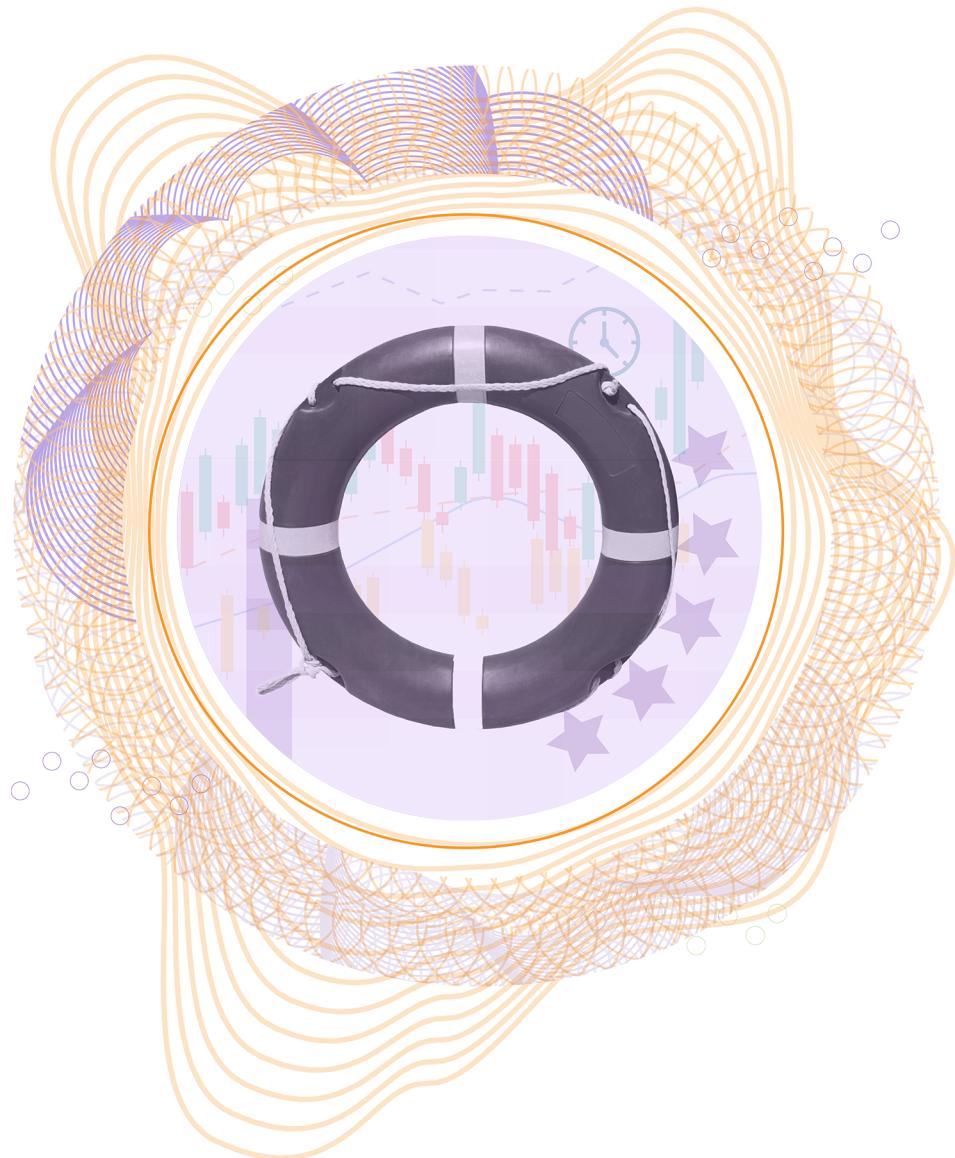


# Deloitte.



Actuarial assumptions  
and COVID-19

## Introduction

The COVID-19 virus has had a global impact. Hundreds of millions of people got infected with the virus, while millions of lives were lost to the infection. Even those who avoided a positive diagnosis may have still been infected, falling into the asymptomatic category, a classification and word most of us gained familiarity with over a year-and-a-half ago.

Many insurance companies are continuing to deal with and are navigating the direct and indirect impact of COVID-19 on their business and dealing directly with the uncertainty of the future across a spectrum of operations and coverages. In spite of this uncertainty, actuaries still need to set assumptions that drive pricing and measure financial impacts. Assumption setting can be a challenge; as data continues to be refined as it emerges on COVID-19-related deaths, morbidity incidence related to COVID-19 had an immediate impact and left long-term health impacts uncertain. The question that continues to be asked is, "How do we quantify the impact COVID-19 had on the survivors and the general population?"

How do actuaries approach the assumption-setting process for morbidity, mortality, and mortality improvement, resulting from COVID-19? When does one start accepting that readily available data is limited and perfect data does not exist, regardless of effort? Companies can accept these challenges and begin with distinguishing between what could be considered permanent versus temporary impairments across insurance industries. Assumption setting has always involved a level of actuarial judgment. Reflecting COVID-19 impacts on assumption setting will be no different; however, it will be even more important to critically consider the use of the data that is available and to reflect it in the setting of assumptions.

Assumption setting requires continued analysis, adjustments as new information becomes available or is refined, and applying professional judgment. This article does not provide answers or instructions on how to tackle setting assumptions in a COVID-19 environment, but it is intended to provoke thoughts on how to start the journey. Starting the assumption-setting process by developing a hypothesis based on awareness supported by data and sound analyses is a step in the right direction.

## Awareness of COVID-19 impacts

Variations exist in the level of risk that COVID-19 presents to the insurance industry. As we apply professional actuarial judgment about the impact of the pandemic on actuarial assumptions, we consider the levels of risk that inform our judgment. These different levels of risk are explored further and discussed as primary, secondary, and tertiary, respectively.

**Primary:** The primary risk from COVID-19 infection is death. Early on in the pandemic, before much was known about the virus, certain pockets of the demographic population were more susceptible to severe illness or death. Over time, this primary risk has been treated using different therapeutic techniques and, more recently, through the availability of vaccines and vaccine boosters.

**Secondary:** The secondary risk from COVID-19 infection is hospitalization and survival or asymptomatic or symptomatic infection that does not result in hospitalization. While many who are infected develop a level of natural immunity, there are also secondary health impacts and quality-of-life issues in the post-recovery period, such as brain fog, shortness of breath, and fatigue. These individuals are often referred to as "long-haulers." We do not yet know the potential universe or duration of these post-recovery impacts of COVID-19 infection on an individual's life expectancy or health.

**Tertiary:** The tertiary risks from COVID-19 infection are societal, economic, and emotional impacts. Government lockdowns, restrictions, and strict social measures were put into place. Downstream impacts from COVID-19 will continue to emerge along with the long-term impacts of the secondary risks.

Establishing a "universe of sorts" for hypothesis creates a framework to explore and build a rationale that can be shared across key stakeholders, allowing them to develop a common nomenclature, foster a threshold of understanding, ask questions, or investigate ideas in a manner that does not demand ownership or that becomes too theoretical.

## Establishing a hypothesis

Due to so much uncertainty across the time horizon of the impact that the virus can have, general practice is to establish a hypothesis based on available indications. Given the three-levels-of-risk framework noted above and the experiences observed, a hypothesis that explores a short-, medium-, and long-term set of impacts on an individual's mortality/morbidity as a result of COVID-19 can be developed. This established hypothesis explores a specific set of assumptions that impact life and health insurance products. This framework can be adapted to various insurance products inclusive of property/casualty and liability insurance.

In the **short term**, data indicates that vaccines and therapies are reducing the likelihood of death. The length of time to vaccinate the most at-risk population has a direct impact on the number of deaths and any concentrated strain on the hospital/medical infrastructure. The increasing amount and effectiveness of therapeutics will have a direct impact on reducing the number of deaths and availability of treatment. While the longer-term side effects resulting from having COVID-19 are still unknown, some common symptoms are starting to appear.

COVID-19 variants emerged around the globe and may continue to do so; there is not enough information on the additional impacts on the population from these variants yet to know. However, the vaccines appear to be effective at preventing severe illness from the virus.

There are many **medium-term** impacts that can be explored under a hypothesis. These medium-term impacts include the general health of the population. These may affect future insurable lives or current insured lives.

A study carried out by scientists at the University of Oxford<sup>1</sup> found that even three to six months after recovery from COVID-19, some survivors experienced breathing problems, abdominal pain, fatigue, anxiety, and depression. Furthermore, individuals demonstrated impaired cognitive performance.

As time passes, more data and studies may bring light to the **long-term** health impacts from COVID-19. A Cigna study,<sup>2</sup> based on its commercial customers, revealed that the most common long-term complications resulting from COVID-19 "include issues with the nervous system (such as headaches, migraines and seizures), hypertension, depression and substance use disorders, in addition to the well-documented respiratory issues."

Based on the current information available, we established an expectation on how the short-, medium-, and long-term impacts from COVID-19 may influence the setting of mortality, mortality improvement, and morbidity assumptions for life and health insurance products in figure 1.

**Figure 1. Proposed duration-based impacts of COVID-19**

	Mortality	Mortality improvement	Morbidity
Short term	Increase	Decrease	Increase
Medium term	Increase	No change	Increase
Long term	Decrease	No change	Increase

The following is an excerpt from Actuarial Standards of Practice (ASOP) 10:

*"In advising management as to the selection of best-estimate assumptions, the actuary should consider, among other things, the characteristics and magnitude of the company's business; the maturity of the company and its rate of growth; the prior experience of the company and the trends in that experience; as well as medical, economic, social, and technological developments that might affect future experience."*

The standards established for actuarial evaluation are highly pertinent to the development of a framework and hypothesis. Scientists work to catch up with and publish their understanding of all aspects of the virus. Social policies are developed to prevent the virus spread and improve the vaccinations. Actuaries must remain diligent in their collection of data, assessment of data, and evaluation of the medical, economic, social, and technological activities on the virus's impact.

## Assessing the data

The availability of documented and recorded data related to COVID-19 mortality and morbidity impact is far from perfect. Some companies are able to obtain information on COVID-19 deaths with death certificates as evidence. The death certificates are only "good at best" data. Not all recorded COVID-19 deaths are solely due to a direct result of having the virus. It is also likely that there are deaths in which COVID-19 was not listed as the cause of death on the death certificate, despite being the cause of death.

Even though the interpretation, accuracy, and completeness of the data is questionable, the insurance industry cannot change nor can it ignore what is available. Companies will be faced with accepting the quality of the data, learning from it, and making adjustments, as necessary.

Companies should start by taking an inventory on what data is available and then evaluate the data, using a critical mindset to apply actuarial judgment. It will be important to establish a framework that clearly documents judgment versus fact that is used in the evaluation of the evidence.

To gain insight, consideration could be given to past pandemics, such as the Spanish flu, bird flu, or swine flu. Impacts from these previous pandemics could provide valuable information for assessing the data from the COVID-19 pandemic.

## Performing analysis

Given it has only been a short time since the first COVID-19 case was publicly suspected in December 2019, industry experience studies are not yet available to leverage. More time is needed for the impacts to be realized and to collect and analyze this information. Data will continue to evolve, so it's not as simple as taking the data used in last year's experience study, or even the data from 2020, and using an extrapolation method.

Similar to performing traditional mortality experience studies, companies could consider segmenting the population by risk category, such as age. The population may not be equally impacted, therefore segmenting the analysis to consider age grouping may be a practical approach.

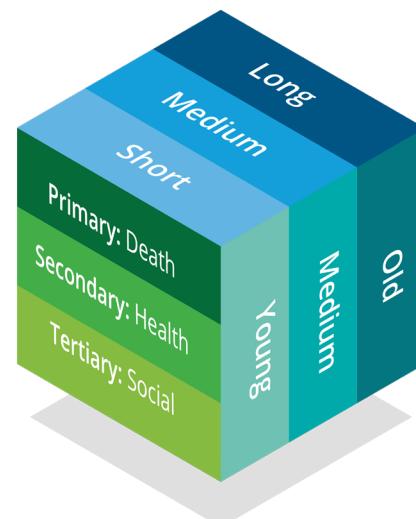
For purposes of this article, we segment the population into low risk (younger ages), medium risk (middle ages), and high risk (older ages) categories. Thus far, we have seen that the younger and middle ages may be less impacted by the primary risk from COVID-19, as fewer COVID-19 deaths are resulting at these age bands.

However, secondary and tertiary impacts may be more prevalent, which could result in an increase in mortality and morbidity. For the older ages, the primary risk may be the most predominant; however, in the long term, this may result in reduced mortality if the highest risk lives were removed from the population, yet still an increase in morbidity.

For mortality improvement, a study may not be necessary. Companies could consider reducing mortality improvement by age group and for a certain length of time. More time and data are needed to understand if mortality improvement will be greater due to those who contracted COVID-19 in the short term or if long-haulers will put a strain on mortality improvement. Setting this type of assumption is not, however, new ground for actuarial experience analysis. Interest-sensitive policyholder behavior assumptions (dynamic lapse or rider utilization) were developed years before interest-rate movements were significant enough to be realized. Judgment in this area will be critically evaluated and should be subjected to rigorous documentation.

Given some of the intermediate health-related issues developed by those impacted by COVID-19, health actuaries may consider how these medium- and long-term impacts may play out relative to health care. A hypothesis matrix (figure 2) for morbidity might consider how long-term-care benefit costs might decrease due to mortality in the short term but spike in the long term. How would a spike in future chronic obstructive pulmonary disease (COPD) ailments impact the utilization of health care benefits and drive up health care costs? As with mortality, morbidity assumption assessments, made within a risk- and duration-driven framework, help the actuary to ensure consistency of thought and reasonableness of recommendations.

**Figure 2. Mortality assumption framework**



## Conclusion

Although much time has passed since the pandemic started, there are still a lot of unknowns around the impacts resulting from COVID-19 and the data that is presented to us for consumption. In setting actuarial assumptions, judgment should always be used. This article is less about the final outcome of the assumptions recommended than about establishing a framework that clearly illustrates an actuary's responsibility to consider "medical, economic, social, and technological developments" (ASOP 10) in the assumption-setting process within the current environment. We must take the knowledge that we have gained with the data in front of us and continue to perform sound analyses to arrive at the best conclusion. Then, we must communicate our evolving conclusions clearly and succinctly.

## Authors

### Thomas Q. Chamberlain, ASA, MAAA

Managing director  
Actuarial and Insurance Solutions  
Deloitte Consulting LLP  
tchamberlain@deloitte.com  
+1 312 486 3828

### Maria Itteilag

Senior manager  
Actuarial and Insurance Solutions  
Deloitte Consulting LLP  
mitteilag@deloitte.com  
+1 860 725 3228

### Matthew Clark, FSA, CFA, CERA, MAAA

Principal  
Actuarial and Insurance Solutions  
Deloitte Consulting LLP  
matthewclark@deloitte.com  
+1 312 486 0185

## Endnotes

1. University of Oxford, "Over a third of COVID-19 patients diagnosed with at least one long-COVID symptom," September 29, 2021.
2. Cigna, "Understanding the long-term effects of COVID-19 infection to better support the American workforce," 2021.

# Deloitte.

This publication contains general information and predictions only and Deloitte is not, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your business. Before making any decision or taking any action that may affect your business, you should consult a qualified professional adviser. Deloitte shall not be responsible for any loss sustained by any person who relies on this publication.

## About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see [www.deloitte.com/about](http://www.deloitte.com/about) to learn more about our global network of member firms.