

Assessing and Mitigating Risks for Hajj 1437 (2016)

Introduction

Hajj (pilgrimage) is the fifth pillar of Islam and is obligatory for every Muslim male or female at least once in a lifetime, provided that he/she is free, an adult or mature enough, of sound mind, and has the ability to afford the journey and maintain one's dependents back home for the duration (1).

The number of pilgrims undertaking the Hajj has increased from 58 584 in 1920 to 3 161 573 in 2012 (1 752 932 from outside Saudi Arabia). However, since the introduction of permits to pilgrims for there has been a reduction in the number of pilgrims from Saudi Arabia and other countries with the number of pilgrims declining to approximately 2 million between 2013 and 2015 and declining to 1,862,909 pilgrims in 2016 (1,325,372 foreign and 537,537 domestic pilgrims). (Figure 6) (2)

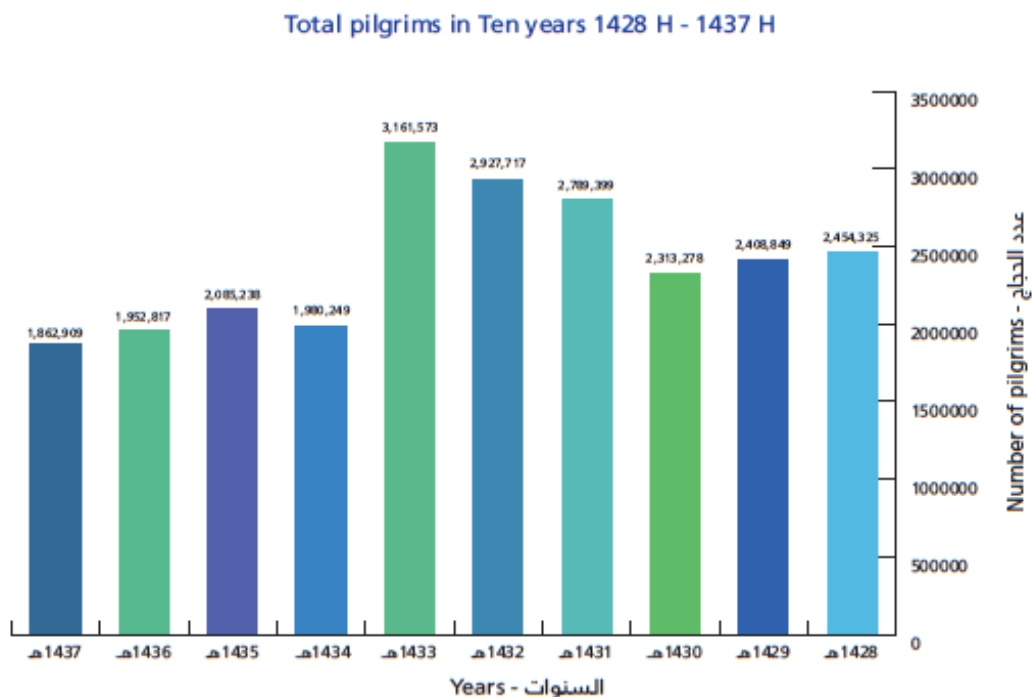


Figure 1: Total number of Pilgrims between 2007 and 2016 (Source: General Authority for Statistics) (3)

On the eighth day of the Zil-Hijjah, most pilgrims gather in Mina. This is approximately a 3-kilometer square area where pilgrims are housed in tents that accommodate 50-100 people. At early dawn on the 9th Zil- Hijjah, pilgrims travel approximately 13km to Arafat to complete a compulsory act of Hajj. Pilgrims engage in prayer from noon till dusk. At the onset of dusk, pilgrims move to Muzdalifah (10km back) to collect their pebbles – for the jamaraat rite-perform prayers and rest overnight under open skies. At the break of dawn or for some after midnight, the pilgrims move back to Mina for pelting the Jamaat (a ritual act in commemoration of the action of Prophet Abraham)– throwing the seven collected pebbles on the big jamaraat (Figure 2). Pilgrims offer a sacrifice an animal – as part of the rites-, shave their heads` hair and go back to Makkah for the Tawaf and Sa`ee. The pilgrim then returns to Mina for a further two or three days and pelts all three jamarats on the remaining days. They move between ritual sites in fully loaded buses, trains or on foot.

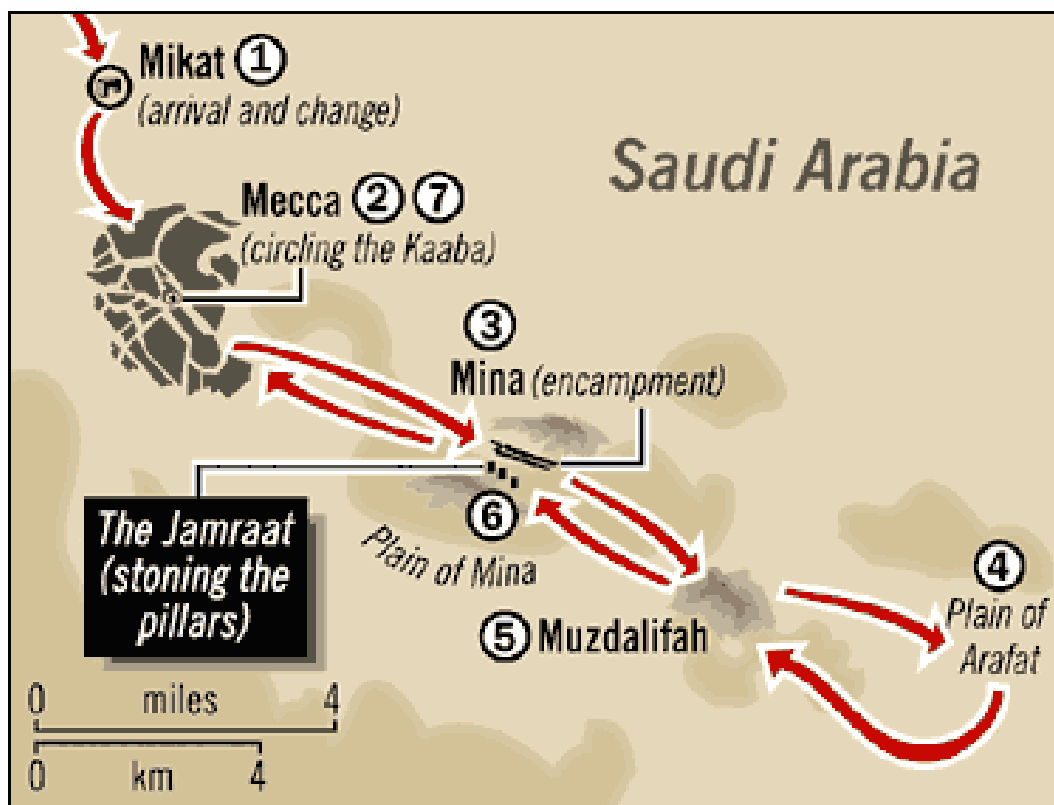


Figure 2: Pilgrim route for Hajj (Source: Perry-Castaneda map collection [http://www.lib.utexas.edu/maps/])

Mass Gatherings such as Hajj pose logistical as well as health related challenges. Logistical challenges include crowd management, security, and emergency preparedness. Violence and Crowding may predispose and result in Stampedes and crush injuries (3) lacerations, trampling, head injury and musculoskeletal injuries (4). Outdoor events are associated with heat-related illness as result of complications of exposure, dehydration, sunburn, and heat exhaustion. Other health hazards arise from lack of food hygiene, inadequate waste management, and poor sanitation (3).

Due to the close proximity of pilgrims with each other, mass gatherings provide a fertile environment for Individuals to transmit communicable diseases to many others, who then return to their homes. In the current decade of social unrest and terrorism mass gatherings may provide opportunities for terrorist activities-both chemical and bio-terrorist attacks (4).

The annual Hajj has been affected by numerous disasters starting as far back as 1975, when a fire spread across pilgrim's tents killing 200 pilgrims. Over the last decade, major disaster incidents included a hotel collapse (2006) killing 76 and injuring 64; a stampede on the last day of the Hajj (2006) in Mina killing at least 346 pilgrims and injuring at least 289 more; a crane fall in the grand mosque ten days before Hajj (2015) resulting in 118 people dead and 394 injured and a September 2015 stampede with an estimated 2,411 pilgrims killed (5). In addition to major disaster events, numerous infectious disease outbreaks such as Meningitis and Influenza have also been reported.

The rapidly changing global environment both in terms of technological development, human and environmental threats impact directly on mass gatherings and Hajj in particular. Continuous strengthening of the preparedness and response capacity of the Kingdom is essential to ensure the health and well-being of the pilgrim.

The Kingdom of Saudi Arabia prides itself in the service of the guests of the Almighty and has invested a huge amount of resources in upgrading the infrastructure,

implementing a quota system for Hajj and developing a well coordinated plan under the Supervision of the Supreme Hajj Committee to mitigate against these challenges.

Over the years, the Ministry of Health (MoH) has been involved in Hajj planning, coordinating with other agencies to ensure the provision of essential health services during Hajj, with a very little emphasis pro-active risk assessment and management. To provide such a platform for intelligence gathering through surveillance, operational research to strengthen implementation plans, risk and capacity assessment to mitigate against any serious risks, knowledge acquisition, dissemination and international collaboration as well as capacity transfer the Global Centre for Mass Gatherings Medicine (GCMGM) was established as a World Health Organisation (WHO) Collaborating Center in 2012 and obtained Supreme Decree Approval (#7190) in 2013.

In addition to surveillance, a key activity of the GCMGM for 1437 (2016) was to pro-actively assess the risks for Hajj and develop mitigating plans. The current manuscript presents the approach and the results from the risk assessment.

Methodology

The International Organisation for Standardization (ISO) 31000:2009 provides principles, framework and a process for managing risk that can be used by any organization. The framework adopts a five-step approach: Establishment of the context, Risk Assessment; Risk Treatment; Monitoring and Review and Communication and consultation (Figure 3) (6).

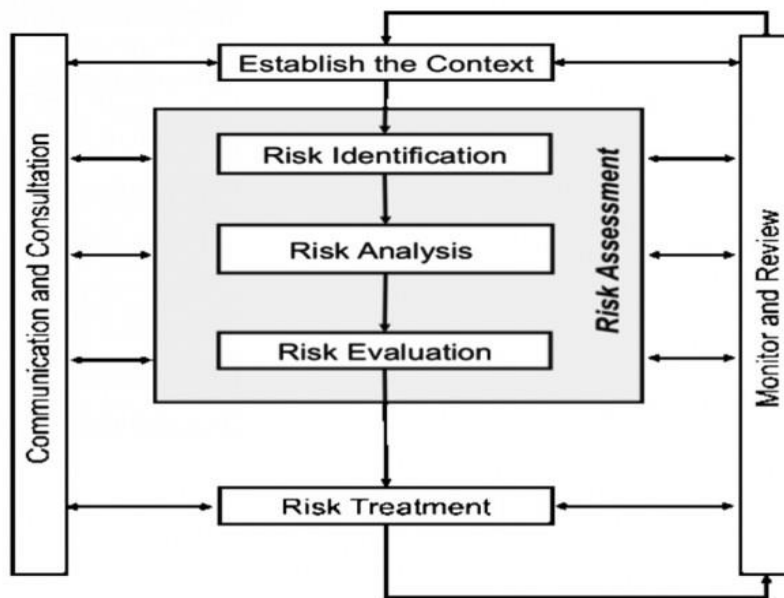


Figure 3: ISO 31000: 2009 Risk Management Process (Source: ISO 31000-Risk management)

The following steps were followed in assessing the risk for Hajj 2016.

1. Establishment of the Risk Assessment Team

A risk assessment steering committee under the custodian of the Deputy Minister for Public Health, Ministry of Health Saudi Arabia was constituted and included the Head, Hajj Preparatory Committee, Director General of Health Affairs, Mecca Region, Director General, Medina Health Directorate, Assistant Director General of Health Affairs for Public Health, Mecca Region, Supervisor General of Health Services for

Hajj and Umra, Director general, Global Center for Mass Gathering Medicine (GCMGM) and the Director, Field Epidemiology Training Program.

Subject matter experts from the Food and Water Safety; Disease Vector Units Malaria Programme; Health Education; Infectious Disease Control; Infectious Diseases Department; World Health Organisation; Emergency Department, Makkah and Medina; Health Facilities Infection Control and the Health Information department were consulted.

The core team for the risk assessment consisted of a team from the Global Centre of Mass Gathering Medicine and field workers from the Field Epidemiology Training Programme as well as subject matter experts from the MOH relevant directorates.

2. Contextual Assessment

The Risk Assessment team conducted a review of various data sources such as the World Health Organisation, World Bank, Central Intelligence Agency of the United States and Center for Disease Control in United States databases as well as database for the General Ministry of Statistics in the Kingdom of Saudi Arabia in order to develop a country profile for Saudi Arabia

3. Risk identification

An all-hazard risk identification strategy was adopted. The risk assessment team reviewed literature for trends in disease outbreaks in Saudi Arabia, inspected standard operating procedures and analysed the contextual factors to identify internal and external risks.

4. Risk characterization

The risks were characterized using the risk matrix that combines the probability of a threat occurring and the consequences (impact) of that event. For each identified hazard, a data collection tool – questionnaire- was developed and each indicator was given a score from 1 (minimum) to 5 (maximum) according to its relevance and impact on hazard`s risk. Similarly, an indicator weight was assigned from 1

(minimum) to 10 (maximum) in order to calculate the weighted score for the indicators and subsequently for the hazard. Afterwards, mapping of data sources was carried out – by the project team- to determine whether or not the data source is from the MOH and to schedule the visits for interviewing the stakeholders. Data collection was conducted between 5th April and 5th May 2016 on potential threats, identifying vulnerability factors and mitigating shortcomings through interviewing the MOH officials and relevant stakeholders, reviewing the current available guidelines and procedures as well as revising the published articles and annual MOH reports. The team and subject matter experts allocated indicator scores during data collection. The collected data was daily shared with subject matter experts for input and feedback then their comments were reviewed and distributed to all the project groups including subject matter experts and the steering committee.

Table 1: Risk characterization likelihood and potential consequences (Source: World Health Organisation) (7)

Level	Definition
Almost certain	Is expected to occur in most circumstances (e.g. probability of 95% or more)
Highly likely	Will probably occur in most circumstances (e.g. a probability of between 70% and 94%)
Likely	Will occur some of the time (e.g. a probability of between 30% and 69%)
Unlikely	Could occur some of the time (e.g. a probability of between 5% and 29%)
Very unlikely	Could occur under exceptional circumstances (e.g. a probability of less than 5%)

	Potential impact on the MG	Potential impact on public health
Minimal	Little or no consequence or disruption to the MG	Little or no consequences
Minor	Small impact on MG can be managed with little impact on the event	Few illness or injuries which public health and medical services can manage
Moderate	Some controlled impact on the Games and reputation for host	Death and or injuries or illness occur. Public and medical services are strained
Major	Event is disruptive to MG and reputation of host	Many deaths, injuries or illness. Disrupts public health and medical services
Severe	Event causes cancellation of some or all of MG. Significant adverse impact on MGs and host reputation.	Substantial loss of life and serious injuries or illness. Widespread disruption of local services and infrastructure

5. Risk Management

The team carried out focus group discussions, in order to develop evidence-based recommendations and mitigation measures for the coming hajj seasons accordingly. The preventive recommendations were sent to the subject matter experts for review and approval, then shared with all the groups and presented to the steering group committee and finally to the hajj preparatory committees who will be the actual users of these recommendations and measures.

Results

Table 2 below provides a summary of the risks, characterization and risk management strategies as proposed for Haj 1437. Crowd related events and health related illnesses were characterized as high risks, whilst all the other risks were classified as moderate risks.

Table 2: Risk identification, characterization and management for Hajj 1437

No:	Risk Identification	Risk Characterisation	Risk Management interventions
1.	<p>All Hazard Risk</p> <ul style="list-style-type: none"> • Pilgrim profile- Age > 60 years and co-morbidities • Increased numbers- requirement may outstrip supply of care • Staff training prior to Hajj • Medicines and supplies procurement and logistics 	Moderate	<ol style="list-style-type: none"> 1. Pre-departure screening of adults aged 50 years and above for chronic diseases 2. Point of source capturing of data that should be integrated with hajj surveillance system 3. Establish well-equipped health posts at intervals of 800 metres or approximately within 20 minutes walking distance, at safe locations along the Hajj route, 4. Develop an electronic monitoring system for the utilization of

			<p>medical supplies to prevent stock outs, especially during mass-casualty events.</p> <p>5. Conduct the training of healthcare workers in time before the commencement of Hajj (at least one month before Haj)</p>
2.	<p>Middle East Respiratory Syndrome- Corona Virus (MERS-CoV)- MERS-CoV remains a threat during Hajj, due to the current outbreak of the disease in KSA. The current IPC guideline for MERS-CoV in Saudi Arabia, is well developed, regularly updated and widely disseminated among relevant stakeholders. However, the guideline does not include the protocol for contact tracing and isolation of case contacts intending to participate in the Hajj, or those who are already in Hajj before the patient was diagnosed</p>	Moderate	<ol style="list-style-type: none"> 1. Asymptomatic contacts of confirmed cases diagnosed within 2 weeks of commencement or during 1437 Hajj, intending to participate in Hajj should be restricted from embarking on the current pilgrimage 2. Asymptomatic contacts of confirmed cases diagnosed within 2 weeks of commencement or during 1437 Hajj, already in Hajj should be isolated, regardless of laboratory investigation results for MERS-CoV. Public health officials should take an informed decision, based on current capacities for continuation of Hajj for an isolated pilgrim. 3. Establish an isolation area, away from health facilities for asymptomatic contacts of laboratory confirmed cases of MERS-CoV during Hajj

3.	Airborne infections- are common during Hajj and could range from acute upper respiratory tract infections to more severe lower respiratory tract infections	Moderate	<ol style="list-style-type: none"> 1. Introduce influenza vaccination as a mandatory requirement for participation in Hajj 2. Revise current health education messages, taking into consideration globally accepted standards for content development and the cultural and religious practices of pilgrims, for the 1437 Hajj 3. Ensure the development of a harmonised risk communication plan for the Hajj and establish a risk communication unit in the MoH 4. Provide and sustain necessary infrastructure, including HEPA filters, calibrated monitors and sealed doors in designated isolation rooms in each hospital, to meet global standards for infectious diseases prevention and control, as part of preparedness for the next Hajj.
4.	Foodborne illnesses- Outbreaks of foodborne infectious diseases are common during Hajj- linked to poor storage of prepared food by pilgrims and unregulated street food hawking in Arafat.	Moderate	<ol style="list-style-type: none"> 1. Street hawking in Arafat and Musdalifa during Hajj should be regulated 2. Design pre-evaluated messages for prevention of food borne diseases during Hajj and

			<p>disseminate it widely to pilgrims,</p> <ol style="list-style-type: none"> 3. Improve the surveillance capability of primary health centres and medical offices for pilgrims, 4. Strengthen the capacity of the regional laboratory in Mecca to provide standard services regarding the detection of potential complex chemicals and biological contaminants of food and water during Hajj
5.	<p>Vector borne illness- are potential threats to the well-being of pilgrims during Hajj. Dengue fever, malaria Yellow fever, Zika virus</p>	Moderate	<ol style="list-style-type: none"> 1. Conduct a vector surveillance survey for Zika virus, yellow fever and other mosquito borne pathogens to identify existing pathogens and to map the distribution of vectors within the Hajj areas, including transit points in KSA 2. Provide strict regulations and monitor firms involved in vector control, to ensure the use of effective and safe insecticides at specified period before and during Hajj 3. Provide laboratory capacity for the detection and characterisation of yellow fever virus and Zika virus in Makkah

			4. Enforce vaccination requirements
6.	Crowd-related incidents such as crushes and stampedes occur commonly during mass gatherings.	High	<ol style="list-style-type: none"> 1. Develop pre-evaluated health education messages for pilgrims, highlighting the prevention strategies and survival skills for crowd-related incidents 2. Introduce a high alert for crowd management on day 12th Dhill Hijja based on historical evidence of previous stampedes, 3. Consider the use of public communication systems, such as loud speakers to reassure anxious pilgrims and communicate risks, including broadcasting pre-specified instructions to support the clearing of an area to gain access to casualties and to follow the instructions of response personnel during an emergency. This would improve crowd control initiatives and prevent further panic and injuries during mass casualty events.
6.	Heat related illnesses- Heat illnesses, including heat stroke and heat exhaustion contributed to 24% of hospital admissions during the 1436 Haj	High	<ol style="list-style-type: none"> 1. On-going construction of ventilated shades covering the walking areas, and shower rooms at regular intervals along the Hajj 2. Heat illnesses prevention and

			<p>control strategies, including early arrival of pilgrims from countries having mostly low temperatures for acclimatisation, hydration with drinking water and the need for physical fitness into the public health pre-travel advice and requirement for pilgrims/visitors travelling to KSA for the Hajj</p> <ol style="list-style-type: none">3. Establish cool drinking water distribution points at intervals of 500 metres along the Hajj route or approximately within 30 minutes walking distance, given the crowded conditions expected during Hajj with focus on walking roads 64. Establish well-trained heat illness management teams and infrastructures in selected PHCs, especially in Mina and Arafat, and on the road between, to promote early recognition of cases, prompt management of heat cramps and heat exhaustion, and facilitate referral of heat stroke cases to hospitals5. Improve capacity of health facilities to deal with heat related illnesses6. Liaise with the religious Fatwa to
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			<p>recommend the performance of rituals at nights or periods of low temperature to limit the exposure time to heat wave for elderly pilgrims and those with comorbidities.</p>
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