannang Sata district, Tham Thalu (ID=22) showed an injury-death rate (cases per 100,000 population) of 153.60 with its 95%CI of 102.81 and 229.47. Khuean Bang Lang (ID=24) had an injury-death rate (cases per 100,000 population) of 122.52 with its 95%CI of 98.77 and 151.98.

In Than To district, Than Ton (ID=25) showed an injury-death rate (cases per 100,000 population) of 100.99 with its 95%CI of 85.46 and 119.33. Khiri Khet (ID=28) revealed an injury-death rate (cases per 100,000 population) of 178.44 with its 95%CI of 114.59 and 277.89.

In Raman district, injury-death rates in the sub-districts of Kayu Boko (ID=36), Kalupang (ID=37), Kalo (ID=38), and Ba-ngoi (ID=38) were 111.20 (95%CI=(89.66, 137.92)), 187.34 (95%CI=103.46, 339.22), 151.98 (95%CI=106.54, 216.78), and 119.57 (95%CI=76.76, 186.26), respectively.

Table 4.6 The coefficients from log-linear regression of sub-district in Narathiwat

Districts in Narathiwat	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	(Intercept)	3.472	0.020	175.738				<0.0001	
Mueang	1:Bang Nak	-0.956	0.056	-17.085	22.52	19.96	25.41	<0.0001	***
	2:Lam Phu	-0.722	0.128	-5.626	29.13	22.09	38.42	<0.0001	***
	3:Manang Tayo	-0.295	0.145	-2.031	46.61	34.08	63.73	0.0423	*
	4:Bang Po	-0.388	0.083	-4.680	42.08	35.20	50.31	<0.0001	***
	5:Kaluwo	-0.514	0.178	-2.894	36.60	24.95	53.70	0.0038	**
	6:Kaluwo Nuea	-1.208	0.165	-7.332	17.08	11.98	24.36	<0.0001	***
	7:Khok Khian	-1.012	0.103	-9.857	21.18	16.97	26.42	<0.0001	***
Tak Bai	8:Chehe	-0.650	0.078	-8.308	31.55	26.66	37.34	<0.0001	***
	9:Phrai Wan	-0.188	0.109	-1.723	52.43	41.46	66.31	0.0849	
	10:Phron	0.413	0.142	2.916	101.52	74.81	137.77	0.0035	**
	11:Sala Mai	-0.427	0.100	-4.280	40.30	32.50	49.97	<0.0001	***
	12:Bang Khun Thong	0.163	0.218	0.747	77.09	48.20	123.30	0.4548	
	13:Ko Sathon	-0.528	0.092	-5.755	36.06	29.59	43.95	<0.0001	***
	14:Na Nak	0.336	0.128	2.618	93.30	70.73	123.07	0.0089	**
	15:Khosit	-0.057	0.119	-0.481	60.54	46.88	78.17	0.6308	
Bacho	16:Bacho	0.225	0.075	3.001	82.57	70.23	97.06	0.0027	**
	17:Lubo Sawo	-0.013	0.131	-0.096	63.57	47.90	84.37	0.9238	
	18:Kayo Mati	0.269	0.092	2.926	86.61	71.06	105.58	0.0034	**
	19:Paluka Samo	0.059	0.077	0.767	68.77	58.27	81.16	0.4429	
	20:Bare Nuea	0.319	0.109	2.930	91.50	72.38	115.67	0.0034	**
	21:Ba Re Tai	0.299	0.096	3.105	89.53	72.75	110.18	0.0019	**

Districts in Narathiwat	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	(Intercept)	3.472	0.020	175.738				<0.0001	
Yi-ngo	22:Yi-ngo	0.316	0.097	3.247	91.25	73.98	112.57	0.0012	**
	23:Lahan	-0.289	0.114	-2.527	46.89	36.64	60.01	0.0115	*
	24:Chobo	-0.290	0.138	-2.099	46.87	34.80	63.11	0.0359	*
	25:Lubo Baya	0.103	0.308	0.336	72.22	37.16	140.36	0.7371	
	26:Lubo Buesa	0.157	0.159	0.987	76.61	54.35	107.98	0.3237	
	27:Tapoyo	-0.133	0.150	-0.891	55.67	40.32	76.85	0.3729	
Ra-ngae	28:Tanyong Mat	0.023	0.063	0.359	66.09	57.65	75.76	0.7196	
	29:Tanyong Limo	0.301	0.072	4.150	89.71	76.74	104.87	<0.0001	***
	30:Bo-ngo	-0.176	0.065	-2.691	53.10	46.11	61.15	0.0071	**
	31:Kalisa	-0.610	0.095	-6.420	32.97	26.86	40.46	<0.0001	***
	32:Ba-ngo Sato	-0.105	0.084	-1.255	57.43	47.95	68.77	0.2094	
	33:Chaloem	-0.324	0.090	-3.616	45.11	37.18	54.74	0.0003	***
	34:Maruebo Tok	-0.120	0.107	-1.121	56.47	44.81	71.16	0.2623	
Rueso	35:Rueso	0.376	0.059	6.336	97.47	85.76	110.77	<0.0001	***
	36:Sawo	0.624	0.093	6.728	128.08	104.86	156.45	<0.0001	***
	37:Riang	0.336	0.111	3.042	93.29	73.51	118.39	0.0024	**
	38:Samakkhi	0.133	0.104	1.274	74.58	59.58	93.34	0.2028	
	39:Batong	0.042	0.101	0.418	67.52	54.29	83.97	0.6761	
	40:Lalo	-0.252	0.107	-2.350	48.85	38.77	61.56	0.0188	*
	41:Rueso Ok	0.777	0.063	12.273	151.55	132.21	173.73	<0.0001	***
	42:Khok Sato	0.006	0.101	0.054	64.85	52.12	80.69	0.9566	
	43:Suwari	-0.179	0.106	-1.692	52.95	42.17	66.49	0.0907	
Si Sakhon	44:Sako	0.421	0.097	4.326	102.46	83.05	126.41	<0.0001	***
	45:Tamayung	0.156	0.119	1.313	76.50	59.24	98.80	0.1891	
	46:Si Sakhon	-0.107	0.096	-1.117	57.28	46.56	70.47	0.2642	
	47:Choeng Khiri	0.040	0.126	0.318	67.35	51.37	88.31	0.7502	
	48:Kalong	0.574	0.145	3.951	121.14	88.58	165.67	0.0001	***
	49:Si Banphot	0.433	0.087	4.977	103.77	86.02	125.17	<0.0001	***
Waeng	50:Waeng	0.093	0.092	1.016	71.42	58.59	87.06	0.3095	
	51:Kayu Khla	-0.263	0.129	-2.045	48.27	36.59	63.68	0.0409	*
	52:Kholo	-0.288	0.252	-1.142	46.98	27.29	80.86	0.2536	
	53:Lochut	0.381	0.309	1.233	97.98	50.34	190.68	0.2177	
	54:Mae Dong	-0.387	0.616	-0.628	42.13	11.17	158.99	0.5303	
	55:Erawan	-0.132	0.436	-0.302	55.76	21.80	142.63	0.7624	
Sukhirin	56:Mamong	0.657	0.151	4.359	132.72	95.91	183.66	<0.0001	***
	57:Sukhirin	0.540	0.111	4.880	116.75	91.96	148.22	<0.0001	***
	58:Kia	0.493	0.186	2.651	110.81	74.23	165.41	0.0080	**
	59:Phukhao Thong	-0.093	0.616	-0.152	58.17	15.42	219.45	0.8795	
	60:Rom Sai	0.163	0.129	1.263	77.09	58.39	101.77	0.2066	
Su-ngai Kolok	61:Su-ngai Kolok	-0.970	0.053	-18.205	22.18	19.77	24.88	<0.0001	***
	62:Pase Mat	-1.177	0.116	-10.109	17.66	13.74	22.70	<0.0001	***
	63:Muno	-0.163	0.165	-0.989	53.88	37.76	76.86	0.3228	
	64:Puyo	-0.226	0.218	-1.034	50.29	31.43	80.48	0.3009	
Su-ngai Padi	65:Paluru	0.219	0.067	3.246	82.01	70.91	94.85	0.0012	**
	66:Su-ngai Padi	-0.224	0.150	-1.499	50.37	36.49	69.53	0.1339	
	67:To Deng	0.344	0.089	3.879	94.12	77.73	113.97	0.0001	***
	68:Sako	-0.549	0.138	-3.984	35.26	26.20	47.44	0.0001	***
	69:Riko	0.154	0.089	1.736	76.37	63.06	92.49	0.0825	
	70:Ka Wa	0.399	0.126	3.175	99.99	76.25	131.13	0.0015	**
Chanae	71:Chanae	-0.633	0.081	-7.775	32.14	26.97	38.30	<0.0001	***
	72:Dusong Yo	-0.072	0.096	-0.754	59.52	48.38	73.22	0.4511	
	73:Phadung Mat	0.093	0.114	0.813	71.39	55.80	91.33	0.4162	
	74:Chang Phueak	0.123	0.084	1.458	73.80	61.51	88.54	0.1450	
Cho-airong	75:Chuap	0.068	0.064	1.066	69.47	60.52	79.74	0.2866	
	76:Bukit	-0.823	0.079	-10.363	26.06	21.96	30.93	<0.0001	***

Districts in Narathiwat	ID: Sub-district Name	Estimate	SE	t-value	Mean	CILB	CIUB	P-value	
	(Intercept)	3.472	0.020	175.738				<0.0001	
	77:Maruebo Ok	-0.273	0.091	-3.007	47.75	39.28	58.06	0.0026	**

Note: ***Significant at p-value <0.001 **Significant at p-value <0.01 *Significant at p-value <0.05

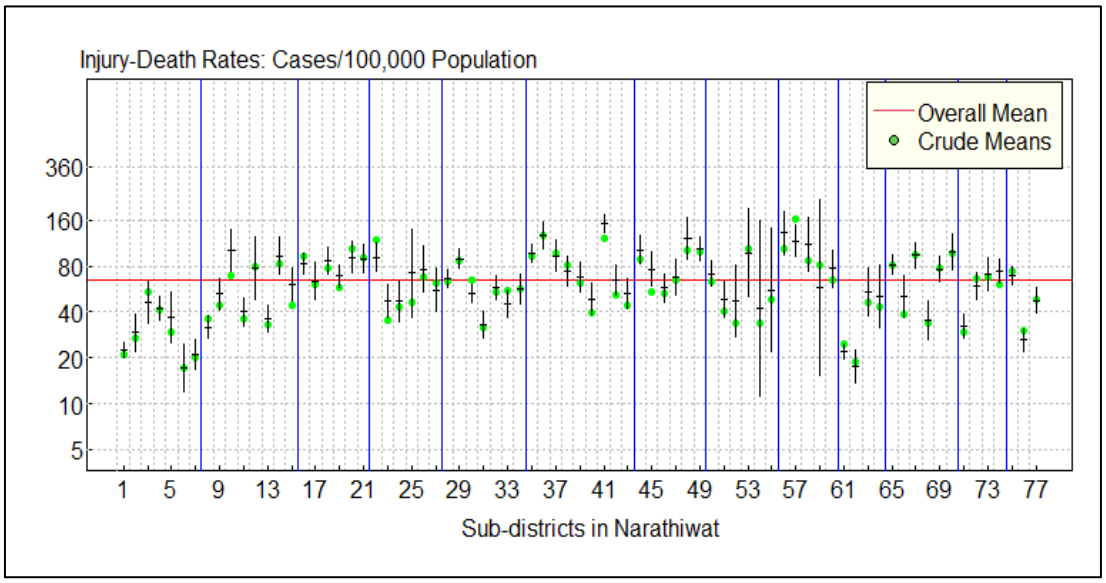


Figure 4.7 The 95% CI of the injury-death rates for the effects of sub-district in Narathiwat

In Narathiwat province, sub-districts of Mueang Narathiwat and Su-ngai Kolok had an average of injury-death rate lower than the overall mean. It seems that most of the sub-districts in the districts of Bacho, Rueso, Si Sakhon, and Sukhirin had an injury-death rate higher than the overall mean. The injury-death rates greater than 100 cases per 100,000 population were showed in nine sub-districts.

In Rueso district, Sawo (ID = 36) had an average injury-death rate (case per 100,000 population) of 128.08 (95% CI = 104.86, 156.45), while Rueso Ok (ID = 41) had an average of 151.55 (95% CI = 132.21, 173.73).

In Si Sakhon district, Sako (ID=44), Kalong (ID=48), and Si Banphot (ID=49) showed injury-death rates (cases per 100,000 population) of 102.46 (95%CI=(83.05, 126.41)), 121.14 (95%CI=(88.58, 165.67)), and 103.77 (86.02, 125.17), respectively.

In Sukhirin district, the injury-death rate (case per 100,000 population) of Mamong (ID=56) was 132.72 and its 95%CI of 95.91 and 183.66. the injury-death rate (case per 100,000 population) of Sukhirin (ID=57) was 116.75 and its 95%CI of

91.96 and 148.22. Kia (ID=58) had the injury-death rate (case per 100,000 population) of 110.81 with its 95%CI of 74.23 and 165.41.

4.2 Model assessment

The performances of model from the current study were shown in Table 4.7 and Figure 4.8. The results showed that all determinants, i.e. gender-age, year, and sub-district, had a statistically significant relationship with the injury-death rate with a p-value lower than 0.05. The adjusted r-squared was 46.26% and the graph of normal quantile-quantile plot was acceptable.

Table 4.7 The ANOVA of log-linear regression

Source of Variance	Df	Sum Sq	Mean Sq	F value	P-value
Gender-age	17	1015.3	59.724	157.632	<0.0001
Year	16	209.1	13.067	34.489	<0.0001
Sub-district	283	1821.9	6.438	16.992	<0.0001
Residuals	8657	3280	0.379		
Residual standard error: 0.6155 on 8657 degrees of freedom Multiple R-squared: 0.4815, Adjusted R-squared: 0.4626 F-statistic: 25.44 on 316 and 8657 DF, p-value: < 2.2e-16					

Figure 4.8 The normal quantile-quantile plot of log-linear regression

4.3 Injury-death rates with a thematic map

Figure 4.9-4.13 illustrated a thematic map of injury-death rate comprising of above overall mean (red), around overall mean (yellow), below overall mean (green), and no cases (grey). In order to describe the injury-death rate on the

map, the color's name was then employed. Figure 4.9 depicts the injury-death rate of the whole study area's sub-districts. The maps were zoomed in for each province to be more clearly shown in Figure 4.10-4.13.

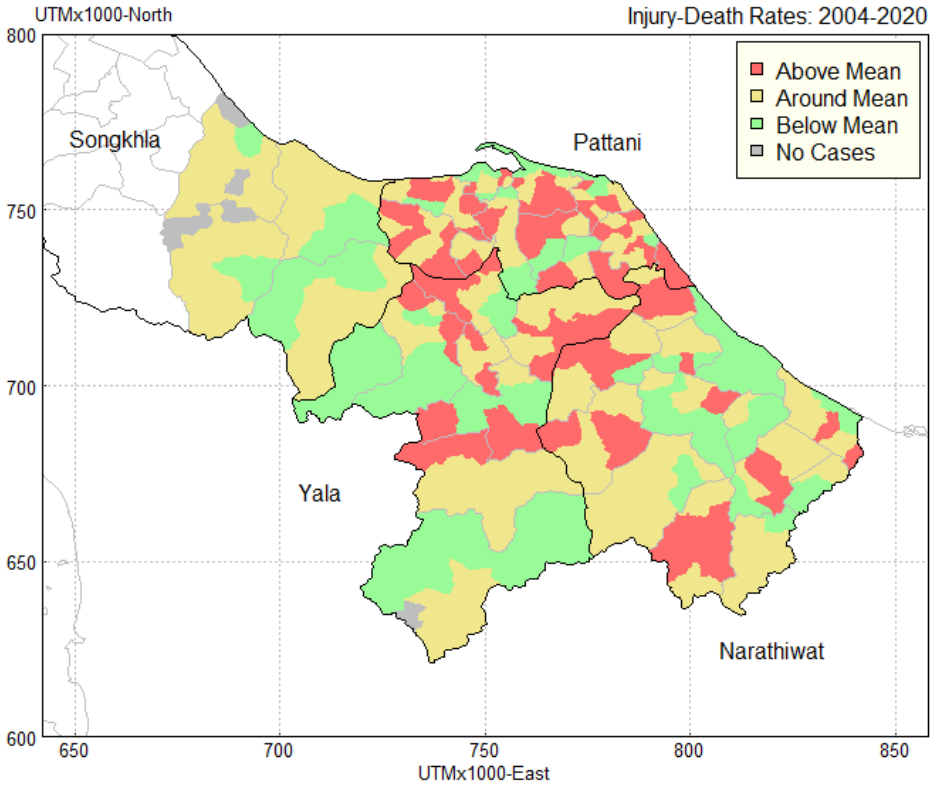
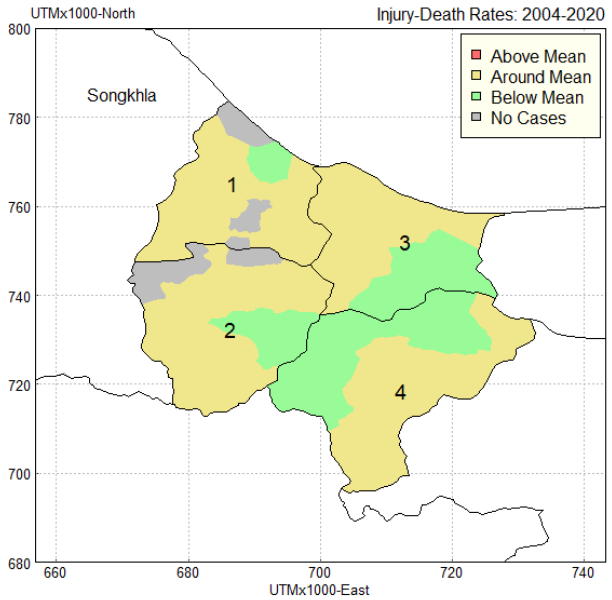
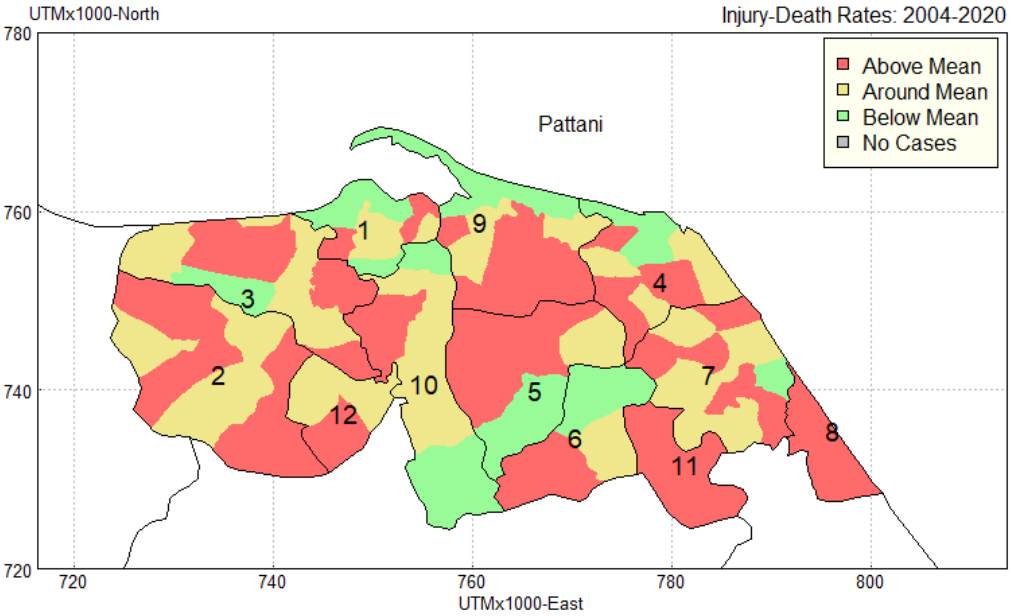


Figure 4.9 The injury-death rate of sub-districts in four provinces



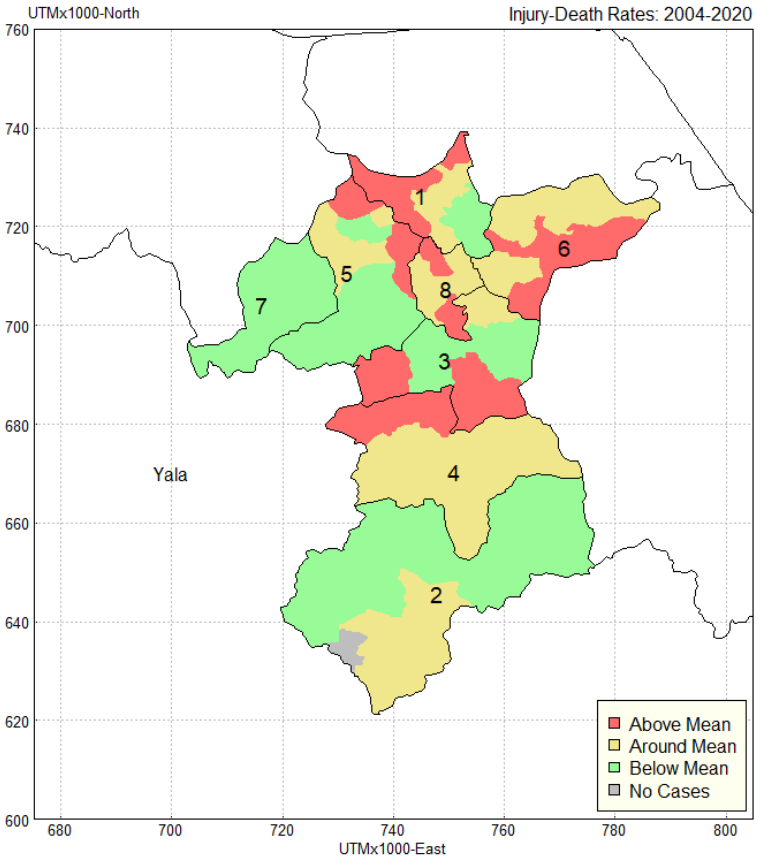
1:Chana
2:Na Thawi
3:Thepha
4:Saba Yoi

Figure 4.10 The injury-death rate of sub-district in Songkhla



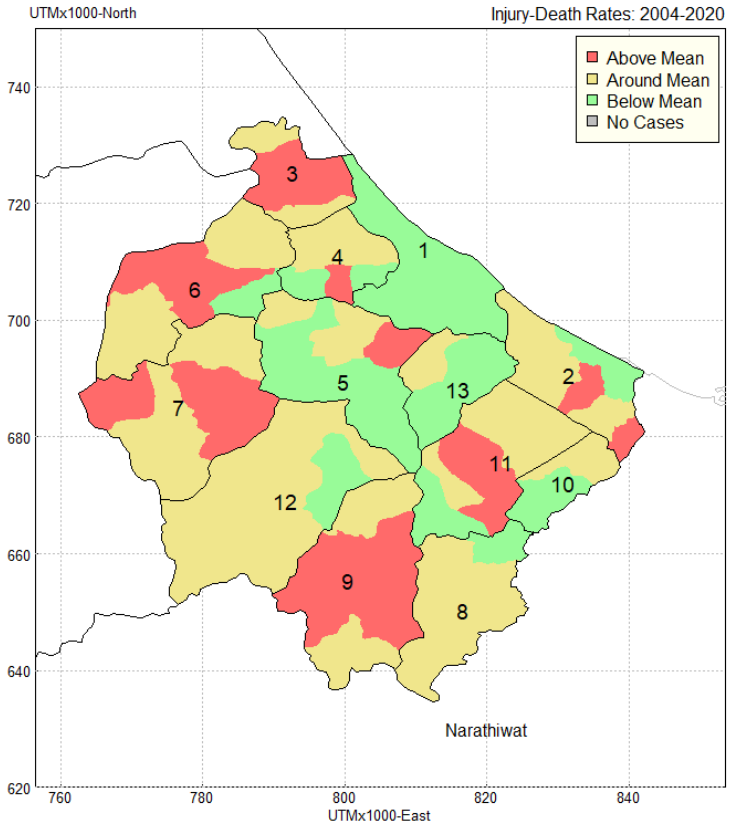
1:Mueang Pattani
2:Khok Pho
3:Nong Chik
4:Panare
5:Mayo
6:Thung Yang Daeng
7:Sai Buri
8:Mai Kaen
9:Yaring
10:Yarang
11:Kapho
12:Mae Lan

Figure 4.11 The injury-death rate of sub-district in Pattani



1:Mueang Yala
2:Betong
3:Bannang Sata
4:Than To
5:Yaha
6:Raman
7:Kabang
8:Krong Pinang

Figure 4.12 The injury-death rate of sub-district in Yala



1:Mueang Narathiwat
2:Tak Bai
3:Bacho
4:Yi-ngo
5:Ra-ngae
6:Rueso
7:Si Sakhon
8:Waeng
9:Sukhirin
10:Su-ngai Kolok
11:Su-ngai Padi
12:Chanae
13:Cho-airong

Figure 4.13 The injury-death rate of sub-district in Narathiwat

It can be seen that the sub-districts in Pattani were more crowded of red area than other provinces. When compared to its own province, 53.91% (62 sub-districts) of the sub-districts in Pattani were red, 33.04% (38 sub-districts) of those were yellow, and 13.04% (15 sub-districts) of those were green (see Figure 4.11).

Meanwhile, most of the sub-districts in Narathiwat (see Figure 4.13) were yellow at 42.86% (33 sub-districts), green at 29.87% (23 sub-districts), and red at 27.27% (21 sub-districts). Likewise, most of the sub-districts in Yala (see Figure 4.12) were yellow at 39.66% (23 sub-districts), red at 37.93% (22 sub-districts), and green at 20.69% (12 sub-districts). The majority of sub-districts in Songkhla were yellow at 67.50% (27 sub-districts), and green at 20.00% (8 sub-districts).

Some districts appeared as red sub-districts at the border between provinces, such as the sub-districts in Khok Pho (ID=2) and Mae Lan (ID=12) of Pattani province, which bordered the sub-district in Mueang Yala (ID=1) of Yala province. The red sub-districts in Mai Kaen (ID=8) and Kapho (ID=11) of Pattani

province bordered with the red sub-districts in Bacho (ID=3) of Natathiwat province. The red sub-districts in Raman (ID=6) of Yala province bordered with the red sub-districts in Rueso (ID=6) of Narathiwat province. The red sub-districts in Bannang Sata (ID=3) of Yala province bordered with the red sub-districts in Si Sakhon (ID=7) of Narathiwat province.

Pattani, Figure 4.11, demonstrates that the red areas in two districts that bordered between them occupied a wide area, and the two districts were the sub-districts in Yaring (ID=9) and Mayo (ID=5). All sub-districts in Ma Kaen (ID=8) and Kapho (ID=11) were red. The sub-districts in Khok Pho (ID=2) and Mae Lan (ID=12) shaded with red and yellow. Yala, Figure 4.12, Than To (ID=4), Raman (ID=6), and Krong Pinang (ID=8) showed only in red and yellow sub-districts. Narathiwat, Figure 4.13, Bacho (ID=3), Si Sakhon (ID=7), and Sukhirin (ID=9) showed that all sub-districts were in red and yellow. On the other hand, the sub-districts in Mueang Narathiwat were all green. Meanwhile, the sub-districts (district ID=3, 6, 7, 12, 9, 8) around the province were mostly red and yellow.

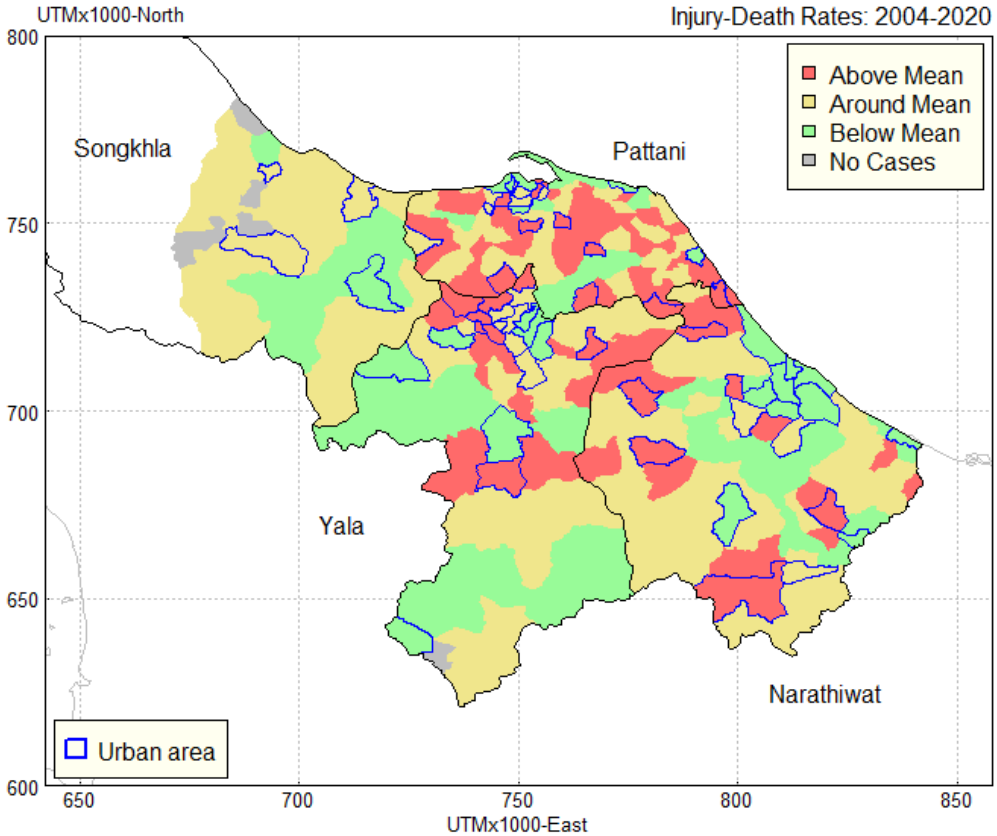


Figure 4.14 The injury-death rate of the urban sub-districts in four provinces

When comparing rural and urban sub-districts of each province, it was found that 82.26% (51 of 62 red sub-districts) of the red sub-districts in Pattani occurred in rural areas, and 17.7% (11 of 62 red sub-districts) of those in urban areas. 63.64% (14 of 22 red sub-districts) of the red sub-districts in Yala appeared in rural areas, and 36.36% (8 of 22 red sub-districts) of those in urban areas. In Narathiwat, 71.43% (15 of 21 red sub-districts) of the red sub-districts were in rural areas, and the rest, 28.57% (6 of 21 red sub-districts), were in urban areas. However, the yellow zones covering more than 70% of each province occurred in rural sub-districts in all provinces.

Considering only the urban area, 45.83% (11 of 24 urban sub-districts) of the urban sub-districts of Pattani were red. The urban sub-districts in Yala were 38.10% red (8 of 21 urban sub-districts), and the percentages for green and yellow were not different from that at 33.33 (7 urban sub-districts) and 28.5 (6 urban sub-districts), respectively. Nevertheless, most of the urban sub-districts in Narathiwat were green, with a percentage of 52.63 (10 of 19 urban sub-districts).

Considering only the rural area, more than half of sub-districts at 56.04% (51 rural sub-districts) in Pattani were red. 45.95% (17 rural sub-districts) and 51.72% (30 rural sub-districts) of the rural sub-districts in Yala and Narathiwat, respectively, were yellow.

CHAPTER 5

Discussion and Conclusion

5.1 Discussion

The current study found that males aged 21–30 years had the highest injury-death rate of 103.71 cases per 100,000 populations. The possible reason behind this, men of this age are more likely to have outdoor activities than women, such as meeting at a village coffee shop, which can be seen commonly in these areas; it may become one of the cultures in the southernmost provinces of Thailand. Another possible reason is that this dataset included all occupations, whether police or military, and most of these occupations were male. Consistent with the study by Chirtkiatsakul et al. (2014), it was found that the majority of fatalities among victims of the unrest were male (the odds ratio (OR) was 2.32 and the 95% CI was 2.03-2.65) and older than 24 years. Similarly, McEvoy and Hideg (2017) demonstrated the global violent death rate and discovered a substantial correlation between gender and victimization. Likewise, Peleg et al. (2003) claimed that the population injured by terrorist activity was young, with 61% between the ages of 15 and 29 years. In addition, the survey study by Ford et al. (2018) reported that males had poorer mental health than females. It seems that females would like to work in another Thai province, while males showed a greater preference for Malaysia (76%).

Although the number of injuries and deaths was the lowest in 2020, the injury-death rate was quite high in that year. with a case rate of 44.87 (95% CI = 37.84-53.21) per 100,000 population. With those statistics, the government still has to monitor and take care of the people in the area. The government still has to come up with a plan to deal with the potential damage in the area. Nevertheless, the highest injury-death rate was in 2007, as confirmed by earlier studies such as Chirtkiatsakul *et al*. (2014), and Khongmark and Kuning (2013).

The study by Chirtkiatsakul et al. (2014) showed that fatalities were more likely to occur in Songkhla (OR = 1.57 and a 95% CI = 1.25–1.98), which is in contrast with this study. The current study found that 53.91% of sub-districts in Pattani had an injury-death rate higher than the overall mean, which was the highest

percentage compared to other provinces. However, half of the sub-districts (53.91%) in Pattani had an injury-death rate above the overall mean. Considering the main city (Mueang) of each province, Mueang Narathiwat had a lower injury-death rate than the overall mean (green). Whereas Mueang Pattani was occupied by some red and yellow sub-districts, most of them were green. However, Mueang Yala was covered in red and yellow, and some were green. It was noted that all sub-districts in Ma Kaen and Kapho, Pattani, were red. Most of the green sub-districts in Yala were mountainous zones. The border sub-districts in Narathiwat were mostly red and yellow. Furthermore, more than 60% of the red sub-districts occurred in rural areas of all provinces, except Songkhla, which had no red area. According to Khongmark et al. (2013), non-Muslim residents of rural areas were more likely to be in dangerous situations than Muslim residents. Furthermore, these findings would recommend that they be one of the criteria for determining the green, yellow, and red zones in order to support the military's policy in the area.

5.2 Conclusion

The findings from the current study were showed that during 17 years, the overall mean of injury-death rate was 64.45±2.52 cases per 100,000 population. The young males were more vulnerable than the females. Pattani was a riskier area than other provinces. More than 60% of the red sub-districts occurred in rural areas of all provinces, except Songkhla. The study showed the magnitude of injury-death rate over person, time and place to support problem solving. It would be useful to the government or other sections for preparing and planning the readiness of health care, compensation, and economic development in the southernmost provinces of Thailand, while the incident may be unpredictable, the study clearly shows a downward trend in the injury-death rate.

5.3 Limitation of the Study

The current study only looked at four variables: age, gender, year, and sub-district. Other interesting variables, such as occupation, religion, and weapon type, should be included to provide more information.

5.4 Suggestion for Further Study

According to the study of Khongmark and Kuning (2013), their study area was conducted similarly to the current study but over a shorter time period, which was between 2004 and 2010. The incident rate per 100,000 population was classified by religion. Gender and age group, as well as year and region, were combined. The methods from that study would be repeated with the current dataset for comparing the results with those of the previous study.

Furthermore, the number of injuries and deaths can be classified by occupation to determine the differences between various occupations. It is possible to divide them into military/police and civilian. Meanwhile, Factor Analysis of the injury-death rate by sub-districts might classify magnitude or intensity better than the only two levels in the current study: rural and urban areas.

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APPENDIX

Table A The results from log-linear regression model

Variable		Estimate	SE	t value	mAdj	cilb	ciub	p-value
	(Intercept)	3.472	0.020	175.738				<0.0001
Gender: Age group	Male: 0-10	-0.399	0.044	-9.167	3.727	3.633	3.821	<0.0001
	Male: 11-20	-0.184	0.026	-7.040	3.964	3.908	4.020	<0.0001
	Male: 21-30	0.433	0.015	29.664	4.642	4.610	4.673	<0.0001
	Male: 31-40	0.281	0.014	19.713	4.475	4.444	4.505	<0.0001
	Male: 41-50	0.101	0.015	6.875	4.277	4.246	4.309	<0.0001
	Male: 51-60	-0.151	0.018	-8.410	4.000	3.961	4.038	<0.0001
	Male: 61-70	-0.418	0.030	-13.771	3.707	3.641	3.772	<0.0001
	Male: 71-80	-0.508	0.051	-9.896	3.607	3.496	3.718	<0.0001
	Male: 81-90	-0.681	0.120	-5.684	3.417	3.158	3.675	<0.0001
	Female: 0-10	-0.481	0.053	-9.129	3.637	3.524	3.751	<0.0001
	Female: 11-20	-0.314	0.043	-7.289	3.821	3.728	3.914	<0.0001
	Female: 21-30	-0.256	0.034	-7.641	3.884	3.812	3.956	<0.0001
	Female: 31-40	-0.198	0.029	-6.815	3.949	3.886	4.011	<0.0001
	Female: 41-50	-0.312	0.030	-10.432	3.822	3.758	3.887	<0.0001
	Female: 51-60	-0.426	0.038	-11.144	3.698	3.616	3.780	<0.0001
	Female: 61-70	-0.554	0.058	-9.536	3.556	3.431	3.681	<0.0001
	Female: 71-80	-0.673	0.081	-8.321	3.425	3.251	3.600	<0.0001
	Female: 81-90	-0.690	0.180	-3.845	3.407	3.020	3.794	0.0001
Year	2004	-0.058	0.029	-1.991	4.102	4.039	4.165	0.0465
	2005	0.020	0.024	0.839	4.188	4.136	4.240	0.4017
	2006	0.026	0.021	1.244	4.195	4.149	4.241	0.2137
	2007	0.269	0.017	15.441	4.462	4.425	4.500	<0.0001
	2008	0.122	0.022	5.610	4.301	4.254	4.348	<0.0001
	2009	0.090	0.021	4.249	4.265	4.219	4.311	<0.0001
	2010	-0.055	0.023	-2.344	4.106	4.056	4.156	0.0191
	2011	0.004	0.024	0.188	4.171	4.120	4.222	0.8505
	2012	-0.049	0.025	-1.973	4.112	4.058	4.166	0.0485
	2013	-0.062	0.025	-2.520	4.098	4.044	4.151	0.0117
	2014	-0.170	0.028	-6.135	3.979	3.920	4.039	<0.0001
	2015	-0.249	0.033	-7.462	3.893	3.821	3.964	<0.0001
	2016	-0.203	0.030	-6.742	3.943	3.878	4.008	<0.0001
	2017	-0.166	0.044	-3.794	3.984	3.890	4.078	0.0001
	2018	-0.362	0.072	-5.034	3.768	3.613	3.923	<0.0001
	2019	-0.308	0.055	-5.567	3.827	3.708	3.947	<0.0001
	2020	-0.329	0.079	-4.163	3.804	3.633	3.974	<0.0001
Province: Songkhla								
Chana	1	0.076	0.100	0.761	4.250	4.034	4.466	0.4466
	2	-0.172	0.616	-0.279	3.977	2.648	5.305	0.7799
	3	-0.160	0.436	-0.367	3.990	3.049	4.931	0.7138
	4	-0.688	0.356	-1.934	3.409	2.642	4.176	0.0532
	5	-0.546	0.436	-1.251	3.566	2.626	4.506	0.2108
	6	-0.255	0.436	-0.585	3.886	2.947	4.825	0.5589
	7	-0.468	0.436	-1.074	3.651	2.712	4.590	0.2827
	8	-1.022	0.616	-1.660	3.042	1.714	4.369	0.0970
	9	0.101	0.233	0.433	4.277	3.775	4.779	0.6652
	10	-0.198	0.617	-0.322	3.948	2.618	5.277	0.7476
	11	-0.859	0.436	-1.972	3.221	2.282	4.160	0.0486
Na Thawi	12	-0.166	0.159	-1.039	3.984	3.640	4.327	0.2987
	13	0.335	0.436	0.768	4.534	3.594	5.474	0.4425
	14	-0.499	0.616	-0.810	3.617	2.290	4.945	0.4181
	15	0.161	0.616	0.262	4.343	3.015	5.671	0.7936
	16	-0.674	0.276	-2.443	3.425	2.831	4.019	0.0146

Variable		Estimate	SE	t value	mAdj	cilb	ciub	p-value
	17	-0.503	0.436	-1.156	3.612	2.673	4.551	0.2478
	18	-0.417	0.436	-0.956	3.707	2.768	4.647	0.3389
	19	-0.745	0.436	-1.710	3.347	2.408	4.286	0.0874
Thepha	20	-0.139	0.155	-0.899	4.013	3.680	4.346	0.3689
	21	-0.144	0.101	-1.422	4.007	3.789	4.226	0.1552
	22	0.080	0.437	0.183	4.254	3.311	5.197	0.8551
	23	-0.729	0.159	-4.578	3.364	3.020	3.707	<0.0001
	24	-0.697	0.080	-8.685	3.399	3.226	3.572	<0.0001
	25	-0.224	0.206	-1.089	3.919	3.475	4.363	0.2760
	26	-0.737	0.437	-1.687	3.356	2.414	4.297	0.0917
Saba Yoi	27	-0.202	0.085	-2.389	3.944	3.761	4.126	0.0169
	28	-0.397	0.218	-1.823	3.729	3.259	4.199	0.0684
	29	-0.296	0.145	-2.040	3.840	3.527	4.153	0.0414
	30	-0.422	0.356	-1.185	3.702	2.935	4.469	0.2360
	31	-0.152	0.171	-0.890	3.999	3.630	4.367	0.3733
	32	-0.391	0.179	-2.186	3.736	3.351	4.122	0.0288
	33	-0.723	0.252	-2.873	3.371	2.829	3.913	0.0041
	34	0.105	0.436	0.242	4.282	3.342	5.222	0.8090
	35	-0.260	0.205	-1.265	3.880	3.437	4.323	0.2058
Province: Pattani								
Mueang Pattani	1	-0.993	0.085	-11.736	3.074	2.892	3.257	<0.0001
	2	0.134	0.074	1.818	4.313	4.154	4.472	0.0691
	3	-0.183	0.117	-1.570	3.964	3.713	4.216	0.1165
	4	-0.900	0.084	-10.756	3.176	2.995	3.356	<0.0001
	5	0.593	0.154	3.846	4.818	4.486	5.151	0.0001
	6	0.572	0.154	3.717	4.795	4.463	5.127	0.0002
	7	0.079	0.233	0.339	4.253	3.751	4.755	0.7346
	8	0.604	0.205	2.940	4.830	4.387	5.273	0.0033
	9	0.453	0.095	4.764	4.664	4.459	4.869	<0.0001
	10	-0.225	0.058	-3.876	3.919	3.793	4.044	0.0001
	11	0.134	0.100	1.343	4.313	4.098	4.529	0.1793
	12	0.045	0.113	0.402	4.216	3.973	4.458	0.6880
	13	-0.276	0.123	-2.237	3.863	3.597	4.128	0.0253
Khok Pho	14	0.131	0.077	1.702	4.310	4.144	4.476	0.0887
	15	0.341	0.117	2.928	4.541	4.290	4.793	0.0034
	16	1.216	0.154	7.874	5.503	5.170	5.836	<0.0001
	17	0.574	0.117	4.925	4.797	4.546	5.048	<0.0001
	18	0.280	0.186	1.507	4.474	4.073	4.875	0.1318
	19	0.099	0.078	1.274	4.275	4.107	4.444	0.2028
	20	0.305	0.101	3.013	4.501	4.283	4.720	0.0026
	21	0.613	0.126	4.872	4.840	4.569	5.112	<0.0001
	22	0.668	0.171	3.895	4.900	4.531	5.270	0.0001
	23	-0.031	0.087	-0.361	4.131	3.944	4.319	0.7183
	24	0.397	0.103	3.868	4.602	4.381	4.824	0.0001
	25	0.522	0.154	3.388	4.740	4.408	5.072	0.0007
Nong Chik	26	0.347	0.276	1.260	4.548	3.954	5.142	0.2076
	27	-0.034	0.103	-0.334	4.128	3.907	4.349	0.7381
	28	0.132	0.092	1.442	4.311	4.114	4.509	0.1495
	29	0.675	0.195	3.468	4.909	4.489	5.329	0.0005
	30	0.277	0.081	3.400	4.470	4.295	4.646	0.0007
	31	-0.101	0.100	-1.014	4.055	3.840	4.270	0.3104
	32	-0.411	0.068	-6.048	3.714	3.568	3.861	<0.0001
	33	0.311	0.071	4.381	4.508	4.355	4.661	<0.0001
	34	0.230	0.616	0.373	4.419	3.090	5.747	0.7093
	35	-0.004	0.088	-0.042	4.162	3.973	4.351	0.9667

Variable		Estimate	SE	t value	mAdj	cilb	ciub	p-value
	36	0.663	0.218	3.037	4.895	4.424	5.365	0.0024
	37	0.642	0.109	5.903	4.873	4.638	5.107	<0.0001
Panare	38	-0.345	0.099	-3.491	3.786	3.573	3.999	0.0005
	39	0.983	0.356	2.759	5.247	4.479	6.015	0.0058
	40	0.382	0.195	1.955	4.586	4.165	5.007	0.0506
	41	0.490	0.129	3.811	4.705	4.428	4.982	0.0001
	42	0.891	0.109	8.184	5.146	4.911	5.381	<0.0001
	43	0.205	0.145	1.408	4.391	4.078	4.704	0.1590
	44	1.261	0.155	8.159	5.553	5.220	5.886	<0.0001
	45	0.529	0.131	4.032	4.748	4.465	5.031	0.0001
	46	-0.232	0.099	-2.348	3.911	3.698	4.124	0.0189
	47	0.119	0.096	1.239	4.297	4.090	4.504	0.2153
Mayo	48	0.538	0.111	4.852	4.757	4.518	4.996	<0.0001
	49	0.339	0.126	2.693	4.538	4.267	4.810	0.0071
	50	0.378	0.178	2.124	4.582	4.198	4.965	0.0337
	51	0.472	0.138	3.431	4.685	4.389	4.982	0.0006
	52	-0.598	0.091	-6.589	3.508	3.312	3.704	<0.0001
	53	-0.124	0.114	-1.080	4.030	3.783	4.277	0.2800
	54	0.528	0.145	3.636	4.747	4.434	5.060	0.0003
	55	0.255	0.114	2.228	4.446	4.200	4.692	0.0259
	56	0.249	0.126	1.979	4.439	4.168	4.710	0.0479
	57	0.690	0.160	4.325	4.925	4.581	5.269	<0.0001
	58	1.012	0.205	4.928	5.279	4.836	5.722	<0.0001
	59	0.114	0.150	0.763	4.291	3.969	4.614	0.4457
	60	1.202	0.206	5.847	5.488	5.045	5.932	<0.0001
Thung Yang Daeng	61	0.492	0.138	3.571	4.707	4.410	5.004	0.0004
	62	-0.308	0.119	-2.599	3.827	3.571	4.083	0.0094
	63	0.575	0.092	6.262	4.798	4.600	4.996	<0.0001
	64	0.038	0.086	0.443	4.208	4.022	4.394	0.6575
Sai Buri	65	-0.216	0.073	-2.956	3.928	3.771	4.086	0.0031
	66	0.443	0.079	5.639	4.654	4.484	4.823	<0.0001
	67	-0.179	0.101	-1.771	3.969	3.751	4.187	0.0766
	68	0.663	0.186	3.566	4.895	4.494	5.296	0.0004
	69	0.932	0.123	7.569	5.191	4.926	5.457	<0.0001
	70	0.108	0.082	1.321	4.285	4.108	4.462	0.1866
	71	0.196	0.111	1.770	4.381	4.143	4.620	0.0768
	72	0.255	0.093	2.748	4.446	4.246	4.646	0.0060
	73	0.017	0.093	0.180	4.184	3.984	4.384	0.8570
	74	0.152	0.116	1.303	4.333	4.082	4.584	0.1926
	75	1.083	0.186	5.828	5.357	4.956	5.758	<0.0001
Mai Kaen	76	0.240	0.109	2.203	4.429	4.195	4.664	0.0277
	77	1.121	0.276	4.068	5.399	4.805	5.994	<0.0001
	78	0.753	0.165	4.565	4.994	4.639	5.350	<0.0001
	79	0.619	0.178	3.478	4.846	4.463	5.230	0.0005
Yaring	80	0.983	0.252	3.905	5.247	4.704	5.789	0.0001
	81	-0.212	0.101	-2.094	3.933	3.715	4.151	0.0363
	82	0.544	0.126	4.325	4.764	4.493	5.035	<0.0001
	83	1.085	0.195	5.570	5.360	4.940	5.780	<0.0001
	84	1.104	0.150	7.359	5.380	5.056	5.703	<0.0001
	85	0.351	0.145	2.410	4.551	4.238	4.865	0.0160
	86	0.547	0.138	3.970	4.768	4.471	5.065	0.0001
	87	0.106	0.090	1.173	4.282	4.088	4.476	0.2410
	88	-0.438	0.093	-4.727	3.684	3.484	3.884	<0.0001
	89	0.419	0.195	2.150	4.627	4.207	5.047	0.0316
	90	0.502	0.150	3.354	4.718	4.395	5.041	0.0008

Variable		Estimate	SE	t value	mAdj	cilb	ciub	p-value
	91	0.880	0.276	3.189	5.133	4.539	5.728	0.0014
	92	0.825	0.123	6.697	5.073	4.808	5.339	<0.0001
	93	0.685	0.186	3.683	4.919	4.518	5.320	0.0002
	94	0.636	0.134	4.733	4.866	4.576	5.156	<0.0001
	95	0.252	0.138	1.830	4.443	4.146	4.740	0.0673
	96	-0.073	0.308	-0.237	4.086	3.421	4.751	0.8130
	97	-0.612	0.308	-1.988	3.493	2.829	4.157	0.0469
Yarang	98	0.196	0.084	2.338	4.381	4.201	4.561	0.0194
	99	-0.446	0.145	-3.072	3.675	3.362	3.988	0.0021
	100	-0.189	0.104	-1.815	3.958	3.734	4.183	0.0696
	101	-0.356	0.436	-0.817	3.775	2.835	4.714	0.4141
	102	0.155	0.145	1.070	4.337	4.024	4.650	0.2847
	103	0.200	0.089	2.255	4.386	4.195	4.577	0.0242
	104	0.163	0.195	0.836	4.345	3.925	4.766	0.4034
	105	0.114	0.114	0.996	4.291	4.045	4.537	0.3193
	106	0.530	0.101	5.237	4.748	4.530	4.966	<0.0001
	107	0.014	0.069	0.197	4.181	4.032	4.330	0.8438
	108	0.105	0.103	1.019	4.281	4.060	4.503	0.3082
	109	-0.544	0.080	-6.796	3.568	3.396	3.741	<0.0001
Kapho	110	0.423	0.086	4.905	4.631	4.445	4.817	<0.0001
	111	0.361	0.104	3.467	4.563	4.338	4.787	0.0005
	112	0.295	0.090	3.291	4.491	4.297	4.684	0.0010
Mae Lan	113	0.833	0.129	6.462	5.082	4.804	5.360	<0.0001
	114	0.173	0.123	1.403	4.356	4.091	4.622	0.1605
	115	-0.028	0.129	-0.215	4.136	3.858	4.413	0.8300
Province: Yala								
Mueang Yala	1	-0.781	0.047	-16.774	3.307	3.206	3.407	<0.0001
	2	-0.416	0.111	-3.757	3.709	3.470	3.947	0.0002
	3	0.103	0.083	1.246	4.279	4.101	4.458	0.2129
	4	0.190	0.089	2.143	4.375	4.184	4.567	0.0321
	5	0.578	0.149	3.871	4.802	4.480	5.124	0.0001
	6	0.132	0.085	1.565	4.311	4.129	4.494	0.1176
	7	0.247	0.090	2.756	4.438	4.244	4.631	0.0059
	8	0.322	0.178	1.809	4.520	4.136	4.904	0.0705
	9	0.281	0.122	2.313	4.475	4.213	4.738	0.0208
	10	0.333	0.114	2.910	4.532	4.285	4.779	0.0036
	11	0.113	0.104	1.085	4.290	4.066	4.514	0.2778
	12	0.106	0.121	0.875	4.283	4.021	4.544	0.3813
	13	-1.168	0.071	-16.456	2.882	2.729	3.035	<0.0001
	14	0.230	0.104	2.202	4.418	4.194	4.643	0.0277
Betong	15	-0.852	0.117	-7.270	3.229	2.976	3.482	<0.0001
	16	-0.490	0.436	-1.125	3.627	2.687	4.566	0.2606
	17	-0.602	0.275	-2.186	3.504	2.910	4.097	0.0288
	18	-0.447	0.112	-3.974	3.675	3.432	3.917	0.0001
Bannang Sata	19	-0.240	0.053	-4.496	3.902	3.787	4.017	<0.0001
	20	0.169	0.077	2.199	4.352	4.186	4.517	0.0279
	21	-0.123	0.079	-1.553	4.031	3.860	4.201	0.1205
	22	0.790	0.186	4.240	5.034	4.633	5.436	<0.0001
	23	-0.254	0.073	-3.456	3.887	3.729	4.045	0.0006
	24	0.584	0.100	5.843	4.808	4.593	5.024	<0.0001
Than To	25	0.408	0.077	5.273	4.615	4.448	4.782	<0.0001
	26	0.146	0.075	1.953	4.327	4.165	4.489	0.0508
	27	-0.149	0.124	-1.202	4.002	3.736	4.269	0.2292
	28	0.926	0.205	4.507	5.184	4.741	5.627	<0.0001
Yaha	29	-0.584	0.077	-7.540	3.524	3.357	3.691	<0.0001

Variable		Estimate	SE	t value	mAdj	cilb	ciub	p-value
	30	0.351	0.154	2.275	4.552	4.219	4.885	0.0229
	31	-0.188	0.072	-2.594	3.959	3.803	4.115	0.0095
	32	-0.084	0.084	-0.999	4.074	3.894	4.254	0.3177
	33	0.750	0.276	2.719	4.991	4.396	5.586	0.0066
	34	-0.111	0.126	-0.877	4.044	3.771	4.317	0.3807
	35	0.118	0.095	1.242	4.296	4.091	4.501	0.2141
Raman	36	0.496	0.100	4.966	4.711	4.496	4.927	<0.0001
	37	0.970	0.275	3.522	5.233	4.639	5.827	0.0004
	38	0.780	0.165	4.734	5.024	4.669	5.379	<0.0001
	39	0.049	0.109	0.453	4.220	3.986	4.455	0.6503
	40	0.172	0.134	1.280	4.355	4.065	4.645	0.2007
	41	0.153	0.090	1.703	4.334	4.141	4.527	0.0886
	42	0.242	0.092	2.637	4.432	4.234	4.629	0.0084
	43	-0.144	0.123	-1.166	4.008	3.742	4.274	0.2437
	44	-0.019	0.114	-0.168	4.145	3.898	4.391	0.8670
	45	0.335	0.104	3.220	4.534	4.310	4.759	0.0013
	46	0.562	0.206	2.733	4.784	4.341	5.227	0.0063
	47	-0.084	0.159	-0.529	4.073	3.730	4.416	0.5966
	48	0.046	0.159	0.291	4.217	3.874	4.560	0.7711
	49	-0.083	0.126	-0.659	4.075	3.804	4.346	0.5102
	50	0.171	0.109	1.570	4.354	4.119	4.588	0.1164
	51	0.282	0.114	2.463	4.476	4.229	4.723	0.0138
Kabang	52	-0.711	0.109	-6.535	3.384	3.149	3.618	<0.0001
	53	-0.275	0.116	-2.357	3.864	3.613	4.115	0.0184
Krong Pinang	54	-0.043	0.076	-0.568	4.119	3.956	4.282	0.5699
	55	0.077	0.080	0.965	4.251	4.078	4.423	0.3343
	56	0.351	0.114	3.073	4.552	4.306	4.799	0.0021
	57	0.361	0.126	2.871	4.563	4.292	4.834	0.0041
Province: Narathiwat								
Mueang Narathiwat	1	-0.956	0.056	-17.085	3.114	2.994	3.235	<0.0001
	2	-0.722	0.128	-5.626	3.372	3.095	3.649	<0.0001
	3	-0.295	0.145	-2.031	3.842	3.529	4.155	0.0423
	4	-0.388	0.083	-4.680	3.740	3.561	3.918	<0.0001
	5	-0.514	0.178	-2.894	3.600	3.217	3.983	0.0038
	6	-1.208	0.165	-7.332	2.838	2.483	3.193	<0.0001
	7	-1.012	0.103	-9.857	3.053	2.832	3.274	<0.0001
Tak Bai	8	-0.650	0.078	-8.308	3.452	3.283	3.620	<0.0001
	9	-0.188	0.109	-1.723	3.960	3.725	4.194	0.0849
	10	0.413	0.142	2.916	4.620	4.315	4.926	0.0035
	11	-0.427	0.100	-4.280	3.696	3.481	3.911	<0.0001
	12	0.163	0.218	0.747	4.345	3.875	4.815	0.4548
	13	-0.528	0.092	-5.755	3.585	3.388	3.783	<0.0001
	14	0.336	0.128	2.618	4.536	4.259	4.813	0.0089
	15	-0.057	0.119	-0.481	4.103	3.848	4.359	0.6308
Bacho	16	0.225	0.075	3.001	4.414	4.252	4.575	0.0027
	17	-0.013	0.131	-0.096	4.152	3.869	4.435	0.9238
	18	0.269	0.092	2.926	4.461	4.263	4.659	0.0034
	19	0.059	0.077	0.767	4.231	4.065	4.396	0.4429
	20	0.319	0.109	2.930	4.516	4.282	4.751	0.0034
	21	0.299	0.096	3.105	4.495	4.287	4.702	0.0019
Yi-ngo	22	0.316	0.097	3.247	4.514	4.304	4.724	0.0012
	23	-0.289	0.114	-2.527	3.848	3.601	4.095	0.0115
	24	-0.290	0.138	-2.099	3.847	3.550	4.145	0.0359
	25	0.103	0.308	0.336	4.280	3.615	4.944	0.7371

Variable		Estimate	SE	t value	mAdj	cilb	ciub	p-value
	26	0.157	0.159	0.987	4.339	3.996	4.682	0.3237
	27	-0.133	0.150	-0.891	4.019	3.697	4.342	0.3729
Ra-ngae	28	0.023	0.063	0.359	4.191	4.054	4.328	0.7196
	29	0.301	0.072	4.150	4.497	4.340	4.653	<0.0001
	30	-0.176	0.065	-2.691	3.972	3.831	4.113	0.0071
	31	-0.610	0.095	-6.420	3.496	3.291	3.700	<0.0001
	32	-0.105	0.084	-1.255	4.050	3.870	4.231	0.2094
	33	-0.324	0.090	-3.616	3.809	3.616	4.003	0.0003
	34	-0.120	0.107	-1.121	4.034	3.802	4.265	0.2623
Rueso	35	0.376	0.059	6.336	4.580	4.452	4.707	<0.0001
	36	0.624	0.093	6.728	4.853	4.653	5.053	<0.0001
	37	0.336	0.111	3.042	4.536	4.297	4.774	0.0024
	38	0.133	0.104	1.274	4.312	4.087	4.536	0.2028
	39	0.042	0.101	0.418	4.212	3.994	4.430	0.6761
	40	-0.252	0.107	-2.350	3.889	3.658	4.120	0.0188
	41	0.777	0.063	12.273	5.021	4.884	5.158	<0.0001
	42	0.006	0.101	0.054	4.172	3.953	4.391	0.9566
	43	-0.179	0.106	-1.692	3.969	3.742	4.197	0.0907
Si Sakhon	44	0.421	0.097	4.326	4.629	4.419	4.840	<0.0001
	45	0.156	0.119	1.313	4.337	4.082	4.593	0.1891
	46	-0.107	0.096	-1.117	4.048	3.841	4.255	0.2642
	47	0.040	0.126	0.318	4.210	3.939	4.481	0.7502
	48	0.574	0.145	3.951	4.797	4.484	5.110	0.0001
	49	0.433	0.087	4.977	4.642	4.455	4.830	<0.0001
Waeng	50	0.093	0.092	1.016	4.269	4.071	4.467	0.3095
	51	-0.263	0.129	-2.045	3.877	3.600	4.154	0.0409
	52	-0.288	0.252	-1.142	3.850	3.307	4.393	0.2536
	53	0.381	0.309	1.233	4.585	3.919	5.251	0.2177
	54	-0.387	0.616	-0.628	3.741	2.413	5.069	0.5303
	55	-0.132	0.436	-0.302	4.021	3.082	4.960	0.7624
Sukhirin	56	0.657	0.151	4.359	4.888	4.563	5.213	<0.0001
	57	0.540	0.111	4.880	4.760	4.521	4.999	<0.0001
	58	0.493	0.186	2.651	4.708	4.307	5.108	0.0080
	59	-0.093	0.616	-0.152	4.063	2.735	5.391	0.8795
	60	0.163	0.129	1.263	4.345	4.067	4.623	0.2066
Su-ngai Kolok	61	-0.970	0.053	-18.205	3.099	2.984	3.214	<0.0001
	62	-1.177	0.116	-10.109	2.872	2.621	3.123	<0.0001
	63	-0.163	0.165	-0.989	3.987	3.631	4.342	0.3228
	64	-0.226	0.218	-1.034	3.918	3.448	4.388	0.3009
Su-ngai Padi	65	0.219	0.067	3.246	4.407	4.261	4.552	0.0012
	66	-0.224	0.150	-1.499	3.919	3.597	4.242	0.1339
	67	0.344	0.089	3.879	4.545	4.353	4.736	0.0001
	68	-0.549	0.138	-3.984	3.563	3.266	3.860	0.0001
	69	0.154	0.089	1.736	4.336	4.144	4.527	0.0825
	70	0.399	0.126	3.175	4.605	4.334	4.876	0.0015
Chanae	71	-0.633	0.081	-7.775	3.470	3.295	3.646	<0.0001
	72	-0.072	0.096	-0.754	4.086	3.879	4.293	0.4511
	73	0.093	0.114	0.813	4.268	4.022	4.515	0.4162
	74	0.123	0.084	1.458	4.301	4.119	4.483	0.1450
Cho-airong	75	0.068	0.064	1.066	4.241	4.103	4.379	0.2866
	76	-0.823	0.079	-10.363	3.261	3.089	3.432	<0.0001
	77	-0.273	0.091	-3.007	3.866	3.671	4.062	0.0026

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The Unrest Situation in The Southernmost Provinces of Thailand from 2004-2018

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Abstract The unrest situation in Thailand has been occurring in four provinces of Pattani, Yala, Narathiwat, and Songkhla since 2004. People are affected by the situation not only on their loss of property but also on their physical and mental health. The purposes of this study were to examine the injury-death rates of the victims and to investigate the effects of year, age, gender, and sub-district on the injury-death rates from the unrest situation during 2004-2018. The data were obtained from the Deep South Coordination Center, Prince of Songkla University, Pattani Campus. A log-linear regression model was used to examine the effect of the factors on injury-death rates. The results showed that the overall mean injury-death rate was 35.5 cases per 10,000 population. The rate peaked in the year 2007 and decreased until 2018 with the lowest rates of around 23.1 cases per 10,000 population. Males aged greater than 20 years were more likely to be injured and had higher death injury-death rates than the overall mean. Women aged greater than 60 years had higher injury-death rates than the overall mean. Most of the injury-death rates of sub-districts in Songkhla were lower than the overall mean. In contrast, most of the sub-districts of Pattani and Yala provinces had rates higher than the overall mean. Men were at a higher risk than women while those living in Pattani and Yala were more vulnerable than other provinces.

MSC: 49K35; 47H10; 20M12
Keywords: unrest situation; log-linear regression; injury-death rates; Deep South of Thailand

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1. Introduction

The unrest situation in the four deep south provinces of Thailand has been occurring since 2004. It has been affecting the daily lives of people in all communities. During 2004 to 2019, there were 20,485 incidents of violence involving 20,432 victims, and caused 7,000 deaths, 13,644 injuries, 3,075 widows, and 6,575 orphans [1]. The victims included military personnel, police officers, teachers, government staff, women and children. More than 360 schools and about 50 hospitals were attacked [2].

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The effects of the unrest in terms of area development, health, economics, tourism, and education have been severe and extensive. Agriculture, especially rubber tapping, is the main occupation of the people in the area. Since the unrest began, people have been concerned about traveling to work and even while working. In economics, the Office of The National Economic and Social Development Board (NESDB) reported that from 2007 to 2018 people in Pattani, Yala, and Narathiwat provinces were ranked in the top ten in terms of poverty each year compared to other provinces of Thailand [3]. In education, primary schools would close frequently and teachers are reluctant to work causing students to miss educational opportunities. The United Nations Development Programme (UNDP) reported that in Yala, Pattani, and Narathiwat provinces in the year 2011, had the lowest average score of the ordinary national educational test (o-net) [4]. The effects have also been visible on tourism and related businesses, not only in the three Deep South provinces, but also in nearby areas such as Hat Yai district in Songkhla province, where many tourists from Malaysia and Singapore frequent. Fewer tourist arrivals to Hat Yai were seen after 2004 compared to before the unrest [5]. The unrest situation has also affected the relationship between people of different religions - people no longer trust each other, unlike in the past where people of all religions were at peace with one another. The biggest impact from the unrest situation has been felt on the physical aspects, such as death, injuries, and disabilities. The number of orphans and widows in the area has also increased. However, throughout the 16 years, the government has spent more than 300,000 million baht and provided 30,800 million baht by 2020 for solving the problems in the area [6].

This study aimed to investigate trends of injury-death rates and to examine the association between relevant factors and the injury-death rates from 2004 to 2018 in the three Deep South provinces and four districts of Songkhla province, Thailand.

2. Methodology

2.1. Data source and data management

The daily data of victims from the unrest in the southernmost provinces of Thailand during 2004 were obtained from the Deep South Coordination Center (DSCC), Prince of Songkla University, Pattani Campus. The outcome, injury-death rate, was defined as the frequency counts for each gender, age, and sub-district divided by the respective population and multiplied by 10,000. As the injury-death rates were not normally distributed, they were log transformed before model fitting.

The determinants were year and sub-district of unrest, age and gender of the victims. The years consisted of 15 years from 2004 to 2018. There were 284 sub-districts from Pattani, Yala, Narathiwat, and Songkhla provinces. The age was classified into 10 groups including 0-10 years, 11-20 years, 21-30 years, 31-40 years, 41-50 years, 51-60 years, 61-70 years, 71-80 years, and 81-90 years. The variables of age and gender were combined together to form 18 age-gender groups.

2.2. Statistical analysis

Log-linear regression was used to examine the association between the determinants and the injury-death rates as follows.

$$log(y) = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \varepsilon \tag{2.1}$$

where y is the injury-death rates, β_0 is intercept, and β_i are regression coefficients for the independent variables, X_i are independent variables, ε is the error term or residual, and k is the number of determinants.

The overall goodness-of-fit of the model was assessed using normal quantile-quantile plot and the R-squared. The 95% confidence interval of the estimated parameter was calculated using sum contrasts [7]. All graphical and statistical analysis was carried out using R.

3. Results

The total number of injuries and deaths was 21,838 and the overall mean was 35.5/10,000 population. The frequency, percentage and rate classified by age group, gender, year, and sub-district from 2004 to 2018 are shown in Table 1.

Table 1. Frequency and percentage of injury and death victims

Variables	Frequency of injury+death	Percent	Average of injury+death rates (10,000 population)
Total	21,838	100	35.50
Age group (years)			
0-10	447	2.05	13.78
11-20	1,507	6.90	24.09
21-30	6,382	29.22	53.39
31-40	5,934	27.17	51.24
41-50	4,358	19.96	52.51
51-60	2,254	10.32	60.97
61-70	667	3.05	69.03
71-80	249	1.14	99.68
81-90	40	0.18	195.23
Gender			
Male	18,021	82.52	58.78
Female	3,817	17.48	31.02
Province			
Pattani	6,888	31.54	59.37
Yala	6,145	28.14	52.65
Narathiwat	8,184	37.48	46.72
Songkhla	621	2.84	35.83
Year			
2004	1,012	4.63	52.30
2005	1,607	7.36	51.76
2006	1,938	8.87	53.49
2007	3,598	16.48	69.09
2008	2,060	9.43	65.64

Variables	Frequency of injury+death	Percent	Average of injury+death rates (10,000 population)
Year			
2009	2,089	9.57	55.02
2010	1,557	7.13	48.81
2011	1,698	7.78	49.78
2012	1,560	7.14	46.06
2013	1,458	6.68	51.32
2014	1,052	4.82	39.28
2015	681	3.12	37.85
2016	881	4.03	37.88
2017	497	2.28	43.69
2018	150	0.69	31.73

The majority of cases were aged between 21 and 50 years. The rate for males (82.52%, 58.78 cases/10,000 population) was higher than for females. Narathiwat and Pattani had high percentages with 37.48 and 31.54, respectively but Pattani and Yala had higher number of cases than the others, 59.37 and 52.65 respectively. After the percentage of injury and death reached the peak in 2007, the percentages of injury-death rates decreased every year until 2018. However, the rates in 2007 and 2008 exceeded 60 cases/10,000 population and was above 30 cases/10,000 population until the year 2018.

Table 2 shows the results from the ANOVA and demonstrates that all determinants, year, sub-district, and age-gender were statistically significant at the 0.05 level.

TABLE 2. ANOVA table of log-linear regression

	Df	Sum Sq	Mean Sq	F value	P-value
Year	14	206.1	14.72	38.258	<0.0001
Sub-district	283	2,126.3	7.51	19.527	<0.0001
Age-gender	17	1,366.4	80.37	208.884	<0.0001
Residuals	8,458	3,254.5	0.39		

The 95% confidence intervals of the effects of year, age-gender, and sub-district into the injury and death rates from log-linear regression are shown in Figures 1-6. From the figures, the y-axes are the injury-death rates (cases/10,000 population) presenting in a log-scale. The horizontal red line is the overall mean which was 35.50 cases/10,000 population.

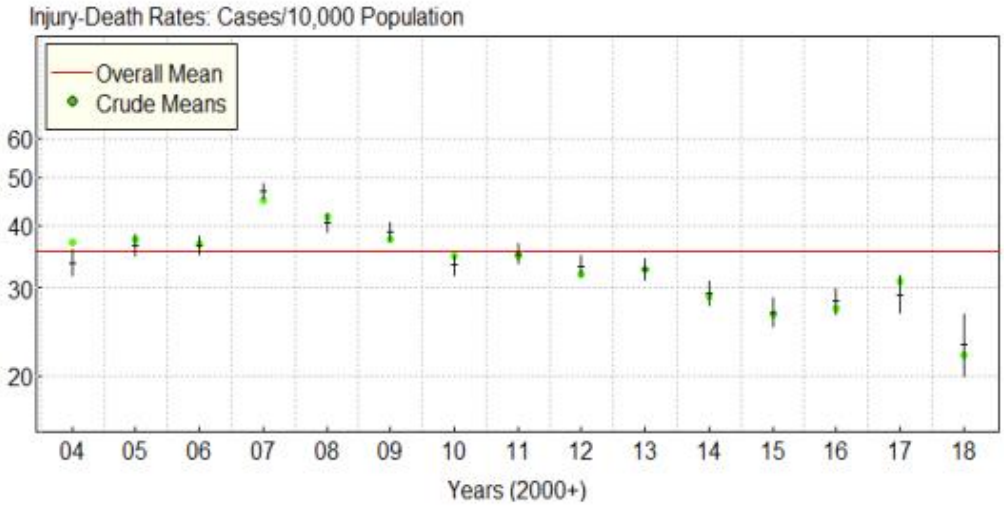

FIGURE 1. Mean and 95% confidence intervals of the injury-death rates for the effects of year

Figure 1 shows that the highest injury and death rates occurred in 2007 at around 46.92 cases per 10,000 population after which the rates declined. Although the rates increased slightly in 2011 (35.14 cases per 10,000 population) and in 2017 (29.07 cases per 10,000 population), the rates after 2011 remained below the overall mean. The injury-death rates in 2018 was 23.06 cases per 10,000 population falling from 2007 by 50.85% and falling from 2004 by 31.51%.

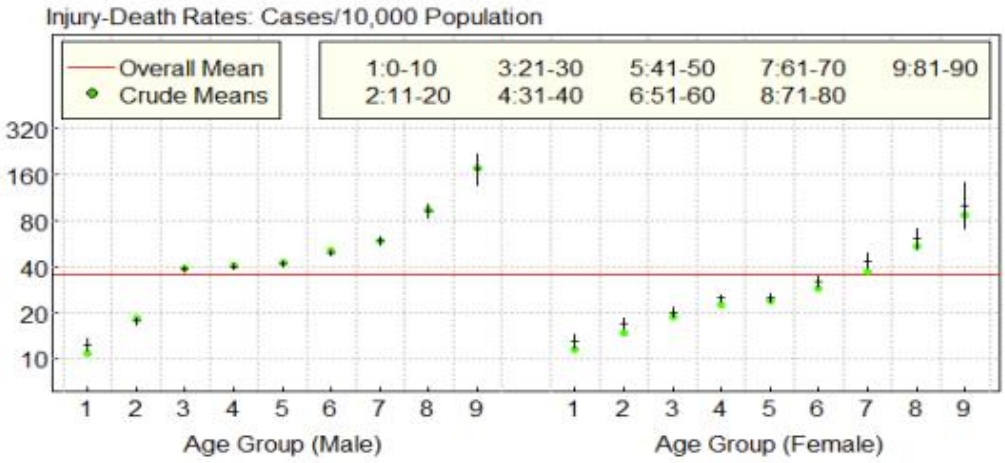

FIGURE 2. Mean and 95% confidence intervals of the injury-death rates for the effects of age-gender

Figure 2 shows that males aged more than 20 years had higher injury-death rates than the overall mean. Furthermore, there was a wide gap between age group 11-20 years and 21-30 years, which were 17.63 cases per 10,000 population, and 38.65 cases per 10,000

population respectively. Females aged more 60 years had higher rates than the overall mean. Overall, females aged between 21 and 60 years had lower rates than males of the same age. The rates among males of aged 21-30, 31-40, 41-50 and 51-60 years were 38.65, 40.21, 41.40, and 49.31 cases per 10,000 population, respectively.

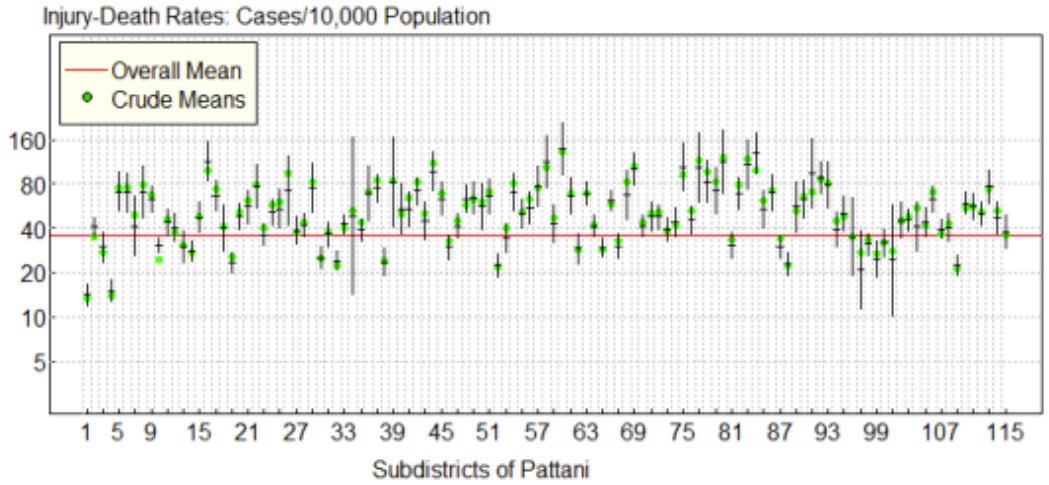

FIGURE 3. Mean and 95% confidence intervals of the injury-death rates for the effects of sub-district in Pattani

Figure 3 shows the injury-death rates for the 115 sub-districts of Pattani province. The rates of 65 sub-districts were higher than overall mean of which most were in the rural area. The lowest rate was 14.19 cases per 10,000 population and occurred in Sabarang sub-district, Mueang Pattani district and the highest rate was 137.35 cases per 10,000 population in the sub-district of Panan, Mayo district.

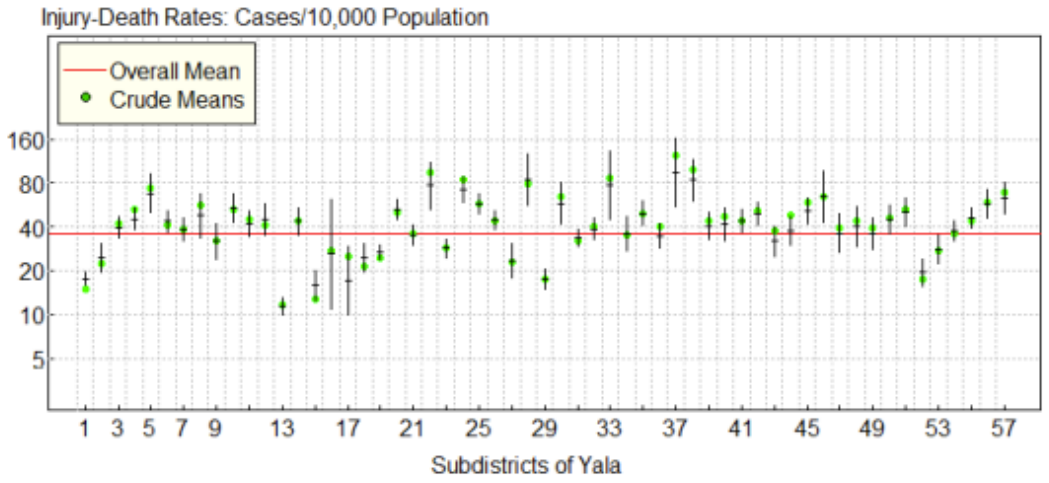

FIGURE 4. Mean and 95% confidence intervals of the injury-death rates for the effects of sub-district in Yala

There were 57 sub-districts in Yala as shown in Figure 4. The injury-death rates of 24 sub-districts were higher than overall mean that were in Raman, Yaha, Than To, Banang Sata, and Mueang districts. The injury-death rates of 12 sub-districts were lower than overall mean, and the injury-death rates of 21 sub-districts were around the overall mean. The minimum of the injury-death rates was 11.39 cases per 10,000 population in the sub-district of Sateng Nok, Mueang Yala district and the maximum of the rate was 94.24 cases per 10,000 population in the sub-district of Kalupang, Raman district.

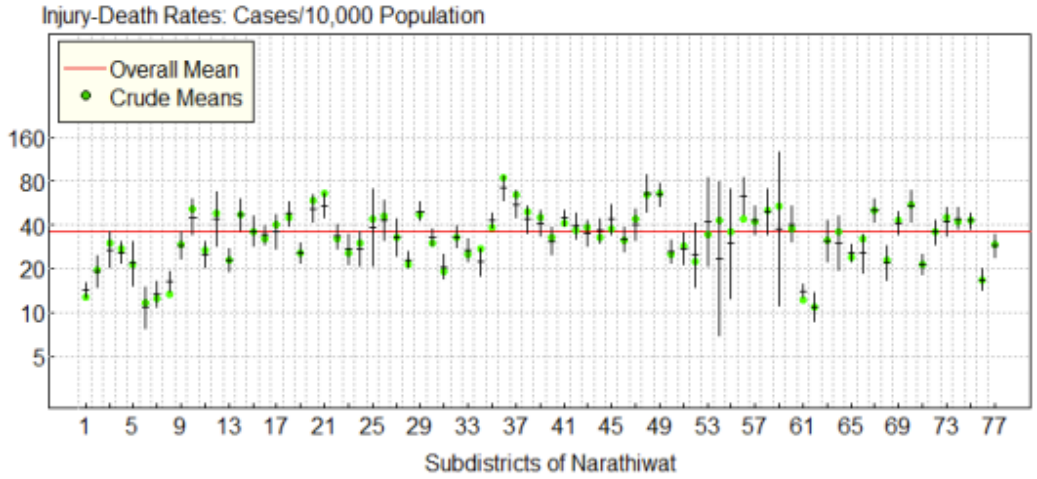

FIGURE 5. Mean and 95% confidence intervals of the injury-death rates for the effects of sub-district in Narathiwat

In Narathiwat, the 77 sub-districts were effected from the unrest situation as shown in Figure 5. The injury-death rates of 16 sub-districts were higher than overall mean. The injury-death rates of 25 sub-districts were lower than overall mean, and the injury-death rates of 36 sub-districts were around the overall mean. The minimum of the injury-death rates was 10.86 cases per 10,000 population in the sub-district of Kaluwo Nuea, Mueang Narathiwat district and the maximum of the rate was 71.51 cases per 10,000 population in the sub-district of Sawo, Rueso district.

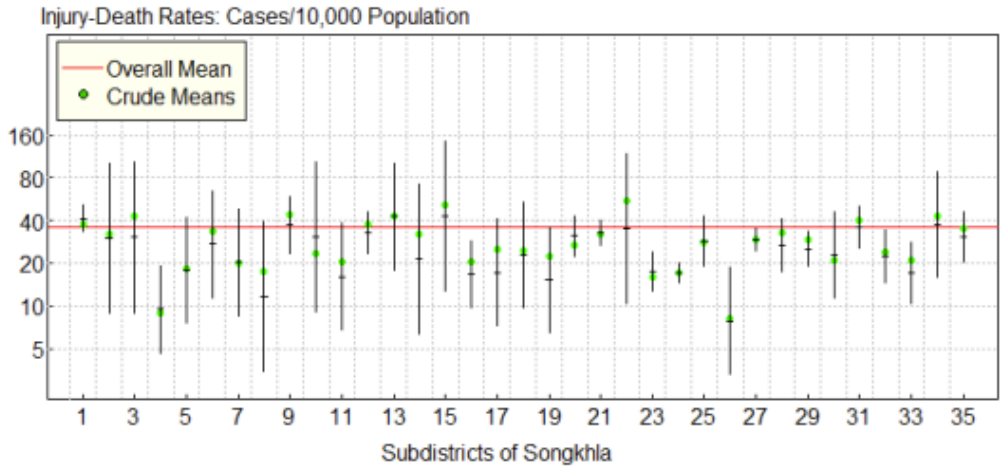

FIGURE 6. Mean and 95% confidence intervals of the injury-death rates for the effects of sub-district in Songkhla

There were 35 sub-districts in Songkhla as shown in Figure 6. The injury-death rates of 9 sub-districts were lower than overall mean. The injury-death rates of 26 sub-districts were around the overall mean. The minimum of the injury-death rates was 7.84 cases per 10,000 population in the sub-district of Sakom, Thepha district and the maximum of the rates was 42.75 cases per 10,000 population in the sub-district of Tha Pradu, Na Thawi district.

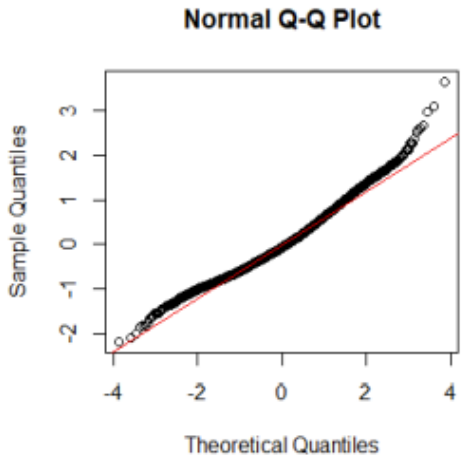

FIGURE 7. The graph of normal quantile-quantile plot of log-linear regression.

Figure 7 illustrates that the model of the injury-death rates conducted from log-linear regression was acceptable with the adjusted R-squared of 51.46%.

4. Discussion and conclusion

The total number of cases of injuries and deaths from 2004 to 2018 in the current study was 21,838 and the overall mean rate was 35.50 cases/10,000 population. The injury-death rates declined during the study period falling around 50.85% compared to 2007 in line with the study of Pak Institute for Peace Studies (PIPS) [8] in Pakistan, which found that the fatalities fell by 46% from 2015 to 2016. A study from the United Nations Assistance Mission in Afghanistan (UNAMA) found that the number civilian casualties in Afghanistan increased in 2017 with 916 cases and 1,751 cases in 2018 [9]. However, this study was conducted during 15 years but the previous studies were conducted during 2 years.

Males aged more than 20 years had injury-death rates than the overall mean. The injury-death rates among males aged 21-30, 31-40, and 41-50 years were 38.65, 40.21, and 41.40 cases per 10,000 population, respectively. During 2004-2011, males were 2.32 times more likely to die than females [10] and during 2004-2016 the global violent death rate had a significant association between gender and being a victim [11].

The injury-death rates showed the higher rate mostly in the rural area than the urban area. However, the terrorist activities had spreading from terrorism in the border region to many parts of the country in Pakistan [8].

In addition, for the further study need to display the injury-death rates in each area using thematic map clearer figure.

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