CASE REPORT: As of 28 JUN, 2,112 (+59) cases of Middle East respiratory syndrome coronavirus (MERS-CoV) have been reported, including at least 652 (+13) deaths (CDC reports at least 737 (+12) deaths as of 26 JUN) in the Kingdom of Saudi Arabia (KSA) (+57), Jordan, Qatar, United Arab Emirates (UAE) (+2), 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. Primary cases are individuals who have had direct or indirect exposure to dromedary camels, or have had no known exposure to a confirmed MERS-CoV case. Secondary cases are individuals who have had direct or indirect exposure to a confirmed MERS-CoV case. Of the 59 new cases, 57 were identified in KSA: Dammam (1), Hufoof (2), Jeddah (1), Madinah (2), and Riyadh (51). The KSA Ministry of Health (MOH) has classified nine of its new cases as having primary exposure to camels, 46 as secondary healthcare-acquired contacts, and two as secondary household contacts. One new case was reported in UAE on 1 JUN; this is the fourth case of MERS-CoV reported in UAE in 2017. 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.

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 camel-to-human transmission of MERS-CoV has been proven to occur. The most recent known date of symptom onset is 22 JUN 2017. The KSA 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 649 (+24) cases in females to date. In its most recent MERS-CoV risk assessment on 5 DEC, WHO reported 20% of total MERS-CoV cases have been HCWs. Limited human-to-human transmission has been identified in at least 69 (+5) spatial clusters as of 28 JUN, predominantly involving close contacts. WHO has reported three simultaneous clusters of MERS-CoV occurring in hospitals in Riyadh since 26 MAY, two of which are epidemiologically linked. The index case of the first cluster was a 47-year-old man with symptom onset on 26 MAY; at least 34 cases have been linked to this nosocomial cluster. At least seven cases have been linked to the second cluster; the index case was a 46-year-old asymptomatic male who visited the emergency room of the first cluster hospital and subsequently continued to receive kidney dialysis sessions in the hospital where the second cluster occurred. At least nine cases have been linked to the third cluster, for which the index case was a 24-year-old male who reported direct contact with camels. Additionally, there was one cluster involving two individuals in Al Ain, UAE. The index case of this cluster was a 69-year-old male who had primary exposure to camels and was hospitalized on 5 MAY; the other case was a 45-year-old male who was asymptomatic and identified through contact tracing. One cluster in Jeddah involving two individuals has also been reported. The index case was a 52-year-old male who had a history of contact with camels, had symptom onset on 15 MAY, and was hospitalized on 23 MAY; the other case was a 51-year-old male who visited the index case in the hospital and had symptom onset on 28 MAY. For additional data on the five new spatial clusters reported since the previous Summary, see Table 1.

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. On 14 APR, the CDC issued a Level 2, Practice Enhanced Precautions, travel alert in relation to the Hajj and Umrah in KSA. In 2017, Hajj will take place from approximately 30 AUG to 4 SEP; Umrah is a similar pilgrimage that can occur at any time of the year, but is expected to be more crowded during the month of Ramadan (approximately 27 MAY to 24 JUN). Due to ongoing cases of MERS-CoV, the KSA MOH has recommended that the following groups postpone travel for these events: individuals older than 65 or under 12 years old, pregnant women, people with chronic diseases, immunocompromised people, and people with cancer or terminal illness.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Total Cases</th>
<th>Healthcare Workers</th>
<th>Asymptomatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riyadh 1</td>
<td>34</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>Riyadh 2</td>
<td>7</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Riyadh 3</td>
<td>9</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Jeddah 1</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>UAE 1</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

(+xx) represents the change in number from the previous AFHSB Summary of 31 MAY 2017.
All information has been verified unless noted otherwise.
For questions or comments, please contact: gha.ncr.health-surv.list.afhs-ib-alert-response@mail.mil
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RELEVANT STUDIES: On 4 MAR 2016, 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. A 30 MAR study in Eurosurveillance found evidence of MERS-CoV infection in camels in Ethiopia, Burkina Faso, and Morocco, with RNA detection rates of up to 15%, 12.2%, and 7.6%, respectively, among camels tested in each country. This is the first evidence that MERS-CoV is circulating in camels in Burkina Faso and Morocco. Previous research has found evidence of MERS-CoV infection in camels in Ethiopia, Egypt, Jordan, Kenya, Kuwait, KSA, Nigeria, Oman, Pakistan, Sudan, Tunisia, Turkey, UAE, and the Canary Islands. Another study in Eurosurveillance found that 84.5% of camels tested in Egypt were seropositive for MERS-CoV; of these, seroprevalence was significantly higher in imported camels than resident camels (p<0.05). A new longitudinal study in Emerging Microbes & Infections followed two camel herds in KSA from SEP 2014 to MAY 2015 and confirmed that camels could be naturally re-infected with MERS-CoV despite seropositivity with high antibody titers within the past 13 months. The finding raises questions about the potential duration of protection in camels conferred by previous MERS-CoV infection and has implications for the feasibility of vaccinating camels as a means of reducing zoonotic transmission. A new study in One Health found serological evidence of MERS-CoV in dromedary camels in northern Mali; 502 of 570 camels sampled were seropositive (88%). A study in CDC’s Emerging Infectious Diseases followed 11 patients who were confirmed via RT-PCR to have been infected with MERS-CoV during the ROK outbreak in 2015 for one year and found that the duration of viral RNA detection was positively correlated with antibody magnitude response. For four out of the six patients with mild disease, antibody titers were marginal or undetectable throughout the first year following illness; this implies that MERS-CoV seroepidemiologic studies may considerably underestimate the extent of mild and asymptomatic infections.

(+xx) represents the change in number from the previous AFHSB Summary of 31 MAY 2017.

All information has been verified unless noted otherwise.

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MERS-CoV Diagnostics and Medical Countermeasures at DoD Laboratories

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Global Distribution of Reported MERS-CoV Cases*
(Sep 2012–Jun 2017)

*KSA (1,745 (+57) cases – 82.6%)

- Qatar (21)
- Philippines (2)
- Oman (9)
- Netherlands (2)
- Malaysia (1)
- Lebanon (1)
- Kuwait (4)

- Turkey (2)
- Tunisia (3)
- Thailand (3)

- UAE (82 (+2) cases – 3.9%)

- ROK (186 cases – 8.8%)

*Data includes confirmed, suspect and probable cases reported by WHO, CDC, and various country MOHs
Geographic Distribution of MERS-CoV Cases
1 APR 2012 - 28 JUN 2017

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