

Estimating the impact of COVID-19 on healthcare costs in 2020

Key factors of the cost trajectory

Hayley Rogers, FSA, MAAA
 Charlie Mills, FSA, MAAA
 Emma Kramer, FSA, CERA, MAAA

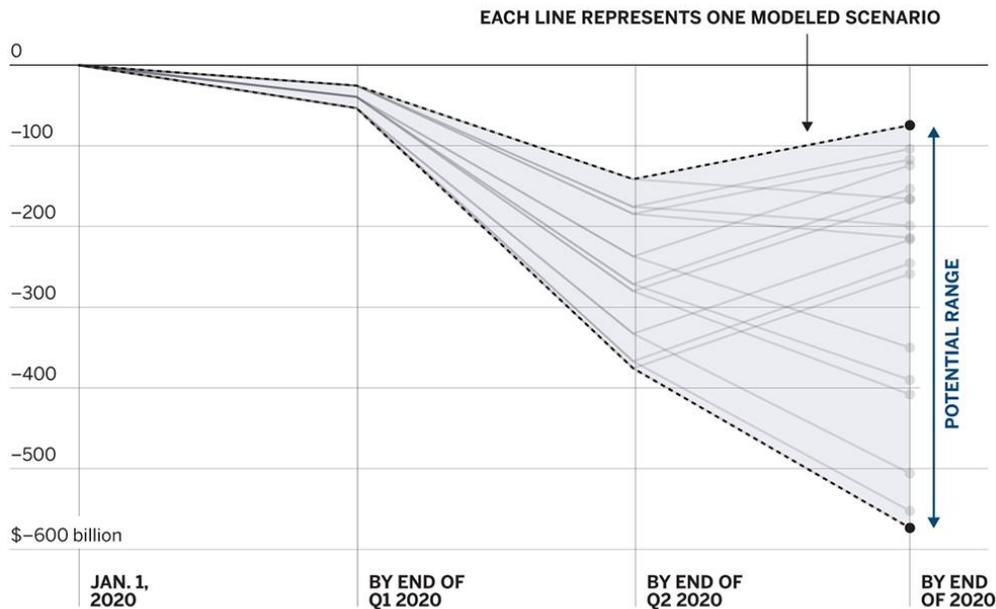


In just a few months, COVID-19 has brought the world to a standstill—economies are closed, unemployment claims are at an all-time high, and the cost of oil dropped to essentially zero. The healthcare system has entered an extraordinary period as it responds to the disease. The system is wrestling with a virus that threatens to overwhelm hospital capacity, while simultaneously confronting an unprecedented reduction in elective and non-essential care. This dramatic deviation from the status quo has significant financial implications. While the effect on healthcare delivery and utilization is not yet fully understood, we do know the key factors driving the financial impact of the disease: the cost of testing and treatment of COVID-19 patients, and the cost of medical services that are not provided due to social distancing mandates, as well as efforts to preserve hospital capacity so that the healthcare system is not overwhelmed. Conventional wisdom holds that COVID-19 is increasing costs for healthcare payers due to an influx of patients requiring testing and treatment. While these costs are significant, our analysis reveals that the deferral and elimination of care is a far more impactful driver of costs. We project a net reduction in medical costs for healthcare payers by at least \$75 billion and as much as \$575 billion if the deferral and elimination of care continues through the end of 2020.

Key results of the analysis include:

- If COVID-19 results in deferred care through the end of June, the net reduction of 2020 healthcare costs through June will be between \$140 billion and \$375 billion nationally. The net reduction at year-end would depend on pent-up demand as care resumed in the second half of the year.
- If COVID-19 results in deferred care through the end of the year, either because of a “second wave” or an elongated first wave of infections, the net reduction in 2020 healthcare costs will be between \$75 billion and \$575 billion nationally.
- These net impact estimates differ significantly by payer. While commercial and Medicare payers are likely to see net decreases in costs, Medicaid payers could experience a net increase, with more people who have lost their jobs shifting to this safety net program.
- We expect an increase in costs after the pandemic due to deferred care and pent-up demand, which is included in our estimate of the impact to 2020 medical costs. The estimate of services deferred to 2021 is beyond the scope of this paper, but those costs are likely to be very significant.

Using the Milliman COVID-19 Pandemic Modeling Suite, we modeled 18 different scenarios with various assumptions about duration of the pandemic and service deferral/elimination. Each scenario generated a different range of results. Figure 1 shows these results by scenario at the end of June 2020 and the end of December 2020. The key assumptions underlying this analysis are almost certain to change as our knowledge of COVID-19 expands and additional experience emerges. This variation in results is illustrated by the widening of the potential range in Figure 1 as time elapses.

FIGURE 1: TOTAL 2020 NATIONWIDE NET ALLOWED COST IMPACT OF COVID-19 FOR COMMERCIAL, MEDICARE AND MEDICAID COMBINED

Key factors of the analysis

In this white paper, we explore the key factors expected to influence the course of the COVID-19 cost trajectory. Throughout this paper, we refer to “impact,” which is the net of the cost of testing for and treating COVID-19 and the cost of services deferred or eliminated. All costs are measured based on the estimated fee-for-service (FFS) allowed reimbursement rate. The impact is estimated relative to what these amounts would have been in the absence of COVID-19 in 2020. The magnitude of the cost impact depends on the duration of the pandemic and deferral of healthcare services.

We estimate the effect of changes in several key factors on the nationwide commercial, Medicare, and Medicaid net medical costs by testing several scenarios within a reasonable range. Although we do not know how or when this crisis will end, we created a framework for modeling the pandemic both nationwide and for specific populations and geographic areas, estimating the range of potential financial consequences of the pandemic on the healthcare industry in 2020. This information can be used to support financial decisions by government agencies, health insurance companies, self-funded employer health plans, risk-bearing healthcare providers, and others involved in the healthcare delivery and financing system.

COST OF COVID-19 TESTING AND TREATMENT

The cost of COVID-19 patients includes variables we can predict with a high level of confidence, such as the cost of inpatient days in a hospital or intensive care unit (ICU). However, the total cost of care is dependent on the total number of COVID-19 patients requiring treatment, and the severity of each one's illness. The expected range of potential COVID-19 patients through the end of calendar year (CY) 2020 is wider when we consider the potential for a “second wave,” or multiple waves of infections. Based on a survey of epidemiologists¹ and Milliman healthcare clinicians, we developed a reasonable range of reported case rate scenarios in CY2020 to account for the increased medical costs related to COVID-19.

¹ Berkeley Electronic Press. "COVID19-Survey9-2020_04_15" By Thomas McAndrew, works.bepress.com/mcandrew/6/.

COST OF DEFERRED CARE

While the increased medical costs for COVID-19 are novel to the healthcare industry, hospitals and other healthcare providers nationwide are reporting significant revenue reductions since the outbreak began in the United States. A large portion of medical services that would typically be expected to occur under normal circumstances are not occurring due to efforts to increase hospital capacity to serve COVID-19 patients, reduce the spread of COVID-19, and follow social distancing mandates. Most elective procedures are being avoided at this time, and some non-elective procedures are being avoided as well. When modeling the financial impact of these medical services that are not occurring, we consider the portion of services that might occur at a later time, as well as any constraints to the capacity in medical facilities. We also incorporate the impact of pent-up demand for medical services once facilities resume their normal business operations. Although the cost of COVID-19 and the deferred medical services are modeled as separate variables, they are intricately linked.

We project that the effect of service deferral and elimination will greatly exceed the cost of testing for and treating COVID-19 in 2020. The reduced medical costs imply a significant revenue reduction for healthcare providers and a benefit cost reduction for healthcare payers, including the commercial market and the government. This revenue reduction for providers could have a broad range of implications, from furloughed healthcare employees to physician practice and medical facility closures. The Coronavirus Aid, Relief, and Economic Security (CARES) Act allocated \$100 billion of stimulus funds for hospitals and provider groups to dampen the financial impact of COVID-19 on the healthcare delivery system. The stimulus funds will not be dispensed across providers based on their increased, or decreased, use of services during this pandemic.² It remains to be seen whether this amount will fully offset healthcare providers' lost revenue.

SENSITIVITY TESTING

Our analysis uses a number of scenarios to test the sensitivity of results to changes in two key factors:

1. **Infection rate:** We consider multiple different scenarios, reflecting different levels of reported cases for the current wave of infections, in addition to possible new waves of infection in the second half of 2020. Healthcare providers have braced for a surge of COVID-19 cases, which has taken a toll on some areas of the country while sparing other areas to date. The COVID-19 infection rate is an important factor when determining the expected cost of testing and treatment. We assume a higher infection rate in the second half of the year also has the effect of causing more service deferral and elimination.
2. **How long care will be deferred:** We test the presence or absence of a second wave of major infection, assumed to take place later in the year. If a second wave arises, or if the current wave lasts longer than expected, people are likely to continue to defer care. The timing and magnitude of service deferral and elimination is largely a function of the second wave and its assumed magnitude. Given the uncertainty of this timeline, we model scenarios with and without a resurgence in infection and deferral in the latter half of the year.

A significant proportion of healthcare services, both elective and non-elective, are currently being deferred and eliminated relative to when they would have taken place in the absence of COVID-19. For example:

- **Deferral:** A knee replacement scheduled for April 2020 might be deferred to August 2020. Nearly all elective procedures are being deferred at this time, and some non-elective procedures are being deferred as well.
- **Elimination:** We expect fewer discretionary medical visits. For example, a persistent headache or a badly sprained ankle might have elicited a visit to a healthcare provider in normal times but not during the COVID-19 pandemic.

The proportion of care deferred or eliminated in 2020 is difficult to anticipate. In the second quarter of 2020, we assume service deferral and elimination causes a medical cost reduction of 30%, 45%, or 60%, varying by scenario. We relied on research by Milliman clinicians to support this assumption. Eventually, furloughed staff members will return, providers will open their doors again, and patients will schedule appointments as new infections subside, "stay at home" orders will lift, and rigorous testing will be implemented. Even in the scenarios where we assume there is no second wave of COVID-19, we assume some service deferral and elimination occurs in the second half of 2020. This analysis was performed prior to CMS's release of recommendations to re-open health care systems in areas with low incidence of COVID-19,³ and does not take that guidance into account. Our assumptions for the impact of service deferral and elimination are explained in detail in the Appendix.

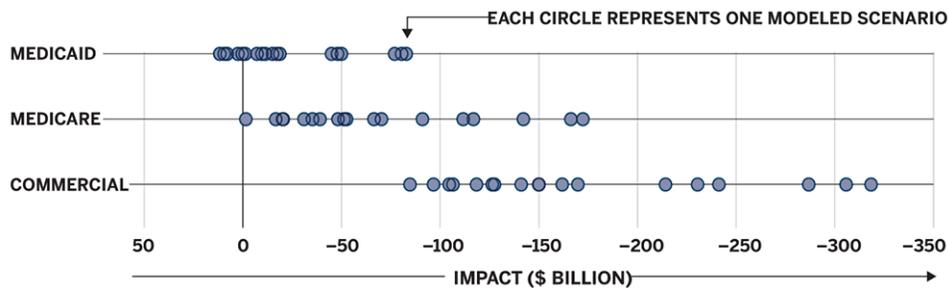
² The full text of the bill is available at <https://www.congress.gov/116/bills/hr748/BILLS-116hr748enr.pdf>.

³ <https://www.cms.gov/newsroom/press-releases/cms-issues-recommendations-re-open-health-care-systems-areas-low-incidence-covid-19>

Results by market

The net effect of COVID-19 on CY2020 healthcare costs will be different for the commercial insurance, Medicare, and Medicaid markets. These markets have very different member characteristics, reimbursement levels, and regulations. Figure 2 shows the market-level allowed dollar impact for each of these three markets based on the modeling scenarios.

FIGURE 2: IMPACT BY MARKET AND SCENARIO



As previously discussed, we expect the commercial and Medicare lines of business to have decreased levels of medical costs in 2020. However, the Medicaid program may expect a higher level of overall costs in 2020, due to the expected shift of members to Medicaid during the global recession due to rising unemployment.

Regional variations

Although we expect COVID-19 will have an overall negative net impact on medical costs in 2020, the regional impact varies based on the key parameters modeled in our research.

Figures 3 and 4 present our high-level estimates of the regional commercial and Medicare net financial impact change due to COVID-19 from April 1, 2020, through June 30, 2020, by Metropolitan Statistical Area (MSA). We have not performed an MSA-level analysis for Medicaid. The analysis summarized in this report is for the full year of 2020, but we limit our MSA-specific analysis to the first half of the year due to the longer-term uncertainties around the potential for future COVID-19 infections. Figures 3 and 4 show the effects of the minimum (30%) and maximum (60%) assumed rates of service deferral and elimination we tested in our analysis. The projected reported case rates by MSA are based on the current number of infections as of April 19, 2020, and adjusted for the regional growth rates relative to the nationwide average.

FIGURE 3: ESTIMATED NET IMPACT OF COVID-19 BY MSA IN SECOND QUARTER OF 2020 – 30% REDUCTION IN MEDICAL SERVICES

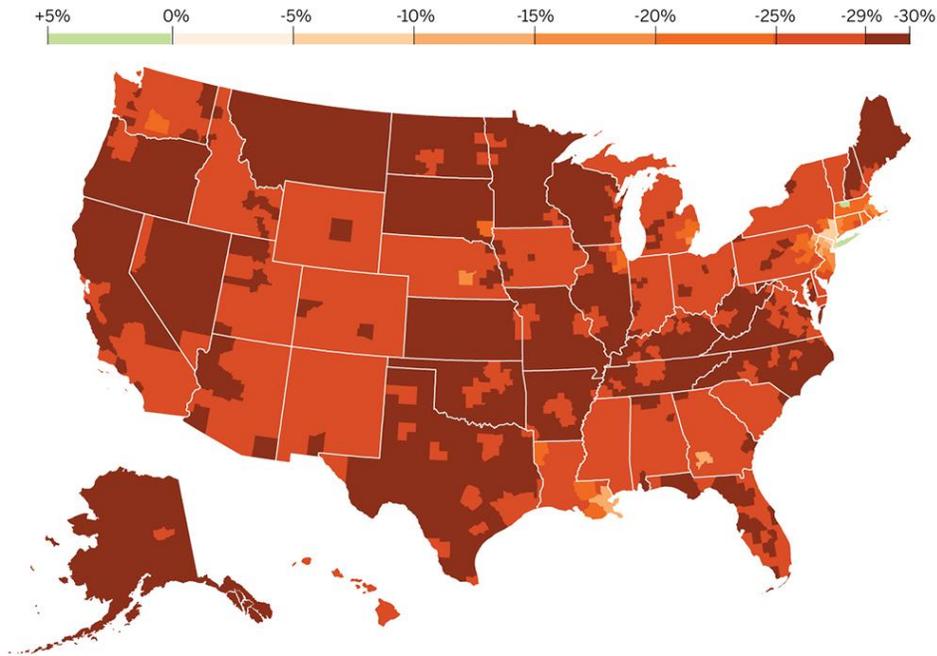
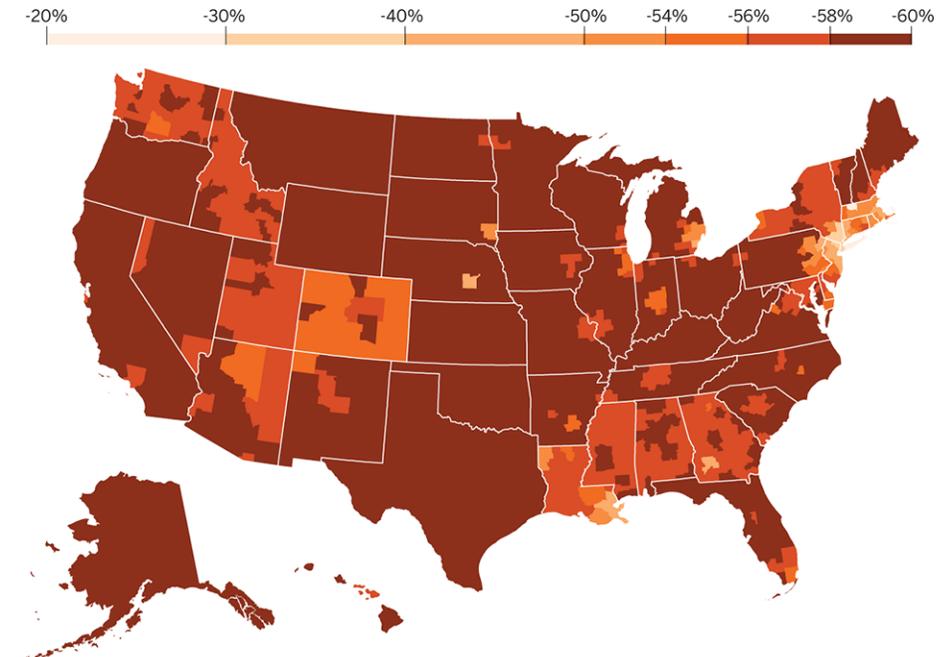


FIGURE 4: ESTIMATED NET IMPACT OF COVID-19 BY MSA IN SECOND QUARTER OF 2020 – 60% REDUCTION IN MEDICAL SERVICES



Almost every MSA is expected to see a net decline in health expenditures, though most hot spots see less of a decline, because they are treating more COVID-19 patients. Some of the areas with the least decline include New York City, New Orleans, and Nassau and Suffolk counties on Long Island.

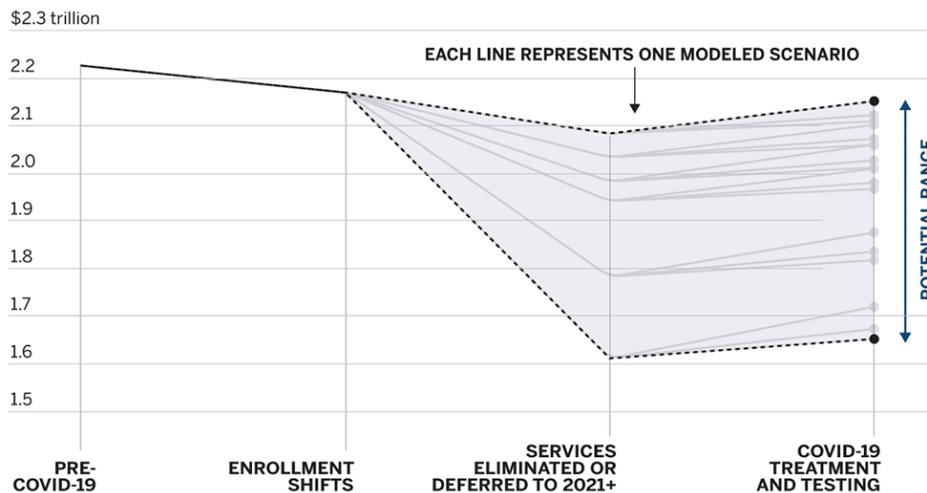
Some rural areas may experience smaller declines in health expenditures in the first half of 2020, due to the current high growth in reported COVID-19 cases. Rural areas have smaller populations but also fewer resources than urban centers to meet the potential demand of high-severity patients. Regions with higher average ages generally have greater expected costs of treatment than regions with lower average ages, because older populations have higher likelihoods of being admitted to the hospital and requiring costly medical care. We do not vary the rate of deferral and elimination of services (i.e., the avoidance rate) by MSA in this modeling. We believe most MSAs will ultimately fall in the range of deferred service rates presented in Figures 3 and 4.

Key parameter impact

We test the sensitivity of results to changes in the key parameters: service deferral and elimination, and the infection rate. The net impact due to COVID-19 in 2020 is dependent on the level of services deferred or eliminated and the change in infection rate in the coming months, which is highly uncertain. We will continue our research to enhance our understanding of the key parameters discussed in this section, and other parameters that affect net medical costs. We expect to update our projections to look past 2020 into 2021 and beyond, to reflect emerging data and scientific knowledge and the measures taken by governments and the healthcare system to respond to the rapidly changing pandemic.

Figure 5 shows the cumulative total expected nationwide medical expenditures, and the impact of enrollment shifts between payers, services eliminated, services deferred to 2021, and the COVID-19 cost of treatment and testing. The total nationwide healthcare expenditure is for commercial, Medicare, and Medicaid combined, and is limited to medical services these payers typically pay for (excluding prescription drug). The scenarios represent the net medical impact ranges presented in Figure 1.

FIGURE 5: CUMULATIVE TOTAL EXPECTED NATIONAL MEDICAL EXPENDITURES FOR EACH MODELED IMPACT



As shown in Figures 5, these are competing forces working in opposite directions. We expect the nationwide medical expenditures⁴ to decrease as members shift from commercial plans to Medicaid plans, which reimburses providers at a much lower level for medical services performed. A higher proportion of services avoided (i.e., deferred or eliminated until after December 31, 2020), leads to an overall cost reduction, while there is a wide range of possible results for the cost increase due to the cost of treatment and testing for COVID-19.

⁴ The nationwide medical expenditure total of \$2.3 trillion does not include prescription drug, nursing home, VA, dental, etc.

Limitations and Disclaimers

Our estimates rely on a number of key assumptions that are subject to extreme uncertainty given the limited experience available at this time. These assumptions include the overall confirmed infection rate for the community, assumed infection rates by age and gender, projected costs by severity, severity distributions by age, the impact of hospital capacity limitations, and the frequency and cost impact associated with deferred or eliminated non-COVID-19 services. The assumptions supporting the conclusions outlined in this paper are based on a combination of publicly available data and Milliman's proprietary claim data, and represent our best estimates as of the date of publication. Many of these assumptions will likely change over the coming weeks as COVID-19 experience manifests.

Scientific knowledge of these items is incomplete and new data on the spread of COVID-19 in the United States is constantly emerging. In addition, actions taken by governmental authorities and the healthcare system related to the COVID-19 pandemic are rapidly changing. We expect these assumptions to change as more information becomes available, and our team of consultants closely monitor the impact of COVID-19 to ensure our projections are calibrated to the most current information. Due to the limited information available on the pandemic, any analysis is subject to a substantially greater than usual level of uncertainty.

This paper examines total medical cost impact to the United States nationwide over calendar year 2020. The cost impact for 2021 and beyond are not included in this analysis. Member cost sharing and prescription drug costs are not considered. COVID-19 may cause long-term healthcare issues for survivors, and these costs are not included in this model. The cost and timing of a vaccine is also not estimated in this model, nor are the costs of any disease-modifying therapies that may emerge as treatments for COVID-19. The Appendix summarizes the assumptions and methodology used to develop the results in this paper.

The authors of this paper are members of the American Academy of Actuaries, and meet its qualification standards to provide this analysis.



Milliman is among the world's largest providers of actuarial and related products and services. The firm has consulting practices in life insurance and financial services, property & casualty insurance, healthcare, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

[milliman.com](https://www.milliman.com)

CONTACT

Hayley Rogers
hayley.rogers@milliman.com

Charlie Mills
charlie.mills@milliman.com

Emma. Kramer
emma.kramer@milliman.com

Appendix: Methodology and Assumptions

This section outlines the methodology and assumptions used to develop the analyses contained within this paper. We develop the estimated impact of COVID-19 for Medicare, Medicaid, and commercial payers separately, using the suite of Milliman COVID-19 models summarized below.

METHODOLOGY OVERVIEW

We develop our estimates by starting with national medical cost and membership statistics for commercial health insurance, including group and individual insurance and self-funded employers, as well as the Medicare and Medicaid programs. We estimate the shift of membership from commercial plans to Medicaid based on a national unemployment rate scenario of 17.5%, consistent with recent statistics from the U.S. Department of Labor.⁵

We apply COVID-19 infection rate assumptions by age and gender to estimate a population-specific distribution of confirmed cases by severity level for each MSA and type of insurance coverage. Area-specific healthcare cost assumptions are developed for each COVID-19 case severity level to estimate the total costs related to treatment. This information is used to develop estimates of the total expected allowed cost for treatment and testing for the period of January 1, 2020, through December 31, 2020 (i.e., calendar year 2020).

We compared our hospital bed-day utilization projections to hospital capacity statistics based on the Medicare Cost Reports filed for each hospital. In general, we identified few areas with capacity constraints. We therefore assume the treatment for all COVID-19 patients will be based on standard allowed reimbursement rates.

We developed several scenarios for the proportion of pre-pandemic medical allowed costs that will be deferred or eliminated. We applied these scenarios to the 2020 pre-pandemic costs to estimate the reduction in allowed costs from services deferred to 2021, or eliminated in 2020. We include the expected medical services delayed to a later time in 2020 in our total expected medical cost estimates. The cost reductions from services deferred to 2021, or eliminated services, offset the estimated 2020 COVID-19 testing and treatment costs, resulting in the overall estimate of 2020 net allowed PMPM impact due to COVID-19 under each scenario.

Our assumptions are based on rapidly changing information, where limited data exists for many key decision points. We monitor this situation daily as it unfolds and we revise our assumptions to align with the best information available. The assumptions underlying these results reflect a wide variety of publicly available data and Milliman proprietary claim data.

The suite of Milliman COVID-19 models relies on internal Milliman research and publicly available information, including:

- 2020 Milliman Commercial Health Cost Guidelines™
- 2020 Milliman Over 65 Health Cost Guidelines™
- A county-level database developed by the New York Times, which summarizes reported cases and deaths by county through April 19, 2020⁶
- The 2018 hospital bed capacity by MSA, generated in the Hospital Coalition Catchment Area Surge Capacity Tool

Our models are continually evolving, as new data and scientific knowledge continually emerges, and as governments and the healthcare system respond to the rapidly changing pandemic.

⁵ <https://www.dol.gov/ui/data.pdf>, retrieved April 21, 2020

⁶ New York Times (April 17, 2020). COVID-19 County Level Data. Coronavirus (Covid-19) Data in the United States. Retrieved April 21, 2020, from <http://github.com/nytimes/covid-19-data>.

TOTAL NATIONWIDE MEDICAL COSTS

The estimated total nationwide allowed medical cost relies on the following data sources:

- The CY2018 National Health Expenditures by type of expenditure and program⁷
- The projected CY2020 National Health Expenditures by type of expenditure and program⁸
- CY2018 nationwide health insurance coverage estimates from the Kaiser Family Foundation⁹
- The estimated impact to health insurance coverage due to COVID-19 from Health Management Associates¹⁰

We only include national expenditures related to medical costs commonly paid for by insurers, such as hospital care, physician services, other professional services, home healthcare, nursing care facility, and durable medical equipment. We exclude dental and vision costs, prescription drugs, medical sundries, and services in nontraditional settings, such as community centers and senior centers. The medical expenditures exclude costs related to administrative services, public health initiatives, research, structures, or equipment.

The national health expenditures are limited to out-of-pocket costs, commercial health insurance (group and individual), Medicare, Medicaid, and the Children's Health Insurance Program (CHIP). We exclude medical costs from other third-party payers and programs, worksite healthcare, Indian Health Services, the Department of Defense, TRICARE, the Department of Veterans' Affairs, and workers' compensation.

COVID-19 UTILIZATION AND HOSPITAL CAPACITY LIMITS

We expect the United States has the capacity to serve all COVID-19 patients in all scenarios we modeled, and we expect hospitals to be significantly below their baseline capacities in 2020 due to care avoidance. However, because COVID-19 outbreaks can be localized and put demands on intensive care unit (ICU) beds, certain regions may experience a squeeze in bed capacity. It is possible that other scenarios we did not model might exceed baseline capacity.

Figure 6 represents our best estimate of the range for total future hospital bed utilization for all patients requiring care using case and death data through April 19, 2020.

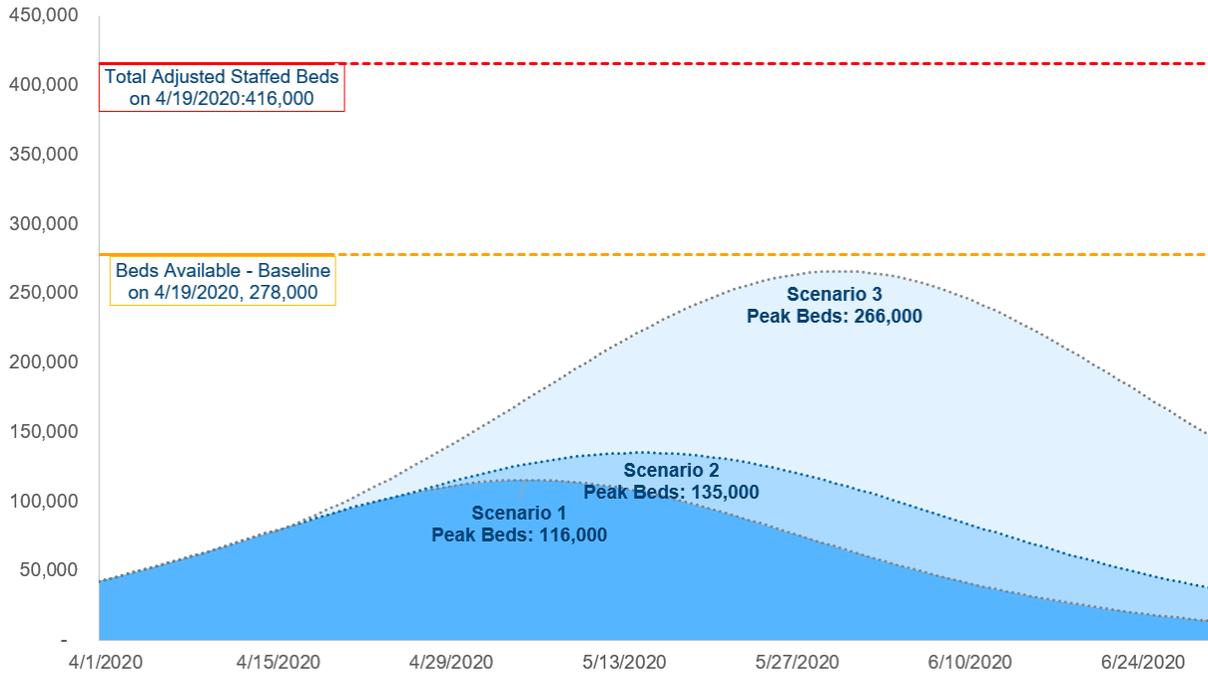
⁷ U.S. Department of Health and Human Services. National Health Expenditure Accounts: Methodology Paper, 2018: Definitions, Sources, and Methods. , Retrieved April 21, 2020, from <http://www.cms.gov/files/document/definitions-sources-and-methods.pdf>.

⁸ Ibid.

⁹ Kaiser Family Foundation. Health Insurance Coverage of the Total Population, Multiple Sources of Coverage. , Retrieved April 21, 2020, from <http://www.kff.org/other/state-indicator/health-insurance-coverage-of-the-total-population-multiple-sources-of-coverage/?currentTimeframe=0&sortModel=%7B%22colId%22%3A%22Location%22%2C%22sort%22%3A%22asc%22%7D>.

¹⁰ Health Management Associates (April 3, 2020). COVID-19 Impact on Medicaid, Marketplace, and the Uninsured, by State., Retrieved April 21, 2020, from <http://www.healthmanagement.com/wp-content/uploads/HMA-Estimates-of-COVID-Impact-on-Coverage-public-version-for-April-3-830-CT.pdf>.

FIGURE 6: NATIONWIDE HOSPITAL CAPACITY SCENARIOS, PROJECTED USING DATA THROUGH APRIL 19, 2020



The relevant assumptions underlying this analysis are not only subject to change, they are almost certain to change, as our knowledge of COVID-19 expands and additional experience emerges.

The scenarios in Figure 6 represent infection rates corresponding to the range of total COVID-19-related deaths based on consultation with epidemiologic and clinical experts as well as reference to a survey of expert epidemiologic modelers carried out weekly.¹¹ Some regions in the United States appear to have already hit their peak medical resource use, while other regions are just emerging as new outbreak zones. Scenario 1 represents a U.S. peak resource use at the end of April; Scenario 2 represents a peak resource use in the middle of May, and Scenario 3 represents peak resource use at the end of May.

Scenario 2 does not represent the best estimate of the three scenarios and Scenario 3 does not represent a “do nothing” scenario, as each of these scenarios is consistent with a best estimate based on a different set of assumptions. If “stay at home” orders were lifted too soon, then the cost impact could exceed Scenario 3 in Figure 6.¹²

Our cost impact projections rely on the expected COVID-19 patient bed-day utilization, which may be constrained by hospital capacity limits. In Figure 6, the “Beds Available – Baseline” orange line represents the baseline hospital capacity before COVID-19, and the red “Adjusted Staffed Beds” line represents the expected number of hospital beds available once 30% of inpatient services are deferred or eliminated.

For the purpose of this analysis, we assume all patients that require care will receive a staffed bed, either in a traditional hospital setting or an alternative location, such as a field hospital, back-up hospital, or hospital ships.

¹¹ <https://works.bepress.com/mcandrew/6/>

¹² Kesslen, B. (March 30, 2020). Dr. Birx predicts up to 200,000 U.S. coronavirus deaths 'if we do things almost perfectly.' NBC News. Retrieved April 21, 2020, from <http://www.nbcnews.com/news/us-news/dr-deborah-birx-predicts-200-000-deaths-if-we-do-n1171876>.

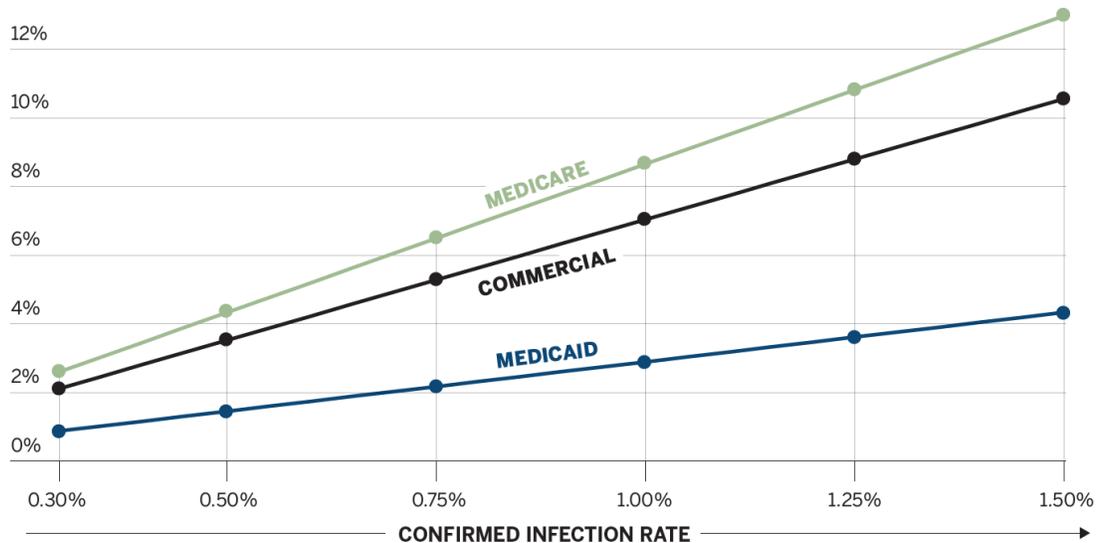
ESTIMATING THE NUMBER OF CONFIRMED INFECTIONS

There is no consensus on what the ultimate infection rate will be, and no consensus on how long it will take for this pandemic to resolve. Infection rate estimates are frequently changing and will vary based on region. There is also a difference between the true infection rate (i.e., the percentage of people who are infected) and the confirmed infection rate (i.e., the percentage of people who are tested and test positive for coronavirus). Of course, the total infection rate will never be known because complete testing will never occur. Our projection estimates are based on modeling the confirmed infection rate, because it is the only data available to us and because we anticipate confirmed infections will drive spending much more than unconfirmed infections (many of which may be asymptomatic and not require medical intervention).

This gap between confirmed and true cases makes it difficult to know the distribution of outcomes for the average case. Many cases will incur little or no costs. We assume that the most severe cases, where individuals incur long hospitalizations or ICU stays, will have the greatest impact on overall costs and will almost certainly have positive COVID-19 test results. It is important that these results be viewed in this light and that future data may change the nature of this assumption.

Figure 7 shows a range of confirmed infection rates for commercial, Medicaid, and Medicare populations. The confirmed infection rate is the proportion of the population confirmed to have COVID-19, and that differs from the true infection rate, which is much higher. The difference between the confirmed and true infection rates represents the individuals who have COVID-19 but do not test positive. Those individuals may be asymptomatic, or may not be tested due to a lack of diagnostic testing availability.

FIGURE 7: CHANGE IN NET MEDICAL COSTS AS A FUNCTION OF INCREASING CONFIRMED INFECTION RATE



Increasing the confirmed infection rate for Medicare payers has a larger impact on medical costs than increasing the rate for commercial and Medicaid payers. This is primarily because the Medicare population has a higher projected number of hospitalizations per infected person.

HEALTHCARE SERVICE DEFERRAL AND ELIMINATION

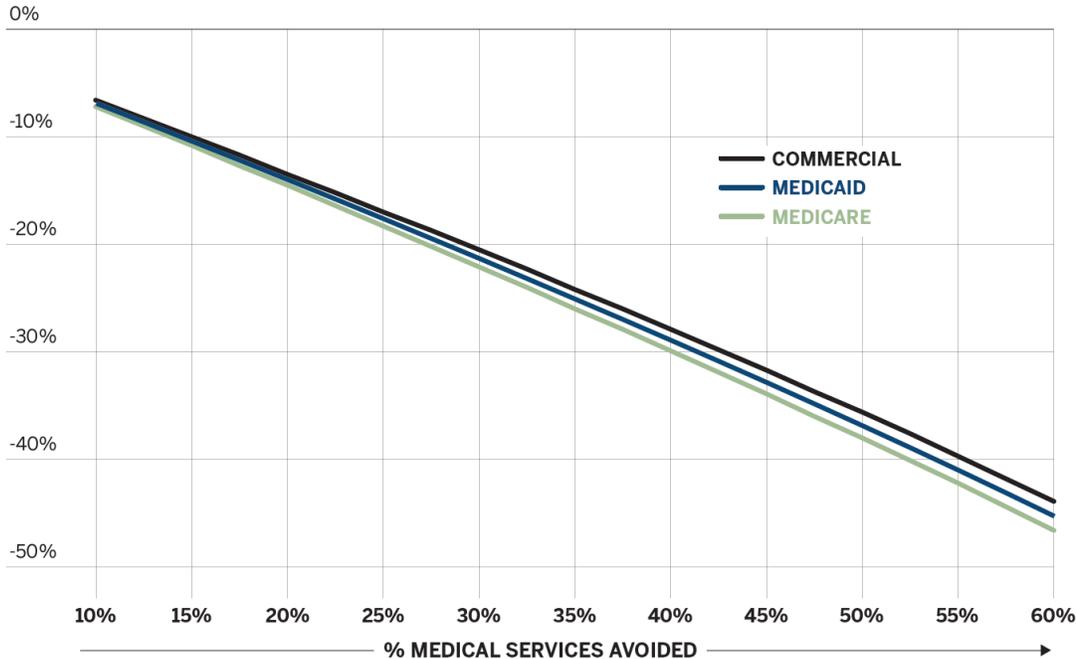
The proportion of allowed dollars for services that would have occurred in the absence of COVID-19 that will either be eliminated or postponed until after 2020 is not known. This proportion is a key variable in our projections, and we have tested the sensitivity of our results accordingly, as shown above. The proportions of allowed dollars representing service deferral and elimination used in our modeling are based on consultations with Milliman healthcare clinician experts, and are summarized below.

Our scenarios assume that the combined percentage of allowed dollars deferred and eliminated in the second quarter of 2020 is 30% in the low scenario, 45% in the medium scenario, and 60% in the high scenario. Of these proportions, we assume approximately 50% is eliminated outright and 50% is deferred to later for inpatient services, and we assume approximately 30% is eliminated outright and 70% is deferred to later for non-inpatient services. We vary the service deferrals in the second

half of 2020 based on whether a second wave is assumed to occur in the second half of 2020. Some services deferred in the second quarter of 2020 are assumed to take place in the second half of 2020, subject to hospital and physician capacity limits. Depending on the level of deferred services in our scenarios, some services are assumed to take place in 2021.

Figure 8 shows the impact of increasing care avoidance for commercial, Medicaid, and Medicare populations. The Y-axis in Figure 8 is the increase in net medical costs relative to a no-infection rate scenario, holding the avoidance rate constant.

FIGURE 8: CHANGE IN NET MEDICAL COSTS AS A FUNCTION OF PERCENT OF MEDICAL SERVICES AVOIDED



Increasing the level of care avoidance for Medicare payers has the highest impact on medical costs, due to the higher projected number of hospitalizations per person.

SEVERITY LEVELS

Some people will experience mild symptoms, and their treatment might be a simple telemedicine visit with a primary care physician or nurse practitioner. Others with more severe symptoms may seek treatment in a physician’s office, or an urgent care or emergency room (ER). Some will be admitted to the hospital, where they may require intensive care, possibly including the use of a ventilator. The model estimates the allowed cost per infection at six different severity levels:

1. Mild – At-home Treatment
2. Mild – Telehealth
3. Mild – Office Visit
4. Mild – ER (no admit)
5. Inpatient Hospitalization – Severe
6. Inpatient Hospitalization – Critical

The Centers for Disease Control and Prevention (CDC) studies published on March 18, 2020, and March 31, 2020, are key data points for estimating the severity distribution. We also applied a significant amount of professional judgment and input from clinicians.

COST OF TESTING AND TREATMENT

We estimated the cost of testing based on the expected percentage of the population to be tested and publicly available information on testing costs.¹³ We model the cost of treatment using Medicare fee-for-service (FFS) payment methodologies. Commercial and Medicaid payments are estimated as a percentage of Medicare payments using Milliman proprietary research and databases. The cost of treatment of COVID-19 will vary by severity level. The severity levels we model are shown above.

Hospital admissions for COVID-19 are generally long and costly. Because hospital admissions for COVID-19 are expected to be much longer than historical average stays for pneumonia and other respiratory issues, the cost per hospital admission for COVID-19 will be substantially higher than historical average costs. Additionally, the CARES Act applied a 20% increase to the weighting factor used in determining Medicare FFS diagnosis-related group (DRG) payments to hospitals for COVID-19 treatment. That weighting factor increase may also apply for Medicare Advantage, commercial, and Medicaid contracts with providers, because those contracts often leverage the DRG methodology. Because of the complex way DRG payments are calculated, a 20% increase to the weighting factor does not translate into a 20% increase in the total payment.

We develop medical cost estimates, by severity level from expected DRG, emergency room, and professional costs, using Milliman proprietary research and databases. We assume an average length of stay based on recent studies,¹⁴ and we model the resulting DRG outlier payments accordingly. We include a 20% increase to the base DRG weight for Medicare payments only.

DEMOGRAPHICS AND GEOGRAPHY

When modeling the MSA-level results, we relied on the starting nationwide 2020 Medicare and commercial medical costs and area factors from the Milliman Health Cost Guidelines.

We also rely on the nationwide age and gender distributions from the Milliman Health Cost Guidelines, and adjusted for age and gender differences at the MSA level using the 2018 Census information.¹⁵

¹³ CMS (March 12, 2020). Medicare Administrative Contractor (MAC) COVID-19 Test Pricing. Retrieved April 21, 2020, from <https://www.cms.gov/files/document/mac-covid-19-test-pricing.pdf>.

¹⁴ Zhou et al. (March 9, 2020). Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *Lancet*.

¹⁵ US Census Bureau. County Population by Characteristics: 2010-2018. Retrieved April 21, 2020, from http://www.census.gov/data/tables/time-series/demo/popest/2010s-counties-detail.html#par_textimage_1383669527.