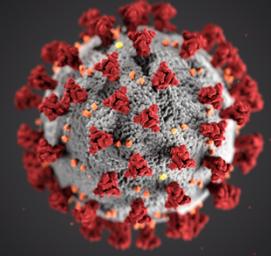


Pandemic Series
Countering COVID-19



- Social distancing for months in the US would limit the death toll; however, the death toll could exceed the total lives lost in both world wars by the US.
- Projected deaths in the US could top two million with peak ICU demand exceeding capacity by eight times if no mitigation methods are implemented.
- Mitigation methods to limit the ability to transmit the disease are required and include isolation of the exposed, quarantine of the infected, and social distancing for all others.
- Robust testing and tracing methods are required before the relaxation of social distancing strategies and would suggest a time of up to three months.
- The battle is between developing an antiviral or vaccine quickly enough to minimize the impact of the virus, where a year would enable it to infect nearly 80% of the population.

The prognosis is grim. Millions of dead, overrun hospitals, and insufficient ICU beds for the seriously ill. These are the outcomes absent mitigation strategies to slow the spread of the virus until the development of an antiviral drug for treatment or a vaccine. Unfortunately, both the solutions may take a year to 18 months. Barring their expedient development, the most probable outcome is that mitigation strategies will remain in force for upwards of six months. The business world shudders at the thought of closures for a month, let alone six months to a year. The conflict for the West is the balancing of individual liberty versus the common good when implementing mitigation strategies. The calamity is that this struggle will prolong the duration, magnify the economic impact, and place more people at risk. The hope is for the common good to prevail over the tragedy of the commons and bear this sacrifice at the altar of freedom.

Note: The disease spread model used in this analysis is available in an interactive dashboard at capitalriskmanagement.com/virus

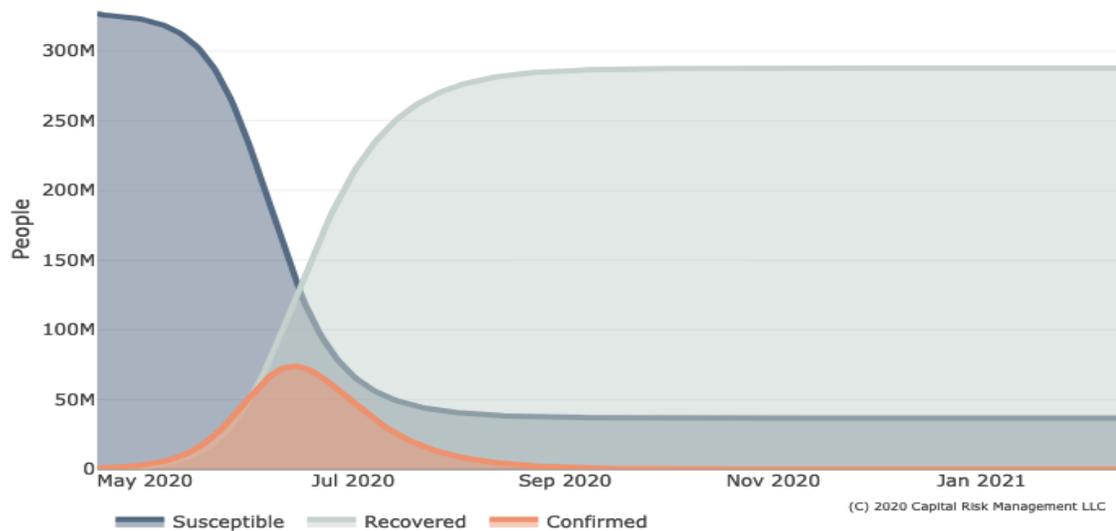
Modeling Contagion is the domain of the epidemiologist. While the rest of the world wonders when this pandemic will end, scientists the world over create models to understand the path of the virus and others work to develop antivirals and vaccines. Recent projections for the US and UK are grim from the Covid-19 Response team at the Imperial College London. Millions of dead in the US without effective mitigation methods to contain the spread of the disease. How did they come up with their projection? Robust mathematics based on hard data.

A standard model for disease spread is the Susceptible-Infected-Recovered (SIR) model. The critical dimension of a disease spread model is the reproductive rate (R_0), which indicates how many people are infected by each infected person. Current estimates suggest a number of around two with a range between 1.5 and 3. This number derives indirectly from two other variables: the infection and recovery periods. The longer a person is infected, the more opportunity they have to spread the virus. Similarly, the longer a person takes to recover, the longer they can spread the disease. The trouble is that reducing the reproductive rate (or conversely, extending the time it takes to transmit the disease) requires knowing who has the disease.

Testing is Everything. There is an urgent need for testing people for the virus to ensure case isolation occurs, and the transmission time lengthens. Testing is partially the reason why South Korea is an outlier in fatality rates. Sick individuals can have severe symptoms, while most cases are mild to the point where a person might not even know they have the virus. Unfortunately, they can still transmit the virus to other people. Testing helps reduce this threat.

Testing permits health organizations to trace where an infected person acquired the virus. They can then treat the infected person to help manage the infection *before* it becomes critical. While there is currently no cure or vaccine, it is the virus interaction with other manageable health ailments that makes it deadly. Most importantly, they can use containment strategies to reduce the ability of the disease to spread. First, you isolate the infected individual to ensure that they don't pass it to anyone else. If they have not, their reproductive rate drops to zero. If not, the battle is to find whom they infected *before* they infect anyone and reduce their reproductive rate.

Exhibit I. US Base Case Scenario of People Infected

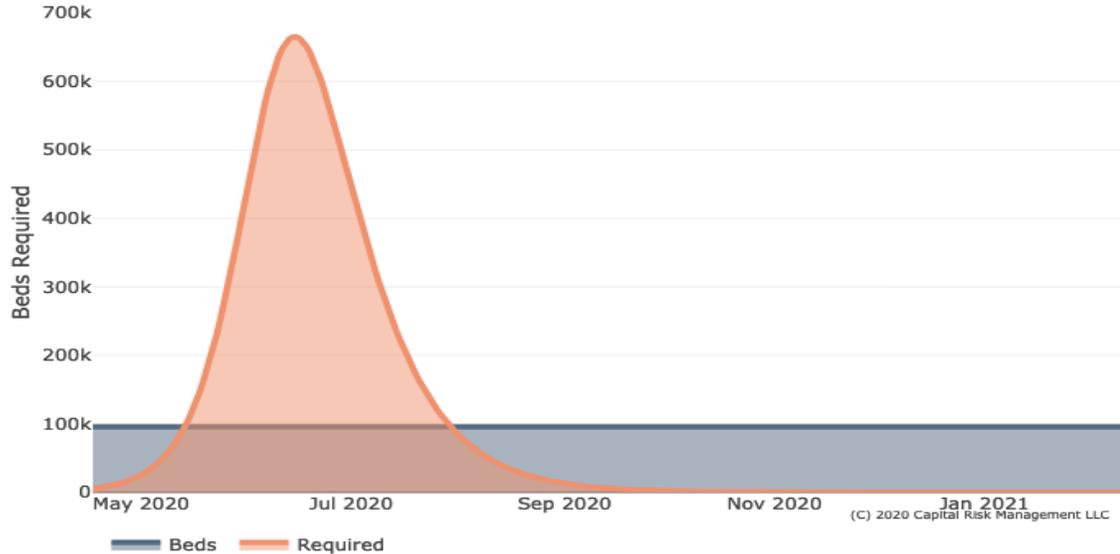


Source: CRM calculations based on the SIR disease spread model with no mitigation methods. [Click the graph to link to more details on the model.](#)

Flatten the Curve. That the zeitgeist is about the distribution of infected cases over time tells us much about the public conscience (exhibit I, orange line). The mortality rate is between one to five percent with the consensus from the World Health Organization at about three percent. This rate is many multiples of the regular flu at about 0.1%, but much lower than Ebola that ranges between 25-90%. The trouble for the mortality rate is that the denominator is not known with certainty as extensive testing has not yet occurred globally. China's initial mortality rate was tragically high; however, subsequent measures have seen a mortality rate of less than one percent. Thus, the number may be lower than currently estimated.

The concern, however, is not the mortality rate. Instead, the matter is the need for intensive care units/beds (ICU) that can treat those with severe symptoms. If the virus spread is unabated, then ICU bed demand could exceed nine times the current capacity (exhibit 2). This outcome would cause a dramatic increase in the mortality rate as seen in Italy, where consideration of health care rationing occurred. Avoiding this escalation is necessary at all costs.

Exhibit 2. US Base Case of ICU Beds & Possible Demand
ICU Beds



Source: CRM calculations based on the SIR disease spread model with no mitigation methods. Click the graph to link to more details on the model.

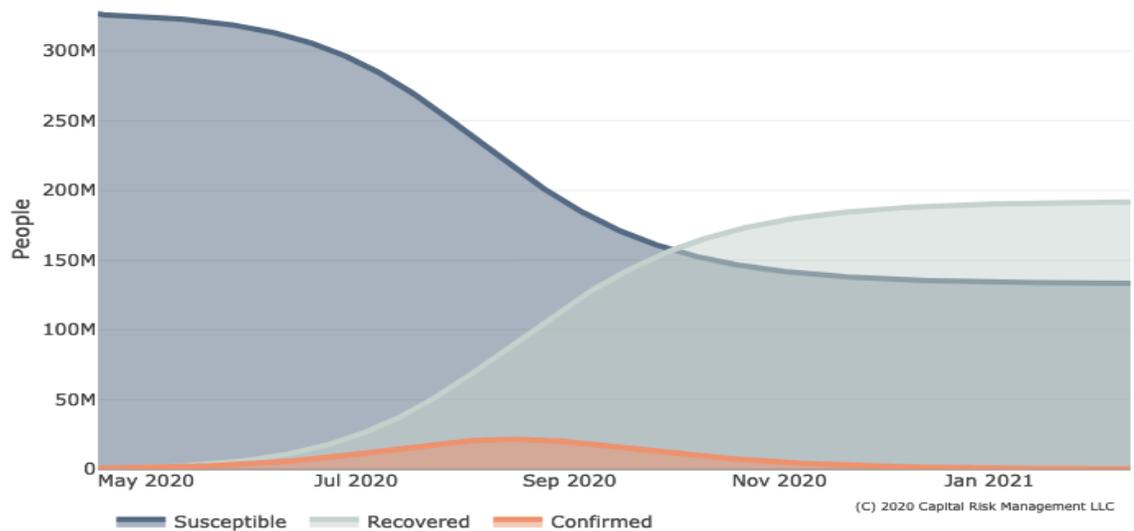
Tempering Tragedy. Until an antiviral or vaccine is available, there are not many easy options to reduce the spread of the virus. This result occurs because of 'community spreading' of the disease. Health officials are not able to adequately track the disease. So, it's not possible to do the required isolation strategy, where the infected person avoids contact with others. Thus, the reverse situation occurs: isolate everyone from a possible carrier. This action is an economically painful, but a necessary outcome.

Standard mitigation strategies from the epidemiologists at the Imperial College London are:

- **Case Isolation:** Isolate possible cases at home.
- **Home Quarantine:** Isolate everyone in the house where an infected person lives.
- **Social Distancing:** Reduce contacts outside of the house, school, or work.
- **School Closure:** Close schools and universities.

The impact of these strategies is dramatic on the rate of infection (exhibit 3). Peak infection rates drop by 2/3 while delaying the peak to October. These actions place dramatically less stress on the ICU capacity while permitting time for the emergence of antivirals and a vaccine.

Exhibit 3. US Mitigation Scenario of People Infected



Source: CRM calculations based on the SIR disease spread model with case isolation, home quarantine, and social distancing methods. [Click the graph to link to more details.](#)

Shut'em Down. There is one strategy that does work that causes the least economic impact, the shortest duration of disruption, and can eradicate the virus without an antiviral. Quarantine everyone for two weeks and the virus dies without new hosts. This strategy enabled China to bend the curve down for new infections within six weeks and South Korea did it in three weeks. Japan and Singapore contained the virus reproductive rate to ten days, which greatly reduces the threat of contagion. These measures, however, are not amenable to the citizens of western democracies.

Western countries enjoy greater liberty from government control than their Asian counterparts. This freedom does not readily permit the draconian measures required to ensure the easiest path through the pandemic. While States of Emergency are declared and social distancing recommended, some do not heed the warnings. This is the tragedy of the commons for the West: the economic repercussions will be deeper and longer than necessary because people elect their individual freedom over the greater good while politicians delay the inevitable outcome for political expediency.

Facing Reality. There is no doubt that mitigation strategies will slow the spread of the virus and dramatically reduce the possible deaths from insufficient ICU beds. The trouble is that lifting the measures in advance of a pharmaceutical intervention will result in the infection spread rate returning to its base case. Given the consequence of

removing the mitigation strategies early, it is improbable that their removal occurs in advance of antiviral or vaccine development.

The economic challenge is apparent: the complete shuttering of 5% of the global economy that covers the discretionary spending section for most likely at least six months. The lost income from employment in the shuttered sectors will reverberate through the essential services that remain open, causing their revenue to fall as well. The dramatic dropping of demand makes everyone a Keynesian economist today, where fiscal stimulus will fill the demand divide. While the ride will be challenging, decisive leadership with a focus on the people in need can make it bearable.

"Leaders are made, they are not born. They are made by hard effort, which is the price which all of us must pay to achieve any goal that is worthwhile."

Vince Lombardi

This article is part one in a series on the economic impact of the COVID-19 virus.

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