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COVID-19 Cost Scenario Modeling

Estimating the Cost of COVID-19 Treatment for U.S. Private Insurers

America's Health Insurance Plans

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Table of Contents

Executive Summary

The COVID-19 pandemic has had an extraordinary, unprecedented, and severe impact on virtually all aspects of life in the United States. As significant an impact as the virus has already had in several countries around the world, and in several states, the potential impact of the continued virus proliferation on our health care system could be immense. Given the potential for broad infection and a significant increase in associated hospitalizations in the United States, America's Health Insurance Plans ("AHIP") retained Wakely Consulting Group ("Wakely") to explore the potential COVID-19 testing and treatment cost implications to U.S. private insurers for 2020 and 2021.

We will start by acknowledging the astonishingly broad range of potential outcomes, in total, by geographic region within the United States, and by health insurance line of business. Our analyses rely, in part, on rapidly evolving and diverse data sets and epidemiological studies from around the world. Wide variation in variables such as: data quality, testing availability and prioritization protocol, demographics, smoking incidence, timing and severity of intervention measures (e.g. social distancing, lockdowns, etc.), reported hospitalization rates and lengths of stay, hospitalizations requiring intensive care unit ("ICU") services, health care system capacity and labor/supply constraints, the availability and efficacy of temporary health care facilities, and case fatality rates by country/region, to name a few – make it impractical to put forth precise cost projections over a two-year period. Finally, given the asymptomatic nature of many confirmed COVID-19 cases and gaps in U.S testing capacity from the outset of the crisis, it is impossible at this stage to identify the true incidence rate.

Importantly, our modeling was performed based on emerging data and information available to us as of March 28, 2020. Considering the extraordinary pace at which available data is evolving and changing, there is potential that analysis performed later could yield material updates to the scenario estimates detailed herein.

Recognizing all of the modeling challenges, we have compiled, for a wide range of assumed infection rates, estimates of the potential COVID-19-related costs for U.S. private insurers operating in the Commercial, Medicare Advantage, and Medicaid Managed Care lines of business. To the extent that COVID 19-related costs are ultimately the burden of stand-alone Part D Prescription Drug Plans ("PDP") or other lines of business, such costs have not been contemplated in our analysis. Given the uncertainty on the rate and timing of infections, Wakely did not include savings to insurers as a result of individuals forgoing care but acknowledges that it could have material impact on costs, particularly in the commercial population. Our estimates may also be materially impacted by enrollment shifts across lines of business (e.g. commercial to Medicaid).

Considering the longer duration of our analysis period (2020 and 2021), we explored a very wide range of potential infection rates – the percent of the total population infected, including confirmed cases and cases that go untested, due to testing availability limitations and/or asymptomatic manifestation. Based on published epidemiological studies[1], we modeled infection rates ranging from 20% to 60% of the population. We also modeled a 10% infection rate, which reflects half the lower bound of infection rates in published studies, in order to explore a scenario in which effective interventions drastically mitigate exposure versus unchecked virus proliferation.

Recognizing limitations in testing availability as well as asymptomatic cases, we assume that a subset of true infections will be tested and confirmed to be positive cases. Within the subset of confirmed positive cases, we identify various categories of case severity, including intensive care unit ("ICU") hospitalizations, non-ICU hospitalizations, non-inpatient cases that receive health care services, and cases that receive no health care services (recover at home). In order to derive cost estimates within each tranche of cases, we compiled utilization and unit cost information from various benchmark health care claim data resources for the treatment of similar conditions (e.g. influenza, pneumonia). Within the benchmark cost data associated with treatment of similar conditions, we explored a wide range of treatment cost profiles, including inpatient, professional, outpatient, and potential pharmacy (Rx) costs. Cost estimates reflect allowed costs, which means that any enrollee cost sharing, if applicable, is reflected in our estimates.

There are a number of potentially material variables that have not been explicitly modeled in our analysis. Due to various "lockdown" directives, as well as directives to delay elective and non-emergency procedures, a material portion of non-COVID-19 related services will be delayed. We acknowledge that a portion of these foregone services may remain foregone over the course of 2020 and 2021. On the other hand, delayed services could lead to adverse and costly events associated with the absence of preventive care and poor management of chronic conditions. We also acknowledge that the wide variation in infection rates may drive local system capacity in some areas to be overwhelmed.

We have not explicitly adjusted cost projections for potential inpatient hospital bed capacity constraints. We assume that a higher volume of COVID related services will be incurred in 2020 and lower volume in 2021, distributing approximately 75% of the total services to 2020 and 25% to 2021. In the higher infection rate scenarios (60%), we acknowledge that the estimated inpatient case incidence figures may exceed local bed capacity (in total and ICU-specific), even after adjusting for emergency capacity expansion (e.g. field hospitals, re-purposing of non-ICU beds to ICU).

[1] See Appendix A for the list of sources used in the analysis.

The estimated costs range from $56 to $556 billion over the two-year time period. Table 1 presents the estimated range of total allowed costs by infection rate scenario for 2020, 2021 and over the two years combined.

Table 1 – Estimated Range of Total COVID Associated Treatment and Testing Costs, 2020-2021

Scenario	2020 Range Total Allowed Cost (in billions)	2021 Range Total Allowed Cost (in billions)	2020-2021 Total Range of Allowed Cost (in billions)	2020-2021 Total Range of Enrollee Cost Sharing (in billions)
Low Infection Rate (10%)	$42.2 - 69.5	$14.1 - 23.2	$56.2 - 92.7	$10.0 – 13.0
Baseline Infection Rate (20%)	$84.4 – 139.0	$28.1 - 46.3	$112.5 - 185.4	$20.0 – 26.0
High Infection Rate (60%)	$253.1 - 417.1	$84.4 – 139.0	$337.5 - 556.1	$59.9 – 78.0

Table 2 presents a summary of key population and utilization assumptions by line of business for the baseline scenario (20% infection rate with low hospitalization rate estimate) including the assumed number of enrollees assumed to be infected, the portion of the infected enrollees assumed to be tested and seeking care, and the subset of enrollees that become hospitalized (split between ICU and non-ICU hospitalization). While the modeling was completed at a demographic cohort level, the summary presents values aggregated over all demographic groups.

Table 2 – Population/Utilization Assumptions in Baseline 20% Infected Scenario, 2020-2021

Assumption	Medicare Advantage	Commercial (Group + Non-Group)	Medicaid MCO	Total
Total enrollees	24,480,000	176,700,000	54,180,000	255,360,000
Total Number Infected (includes those not tested)	4,896,000	35,340,000	10,836,000	51,072,000
Number Confirmed Cases	3,380,000	24,690,000	7,540,000	35,610,000
Number Receiving Treatment				
Number Hospitalized:	920,000	3,780,000	800,000	5,500,000
Non-ICU	660,000	2,930,000	610,000	4,200,000
ICU	260,000	850,000	190,000	1,300,000

Table 3 presents a summary of key utilization and cost per utilizer assumptions by line of business for the baseline scenario (20% infection rate with low hospitalization rate estimate) including the expected number of enrollees hospitalized (split between ICU and non-ICU hospitalization), number of enrollees seeking outpatient hospital services, professional services, prescription drug

services, and other covered services such as durable medical equipment (DME), skilled nursing facility (SNF), and home health services for Medicare Advantage enrollees.

Table 3 - Utilization and Cost per Utilizer Assumptions in 20% Infected Scenario, 2020-2021

Service Category	Medicare Advantage	Commercial (Group + Non-Group)	Medicaid MCO	Total / Average
Utilization				
IP Hospital Services	920,000	3,780,000	800,000	5,500,000
Non-ICU	660,000	2,930,000	610,000	4,200,000
ICU	260,000	850,000	190,000	1,300,000
OP Hospital Services	2,030,000	14,820,000	4,520,000	21,370,000
Professional Services	2,030,000	14,820,000	4,520,000	21,370,000
All Other Services	120,000	220,000	40,000	380,000
Rx[2] Services	1,110,000	11,040,000	3,720,000	15,870,000
Cost per Utilizer				
IP Hospital Cost				
Non-ICU	$8,850	$12,450	$6,800	$11,050
ICU	$17,000	$38,450	$16,250	$30,950
OP Hospital Cost	$600	$1,000	$460	$850
Professional Cost	$170	$140	$70	$130
All Other Cost[3]	$4,850	N/A	N/A	$20
Rx Services	$90	$110	$130	$120

[2] To estimate a potential cost associated with any medications developed over the course of 2020-2021 as a treatment or prevention (e.g., vaccine) of COVID, Wakely included cost of Tamiflu (one script per treated enrollee) from IBM MarketScan® Research Database (2017) as a representative medication. Wakely acknowledges there is considerable uncertainty as to the price of any treatment or preventive vaccine for COVID.

[3] All other costs include service cost categories specific to Medicare Advantage enrollees and include durable medical equipment (DME), skilled nursing facility (SNF), and home health services. Given data structure limitations, Wakely only measured this explicitly for Medicare Advantage plans. We do not believe other lines of businesses would likely have material costs associated not already accounted for in the other listed service categories.

Introduction

America's Health Insurance Plans ("AHIP") retained Wakely Consulting Group, LLC ("Wakely"), to model the potential costs associated with the COVID-19 ("COVID") pandemic for United States private health insurers. Wakely was tasked with modeling model potential scenarios of incremental costs associated with COVID testing and treatment in 2020 and 2021 benefit years for private insurers in the United States. Wakely analyzed the effects of the pandemic and potential legislation requiring private insurers cover the cost of treatment on Commercial health insurers, Medicaid managed care organizations (MMCOs), and Medicare Advantage Organizations (MAOs). Our analysis did not specifically contemplate the potential cost to stand-alone Medicare Prescription Drug Plans ("PDP").

This document has been prepared for the sole use of AHIP. Wakely understands that the report may be made public. This document contains the results, data, assumptions, and methods used in our analyses and satisfies the Actuarial Standard of Practice (ASOP) 41 reporting requirements. Using the information in this report for other purposes may not be appropriate.

Results of the Analyses

The following is a summary of various scenarios for potential testing and treatment costs associated with COVID on Medicare Advantage, Commercial, and MCOs for the 2020 and 2021 benefit years. As discussed in greater detail in the methodology section, there is inherent and substantial uncertainty to these estimates.

The methodology used in the analysis focused on two drivers of the aggregate incremental cost associated with COVID treatment and diagnosis – (1) medical services utilization rate, given an assumed rate of infection, and (2) cost per medical service by major service category. The product of the two estimates produces aggregate cost for each line of business.

The starting line of business populations used in the analysis were sourced from figures published by Kaiser Family Foundation ("KFF"), the Centers for Medicare and Medicaid Services ("CMS"), Medicare Advantage program reports, and National Health Expenditure ("NHE") projections for 2020 and 2021 market growth. A small adjustment was applied to Medicaid managed care enrollment to remove the estimated number of duals enrollees that would also be enrolled in Medicare Advantage plans, in order to avoid double counting of these beneficiaries.

The medical utilization rate was estimated for a subset of the enrolled population assumed to be infected with COVID using a broad range of assumed rates of infection - 10%, 20% to 60% of the

population, with the 20% and 60% scenarios based on published epidemiological studies.[4] The estimated rate of hospitalizations and the rate of ICU admissions by age group among the infected was released by the Centers for Disease Control and Prevention ("CDC") on March 18, 2020.[5] The assumed rate of infection was applied uniformly to all age categories. Given the rapidly evolving nature of the pandemic and data limitations, exposure to COVID-19 was assumed to be equally likely in any demographic cohort.

The estimated average cost per service was modeled on historical costs for conditions that may represent a similar cost profile. Specifically, International Classification of Diseases, 10th revision ("ICD-10) diagnoses in the code groups J09 through J18, representing varying levels of influenza and pneumonia, served as proxy conditions with similar treatment and cost profiles. Wakely relied on two large claims databases in order to estimate costs incurred in Commercial, Medicare Advantage and Medicaid managed care enrolled populations:

- IBM MarketScan® Research Database (2017)
- Medicare Limited Data Set ("5% Sample" or "LDS") (2018).

All services[6] with the above specified diagnosis codes were identified and the cost per service was determined by age and gender category. Since the source data is from 2017 and 2018 time periods, costs per service data were trended to target time periods (2020 and 2021) using high level trend estimates based on NHE cost per enrollee projections by service and line of business[7]. To estimate Medicaid managed care cost levels, commercial cost per service figures were adjusted downward to approximate Medicaid fee schedules. Reimbursement differentials were sourced from American Hospital Association[8] and further were constrained not to exceed Medicare cost levels. Further, for each infected individual modeled, we assumed at most one service episode over the remainder of 2020 and 2021. In other words, we are not modeling a 20% infection rate as indicating that 20% of the population is infected in both 2020 and 2021 (similar to annual influenza infections), but rather assuming that the 20% infection rate happens over the course of 2020 and 2021. Each infected individual is assumed to be infected only once over the two year period.

Appendix B presents the detailed methodology and assumptions.

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[4] https://www.nytimes.com/interactive/2020/03/17/upshot/hospital-bed-shortages-coronavirus.html
[5] Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep. ePub: 18 March 2020. DOI: http://dx.doi.org/10.15585/mmwr.mm6912e2external icon.
[6] The definition of a 'service' varied by the major service category representing inpatient admissions, outpatient visits, professional services, home health visits, hospice stays, skilled nursing facility stays and a limited set of prescription medications.
[7] National Health Expenditures 2011-2027, by source of coverage for hospital, physician and clinical services, and prescription drugs. Centers for Medicare & Medicaid Services, Office of the Actuary.
[8] "Table 4.4: Aggregate Hospital Payment-to-Cost Ratios for Private Payers, Medicare, and Medicaid, 1994-2016," *TrendWatch Chartbook,* 2018. As of November 8, 2019: https://www.aha.org/system/files/2018-06/2018-AHA-TrendWatch-Chartbook-Appendix-4.pdf

Table 4 presents summary of key population and utilization assumptions by line of business for the baseline scenario (20% infection rate with low hospitalization rate estimate) including the assumed number of enrollees assumed to be infected, the portion of the infected enrollees assumed to be tested and seek care, and the subset of enrollees that become hospitalized (split between ICU and non-ICU hospitalization). While the modeling was completed at a demographic cohort level, the summary presents values aggregated over all demographic groups.

Table 4 – Population and Utilization Assumptions in Baseline (20% Infection) Scenario, 2020-2021

Assumption	Medicare Advantage	Commercial (Group + Non-Group)	Medicaid MCO	Total
Total Enrollees	24,480,000	176,700,000	54,180,000	255,360,000
Number Infected	4,896,000	35,340,000	10,836,000	51,072,000
Number Confirmed Cases	3,380,000	24,690,000	7,540,000	35,610,000
Number Hospitalized:	920,000	3,780,000	800,000	5,500,000
Non-ICU	660,000	2,930,000	610,000	4,200,000
ICU	260,000	850,000	190,000	1,300,000

Table 5 presents summary of key utilization and cost per utilizer assumptions by line of business for the baseline scenario (20% infection rate with low hospitalization rate estimate) including the expected number of enrollees hospitalized (split between ICU and non-ICU hospitalization), number of enrollees seeking outpatient hospital services, professional services, prescription drug services, and other covered services such as DME, SNF, and home health services for Medicare Advantage enrollees. The number of utilizers of the outpatient facility and professional services only was modeled as 60% of positive cases less than number of hospitalized cases. The 60% estimate was based on published research[9] that reported that in 60% of confirmed cases, individuals presented with severe coughing symptoms, which by extension we assume would then seek medical care. Hence, 40% of confirmed cases are assumed to be mild in nature and not require medical treatment.

[9] https://jamanetwork.com/journals/jama/fullarticle/2761044?guestAccessKey=f61bd430-07d8-4b86-a749-bec05bfffb65

Table 5 - Utilization and Cost per Utilizer Assumptions in Baseline (20% Infection) Scenario, 2020-2021

Service Category	Medicare Advantage	Commercial (Group + Non-Group)	Medicaid MCO	Total / Average
Utilization				
IP Hospital Services	920,000	3,780,000	800,000	5,500,000
Non-ICU	660,000	2,930,000	610,000	4,200,000
ICU	260,000	850,000	190,000	1,300,000
OP Hospital Services	2,030,000	14,820,000	4,520,000	21,370,000
Professional Services	2,030,000	14,820,000	4,520,000	21,370,000
All Other Services	120,000	220,000	40,000	380,000
Rx[10] Services	1,110,000	11,040,000	3,720,000	15,870,000
Cost per Utilizer				
IP Hospital Cost				
Non-ICU	$8,850	$12,450	$6,800	$11,050
ICU	$17,000	$38,450	$16,250	$30,950
OP Hospital Cost	$600	$1,000	$460	$850
Professional Cost	$170	$140	$70	$130
All Other Cost[11]	$4,850	N/A	N/A	$20
Rx Services	$90	$110	$130	$120

SENSITIVITY TESTING – RATE OF INFECTION

Tables 6A-C present summary of aggregate allowed costs by line of business and major service category for each selected infection rate scenario (10/20/60%). The range was selected to represent a range of potential disease incidence from a number of published studies and research, which ranged anywhere from 20% to 80%[12]. This range is meant to be representative of plausible future scenarios with higher and lower success rates of the infection mitigation mechanisms that are currently being put in place (i.e., social distancing, stay-at-home orders, availability of personal protective equipment to health care workers, etc.).

[10] To estimate a potential cost associated with any medications developed over the course of 2020-2021 as a treatment or prevention (e.g., vaccine) of COVID, Wakely included cost of Tamiflu (one script per treated enrollee) from IBM MarketScan 2017 database as a representative medication.

[11] All other costs include service cost categories specific to Medicare Advantage enrollees and include durable medical equipment (DME), skilled nursing facility (SNF), and home health services. Given data structure limitations, Wakely only measured this explicitly for Medicare Advantage plans. We do not believe other lines of businesses would likely have material costs associated not already accounted for in the other listed service categories.

[12] Ferguson, N et al. Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand. DOI: https://doi.org/10.25561/77482. 16-Mar-2020. Medical Research Council (MRC).
Kissler S.M. et al. Projecting the transmission dynamics of SARS-CoV-2 through the post-pandemic
Period. 04-Mar-2020. Department of Epidemiology, Harvard. T.H. Chan School of Public Health, Boston, MA, USA

Table 6A – 10% Infection Rate Scenario: Total Cost by Line of Business, 2020-2021 (in billions of dollars)

Service Category	Medicare Advantage	Commercial (Group + Non-Group)	Medicaid MCO	Total
(in billions of dollars)				
IP Hospital Services	$5.3 - 10.2	$35.4 - 63.0	$3.7 - 6.1	$44.3 - 79.4
OP Hospital Services	$0.6 - 0.8	$7.6 - 8.4	$1.1 - 1.1	$9.3 - 10.3
Professional Services	$0.2 - 0.2	$1.0 - 1.1	$0.2 - 0.2	$1.4 - 1.5
All Other Services	$0.3 - 0.7	N/A	N/A	$0.3 - 0.7
Rx Services	$0.1 - 0.0	$0.6 - 0.5	$0.2 - 0.2	$0.9 - 0.8
Total	**$6.5 - 11.9**	**$44.6 - 73.1**	**$5.1 - 7.7**	**$56.2 - 92.7**

Table 6B – 20% Infection Rate Scenario: Total Cost by Line of Business, 2020-2021 (in billions of dollars)

Service Category	Medicare Advantage	Commercial (Group + Non-Group)	Medicaid MCO	Total
(in billions of dollars)				
IP Hospital Services	$10.6 - 20.4	$70.8 - 126.1	$7.3 - 12.3	$88.7 - 158.8
OP Hospital Services	$1.3 - 1.6	$15.2 - 16.7	$2.1 - 2.3	$18.6 - 20.5
Professional Services	$0.3 - 0.4	$2.1 - 2.3	$0.3 - 0.3	$2.8 - 3.1
All Other Services	$0.6 - 1.4	N/A	N/A	$0.6 - 1.4
Rx Services	$0.1 - 0.0	$1.3 - 1.1	$0.5 - 0.5	$1.9 - 1.6
Total	**$12.9 - 23.8**	**$89.3 - 146.2**	**$10.3 - 15.4**	**$112.5 - 185.4**

Table 6C – High (60%) Infection Rate Scenario: Total Cost by Line of Business, 2020-2021 (in billions of dollars)

Service Category	Medicare Advantage	Commercial (Group + Non-Group)	Medicaid MCO	Total
(in billions of dollars)				
IP Hospital Services	$31.8 - 61.2	$212.3 - 378.3	$21.9 - 36.8	$266.0 - 476.3
OP Hospital Services	$3.8 - 4.7	$45.5 - 50.2	$6.4 - 6.8	$55.7 - 61.6
Professional Services	$1.0 - 1.3	$6.3 - 6.8	$1.0 - 1.0	$8.3 - 9.2
All Other Services	$1.8 - 4.2	N/A	N/A	$1.8 - 4.2
Rx Services	$0.3 - 0.1	$3.8 - 3.3	$1.5 - 1.4	$5.7 - 4.8
Total	**$38.8 - 71.5**	**$267.9 - 438.5**	**$30.8 - 46.1**	**$337.5 - 556.1**

The estimated range of potential costs was from $56 to $556 billion over the two-year time period. Table 7 presents the estimated range of total allowed costs in 2020, 2021 and over the two years combined by infection rate scenario. We assumed that a higher volume of COVID related services would be incurred in 2020 and lower volume in 2021, as the virus footprint is reduced through infection mitigation mechanisms already in place in many states. Hence, we distributed 75% of the total services to 2020 and 25% to 2021. As a result, particularly in the higher infection rate scenarios, the inpatient ICU hospital bed day capacity[13] may be reached, but we have not dampened cost estimates for this phenomenon.

Table 7 – Estimated Range of Total COVID Associated Treatment and Testing Allowed Costs, 2020-2021 (in billions of dollars)

Scenario	2020 Range Total Allowed Cost (in billions)	2021 Range Total Allowed Cost (in billions)	2020-2021 Total Range of Allowed Cost (in billions)
Low Infection Rate (10%)	$42.2 - 69.5	$14.1 - 23.2	$56.2 - 92.7
Baseline Infection Rate (20%)	$84.4 - 139	$28.1 - 46.3	$112.5 - 185.4
High Infection Rate (60%)	$253.1 - 417.1	$84.4 - 139	$337.5 - 556.1

Finally, there is the potential for a vaccine to be ready and distributed at some point during the 2021 benefit year. While the costs of the vaccine are unknown, the costs could be significant. For example, if a cost per inoculation is $500 and the majority (80%) of the population gets vaccinated in 2021, this alone would add over $100 billion to the total cost estimate.

[13] American Hospital Association Fast Facts (2018). ttps://www.aha.org/statistics/fast-facts-us-hospitals. Total inpatient hospital beds in the U.S. was 924,107. In calculating the hospital bed utilization in each scenario, we assumed 4 days per non ICU admission and 14 days per ICU admission based on 50th and 90th percentiles of length of stay in the IBM's MarketScan database, respectively.

ENROLLEE COST SHARING

For the target services with diagnoses most closely related to COVID-19, we have summarized average enrollee cost sharing per service by service category from the two claim databases' historical experience. We assumed zero cost sharing for Medicaid MCO enrollees, assuming that most states take up extra FMAP funding as stipulated in the Families First bill[14]. After applying trend adjustments and estimated service utilization rates, we estimated the enrollee cost sharing portion to be 14-18% of annual allowed costs. After accounting for the service volume shifts between 2020 and 2021, the range of potential enrollee cost sharing across all six scenarios was between $10 and $78 billion dollars. Table 8 presents this information by scenario.

Table 8 – Estimated Range of Total COVID Associated Treatment and Testing Allowed Cost and Enrollee Cost Sharing, 2020-2021

Scenario	2020-2021 Total Range of Allowed Cost (in billions)	2020-2021 Total Range of Enrollee Cost Sharing (in billions)
Low Infection Rate (10%)	$56.2 - 92.7	$10 – 13.0
Baseline Infection Rate (20%)	$112.5 - 185.4	$20 – 26.0
High Infection Rate (60%)	$337.5 - 556.1	$59.9 – 78.0

Appendix A: Reliances and Limitations

Wakely relied primarily on the 5% Medicare Fee For Service ("FFS") Sample data (2018) and the IBM MarketScan® Research Database (2017) for this analysis. The 5% sample data contains a random sample of Medicare FFS beneficiaries, including eligibility details and detailed claims experience. Claims data reflect all medical (inpatient, outpatient, and professional), durable medical equipment, home health, hospice and skilled nursing facility claims.

MarketScan® is a detailed claims and enrollment data set for a nationally representative sample of insured lives for benefit year 2017. The commercially-insured lives in the database span various health plan design types such as HMO, POS, PPO, and indemnity. Claim data reflect all medical (inpatient, outpatient, and professional), pharmacy, and dental claims. Claim data reflect details on Current Procedural Terminology (CPT), diagnosis-related group (DRG), revenue codes, International Statistical Classification of Diseases and Related Health Problems 10th revision (ICD-10, or ICD-9, depending on claim incurred date) diagnosis codes, and other common claim identifier elements. Claim data contain sufficient run- out to be considered over 99% complete. Enrollment data contain demographic details such as age, gender, Metropolitan Statistical Area (MSA), state, months of enrollment, and other common identifying information.

[14] https://ccf.georgetown.edu/wp-content/uploads/2020/03/Families-First-Final-3.25.pdf

Wakely also relied on the following public data sources to inform the assumptions used in the analyses:

- KFF (enrollment figures by line of business)
- CDC (rates of hospitalization and deaths)
- CMS Medicare Advantage enrollment reports
- Rate of Infection (as noted in references)
- Managed Medicaid enrollment data (https://data.medicaid.gov/)
- U.S. Census Bureau, Current Population Survey Table Creator (2018)
- American Hospital Association (nationwide hospital capacity, reimbursement rate differences by line of business, as noted in references)
- National Health Expenditures 2011-2027, by source of coverage for hospital, physician and clinical services, and prescription drugs. Centers for Medicare & Medicaid Services, Office of the Actuary.

Limitations

- **High Risk Conditions.** While Wakely did make adjustments for age and gender in its analysis, it did not adjust for individuals with higher-risk conditions for different lines of business. The CDC acknowledges that individuals with high-risk conditions (such as obesity, heart disease, or severe asthma) are more at risk for severe complications.[15] Differences in health status, holding constant age and gender, between lines of business could result in differences from what is included in our estimates.
- **Forgoing of Care.** As a result of social distancing, hospital capacity, and state guidelines, individuals may delay care. This could produce savings for insurers if individuals do not ultimately undergo procedures or cost-shifting (shifting costs to a later date). Additionally, insurers could experience increase in costs if otherwise needed care is delayed resulting in complications.
- **Out of Network Costs and Cost-Sharing.** Wakely also did not adjust for potential out of network costs. If individuals receive treatment in out of network setting costs for commercial carriers could be significantly higher. Our analysis did not take into account announcements made by health insurance providers that they are waiving out-of-pocket costs for COVID-19 testing and treatment – which shifts the responsibility for those costs from the patient to the insurance provider.
- **Price Changes.** The cost data used was measured from historical cost databases. Wakely implicitly assumed that unit costs derived from historical databases would be relatively stable despite the pandemic. If prices increase due to shortages or price gauging, the figures presented may underestimate true cost. Finally, Wakely completed its analysis before the enactment of the CARES Act. The Act included an increase in

[15] https://www.cdc.gov/coronavirus/2019-ncov/specific-groups/people-at-higher-risk.html

Medicare payments for patients with COVID-19. Consequently, all things equal, costs associated with Medicare in this report may be underestimated.

- **Coverage Status.** Wakely assumed that coverage status would stay relatively constant. Changes in insurance coverage status (e.g., shift in number of insured, shift of coverage of status from commercial to Medicaid, etc.) were not included and potentially could have material impact.
- **Economic Impacts.** There is the potential for severe economic effects of the pandemic and related policies to materially increase or decrease the impact on health insurers. Given the uncertainty, Wakely did not adjust coverage status and utilization patterns as a result of potential job loss or income loss that may occur.
- **Changes in Disease Costs.** Wakely did not model any changes in the long term costs for infected individuals. Individuals that have severe symptoms from the virus may require additional medical services. Wakely also assumed that individuals infected would not be re-infected by the disease. Finally, Wakely did not account for any potential savings due to increased mortality among high risk individuals with co-morbidities.

The information contained in this report is not intended nor is appropriate or sufficiently detailed to use in product pricing in any line of business.

Appendix B: Methodology and Assumptions

The methodology applied in our analysis focused on two drivers of the aggregate incremental cost associated with COVID-19 treatment and diagnosis – (1) medical services utilization rate, given an assumed rate of infection, and (2) cost per medical service by major service category. The product of the two estimates produces aggregate cost for each line of business.

The starting population used in the analysis was sourced from figures published by KFF, CMS, Medicare Advantage enrollment reports, and projected to 2020 and 2021 benefit years. Small adjustment was made to reduce the number of Medicaid managed care enrollees to remove estimated number of duals enrollee that would also be enrolled in Medicare Advantage plans, in order to avoid double counting of these enrollees in both lines of business.

The medical utilization rate was estimated for a subset of enrolled population assumed to be infected with COVID using a range of assumed rates of infection - 10%, 20% to 60% of the population. The estimated rate of hospitalizations and the rate of ICU admissions by age among the infected was released by CDC on March 18, 2020.[16] The assumed rate of infection was applied uniformly to all age categories. Given lack of information at this time, the exposure to COVID-19 virus was assumed to be equally probable across all demographic cohorts.

The estimated average cost per service was modeled based on historical costs for several conditions, the treatment cost of which may approximate COVID-19 treatment costs. Specifically, ICD-10 diagnoses codes in the code groups J09 through J18 representing influenza and pneumonia served as proxy conditions with similar treatment and diagnosis (Table B1). Wakely relied on two large claim databases in order to estimate costs incurred in commercial, Medicare Advantage and Medicaid managed care enrolled populations – IBM MarketScan® Research Database (2017) and 5% Medicare Sample data (2018). All services[17] with the above specified diagnosis codes were identified and the cost per service was determined by age and gender category. Since the source data was from 2017 and 2018 time periods, cost per service was trended to target time periods (2020 and 2021) using high level trend estimates based on NHE cost per enrollee projections by service and line of business[18]. To estimate Medicaid managed care cost levels, commercial cost per service was adjusted downwards closer to Medicaid fee schedules. Reimbursement differentials were taken from American Hospital Association report[19] and further were constrained not to exceed Medicare cost levels. Further, for each enrolled and infected individuals, we assumed at most one service episode over the 2020 and 2021 period,

[16] Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep. ePub: 18 March 2020. DOI: http://dx.doi.org/10.15585/mmwr.mm6912e2external icon.
[17] The definition of a 'service' varied by the major service category representing inpatient admissions, outpatient visits, professional services, home health visits, hospice stays, skilled nursing facility stays and a limited set of prescription medications.
[18] National Health Expenditures 2011-2027, by source of coverage for hospital, physician and clinical services, and prescription drugs. Centers for Medicare & Medicaid Services, Office of the Actuary.
[19] https://www.aha.org/system/files/2018-06/2018-AHA-TrendWatch-Chartbook-Appendix-4.pdf

assuming that COVID infection would not reoccur after the initial incidence. If repeated infections do occur, the estimates in this report would increase.

Since inpatient costs represent the largest cost driver, admissions were further stratified into ICU and non-ICU admissions to align with the CDC's rate of hospitalizations. For the ICU admissions, 75th percentile cost per admission was used, and for the non-ICU admissions, the 25th percentile cost per admission was used. The cost per admission was assumed to be inclusive of all necessary testing and treatment costs for both facility and professional services components. All inpatient admissions were assumed to have been admitted through the emergency department. The cost of an emergency department visit was estimated at the 75% percentile of outpatient facility cost per service plus the 75th percentile of professional cost per service. Additionally, for the Medicare Advantage population only, we modeled costs associated with SNF, and home care services. The frequency of these services was modeled using the COVID-19 case fatality rate as reported by CDCs March 18th report.

For the remaining cases not resulting in a hospitalization, it was further assumed that a portion of these (50%) would be mild in nature and not result in any medical services, including COVID-19 testing. For the 50% that do seek medical care and get tested, we estimated costs associated with outpatient facility services, professional services, and limited scope of prescription drug services.

Outpatient facility and professional cost per service estimates were assumed to be comprised of emergency department (ED) and office visits. All cases that did not result in an inpatient admission were assumed to follow an observed distribution of ED and office visits along with a mean cost per case (facility and professional). The testing costs were assumed to be reflected in the average professional cost per service.

To estimate a potential cost associated with any medications developed over the course of 2020-2021 as a treatment or prevention (e.g., vaccine) of COVID, Wakely included cost of Tamiflu (one script per infected enrollee) from IBM MarketScan® Research Database 2017 database as a representative medication. Tamiflu was selected as a potential proxy for costs associated with a prescription drug treatments that may be developed in future. Wakely acknowledges that the range of potential drug treatment costs is large. The list of NDC codes used in the analysis is presented in Table B2.

Using this methodology, six scenarios were modeled, varying rates of COVID infection (10%, 20%, and 60%) and range of hospitalizations (low to high, based on CDC's estimates).

Table B1 - List of ICD-10 Diagnoses Used in Cost Estimates

ICD-10 Code	Diagnosis Description
J09.XX	Influenza due to certain identified influenza viruses
J10.XX	Influenza due to other identified influenza virus
J11.XX	Influenza due to unidentified influenza virus
J12.XX	Viral pneumonia, not elsewhere classified
J13.XX	Pneumonia due to Streptococcus pneumoniae
J14.XX	Pneumonia due to Hemophilus influenzae
J15.XX	Bacterial pneumonia, not elsewhere classified
J16.XX	Pneumonia due to other infectious organisms, not elsewhere classified
J17.XX	Pneumonia in diseases classified elsewhere
J18.XX	Pneumonia, unspecified organism

Table B2 – List of 9-digits of NDCs for Tamiflu

NDC List		
50090-0662	00004-0800	54868-4476
50090-1244	00004-0801	54868-6083
54569-4888	00004-0802	54868-6315
55045-2759	00004-0810	42254-0001
55045-3198	00004-0820	42254-0092
70518-2042	00004-0822	52125-0307

Appendix C Disclosures and Limitations

Responsible Actuary Ksenia Whittal and Tim Murray are the actuaries responsible for this communication. Ksenia and Tim are both Members of the American Academy of Actuaries and Fellows of the Society of Actuaries. They meet the Qualification Standards of the American Academy of Actuaries to issue this report. Michael Cohen, PhD, also contributed to this report.

Intended Users. This information has been prepared for the sole use of the America's Health Insurance Plans (AHIP) and cannot be distributed to or relied on by any third party without the prior written permission of Wakely. Wakely understands that the report may be made public. Distribution to such parties should be made in its entirety and should be evaluated only by qualified users. The parties receiving this report should retain their actuarial experts in interpreting results.

Risks and Uncertainties. The assumptions and resulting estimates included in this analysis are inherently uncertain. Users of the results should be qualified to use it and understand the results and the inherent uncertainty. **Actual results may vary, potentially materially, from our estimates.** Wakely does not warrant or guarantee the projected values included in the analysis. It is the responsibility of the organization receiving this output to review the assumptions carefully and notify Wakely of any potential concerns.

Conflict of Interest We are financially independent and free from conflict concerning all matters related to performing the actuarial services underlying these analyses. In addition, Wakely is organizationally and financially independent to AHIP.

Data and Reliance We have relied on others for data and assumptions used in the assignment. We have reviewed the data for reasonableness, but have not performed any independent audit or otherwise verified the accuracy of the data/information. If the underlying information is incomplete or inaccurate, our estimates may be impacted, potentially significantly.

Subsequent Events Subsequent events may impact the findings in this report. Changes in state policy, economic conditions, federal legislation, rate of COVID-19 infection and treatment patterns, and other factors and emerging data could result in material changes to this analysis.

Wakely completed its analysis before the enactment of the CARES Act. The Act included an increase in Medicare payments for patients with COVID-19. Consequently, Medicare COVID estimates in this report may be underestimated.

Contents of Actuarial Report. This document and the supporting exhibits/files constitute the entirety of actuarial report and supersede any previous communications on the project.

Deviations from ASOPs. Wakely completed the analyses using sound actuarial practice. To the best of our knowledge, the report and methods used in the analyses are in compliance with the appropriate ASOPs with no known deviations. A summary of ASOP compliance is listed below:

ASOP No. 23, Data Quality
ASOP No. 41, Actuarial Communication