REPORT TO THE BOARDS OF HEALTH

Jennifer Morse, MD, MPH, FAAFP, Medical Director

Mid-Michigan District Health Department, Wednesday, May 27, 2020
Central Michigan District Health Department, Wednesday, May 27, 2020
District Health Department 10, Friday, May 29, 2020

Future of the COVID-19 Pandemic

Never before has a coronavirus caused a global pandemic. In 2002-2003, SARS-CoV caused the Severe Acute Respiratory Syndrome (SARS) outbreak, causing around 8,098 cases and 774 deaths in 24 countries (Rabaan, et al, 2020). In 2012, and then sporadically since then, MERS-CoV caused the Middle East Respiratory Syndrome (MERS) outbreak. In total, there have been 2,519 cases of MERS-CoV with 866 deaths in 27 counties. However, these did not cause global pandemics like SARS-CoV-2. Why is that?

The majority of people ill with SARS and MERS were in the hospital and severely ill. Much of the spread of SARS and MERS was to healthcare workers caring for these patients. Coronavirus Disease 2019 (COVID-19), which is caused by SARS-CoV-2, has caused more mild illness in most people. This has allowed for most COVID-19 illness to spread in the community. Another difference is those ill with COVID-19 shed the most virus just before and during the first few days they feel sick, meaning they can spread the illness before they know they have COVID-19. However, those ill with SARS and MERS shed the most virus around 7 to 10 days after their symptoms start (Petrosillo, et al, 2020). All of these factors, as well as having a lower death rate and overall being more contagious than SARS and MERS, have been some of the reasons COVID-19 has been able to cause a worldwide pandemic.

Since a coronavirus has never behaved in this manner, it is challenging to predict what will happen in the future of this pandemic. The best comparisons that can be made are to influenza pandemics, of which there have been many over the centuries. On April 30, 2020, the Center for Infectious Disease Research and Policy (CIDRAP) published "*COVID-19: The CIDRAP Viewpoint Part 1: The Future of the COVID-19 Pandemic: Lessons Learned from Pandemic Influenza,*" which looked to prior influenza pandemics to attempt to make predictions about the future of COVID-19 (Moore, et al, 2020). Key points from this publication will be summarized here.

There are ways in which SARS-CoV-2 and pandemic influenza are similar. Both viruses are spread mostly by respiratory droplets and both can be spread by someone before they have symptoms or who never has symptoms. SARS-CoV-2 and pandemic influenza viruses are also both new viruses that the world population does not have immunity to, making millions of people vulnerable to infection.

There are also some important differences between COVID-19 and pandemic influenza that may make them difficult to compare. The average incubation period, or time from being exposed to the virus and getting sick, for influenza is 2 days but it can range from 1 to 4 days. For COVID-19 the incubation period averages 5 days but can range 2 to 14 days. This longer incubation period can allow for COVID-19 to spread without notice more so than influenza. COVID-19 illness may be asymptomatic 6% to 41% of the time (average of 16%) (Byambasuren, et al, 2020). Influenza can be asymptomatic as well, but less often (4% to 28% of the time), which can also allow COVID-19 to spread more easily than influenza. The amount of virus produced by those infected with influenza peaks 1 to 2 days after symptoms start, unlike COVID-19, where it peaks just before and during the first several days of illness.

All of these differences cause SARS-CoV-2 to be nearly twice as contagious, or transmissible, as pandemic influenza. The contagiousness is represented by the basic reproductive number, or R_0, which is the average number of newly infected people that are caused by one infected person if everyone in the community is completely

susceptible to the infecting organism. The R_0 for COVID-19 is estimated to be 2.2 to 3.3 (Ensser, Ueberla, 2020). For past flu pandemics, it has been 1.46 to 1.8.

There does not seem to be any seasonal pattern when looking at eight influenza pandemics that have occurred since the early 1700s. Seven had an early peak followed by a second peak around 6 months later. Some of the pandemics had smaller waves of cases over the 2 years following the first wave. During the pandemic of 2009-2010, a vaccine did become available about 6 months after the beginning of the pandemic, however it was not available in large amounts until after the first high peak of cases. It is estimated the vaccine prevented 700,000 to 1.5 million cases, 4,000 to 10,000 hospitalizations, and 200 to 500 deaths in the U.S. alone. After three of the influenza pandemics in the 1900s, the pandemic virus strain became one of the seasonally circulating strains. In other words, the new virus did not go away after the pandemic.

Since COVID-19 is more contagious, more people will need to become immune before the pandemic can end. It is estimated 60% to 70% of the population needs to be immune before this pandemic stops. This will likely take 18 to 24 more months. It is not known how long immunity to COVID-19 infection lasts. Based on what we know about seasonal coronaviruses, immunity may decrease over time but it may still reduce contagiousness and protect against severe illness. A vaccine, when and if available, may help us to reach the goal levels of immunity, but one likely will not be available until 2021 and there are many potential causes for delay.

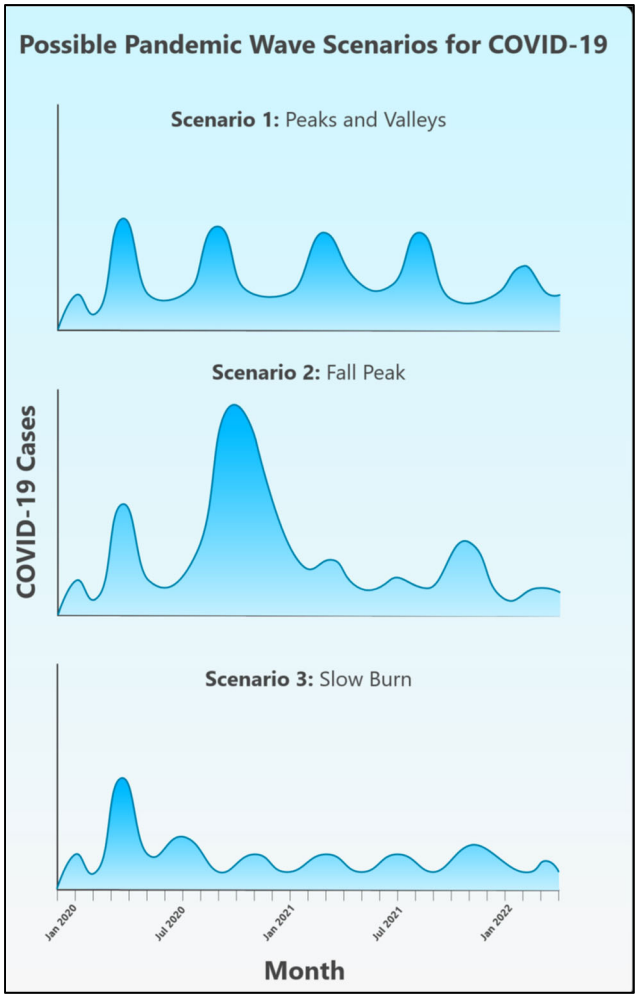
Possible scenarios proposed by CIDRAP:

Scenario 1: First wave spring 2020, followed by smaller waves for 1 to 2 years, gradually ending in 2022. May vary in different areas, may need reinstitution and relaxing of mitigation measures to control waves.

Scenario 2: First wave in spring 2020, followed by larger wave in fall/winter 2020 which will require reinstitution of mitigation efforts. Then followed by smaller waves. Pattern seen in 1928-19, 1957-58, 2009-10 influenza pandemics.

Scenario 3: First wave in spring 2020, followed by slow burn of cases, varying by locations.

Following any scenario, it is likely that SARS-CoV-2 will join other seasonal coronaviruses and continue to circulate.



Moore, K., Lipsitch, M., Barry, J., Osterholm, M. (2020). COVID-19: The CIDRAP Viewpoint. Part 1: The Future of the COVID-19 Pandemic: Lessons Learned from Pandemic Influenza. Center for Infectious Disease Research and Policy (CIDRAP).

Recommendations (from CIDRAP, Moore, et al, 2020)

1. States, territories, and tribal health authorities should plan for the worst-case scenario (Scenario 2), including no vaccine availability or herd immunity.
2. Government agencies and healthcare delivery organizations should develop strategies to ensure adequate protection for healthcare workers when disease incidence surges.

3. Government officials should develop concrete plans, including triggers for reinstituting mitigation measures, for dealing with disease peaks when they occur.

4. Risk communication messaging from government officials should incorporate the concept that this pandemic will not be over soon, and that people need to be prepared for possible periodic resurgences of disease over the next two years. (*See COVID-19: The CIDRAP Viewpoint Part 2: Effective COVID-19 Crisis Communication* https://www.cidrap.umn.edu/sites/default/files/public/downloads/cidrap-covid19-viewpoint-part2.pdf)

References

- Rabaan, A. A., Al-Ahmed, S. H., Haque, S., Sah, R., Tiwari, R., Malik, Y. S., ... & Rodriguez-Morales, A. J. (2020). SARS-CoV-2, SARS-CoV, and MERS-CoV: a comparative overview. Le Infezioni in Medicina, 2, 174-184.
- Petrosillo, N., Viceconte, G., Ergonul, O., Ippolito, G., & Petersen, E. (2020). COVID-19, SARS and MERS: are they closely related?. Clinical Microbiology and Infection.
- Byambasuren, O., Cardona, M., Bell, K., Clark, J., McLaws, M. L., & Glasziou, P. (2020). Estimating the extent of true asymptomatic COVID-19 and its potential for community transmission: systematic review and meta-analysis. medRxiv.
- Moore, K., Lipsitch, M., Barry, J., Osterholm, M. (2020). COVID-19: The CIDRAP Viewpoint. Part 1: The Future of the COVID-19 Pandemic: Lessons Learned from Pandemic Influenza. Center for Infectious Disease Research and Policy (CIDRAP).
- Ensser, A., & Ueberla, K. (2020). Determination of daily reproduction numbers of SARS-CoV2 based on death cases suggests more rapid initial spread in Italy and the United States. medRxiv.