



Society of Actuaries Research Brief

Impact of COVID-19

March 10, 2020





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Section 1: Introduction

In late December 2019, doctors in the Wuhan province of China began to piece together information from several medical cases showing similar symptoms. As 2019 ended, Chinese officials announced a pneumonia-like outbreak and began to identify a “novel coronavirus” linked to the cases. As the Lunar New Year banquet tradition occurred in Wuhan in mid-January 2020, infections began to rapidly increase. By January 23, over 600 cases had been confirmed and Wuhan and other areas in China instituted quarantines.

Through the month of February to today, the epidemic has spread. The number of confirmed cases involving the novel coronavirus named “SARS-CoV2”, and causes the respiratory disease now named “coronavirus disease 2019” (COVID-19), has reached over 110,000 world-wide. Over 60 countries have reported cases, and over 4,000 deaths world-wide have now occurred. The health, mortality and economic focus has become one of international concern beyond China, as countries like Italy, South Korea, Iran, France, Germany and Spain have also reported well over 1,000 confirmed cases. Increases in cases in other locations may occur depending on the pace of implementing testing protocols.

The impact of travel and shipping restrictions in a modern, interconnected international economy has had an exacerbating effect of the outbreak into logistics and the financial markets. When the severe acute respiratory syndrome (SARS) outbreak occurred in 2003, annual airline passenger traffic between the U.S. and China was well under 2 million travelers per year. In more recent years, the number annually exceeds 8 million people. Supply chains of international operations are greatly impacted as well, as many major worldwide manufacturers are ever-more connected across continents.

The result in February and March 2020 has been one where a confluence of risks has come together. Morbidity, mortality, asset/liability management and operational risks are all a part of the initial and evolving story. This Society of Actuaries Research Brief has been constructed to highlight some of the key features of the epidemic and contemplate the risks for the actuarial profession to consider in their work.

Section 2: Key Statistics

Reported Cases

National health organizations around the world have been fast at work in connecting with health care providers in order to collect current case information. As of March 10, 2020, over 118,000 cases have been reported world-wide, and these countries have all reported over 300 cases of COVID-19:

| Country | Confirmed Cases | Percentage of World-Wide Cases |
|--------------------------|-----------------|--------------------------------|
| China | 80,757 | 68.4% |
| Italy | 10,149 | 8.6% |
| Iran | 8,042 | 6.8% |
| South Korea | 7,513 | 6.4% |
| France | 1,784 | 1.5% |
| Spain | 1,646 | 1.4% |
| Germany | 1,457 | 1.2% |
| United States of America | 808 | 0.7% |
| Japan | 581 | 0.5% |
| The Netherlands | 382 | 0.3% |
| Switzerland | 374 | 0.3% |
| United Kingdom | 325 | 0.3% |

Mortality Rates

World-wide mortality is currently crudely estimated at approximately 3.6% and are generally reported by health and media publications in the 3.0% – 4.0% range. These crude estimates, however, often are adjusted due to likely under-reporting of actual cases. Many potential cases may be asymptomatic, and mild cases may not seek treatment in the local health care systems. Initial crude mortality rates in the U.S. are currently estimated at 3.5% - 4.5%, slightly higher than the world-wide rate, primarily due to the disease initially being seen in higher age groups. Mortality rates appear to be emerging as very dependent on age, with much higher mortality rates being seen for patients over ages 70, especially for those with health conditions that weaken the lungs and immune system. Estimates for older age groups have been estimated in the 8.0% - 10.0% range from various health officials and media sources.

The ultimate rate of mortality from COVID-19 will evolve over time. Some key health officials in the U.S. expect an ultimate population mortality rate from the disease to settle in the 0.5% - 1.0% range. Life insurance companies will focus on how the population mortality rate translates into the ultimate mortality of their own insured populations. Socioeconomic factors may be a key driver of how mortality plays out, as an individual's access to healthcare services and current health condition are often factors that drive survival rates in a confirmed case.

Comparison to Past Pandemics and Influenza

By comparison, the spread of COVID-19 has been much greater than similar epidemics witnessed in the 21st century, but also with much lower mortality rates. The following table shows comparative statistics of COVID-19

compared to the severe acute respiratory syndrome (SARS) outbreak of 2003 and the Middle East Respiratory Syndrome (MERS) in 2012.

| Epidemic | Number of Countries Reporting Cases | Estimated Deaths | Estimated Contracted Cases | Estimated Mortality Rate |
|------------------------|-------------------------------------|------------------|----------------------------|--------------------------|
| SARS (2002 – 2003) | 29 | 774 | 8,098 | 9.6% |
| MERS (2012 – 2014) | 27 | 858 | 2,494 | 34.4% |
| COVID-19 (2019 – 2020) | 60+ | 4,262 | 118,101 | 3.6% |

The U.S. was a very small part of these previous outbreaks in comparison to the level of activity seen with COVID-19. Eight U.S. patients had evidence of the SARS infection, and no deaths occurred in the U.S. due to SARS. The U.S. saw only two cases and no deaths due to MERS in 2014, both associated with individuals who had lived or worked on the Arabian Peninsula.

In addition, it can be beneficial to compare the extent of the impact of a sample influenza year to understand the magnitude and strain on health care systems and population mortality. The most recent full year of mortality in the U.S. is from 2018, which was also a fairly harsh year for the age-adjusted influenza mortality rate. The overall U.S. population age-adjusted rate for influenza grew by 4.2% in 2018. The U.S. influenza season across 2017-2018 saw over 48 million people become ill, with over 950,000 people hospitalized and over 79,000 deaths. The annual mortality rate for influenza in the U.S. typically is observed between 0.1% and 0.3%.

Additionally, in 1918 the world faced an influenza H1N1 pandemic as World War I was ending. Mortality was high in people younger than 5 years old, 20-40 years old, and 65 years and older. The high mortality in healthy people, including those in the 20-40-year age group, was a unique feature of this pandemic. Health officials estimate that about 500 million people became infected with this virus, and mortality was estimated to be approximately 50 million worldwide. Since 1918, the world has experienced three additional pandemics, in 1957, 1968, and most recently in 2009. These subsequent pandemics were less severe and caused considerably lower mortality rates than the 1918 pandemic. The 1957 H2N2 pandemic and the 1968 H3N2 pandemic each resulted in an estimated 1 million global deaths, while the 2009 H1N1 pandemic resulted in fewer than 300,000 deaths in its first year.

Health Care Cost and Utilization

Data on the cost and utilization of treatment for individuals who are diagnosed with COVID-19 still appears to be emerging. Future research efforts will focus on emerging data for the cost of detection and treatment. In an effort to encourage early detection and treatment, some U.S. health insurers announced that they would waive copays and cost sharing for COVID-19 detection tests. Several pharmaceutical companies have been developing and testing treatments for COVID-19, though results are still preliminary. In addition to these antiviral and anti-infective treatments, preventive medicines and therapeutic antibodies are being reviewed.

Infection Spread Rate

Transmission rates for diseases, and the intensity of an outbreak, are highly dependent on how the pathogen travels between people. Coronaviruses generally can travel up to six feet from an infected person, as they move through respiratory droplets produced through sneezes, coughs or conversations. Some estimates suggest that

each person with the new coronavirus could infect between two and four people without effective containment measures. The incubation period for COVID-19 is also relatively long compared to other diseases, with estimates running from 2- 14 days from the time of exposure to when the individual shows symptoms. With concerns about the spread of the disease and the length of the incubation period, many countries have implemented quarantines. The quarantines vary broadly, including limitations on entering the country to full regional or national quarantines of the population. Recently, the Italian government declared the entire country a "red zone," meaning people should stay home except for work and emergencies.

By comparison, other pathogens more easily travel through the air for longer distances, such as up to 30 meters for tuberculosis, chickenpox and measles. With the SARS coronavirus in 2003, world health authorities were able to eventually track and isolate cases. The result was to bring the average number each sick person infected down to 0.4, suppressing the outbreak.

Health and public officials have responded in several cases by canceling spectator events that would bring large groups of individuals into close proximity to each other. As examples:

- The BNP Paribas Open, a main tennis tournament held in Indian Wells, CA for the Association of Tennis Professionals and Women's Tennis Association, was canceled due to concerns surrounding the coronavirus and the safety of the participants and attendees at the event.
- Several Union of European Football Associations (UEFA) Champions League matches, which often feature large fanbases travelling across Europe to support their teams, will be played behind closed doors without spectators in attendance.
- The South by Southwest music, film and technology festival, held annually in Austin, TX has been canceled due to concerns about the coronavirus.

Section 3: Economic and Asset Impact

Macroeconomic Variables

With COVID- 19 impacting business around the world, domestic and international financial markets have reacted to reflect potential lower levels of economic activity.

The U.S. Bureau of Labor Statistics released its initial report for February 2020 on March 6 and noted that the U.S. labor markets were little changed from previous months. Nonfarm payroll employment rose by 273,000 in February, the unemployment rate was relatively unchanged at 3.5%, and the number of unemployed persons in the U.S. remained at 5.8 million. This reflected the continuing general steadiness within the U.S. labor market prior to trade and commerce disruptions that resulted as impacts of COVID-19 emerged in international trade.

On Tuesday March 3, in an attempt to limit the economic and financial fallout from COVID-19, the Federal Reserve reduced the benchmark U.S. interest rate by half a percentage point to just below 1.25%, down from about 1.75%.

As the impact of the epidemic was seen to impact global economic activity, the Organization for Economic Cooperation and Development estimated that global growth could slow to 1.5% in 2020. This was approximately half the rate it projected in November 2019. Similarly, the International Monetary Fund indicated it expected global growth could slow to 2.9%, following an estimation of 3.3% in January 2020.

Asset Values and Volatility

International financial markets have reacted to COVID-19 as some investors sought increasing shelter in government bonds amid uncertain future economic activity arising from the impact of COVID-19. Equity trading at the New York Stock Exchange was halted for 15 minutes early in the session on Monday March 9 as the Standard & Poor's 500 Index fell 7% from its previous close. Major U.S. indexes are approximately 15 – 20% lower than recent highs from mid-February 2020, with current values similar to levels seen in August and October 2019 prior to general run-ups in equity values between October 2019 through mid-February 2020.

Low Interest Rate Environment

Low Interest rates in major international financial markets have been more the norm over recent years, and the current impact of COVID-19 has further driven down interest rate levels. Benchmark Treasury yields in the U.S. have fallen nearly 100 basis points since mid-February, with the benchmark 10-year Treasury yield temporarily reaching a record low of under 0.40% and the 30-year Treasury moving below 1.00% for the first time ever. While some widening of corporate spreads was initially seen as interest rates fell in late February 2020 to maintain reinvestment yields, spread widening has not kept up with the decline in Treasury yields in more recent observations.

Reinvestment Risk

With the material drop in interest rates to even lower levels, the opportunity to reinvest maturing assets becomes even more difficult for financial institutions. Maintenance of fixed income portfolio yields that support fixed interest crediting rates will pose a continuing challenge as the prolonged low interest rate environment continues.

Section 4: Operational Risks

As businesses around the world work with their employees to minimize the impact of COVID-19, new operational risks and concerns begin to emerge. The following risks have been identified as key ones to watch through discussions with actuarial profession thought leaders.

Remote Work

A common step implemented by many organizations around the world has been to encourage remote work environments. In this setup, employees work from a remote location outside the normal office setting, often from their own personal residence. Often, the organization will provide key technology items, such as a laptop computer or access to systems through internet connections, in order to facilitate a productive work environment. This helps maintain physical distance and reduce the chance of spreading disease among an employee population.

While remote work is not a new concept, the volume of remote work that is expected to be implemented due to COVID-19 may greatly exceed previous expectations. Employers will be looking to maintain productivity and keep processes moving. Many organizations may need to quickly convert paper-based processes and educate employees on effective communication through technology solutions.

A mitigation to this risk is that many employers have already implemented some form of remote work, ranging from arrangements that allow employees to periodically work remotely up to full time remote work. The previous investment of these work arrangements may be beneficial to companies in any prolonged transition for their employees.

Physical asset and information security risk also increases as remote work becomes more the norm. Organizations are often encouraged to remind staff of basic security practices, like ensuring that they don't leave company assets, documentation, confidential information or property unattended in public places, and to be aware of others who may be working around them.

Internet Service Provider Capacity

With the growth of remote work, many employers are looking to determine if there will be any new or different strains on internet service provider (ISP) capacity. Remote work in large volumes across many organizations may put different pressure loads on internet service providers. Organizations and their employees will be monitoring connection speeds needed for a range of work, especially if work is done using a remote desktop connection.

Cyber Risk

Cyber criminals may take the opportunity, with both less physical presence at offices and more remote nodes connecting to an organization's network, to increase cyber-attacks. Distributed denial of service (DDoS) attacks may increase where attackers flood the bandwidth or resources of a targeted system, usually one or more web servers. These types of attacks can severely slow or cut off system access at critical times for organizations.

Organizations will look to refresh or implement additional cyber protections, such as ensuring devices use full disk encryption. If a physical computer asset is lost or stolen, organizations will look to further ensure that data on the device would not be accessible. Virtual Private Network (VPN) connections are expected to further increase in their usage to enable access to corporate networks remotely, but also creating a higher risk of unauthorized access and data leakage. The use of personal ISPs, and an expected growth in the use of public Wi-Fi services, create

opportunities that enhance cyber risk. In a growing era of data privacy, and the costs associated with reconciling the loss of customer data, this risk may become more prominent.

International Trade Dependency

Many manufacturing organizations around the world today are dependent on international trade and shipping systems in order to receive supplies, facilitate sales and distribute products. Financial services companies may be less exposed to these operational risks on a short-term basis, but longer-term events could cause risks when physical assets (such as computers, and network servers) need maintained or replaced.

Section 5: Previous SOA Research Highlights

Over the years, many committees and sections within the Society of Actuaries (SOA) have helped support, fund and promote research related to disease outbreaks. The following is a short highlight of key reports previously released by the SOA or highlighted at SOA professional development sessions that may be of benefit for the actuarial profession. The SOA is committed to updating these types of reports as new information emerges.

The report series on “**Potential Impact of Pandemic Influenza on the U.S. Life Insurance Industry**” gives guidance through several reports on the potential impact of a disease outbreak on population and insured mortality in the United States, and additionally has information on the potential impact on financial markets, corporate bond spreads, monetary policy and economic output.

<https://www.soa.org/resources/research-reports/2007/research-impact-pan-influ-life-ins/>

Potential Impact of Pandemic Influenza on the U.S. Life Insurance Industry

Research Projects – Life Insurance

Sponsored by the Committee on Life Insurance Research and the Risk Management Section's Research Team, Jim Toole of MBA Actuaries evaluates the financial effects of different flu pandemic scenarios on the U.S. Life Insurance industry. In addition to the research report, he has developed an accompanying spreadsheet tool for individual insurers to better understand the associated financial risks of a flu pandemic.

During this study, the Project Oversight Group conducted two Delphi studies. One study examined how excess insured mortality as a result of a flu pandemic might differ from that of the general population. The second study examined the potential economic effects of a flu pandemic. Results are presented in the following reports.

Materials

[Potential Impact of Pandemic Influenza on the U.S. Life Insurance Industry Report](#) 

[Pandemic Model Tool Documentation](#) 

[Pandemic Model Tool](#) 

[Study of the Effect of a Flu Pandemic on Economic Values Using the Delphi Method](#) 

[Study of the Effect of a Flu Pandemic on Insured Mortality Using the Delphi Method](#) 

The report series “**Potential Impact of Pandemic Influenza on the U.S. Health Insurance Industry Report**” highlights the potential impact of an outbreak on health care costs, including information on how costs may vary by the site of care, and the impact on operational risks to health care providers.

<https://www.soa.org/resources/research-reports/2010/research-pandemic/>

Potential Impact of Pandemic Influenza on the U.S. Health Insurance Industry Report

Research Projects – Health

Sponsored by the Committee on Life Insurance Research, the Joint Risk Management Section's Research Team, and the Health Section, Jim Toole of MBA Actuaries evaluates the financial effects of different flu pandemic scenarios on the U.S. health insurance industry. In addition to the research report, he has developed an accompanying spreadsheet tool for individual health insurers to better understand the associated financial risks of a flu pandemic.

This is the second paper in a two-part series examining the potential impact of pandemic influenza on the insurance industry. The [first paper](#) focused on the potential impact of pandemic influenza on the life insurance industry.

Materials

[Potential Impact of Pandemic Influenza on the U.S. Health Insurance Industry Report](#) 

[Health Company Pandemic Modeling Tool Spreadsheet Documentation](#) 

[Health Company Pandemic Modeling Tool](#) 

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About the Society of Actuaries

With roots dating back to 1889, the Society of Actuaries (SOA) is the world's largest actuarial professional organization with more than 31,000 actuaries as members. Through research and education, the SOA's mission is to advance actuarial knowledge and to enhance the ability of actuaries to provide expert advice and relevant solutions for financial, business and societal challenges. The SOA's vision is for actuaries to be the leading professionals in the measurement and management of risk.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policy makers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and non-actuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues, and thereby provides value to stakeholders and decision makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

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