USING DATA TO DEVELOP CONTAGION CONTAINMENT STRATEGIES

This research can help organizations plan for different COVID-19 scenarios

Barrie Wilkinson and Helen Leis

It has been difficult for healthcare systems and businesses to plan for the impact of coronavirus because of the lack of historical comparisons for outbreaks of this magnitude and severity. But the virus' rapid spread across Asia, Europe, and the United States is starting to generate a critical mass of data from which plausible — even likely — regional contagion scenarios are emerging.

Based on work with observed data collected thus far by the World Health Organization (WHO) and the Johns Hopkins Center for Systems Science and Engineering, we have been able not only to detect the effects of containment in limiting the growth in cases, but also to measure how the different containment measures across time and across regions have created variations in outcomes. As Tedros Adhanom Ghebreyesus, director general of the WHO, said recently: This is the first pandemic in history that we can contain.

OUR FINDINGS

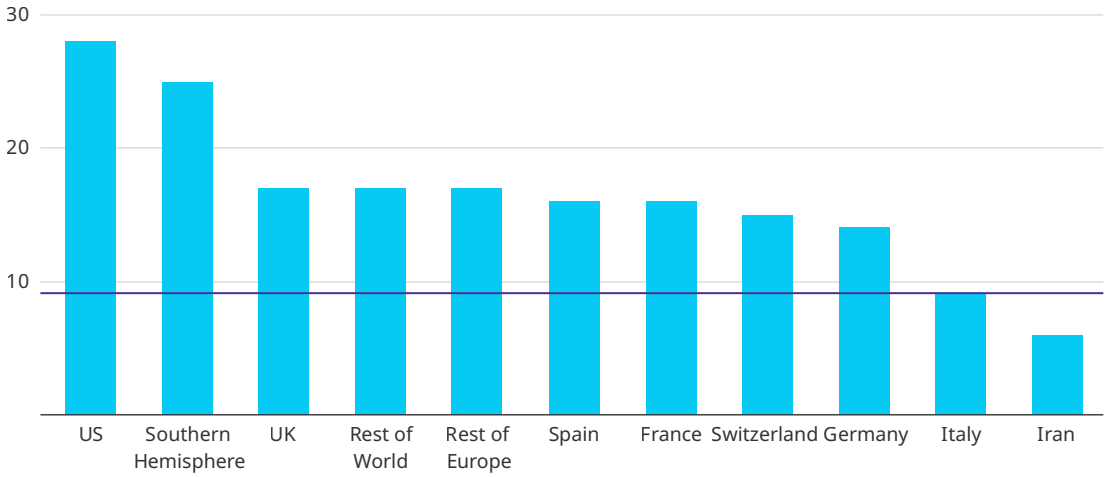
The growth in new coronavirus cases is often described as exponential, or ever-constant compounding growth. While this is true during the early stages of a viral outbreak, the full shape of an epidemic curve is an "S-curve", in which growth in cumulative cases eventually slows and starts to flatten out.

Theoretical models predict this flattening of the curve because, eventually, the population becomes saturated with so many cases that there are fewer people left to infect. But in China, we discovered a very different kind of flattening: The outbreak stopped growing without getting anywhere near the saturation point. There are still more than 1 billion Chinese citizens that have not yet been infected and who show no sign of becoming infected anytime soon.

This flattening of the curve was caused by the Chinese containment effort. Nonetheless, given the huge variance in how regions are responding to outbreaks, hospitals and businesses could be caught off-guard if they fail to recognize the scenario that applies to their locality.

For example, our analysis shows that new cases plateau once the daily growth rate falls below 9 percent. This suggests Iran and Italy have reached their peaks, while the United Kingdom may not reach its peak until mid-April and the US likely won't reach that threshold until after that.

Heading For A Peak
New cases of COVID-19 tend to plateau once the daily growth rate falls to 9%, as it has in Italy and Iran.



Note: Growth rates as of March 25th, 2020
Source: Oliver Wyman analysis

TIPPING POINT?

This poses an important question for policymakers, businesses, and medical practitioners who are trying to anticipate the number of cases that will be coming through hospital doors in the coming weeks. Should they be planning for a flattening of the curve only when 60 percent to 80 percent of the population has been infected? Or should they expect the curve to flatten much earlier than this — that is, when the coronavirus reaches only a small subset of the population? The short answer: It depends on the containment measures that are put in place.

What follows are some suggestions for how organizations can begin to plan for different outbreak scenarios based on our research findings.

BEWARE THE EARLIEST DATA

When tracking and forecasting the potential number of new cases for a region, it's important to understand that the early stages of data collection can be highly volatile. The number of new cases generally becomes more predictable after regions have at least 100 confirmed cases.

Before there are 100 confirmed cases in a region, the numbers can bounce around - from five cases to, say, 50 in one day — as undiscovered cases come to light. The number of confirmed cases could also spike as areas move from limited to more extensive testing.

CONTAINMENT MEASURES MATTER

Our scenario modeling shows that the degree and timeliness of containment measures such as social distancing can alter the number of new cases in an area by orders of magnitude over an eight-week period.

Containment measures can take a few days to put in place, but once they take hold we see a steady decay in the growth of cases and an eventual flattening of the curve. In a country with cases growing at 40 percent per day, an unconstrained outbreak could easily convert 100 cases into 180,000 cases in an eight-week period. However, with high levels of containment in place this 40 percent growth will drop steadily each day, eventually falling to 20 percent, 10 percent and then 5 percent. Along this containment path, 100 cases become more like 4,000 cases over the same eight-week period, creating a different scale of problem for the healthcare system to process.

But such an improvement in case numbers doesn't come for free. Extensive testing with rapid results, widespread and mandated school and business closures, and quarantines with digital or physical monitoring to ensure compliance are all essential.

We have calibrated our model to reflect high, medium, and low levels of containment across different regions. The curves for high levels of containment were calibrated to the Asian experience of rapid containment. However, to date we haven't witnessed any western regions successfully replicate equivalent levels of containment in Asia. So we are recommending Western users to read from our low- or at best, medium-containment curves.

Countries may struggle to implement even a medium level of containment — entailing testing with rapid results for suspected cases, region-wide school closures, mandated working from home, limited travel, and high individual compliance with quarantines. If authorities implement a medium level of containment one week after detecting the first 100 cases in an area in which cases are growing by 40 percent daily, our model indicates growth to 11,000 cases over eight weeks.

BE DECISIVE AND AGGRESSIVE

Policymakers must balance numerous factors when assessing their containment strategy, with the impact on healthcare systems being traded off against long-term damage to the economy. But our experience to-date shows that decisive and aggressive action to contain the outbreak can pay dividends in the long run. Attempts to delay containment efforts have so far only delayed the inevitable by a week or so — while potentially adding a large multiple to the levels of stress on healthcare systems.

CONCLUSION

These scenarios are only a starting point for conducting a more detailed analysis based on the particular circumstances of different locations. But the data make one thing clear: If companies and hospitals tie their futures to a strategy based on a single potential scenario, they might miss the mark by an order of magnitude. The richer the understanding of the possibilities, the less destabilizing the outbreak will be — and the sooner life can begin to get back to normal.

Barrie Wilkinson is a London-based partner in the Digital practice.

Helen Leis is a New York-based partner in the Health and Life Sciences practice.

This article first appeared on the World Economic Forum Agenda blog.