

**Hajj Pilgrimage: Health problems burden among Thai Hajj pilgrims when visiting the Thai medical mission clinics during Hajj season 2016-2018**

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Thailand**

Master of Science in International Health  
3 March 2017 – 5 September 2021

Koninklijk Instituut voor de Tropen (KIT)  
International Health  
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A thesis submitted in partial fulfilment of the requirement for the degree of Master in International Health

By

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## **Dedication**

To the Global citizens and all Thai



## **Glossary**

<b>Arafat:</b>	A barren plain some 20 kilometres east of Mecca, where all the pilgrims do Wukuf
<b>Dhul-Hijjah:</b>	The twelfth Islamic lunar month which Hajj will be performed in this month.
<b>Hajj:</b>	An annual Islamic pilgrimage to Mecca, Saudi Arabia and a mandatory religious duty for Muslims that must be carried out at least once in their lifetime by all adult Muslims who are physically and financially capable of undertaking the journey, and can support their family during their absence.
<b>Halq</b>	Hair shaving for men
<b>Ihram</b>	A sacred state which a Muslim must enter in order to perform Hajj or Umrah. A pilgrim must enter into this state before crossing the pilgrimage boundary, known as Mīqāt, by performing the cleansing rituals and wearing the prescribed attire.
<b>Jamarat:</b>	The symbolic stoning of the devils, by throwing the pebbles at three white pillars in Mina. The three pillars are Jamrah of Aqaba (stone on 10, 11 and 12 of Dhul-Hijjah), jamrah al-wuṣṭā (stone on 11 and 12 of Dhul-Hijjah), jamrah al-'ūlā (stone on 11 and 12 of Dhul-Hijjah) some pilgrims may stone at the three pillars another day on 13 of Dhul-Hijjah
<b>Kaaba:</b>	One of Islam's holiest sites and the direction of Muslim prayer.
<b>Mabit:</b>	Overnight outdoor camping in Muzdalifah where the pebbles (small stone in chickpea size) are collected here for the stoning ritual. Many pilgrims spend the night sleeping on the ground before returning to Mina.
<b>Mecca:</b>	The city in the Kingdom of Saudi Arabia which is 70 km (43 mi) inland from Jeddah, in a narrow valley 277 m (909 ft) above sea level, 340 kilometres (210 mi) south of Medina, its population in 2012 was 2 million, although visitors are more than triple this number every year during the Hajj, held in the twelfth Muslim lunar month of Dhul-Hijjah, regarded as the holiest city in Islam, and a pilgrimage to it, known as the Hajj, is obligatory for all able Muslims. Mecca is home to the Kaaba, one of Islam's holiest sites and the direction of Muslim prayer.
<b>Medina:</b>	A city in the Kingdom of Saudi Arabia. At the city's heart is al-Masjid an-Nabawi ('The Prophet's Mosque'), which is the burial place of the Islamic Prophet, Muhammad, and it is one of two holiest cities in Islam, the other being Mecca

<b>Mina:</b>	A neighbourhood of Mecca, in western Saudi Arabia. It is situated 5 kilometres approximately to the east of the Holy city of Mecca, and stands on the road from Mecca's city centre to the plain of Arafat. It covers an area of approximately 20 km <sup>2</sup>
<b>Miqat:</b>	The principal boundary point of an area, within which on the <u>Hajj</u> must be in the state of <u>Ihrām</u> (a state of consecration in which certain worldly activities are prohibited). These prohibited activities include clipping the nails, shaving any part of the body, having sexual relations; using perfumes, damaging plants, killing animals, covering one's head (for men) or one's face and hands (for women); getting married; or carrying weapons.
<b>Muzdalifah:</b>	An open, level area near Mecca, Saudi Arabia that is associated with the Hajj. It lies just southeast of Mina, on the route between Mina and Arafat.
<b>Rami al-Jamarat:</b>	meaning "stoning of the Jamarat", sometimes referred to as the "Stoning of the Devil" is a rite carried out by Hajj pilgrims whereby small pebbles are thrown at three stone structures in Mina. The act of throwing stones at the Jamarat is known as "Rami".
<b>Safa and Marwah:</b>	Two small hills now located in the Grand Mosque Al-Haram (where the Kaaba is located inside). The distance between them is 400 meters approximately. Muslims travel back and forth between them seven times, during the ritual pilgrimages of Hajj and Umrah.
<b>Saiee:</b>	Walking between Safa and Marwa for seven times
<b>Taqsir:</b>	Hair trimming for women
<b>Tawaf:</b>	Walking around Kaaba 7 times in counter clockwise direction
<b>Tawaf al-Wida:</b>	The last rite to complete Hajj. It is a walk 7 circuits around the Kaaba without Saiee. This has to be performed on the last day that the pilgrims leave from Mina on the 12 <sup>th</sup> Dhul-Hijja or 13 <sup>th</sup> dhul-Hijjah
<b>Tawaf as-ziyara:</b>	Tawaf al-Ziyarah also known as Tawaf al-Ifadhah is the <u>Tawaf</u> that is carried out on the <u>10<sup>th</sup> of Dhul Hijjah</u> after leaving the state of <u>Ihram</u> and changing into regular clothing, before returning to <u>Mina</u> to perform <u>Rami al-Jamarat</u> . Marital relations are prohibited until this Tawaf is completed.
<b>Umrah:</b>	An Islamic pilgrimage to Mecca, Saudi Arabia, performed by Muslims that can be undertaken at any time of the year, in contrast to the Hajj which has specific dates according to the Islamic lunar calendar.

**Wukuf:**

The presence on Arafat for supplication, praying and reading or reciting Al-Quran even for a few moments on 9<sup>th</sup> of Dhul-Hijjah. It is the climax of Hajj. If the pilgrims fail to reach the plain of Arafat on this day, the Hajj is invalid and will have to be repeated.

## List of Abbreviations

a.m.	ante meridian (Before midday)
BMA	Bangkok Metropolitan Administration
BMI	Body mass index
CA	Cancer or Carcinoma
CSMBS	Civil Servant Medical Benefit Scheme
COVID-19	Corona virus disease 2019
DDC	Department of Disease Control
DORA	Department of Religious Affairs
DM	Diabetes mellitus
ER	Emergency room
GID	Gastrointestinal disease
ICD 10	International Classification of Diseases, Tenth Revision
ILI	Influenza Like Illness
IPD	In-patient department
KSA	Kingdom of Saudi Arabia
MERS CoV	Middle East Respiratory Syndrome-Corona Virus
MOPH	Ministry of Public Health
NCD	Non communicable disease
NHI	National health insurance
OPD	Out-patient department
p.m.	post meridian (After midday)
SAR-CoV-2	Severe Acute Respiratory Corona virus 2
SBPAC	Southern Border Provinces Administrative Centre
SSS	Social Security Scheme
UCS	Universal Coverage Scheme
VU	Vrije Universiteit Amsterdam
WHO	World Health Organization

## **Abstract**

**Background:** Hajj is one of the largest religious rituals where approximately 2 million pilgrims globally attend, including Thai pilgrims. Each year, Thai dispatches roughly 10,000 pilgrims to join the Hajj. It is very crowded with many health risks, that create health problems among the pilgrims in every Hajj season. Thai pilgrims also have morbidity and mortality of pilgrims during the Hajj.

**Objective:** To explore, describe and analyze the epidemiological characteristics, determinants and causes of health problems among Thai pilgrims during 2016-2018.

**Methodology:** The study consists of 2 parts. The first part is reviewing literature for health risks, health problems, and medical care services and prevention in pre-travel, during Hajj, and post travel. This part uses The Sendai Framework for Disaster Risk Reduction 2015–2030 as a conceptual framework. The other part is a secondary data analysis of morbidity and mortality of Thai pilgrims during Hajj. The suspected risks are analysed with STATA17 by using multiple logistic regression.

**Findings:** 6,998-9,581 Pilgrims from Thailand join Hajj from 2016-2018. Eighty per cent of the pilgrims was screened by medical check-up before departure. 41-46% of pilgrims had pre-existing diseases. With the combination of environmental risks such as extreme hot daytime weather, steep terrain, overcrowding, congested traffic. The pilgrims are categorized into the pilgrims with underlying disease or without the underlying disease. The most common medical problem is respiratory tract infection. The leading cause of death is cardiovascular disease. The overall mortality rate is 0.85 – 1.02 cases per 1,000 people. The identified risk are the old age group over 60 year old and the underlying disease.

**Conclusion:** Hajj has posed substantial health related problems to the pilgrims, possible public health threats to the indigenous population, between host and home countries, and also to the global health security. A good strategic public health plan for physical and mental health for the pilgrims prior to departure should be implemented. It is important to improve the health facilities and use well-trained medical personnel during Hajj. Health monitoring among pilgrims after home arrival should be done. These measures should be continuously done in order to minimize the risks and negative impacts.

**Key words:** Hajj, pilgrimage, risk, health problems, health facility, prevention, Thailand,  
Word count

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## **Introduction**

Hajj is one of the world's largest annual mass gatherings of 2-3 million pilgrims. It is one of the 5 pillars of Islam, which all Muslims wish to attain at least once in their lifetime. Actually, Hajj is a 6-day-ritual. To complete the whole process of it, the locals need only 2 weeks, while the international pilgrims have to stay 1-2 months due to the limitation in ports' and airports' capacity, to accommodate all the pilgrims. This enormous increase of population, within a short period of time in the limited area of Hajj, causes an immense concentration of people, which may lead to a strain on healthy living resources. Every pilgrim faces health risks and most of them get health problems at least once during the ritual.

As a Muslim medical doctor, I have joined the Hajj pilgrimage, both privately and on-duty, for 6 times in 2002, 2005, 2006, 2007, 2009, 2014. I witnessed the incidents during Hajj, such as flooding in Mina in 2005 and the collapse of the Al Gaza Hotel, which caused more than 70 deaths in 2006 (The hotel was located just in walking distance from the Thai medical mission unit). Hajj has a spot in the media every year.

During Hajj, I witnessed lots of patients in many situations, from mild to severe manifestation, even deaths. There were many health risks out there, in various forms of both communicable and non-communicable diseases, accidents, disasters (manmade and natural ones), etc. When the Middle East Respiratory Syndrome-Corona Virus (MERS-CoV) emerged in 2012, Hajj immediately became an international concern. I strongly believe that it is worth raising Hajj as a case study for the public health issues.

Inspired by my job, I would like to learn more about the health risk factors and outcomes on morbidity and mortality during Hajj. So, the aim of this study is to identify and describe the disease burden, in terms of epidemiological characteristic, distribution and public health among Thai pilgrims, to gain information for the benefit of health policy and best practice.

## **Chapter 1: Country Background**

### **1.1 Country Profile**

Thailand is situated in the middle of the Indochinese peninsular of south-east Asia with an area of 513,000 square kilometres (Annex 1). Its north shares the border with Myanmar and Laos, while the south borders with Malaysia. The eastern part is bordered with Laos and Cambodia and the western part is bordered with the Andaman Sea and Myanmar (1). Thailand is comprised of 76 provinces and 1 metropolitan capital city, which is Bangkok. Bangkok has more than 5 million registered population (2). Normally, Thailand is divided into 4 regions by the Ministry of Interior as the Northern region, North-eastern region, Central and South (3). Since the number of Thai Muslims in Northern and North-eastern is low, this study refers to the two regions as Northern region. The density of the Thai Muslim population is a lot higher in the south, especially the four Deep South provinces (Yala, Pattani, Narathiwat, and Satun). This study separates this region into upper southern and deep southern regions.

### **1.2 Demographic Information**

In 2017, Thailand's population was 66.2 million and will approximately be 66.5 million in 2020(4) with a 50.9% female population and 49.1% male population (4). Thailand is a diverse country with several ethnic groups, such as Thai, Chinese, Malay, Indian, other minorities and tribal people. In 2014, there were about 4.4% of Thai Muslims living in Thailand (5). The number should be around 2.93 million in 2020, and most Muslims are in the southern part of Thailand, where they call themselves Thai-Malay.

### **1.3 Financial status**

In 2011, Thailand became an upper-middle income country with a GNI of 18,160 per capita (current PPP, international \$) in 2018(6). It had an average slow growth rate of 3.5% during 2005-2015 and grew higher in 2018 with 4.1% (7). The poverty had drastically reduced for the last 30 years (1986-2017) from 67% to 7.8% (7). The poverty is still a concerning issue among the people, especially, in the rural and remote areas.

### **1.4 Health Situation in general**

In 2019, the WHO reported that the infant mortality rate (IMR) was 7 per 1,000 live births, neonatal death rate was 4 per 1,000 live births and under 5-year age mortality rate were 10 per 1,000 live births in 2015. The Maternal Mortality Ratio (MMR) for the year 2015 was 20 per 100,000 live births (mother aged 14-32). The population median age was 36.9 in 2013. Life expectancy at birth for female and male were 79 and 72 respectively (8). Thailand is going into an ageing society due to that the total fertility rate is quite low, 1.5 birth per woman in 2018 (9). The birth rate is estimated 10.7 per 1,000 population in 2020 (10).

In 2017, the major causes of death in Thailand, were non-communicable diseases, such as ischemic heart disease, stroke, Alzheimer's disease, chronic kidney disease and cancers. They

have been approximately increasing by 20-70% since 2007 (11). The leading cause of death, among infectious diseases, was a lower respiratory tract infection, which was 75.2% higher than the year 2007(11).

## **1.5 Health System**

Thailand has started investing in the Health care infrastructure in 1970s, including primary health care, community hospitals, provincial hospitals, and regional health care centres (13).The health care system has been provided for Thai citizen in many dimensions, such as health promotion, medical diagnosis and treatment, disease prevention and control, and health rehabilitation, managed by both government and private sectors. For government sectors, they mainly provide the medical care as modern medicine in all levels as follows: (12).

1. Primary Health Care Level. There are 9,768 Primary Health care centres in all rural sub districts and 3,108 Primary Health care centres in urbanized sub districts. Each site covers a 3000 -5000 population within a reach of 10-20 kilometres. They provide health promotion, such as immunization to the children in the villages, and non-complicated illness treatment in an Out Patient Department (OPD). The emergency cases and complicated cases will be referred to the community hospitals.
2. Community Hospitals. There are 734 community hospitals in all districts of Thailand. The size of the hospital is in the range of 30-150 hospital beds, which covers the 30,000 – 50,000 population (13). These hospitals provide Out Patient Department (OPD), In Patient Department (IPD), non-complicated emergency cases, and Obstetric unit service to the community. More complicated cases will be referred to the provincial Hospital for proper management and better treatment.
3. Provincial level. There are 69 provincial hospitals. At this level, they can provide comprehensive medical care to most of the patients in every age group. They perform as a general hospital. If the patients need a more specialized treatment, they will be referred to regional health care centres for further treatments, such as open heart surgery.
4. Regional level. There are 54 specialized hospitals and medical school hospitals and 25 excellent medical hospital centres.

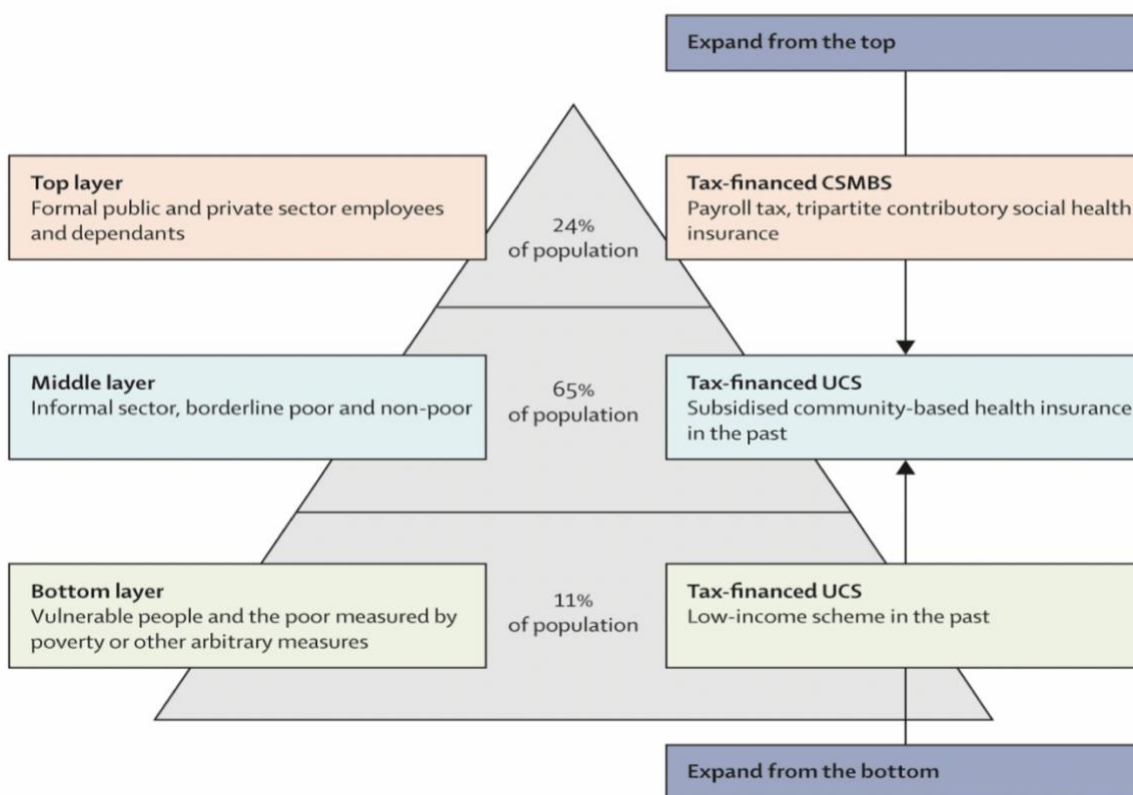
The Thai government has been the main funding sources of the Thai health care service. In 2014, the MOPH owned 67 percent of hospital beds, from a total of 161,000 hospital beds, compared to 14 percent from other governmental Ministry's hospitals and 19 percent from the private sector. In 2015, although the private health care sector was growing, the contribution to the health care system was still low. They provided OPD service 14 percent and IPD service 11.3 percent from the total of the health care system (13).



## 1.6 Health Financing

The expenditure on Health care, for Thai citizens, is free of charge by the Universal Health Care (UHC), which comprises 3 schemes. The schemes consist of Civil Servant Medical Benefit Scheme (CSMBS), Social Security Scheme (SSS or tripartite contributory social health insurance) and Universal Coverage Scheme (UCS) (14). The funding is from the Government which is pooled from 3 sources; Taxes, Government welfare and Social Security funding (it is a tripartite contributory social health insurance. See in Figure1). 99% of Thai were covered by these schemes. As a result, the catastrophic health spending was lessened and the out-of-pocket was reduced from 34% in 2000 to 12% in 2014 (13).

### Health Security Schemes in Thailand , 2017



**Figure 1. Health Security Scheme in Thailand, 2017**

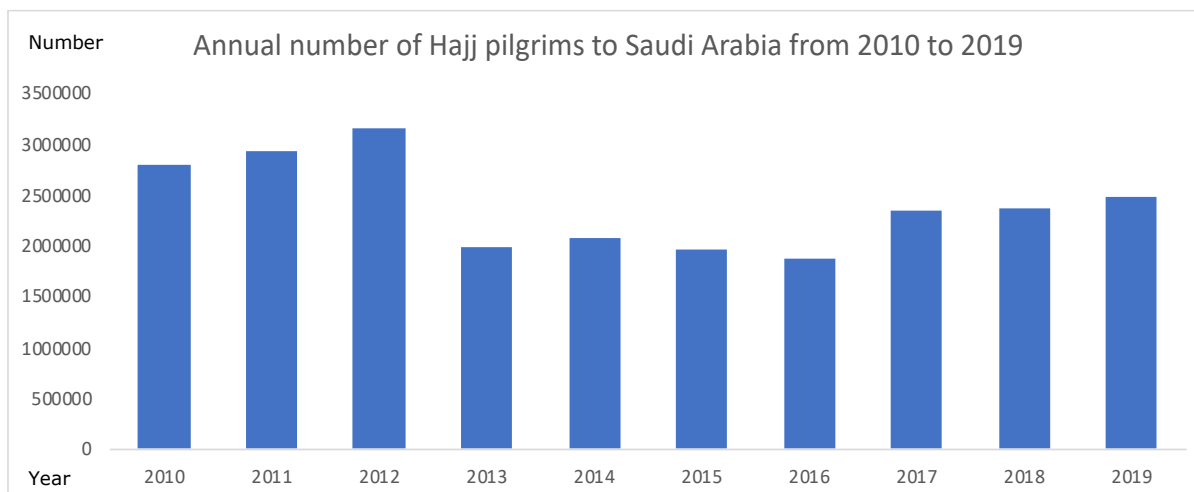
Source: Health system research office, Ministry of Public Health, Thailand (13)

## 1.7: Saudi Arabia and Hajj background

### 1.7.1. Overview

Hajj and Umrah are Islamic pilgrimages to the holy places in Mecca, Kingdom of Saudi Arabia (KSA) (see Annex2). Any able-bodied Muslim, who does not have any financial problem, is

obligated by Islamic teaching, to perform Hajj, at least once in their lifetime. The period of Hajj starts from the 8<sup>th</sup> - 13<sup>th</sup> days of Dhul-Hijah (the 12<sup>th</sup> month of Islamic lunar calendar). Each year, the period of Hajj will be 10-11 days earlier than the year before, compared to the Gregorian calendar. For example, last year Hajj was held on August 9-14, this year, 2020, it will fall on July 28 – August 2. However, Umrah, the “minor pilgrimage,” is different from Hajj. It is not mandatory and can be performed at any time of the year (15). Between 2010-2019, There were 2-3 million Muslims, who joined the sacred Hajj ritual, with two thirds of the pilgrims, who were from outside the Kingdom of Saudi Arabia. In 2019, the number of pilgrims was 2.49 million (16).



**Figure 2. The Annual number of Hajj pilgrims, 2010 - 2019**

Source: General Authority for Statistic, Kingdom of Saudi Arabia (61)

### 1.7.2. Description of the Hajj

The pilgrims performed Hajj at various locations in Mecca (See Annex3). Each day, there are many steps of ritual as follows:

- Day 1 - In the morning of Dhul-Hijjah 8, all pilgrims put on ihram (Hajj dress code) and proceed on foot or by bus, for approximately 8 kilometres, to the camp of Mina, where the Saudi Arabia’s government provides 100,000 air-conditioned tents, for all groups of pilgrims. Mina is 20 square kilometres in size. The pilgrims will arrive before the afternoon prayer and they must stay overnight at their assigned tents.
- Day 2 - After the dawn prayer on Dhul-Hijjah 9, all pilgrims depart for the Arafat plain, about 13 kilometres from Mina. Spending some time at Arafat, is the most important period of the whole ritual. If any pilgrims miss this part, their Hajj is invalid. All pilgrims will say as many prayers and supplications as they can do here, until the sunset, then immediately leave for Muzdalifah, which is another 9 kilometres to go. Pilgrims perform dusk and night prayers there, collect and save pebbles for pillars stoning on 10<sup>th</sup>, 11<sup>th</sup>, 12<sup>th</sup> and 13<sup>th</sup> Dhul-Hijjah. Pilgrims will stay overnight here.
- Day 3 - Dhul-Hijjah 10, all pilgrims travel 4 kilometres to Mina before the sunrise and stay there until the midday. During this time, they walk, to stone the big pillar (Jamrat al-'Aqaba) with 7 tiny pebbles, then perform animal sacrifice (nowadays, the licensed company will

perform this on behalf of the pilgrims). After that, the pilgrims will perform Halq/Taqsir; a complete shave of the head for men and partial shortening of the hair for women. At this point, they can exit the state of ihram, go back to Mecca to perform Tawaf al ziyara (Tawaf of invitation) by doing Tawaf and Saiee at the Grand Mosque. After Tawaf al ziyara, the pilgrims have to go back to Mina and stay there for 2-3 days.

- Days 4–6: Dhul-Hijjah 11, 12, and 13, all pilgrims in Mina will go to stone all three pillars in a set order. After the stoning, they will leave for Mecca to perform Tawaf al wida (Tawaf of farewell). Hajj completes at this step.

At this point, the pilgrims who already visited the Prophet’s tomb at the Grand Prophet’s Mosque in Medina, when they first arrived, may stay a few more days in Mecca before going home. For the ones who haven’t visited Medina, will prepare to go there, to stay and perform 5 times a day, at least 8 days at the Mosque. Then, travel back to their home countries via the International airport at Jeddah or Medina.

### 1.7.3. Thailand Pilgrims situation

The Ministry of Hajj, KSA previously set a quota of Thai pilgrims at 13,000 heads per year. Since 2013, all countries were asked to reduce the number of pilgrims by 20%, owing to the expansion project of the Grand Mosque. Therefore, 10,400 is Thailand’s annual current quota of pilgrims. There were 6,998 – 9,581 pilgrims from Thailand during 2016-2018 due to the Thai economic recession. These pilgrims mainly utilized the services of 5 airports, which were Suvarnabhumi International Airport, Phuket International Airport, Krabi Airport, Had Yai International Airport, and Narathiwat Airport (19).

**Table 1. Number of Thai pilgrims 2016 – 2018**

<b>Year</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<b>Number of Pilgrims who got the Hajj code</b>	<b>9,581</b>	<b>8,770</b>	<b>6,998</b>

Source: The Regional Health 12 Office, Ministry of Public Health, Thailand

## **Chapter 2: Problem statement, Justification, Objective and Methodology**

### **2.1 Problem statement**

Hajj is regarded as one of the largest annual religious mass gatherings, of Muslims from all over the world. Over 2 million, from 180 countries, travel for hajj annually. In terms of health, there are many environmental risk factors, like high ambient temperature, steep terrain, congested traffic, and overcrowding. Together with mass gatherings in a confined area within a scheduled period, Hajj requires physical and mental efforts, to achieve all the religious activities within its duration. Most pilgrims from the low and middle-income countries are of old age, because they have to save enough money, to afford the costly Hajj expenses (33). In some cases, it means a lifetime of saving before they can go for Hajj. Many pilgrims tend to have underlying diseases according to their age. During Hajj, these pilgrims probably face health problems; infectious diseases, non-communicable diseases, mental health problems, and injury. Some health problems lead to fatalities like cardiac arrest, stroke, pneumonia, asthma, stampede etc. (38,39,40,41,42). One of the major concerns is the infectious disease spreading, either among the pilgrims and local population (43), or bringing in or taking out the infectious diseases from the home country to the host country.

Saudi Arabia (KSA), the host country, provides free of charge healthcare services to all pilgrims during the Hajj season. In 2009, the Ministry of Health (Kingdom of Saudi Arabia) prepared health facilities, including 24 hospitals, 136 health centres, and 17,609 specialized personnel (41). Not only do KSA provide medical services to the pilgrims but also prevention measures, such as providing the environment of weapons- drugs- and alcohol free, a health education campaign through reading materials like leaflets and posters. On top of that, the KSA's government allows the medical practice by foreign medical personnel during Hajj season.

In 2016, the total of 9,581 Thai pilgrims joined Hajj (data from the 12<sup>th</sup> regional health office, Thai MOPH). 54.3% of the total pilgrims (5,205 out of 9,581) was female. There are the following numbers of Thai pilgrims in 2016: less than 20 years old 86 persons (0.9%), 21-30 years old 524 persons (5.47%), 31-40 years old 1,014 persons (10.58%), 41-50 years old 2,358 (24.61%), 51-60 years old 3,110 persons (32.46%), 61-70 years old 2,037 persons (21.26%), 71-80 years old 419 persons (4.37%), and over 80 years old 33 persons (0.34%). The age group over 60 year old (which include the age group of 61-70, 71-80, over 80 year old), is the highest percentage of the total pilgrims. Both groups of female pilgrims and old age pilgrims, were considered as vulnerable groups among the pilgrims, due to the overcrowding, the physical exhaustion, and the unfamiliar environment in KSA during the pilgrimage.

The pilgrims' exhaustion, overcrowding, and underlying health conditions such as hypertension, diabetes, hyperlipidaemia, heart disease, chronic lung disease, are prone to the spread of communicable diseases, such as meningococcal meningitis, influenza, tuberculosis, and pneumonia. Other health risks associated with the Hajj are related to injuries and trauma. Those risks may be reduced by providing the pre travel measures such as health screening,

immunizations, and practical advice. The health education should be offered by the health authorities which is now available in Thailand

Every year some pilgrims may lose their lives or face other disabilities, which need further care. There are only a few studies about health problems among Thai pilgrims during Hajj. Most of them were just activities records or medical mission reports, with only some brief reports on morbidity and mortality (19,36,37). In fact, there are many more health problems of Thai pilgrims while performing Hajj, which are awaiting clarity.

## **2.2 Justification**

Each year, Thai pilgrims going to Hajj, are faced with communicable diseases, non-communicable diseases, mental health problems, accidents, and perhaps natural or manmade disasters. From the review literature, only a few documents exist that are related to health burdens and public health services among Thai Hajj pilgrims. This study strongly believes that more in-depth knowledge on the disease burden, epidemiological information and proper public health interventions will lead to an improvement of health care services for Thai Hajj pilgrims. This knowledge will provide policy makers with recommendations, to improve health care prevention, promotion and service to the pilgrims and contribute to a reduced morbidity and mortality in a long term, among Thai hajj pilgrims.

## **2.3 Objectives**

### **General objective**

The general objective of this study is to explore and analyze health risks and health problems of Thai Hajj Pilgrims, in order to provide recommendations to improve health care service and prevention for the pilgrimage.

### **Specific objectives**

The specific objectives are:

1. To identify and analyze health risks and problems among Thai pilgrims.
2. To identify and analyze morbidity and mortality among Thai pilgrims.
3. To identify effective interventions from other countries related to the pilgrims' public health challenges in the period of pre-travel, during Hajj, and post travel.
4. To identify the mechanism to implement the effective interventions for health risk reduction among Thai pilgrims.
5. To provide the recommendation to the policy makers for a better plan to minimize the negative public health impacts among Thai pilgrims

## **2.4 Methodology**

The study consists of 2 parts; review of existing literature and secondary data analysis.

### **2.4.1 Review Literature**

A review of literature was conducted to identify health risks, health care services and preventive measures. The VU e-library was visited, to access the related articles and chapters. Search engines were used specifically: Google, Google scholar, PubMed, Medline, WHO's web page, Thailand's and KSA's Ministry of Health webpage, were accessed to get relevant information. Few grey literature, publications and reports were screened for relevant topics. Approximately 100 published articles were retrieved by using keywords combination, but some articles were excluded after reading the abstracts.

#### **2.4.1.1 Inclusion criteria**

- Documents during 2005-2020 (updated situation of COVID 19)
- Documents in English and Thai

#### **2.4.1.2 Exclusion Criteria.**

- Full published document that could not be retrieved were excluded.

**Table 2. Summary of Search Strategy**

	Objective	Source	Keyword
1	To identify and analyze health risks and problems among Thai pilgrims.	-PubMed -VU Library -Google -Google Scholar -Institution's websites -Grey literatures	Hajj, pilgrims, pilgrimage, health, health risk, health care service, preventive measures, mass gathering, Infectious diseases, NCD, injury, stampede.
2	To identify effective interventions from other countries related to the pilgrims' public health challenges.	-PubMed -VU Library -Google -Google Scholar -Institution's websites -Grey literatures	Hajj, pilgrims, pilgrimage, health, health risk, health care service, preventive measures, mass gathering, Infectious diseases, NCD, injury, stampede.
3	To identify the mechanism to implement the effective interventions for health risk reduction among Thai pilgrims.	-PubMed -VU Library -Google -Google Scholar -Institution's websites -Grey literatures	Hajj, pilgrims, pilgrimage, health, health risk, health care service, preventive measures, mass gathering, Infectious diseases, NCD, injury, stampede.

2.4.1.3 Key words: Hajj, pilgrims, pilgrimage, health, health risk, health care service, preventive measures, mass gathering, Infection, NCD, injury, stampede.

#### **2.4.2 Secondary data analysis**

The morbidity and mortality data were obtained from the patient record database during Hajj, which was collected by medical technicians during 2016-2018. The demographic data was collected by the Department of Religious Affairs (DORA), Ministry of Culture in 2016 and a Division of Islamic Organizations and Hajj Affairs (DIOHA), Ministry of Interior during 2017-2018.

Pre-travel phase: Every pilgrim has to register online through their own travel agencies. This online registration system belongs to the government offices (before 2017 it was run by DORA, Ministry of Culture. After 2017, it was run by DIOHA, Ministry of Interior). The pilgrims

who passed this step will be given the Hajj code which will be used by the Saudi Arabia embassy to issue the Hajj visa. In the year that the number of applications is higher than the quota, some applicants might be rejected. At this step, the Ministry of Interior collects the personal data and travel agents' data of the pilgrims. All the registered data will be transferred to the Ministry of Public Health (The regional health 12 office) and merged with the personal health record data such as health screening profile, history of health education, history of immunization,

**Table 3. The data during pre-travel**

Source	variables
Ministry of Interior	<u>Pre-Travel phase:</u> Identification number, passport number, hajj code, Name, address, gender, date of birth, age, name of travel agent, flight and travel information
Ministry of Public Health	<u>Pre-Travel phase:</u> Identification number, passport number, hajj code, Name, address, gender, date of birth, age, history of underlying health condition, name of primary health care, name of hospital, date of birth, diagnosis, history of health education, history of vaccination, name of primary health care, hospital name, <u>During Hajj:</u> personal bio data, history of medical visits, diagnosis and treatment, history of referral transfer

Limitation of Data entry in pre-travel phase

- Lack of well-trained staff: there are mismatched classifications during the data entry
- Lack of well-collaboration between Ministry of Interior and Ministry of Public Health; there is missing data, which is hard to retrieve, data such as date of birth and gender.
- Some pilgrims may not tell the truth about their pre-existing health condition, such as the pregnancy status, because they think that they might not be able to be fit for travel.
- During Hajj: data on diagnosis were coded by arbitrary number not by ICD X

During Hajj phase: The Medical Hajj Mission in Mecca and Medina would collect and compile the Thai pilgrims' secondary data, such as medical visits, diagnosis and treatment, history of referral transfer, then the data would be reported and transferred to the database system of the regional health 12 office.

Post-travel phase: no data available.

All the data was collected, extracted, and analyzed by using Excel and Stata17

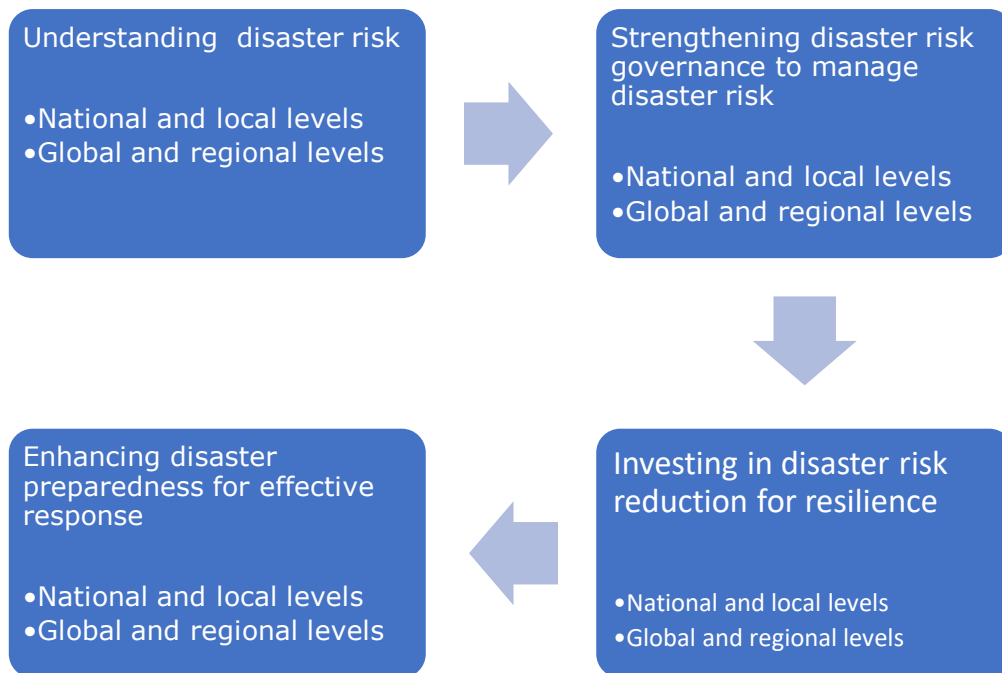
## 2.5 Conceptual framework

Hitherto, there is no specific framework about health problems related to Hajj. According to Shafi et al, the author discussed ways to help reduce health risks, such as pre-Hajj preparations and measures taken during Hajj (44). Most of the articles related to health and Hajj, focused only on what the risks before Hajj and health problems during Hajj were. Some



articles were concerned about an importation and exportation of the infectious diseases resulting in the outbreak (47). However, there is a framework called “The Sendai Framework for Disaster Risk Reduction 2015–2030” that can be applied to the study.

The framework was adopted in 2015 at the World Conference on Disaster Risk Reduction to provides an all-hazard, preventive, multisectoral and multidisciplinary approach to mitigate the disaster as much as possible. This framework will help analyze health risks, problems, and medical action through the concert of multisectoral coordination, in order to improve and promote health services and prevention.



**Figure 3. Conceptual framework on health problem analysis in Hajj based on Sendai framework 2015-2030**

Source: The United Nations Office for Disaster Risk Reduction (66)

## 2.6 Limitations of methodology

This study aims to analyze the Thai pilgrims’ health through the Sendai framework. Its methodology was mixed between literature review and secondary data analysis. The literatures regarding Thai pilgrims, especially in the aspect of health, were very scarce, even in the Thai language. Instead, non-Thai documents, of similar situations at Hajj, were chosen and adapted to study about Thai pilgrims. This could be limiting to the validity of the study, as Thai pilgrims might have different beliefs, lifestyle, and practices. With regards to the secondary data analysis, there was incomplete data, due to human error and multiple Hajj data sources. These caused missing data, mismatched classification, which could reduce the significance of findings. The available data did not include the key variables of Hajj pilgrims, such as educational background, socioeconomic status, the Hajj experience, etc. This might not be appropriate to conclude that all risks were covered.

## **2.7 Ethical consideration**

First of all, the permission of the Ministry of Public Health was asked and granted. All pilgrims' individual data were kept confidential. Their names and identifications were excluded.

## Chapter 3: Findings/Results

The health risks, the disease burden, and the health care services are described based on the Sendai framework for disaster risk reduction 2015-2030.

### 3.1 To understand the risk

#### 3.1.1 Risks in Pre-travel phase

Pre-travel phase means the period that the pilgrims must prepare their physical and mental fitness before leaving for Hajj pilgrimage.

Pilgrims are screened and categorized as risk group, if they have a pre-existing disease or condition (see annex) after the medical examination, provided by MOPH, at the level of community and provincial hospitals. Some of them may not show the risk at the first time of medical examination but they may show later in the second or third. Some of the pilgrims might not have the examination, due to the lack of the coordination between MOPH and travel agents. The health risks are various, such as hypertension, diabetes, chronic renal failure, chronic obstructive pulmonary disease, breast cancer. All the health risk factors were recorded in the pilgrims' health book as a medical note. When they visit Thai medical clinics in Hajj, the doctors will know and recognize the precautions about their patients' condition.

Based on the data from the regional health 12 office, from 2016-2018, there were 9,581 pilgrims in 2016, 8,770 pilgrims in 2017, and 6,998 pilgrims in 2018, who got Hajj code and can join Hajj. Of which 54.3%, 53.6%, and 47.4% respectively were female pilgrims. As shown in the table below.

**Table 4. Demographic characteristic of Thai Hajj Pilgrims 2016-2018**

Demographic characteristic\year	2016	2017	2018
Number of Hajj Pilgrims	9,581	8,770	6,998
Female pilgrims (%)	54.3	53.6	47.4
Median Age (Min-Max, S.D.)	53 (4-90,12.3)	54 (5-88,12.3)	54 (6-97,11.9)

Source: The regional health 12 office, Ministry of Public Health, Thailand

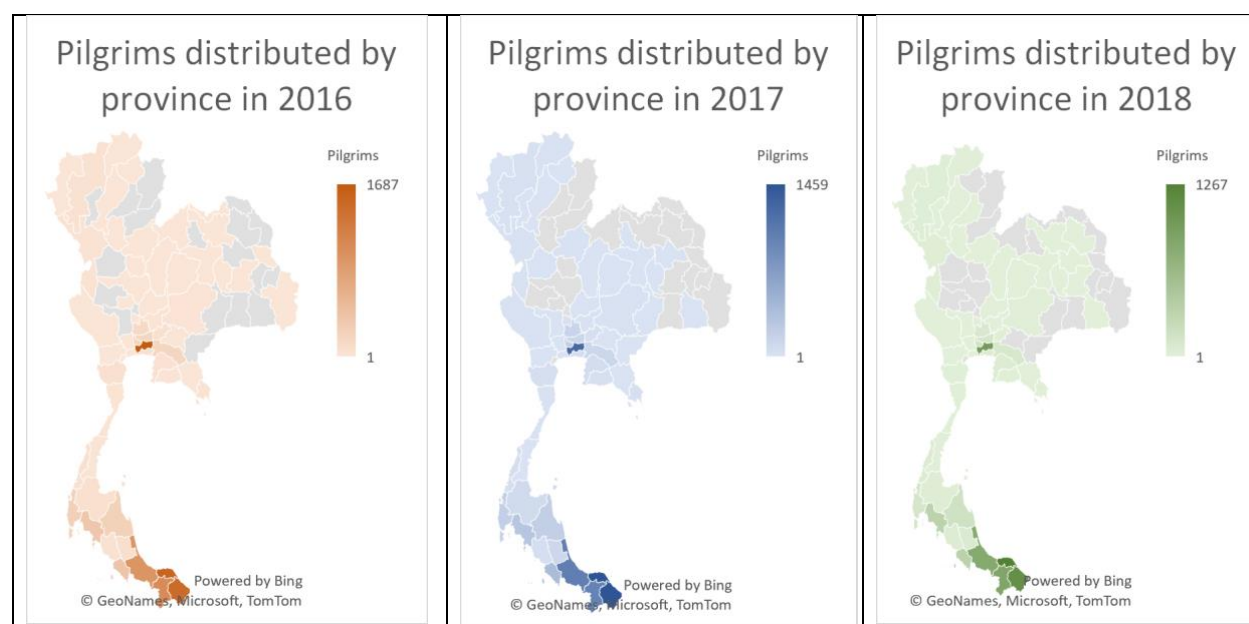
From the table above, the median age of the pilgrims in 2016 is 53-year-old, while in 2017, 2018 it is 54-year-old.

The next table indicates that the highest percentage of pilgrims belong to the age group of over 52 year old (51.66 %, 54.20%, 54.65% respectively). This expressed basically that the pilgrims are the people from the age group over 52 year old, Most of the pilgrims were over 20 years old (the lawful age according to Thai law). In this age group, they may have underlying diseases, more than the younger age group. Hence, this may also lead to a higher mortality.

**Table 5. The number of the departed pilgrims from Thai in 2016 – 2018 by gender and age group**

Age group	2016			2017			2018		
	gender		Total	gender		Total	gender		Total
	male	female	n (%)	male	female	n (%)	male	female	n (%)
<=20	51	35	86 (0.90)	42	29	71 (0.81)	43	21	64 (0.91)
21-30	277	247	524 (5.47)	252	218	470 (5.36)	222	123	345 (4.93)
31-40	463	551	1,014 (10.58)	423	508	931 (10.62)	370	265	635 (9.07)
41-50	988	1,370	2,358 (24.61)	823	1,164	1,987 (22.66)	818	788	1,606 (22.95)
51-60	1,353	1,757	3,110 (32.46)	1,300	1,695	2,995 (34.15)	1,202	1,307	2,509 (35.85)
61-70	1,009	1,028	2,037 (21.26)	965	907	1,872 (21.35)	845	687	1,532 (21.89)
71-80	216	203	419 (4.37)	231	173	404 (4.61)	163	115	278 (3.97)
>80	19	14	33 (0.34)	27	13	40 (0.46)	18	11	29 (0.41)
Total	4,376	5,205	9,581 (100)	4,063	4,707	8,770 (100)	3,681	3,317	6,998 (100)

Source: The regional health 12 office, Ministry of Public Health, Thailand



**Figure 4. The distribution of pilgrims by province in Thailand, 2016-2018**

Source: The regional health 12 office, Ministry of Public Health, Thailand

## A. Risks

To apply for the Hajj visa, Thai pilgrims must visit their doctors at least once, for health check-up and screening, in any level (district, provincial, or regional). The pilgrims are categorized into 4 groups, based on their health screening: 1. Normal physical examination, 2. Moderate risk group, 3. High risk group, and 4. Special care or terminal illness group like Cancer (CA), or mental health problems like schizophrenia, bipolar disorder, etc. (For definition of the different groups see full details in annex 4)

During the doctors' visit, the pilgrims' medical history, health risks, and extreme age (over 75 years) are recorded. In addition, doctors also screen and evaluate drug and food allergy history, medical family history, Body Mass Index, and smoking history. After the visit, each pilgrim will be given a personal medical record book, which they are required to always keep with them during their stay in KSA. Different coloured stickers are used in the medical record book to identify the pilgrims' health groups. The green sticker indicates normal physical health, the yellow means controlled underlying diseases which are labelled as "moderate risk", the red means uncontrolled underlying disease (which is labelled as "high risk"), and the grey means terminal illness or special care needed (which is included in "high risk") (see annex 4). The results of the physical screening are: Normal physical health, need to be treated, and need to be referred to a specialist for further management. If the pilgrims are not in the category of normal physical health, they need two more follow-up visits and a course of treatment, to control the underlying disease. On all detected health risks will be advised. For pregnant women, they are advised not to apply for Hajj visa, because they cannot be given a meningococcal vaccine, which is mandatory to obtain a Hajj visa from the KSA embassy. Note that the medical services for Hajj application are free of charge for the pilgrims.

## B. Pre-existing disease or medical condition

According to the Table 6, In 2016-2018, the deep south region has the highest number and percentage of pre-travel health screening, while other regions are lower. The percentage of screening in 2017 and 2018 is even higher, while other regions are lower than in 2016. This may be because of the switching of the Hajj administrative organization from Ministry of Culture to Ministry of Interior in 2017. The Ministry of Interior can direct the Southern Border Provinces Administrative Centre (SBPAC) to be the main actor in Hajj affair for the local pilgrims in deep south provinces, while there is no such organization in other regions.

**Table 6. Health screening among Thai pilgrims 2016-2018**

Region of Thailand	2016			2017			2018		
	Number of pilgrims	Number of pilgrims screened	% screened	Number of pilgrims	Number of pilgrims screened	% screened	Number of pilgrims	Number of pilgrims screened	% screened
Deep south	5,098	4,437	87.03	4,297	4,256	99.05	3,571	3,539	99.10
Others	4,083	3,412	83.57	4,473	2,807	62.75	3,427	2,155	62.88
total	9,581	7,849	81.92	8,770	7,063	80.54	6,998	5694	81.37

Source: The regional health 12 office, Ministry of Public Health, Thailand

**Table 7. The proportion between normal physical exam and pre-existing diseases at pre-travel health screening among Thai pilgrims 2016-2018**

Region of Thailand	2016				2017				2018			
	Number of Normal physical exam	per cent of Normal physical exam	Number of Pre-existing diseases	per cent of Pre-existing diseases	Number of Normal physical exam	per cent of Normal physical exam	Number of Pre-existing diseases	per cent of Pre-existing diseases	Number of Normal physical exam	per cent of Normal physical exam	Number of Pre-existing diseases	per cent of Pre-existing diseases
Deep south	2,672	60.22	1,765	39.78	2,534	59.54	1,722	40.46	1,885	53.26	1,654	46.74
Others	1,922	56.33	1,490	43.67	1,535	54.68	1,272	45.32	1,183	54.90	972	45.10
total	4,594	58.53	3,255	41.47	4,069	57.61	2,994	42.39	3,068	53.88	2,626	46.12

Source: The regional health 12 office, Ministry of Public Health, Thailand

In table 7, the pre-travel medical assessment, 41.47%-46.12% of the screened pilgrims, were categorized as at-risk group, due to their underlying diseases or health conditions, such as DM, Hypertension, or other diseases (See annex4 for the definition of risk groups in Thailand).

Some of Thai pilgrims may develop a serious complication before they go for Hajj, they may need to be referred for the proper management. A few of them may die before going to Hajj. This can occur each year.

Terminal illnesses like Cancer might be found, due to the pilgrims' belief that they will be rewarded with the paradise in the Hereafter if they die during Hajj performing (24).

The next tables (table 8-10) show number and prevalence of group of diseases per 1,000 pilgrims in 2016-2018

**Table 8. The number of Thai pilgrims with pre-travel diagnosis by diseases and group of diseases in 2016**

Group of disease	Male (total =4,375)		Female (total=5,206)		Total(total=9,581)	
	n	Prevalence (per 1000)	n	Prevalence (per 1000)	n	Prevalence (per 1000)
Hypertension	620	141.71	933	179.22	1553	162.09
Diabetes	272	62.17	390	74.91	662	69.10
Heart Diseases	87	19.89	72	13.83	159	16.60
Dyslipidemia	83	18.97	177	34.00	260	27.14
Lung disease	46	10.51	79	15.17	125	13.05
Skeletal and muscle system	43	9.83	21	4.03	64	6.68
Kidney and Liver disease	14	3.20	12	2.31	26	2.71
Thyroid disease	11	2.51	26	4.99	37	3.86
Cerebrovascular disease	6	1.37	1	0.19	7	0.73
Cancer	1	0.23	8	1.54	9	0.94
Mental disorder	1	0.23	3	0.58	4	0.42

Anemia	2	0.46	8	1.54	10	1.04
Others	50	11.43	72	13.83	122	12.73
Total	1236	282.51	1802	346.14	3038	317.09

Source: The regional health 12 office, Ministry of Public Health, Thailand

**Table 9. The number of Thai pilgrims with pre-travel diagnosis by diseases and group of diseases in 2017**

Group of disease	Male (total =4,063)		Female (total=4,707)		Total(total=8,770)	
	n	Prevalence (per 1000)	n	Prevalence (per 1000)	n	Prevalence (per 1000)
Hypertension	612	150.63	843	179.09	1455	165.91
Diabetes	289	71.13	385	81.79	674	76.85
Heart Diseases	84	20.67	45	9.56	129	14.71
Dyslipidemia	74	18.21	131	27.83	205	23.38
Lung disease	53	13.04	52	11.05	105	11.97
Skeletal and muscle system	56	13.78	29	6.16	85	9.69
Kidney and Liver disease	25	6.15	9	1.91	34	3.88
Thyroid disease	6	1.48	13	2.76	19	2.17
Cerebrovascular disease	5	1.23	6	1.27	11	1.25
Cancer	1	0.25	1	0.21	2	0.23
Mental disorder	5	1.23	6	1.27	11	1.25
Anemia	2	0.49	14	2.97	16	1.82
Others	37	9.11	37	7.86	74	8.44
Total	1249	307.41	1571	333.76	2820	321.55

Source: The regional health 12 office, Ministry of Public Health, Thailand

**Table 10. The number of Thai pilgrims with pre-travel diagnosis by diseases and group of diseases in 2018**

Group of disease	Male (total =3,681)		Female (total=3,316)		Total(total=6997)	
	n	Prevalence (per 1000)	n	Prevalence (per 1000)	n	Prevalence (per 1000)
Hypertension	595	161.64	702	211.70	1297	185.37
Diabetes	253	68.73	257	77.50	510	72.89
Heart Diseases	84	22.82	39	11.76	123	17.58
Dyslipidemia	136	36.95	157	47.35	293	41.88
Lung disease	32	8.69	26	7.84	58	8.29
Skeletal and muscle system	43	11.68	19	5.73	62	8.86
Kidney and Liver disease	15	4.07	4	1.21	19	2.72
Thyroid disease	5	1.36	30	9.05	35	5.00
Cerebrovascular disease	11	2.99	2	0.60	13	1.86
Cancer	8	2.17	7	2.11	15	2.14
Mental disorder	6	1.63	13	3.92	19	2.72
Anemia	5	1.36	8	2.41	13	1.86

Others	23	6.25	15	4.52	38	5.43
Total	1216	330.35	1279	385.71	2495	356.58

Source: The regional health 12 office, Ministry of Public Health, Thailand

The disease group of heart diseases, included ischemic heart disease, heart valve diseases, cardiomegaly, acute myocardial infarction.

Lung diseases consist of Chronic pulmonary obstruction disease and asthma.

The group of disease of skeletal and muscle disease includes osteoarthritis of the knee, spinal spondylosis, myalgia.

Kidney and liver diseases includes Chronic renal failure with unspecified stage, fat liver and Hepatitis B.

Cerebrovascular diseases including stroke and epilepsy.

Cancer, including breast cancer, Thyroid cancer, Gastrointestinal cancer and Nasopharyngeal cancer.

Mental disorder including depressive disorder, anxiety and schizophrenic disorder (see annex for further pre-travel diagnosis)

The top 3 pre-existing diseases are Hypertension, Diabetes Mellitus, and Dyslipidaemia with the prevalence 162.09, 69.10 and 27.14 per 1,000 pilgrims respectively. These 3 diseases are "silent killers" that may develop into serious health problems, such as sudden cardiac arrest and stroke. These diseases may lead to a high mortality among the pilgrims. It is noted that male pilgrims have a higher prevalence rate of heart diseases than female pilgrims. This might be expected that the higher mortality in male than female pilgrims.

All the pilgrims did not depart with a disease-free condition, some of them were categorized as no risk, moderate risk, and high-risk groups. During the analysis, the moderate risk group was combined with the high-risk group as risk groups. The next table will show the proportion of risk group among Thai pilgrims.

**Table 11. The risk group among Thai pilgrims in 2016-2018**

Pre-travel diagnosis	2016	2017	2018
With underlying disease	3,255 (33.97%)	2,994 (34.14%)	2,627 (37.52%)
No underlying disease	4,594 (47.95%)	4,069 (46.40%)	3,068 (43.85%)
Missing data	1,732 (18.08%)	1,707 (19.46%)	1,303 (18.64%)
Total	9,581 (100%)	8,770 (100%)	6,998 (100%)

Source: The regional health 12 office, Ministry of Public Health, Thailand

The proportion of the pilgrims with pre-travel disease is approximately one third of the departed pilgrims (33.97%, 34.14%, and 37.52%). According to the proportion of missing data, the real situation of the risk group is higher than the calculated risk group. The proportion of missing data may deviate from the real situation of the morbidity and mortality. The high rate of missing data may reflect on the ineffective coordination in Hajj



administrative organization (Ministry of Culture in 2016, Ministry of Interior in 2017-2018) that they cannot recruit more pilgrims to enrol for the health screening.

**Table 12. The number of Thai pilgrims with risk by age group and gender in 2016**

Age group (Year)	Gender		Pilgrims with underlying disease	Total	Prevalence (per 1000)
	Male	Female			
<=20	4	3	7	86	81.40
21-30	31	16	47	524	89.69
31-40	75	65	140	1,014	138.07
41-50	227	419	646	2,358	273.96
51-60	490	741	1,231	3,110	395.82
61-70	437	520	957	2,037	469.81
71-80	111	100	211	419	503.58
>80	9	7	16	33	484.85
Total	1,384	1,871	3255	9,581	339.73

Source: The regional health 12 office, Ministry of Public Health, Thailand

The prevalence of the underlying diseases is calculated by using the departed pilgrims as denominators in each age group. Because of the missing data, the real prevalence of the departed pilgrims is slightly higher.

From the table above, the highest prevalence of 503.58 per 1,000 pilgrims is in the age group 71-80 year old followed by the prevalence of 484.85 per 1,000 pilgrims in the age group of over 80 year old. There are relatively more women than men in both age groups in 2016.

**Table 13. The number of Thai pilgrims with risk by age group and gender in 2017**

Age group (Year)	Gender		Pilgrims with underlying disease	Total	Prevalence (per 1000)
	Male	Female			
<=20	2	2	4	71	56.34
21-30	26	10	36	470	76.60
31-40	64	67	131	931	140.71
41-50	191	343	534	1,987	268.75
51-60	513	710	1,223	2,995	408.35
61-70	424	418	842	1,872	449.79
71-80	109	92	201	404	497.52
>80	18	5	23	40	575.00
Total	1,347	1,647	2,994	8,770	341.39

Source: The regional health 12 office, Ministry of Public Health, Thailand

**Table 14. The number of Thai pilgrims with risk by age group and gender in 2018**

Age group (Year)	Gender		Pilgrims with underlying disease	Total	Prevalence (per 1000)
	Male	Female			
<=20	5	4	9	64	140.63
21-30	20	14	34	345	98.55
31-40	58	51	109	635	171.65
41-50	252	250	502	1,606	312.58

51-60	483	587	1070	2,509	426.46
61-70	396	342	738	1,532	481.72
71-80	94	59	153	278	550.36
>80	6	5	11	29	379.31
Total	1,314	1,312	2,626	6,998	375.25

Source: The regional health 12 office, Ministry of Public Health, Thailand

The high prevalence among the pilgrims aged over 60 year old, can also be observed in 2017 and 2018. It is noted that when the age group increases, the higher prevalence of the underlying disease can be seen. This may reflect on that the mortality rate might be higher among the older age group of the pilgrims.

### **3.1.2 Risks among pilgrims during Hajj phase**

During the Hajj, the pilgrims face many health risks, that can cause health problems, that brings them to the Thai medical mission hospital and clinic.

#### **A. Risks**

The risks and health problems are interrelated. The medical services play an important role to solve and mitigate the health problems, while the prevention measures try to reduce the risks.

There are two kinds of risks that may create health problems for the pilgrims.

#### **Environmental risks**

KSA is a foreign land for overseas pilgrims. Thailand is a tropical country; the pilgrims would not be familiar with the environment in KSA. There are various unfamiliar environmental risks that can aggravate the Thai pilgrims' underlying diseases. Those are the desert climate, high ambient temperatures during the day, dryness, dust, and steep terrain. In addition, congestion and unfamiliar traffic rules may increase the chance of contracting communicable diseases.

These environmental factors can impose the accidental injury or even detriment the mental health of the pilgrims. Some Pilgrims from other Asian countries may live in poor condition accommodations (an overcrowded room with poor ventilation) which may be far away from the Holy mosque. Food supplies were inadequately available (24). In Mina, tents had not sufficient cooling systems. In Arafat, some pilgrims had to stay in tents without an air-conditioned cooling system. In Mudzdalifah, there were sufficient facilities for sanitation, but the cleanliness was poorly managed (24).

#### **Pilgrims' health risks and pre-existing diseases**

The median age of Thai pilgrims is 54 years. 33.97-37.52% of the Thai pilgrims were classified as a risk group. These pilgrims may have only a health risk such as old age, obesity, or pre-existing disease such as HT, DM, etc. As mentioned previously, the health risks and pre-existing diseases are grouped together and are defined as risk group.

By comparing Thai Medical Hajj's records to the studies from India and Indonesia on the morbidity and mortality during Hajj, the following differences were observed (33,57)

-The median age from both countries, are higher than the Thai pilgrims' median age. Indian male pilgrims' median age was 62.7 years, while female was 56.7. The Indonesian pilgrims' median age was 62.5-66.1 years. The Thai pilgrims' median age was 53-54 years. This may be because India and Indonesia have a high number of Muslims. Their need to perform Hajj, is extremely high, but very limited, due to the Pilgrims' quota (which is given by Ministry of Hajj and Umrah, KSA). So, they have to be on the waiting list for many years. In contrast to Thailand, Thai Muslims are a minority. The need for Hajj is not quite high. The quota for Thai pilgrims is sufficient. So, they can apply to perform Hajj in the year they need. This may be a reason why the median age of Thai pilgrims is lower than both Indian pilgrims and Indonesian pilgrims.

-During 2004-2011, 27-43.4% of the Indonesian pilgrims were categorized as a high risk group due to pre-existing medical conditions. Thai pilgrims included all level of risks as risk group in the database. The high-risk group among Thai pilgrims may be lower. And this might lead to a lower mortality among Thai pilgrims.

## **B. Diseases and Health problems which occur during Hajj pilgrimage from literature review.**

Mass gatherings facilitate to cause certain illnesses and even death, especially among the vulnerable groups, in a period of 1-2 month long of the Hajj, with the hot weather in the desert(21). Staying there during Hajj may expose the infectious and non-infectious illness as follows.

### **List of Diseases from literature review**

#### **1. Communicable diseases**

##### **-Meningococcal infection**

Only 6 serogroups (A,B,C,W135,Y,X) of *Neisseria meningitidis* are responsible for an invasive meningococcal disease. The large outbreaks of meningococcal disease occurred in KSA during Hajj, were caused by serogroup A in 1987 and serogroup W135 in 2000 and 2001. Since 2001, KSA requires that every pilgrim is to be immunized with a quadrivalent (A,C,W135,Y) meningococcal vaccine. It is mandatory, and the pilgrims have to show the proof of vaccination for a Hajj visa issuance (20,21). The vaccine does not cover all serogroups which causes the disease. There is a potential of the causing of an outbreak if there is any sudden change in serogroup prevalence.

According to the National Surveillance database from the Bureau of Epidemiology, Thailand, in 2019, there were 24 cases of meningococcal infection, two of them died. The morbidity is quite low, 0.04 per 100,000 population (48).

There might be some possibility for the pilgrims to get contracted from the serogroups that the vaccine did not cover, however there is no report of the Meningococcal patients who get contracted from KSA after arrival.

##### **-Influenza and other viral respiratory infection**

In 2013, a study on Influenza-like Illnesses (ILI) among pilgrims from Australia, Qatar, and Saudi Arabia, during Hajj days in Mina, found that 42 laboratories confirmed cases out of 112

recruited patients (who were asked to participate in the study) with ILI. The most common viral respiratory infection was Rhinovirus, 28 cases from 42 cases. The other viruses were Influenza A, Adenovirus, human corona virus (OC43/229E), and parainfluenza (22). According to the National Surveillance database from the Bureau of Epidemiology, Thailand, there were 390,773 cases of Influenza in Thailand in 2019. The morbidity was 588.39 cases per 100,000 population. There was no data available on what type of influenza. The mortality was 0.04 per 100,000 population (48). Based on this data, quadrivalent influenza vaccine is a prerequisite vaccine for Thai pilgrims, before leaving for Hajj. There is a high possibility to get contracted Influenza during Hajj, because several strains of Influenza viruses are circulated among the pilgrims from all the nations.

### **-Middle East Respiratory Syndrome Corona Virus (MERS-CoV)**

In 2012, Hajj received international concern when MERS-CoV firstly emerged in Jeddah, KSA and spread to other countries. The virus originated in bats and spread to camels and to humans (23). The case fatality was more than 30% and no vaccine was available (24). It is important to note that there was no reported case from pilgrims that performed Hajj that year. Nevertheless, there was a reported case of Umrah-related MERS-CoV from various countries like Malaysia in 2014 (25).

In June 2015, Thailand detected the first imported case of MERS in an Omani patient, with a diagnosis of pneumonia on hospital admission. After that, there were 170 contacts traced, 48 were quarantined and 122 self-quarantined. All their laboratory results were negative (49). From this incident, the pilgrims might have some chance to get infected by MERS-CoV.

### **-Coronavirus Disease 2019 (COVID-19)**

In December 2019, the Corona virus disease was first identified in Wuhan, China. It was caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). COVID-19 caused a global pandemic outbreak, which was so declared by the World Health Organization on the 11<sup>th</sup> March 2020. As of the 9<sup>th</sup> of June 2020, there were 406,000 deaths and 7.1 million infections reported cases worldwide (26).

The first case of COVID-19 was detected on the 2<sup>nd</sup> of March 2020. By the 9<sup>th</sup> of June 2020, there were 108,571 cases and 783 deaths in country wide in KSA (26). There were cases in Pakistan and India, that were linked to the KSA visit (27). In this context, this posed a high risk of creating a super spreader event for the global pandemic outbreak, due to the fact that Hajj is one of the largest mass gatherings. The Ministry of Hajj and Umrah was urged to contribute, to apply the appropriate measures, to prevent the spreading of COVID-19 from July 2020 Hajj (27). Recently, KSA have stated that they do not allow foreign pilgrims from overseas to enter the country for Hajj (50).

In Thailand, the first case of COVID-19 was discovered on the 14<sup>th</sup> of January 2020. By the 11<sup>th</sup> of July 2020, there were 3,217 cases with 3,088 people recovered, 71 people were hospitalized, and 58 deaths with zero local transmission for 47 days, consecutively (51). Due to the KSA's policy in 2020, no pilgrims from Thailand attended the Hajj. There is no possibility for Thai pilgrims to get infected by COVID-19.

### **-Pneumonia**

During Hajj, the leading cause of ICU admission and hospitalization was pneumonia, among pilgrims in KSA hospitals (28). A pneumococcal pathogen played an important role in this

infection. In 2012, the nasal carriage of *Streptococcus pneumoniae* was increasing among French pilgrims from 7% before departing from France to 20% after arrival (28). Since then, the Thai medical mission diagnoses pneumonia among Thai pilgrims every year, there is a chance for them to get the disease. However, there is no report of the patients after 14 days of the arrival.

### **-Tuberculosis (TB)**

According to SaberYezli et al, a prospective cross-sectional study was conducted in Mecca 2015 and found that there were 15 (1.4%) undiagnosed pulmonary TB cases from the TB endemic countries (1,093 pilgrims from 5 countries). KSA is also endemic to TB (53). This poses the risk to spread TB to the other pilgrims in Hajj (52).

According to the National Surveillance database, from the Bureau of Epidemiology, Thailand, in 2019, there were 8,894 cases of Pulmonary tuberculosis. The morbidity was 13.39 cases per 100,000 population. The mortality was 0.03 per 100,000 population. A higher morbidity rate was found in male patients (male-to-female gender ratio = male: female = 1:0.44). Forty-eight percent of Pulmonary TB was found in the age group over 55 years (48). There might be some chance to contract TB due to overcrowded pilgrim groups.

### **-Diarrhoea and Gastrointestinal infection**

Diarrhoea and Gastrointestinal disease (GID) used to be the potential public health concern, during Hajj, in the past due to cholera. Because of the improvement of public sanitation and hygiene in KSA, the last cases were reported in 1989. GID and diarrhoea are still reported among the pilgrims. The etiological causes are various. It could be virus, parasites, or bacteria. In 2008, a survey of 206,831 pilgrims, on mortality data, conducted by an Indonesian public health team, found that 2 out of 446 death (0.45%) were from GID (29). According to the National Surveillance database from Bureau of Epidemiology, Thailand, in 2019, there were in total 1,068,108 cases of diarrhoea. The morbidity was 1,608.26 cases per 100,000 population. The mortality was 0.01 per 100,000 population (48). There is a high possibility for pilgrims to contract GID. The Thai medical mission diagnoses and reports this disease every year.

### **-Dengue**

The first documented dengue outbreak was in 1994 (53). KSA became endemic for dengue and the recent outbreak was in 2010 with 100,000 reported cases and 200 deaths. Thailand is also an endemic country for dengue, including dengue fever, dengue haemorrhagic fever, and dengue shock syndrome, with cases of 128,964 and 133 deaths in 2019 (48). There might be some possibility to bring about the Dengue outbreak, because both KSA and Thailand are the endemic countries for Dengue. However, there is no report of dengue cases among Thai pilgrims after 14 day of arrival.

### **-Leishmaniasis**

Sand flies are distributed throughout KSA including Mecca and Medina. This insect is a Cutaneous Leishmaniasis's vector. This disease has dropped dramatically by the disease control programme in KSA. The average annual prevalent cases in 2017 are 2,500 and this may pose a risk to spread to other countries through Hajj and Umrah (54)

Thailand is not an endemic country for Leishmaniasis. There have been only 1-2 cases per year reported as imported or indigenous cases. This case has not been present in years (56). There might be some possibility, but there are no reported cases among Thai pilgrims.

### **-Ebola**

It is one of the concerns during Hajj in 2014, due to the outbreak in West Africa. The Ministry of Health, KSA, took many measures including banning the pilgrims from the countries in West Africa, to join Hajj in 2014, Ebola surveillance establishment, screening and isolation measures, rapid diagnosis and proper management. There was no reported case among the pilgrims in Hajj 2014 (34).

Thailand setup the Ebola surveillance to detect the imported cases, but no cases were found (48). There might be a very rare opportunity to get this infection. There was no case found among Thai pilgrims.

### **-Skin infection**

Skin infections are common due to the lengthy ritual of walking, heat and poor hygiene. Pyoderma, carbuncle, folliculitis, impetigo are frequently found among pilgrims. Some pilgrims are walking barefoot and may have injuries, which lead to secondary infection (35). There is no record of skin disease in Thailand, because it is not on the list of the disease surveillance system (48). However, the Thai medical mission diagnoses this health problem every year.

## **2. Noncommunicable diseases**

### **-Cardiovascular disease**

Ischemic Heart Disease (IHD) is the most common cause of death during Hajj. In 2002, one of the most important causes of death was cardiovascular disease with hypertension. The percentage of mortality was 45.8% (31).

According to the Department of Disease Control and Prevention, MOPH, Thailand. The prevalence of IHD among Thais is 5 per 1,000 populations (55). This is also the leading cause of death among Thai pilgrims.

### **-Cerebrovascular disease**

Stroke is the leading cause of death with a neurological complication. One study showed that the incidence of stroke during Hajj in 2015, was 8.9 per 100,000 pilgrims. The peak of the incidence was on the 10<sup>th</sup> Dhul-Hijjah (32)

According to the Department of Disease Control and Prevention, MOPH, Thailand. The prevalence of Cerebrovascular disease, among Thai people is 4.5-5 per 1,000 populations (55). It may occur among the pilgrims, due to the exacerbating of the pre-existing diseases like DM, Hypertension, etc.

### **-Terminal illness**

Due to cultural belief, some pilgrims believed that they will be rewarded with being in the paradise in the Hereafter if they die during the Hajj. This encourages some of the terminal illness cases, like cancer, to be found among the Hajj pilgrims. According to Pane et al, there were 2-8 deaths (0.4-1.51% out of the total deaths) due to neoplasm among Indonesian

pilgrims from 2004-2011(33). In the Thai medical mission during 2017-18, there were some pilgrims who died from cancer among the Thai pilgrims.

### **3. Mental Health**

The overseas pilgrims may face all kinds of stress during Hajj stay. Being in a foreign land, language barrier, different culture, fear of getting lost, and home sickness are the factors that can cause mental health problems (65).

In 2016, Khan et al revealed that 182 pilgrims developed mental problems (1.3%) of which 45.7% had stress related issues, 9.8% psychosis, 7.3% insomnia, and 5.6% mood disorder in the study on 136,000 Indian pilgrims(57). Common mental health problems are Psychosis, Insomnia, and Mood disorders, such as Major depression and Bipolar (65).

### **4. Injury and other problems**

#### **-Orthopaedic and musculoskeletal diseases**

Myalgia, osteoarthritis, dislocation, fractures, sprain, low back pain, sciatica can be found. Indian medical mission reported that 45% of all fractures among Indian pilgrims were Colle's fracture due to falls(57).There is some possibility to diagnose this medical condition. There was no data available among Thai pilgrims.

#### **-Heat Stroke**

Mecca in the summer is very hot. The temperature could exceed 40 Celsius degrees in the afternoon; therefore, heat stroke is common and usually occurs when the ambient temperature is higher than 41 Celsius degrees (63). In 1985, approximately 2,000 cases of heat stroke were reported and 1,000 died after a few days into Hajj (34). In 2016, 80 patients (29%) out of 267 patients at four hospitals in the Mina and Arafat regions, were diagnosed with heatstroke. The mortality rate was 6.3% with the mean age of  $54.0 \pm 16$  years(63). There is some possibility to diagnose this medical condition. There was no data available among Thai pilgrims.

#### **-Stampede**

Hajj is one of the most crowded gatherings. Most of the pilgrims are from the lower- and middle-income countries and are old, poor, and illiterate. Hajj maybe their first international trip. Hajj must be completed within a limited time for 5 days (6 days for Muslims in some Islamic sects). Hajj has to be performed in a specific unchangeable sequence, following a fixed route within the 4 km<sup>2</sup> area. This leads to a stampede almost every year (24).

From 1990-2015, there were at least 9 incidents of stampede occurring, during the Hajj period, that caused hundreds to thousands of deaths, due to the massive human congestion. It mostly occurred at the Devil stoning area in Mina. This is probably the most serious public health problem, that can cause many casualties and fatalities (35). There is some possibility to face the incident. There was no data available among Thai pilgrims.

### C. The Morbidity and Mortality among Thai Hajj pilgrims from secondary data analysis

#### Morbidity 2016:

The morbidity data of the pilgrims were collected via the software programme that the Thai medical team designed. The diagnosis code was determined by the data technician, and it is not coded by ICD X for a convenient purpose. Data in 2017 and 2018 is incomplete and cannot be used for analysis. Only data in 2016 can be analysed and presented with limitation. It can only show the number of the medical visits by the pilgrims and some information. So, the comparative risks between the pilgrims, during Hajj and the people who did not come to perform Hajj, cannot be done.

According to Table 15, the leading cause of health problem, which required a visit to a medical unit, was infection. The upper respiratory disease was the most infected. The top 10 deceases involved three organ systems: respiratory, musculoskeletal, and the gastrointestinal tract system.

**Table 15. Top 10 diseases diagnosis during Hajj in 2016**

No	Diagnosis	Mecca	Medina	Total
1	Upper respiratory infection	6671	7	6678
2	Myalgia	1123	9	1132
3	Respiratory disease	562	0	562
4	Dyspepsia	336	2	338
5	Dizziness	270	5	275
6	Dermatitis	186	1	187
7	Musculoskeletal diseases	185	0	185
8	Knee Osteoarthritis	164	1	165
9	Hypertension	133	4	137
10	Diarrhoea	112	2	114

Source: the regional health 12 office, Ministry of Public Health, Thailand

**Table 16. Type of Patients in 2016**

OPD	IPD	Refer	Dead
9,543	191	36	9

Source: the regional health 12 office, Ministry of Public Health, Thailand

The number of the cases in table 15 is the patient's visit. It does not represent the case of the diseases. In Table 16, the number in OPD means the times that the pilgrims come to visit, but for IPD, Refer, and Dead are the number of the patients. The IPD cases shows the severity of the patients (such as mild pneumonia, influenza, and acute gastro-enteritis) that they need more health care facilities. The more complicated cases such as stroke, septicaemia, acute myocardial infarction will be referred to KSA hospitals.



-For the morbidity, the most common problem among Thai pilgrims, is respiratory infection, which is the same as Pilgrims from India and Indonesia, but may be caused by different pathogens.

-In details, there are the differences in the diagnosis among the patients. Thai medical missions may diagnose the illness as a broader diagnosis, as fatigue, myalgia, or dizziness.

-There is no heat related illness diagnosis in the Thai medical mission's record. This might be reflected in the gap of the Thai pilgrims' diagnosis.

### **Description of Mortality among the pilgrims during 2016-2018**

#### **Mortality 2016 - 2018:**

During 2016-2018, the total of deaths, among Thai pilgrims, is 9, 9, and 6 respectively. Due to the small number of deaths in the old age group, the table below demonstrated the mortality between only 2 age groups (below 60 and above 60 year old).

**Table 17. The number of deaths among Thai pilgrims during 2016-2018**

Age group (Year)	2016			2017			2018		
	Total	Number of Death	Death rate (per1,000)	Total	Number of Death	Death rate (per1,000)	Total	Number of Death	Death rate (per1,000)
<=60	7,092	1	0.14	6,454	0	0	5,159	3	0.58
>60	2,489	8	3.21	2,316	9	3.88	1,839	3	1.63
Total	9,581	9	0.93	8,770	9	1.02	6,998	6	0.85

Source: the regional health 12 office, Ministry of Public Health, Thailand

The highest mortality rate can be observed among Thai pilgrims, whose age are over 60 year old (3.21, 3.88, and 1.63). So, old age might be a possible risk factor for the mortality. This means that the old age group of the pilgrims have a higher risk to die, during Hajj, compared to the younger age group. This can be concluded by the statistical tool which will be demonstrated later.

**Table 18. The number of deaths and death rate among Thai pilgrims during 2016-2018 by gender**

Year	Male	Death rate per 1,000	Female	Death rate per 1,000
2016	5	1.14	4	0.77
2017	7	1.72	2	0.42
2018	4	1.09	2	0.54

Source: the regional health 12 office, Ministry of Public Health, Thailand

The table above indicates that the male pilgrims have a higher death rate. Hence, the gender might be another risk factor for the mortality of the pilgrims. It means that the male pilgrims

have a higher chance to die during the Hajj than the female pilgrims. This will be proved by statistical tool in the next tables.

**Table 19. Top 10 causes of deaths among Thai pilgrims 2016-2018**

Diagnosis	2016	2017	2018
Acute myocardial infarction	6	5	3
Stroke	1	1	0
Electrolyte imbalance	1	0	0
GI haemorrhage	1	0	0
Respiratory failure	0	2	1
Cancer	0	1	2
Total	9	9	6

Source: the regional health 12 office, Ministry of Public Health, Thailand

According to Table 19, most of the Hajj pilgrims during the Hajj who died, died from acute coronary heart diseases. There are some cases of terminal stages of illness like Cancer, presented during Hajj.

Deaths from cardiovascular disease is the number one ranking in the cause of deaths among the pilgrims and the same among Indian and Indonesian pilgrims (33,57).

The table 20-22 report that the pilgrims from the deep south have a higher mortality than any other regions. This might reflect that the residence of place might be another risk factor.

**Table 20. The number of deaths among Thai pilgrims in 2016 by region**

Region	Number of pilgrims	gender		Total	Death rate (per 1,000)
		Male	Female		
Deep south	4,483	4	4	8	1.78
others	5,098	1	0	1	0.20
Total	9,581	5 (55.55%)	4 (44.44%)	9 (100%)	0.94

Source: the regional health 12 office, Ministry of Public Health, Thailand

**Table 21. The number of deaths among Thai pilgrims in 2016 by region**

Region	Number of pilgrims	gender		Total	Death rate (per 1,000)
		Male	Female		
Deep south	4,297	5	1	6	1.40
others	4,473	2	1	3	0.67
Total	8,770	7 (77.77%)	2 (22.22%)	9 (100%)	1.03

Source: the regional health 12 office, Ministry of Public Health, Thailand

**Table 22. The number of deaths among Thai pilgrims in 2016 by region**

Region	Number of pilgrims	gender		Total	Death rate (per 1,000)
		Male	Female		
Deep south	3,571	2	2	4	1.12
others	3,427	2	0	2	0.58
Total	6,998	4 (66.66%)	2 (33.33%)	6 (100%)	0.86

Source: the regional health 12 office, Ministry of Public Health, Thailand

**Table 23. the number and deaths among the pilgrims from Thailand by underlying disease of Thailand, 2016 - 2018**

Year	Total Pilgrims with underlying disease	Death among Pilgrims with underlying disease	
		Number	Death rate Per 1000
2016	3,255	6	1.84
2017	2,994	6	2.00
2018	2,626	5	1.90

Source: the regional health 12 office, Ministry of Public Health, Thailand

The table above shows that the pilgrims with underlying disease, had a high number of death and death rate. This should be included with other variables associated with a high mortality in statistical analysis, to prove that whether these variables are real risks.

The variables associated with death among Thai pilgrims in this study are gender, age group, pilgrims with underlying disease, and pilgrims from the deep south. These variables are calculated to find an odds ratio, 95% confidential interval and p-value by using STATA17 with a logistic regression model.

In table 24 - 26, The assumption with factors that related to the high mortality are tested with the statistical tool (STATA 17) by logistic regression.

**Table 24. The Odds Ratio of the deaths associated with risks among the pilgrims from Thailand, 2016**

Characteristic	Dead N (%)	Alive N (%)	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Number of Pilgrims	9 (0.09)	9,572 (99.91)	-	-	-
Gender (n=9,581)	n=9	n=9,572			
Male	5 (55.55)	4,551 (47.54)	1.49 (0.40-5.54)	1.31(0.35-4.95)	0.688
Female	4 (44.44)	5,021 (52.46)	1	1	
Age (n= 9,581)	n=9	n=9,572			
<=60	2 (22.22)	7,090 (74.07)	1	1	
61-75	3 (33.33)	2,034 (21.25)	6.07(1.11-33.18)	5.03(0.9-28.19)	<0.001
>75	4 (44.44)	448 (4.68)	72.35 (12.0-436.20)	50.24(8.05-313.59)	<0.001
Underlying disease (n= 7,849)	n=9	n=7,840			
Yes	6 (66.66)	3,249 (41.39)	2.83 (0.71-11.31)	2.06(0.5-8.47)	0.35
No	3 (33.33)	4,591 (58.61)	1	1	
Pilgrims from Deep south (n= 9,581)	n=9	n=9,572			
Yes	8 (88.88)	4,475 (46.75)	9.11(1.14-72.88)	5.36(0.66-43.33)	0.056
No	1 (11.11)	5,097 (53.25)	1	1	

Source: the regional health 12 office, Ministry of Public Health, Thailand

The table above shows the statistical difference in the death rate among the age group over 75 year old is detected in the year of 2016, with adjusted OR = 50.24, 95% CI 8.05 – 313.59 and p-value < 0.05. Although there is no statistically significant difference, the risk of the pilgrims from the deep south is highly possible to die during Hajj.

**Table 25. The Odds Ratio of the deaths associated with risks among the pilgrims from Thailand, 2017**

Characteristic	Dead N (%)	Alive N (%)	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Number of Pilgrims	9 (0.10)	8,761 (99.90)			
Gender (n=8,770)	n=9	n=8,761			
Male	7 (55.55)	4,056 (45.77)	4.06 (0.84,19.55)	2.97 (0.61,14.48)	0.143
Female	2 (44.44)	4,705 (54.23)			
Age (n= 8,770)	n=9	n = 8,761			
<=60	0 (0.00)	6,454 (73.67)	-	-	
61-75	5 (55.55)	1,867 (21.31)			
>75	4 (44.44)	440 (5.02)			
Underlying disease (n= 7,063)	n=9	n = 7,054			
Yes	6 (66.66)	2,988 (42.36)	4.08 (0.82,20.24)	2.01 (0.39,10.3)	0.667
No	3 (33.33)	4,066 (57.64)			
Pilgrims from Deep south (n= 8,770)	n=9	n=8,761			
Yes	6 (66.66)	4,291 (51.26)	2.08 (0.52,8.34)	1.82 (0.38,8.61)	0.437-
No	3 (33.33)	4,470 (48.74)			

Source: the regional health 12 office, Ministry of Public Health, Thailand

In table 25, Although there is no statistically significant difference in all variables, the risk of the pilgrims with the underlying disease are possible to die during Hajj. The reason why the statistical tool cannot detect the risk, may be because of the high number of missing data. This might reflect on the defect of the process of data collection. The OR in the age group variable cannot be calculated due to "0" in the cell of age group lower 60 year old.

**Table 26. The Odds Ratio of the deaths associated with risks among the pilgrims from Thailand, 2018**

Characteristic	Dead N(%)	Alive N(%)	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Number of Pilgrims	6 (0.09)	6,692 (99.01)	-	-	-
Gender (n=6,998)	n=6	n=6,692			
Male	4 (66.66)	3,677 (54.95)	1.8 (0.33,9.85)	1.69 (0.3,9.46)	0.54
Female	2 (33.33)	3,315 (45.05)			
Age (n= 6,998)	n=6	n=6,992			
<=60	3 (50.00)	5,156 (73.74)	1	1	0.026
61-75	1 (16.67)	1,531 (21.90)	1 (0.1,9.63)	0.69 (0.07,6.72)	
>75	2 (33.33)	305 (4.36)	28.64 (4.74,173)	17.26 (2.77,107.53)	
Underlying disease (n= 5,695)	n=5	n=5,689			
Yes	5 (100)	2,621 (46.08)	Cannot calculated	Cannot calculated	-
No	0 (0)	3,068 (53.92)			
Pilgrims from Deep south (n= 6,998)	n=6	n=6,992			
Yes	4 (66.66)	3,567 (51.02)	1.92 (0.35,10.49)	2.06 (0.25,17.25)	0.481
No	2 (33.33)	3,425 (48.98)			

Source: the regional health 12 office, Ministry of Public Health, Thailand

The table above shows that the statistical difference in the death rate among the age group over 75 year old is detected in the year of 2018 with adjusted OR = 17.26, 95% CI 2.77 – 107.53 and p-value < 0.05. Other variables have no significant different in the death rate among the pilgrims. The OR in the underlying disease variable cannot be calculated due to “0” in no underlying disease group. There is one death occurred in the pilgrim who did not have screening for underlying disease.

However, all variables are calculated by using multiple logistic regression (STATA17) with stepwise method to find the adjusted OR among the pilgrims in 2016-2018 (all the pilgrims’ record in 2016-2018 are cumulated). The result is presented in the table below

**Table 27. Multiple logistic regression analysis of factors associated with death, 2016 – 2018 (n=25,439)**

Characteristic	Crude OR (95% CI)	Adjusted OR (95% CI)	P-value
Gender:			
Female	ref	-	
Male	2.18 (0.93-5.11)	1.86 (0.79-4.37)	0.157
Age group			
<=75	Ref	-	
>75	36.1 (15.71,82.97)	25.16 (10.75,58.9)	< 0.001
Pilgrims with underlying disease			
No	ref	-	
Yes	4.5 (1.66,12.2)	3 (1.09,8.27)	0.034
Pilgrims from deep south			
No	ref	-	
yes	3.16 (1.25,7.96)	2.65 (0.93,7.58)	0.069

Source: the regional health 12 office, Ministry of Public Health, Thailand

The table above shows the statistical difference in 2 variables, age group and underlying disease. For the category of age groups, the age group lower than 75-year-old is used as reference, because of the lowest mortality, while age groups > 75 year old have an adjusted OR 25.16 with 95% CI 10.75–58.9 and p-value < 0.001. This means that the age group of 75 year old is a risk factor, associated with the death among the pilgrims during hajj performing.

For the pilgrims with underlying diseases, it shows that the underlying disease is another risk factor associated with the death among the pilgrims during Hajj, with an adjusted OR=3, 95%CI 1.09-8.27 and p-value < 0.05. And all the missing data was not included in the testing. It means that the pilgrims with underlying disease have a higher risk to die during hajj.

There is no risk associated with deaths among the pilgrims in other variables, because all p-values are greater than 0.05.

The year of the Hajj does not affect the death among the pilgrims, due to the process of calculation.

### **3.1.3 Risks among the pilgrims in post travel phase**

#### **A. Risks**

- There might be some risk from travel such as jetlag or any kind of accidents such as sudden cardiac arrest and pulmonary embolism.

#### **B. The diseases**

- There might be some possible infectious diseases that may be contracted before or during travel (during transit flight) to the home country for example, there was a reported case of an Umrah-related MERS-CoV in Malaysia in 2014 (25).
- The exacerbation of the pre-existing diseases might occur during the trip back to home country.

### **3.2 The governance to manage the disaster risk**

The structure of the governance for Hajj in Thailand can be viewed by the multisectoral coordination in the public private coordination and collaboration in all levels. In Thailand, the Ministry of Interior is the main organization to organize and facilitate all the partners to move all the process since the beginning till the date of the pilgrims arrived. MOI initiates the committee from the organizations, such as the representative from the travel agents, the representative of the leading Islamic organizations, the representative from Ministry of Public Health and other stakeholders.

the Southern Border Provinces Administrative Centre (SBPAC) is the main actor in deep south provinces. This organization is playing an important role, to steer the hajj process in the deep south, while other regions did not have an organization like this in the area. In other regions, the travel agents do registration on the pilgrims' behalf in Hajj and bring their customers to receive the medical services such as health screening and immunization. Some travel agents didn't bring their customers to health care centres or clinics. They just bring the pilgrims, to receive the vaccination, because this is compulsory required by the government of KSA. This is one reason why the data of Hajj pilgrims is not complete.

The Ministry of public health is a partner who deals with the pilgrims' health by providing health care to all pilgrims. This responsibility includes the medical personnel recruitment, health care screening, giving immunization, providing medical care to the pilgrims for the whole trip.

The ministry of foreign affair plays an important role in coordinating with the KSA government to take care all Thai pilgrims' welfare.

Travel agents are the private companies who run business as a tour leader. They have to arrange all the air tickets, housing, food and take good care of the pilgrims as their customers. If their pilgrims are sick, they have to bring the pilgrims to see a doctor at the clinics or hospitals during Hajj.

There is no non-government organization or community representatives involve in Hajj management.

All the partners in the hajj process require the integration and cooperation from multisectoral partners from local to international organization. Key partners on the national level are the Ministry of Interior, Ministry of Public Health, and travel agents. All their roles share the responsibility, to facilitate the Hajj, to the pilgrims with care and safety.

The government of KSA is the most important actor on a Global level. The Ministry of Hajj, KSA, provide all the facilities and coordinate with other KSA government officers from other ministries to run Hajj campaign in the country.

The Ministry of Health, KSA, provide medical care and manage the prevention measures to the pilgrims from all over the world. They have to run all the hospitals and primary health centres during Hajj, to reduce morbidity and mortality of the pilgrims. They monitor the Hajj situation, related to the public health hazards and provide the rapid response to mitigate the morbidity and mortality of the pilgrims. In other roles, they provide other facilities like infrastructure and security such as the transportation, housing, food, and security for the pilgrims.

The KSA embassy in Thailand provides every year Hajj visa for Thai pilgrims.

Jedda airport will open a special terminal, called Hajj terminals, to provide air traffic service to the pilgrims, due to more flights during Hajj.

This interrelation between KSA and Thai partners provide the Hajj service for all pilgrims to have a qualified Hajj. The problems that occur in any situation in this multisectoral cooperation may reflect the worse consequences, especially in the morbidity and mortality of the pilgrims.

### **3.3 Investing in disaster risk reduction for resilience**

Based on Sendai risk reduction framework (2015-2030), after the risks were analysed to understand well about the real situation of the disaster. The next steps are to strengthen the governance to manage the risks and to invest in risk reduction for resilience.

So, all the health care facilities both on national level and international level are identified and the health care measures are described below.

#### **A. Medical service and prevention in pre travel phase**

All pilgrims should be screened for their health status. But not all of them are. The coverage of the screening is varied by the regions. The deep south region has the highest coverage of screening, because of the fact that the deep south of Thailand has the Southern Border Provinces Administrative Centre (SBPAC) and a strong provincial Islamic committee, due that it is a Muslim dominant area. One of the committee's important tasks is to collaborate with the local public health administration such as the provincial health office for Hajj and Umrah.

There is incomplete medical record reported in pilgrims' health books. If all the medical screening result from three medical examinations were recorded well, it would be easy for Thai doctors and other medical care providers to give the proper treatment for the pilgrims. Unfortunately, not all health books were filled with sufficient health information.

For the diagnosis that recorded in the health books, it does not follow the ICD X. This makes the data analysis difficult to be done. The diagnosis in one disease may be recorded in many diseases' name. Common cold, viral infection and acute pharyngitis may be referred to the same diagnosis as upper respiratory disease.

All the pilgrims must be given 2 pre-requisite vaccinations before departure: Meningococcal and influenza vaccine. This is compulsory and required by KSA before the visa issuance. The data on vaccine coverage in each region is not available.

Health education is provided to the pilgrims by health personnel. This is to ensure that the pilgrims have the basic knowledge of potential health risks and how to take care of themselves in general, while travelling and performing Hajj. The travel agents and Ministry of Public Health, collaborate to manage this training session. There is no data available on the coverage of the training in each region.

In Indonesia, all pilgrims have to see a doctor for medical assessment at least 3 times, whether they are healthy or have pre-existing diseases. The first visit is done at least 4 months prior to the departure date at the Primary Health Centre. The second visit is completed 2 months before the departure at the District Hospital, and the third visit is done 1 day prior to the departure at the Embarkation Port Health Post. All visits were done to screen for healthy pilgrims, the at-risk group, the ill who need treatment and hospitalization, or the pregnant which need to postpone to the next Hajj (18).

In 2007, Indonesia had a 205,185 registered pilgrim physical check-up three times(100% screening). Most of pre-travel diagnosis, 84.18 per 1000 pilgrims, were circulatory system diseases (essential hypertension, cardiovascular diseases, cerebrovascular diseases). The endocrine disorders were DM (including all type of DM) 28.26 per 1000 pilgrims. Digestive system disorders were 21.19 per 1000 pilgrims. Musculoskeletal system disorders were 17.54 per 1000 pilgrims. Respiratory system disorders were (pneumonia, COPD, asthma, etc.) 9.10 per 1000 pilgrims.

There was a difference in the number between the departed pilgrims and the registered group, due to the long process from registering until departure. Some people were too old and too ill to go for Hajj. The departed pilgrims (195,805 pilgrims) were 95.4% of the total registered pilgrims and 17.47% of the departed were in the high-risk group (18).

### **B. Medical care provided to Thai pilgrims during the Hajj**

The Thai medical mission provided health care to 10,000 patients approximately, in a period of 2 months, between 2016 and 2018, by a team of 8-9 doctors and 24-33 paramedics. In 2018, the ratios of doctors: pilgrims and paramedic: pilgrims from Thailand were



approximately 1.14:1000 and 3.43:1000. The total number of medical staff was 42 in most years, except in 2018 with 32 medical staff, due to the budget cut.

Normally, The Thai medical mission is recruited from the Ministry of Public Health's officers from all over the country, before the departure for Hajj, at least 4 months. After the recruitment, they have some training together, before going to Hajj(19).

There was limited data on medical service during Hajj, such as OPD visit, IPD admission, number of referrals, place of deaths, etc.

**Table 28. Human resources in Medical Hajj mission during 2016-2018**

<b>Human resource/Year</b>	2016	2017	2018
Doctor	9	9	8
Pharmacist	3	3	3
Nurse	24	24	17
Technician	6	6	4

Source: the regional health 12 office, Ministry of Public Health, Thailand

**Table 29. Human resources- to-pilgrims ratio in Medical Hajj mission during 2016-2018**

<b>Human resources</b>	2016		2017		2018	
	<b>number</b>	<b>per 1000</b>	<b>number</b>	<b>per 1000</b>	<b>number</b>	<b>per 1000</b>
Doctor	9	0.94	9	1.02	8	1.14
Paramedic	33	3.49	33	3.75	24	3.43

Source: the regional health 12 office, Ministry of Public Health, Thailand

Doctor and pilgrims ratio= (number of doctors / number of pilgrims)\*1000

Ex. Doctor and pilgrims ratio in 2016 = (9/ 9,581)\*1000 = 0.94

The doctor and pilgrims ratio during 2016-18 is higher than Thailand's doctor and population in 2015, which was 0.39 per 1000 populations. Indonesian's doctor and pilgrims ratio in 2011 was 1.46 per 1000 pilgrims which was higher than Thailand's in 2016-2018. It is noted that the Indonesian health personnel increased from 83 in 2005 to 306 in 2007.

#### **i. Thai Medical Mission Centre in Mecca**

There is one 30-bedded secondary care Hospital, set up by the Thai medical team in Mecca, with 3 – 9 doctors and 10 – 36 paramedics (including nurses, pharmacists, and health officers) each year. The number of health personal, depends on human resource management, because they must dispatch a small medical team(2-3 doctors and 3-4 paramedics), to run another clinic in Medina. The hospital plays an important role as a temporally community hospital, which can provide OPD, IPD and Emergency care. The doctors at the hospital can refer patients for further treatment to the Saudi Hospitals, if the patients need more

specialized medical attendance (19). In 2016, Khan et al, the Indian medical mission provided their medical services to their Indian pilgrims, with (a) 22 static clinics with 5-6 doctors and 5-6 paramedics, which covers Mecca, Medina, and Jeddah (b) 35 tent clinics with 1 doctor and 1 paramedic are covered in Mina, Arafat and Muzdalifah (c) One mobile referral tent-clinic with 5-6 doctors and 5-6 paramedics was covered in Mina (d) The mobile medical task force, with 1 doctor and 2 paramedic was covered to mass congregations, (e) two 40-bedded secondary care Hospital in Mecca and 14-bedded secondary care Hospital in Medina (f) Tertiary care transfer which was coordinated with 30 KSA's hospitals. The Indian medical mission is bigger than the Thai, in terms of Human resources and facilities. They have medical facilities such as an x-ray machine, Ultrasonography machine and electrocardiogram (57).

**ii. Thai Medical Mission Clinic in Medina**

There is one clinic in Medina, which serves a small number of Thai pilgrims who visit Medina. The Medical Mission centre in Mecca organizes and dispatches a small medical team, including one doctor, one pharmacist or nurse and three to four paramedics to run the clinic with a rotational 8-9 days shift. The clinic provides only OPD service and will refer the patient to the Saudi Hospitals if the patients need additional medical treatments (19). Compared to the Indian medical mission, they have more accessibility to their own pilgrims more than the Thai's.

**iii. Saudi Arabia Hospitals and Health Centres**

There are many Saudi Hospitals in Mecca and Medina, which act as referral Hospitals, such as Al-Noor Hospital, King Abdul Aziz Hospital, etc. They provide an excellent centre for specialized medical treatment (e.g., Open heart surgery, Cardiac Cauterization, Renal dialysis, mental health care, and etc). All medical service expense is free of charge.

Health facilities may vary from year-to-year, based on the annual number of pilgrims. In 2012, there were 25 hospitals including a 4,427 bed capacity, 141 health centres with 20,000 health personnel around the Hajj sites (i.e., Mina, Arafat and Muzdalifah). All health facilities are connected with the tertiary health care hospitals in Mecca and Jeddah (31).

According to Shafi S. et al, many preventative measures are conducted by KSA as follows (44):

**Table 30. Preventive measures through the Hajj course (44: p.81)**

	Hajj preparation activities, guidelines, and recommendations
Hajj norms and rules	<ul style="list-style-type: none"> <li>• The elderly, sick, and disabled are exempted from the obligation of performing Hajj</li> <li>• Crime is strictly forbidding during Hajj</li> <li>• The environment is weapon-free, drug-free, alcohol-free</li> <li>• Tobacco intake is banned, curtailing the risk of inadvertent fire hazards</li> <li>• Sexual relations are not allowed, and male and female pilgrims are accommodated separately</li> </ul>

<p>Extensive pre-Hajj activities undertaken by the KSA</p>	<ul style="list-style-type: none"> <li>• The Ministry of Health liaised closely with Ministry of Hajj to ensure entry requirements and Hajj health regulations are fulfilled</li> <li>• Extensive preparations include lessons learned from the previous Hajj; preparations for the Hajj start as soon as possible after Hajj</li> <li>• Sophisticated command and control centre in place</li> <li>• Free healthcare through numerous hospitals and clinics at all points of the Hajj ritual journeys</li> <li>• Ministry of Health liaises with and updates all international public health agencies including the WHO, Public health England, European Centre for Disease Prevention and Control, and the United States Centre for Disease Control and Prevention</li> <li>• Close collaboration with relevant stakeholders (travel agents, Muslim councils, and tour organizers) in the countries where the pilgrims come from to develop appropriate material for health education</li> <li>• Issuing of vaccination and other health precautions guidelines well before the Hajj and vaccination certificates required prior to visa approval</li> <li>• Border controls to ensure fresh or unprocessed food is not imported by pilgrims</li> </ul>
<p>KSA Hajj activities</p>	<ul style="list-style-type: none"> <li>• Ministry of Hajj, Ministry of Health and Ministry of Agriculture coordinate regular pesticide spraying</li> <li>• An additional 25,000 health workers are deployed specifically for pilgrims</li> <li>• Public health teams stationed through the Hajj site supervise key public health and preventive matters</li> <li>• Screening at port of entry for vaccinations; arrangements for one dose of oral Polio vaccine for travellers arriving from polio-endemic countries and children under 15 years</li> <li>• Proactive command and control centre for Hajj</li> <li>• Use of the electronic health surveillance systems</li> </ul>
<p>Area under development</p>	<ul style="list-style-type: none"> <li>• Strategies to encourage personal hygiene behaviour (beyond educational messaging) for pilgrims and those handling food</li> </ul>

	<ul style="list-style-type: none"> <li>• Improving guidelines for non-communicable disease control</li> </ul>
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There are some measures needed to be strengthened such as garbage management, sanitation (in Mina, Arafat, and Muzdalifah), accommodation, transportation, etc.

**C. The Public health care and medical care services in post Travel phase**

Due to the long period of travel, people might bring some diseases from the source countries, or people may get sick from the journey. There is no data available for the post travel phase. It is recommended in the personal health book (every pilgrim was given before the departure to Hajj) that if the pilgrims have any illness, within 14 days after arrival, they have to inform the doctor about the travel history.

- Ministry of Health in Indonesia set up fever screening at the airports where the pilgrims arrived. When pilgrims arrived, If they look sick, they would be referred to the hospital near the International airport (18).
- In Thailand, if any notification from any health care service, that the pilgrims was ill during 14 days after the arrival, the outbreak response team from MOPH will be dispatched to conduct the investigation and disease control.

## **Chapter 4: Discussion**

In this chapter, the findings will be analyzed by using the Sendai framework

### **4.1 Introduction**

Hajj is the religious rite that requires a physical and mental effort to achieve. While performing Hajj, the pilgrims have some risks to get infected from infectious diseases, to exacerbate the pre-existing condition, get mental health problems, and sometimes risk their life. Learning from the previous lessons or the best practices from other countries' medical mission, can improve the health care for the pilgrims.

### **4.2 To understand the risks**

#### **4.2.1 The risks and the pre-existing diseases during pre-travel phase**

- Most of the pilgrims do the physical health check but there is some mismanagement of data collection in term of unclear definition of health risks and pre-travel diagnosis. The diagnosis does not follow ICD 10 which can give more accurate term of disease diagnosis.
- In data analysis process, the death rate among male pilgrims is quite higher than the female pilgrims but there is no significant difference between them even the male pilgrims have a higher prevalence heart diseases than the female pilgrims. This might be because of the high percentage of missing data which is nearly 20%. This might be the same reason why there is no significant difference in the mortality of the pilgrims between the pilgrims from deep south region and other regions.

#### **4.2.2 The risks and the pre-existing diseases, during the hajj phase**

Thai pilgrims are like pilgrims from other countries, that face a lot of environmental health risks in KSA, such as heat exposure, due to the desert climate, overcrowding and poor sanitation. More than 80% of the pilgrims got a vaccine for meningococcal meningitis and influenza prevention. There might be some chance to contract yellow fever, Leishmaniasis, rift valley fever, but it was never found among Thai pilgrims.

The most common infectious diseases among Thai pilgrims are respiratory infectious diseases. This might reflect the overcrowded condition.

Heat related illness is the common diagnosis in the other international medical mission team. This diagnosis was not found among Thai pilgrims. This needs to be clarified.

The older age group is the risk for mortality among the pilgrims because there is no limitation for the age of Hajj registrars. This is the possible cause why the high mortality rate is found among the old pilgrims. The pilgrim with the underlying disease is another risk factors associated with the mortality among the pilgrims because of most of the pilgrims have a higher rate in noncommunicable diseases like hypertension, diabetes, and hyperlipidaemia. Those underlying diseases are the precursor of the more serious diseases such as stroke and

Acute myocardial infarction. This may relate to the most common cause of death among the pilgrims which is Acute myocardial infarction.

In 2018, there is one death occurred in the pilgrims who did not have the health screening before departure. This may deviate the calculated risk in the variable underlying. The cause of the missing data might reflect the inconsistent of the screening policy in each region of Thailand.

There are some death cases from Indonesia at the international airport in Jeddah. That is why the medical mission such as India and Indonesia did set up the clinic in Jeddah to take care of their own pilgrims (33,57,58).

#### **4.2.3 The risks during post-Travel phase**

There might be some possible risks that the pilgrim may contract some infectious diseases from the local transmission in KSA, such as MERS or COVID-19. The duration of air travel is shorter than the incubation period. The Thai medical mission has informed the pilgrims in the personal medical record book that the pilgrims have to notify their doctor if they develop any illness within 14-days after home arrival. But many pilgrims might not read the book. So, there should be measures to prevent the disease outbreak, such as fever screening at the arrival hall in the home country's airport, Suspected cases should be quarantined.

#### **4.3 The governance to manage the disaster risk**

- The poor coverage of screening in other regions than deep south was found. This was possibly because of lack of well coordination between the pilgrims and local health care providers. In deep south provinces, the South Border Province Administrative Centre is the main coordinator to run this task. In other regions, there is no organization like (SBPAC). The travel agent has to do for their pilgrims. Some of the travel agent did not do very well. This is one of the reasons for the high rate of missing data.

#### **4.4 Investing in disaster risk reduction for resilience**

- The Thai medical mission is located in Mecca, only one unit as a 30-bedded community hospital. This provides less accessibility to the pilgrims, compared to the Indonesian and Indian Medical mission. They provide more satellite medical units to increase the accessibility for their pilgrims (33,57,58). It is possible for the Thai medical mission to do the same by increasing the government budget.
- Due to the high ratio of doctor and pilgrims (0.94-1.14 per 1,000 pilgrims), in certain circumstances, the number of doctors might not be sufficient, particularly during the Hajj rites in Mina, where many pilgrims get exhausted from the rites and really need medical attention and care.
- The number of paramedic is insufficient also especially for daily data management and reporting system. That is why the data has

## **Chapter 5: Conclusions and recommendations**

This chapter is to answer the objectives of the study and that is to provide recommendations for policy and practice to improve health care services before and during and after the pilgrimage

### **5.1 Conclusion**

Hajj is the spiritually religious mass gathering from Muslims worldwide. It is important to take a good care of the wellbeing of the pilgrims and the indigenous populations both in the host and home countries.

Many environmental health risks and pilgrims' underlying diseases or health conditions can induce many health problems, like communicable diseases, non-communicable diseases, mental health problems and injury. The impact of health problems during Hajj, may pose a public health threat, to the host and home countries, due to the speed of air transportation, that is faster than the incubation period of pathogens, such as virus or bacteria. The outbreak of serious contagious diseases may happen in home and host countries.

In the pre-travel phase, most of Thai pilgrims were screened and prepared for the Hajj, but not covered enough compared to the Indonesian. The pilgrims' health database was not complete enough to be studied, for establishing the linkage between determinants and health outcome. This needs to be improved. Three medical visits can be done like in Indonesia, but the government has to support, not only for the deep south, but for the whole country.

During Hajj, infectious diseases are most common, especially respiratory infections. Gastrointestinal infection and skin infection are quite common among the pilgrims. There are many diseases that were not found but cannot be excluded, such as leishmaniasis and heat stroke. This must be discussed in the operation staff meeting, on how to improve the effective medical services. The mortality rate is quite low and this may be due to the effective screening and health care service providers in KSA. For the post-travel phase, the procedure of health-problem monitoring for the returned pilgrims is not in place at the moment.

Thai health services are very good and for the Hajj. It is of most importance to use the best quality Thai health services possible, to get the best religious and health outcomes, not only for Hajj pilgrims, but also Hajj pilgrims' family members, and the rest of the Thai community.

#### **5.1.1 Enhancing disaster preparedness for effective response**

##### **Recommendations**

To lessen the potential health risks among the pilgrims and to reduce the possibility of an international diseases outbreak, a well strategic public health preparedness should be implemented.

Based on this study, a Hajj and Health Care matrix model should be introduced for Hajj medical mission's health care.

**Table 31. Hajj and Health Care Matrix Model**

Phase	Purpose	Pilgrims	Pilgrimage Hajj travel agency	Policy/ Health care service/Prevention
Pre travel (pre embarkation)	Physical and Mental health preparedness	-Physical check up -Underlying disease screening -Self-care -Health literacy -Fit to travel	-Hajj information providing to the pilgrims	-Strong political commitment to support Hajj medical mission -Medical assessment and treatment -Immunization -Health education -Research
Performing Hajj (During Hajj stay)	Morbidity and Mortality reduction	-Health risk prevention - Acclimatization -Self-care -Seeking medical attention	-Focal point regarding pilgrims' health issues -Accompanying with the pilgrims for seeking health care	-Medical service (OPD, IPD, Emergency and refer) -Hajj health surveillance -Medical collaboration with the host country -Continued health education/promotion -Research
Post travel (post disembarkation)	Outbreak prevention and life sustaining	-Self-care -Seeking medical attention -Self quarantine	-Public health announcement -Focal point regarding pilgrims' health issues	-Early detection and treatment -State quarantine -Providing annual Hajj medical mission report -Research -Preparedness for the next Hajj



### **5.2.1 Pre-travel phase**

1. Continuously strong support is needed from the Ministry of Public Health in terms of budget, health care facilities and human resources, in order to provide the best quality of Thai health services.
2. The screening policy should be enforced throughout all regions to ensure that all the data collected is consistent.
3. The Ministry of Public Health should cooperate closely with travel agencies and the Ministry of Interior to ensure
  - a. that All pilgrims visit the doctor at least three times before departure to highly effective screening for the physical fitness to join hajj.
  - b. All the pilgrims should do chest x-rays to rule out Tuberculosis.
4. The Health surveillance (database) on Hajj should be improved to be able to collect more consistent and accurate data to include more key variables: the pilgrims' occupation, education level, times of hajj.
5. The medical staff for the Hajj mission should be trained more
  - a. on how to code and data key in followed ICD10 for the precision and accuracy of the data.
  - b. on how to make a diagnosis of heat related injury, such as heat stroke.
6. The extreme age group (the pilgrims below 10 years and above 90 years), the terminal illness group, the pregnant (there might be some pregnant occurred in between medical visit and the departure) should be recommended to postpone the Hajj or not to go for Hajj for the sake of their health.

### **5.2.2 During Hajj phase**

1. The Thai government's medical mission team, should provide more satellite clinics in order to increase accessibility to the pilgrims.
2. The medical mission should dispatch a small team to Jeddah to take care of the pilgrims when they arrive and depart.

### **5.2.3 Post Travel phase**

1. Due to the speed of the plane, the pilgrims who got infected, with some communicable diseases they may not show symptoms after hometown arrival. So,
  - a. There may be a 14-day quarantine in the home country for public health security, in order to prevent the suspected infectious disease outbreak. (The quarantine depends on the situation. If it were Covid-19 and there was no vaccine available, the entire group of pilgrims should be quarantined. These measures should be done to ensure the public health security to the homeland country, for the sake of global health.)
2. There should be a seroprevalence study to compare the infection rate among the pilgrims, before and after Hajj, in some infectious diseases such as influenza, in order to have evidence-based issue for effective public health intervention.

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# Annexes

## Annex 1: Map of Thailand



Source: Administrative Map of Thailand - Nations Online Project (46)

## Annex 2: Geography of Kingdom of Saudi Arabia



Source: Administrative Map of Saudi Arabia - Nations Online Project (47)



### Annex 3: Hajj related locations

**1** Most pilgrims arrive at **Mina** on foot or by bus and are housed in air-conditioned tents.

**2** At dawn, pilgrims travel about 14 km on foot, by bus, or by train from **Mina** to **Mount Arafat**, where they spend the day praying and reading the Quran. After sunset, they travel 9 km on foot, or by bus or monorail, from **Mount Arafat** to **Muzdalifah** and a large number sleep in the open air.

**3** At sunrise, pilgrims collect pebbles at **Muzdalifah** and carry them to **Mina**. During the ritual of Stoning of the Devil at **Jamaraat**, pilgrims throw 7 pebbles at the largest of 3 pillars representing Satan, before returning to **Mina** for the night.

**4** Pilgrims travel from **Mina** to the **Grand Mosque** in **Mecca** and perform a *tawaf*, circling the Ka'aba 7 times. Pilgrims may also perform *sa'i*, walking or running 7 times between **Safa and Marwah**, before they return to **Mina**.

**5** Pilgrims stay over at **Mina** and pelt all three representations of Satan with 7 pebbles each on either two or three days.

**6** Pilgrims leave **Mina** for the final time, travel to the **Grand Mosque** for the last *tawaf*, after which they leave Mecca, ending Hajj.

**Air-conditioned tents in Mina**

**Praying in a tent in Mina**

**Traveling to Mount Arafat**

**Spending the night in Muzdalifah**

**Performing tawaf at Grand Mosque**

**Walking between Safa and Marwah**

**Stoning of the Devil**

Source: Saudi Arabia: Hajj/Umrah Pilgrimage (15)

## **Annex 4: Thai health care services in Hajj**

### **Pre-travel phase**

Before departure, Thai pilgrims has to visit the doctor at least once for health check and screening in any level (district, provincial, or regional level) that is convenient for them to visit. The screening will categorize the patients into 4 groups; normal physical examination, moderate risk, high risk, and special care or terminal illness like CA, or mental health problems like schizophrenia, bipolar, etc. (see annex). After visit, each pilgrim will be given a personal medical record book which they have to bring with all the time during their stay in KSA. Each book will be stuck with the coloured sticker to differentiate the vulnerable groups; the green sticker indicates normal physical health, the yellow means controlled underlying diseases, the red means uncontrolled underlying disease and the grey means terminal illness or special care needed (see annex). If the pilgrims are not in the category of normal physical health, they will need more 2 visits to follow up and treatment to better control the underlying disease. The pregnant were advised not to go for Hajj. The medical service is free of charge.

The definition of risk groups

1. Green = Normal physical health
2. Yellow = Moderate risk which is defined if Blood pressure is over 140/90 mmHg, or Fasting blood sugar(FBS) over 125 mg%, or pre-existing disease which is controllable such as Hypertension(HT), Diabetes mellites(DM), Allergy ,or Obesity which Body Mass Index(BMI) is over 30 kg/m<sup>2</sup> , or Hyperlipidemia (Triglyceride is over 200 mg% or Total ChloresteroL over 250 mg%)
3. Red = High risk which is defined if Uncontrolled DM (FBS is over 160 mg%) or HT is over 160/100 mmHg, or Chronic Obstructive Pulmonary Disease or Asthma, or Myocardial infarction, or Ischemic Heart Disease, or Congestive Heart Failure, or Chronic Renal Failure(CRF), or Tuberculosis (TB) or other condition such as the elderly which age over 75 years , the handicapped.
4. Grey = Special care or Terminal illness which is defined as Cancer, CRF which needed hemodialysis, DM that need insulin treatment, or Mental health problem (Psychosis, or Bipolar)

### **During Hajj phase**

#### **Thai Hajj Medical Mission setup**

Ministry of Public Health(MOPH), Thailand, recruits and sends a medical team of 32-42 health personnel (including 8-9 doctors, others are 24-33 paramedics which include nurses, pharmacists, and public health officers) to provide medical service to Thai hajj pilgrims. They will be divided into 3 teams which their operation period will be different. The first team will arrive with the first wave of the pilgrims. They will setup the clinic in Mecca and Medina (another city where the Prophet was buried. It is located north of Mecca around 400 km.). They will register the clinic to get the license from the Ministry of Health (Saudi Arabia), declare the custom to pick up the medical supply from Thailand at the Saudi Arabia's airport store and send the smaller team to run the clinic in Madinah. The clinic in Mecca is located in an 11 floor hotel which they rented and turned it to be the temporary hospital which can

provide ER, OPD, 30 beds IPD services and residential area for their medical teams. The operation time is 24 hours. OPD service opens from 5.00 a.m. until 10.00 p.m. After that, there will be a night shift service by on call medical team until 5.00 a.m.. The Nurse will screen and take note the basic information of the patient then take the patient to see the doctor. The doctor will do physical exam, give diagnosis and prescription. The nurse will take doctor order and give the patient treatment and the pharmacist will give the prescribed medicine. If the patients need not to be admitted, they can go back to their accommodation but if the patients need to be admitted, they will be admitted in IPD which the IPD nurses will take care of them. The medical data of the patients will be keyed in by the Public health staff. They use Thai Hajj surveillance which is the web-based database program from [www.sasuk12.com](http://www.sasuk12.com) for data entry.

If the patients need to be referred, there will be a referral system to transfer the patient to the local tertiary care hospital in Saudi Arabia. If the patients die, they will be buried in the cemetery in the city. There is no sending back to the country of origin.

There were 2 ambulances and 1 van for transportation. These vehicles belong to Thai government and will be used during the Hajj season for 2 months. After that, they will be parked in the Thai consulate in Jeddah (the city which is south from Mecca around 70 km).

The clinic in Madinah will be set up by renting an apartment which may be different from the previous year. The clinic is smaller than the clinic in Mecca. The medical team will provide the OPD service only. There will be referral system to transfer the patients to the Saudi Arabia hospitals via Saudi Arabia ambulance vans.

The second team will follow the first team 2 weeks later to join the first team for the number of the patients is increasing due to the near coming Hajj period. And the last team will join to accommodate the peak of the patients a week before the Hajj started. When the Hajj started, the medical mission will close both the hospital and the clinic then the staff will be divided into 4-5 teams to stay with the groups of Thai pilgrims at Hajj sites. During this time, the Ministry of Health, Saudi Arabia, did not allow any medical practice by foreign medical personnel. Only the Saudi Arabian Health personnel can provide health care service to all the pilgrims by Saudi Arabia's health care system. All the activities that Thai medical mission can do are to visit the Thai pilgrims and take them to health center when needed. Once Hajj period ended, all the teams will come back to the Hospital in Mecca and dispatch the small medical team to run the clinic in Madinah. At this point, the first medical team will return to Thailand home country in a week later then followed by the second team because the work load is decreasing due to the fact that the Thai pilgrims return to Thailand as well. When the Hajj season ended, the last medical team will check medical stock, write the operational report and close both units in Mecca and Medina, then return to home country, Thailand.

### **Post travel phase**

After arrival, if the pilgrim has illness within 14 days, He or She has to tell the physician that they recently came back from Hajj. The doctor will notify the public health officer to conduct the investigation for public health response.

# Annex 5: Medical Record for Thai pilgrims

THAILAND  
تايلاند

Stickers for 3 medical visits before pilgrim's departure to categorize the vulnerable groups

Pilgrim's medical record  
สมุดสุขภาพเพื่อเป็นการรักษาพยาบาล  
**HEALTH PASSPORT**  
فندوان كصيحاتان

กระทรวงสาธารณสุข  
มกราคม 2562  
January 2019

Instructions for the pilgrims on how to use this personal medical record  
คำอธิบายการใช้สมุด

1. สมุดเล่มนี้ใช้เฉพาะผู้ประกอบพิธีฮัจญ์ชาวไทยเท่านั้น
2. ระหว่างการเดินทางไปประกอบพิธีฮัจญ์ให้นำสมุดนี้ติดตัวตลอดเวลาและให้นำสมุดนี้ไปทุกครั้งเมื่อไปรับบริการตรวจรักษาที่หน่วยพยาบาลไทย ทั้งนี้เมื่อฉันทันทีเมื่อมีโรคภัยที่รุนแรงขอแพทย์ และห้ามมิยา
3. อย่าทำสมุดนี้หายและให้นำสมุดนี้กลับประเทศไทยเพื่อการดูแลรักษาพยาบาล
4. หน่วยพยาบาลไทยให้บริการผู้ประกอบพิธีฮัจญ์ชาวไทยโดยไม่คิดค่าใช้จ่าย

Passport No. \_\_\_\_\_  
Hajjcode \_\_\_\_\_  
เลขบัตรประชาชน (ID) \_\_\_\_\_  
ชื่อ (Name) \_\_\_\_\_  
นามสกุล (Surname) \_\_\_\_\_  
อายุ (Age) \_\_\_\_\_  
ที่อยู่ (Address) \_\_\_\_\_  
อำเภอ (District) \_\_\_\_\_ จังหวัด (Province) \_\_\_\_\_  
โทรศัพท์(มือถือไทย) (Mobile in Thai) \_\_\_\_\_  
โทรศัพท์(มือถือใน KSA) (Mobile in KSA) \_\_\_\_\_  
บริษัท (Travel agent) \_\_\_\_\_  
ชื่อผู้นำกลุ่ม (Tour leader's name) \_\_\_\_\_

2 ข้อมูลด้านสุขภาพ Health data

โรคประจำตัว : Underlying Disease

- โรคโลหิตจาง Hematological diseases
- โรคหอบหืด Asthma, or other lung diseases
- โรคหัวใจ Heart disease
- โรคความดันโลหิตสูง Hypertension
- เบาหวาน Diabetes mellitus
- โรคไต Liver, kidney disease
- โรคข้อกระดูก Orthopedic disease
- โรคหลอดเลือด Strokes
- โรคทางจิตเวช Psychiatric disease
- ภาวะเสี่ยงอื่น ๆ Other health risk

ประวัติการแพ้ยา (Drug Allergy) :  
 ไม่มี  
 มี

ภาวะตั้งครรภ์ (Pregnancy) :  
 D (Yes) S4  
- G.P.A.G.A. \_\_\_\_\_ weeks ณ วันที่ตรวจ Date \_\_\_\_\_  
 ไม่มี (No) ณ วันที่ตรวจ Date \_\_\_\_\_  ไม่ทราบ No test

น้ำหนัก (BW) \_\_\_\_\_ กิโลกรัม (KGS)  
สูง (HT) \_\_\_\_\_ เซนติเมตร (CM.)  
ดัชนีมวลกาย (BMI) \_\_\_\_\_ กก/ม.ก.  
ความดันโลหิต (BP) \_\_\_\_\_ มม.ปรอท  
FBS/DTX : Yes No Pack per day  
สูบบุหรี่ Yes No  
ผลการตรวจหาเชื้อ HIV (ถ้ามี) (Lab) \_\_\_\_\_  
กรุ๊ปเลือด Blood group \_\_\_\_\_ ลิ้นจี่รสอ่อน Lung x-ray finding \_\_\_\_\_

Doctor's opinion \_\_\_\_\_  
Doctor's signature \_\_\_\_\_  
ตำแหน่ง \_\_\_\_\_ วันที่ตรวจ \_\_\_\_\_  
ชื่อ \_\_\_\_\_ วันที่ \_\_\_\_\_  
ชื่อสถานพยาบาล Hospital's name \_\_\_\_\_

4 บันทึกการตรวจสุขภาพเบื้องต้น Summary

Dx 1 \_\_\_\_\_  
Dx 2 \_\_\_\_\_  
Dx 3 \_\_\_\_\_

ยาที่ใช้ (Medication) : \_\_\_\_\_

Date \_\_\_\_\_

บันทึกการตรวจครั้งที่ 1 ว.ค.ป. \_\_\_\_\_

- สุขภาพปกติ (สีเขียว) Normal health = Green sticker
- ภาวะเสี่ยงปานกลาง (สีเหลือง) Moderate risk = Yellow sticker
- ภาวะเสี่ยงสูง (สีแดง) High risk = Red sticker
- ภาวะเสี่ยงสูงมาก (สีเทา) Very high risk = Grey sticker

เกณฑ์การตรวจสุขภาพเบื้องต้น (สีเขียว) Normal health = Green sticker

- ความดันโลหิต < 140/90
- น้ำตาลในเลือด < 125 mg/dl
- ค่าไขมันทั้งหมด < 200 หรือ CHOL < 250
- ไม่มีโรคเรื้อรัง
- ไม่มีโรคเรื้อรัง (TB)
- อายุ < 75 ปี

เกณฑ์การตรวจสุขภาพเบื้องต้น (สีเหลือง) Moderate risk = Yellow sticker

- ความดันโลหิต > 140/90
- น้ำตาลในเลือด > 125 mg/dl
- ค่าไขมันทั้งหมด > 200 หรือ CHOL > 250
- ไม่มีโรคเรื้อรัง
- ไม่มีโรคเรื้อรัง (TB)
- อายุ > 75 ปี

เกณฑ์การตรวจสุขภาพเบื้องต้น (สีแดง) High risk = Red sticker

- ความดันโลหิต > 160/100
- น้ำตาลในเลือด > 160 mg/dl
- ค่าไขมันทั้งหมด > 300 หรือ CHOL > 350
- ไม่มีโรคเรื้อรัง
- ไม่มีโรคเรื้อรัง (TB)
- อายุ > 75 ปี

เกณฑ์การตรวจสุขภาพเบื้องต้น (สีเทา) Very high risk = Grey sticker

- ภาวะเสี่ยงต่อมะเร็ง Cancer
- โรคไตหรือโรคไตเรื้อรัง Renal dialysis
- ภาวะความผิดปกติของอินซูลิน Insulin needed
- โรคจิตเวช (Psychosis, Bipolar)

Doctor's signature \_\_\_\_\_  
ตำแหน่ง \_\_\_\_\_ วันที่ตรวจ \_\_\_\_\_  
ชื่อ \_\_\_\_\_ วันที่ \_\_\_\_\_  
ชื่อสถานพยาบาล Hospital's name \_\_\_\_\_

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2nd visit Date \_\_\_\_\_

บันทึกการตรวจสุขภาพครั้งที่ 2 ว.ค.ป. \_\_\_\_\_

ความดันโลหิต Blood pressure \_\_\_\_\_

อาการสำคัญ Chief complain \_\_\_\_\_

Lab (ถ้ามี) Laboratory \_\_\_\_\_

การรักษา Treatment \_\_\_\_\_

นัดครั้งต่อไป Next follow up \_\_\_\_\_

ภาวะสุขภาพ  สีเขียว Green  สีเหลือง Yellow  สีแดง Red  สีเทา Grey

ชื่อ \_\_\_\_\_ ตำแหน่ง \_\_\_\_\_ วันที่ตรวจ \_\_\_\_\_

Medical history records

ประวัติการตรวจสุขภาพ (บันทึกโดยแพทย์ประจำหน่วยพยาบาลไทย)

Date \_\_\_\_\_ Time \_\_\_\_\_

Note \_\_\_\_\_

7.4

Date / Time

Discharge Summary

Admit Date	D/C date	Dx	Tx

7.5

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Discharge Summary

Admit Date	D/C date	Dx	Tx

Health status after coming back from Hajj

Date

ว.ศ.ป. /

☐ สุขภาวะปกติ (สีเขียว)

☐ ภาวะเสี่ยงปานกลาง (สีเหลือง)

ตรวจสอบความเสี่ยงปกติ

- ☐ ความดันเลือด <= 140/90
- ☐ น้ำตาลในเลือด > 125
- ☐ อัตราส่วนค่า BMI ภาวะความเสี่ยงต่ำกว่าปกติ < 25
- ☐ ภาวะอ้วน (BMI >= 30)
- ☐ ไนโตรเจนในเลือด (TG <= 200 หรือ CHOL <= 250)

☐ ภาวะเสี่ยงสูง (สีแดง)

- ☐ ภาวะอ้วน ภาวะเสี่ยงสูงไม่ได้ (FBS >= 160 BP >= 160/100)
- ☐ โรคหอบหืด (COPD, Asthma)
- ☐ โรคหัวใจ (MI, IHD, CHF)
- ☐ โรคไตเรื้อรัง (CRF)
- ☐ วัณโรคปอด (TB)
- ☐ ภาวะอื่นๆ ที่เกี่ยวข้องกับโรค (อายุ > 75 ปี ผู้ป่วยเรื้อรังชนิดอื่นได้)

☐ ภาวะมีความผิดปกติ (สีฟ้า)

- ☐ โรคเนื้องอกและมะเร็ง
- ☐ โรคหัวใจหลอดเลือด
- ☐ ภาวะความผิดปกติของอวัยวะ
- ☐ โรคจิตเวช (Psychosis, Bipolar)

Check list before departure such as vaccinations, health screening, etc.

Medical advice

1. นำชุดสุขภาพส่วนตัว ไปทุกที่ เว้นแต่ใช้รถสาธารณะ
2. กรณีไปต่างประเทศ ต้องนำบัตรสุขภาพส่วนตัวไปแสดงต่อเจ้าหน้าที่ / หน่วยงานที่เกี่ยวข้อง
3. กรณีไปต่างประเทศ ต้องนำบัตรสุขภาพส่วนตัวไปแสดงต่อเจ้าหน้าที่ / หน่วยงานที่เกี่ยวข้อง
4. สามารถติดต่อ เจ้าหน้าที่อาสาสมัคร หรืออาสาสมัครสาธารณสุขประจำหมู่บ้าน (อสม.)
5. กรณีมีอาการป่วย ควรปรึกษาแพทย์หรือเภสัชกร
6. นำชุดสุขภาพส่วนตัวไปทุกที่ เว้นแต่ใช้รถสาธารณะ

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Key contact phone number e.g. Department of Disease Control, Thailand

1. กรมควบคุมโรค กระทรวงสาธารณสุข โทร. 02-5903021, 02-5903160-1
2. ศูนย์บริหารการฟื้นฟูสุขภาพผู้กลับจากฮัจญ์ โทร. 074-441373
3. สำนักงานสาธารณสุขจังหวัด / โรงพยาบาลในพื้นที่ของท่าน

หมายเหตุ มีจุดหมายไว้บนชุดสุขภาพ สามารถติดต่อหน่วยงานขนส่งและหน่วยงานที่เกี่ยวข้องได้

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บันทึกเพื่อการส่งต่อและติดตามต่อเนื่อง

Record for follow up

คำแนะนำ

Medical advice

ในการเดินทางไปประกอบพิธีฮัจญ์ ควรนำยาสามัญติดตัวไปด้วยเพื่อใช้ในยามฉุกเฉิน หรือเมื่อมีอาการเจ็บป่วยเล็กน้อย เช่น

1. พลาสเตอร์ ยานอน ยาแก้ปวด ยาแก้แพ้
2. ยาแก้ไอ
3. ยาแก้หวัด หรือยาแก้คัดจมูก
4. ยาแก้ท้องเสีย หรือยาระบายอ่อนๆ
5. ยาระบาย หรือยาถ่าย
6. ยาแก้แพ้หรือแก้คัน
7. ผู้ที่มีโรคประจำตัวและจำเป็นต้องใช้ยาเป็นประจำ ควรนำยาติดตัวไปด้วยอย่างน้อย 2 เดือน และมีใบรับของ จากใช้จากแพทย์
8. หลังกลับจาก ฮัจญ์ ภายใน 14 วัน หากมีอาการไข้ ไอ เจ็บคอ มีน้ำมูก กรุณาติดต่อสถานพยาบาลใกล้บ้าน หรือ โทร 1669

## Annex 6: Diagnosis code in pre-travel health screening and during hajj 2016-2018

Diagnosis code	Group of diseases
100 (101-104)	Respiratory disease
110 (111-114)	Musculo skeletal disease
120 (121-124)	cardiovascular disease.
130 (131-134)	Ear Nose Throat disease
140 (141-144)	chest disease
150 (151-154)	Skin disease
160 (161-164)	Gastro intestinal disease
170 (171-174)	Eye/Mouth disease
180 (181-184)	Genito urinary disease
190 (191-194)	Endocrine disease
200 (201-204)	Miscellaneous
210 (211-214)	Wound, Fracture, Burns
220 (221-222)	Gynecology-Obstetric disease
230 (231-233)	Mental & Psychiatric diseases

- 100 Respiratory disease  
 -101 Upper respiratory infection/ Pharyngitis 102 COPD 103 Asthma 104 Pneumonia
- 110 Musculo skeletal disease  
 -111 Myalgia 112 osteoarthritis knee 113 this herniation. 114 fatigue
- 120 cardiovascular disease.  
 -121 hypertension 122. Congestive heart failure. 123 Acute myocardial infraction.
- 124 Ischemic heart disease.
- 130 Ear Nose Throat disease.  
 -131 Tonsillitis. 132 otitis media. 133 Cellulitis/ Abscess 134. Otitis externa
- 140 chest disease.  
 -141 dyspnea 142 respiratory failure. 143 TB 144 chest pain
- 150 Skin disease  
 -151 Dermatitis 152 Dry skin 153 Sinusitis 154 Tenia
- 160 Gastro intestinal disease  
 -161 Dyspepsia/ Peptic ulcer 162 Abdominal pain 163 Diarrhea 164 vomiting
- 170 Eye/Mouth disease  
 -171 Conjunctivitis 172 Cataract 173 dental carries 174 Aphthous ulcer
- 180 Genito urinary disease  
 -181 cystitis 182 urethral calculi/ renal calculi 183 Renal failure 184 urinary incontinence
- 190 Endocrine disease  
 -191 Diabetes 192 Hyperglycemia 193 Diabetic keto acidosis 194 Hyperosmolar coma
- 200 Miscellaneous  
 -201 Headache 202 dizziness 203 Fever 204 Vertigo
- 210 Wound, Fracture, Burns  
 -211 Wound 212 Fracture 213 Burns 214 Diabetic foot
- 220 Gynecology-Obstetric disease  
 -221 Bleeding per vagina 222 dysmenorrhea
- 230 Mental & Psychiatric diseases  
 -231 Anxiety 232 Depressive 233 Psychosis