COVID-19
The Coronavirus

Integrating stories and data

EVENTIDE

What is the Coronavirus and COVID-19?

The coronavirus is a virus whose microscopic image gives the appearance of the virus wearing a crown (from the latin word *corona*), and this is not the first time we have seen this virus. A virus is a microscopic parasite that can cause a disease. The coronavirus has caused diseases such as SARS in '02-'03 and MERS in '12-'13. The disease that this most recent form of coronavirus has caused has been named COVID-19 (corona virus disease of 2019).

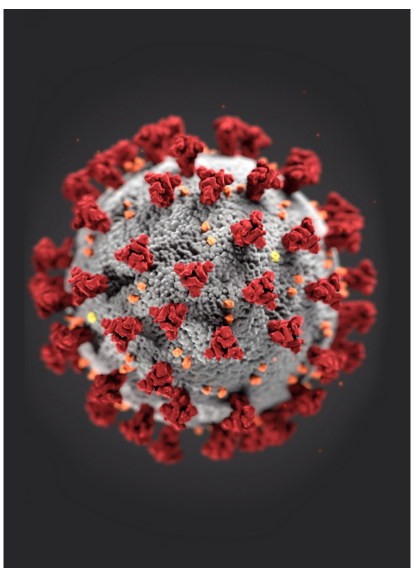


Photo by CDC on Unsplash

No data without stories, no stories without data
At Eventide we believe it is important to interpret data in light of their driving stories and corroborate stories with their underlying data. Understanding the COVID-19 outbreak with this combined data/story lens serves to provide a comprehensive framework that helps us interpret the vast amounts of information we are receiving.

Let's use this framework to inform our answers to some of our biggest questions around this disease:

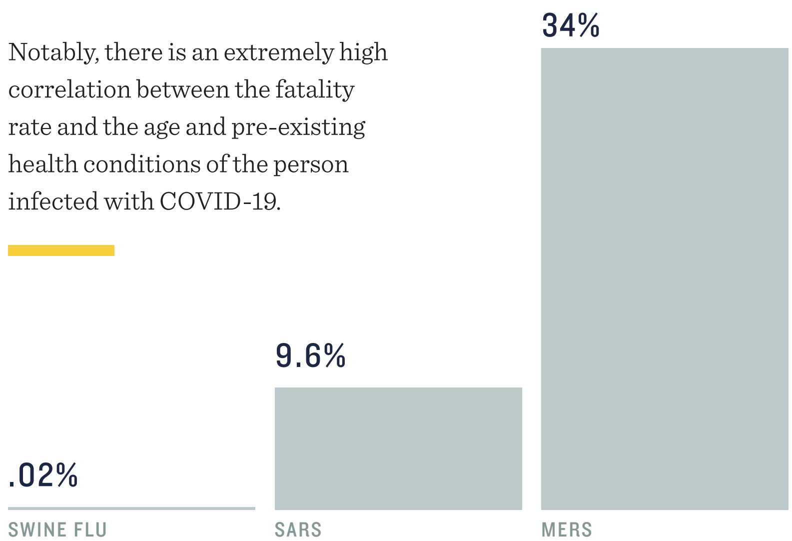
How dangerous is COVID?
There is a lot of uncertainty driving many different stories about how fatal COVID-19 is, how quickly it is spreading and how likely it is to be contained. There are a wide range of outcomes from these stories, so we look to the data to provide insight into how likely these stories are. As we look at the data however, it is important to use judgement to assess its accuracy and relevancy.

Fatality rate

It is difficult to calculate a precise fatality rate of an emerging infectious disease. A study published in 2005 shows the vast difference between the estimated fatality rate of the ’03 SARS epidemic at various points during the outbreak and the fatality rate eventually observed[1]. While it is tempting to use the simple formula of total deaths/total confirmed cases, there are fundamental reasons to approach that formula with an understanding that it will be an inaccurate estimate since there are a number of confirmed and unconfirmed cases that have not reached an outcome. These are the current relevant data points for COVID-19 as of the evening of 3/16/2020:

ACTIVE CASES[2]	CLOSED CASES[2]	TOTAL[2]
95,762 currently infected patients	85,456 cases which had an outcome	181,218 total cases
89,600 (94%) in mild condition	78,328 (92%) recovered/discharged	78,328 recovered
6,162 (9%) serious or critical	7,128 (8%) deaths	7,128 deaths

Notably, there is an extremely high correlation between the fatality rate and the age and pre-existing health conditions of the person infected with COVID-19.

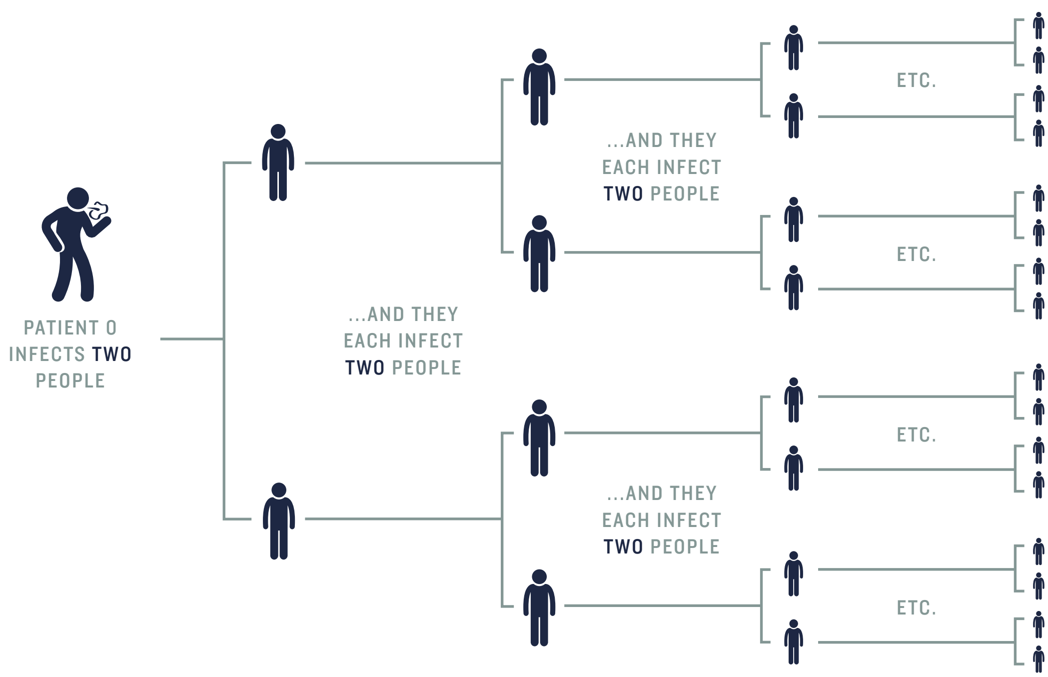


For reference, these are the fatality rates of other viruses[2]

Spread rate

Scientists use a measure called the "basic reproduction number" or R_0 (pronounced R-naught) to represent the contagiousness or transmissibility of an infectious virus.[3] This number tells us the average number of people who will contract the virus from one single infected person. Therefore, if a virus has an R_0 of 2, every infected person will, on average, transmit the virus to 2 other people.

How a virus with a reproduction number (RO) of 2 spreads



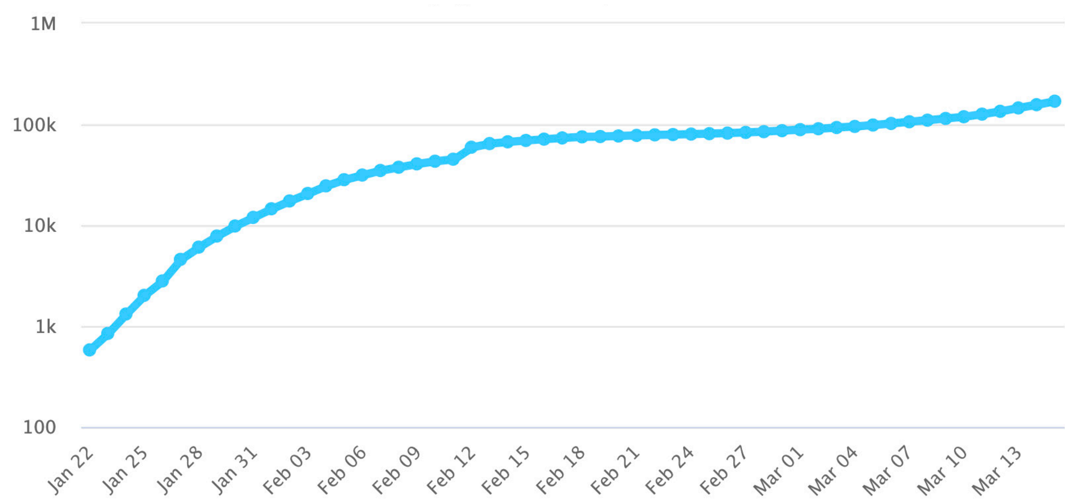
DISEASE	R_0 RANGE
Ebola	1.51-2.53
H1N1 Influenza, 2009	1.46-1.48
Seasonal Influenza	2-3
Measles	12-18
MERS	Around 1
Polio	5-7
SARS	<1-2.75
Smallpox	5-7

As you would guess, the R_0 of a virus can vary based on factors such as population density and healthcare awareness of communities. Calculating an accurate R_0 is difficult for viruses like the coronavirus due to the broad spectrum of symptom severity experienced and reported by people that could be infected with the virus. Currently, there is a wide range of R_0 estimates for COVID-19 from 1.4 to 4.08. Again, for reference, these are the R_0 ranges for other infectious diseases.[4]

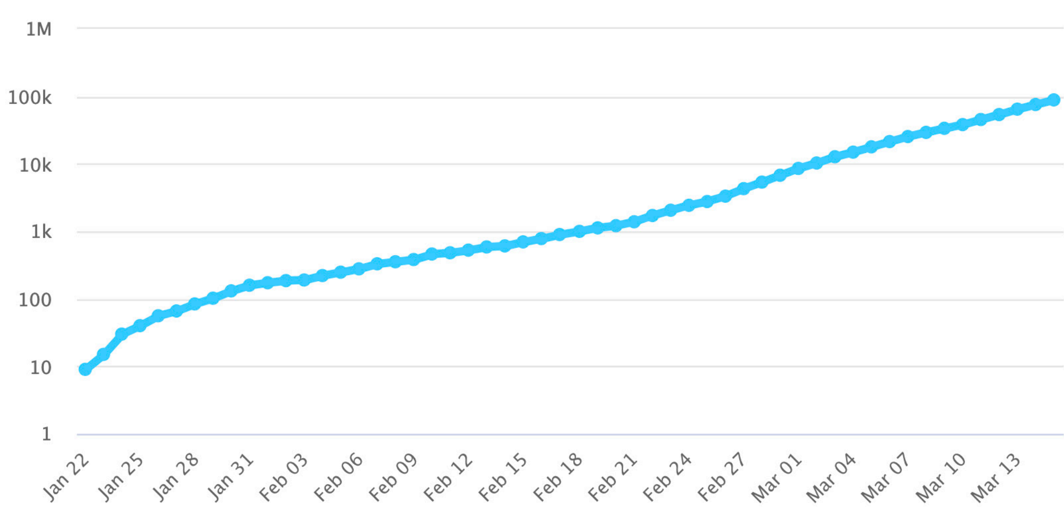
Containment

A looming question we have concerning the danger of this virus is, "Can we slow down or contain the spreading of the coronavirus?" The broadest dataset we can examine to give us insight here is the rate of change for total new cases. We find it more relevant to look at the rate of change in new cases as opposed to numerical change since we are wanting to determine if the rate of change is increasing or decreasing rather than if the number of cases is increasing or decreasing (which we know will increase). The rate of change is best represented on a graph displayed in logarithmic scale as seen on the top graph below[2]:

Total cases — Logarithmic Scale



Total cases outside of China — Logarithmic Scale



As time passes, more data will come available and provide more clarity to the extent of danger posed by COVID-19.

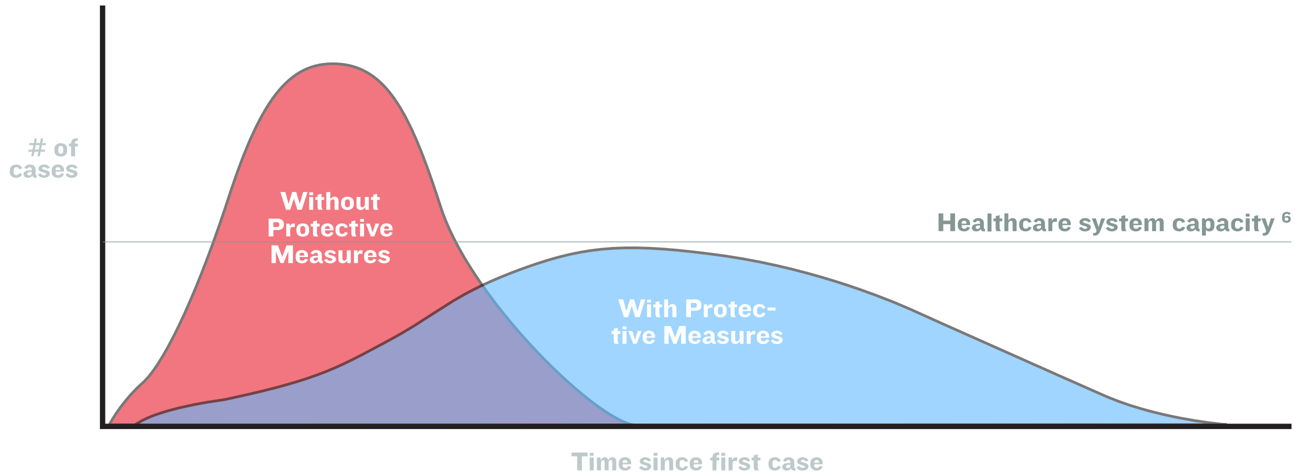
It is important to notice the difference in the graph that shows the rate of change of total cases *including China* (top) and the graph that shows the rate of change of total cases *excluding China* (bottom)[2]. Disease cases are disproportionately represented in China and therefore has the largest dataset to consider. The flattening of the line on the graph that shows rate of change of new cases including China, where extreme measures were taken to contain the spread of the virus at a certain point in time, shows us that it is possible to slow the transmission.

There is skepticism concerning the accuracy of data coming from China, and while it is important to leave room for error, Bruce Aylward, who led the W.H.O. team that visited China corroborates the general trustworthiness of the numbers with personal observations:

> *I know there's suspicion, but at every testing clinic we went to, people would say, "It's not like it was three weeks ago." It peaked at 46,000 people asking for tests a day; when we left, it was 13,000. Hospitals had empty beds.*
>
> *I didn't see anything that suggested manipulation of numbers. A rapidly escalating outbreak has plateaued, and come down faster than would have been expected. Back of the envelope, it's hundreds of thousands of people in China that did not get Covid-19 because of this aggressive response.*[5]

Responsible Action

Since we have observed drastic differences in outcomes from geographic areas where extreme action was taken versus areas with a less organized approach, a community's actions can have a great impact on the spread of the virus. While the spread of the virus might be inevitable, the speed at which it spreads is a major factor in how dangerous it is to a community. A potential problem that a rapid spread of coronavirus could cause is an overwhelming of our healthcare facilities. By slowing the spread, even if the same total cases exist over a longer time period, our healthcare facilities will have more capacity to handle COVID-19 cases as well as the other health needs they are already addressing. Below is a chart that shows how slowing the spread with protective measures can allow care to be more manageable.



These are some of the measures that we can take that will aid in slowing the spread of the virus.

- Frequently wash your hands with soap.
- Keep your hands away from your face.
- Sneeze correctly (into elbow or disposable tissue)
- Less hand shaking
- Put into practice a serious social distancing program. Work at home if you can and avoid crowds and unnecessary travel.
- Be responsible for protecting the most vulnerable members of society.

Conclusion

As we have noted, we believe stories and data should be interpreted in conjunction with each other. This allows us to understand big picture narratives and ground them in objective facts to discern likelihoods. Sensational stories can drive news reports and our conversations, but we believe the existing data supports taking immediate appropriate action while avoiding hysteria. Panic nor apathy are helpful responses. Now is a time to educate ourselves, be compassionate, work together and pray for the well-being of our communities.

References

[1] A. C. Ghani, C. A. Donnelly, D. R. Cox, J. T. Griffin, C. Fraser, T. H. Lam, L. M. Ho, W. S. Chan, R. M. Anderson, A. J. Hedley, G. M. Leung,. "Methods for Estimating the Case Fatality Ratio for a Novel, Emerging Infectious Disease." *American Journal of Epidemiology* (2005): 479-486.

[2.] Worldometer. https://www.worldometers.info/coronavirus/. 10 March 2020. 10 March 2020.

[3] Delamater PL, Street EJ, Leslie TF, Yang Y, Jacobsen KH. "Complexity of the Basic Reproduction Number (R0)." *Emerging Infectious Diseases* (2019): 1-4.

[4] Eisenberg, Joseph. *University of Michigan: School of Public Health*. 12 February 2020. 10 March 2020.

[5] Jr., Donald G. McNeil. New York Times. 4 March 2020. https://www.nytimes.com/2020/03/04/health/coronavirus-china-aylward.html. 10 3 2020.

[6] https://www.nytimes.com/2020/03/11/science/coronavirus-curve-mitigation-infection.html