



Risk Mitigation Consulting Inc.

Intelligence and Analysis Division

WHITE PAPER SERIES

2019 Novel Coronavirus Outbreak: Overview and Outlook

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INTENT

This white paper is designed to provide analysis of relevant, publicly available information on threat and hazard events/trends and their potential impacts to the interests of the United States, both at home and abroad. This product is not intended to be an all-encompassing assessment of the subject.



2019 Novel Coronavirus Outbreak: Overview and Outlook

Introduction & Background

Per the Centers for Disease Control (CDC), coronaviruses make up a large family of human and zoonotic viruses that are prevalent in humans and many different species of animals, including camels, cattle, cats, and bats. The coronavirus name is derived from the crown-like spikes on the virus' surface. Human coronaviruses commonly infect people all around the world, and often cause mild to moderate upper-respiratory infections like the common cold. Rarely, animal coronaviruses can evolve and infect people, and then spread from person to person. Examples of these include the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), which has a 35% mortality rate, and the Severe Acute Respiratory Syndrome-associated coronavirus (SARS-CoV), which caused the SARS outbreak of 2002 and brought along with it a mortality rate of roughly 10%. Similarly, CDC reporting indicates the novel (new) coronavirus, known in the scientific community as 2019-nCoV, likely originated in bats and transferred from animal to animal until finally mutating enough to infect its first human in late 2019.^{1, 2, 3, 4}

The 2019 novel coronavirus is directly attributable to a cluster of pneumonia cases in Wuhan, Hubei Province, China in December 2019. Although the exact location where the virus first jumped from animals to humans is still uncertain, there is compelling evidence that indicates a wet market in central Wuhan may be ground zero for the ensuing outbreak. Wet markets are common in China and are known for housing living and dead animals, to include chickens and other poultry to snakes, in extremely close proximity to each other, with little regard for health and safety standards observed in other nations. From 1 December 2019 to 2 January 2020, there were 41 laboratory confirmed cases of 2019-nCoV infection in Wuhan. Of those initial 41 cases, only 27 (66%) stemmed from direct exposure to the Huanan Seafood Market, with the first reported case not having any contact with the market at all. This possibly indicates that in this one-month time span, the virus mutated from animal-to-human transmission to human-to-human transmission. So far, of those initial 41 cases, there is a 15% mortality rate. However, as the virus has started infecting people worldwide the mortality rate has dropped significantly.^{5, 13}

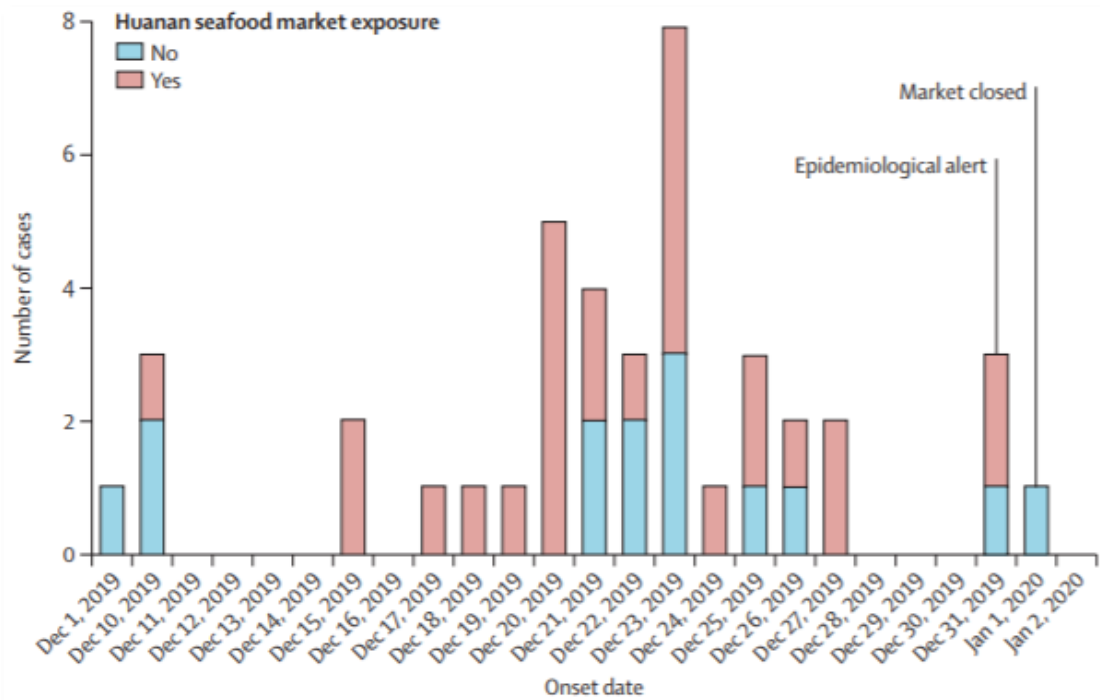


Figure 1
Date of Illness Onset with Laboratory-Confirmed 2019-nCoV Infection⁵

Current Situation

As of 3 February 2020, there have been 20,423 confirmed novel coronavirus cases in mainland China, and 190 confirmed cases in other locations around the world. Chinese officials are now reporting that sustained human-to-human transmission of the virus is occurring. Not including China, there are 26 other countries reporting confirmed novel coronavirus cases. Japan has the most with 20 confirmed cases, followed by Thailand with 19, and Singapore rounding out the top three with 18 confirmed novel coronavirus cases. The virus has been reported on every continent except Africa, Antarctica, and South America. Asia (not including China) has reported 128 cases; however, just 11 cases (8.5%) occurred in people who had no reported recent travel to China. Europe has reported 27 cases: the highest number of cases are in Germany with 12. Russia has reported 2 confirmed cases, although they're both on the Asian continent. Europe has reported 11 cases (40%) in individuals who had no reported travels to China. North America has 15 confirmed cases so far, with the majority of those in the United States. It is also determined that just 3 of those cases (20%) were human-to-human transfer in persons who had not traveled to China. In an effort to contain the novel coronavirus, Chinese authorities have suspended air, road, and rail travel in the area around Wuhan and placed restrictions on travel and other activities throughout the country. ^{6, 8, 9, 11, 13}

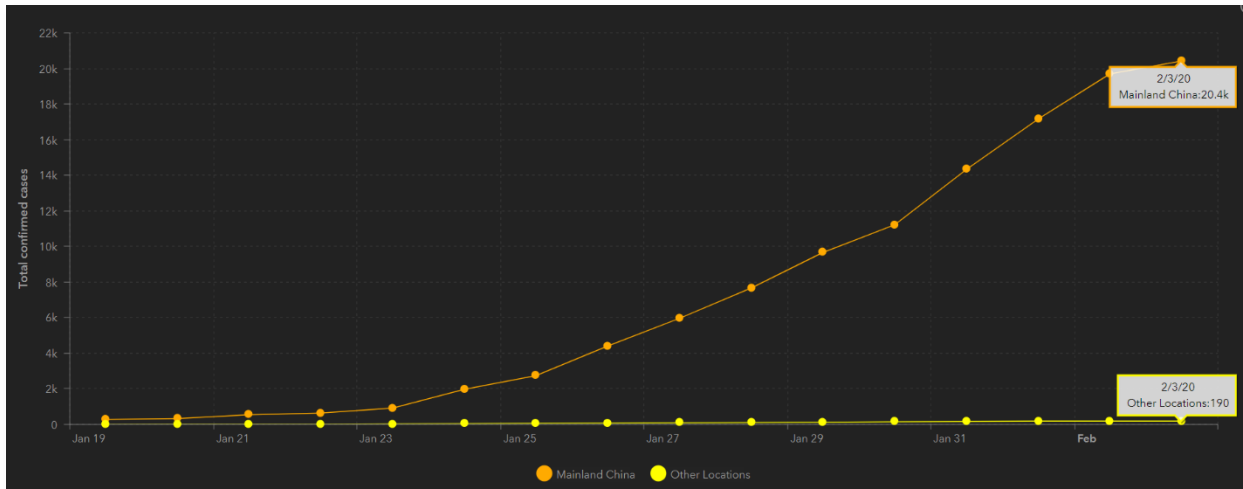


Figure 2
Confirmed 2019-nCoV Cases Worldwide as of 3 February 2020⁶

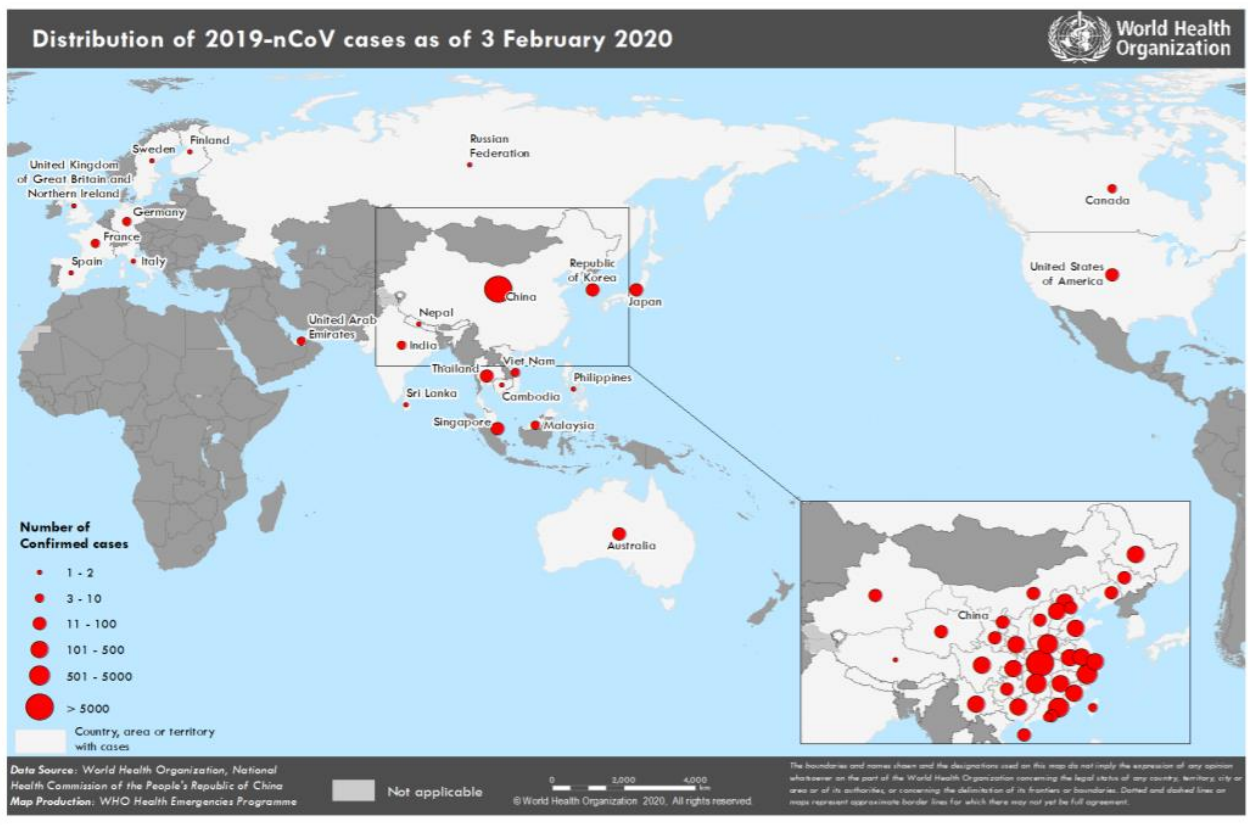


Figure 3
Distribution of Confirmed 2019-nCoV Cases Worldwide as of 3 February⁹



Of the total 20,613 confirmed 2019-nCoV cases worldwide, only 427 have resulted in death making the current mortality rate roughly 2% worldwide. The vast majority of deaths have been in Hubei Province (414 people or 96%), while the rest have come from other locations around China. To date, only 1 death in the Philippines has been reported outside of China. Infected air travelers are the considered to be the primary reason for introductions of the virus outside Wuhan, China, and the first international case was reported on 13 January in Thailand. Following that, on 17 January, the CDC and U.S. Customs and Border Protection (CBP) instituted enhanced health screenings on all travelers entering the country from Wuhan, China. On 23 January, the Department of State (DoS) ordered the departure of all non-emergency U.S. personnel and their family members from Wuhan. Eventually, on 30 January, the World Health Organization (WHO) finally declared the 2019-nCoV outbreak a public health emergency. By that point there had already been over 11,000 confirmed cases worldwide.^{6, 7, 8, 11}

The U.S. has recently taken several measures to prepare for and mitigate the potential influx of possible novel coronavirus carriers. On 29 January, a flight carrying 210 DoS employees, family members and other U.S. citizens living in Wuhan, landed at March Air Reserve Base in Riverside County, California, so passengers could be screened for the coronavirus. The flight was originally slated to land at Ontario International Airport, roughly 25 miles away. As of 3 February, there are no reports of any passengers being sick.¹³

- On 31 January the U.S. suspended entry into the country for all foreign nationals who had visited China within 14 days prior to attempting to enter the United States. Additionally, U.S. citizens who have been in Hubei Province within 14 days of their return will be subject to up to 14 days of mandatory quarantine while they received health screenings, and, if necessary, proper medical care.^{8, 10}
- On 1 February, the Department of Defense (DoD) announced it would allow for the possible use of military facilities to accommodate up to 1,000 people who may have to be quarantined upon return from China. Those facilities are: 168th Regiment, Regional Training Institute, Fort Carson, Colorado; Travis Air Force Base, California; Lackland Air Force Base, Texas; and Marine Corps Air Station Miramar, California. It was stated that DoD personnel would not come in contact with anybody that ends up housed on base.¹³
- Separately, the Department of Homeland Security (DHS) announced on 2 February that all flights from China are now directed to 11 airports: John F. Kennedy International Airport, New York; Chicago O'Hare International Airport, Illinois; San Francisco International Airport, California; Seattle-Tacoma International Airport, Washington; Daniel K. Inouye International Airport, Hawaii; Los Angeles International Airport, California; Hartsfield-Jackson Atlanta International Airport, Georgia; Newark Liberty International Airport, New Jersey; Washington-Dulles International Airport, Virginia; Dallas/Fort Worth International Airport, Texas; and Detroit Metropolitan Airport, Michigan.¹⁰
- Also, on 2 February, DoS issued a Level 4 Travel Advisory of 'Do Not Travel', the strictest level allowable. This corresponds with the CDC's issued 'Level 3 Travel Health Notice', recommending that travelers avoid all nonessential travel to all of the country.^{1, 11}



Out of the top 10 countries (other than China) with confirmed novel coronavirus cases, the U.S. comes in eighth with 11 confirmed cases; however, to date there have been a total of 260 people under investigation for the coronavirus. Out of that 260, only 11 (4%) have been confirmed positive and 167 have been confirmed negative for the virus. Additionally, there are 82 pending cases where the CDC has yet to test or yet to determine 2019-nCoV status. There are currently 36 states with people under investigation, while Washington State, California, Illinois, Arizona, and Massachusetts have all reported confirmed cases.¹

Symptoms and Transmission

It should be noted, in addition to the severe pneumonia cases reported at the onset of the virus discovery, other manifestations of the virus have appeared as acute respiratory distress syndrome (fluid buildup in lungs), septic shock, and multi-organ failure. Symptoms may appear in as little as 2 days or as long as 14 days after exposure.⁸

According to the CDC, human-to-human transmission most likely occurs among close contact (about 6 feet). Human-to-human transmission is believed to occur primarily via respiratory droplets produced when an infected person coughs or sneezes, similar to how influenza and other respiratory pathogens are spread. These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs. It's currently unclear if a person can get 2019-nCoV by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes. One anomaly noted with 2019-nCoV is there are reports of transmission from an infected person even when no symptoms are present. This appears to indicate that even asymptomatic patients can be virus transmitters when not displaying symptoms.¹

Parallels to Other Recent Disease Outbreaks

Medical experts around the world have noted that despite the unknowns, there are numerous similarities between 2019-nCoV, and other vector borne coronaviruses such as MERS and SARS. Like 2019-nCoV, both MERS and SARS are believed to have originated in bats before transferring to other animals, then transferring to people. For SARS cats transferred the virus to humans, and for MERS camels transferred the virus. Additionally, like 2019-nCoV, both coronaviruses caused worldwide panic because of their sudden onset, rapid spread, and seemingly high death toll in a short amount of time.⁵

Although it was not reported to the WHO until well into 2003, the SARS epidemic initially began in November 2002 in the Chinese province of Guangdong. By the time it was reported to the WHO, it had already infected 300 people. The disease went on to infect people in more than 24 countries in North America, South America, Europe, and Asia before it was contained. The infection typically began with a fever, and most patients developed pneumonia. Other symptoms included chills, headache, general feeling of discomfort, body aches, and mild respiratory symptoms. About 10% – 20% of patients experienced diarrhea, a dry, nonproductive cough, and shortness of breath. These symptoms might have been accompanied by or progress to hypoxia, a condition in which the oxygen levels in the blood are dangerously low. The primary way that SARS spread was by close (generally up to 3 feet) person-to-person contact; transmitted most readily by respiratory droplets produced when an infected person coughed or sneezed. The virus



also spread when a person touched a surface or object contaminated with infectious droplets and then touched their mouth, nose, or eyes. As of December 2003, there was 8,096 infections and 774 deaths related to SARS and an established mortality rate of roughly 10%. Although the 2003 global outbreak was contained, the CDC states it is possible that human-to-human transmission of SARS-CoV might recur.^{3, 12}

MERS, unlike SARS, is still currently infecting people around the world. It was first identified in Saudi Arabia in September 2012. Through retrospective investigations, health officials later identified that the first known cases of MERS occurred in Jordan in April 2012. To date, all known cases of MERS have been linked to travel or residency in countries in and near the Arabian Peninsula. The largest known outbreak of MERS outside the Arabian Peninsula occurred in the Republic of Korea in 2015. The outbreak was associated with a traveler returning from the Arabian Peninsula. Since 2012, 27 countries have reported cases of MERS including Bahrain, China, Greece, Iran, Italy, Jordan, Kuwait, Malaysia, the Netherlands, Philippines, Qatar, Republic of Korea, Thailand, United Arab Emirates, United Kingdom, and the United States. However, approximately 80% of human cases have been reported by Saudi Arabia. The clinical spectrum of MERS-CoV infection ranges from no symptoms (asymptomatic) or mild respiratory symptoms to severe acute respiratory disease and death, with typical symptoms of MERS-CoV being fever, cough and shortness of breath. MERS-CoV has spread from ill people to others through close contact, such as caring for or living with an infected person. Approximately 35% of patients who contracted MERS have died, and the disease is still known to be active today. As of 31 May 2019, 2,442 people worldwide have become infected with the virus, causing 842 deaths.^{2, 14}

Looking at these outbreaks comparatively does highlight progress that has been made in the health field over time. Mainly the relative speed that 2019-nCoV was first reported to the WHO and other international health bodies after the virus was first discovered. Still, there were 10,538 combined MERS and SARS infections compared to the 20,613 confirmed 2019-nCoV cases (as of 3 February 2020). This seems to indicate that the novel coronavirus, while possibly less deadly, appears to be much more infectious.

Bats as Hosts

Bats harbor a significantly higher proportion of zoonotic viruses than other mammals, according to a 2017 study. Additionally, extensive research on SARS-CoV and MERS-CoV has driven the discovery of many SARS-like and MERS-like coronaviruses in bats. In 2013, experts reported a whole genome sequence of a SARS-like coronavirus in bats with that ability to use human genomes as a receptor, thus having replication potentials in human cells. Bats can fly across large geographical ranges, transporting diseases as they go. Diseases that bats carry, such as coronaviruses, easily transfer to other animals like livestock via the host's feces. From there the disease mutates and infects humans. That makes bats an ideal and potentially lethal host.^{5, 15}

Official Health Recommendations

According to the CDC and the WHO, the basic standards to reduce the general risk of transmission include the following:^{1, 9}

- Avoiding close contact with people suffering from acute respiratory infections.⁹



- Avoiding unprotected contact with farm or wild animals.⁹
- People with symptoms of acute respiratory infection should practice cough etiquette (maintain distance, cover coughs and sneezes with disposable tissues or clothing, and wash hands).⁹
- Within healthcare facilities, enhance standard infection prevention and control practices in hospitals, especially in emergency departments.⁹
- Wash your hands often with soap and water for at least 20 seconds, especially after going to the bathroom; before eating; and after blowing your nose, coughing, or sneezing.¹
- If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% alcohol. Always wash hands with soap and water if hands are visibly dirty.¹
- Avoid touching your eyes, nose, and mouth with unwashed hands.¹
- Stay home when you are sick.¹
- Clean and disinfect frequently touched objects and surfaces using a regular household cleaning spray or wipe.¹

Misinformation

As with most world events where information is sparse in the beginning, there are several different conspiracies and theories pertaining to other possible causes of the outbreak. One theory that has gained traction is that the virus is manmade and originated from the Wuhan Institute of Virology. Even some U.S. press agencies have reported a possible link to a supposed bioweapons lab. Biosafety and health experts have rejected these notions.¹³

Outlook & Conclusion

Currently, the complete clinical picture concerning 2019-nCoV is not fully understood. Outbreaks of novel virus infections, particularly among higher risk demographics are always of public health concern. According to the CDC, the overall risk from these outbreaks depends on characteristics of the virus, including whether and how well it spreads between people, the severity of resulting illness, and the medical or other measures available to control the impact of the virus (for example, vaccine or treatment medications). Presently there is no vaccine available. It is almost guaranteed that confirmed cases worldwide will continue to increase for the near- to mid-range future, and also possible that there will be more confirmed cases in the U.S. in the immediate future. These cases could be from human-to-human transmission or from infected travelers entering the country. However, if the current trends persist, even if infections increase, there is still low likelihood of widespread deaths in the United States. Per the CDC, the general American public is unlikely to be exposed to this virus and the immediate health risk from 2019-nCoV is considered low at this time.

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