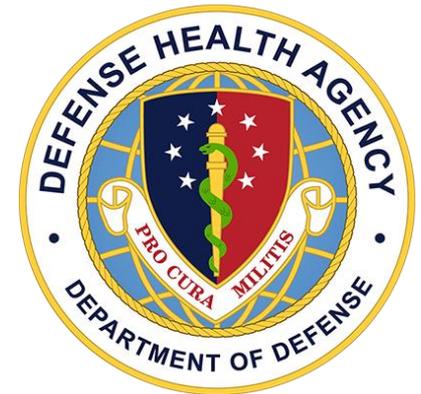


Department of Defense
Armed Forces Health Surveillance Branch
Global MERS-CoV Surveillance Summary
(7 SEP 2016)



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CASE REPORT: As of 7 SEP 2016, 1,878 (+3) cases of Middle East respiratory syndrome coronavirus (MERS-CoV) have been reported, including at least 579 (+1) deaths (CDC reports at least 666 deaths as of 6 SEP) in the Kingdom of Saudi Arabia (KSA) (+3), Jordan, Qatar, United Arab Emirates (UAE), United Kingdom (UK), France, Germany, Tunisia, Italy, Oman, Kuwait, Yemen, Malaysia, Greece, Philippines, Egypt, Lebanon, Netherlands, Iran, Algeria, Austria, Turkey, Republic of Korea (ROK), China, Thailand, Bahrain, and the U.S. According to local media reports, a suspected case of MERS-CoV was identified on 17 AUG in Gwangju City, ROK, in a man who had recent travel to UAE. The individual has been placed in isolation at a state-run hospital, pending confirmatory tests. AFHSB considers this a suspect case, and has included it in the above case count. If tests confirm a MERS-CoV diagnosis, this will be the first case reported in ROK in 2016. AFHSB's death count (Case Fatality Proportion (CFP) - 31%) includes only those deaths which have been publicly reported and verified. While CDC's death count (CFP - 37%) may present a more complete picture, it's unclear when and where those additional deaths occurred during the outbreak.

On 24 AUG, CDC released updated estimates on the number of MERS-CoV cases. Using data from travelers to the region, the authors estimated 3,250 (95% CI 1,300-6,600) severe MERS cases occurred in the Middle East during SEP 2012-JAN 2016, which is 2.3-fold higher than the number of laboratory-confirmed cases recorded in these countries. The authors last estimated the incidence of MERS-CoV two years ago; since then the number of recorded cases has increased by more than 15 times. While significantly larger than the case count mentioned above, these results complement the results from a previous serologic study by KSA that reported antibodies to MERS-CoV were found in 0.15% of the population.

According to OIE on 1 AUG, there are two ongoing outbreaks of MERS-CoV in camels. One outbreak was reported in Alramtha, Irbid region, affecting 14 camels (23 susceptible); the other was reported in Azraq, Az Zarqa region, affecting 22 camels (47 susceptible). PCR testing was performed at the Jordan University of Science and Technology Research Laboratory.

INTERAGENCY/GLOBAL ACTIONS: WHO convened the Tenth International Health Regulations (IHR) Emergency Committee on 2 SEP 2015 and concluded the conditions for a Public Health Emergency of International Concern (PHEIC) had not yet been met. However, the Committee also emphasized that they still have concerns as transmission from camels to humans continues in some countries, instances of human-to-human transmission continue to occur in health care settings, and asymptomatic cases are not always being reported as required. On 13 JUL, CDC released updated [guidance](#) for the monitoring and movement of potential MERS-CoV cases, including a table with specific guidance for public health actions based on exposure category and clinical criteria. [FAO reports](#) that cross sectional surveillance, supported by USAID, continues in Egypt at border entry points, live animal markets, slaughterhouses, and villages. According to FAO, Jordan also is coordinating with USAID and Kansas State University to plan surveillance for coronaviruses in camels and other wildlife.

A recent study by the Journal of Travel Medicine utilized a transport network modelling framework to quantify the risk of MERS-CoV spread internationally via air travel. The authors identified India, Pakistan, and Bangladesh as the highest risk countries which have yet to report a case and should be prepared for the possibility of (pilgrims and general) travelers returning infected with MERS-CoV. In addition, the UK, Egypt, Turkey, and the U.S. are at risk of more imported cases. The authors suggest the results of this model indicate which countries should prioritize their airport and hospital screening and triage protocols.

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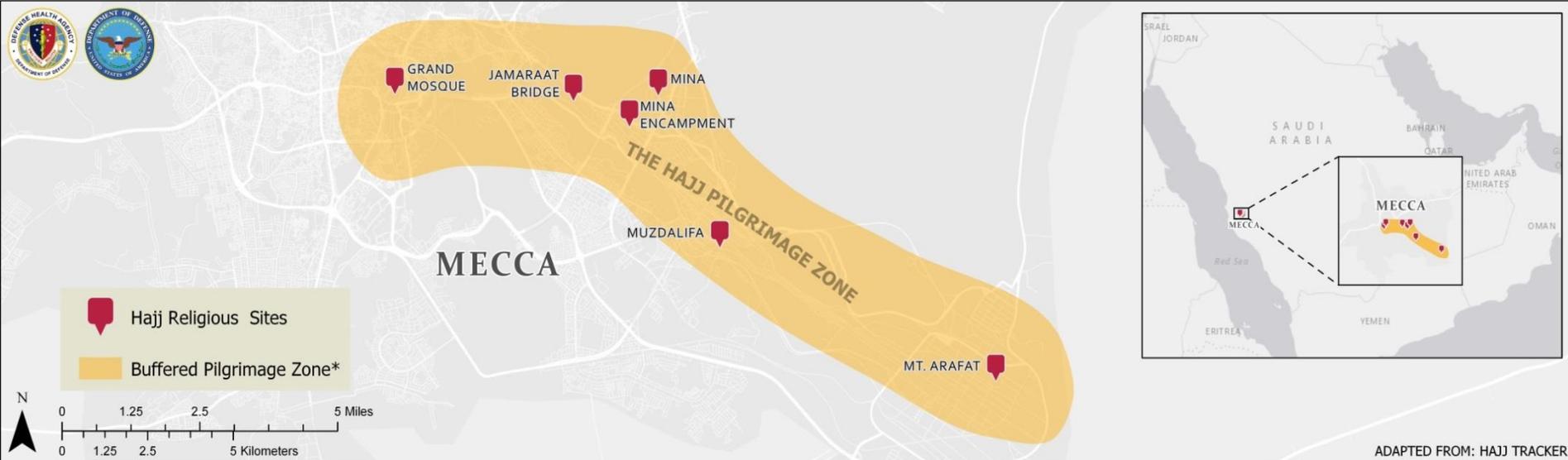
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HAJJ TRAVEL PRECAUTIONS: The annual Muslim pilgrimage to Mecca, known as the Hajj, is scheduled to occur 9-14 SEP 2016, attracting 2-3 million people to KSA. The [U.S. Department of State](#) issued its travel precautions for 2016 citing MERS-CoV as a risk to pilgrims. Individuals are urged to postpone attending the Hajj if they are: pregnant, children, have chronic health issues, such as heart, kidney, diabetes, cancer or respiratory diseases, or have congenital or acquired immunodeficiency. KSA, in coordination with [WHO](#), has been preparing countermeasures to prevent and address any health issues, including MERS-CoV, that could rapidly arise during the pilgrimage. WHO contributed by training more than 25 “health cadre” from Jeddah, Mecca, and Madinah on rapid response to health emergencies. Training was focused on respiratory disease outbreak management, including outbreak investigation, control measures, risk communication, community engagement, data management, and infection control/prevention. The KSA MOH, in conjunction with WHO, has launched a “Together for a healthy pilgrimage” campaign offering educational materials and videos on how to avoid heat illnesses, good personal hygiene, and food safety to prevent foodborne illness. KSA MOH has also planned to increase the number of hospital beds dedicated to heat stroke, provide fans and water at holy sites, and ensure pilgrims have been vaccinated against yellow fever, meningitis, polio, and influenza. Media report a 33-country study on pilgrim awareness of MERS-CoV conducted during the 2015 Hajj that found a lack of accurate information and awareness of MERS-CoV amongst approximately half of Hajj pilgrims. The study called for more effective awareness programs and improved teaching methods about health issues during the Hajj season, likely spurring this year’s Hajj health education campaign. Media report growing controversy and tension between KSA and Iran surrounding last year’s Hajj crowd surge in Mecca that killed approximately 2,426 people from 36 countries. Iranian government officials have barred citizens from attending Hajj this year, and Iran’s supreme leader has publicly accused Saudi authorities of “murdering pilgrims” caught in the stampede. The two nations continue to openly dispute management and safety of the Hajj adding to tensions between the two already divided nations.



*Because there is not a set route of travel between religious sites during the Hajj, the sites were buffered into a general pilgrimage zone where high traffic can be expected.

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DIAGNOSTICS/MEDICAL COUNTERMEASURES: On 8 AUG, GeneOne Life Science (based in ROK) and U.S.-based Inovio Pharmaceuticals announced that full enrollment had been reached for the first human clinical trial of a MERS-CoV vaccine (GLS-5300). The Phase I clinical trial is being funded by the Walter Reed Army Institute of Research (WRAIR), and will be conducted at WRAIR's Clinical Trials Center in Silver Spring, MD. SAB Biotherapeutics recently announced that Phase I clinical trials for its human antibody treatment (SAB-301) are underway; while antibodies to MERS-CoV have been developed using animals, SAB is the first to produce fully human antibodies in large animals (cattle). This study is funded and will be conducted by the National Institutes of Health (NIH). Regeneron Pharmaceuticals and the Biomedical Advanced Research and Development Authority (BARDA) of the U.S. Department of Health and Human Services (HHS) have developed a pair of antibodies to prevent and treat MERS-CoV. HHS has agreed to provide up to \$8.9 million in funding to Regeneron to help back manufacturing, Investigational New Drug (IND) submission, and a clinical trial conducted by the NIH. On 17 AUG, Alpha Diagnostic International announced its recent development of multiple ELISA test kits for screening MERS-CoV infections in humans and animals; the kits are intended for in vitro research use only, not for diagnostic procedures. **A recent study by Surfacide LLC published in the Infection Control and Hospital Epidemiology Journal, found that the Surfacide UV-C healthcare disinfection system "reduced the MERS-CoV virus to undetectable levels...after only [five] minutes of exposure," and that the virus level remained undetectable after 30 minutes of total exposure.**

BACKGROUND: In SEP 2012, [WHO reported two cases of a novel coronavirus](#) (now known as MERS-CoV) from separate individuals – one with travel history to the KSA and Qatar and one in a KSA citizen. This was the sixth strain of human coronavirus identified (including SARS). Limited human-to-human transmission has been identified in at least 51 spatial clusters predominately involving close contacts. Limited camel-to-human transmission of MERS-CoV has been proven to occur. The most recent known date of symptom onset is **10 AUG 2016**. The KSA Ministry of Health (MOH) has previously admitted to inconsistent reporting of asymptomatic cases. Due to these inconsistencies, it is also difficult to determine a cumulative breakdown by gender; however, AFHSB is aware of at least **588** cases in females to date. CDC reports **305** of the total cases have been identified as healthcare workers (HCWs).

RELEVANT STUDIES: A joint study by the Health Authority of Abu Dhabi, UAE, and the U.S. CDC retrospectively analyzed medical data on MERS-CoV patients in UAE from JAN 2013 to MAY 2014, and found that mild and asymptomatic MERS-CoV cases made up the majority (35% and 35% respectively) of UAE's cases in this time period (65 cases), and that many of these mild/asymptomatic individuals were shown to shed the virus for longer than two weeks. A [study](#) published by CDC found that antibodies to MERS-CoV can persist for up to 34 months after infection; furthermore, observed differences in immunologic responses to MERS-CoV exposure and infection suggest a potential role for genetic factors in the immune response. On 4 MAR, CDC published a [study](#) that tested archived serum (from 2013-2014) from livestock handlers in Kenya for MERS-CoV antibodies to search for autochthonous MERS-CoV infections in humans outside of the Arabian Peninsula. The study found two (out of 1,122 samples) tested positive, providing evidence of previously unrecorded human MERS-CoV infections in Kenya. **Three recent studies published by CDC indicate that alpacas are susceptible to MERS-CoV infection and may act as hosts for the virus.**

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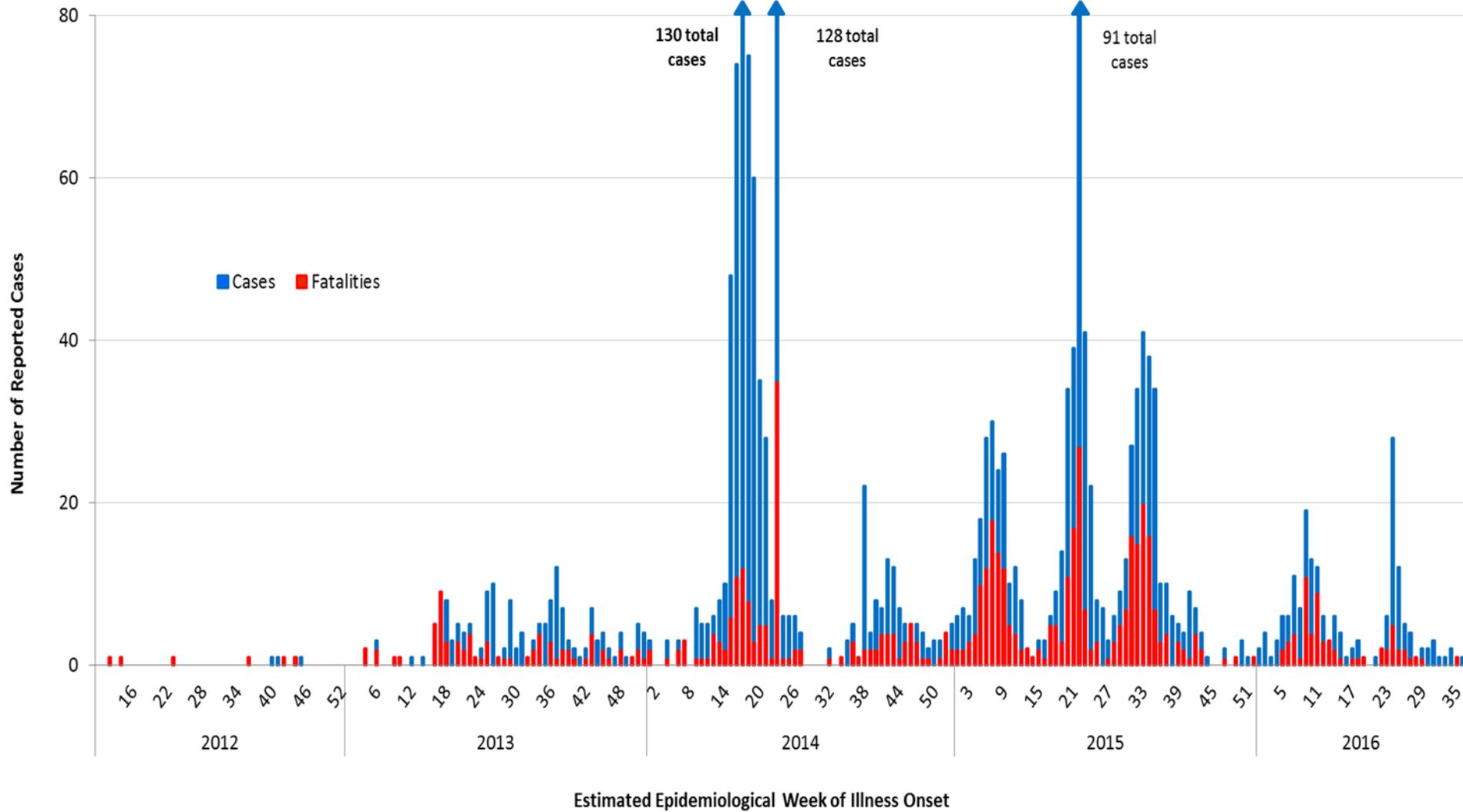
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Global MERS-CoV Epidemiological Curve by Illness Onset



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MERS-CoV Diagnostics and Medical Countermeasures at DoD Laboratories



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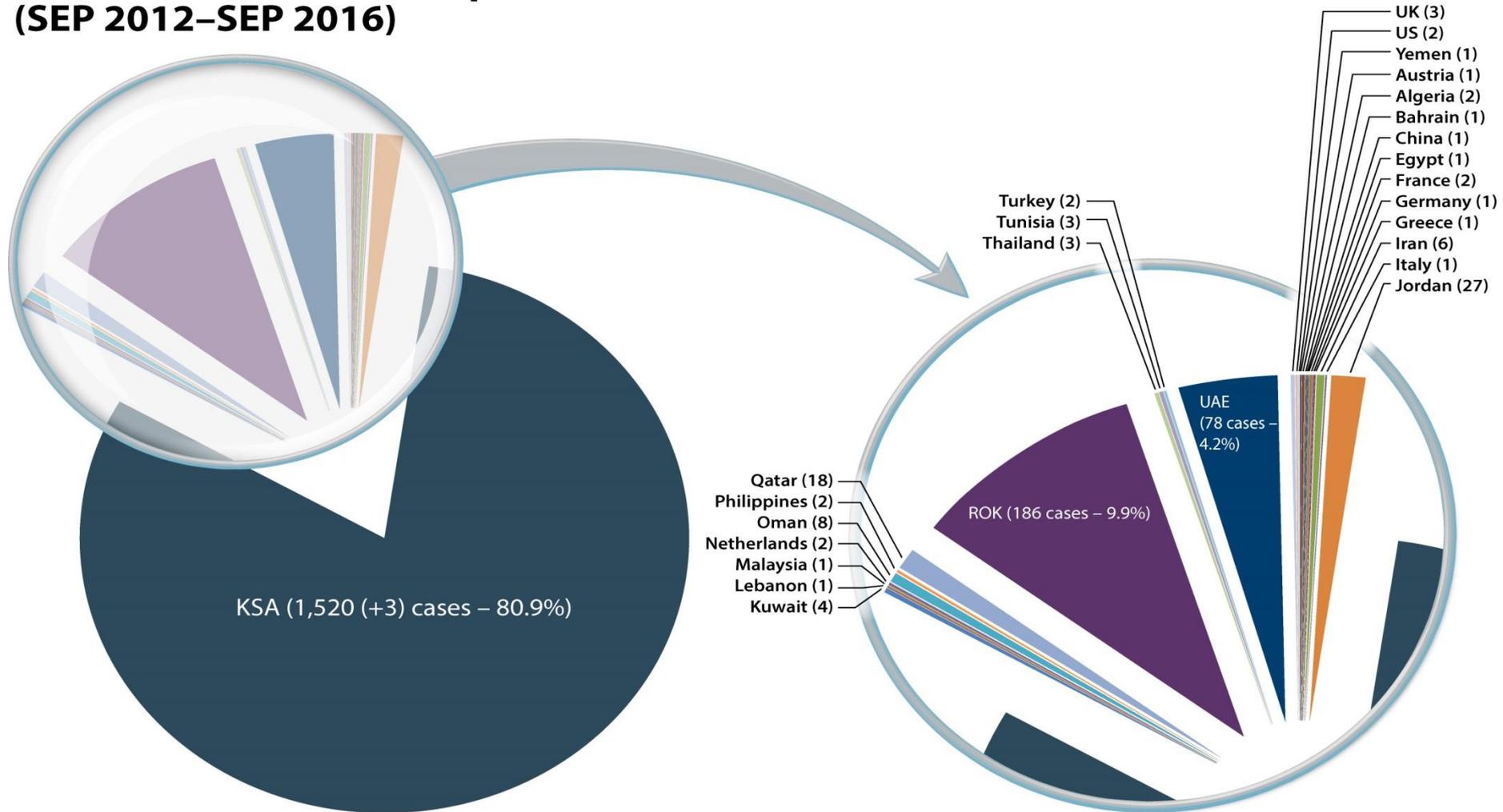
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Global Distribution of Reported MERS-CoV Cases* (SEP 2012–SEP 2016)

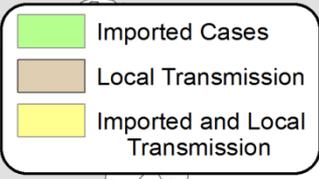
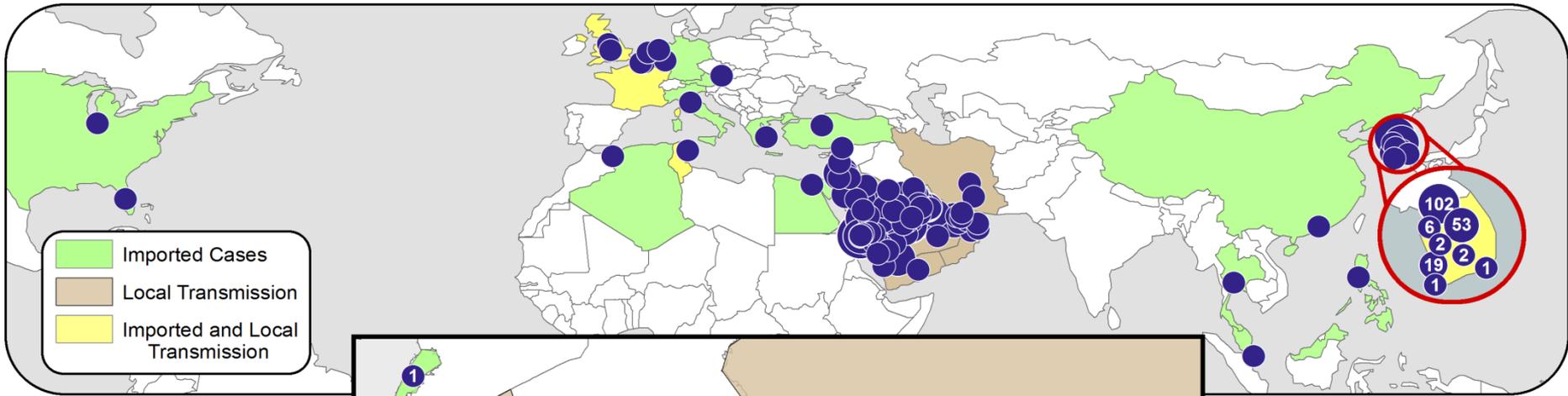


*Data includes confirmed, suspect and probable cases reported by WHO, CDC, and various country MOHs

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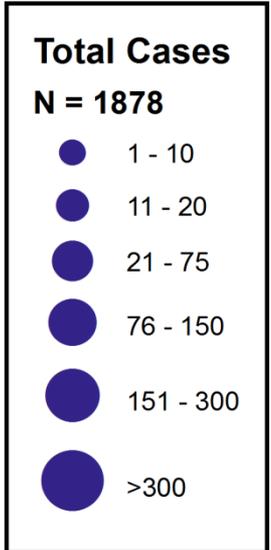
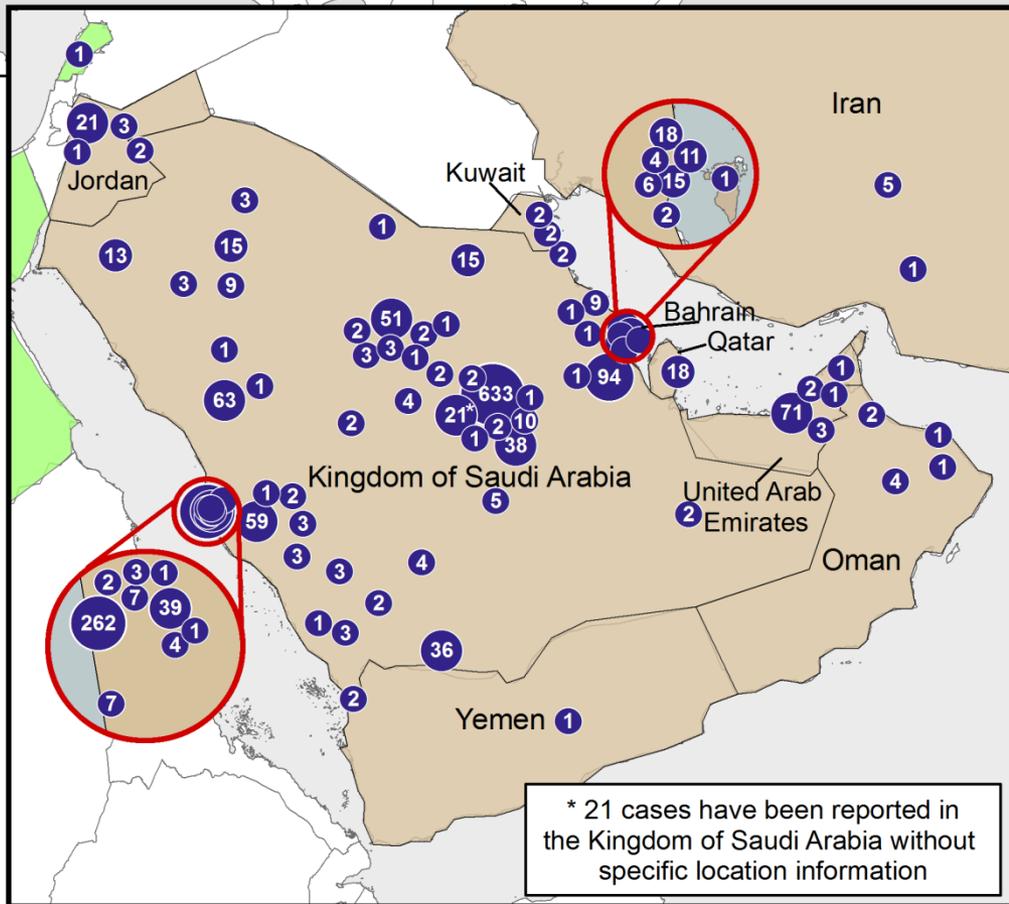
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Geographic Distribution of MERS-CoV Cases
01 APR 2012 - 07 SEP 2016



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* 21 cases have been reported in the Kingdom of Saudi Arabia without specific location information

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