Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Pausing superspreader events for COVID-19 mitigation: International Hajj pilgrimage cancellation

In view of the ongoing COVID-19 pandemic and for avoiding superspreader events, Saudi Arabia on June 22, 2020 announced restriction of international visitors for the 2020 annual Hajj pilgrimage to Mecca and for the domestic population with chronic diseases and aged 65 years and older [1]. Although the holy sites will remain open, limiting access to no more than 1,000 people (who already reside in Saudi Arabia) to the holy sites that would normally be crowded by 3–5 million pilgrims will enable the health authorities assure adequate physical distancing and implement disinfection measures. The new restrictions add to the existing restrictions on the less well-known year--around pilgrimage called Umra that was suspended on March 3, 2020 [2,3].[Fig. 1] The first such decision for suspension of Hajj to international pilgrims since over 200 years, and ever in the history of modern Kingdom of Saudi Arabia, is a protection strategy not just to the Muslim pilgrims and their home countries, but to global health security and from a whole world consideration of pandemic mitigation.

This action is highly relevant to COVID-19 due to three reasons; 50% of the routine pilgrims are elderly and with comorbid conditions; two-thirds originate from countries with sub-optimal public health capabilities or are in conflict situations, where additional sources of seeding of SARS-CoV-2 infections should be avoided at all cost; and respiratory infections are most common during the Hajj, usually affecting 80% [4,5].

Cancellation of Hajj is uncommon. The last restriction of international pilgrims for the Hajj was between the years 1798 and 1801, during the incursions of Napoleon's military aimed at checking British colonial influence in the region. Hajj, unlike any other mass gatherings, is an event of huge religious, geopolitical, and economic significance to multiple stakeholders including the 24% of the world population that are Muslims, governments with high population of Muslims, and

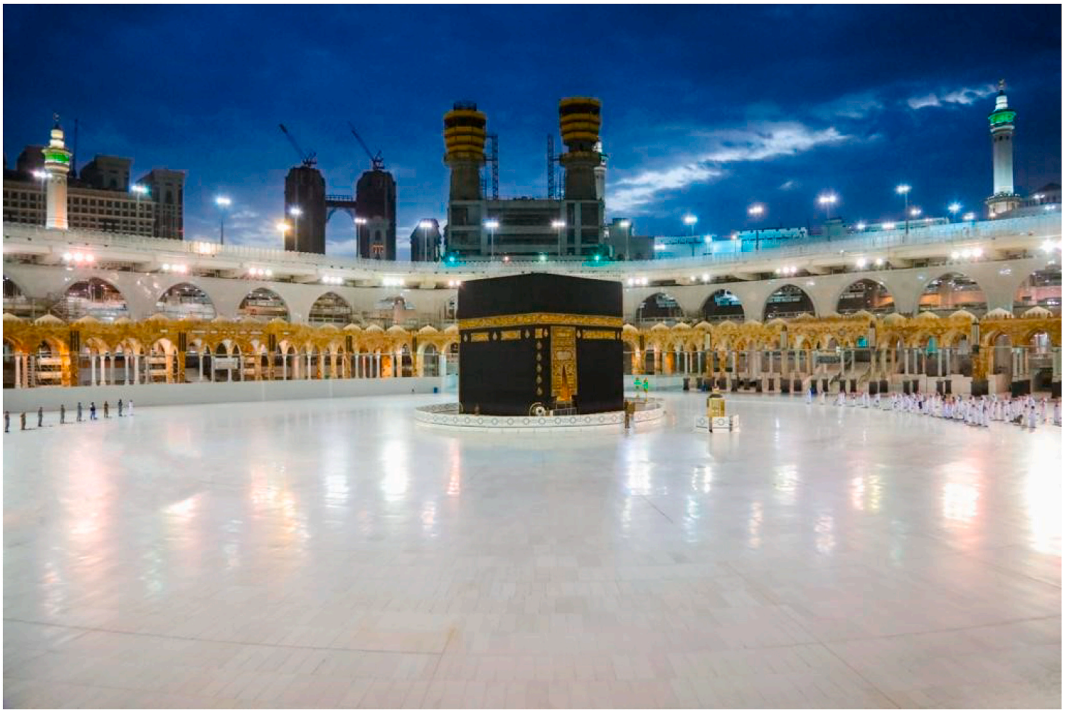

Fig. 1. The Grand Mosque in Makkah during closure for cleaning and disinfection during time of restricted entrance

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numerous religious, travel and service sectors that support the movement of close to 3 million pilgrims from over 180 countries along with 1–2 million domestic pilgrims participating in the mandatory 5-day event and others who wish to perform additional days of rituals in the holy sites. For financially able believers performing the Hajj is a once a lifetime religious obligation but the perceived benefits of compliance are unquantifiable to the extent that some would consider death during the pilgrimage as God's divine blessing. The Hajj related financial planning may span a lifetime for some persons, and some governments have developed a savings schemes that enable its citizens to perform this religious duty. Hajj is a significant source of revenue for pilgrim air and surface travel providers, preparatory, and hospitality services both in home countries and in Saudi Arabia.

The bidirectional interactions of Hajj and diseases have existed for centuries. However, it was the hosting of the Hajj in 2009 and 2012 amidst the 2009 pandemic H1N1 influenza and the 2012 MERS outbreaks that paved the way for scientific and political discourse leading to the formation of the discipline of mass gathering medicine and formation of the first ever World Health Organization Center on mass gathering research [6,7]. The plague in A.D. 967 and drought and famine A. D. 1048 had led to Hajj cancellations. Cholera outbreaks remained a perennial threat throughout the 19th century including among Indian pilgrims in 1831 and Mecca and Medina in 1858. In modern times, other disease outbreaks have led to the existing visa linked mandatory vaccination requirements for polio and meningitis, ad-hoc advisories such as for the elderly during the pandemic, and country specific restrictions placed on Ebola affected countries to refrain from the Hajj. A strong foundation of years of experience of providing medical services at Hajj, establishing diplomatic frameworks on advancing public health recommendations to home country governments of pilgrims, international collaborations and compliance with International Health Regulations, all helped Saudi Arabia amass substantial disease control expertise on mass gatherings. The current Saudi Arabian decision underscores the benefit of this collective knowledge and expertise.

Saudi Arabia's COVID-19 status is also highly relevant to the health of Hajj and pilgrimage. Saudi Arabia, despite success with mitigating huge superspreader events through international seeding, the returning Saudi pilgrims who visited pilgrimage sites in Iran and Iraq were early source of community seeding of SARS-CoV-2, making it contribute 150,000 cases to global total. By extending restrictions on international pilgrimage, Saudi Arabia's proactive decision would contribute significantly to COVID-19 mitigation globally [3].

In addition to significant contribution to global COVID-19 mitigation, the restriction of international visitors to Hajj will also usefully help reduce transmission of other diseases. Of relevance is the ongoing Ebola outbreak in DR Congo, and other diseases such as measles which is now widespread globally [8,9].

The legacy of Hajj-related scientific contribution to public health can be enriched by advancing public health research on COVID-19 mitigation tools that would be implemented at the restricted holy sites. The proposed pre- and post-testing of the 1000 domestic pilgrims that will be permitted to perform rituals at the hajj at summertime temperatures above 40 °C coupled with follow up for 14 days offers the most scientifically sound prospective mass gathering research infrastructure to study the natural history of COVID-19. The opportunities include assessment of spatial, temporal and environmental determinants of disease acquisition, survival of the virus on innate surfaces, the frequency and types of disinfectants required to achieve maximum viral elimination, and the role of stress and meditation on disease acquisition.

Taken together, the earlier decision by the International Olympic Committee to cancel the summer Olympics in Japan and the Saudi decision to restrict international Hajj pilgrimage, two events with superspreader potential, offers impetus and precedence for other stakeholders and countries faced with similar challenges amidst the reports of worsening COVID -19 global pandemic. As a global community, in the absence of a vaccine, the political commitment of nations and compliance of communities to effectively use known mitigation tools will help us overcome the current pandemic. Our decisions today will also offer lessons for future generations.

Declaration of competing interest

All authors have no conflicts of interest.

References

[1] Accessed, https://www.nytimes.com/2020/06/22/world/middleeast/saudi-arabia-hajj-mecca-pilgrims.html. [Accessed 23 June 2020].

[2] Ebrahim SH, Memish ZA. Saudi Arabia's drastic measures to curb the COVID-19 outbreak: temporary suspension of the Umrah pilgrimage. J Trav Med 2020 May 18; 27(3). https://doi.org/10.1093/jtm/taaa029. taaa029.

[3] Ebrahim SH, Memish ZA. COVID-19: preparing for superspreader potential among Umrah pilgrims to Saudi Arabia. Lancet 2020 Mar 14;395(10227):e48.

[4] Memish ZA, Steffen R, White P, Dar O, Azhar EI, Sharma A, Zumla A. Mass gatherings medicine: public health issues arising from mass gathering religious and sporting events. Lancet 2019 May 18;393(10185):2073–84.

[5] Memish ZA. Health of the hajj. Science 2018 Aug 10;361(6402):533. https://doi.org/10.1126/science.aau9617. Epub 2018 Aug 9.

[6] Ahmed QA, Ebrahim S, Memish ZA. From hajj services to mass gathering medicine: Saudi Arabia formalizes a novel discipline. Travel Med Infect Dis Mar-Apr 2019;28: 105–6.

[7] Ahmed QA, Memish ZA. From the "Madding Crowd" to mass gatherings-religion, sport, culture and public health. Trav Med Infect Dis 2019 Mar-Apr;28:91–7.

[8] Ebrahim SH, Zhuo J, Gozzer E, Ahmed QA, Imtiaz R, Ahmed Y, Doumbia S, Rahman NMM, Elachola H, Wilder-Smith A, Memish ZA. All hands on deck: a synchronized whole-of-world approach for COVID-19 mitigation. S1201-9712 Int J Infect Dis 2020 Jun 18;(20):30484. https://doi.org/10.1016/j.ijid.2020.06.049. Online ahead of print.

[9] Massad E, Wilder-Smith AB, Wilder-Smith A, Memish ZA. Modelling the importation risk of measles during the Hajj. Lancet Infect Dis 2019 Aug;19(8):806.

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