Dealing with Pandemics: The Role of Risk Perception and Biases
Howard Kunreuther*
Co-Director Wharton Risk Management and Decision Processes Center
March 27, 2020

The COVID-19 pandemic highlights the challenges one faces in dealing with a pandemic, as illustrated by the following two scenarios related to the coronavirus (COVID-19).

- **January-February 2020**: There were very few cases of the virus in the United States. With the exception of China, Singapore and South Korea no country was paying much attention to steps to curtail COVID-19. There was little concern by individuals that the number of individuals contracting and dying from the virus would be significant. It was only viewed as an epidemic and the general public felt that the impact of the coronavirus would be relatively minor using the flu, SARS and H1NI as their models for what might happen in the coming months. Epidemiologists understood that COVID-19 was an unknown virus that could have significant consequences after examining the data from China, where the virus originated in December 2019. In the United States, government leaders did not demand significant action to prevent the spread of the disease. In contrast, South Korean leaders undertook widespread testing and contact tracing after one patient (Patient 31) contracted COVID-19 and many others were infected by her before doctors discovered she had tested positive for the virus.
- **March 2020:** Individuals in countries throughout the world were contracting COVID-19 in large numbers and a small but significant number of these victims were dying from the virus. Orders were given at the state level in the United States for individuals to stay at home. Schools and universities were closed as were businesses, restaurants, bars and non-essential shops. Hospitals had shortages of masks, ventilators and beds to treat the victims, with nurses and doctors contracting COVID-19. Tests were in short supply throughout the world but noticeably in the United States and there were no drugs approved by the Federal Drug Administration (FDA) to treat the virus. There was no vaccine available to prevent the virus and the estimates were that it would be 1 year to 18 months before it would be available.

These two scenarios highlight the nature of pandemics, such as the Spanish Flu of 1918 and COVID-19. There is exponential growth in the number of those contracting and dying from these viruses and the public and key decision makers do not pay attention to the outcome until the numbers grow large enough for the public to be noticeably affected and concerned. The human mind does not easily grasp the explosive nature of exponential growth until it may be too late. This was demonstrated more than forty years ago in a series of pioneering psychological experiments conducted in the Netherlands by Willem Wagenaar and his colleagues.[1] With respect to the current pandemic it took only 67 days to reach 100,000 coronavirus cases worldwide. The second 100,000 cases took 11 days, and the third 100,000 took only four days

Factors Influencing Behavior Toward Pandemics

This section examines how risk perception and cognitive biases lead key decision makers in the United States and the general public to ignore the impacts of the coronavirus in January-February 2020. I then suggest ways to address these biases so people will recognize the importance of dealing with looming pandemics before they create major disruptions to individuals' lives and the economy, as they have in March 2020.

Risk Perception

Risk perception is concerned with the psychological and emotional factors that have been shown to have an enormous impact on behavior. In a set of path-breaking studies begun in the 1970s, Paul Slovic and his colleagues began measuring laypersons' concerns about different types of risks.[2] Pandemics have the following features that characterize people's perceptions of highly risk hazards based on these studies:
- *Dread:* the outcomes from the hazard are feared
- *New risk:* one that has not been experienced by individuals
- *Not known to science:* little knowledge of their likelihood of occurring and their outcomes
- *Uncontrollable*: the spread of the hazard may be perceived as difficult to control
- *Fatal consequences:* people could die from the hazard
- *Catastrophic potential:* thousands perhaps millions of people could die

In January-February 2020 people in the United States did not perceive the coronavirus as a hazard that they dreaded, partly because they did not experience serious illnesses from SARS and the H1N1 virus. In addition, almost all of those infected by the coronavirus were living across the globe in China and South Korea. Hence the federal government did not consider taking an action to deal with a possible pandemic. Many did not see the coronavirus as an *unknown* risk, being told and believing it was similar to the flu. They felt that it was *controllable* and would lead to few deaths, so it did not have *catastrophic potential.* In March, the situation changed radically, and the world now views the coronavirus as one of the most serious risks we have ever faced.

Biases and Heuristics

A large body of cognitive psychology and behavioral economics research over the past 50 years has revealed that decision-makers are often guided by emotional reactions and simple rules of thumb that have been acquired through personal experience. These processes do not work well for making choices with respect to undertaking protective measures for extreme events, such as pandemics, where individuals have limited or no past experience. The errors that individuals exhibit in deciding whether to prepare for the coronavirus can be traced to the effects of six biases summarized below.[3]

1. *Myopia* – the tendency to focus on overly short future time horizons when appraising immediate costs and the potential benefits of undertaking protection
2. *Optimism* – the tendency to underestimate the likelihood that losses will occur from future hazards
3. *Amnesia* – the tendency to forget too quickly the lessons of past disasters
4. *Inertia* – the tendency to maintain the status quo or adopt a default option when there is uncertainty about the potential benefits of investing in alternative protective measures
5. *Simplification* – the tendency to selectively attend to only a subset of the relevant facts to consider when making choices involving risk
6. *Herding* – the tendency to base choices on the observed actions of others

I now indicate how each of these biases played out in the January-February 2020 scenario in the United States and propose ways to avoid the March 2020 scenario.
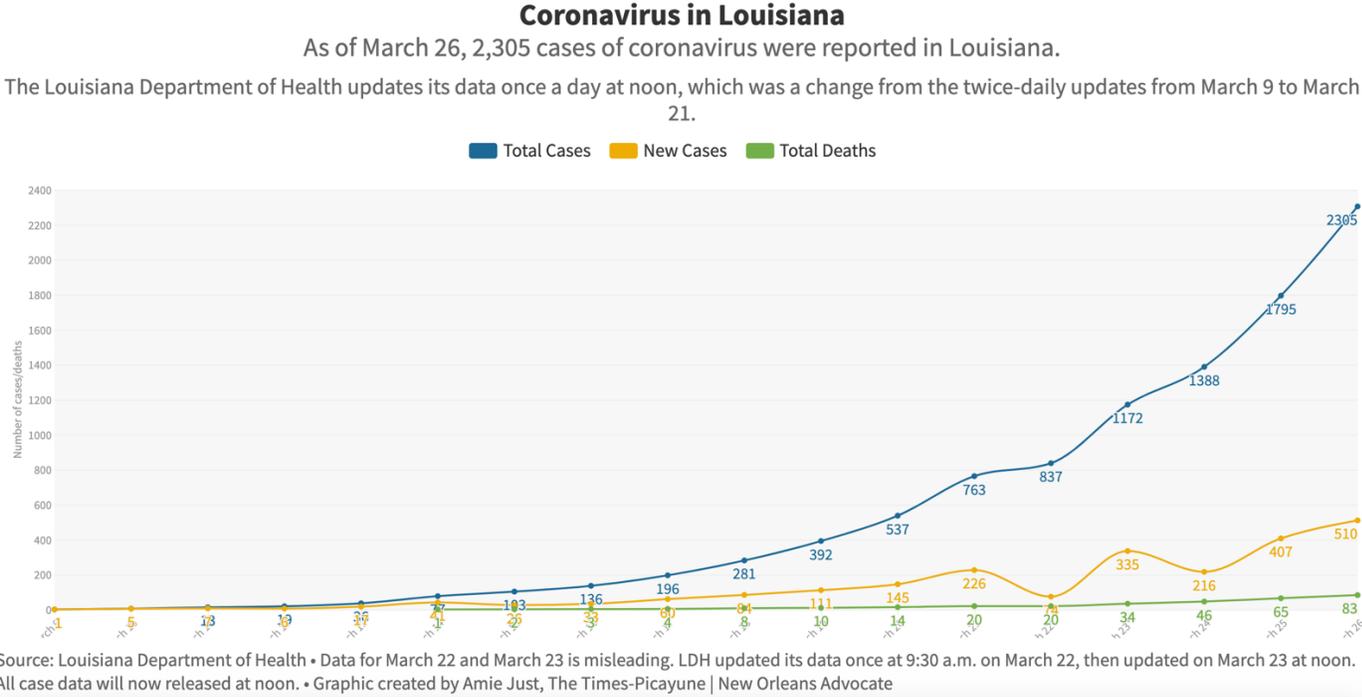
Myopia

Nature of the Bias   One of our greatest weaknesses as decision-makers is that our intuitive planning horizons are typically shorter than those that are needed to see the long-run value of undertaking protection immediately. In this regard, President Trump made repeated efforts to deny and minimize the risk in the early stages of its spread within the U.S., accompanied by under preparation by federal and local health and government officials

Addressing Myopia One needs to highlight the long-term benefits of strategies such as closing schools, businesses and restaurants and staying at home by showing how it reduces the number of people contracting the coronavirus and the number of illness and deaths that would occur if we did not undertake these measures when there was a threat of a pandemic. One can also indicate the ensuing risks associated with a recession or depression as well as the longer-term impacts on the economy, such as permanent loss of jobs.

Optimism

Nature of the Bias. People tend to believe that they are immune or will not suffer severe illnesses or death from viruses. We estimate the likelihood of these adverse events occurring based on our own personal experiences with colds and influenza. Many do not even bother to get flu shots. This behavior can be explained by the *availability heuristic,*[4] where the perceived likelihood of an event occurring depends on its salience and memorability. There is thus a tendency to underweight the probability of a disaster if one has not recently experienced a significant loss.[5] Few individuals in the U.S. experienced severe illnesses from SARS or the HINI virus so they viewed the risk of getting infected as so low that they were not worried about the impact of contracting the coronavirus. In the early stages of COVID-19, epidemiologists recognized that this was a new virus but were unclear how likely individuals would contract it and what its consequences would be.

Addressing Optimism. One way to overcome the optimism bias is to highlight the impacts of exponential growth of the virus by showing that a few illness and deaths in months 1 and 2 (Jan-Feb 2020) can lead to a large number due to contagion in month 3 (March 2020). To highlight this point, the figure below depicts the exponential growth curves of the spread of the coronavirus in Louisiana with respect to the total number of cases, the number of new cases, and the total deaths from March 9th through March 26th.

Coronavirus in Louisiana
As of March 26, 2,305 cases of coronavirus were reported in Louisiana.
The Louisiana Department of Health updates its data once a day at noon, which was a change from the twice-daily updates from March 9 to March 21.

Source: Louisiana Department of Health • Data for March 22 and March 23 is misleading. LDH updated its data once at 9:30 a.m. on March 22, then updated on March 23 at noon. All case data will now released at noon. • Graphic created by Amie Just, The Times-Picayune | New Orleans Advocate

Even when the likelihood of a pandemic does not increase exponentially, data from controlled experiments reveal that most people do not realize that a 1% annual risk of an event that is independent over time implies a 26% chance of at least one occurrence of that event over 30 years. Recent web-based lab experiments found that increasing the time horizon from 1 year to 5, 10, 30 or even 100 years in presenting the probability of a future flood increases demand for flood insurance.[6]

Amnesia

Nature of the Bias. Emotions, such as worry or anxiety, are often stimulated by experiencing a disaster and may lead to concern about undertaking protective measures now. In the case of the coronavirus, the public recognized the importance of staying at home after learning that a large number of individuals had been infected by COVID-19 and the disaster was designated as a pandemic by the World Health Organization. However, empirical studies reveals that this concern fades quickly over time. With respect to natural disasters, many homeowners voluntarily purchase flood insurance after suffering damage to their property. Several years later they decide not to renew their policy if they have not experienced another flood-related loss because they feel they have wasted the money they spent on their premium.[7] They do not appreciate that the best return on an insurance premium is no return at all. One should

celebrate not having a loss over a number of years and continue to purchase insurance to protect themselves financially should their property suffer damage from another flood.

Addressing Amnesia   One way to deal with the tendency to forget the impact of past pandemics, particularly if one has not experienced them, is to provide a scenario of the nature of contagion and deaths from the influenza pandemic of 1918-1919 that spread. It is estimated that about 500 million people or one-third of the world's population became infected with this virus. The number of deaths was estimated to be at least 50 million worldwide with about 675,000 occurring in the United States. Yet there was little reporting of the consequences of this flu in the U.S. and it was rarely mentioned until the coronavirus was declared a pandemic in March 2020.

Inertia

Nature of the Bias   Another important reason why we do not undertake protective measures to reduce future illnesses and deaths from pandemics is that we often prefer to stick with the status quo rather than forging new paths of action. It saves us both time and energy by not having to collect information on the costs and benefits of new alternatives.[8] Sticking with the current state of affairs is the easy option in situations of uncertainty, as illustrated by such aphorisms as 'better the devil you know than the devil you don't' and 'when in doubt, do nothing'. In the case of COVID-19, relatively few individuals contracted the virus in the United States in the first two months of 2020, so it was relatively easy for key decision-makers in both the public and private sectors to indicate that we would not recommend or require actions on anyone's part, such as staying at home or closing schools and businesses.

Dealing with Inertia   Contrast the impacts of maintaining the status quo by making transparent the long-term impacts of a pandemic, such the large number of fatalities, the permanent closing of businesses with a resulting loss of millions of jobs and the challenges of staying at home for long periods of time. In Jan-Feb 2020, the United States and other countries did not recognize how these impacts could have been reduced if preparations had been undertaken to reduce the number of individuals being infected with the coronavirus. Indicate that South Korea is a model to emulate in this regard. The country undertook extensive testing and contact tracing shortly after the coronavirus was identified as a potential serious threat.

Simplification

Nature of the Bias   Individuals are likely to decide how to deal with low probability-high consequence events by focusing either on the likelihood of its occurrence or the consequences from being impacted by it, even though both factors are relevant. In Jan-Feb 2020 the likelihood of a pandemic with severe consequences was below the public's and key decision-makers' threshold levels of concern. The general attitude was why worry about a future pandemic. In March 2020 when we learned about the large number of individuals contracting COVID-19 and the fatalities from the virus, everyone started focusing on the consequences. We all became fearful of our health and safety given the features that characterize risk perception. The hazard is a new risk that is unknown to science, hence not controllable, with potentially catastrophic consequences to our self and others.

Dealing with Simplification   Given the tendency for individuals to view the likelihood of a pandemic as highly unlikely during the early stages of the spread of the virus, highlight a worst-case scenario several months after the first group of individuals have contracted COVID-19. In a recent op-ed piece in the New York Times, Nicholas Kristof provided details of a worst-case scenario of the coronavirus pandemic where 2.2 million people would die in the United States and raised the question as to whether the public would tolerate such an outcome.

Herding

Nature of the Bias   Individuals' choices are often influenced by other people's behavior, especially under conditions of uncertainty. We often follow the actions of others who may not know any more than we do. In the case of the coronavirus, most people went about their normal social activities in the early part of 2020 with some continuing to interact with their friends and colleagues even when COVID-19 was declared a pandemic and viewed as dangerous in March. One notable example highlighted by the media were the number of college students who congregated on the beaches of Florida during their spring break because they wanted to be with friends and did not consider the consequences to them and others if they caught the virus.

Addressing Herding   Humans are social beings, so it is natural for them to want to be with others. At an early stage of the pandemic, most individuals will follow their normal routine that is likely to involve social gatherings, events that attract hundreds if not thousands of individuals. During Jan-Feb 2020, most individuals in the United States adhered to this pattern. Only in March did it become clearer that some restrictions had to be imposed or advocated by state governors and other key decision-makers. Given that it is difficult to establish norms that lead individuals and businesses to voluntarily curb their activities to reduce the risks associated with a pandemic, it may be necessary to impose regulations that require business to close their facilities and for the public to practice social distancing. Social media can play a positive role when individuals are forced to stay at home with Facebook, Facetime and technologies, such as BlueJeans and Zoom enabling to people to be connected by communicating with friends and family who are not with them, for businesses to holding virtual meetings and for universities and schools to continue through online courses and presentations.

Conclusions and Future Research

A principal challenge in dealing with pandemics, such as the coronavirus, is to recognize how individuals perceive the risk and to deal with their biases by taking steps early enough to reduce the potentially severe impacts that may otherwise lead to a large number of fatalities and severe disruptions to the economy. By reframing the nature of the risk, leaders at the federal, state and local level are likely to pay attention to the long-term impacts of a pandemic and impose well-enforced regulations to reduce the spread of the virus. By presenting information on the long-term risks of a pandemic, the public is likely to agree to take unusual measures, such as staying at home for long periods of time. It will also be important for political leaders to listen to the advice of epidemiologists and heads of organizations concerned with infectious diseases such as Anthony Fauci, director of the National Institute of Allergy and Infectious

Diseases (NIAID). They are recommending *social distancing* for a long enough period of time so the virus will be stamped out.

Future research can address the following questions:
- What data and information should epidemiologists and other scientific experts provide so that individuals and key decision makers will undertake steps to reduce the risks of pandemics?
- What messages can be used to convince individuals to make sacrifices now (e.g. staying at home for relatively long periods of time) so they avoid more serious consequences of the pandemic in the future?
- What are the political challenges associated with developing regulations and restrictions that are likely to be resisted by the public and how can one address them?
- How can one use the media and new technologies effectively to create social norms in the future for dealing with pandemics?

The current coronavirus pandemic provides an opportunity for addressing these and other questions so that we are better prepared for future disasters. It also may lead to strategies for addressing other long-term issues such as taking steps now to address the risks associated with climate change. It may also lead to more effective public-private partnerships for addressing issues of inequality by recognizing the severe economic impacts that workers and low income groups are currently facing in dealing with the impacts that the coronavirus is having on their lives.

---

[1] Wagenaar, W.A., Sagaria, S.D. Misperception of exponential growth. *Perception & Psychophysics* **18,** 416–422 (1975). https://doi.org/10.3758/BF03204114

[2] See: Slovic, P. (2000), The Perception of Risk, London and Sterling, VA: Earthscan for a collection of articles on risk perception.

[3] For more details on these biases see Meyer, R. and H. Kunreuther (2017). The Ostrich Paradox: Why We Underprepare for Disasters. Philadelphia, PA, Wharton Press.

[4] Tversky, A. and D. Kahneman (1973). Availability: a heuristic for judging frequency and probability, *Cognitive Psychology*, 5, 207-232

[5] Hertwig, R., G. Barron, E. U. Weber and I. Erev (2004), 'Decisions from Experience and the Effect of Rare Events in Risky Choice', Psychological Science, 15(8): 534–539

[6] Chaudhry, S. J., Hand, M., and Kunreuther, H. (2020) "Broad bracketing for low probability events" Wharton Risk Center Working Paper February

[7] Michel-Kerjan, E., Lemoyne de Forges, S., and Kunreuther, H. (2012). "Policy tenure under the U.S. National Flood Insurance Program (NFIP)." *Risk Analysis* 32: 644-658

[8] Samuelson, W. and R.J. Zeckhauser (1988), "Status Quo Bias in Decision Making." *Journal of Risk and Uncertainty*, 1(1), 7–59.