RESEARCH BRIEF

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April 2020

EXECUTIVE SUMMARY TO NCCI WHITE PAPER

COVID-19 and Workers Compensation: Modeling Potential Impacts

The novel coronavirus (COVID-19) was declared a public health emergency in the United States in late January 2020, followed by the World Health Organization's pandemic designation on March 11, 2020. As the crisis began to unfold, policymakers and the insurance industry began to question the impact COVID-19 would have on the workers compensation (WC) system. Relying on its expertise as a sector thought leader, the National Council on Compensation Insurance (NCCI) has crafted a white paper to assist in understanding the potential cost impact on WC losses due to COVID-19.

While there are many unknowns regarding COVID-19 and its ultimate impact on the US population, the following serves to provide an estimate of potential WC system cost[1] impacts under various hypothetical scenarios detailed in the white paper. This document is being provided as a tool which may be used to gain insight into the potential implications of a state enacting legislation related to the compensability of COVID-19-related claims in certain occupations.

ASSUMPTIONS USED IN THE MODEL

There are many COVID-19-related factors, and the white paper provides a thorough discussion of the many assumptions that must be considered. Data reported to NCCI has been leveraged where possible to estimate various factors such as average weekly indemnity benefits, fatal benefits, and medical severities. Assumptions for infection rates, hospitalization rates, compensability rates, and fatal rates all necessarily come into play when assessing COVID-19's potential impact range on the WC system. Some assumptions have a more pronounced impact than others and some contain a significant amount of variability. While each of these factors is discussed at length in the white paper, the table below summarizes a few of the key assumptions used in the model. Quoted research[2] on the assumptions is shown where applicable.

Category	Assumptions	Ranges Referenced in White Paper	Description
Frequency	Infection rate	From < 10%, up to 81%	Percentage of workers who contract COVID-19
	Report Rate	20% to 95%	One minus the asymptomatic rate
	Compensability Rate	0% to 100%	Percentage of symptomatic cases entitled to WC benefits
Severity	Fatal rate	0.19% to 1.97%	Percentage of claims that result in death benefits
	Hospitalization rate	1% to 31%	Impacts distribution of claims categorized with mild, moderate, or severe symptoms
	Critical Care Rate	5% to 27%	

[1] In this document, the use of the terms "WC system costs" and "WC losses" are considered synonymous

[2] Sources for values used in this white paper and displayed in this table of assumptions include: Institute of Health Metrics and Evaluation; Marc Lipsitch, professor of epidemiology at Harvard T.H. Chan School of Public Health; Imperial College COVID-19 Response Team; Sergio Romagnani, professor of clinical immunology at the University of Florence; Centre for Evidence-Based Medicine; FAIR Health; *The New England Journal of Medicine*; and the Centers for Disease Control and Prevention

Potential Impacts of COVID-19

The following table summarizes a broad range of estimated impacts[3] using the various scenarios displayed in the white paper (Tables 11–13) for all states where NCCI provides ratemaking services[4]:

	First Responders	First Responders and Healthcare Workers	All Workers
# of Workers (BLS)	1,176,110	9,666,420	86,351,950
Potential Range of Impacts on Worker Segment	+10% to +170%	+33% to +550%	+8% to +254%
Estimated Annual Losses Without COVID-19	$1.1B	$3.0B	$32.1B
Potential Range of Impacts From COVID-19	+$0.1B to +$1.9B	+$1.0B to +$16.2B	+$2.7B to +$81.5B
Assumptions[5]			
Infection Rate	5% to 50%	5% to 50%	5% to 50%
Compensability Rate	60% to 100%	60% to 100%	20% to 60%
Fatal Rate	0.5%	0.5%	0.5%

Note: Dollar impacts shown above are provided for illustrative purposes only.[6,7]

The analytical approach referenced in this document and employed in the white paper all operate under the same framework, with the white paper providing a larger set of assumptions and state- or occupation-specific data in its tables and appendices. The white paper provides four detailed scenarios to demonstrate how one may use specific assumptions and the appendices to produce an estimate of the impact of COVID-19 on the WC system. Users can apply this framework to develop their own scenarios by selecting from a range of variables—including those based on their individual jurisdiction(s).

The white paper illustrates the impact of COVID-19 on first responders using one potential set of assumptions for all NCCI states combined. In addition, the white paper contains tables that display the impact for each individual jurisdiction under the same set of assumptions. Hence, the first column of impacts shown in the table above is an example of an application of the white paper. That is, the infection and compensability rates were varied, from that contained in Scenario 3 of the white paper, to produce a potential range of impacts on first responders.

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[3] Displayed values are not shown to full precision.

[4] Includes: AK, AL, AR, AZ, CO, CT, DC, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MD, ME, MO, MS, MT, NC, NE, NH, NM, NV, OK, OR, RI, SC, SD, TN, TX, UT, VA, VT, and WV; subsequent references to this group of jurisdictions have been shortened to "NCCI states."

[5] The impacts displayed in the Executive Summary are for a narrower set of assumptions than shown in the white paper; this should not be interpreted to suggest that selections of assumptions outside of the above ranges are not appropriate.

[6] The dollar impacts are determined by multiplying estimated losses by the percentage impacts displayed. For the specified segment of workers, estimated losses are calculated as the product of US Bureau of Labor Statistics (BLS) annual wages and the weighted average of the latest approved pure premium factors for all states for which NCCI provides ratemaking services. The pure premium factor represents the expected losses as a percentage of payroll in hundreds. Values used to derive the figures shown are included in the white paper's appendices.

[7] The use of BLS wages provides an estimate of the impact on all private and public employers regardless of how work-related injury costs are funded (e.g., privately insured, self-insured, policyholder retained portion of deductible policies, or employees exempted from WC requirements).

Scenario #4 of the white paper provides similar information, but for healthcare workers. Again, an application of the framework in the white paper was used to produce estimates of the potential impacts, utilizing a range of assumptions for infection and compensability rates. The resulting impacts for healthcare workers were combined with the impacts for first responders to produce the second column of data displayed in the table above.

This framework can be further leveraged to develop potential system impacts across a broader set of occupations. In particular, the white paper highlights examples of the impact of COVID-19 across all occupations for individual jurisdictions (Scenario #2) or for all NCCI states combined (Scenario #1). A similar application of the framework for Scenario #1 of the white paper was used to populate the impacts shown in the last column of data in the table above.

An initial look at a broader group of occupations that may be considered essential during the initial wave of infection suggests that between 49 million and 62 million individuals in the workforce (33% to 42%) could potentially qualify as essential workers[8]. To the extent that the essential workers' share of the workforce is comparable to their share of statewide WC losses, the corresponding scenario estimate of WC losses related to COVID-19 for these occupations is between 33% and 42% of the "ALL Workers" estimate for the applicable jurisdiction, as displayed in the white paper.

CONCLUSION

NCCI has provided a framework to estimate the potential magnitude of the impact of COVID-19 on WC losses under various scenarios. The white paper presents a qualitative discussion concerning the challenges in estimating key assumptions and outlines the potential directional impact of variables not contemplated in the model. The framework may also be used to evaluate the potential impact on losses to the system of additional user-defined hypothetical scenarios, as needed. NCCI believes this is a valuable analytical tool that will assist in understanding the potential COVID-19 impact as individual state proposals continue to emerge relating to WC coverage.

[8] Adie Tomer and Joseph Kane. *How to protect essential workers during COVID-19.* Brookings (3/31/2020). www.brookings.edu/research/how-to-protect-essential-workers-during-covid-19/

RESEARCH BRIEF

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COVID-19 AND WORKERS COMPENSATION: MODELING POTENTIAL IMPACTS

Introduction

During December 2019, a new infectious disease appeared in China and has since spread around the world. In late January 2020, the novel coronavirus (COVID-19) was declared a public health emergency in the United States and was officially declared a pandemic by the World Health Organization (WHO) on March 11, 2020.

While there are many unknowns regarding COVID-19 and its ultimate impact on the US population, the following serves to provide an estimate of potential workers compensation (WC) system impacts under various hypothetical scenarios. In addition, this document may be used as a tool to gain insight into the potential implications of a state enacting legislation related to the compensability of COVID-19-related claims in certain occupations.

Incidence of COVID-19

The infection rate of COVID-19 is widely speculated. Depending on the model used, up to 80% of the US population is expected to ultimately be infected (see Table 1). Estimates may vary drastically due to many levels of uncertainty, including:

- The limited time to collect data,
- Incomplete data due to a lack of testing capacity, and
- A changing environment (e.g., social distancing and isolation).

Additionally, any estimate that narrows the focus to a single jurisdiction or occupation further exacerbates the uncertainty surrounding such a projection.

Because of this and uncertainty related to compensability of COVID-19-related claims under WC statutes, NCCI has limited its analysis to quantifying the impact of hypothetical scenarios across a very broad range of assumptions.

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Table 1: Projected Infection Rates by Source

Rate	Source (Date of Estimate)	Comments
Less than 10%	Institute of Health Metrics and Evaluation (4/8/20)[1,2]	US Rate, assumes strict infection controls
20% - 60%	Marc Lipsitch, professor of epidemiology at Harvard T.H. Chan School of Public Health (3/4/20)[3]	Global Adult Population Rate
40% - 80%	NY Gov. Andrew Cuomo (3/21/20)	New York Rate
56%	CA Gov. Gavin Newsom (3/18/20)	California Rate
81%	Imperial College COVID-19 Response Team (3/16/20)[4]	Assumes no infection controls

After assuming less than 80% of the population will become infected by COVID-19, it is then important to determine what subset of the infected are asymptomatic (i.e., will not develop symptoms) or experience mild enough symptoms that they are unaware they have the disease. Similar to the infection rate, the percentage of infected people who develop few to no symptoms is unknown. Those that are asymptomatic are much less likely to be tested for COVID-19 relative to those who show symptoms—resulting in the existence of only limited data for this subset of the infected population. This is especially true when the ability to test for COVID-19 is currently limited, and random sampling of the population cannot be consistently performed. Although some have cited that 40% to 50% of the ultimate number of infected persons will be asymptomatic or have such mild symptoms that they do not seek out medical services, there is not a clear consensus among studies where total populations have been tested (see Table 2).

Table 2: Asymptomatic Rates by Source

Rate	Source (Date of Estimate)	Comments
18%	Centers for Disease Control and Prevention (3/26/20)[5]	Based on 712 infected persons aboard the Diamond Princess cruise ship
40% - 50%	Imperial College COVID-19 Response Team (3/16/20)[4]	Unidentified cases, not just asymptomatic. Based on data from China

[1] Institute for Health Metrics and Evaluation (IHME). *United States COVID-19 Hospital Needs and Death Projections*. Seattle, United States of America: Institute for Health Metrics and Evaluation (IHME), University of Washington, 2020. (4/11/2020), https://covid19.healthdata.org/united-states-of-america

[2] Less than 10% infection rate is not explicitly stated in the projection of bed usage in the United States[1], but was confirmed via correspondence regarding the underlying assumptions on the first wave of infection of COVID-19 in the United States

[3] Jonathan Shaw, "Cooperating to Combat Coronavirus." *Harvard Magazine* (2/23/20), https://harvardmagazine.com/2020/02/fighting-sars-2

[4] Neil M. Ferguson, Daniel Laydon, Gemma Nedjati-Gilani, et al. *Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand*. Imperial College London (3/16/2020), https://doi.org/10.25561/77482

[5] Moriarty LF, Plucinski MM, Marston BJ, et al. *Public Health Responses to COVID-19 Outbreaks on Cruise Ships — Worldwide, February–March 2020*. Morbidity and Mortality Weekly Report 2020 (3/26/20), doi: http://dx.doi.org/10.15585/mmwr.mm6912e3

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Rate	Source (Date of Estimate)	Comments
50% - 75%	Sergio Romagnani, professor of clinical immunology at the University of Florence (3/23/20)[6]	3,000 tested in Vo'Euganeo, Italy
5% - 80%	Centre of Evidence-Based Medicine (4/6/20)[7]	Compilation of 21 distinct sources in review

For purposes of our scenario testing, we made a simplified assumption that 50% of the ultimate number of COVID-19 cases will be asymptomatic or have mild and unnoticed symptoms.[8] Applying these rates to the working population, our impact scenarios will focus on 40% (= 50% x 80%) or less of the US working population having notable COVID-19 symptoms and thereby not being able to work to some extent during their illness. Ultimately, the development of symptoms is expected to be heavily influenced by the age[9] and any associated health conditions[10] of the population. Therefore, caution should be applied when assessing the applicability and reasonability of hypothetical scenarios to specific jurisdictions or occupations.

Severity of COVID-19 Symptoms

To better determine the estimated average cost of wage replacement and medical services for COVID-19 claims, we separate the population of cases with notable symptoms into three distinct symptom groups. The determination of expected fatal benefits will be calculated separately (discussed later).

Symptom Group	Description
Mild	Requires some medical treatment but no hospitalization
Moderate	Requires a hospital stay without the intensive care unit (ICU) or ventilation
Severe	Requires a hospital stay involving the ICU and/or ventilation

Most sources we initially reviewed have cited an overall average hospitalization rate (percentage of infected that require hospitalization) of between 15% and 20% (see Table 3). This initial rate may be biased high, relative to the total infected population, due to an underreporting of less severe cases. However, this is mitigated to the extent that we are focused on cases with notable symptoms in the above scenario range for frequency (infection rate x report rate) of 40% or less. If a 15% hospitalization rate was used, this would imply that up to 6% (=15% x 40%) of the US working population will be hospitalized in part due to COVID-19.

[6] Day M. Covid-19: *identifying and isolating asymptomatic people helped eliminate virus in Italian village. BMJ* 2020 (3/23/20), https://www.bmj.com/content/368/bmj.m1165

[7] Heneghan C, Brassey J, Jefferson T. *COVID-19: What proportion are asymptomatic,* The Centre for Evidence-Based Medicine. (4/6/2020), https://www.cebm.net/covid-19/covid-19-what-proportion-are-asymptomatic/

[8] This assumption is reflected in the scenario calculations as the Report Rate which equals the complement of those that are symptomatic or have mild and unnoticed symptoms (= 1.0 – 50%)

[9] *Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020*. Morbidity and Mortality Weekly Report. (3/26/2020) doi: http://dx.doi.org/10.15585/mmwr.mm6912e2

[10] *Preliminary Estimates of the Prevalence of Selected Underlying Health Conditions Among Patients with Coronavirus Disease 2019 — United States, February 12–March 28, 2020*. Morbidity and Mortality Weekly Report. (4/2/2020) doi: http://dx.doi.org/10.15585/mmwr.mm6913e2

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Table 3: Hospitalization Rates by Source

Rate	Source (Date of Estimate)	Comments
11% or lower	Institute of Health Metrics and Evaluation (4/10/20)[1,2]	Implied hospitalization rate based on a less than 10% infection rate and projected hospital admissions in the United States
1% - 17%	Imperial College COVID-19 Response Team (3/16/20)[4]	Stratified by age based on data from China. Overall weighted average of 7% expected for US age distribution
15% - 20%	FAIR Health (3/25/20)[11]	Based on a review of multiple interviews on COVID-19
21% - 31%	Centers for Disease Control and Prevention (3/18/20)[12]	Based on 4,226 cases in the United States

It should also be noted that the correlation between the severity of symptoms and age could result in a material difference if applied to a population with a different age distribution. Using hospitalization rates by age from the Centers for Disease Control and Prevention (CDC),[13] weighted together using employee counts by age for 2019 from the US Bureau of Labor Statistics (BLS), we observed only a slight difference in the hospitalization rate (99.6% relativity = adjusted/overall hospitalization rate). However, if the BLS employee counts are further restricted to those 65 years of age or younger, the adjustment begins to show more material differences (84.5% relativity). **In view of differences in age distribution and the lower estimates from more recent studies, we assumed a hospitalization rate of 10% in our scenario testing. It should be noted that this assumption can vary materially when applied to a specific occupation or state due to factors such as different age distributions, prevalence of pre-existing health conditions, or intensity of exposure to the virus.**

To distinguish infected persons who are hospitalized with and without the need for ICU or ventilation, a critical care rate that represents the percentage of admitted hospital cases which will require the use of ICU or ventilation was selected. Most sources we reviewed imply a range of between 10% and 20% (see Table 4). **For the purposes of scenario testing, we assumed an average 15% critical care rate.**

Table 4: Critical Care Rates by Source

Rate	Source (Date of Estimate)	Comments
16%	*The New England Journal of Medicine* (2/28/20)[14]	Early estimate of severe illness in China
5% – 27%	Imperial College COVID-19 Response Team (3/16/20)[4]	Stratified by age based on data from China. Overall weighted average of 10% expected for US employee age distribution

[11] *The Projected Economic Impact of the COVID-19 Pandemic on the US Healthcare System.* A FAIR Health Brief (3/25/2020), https://s3.amazonaws.com/media2.fairhealth.org/brief/asset/COVID-19%20-%20The%20Projected%20Economic%20Impact%20of%20the%20COVID-19%20Pandemic%20on%20the%20US%20Healthcare%20System.pdf

[12] *Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020.* Morbidity and mortality Weekly Report (3/18/2020), doi: http://dx.doi.org/10.15585/mmwr.mm6912e2

[13] *Laboratory-Confirmed COVID-19-Associated Hospitalizations Preliminary cumulative rates as of 4/4/2020.* COVID-NET (4/12/2020), https://gis.cdc.gov/grasp/COVIDNet/COVID19_3.html

[14] Wei-jie Guan, Ph.D., Zheng-yi Ni, M.D., Yu Hu, M.D., et al. "Clinical Characteristics of Coronavirus Disease 2019 in China." *The New England Journal of Medicine* (2/28/2020), doi: https://www.nejm.org/doi/full/10.1056/NEJMoa2002032

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Rate	Source (Date of Estimate)	Comments
20%	Institute for Health Metrics and Evaluation (4/10/20)[1,2]	Implied based on projected mean of US new ICU/hospital admission projections
20%	Centers for Disease Control and Prevention (3/28/20)[15]	Based on 6,354 cases in the United States

Based on the hospitalization and critical care rates, our scenarios assume the infected population with notable symptoms is comprised as follows:

- 90% (= 1.0 – Hospitalization Rate) with mild symptoms,
- 8.5% (= Hospitalization Rate x [1.0 – Critical Care Rate]) with moderate symptoms, and
- 1.5% (= Hospitalization Rate x Critical Care Rate) with severe symptoms.

Finally, we must consider any additional fatal benefits associated with cases that end in death. Because the fatal rate associated with COVID-19 is usually projected as a percentage of infected, we did not attempt to break this out by symptom group (mild, moderate, and severe). Most sources suggest the fatal rate is less than 2% (see Table 5) despite some initially observed, crude fatal rates that were much higher.[16] This difference is likely due to gaps in reported asymptomatic or very mild symptom cases. **For the purposes of scenario testing, we assumed a fatal rate of 0.5%.**

Table 5: Fatal Rates by Source

Rate	Source (Date of Estimate)	Comments
0.34%	Centers for Disease Control and Prevention (4/10/20)[17]	Empirical cumulative deaths to confirmed and presumptive positive cases
0.37% - 1.97%	Centers for Disease Control and Prevention (3/18/20)[12]	Weighted age-specific rates using US working population
0.19% - 1.85%	Institute for Health Metrics and Evaluation (4/10/2020)[1,2]	Implied based on a less than 10% infection rate (upper bound set at 1%) and mean projected deaths in the United States

Average Indemnity Cost per COVID-19 Claim

Workers who contract COVID-19 are not expected to be able to work due to illness, hospitalization, or self-quarantine, and may be entitled to wage replacement benefits if exposure is determined to be work-related. The average amount of time away from work (i.e., average duration) will depend on the severity of their symptoms. Average durations were assigned to each of our symptom groups (mild, moderate, and severe). These duration estimates were based on figures reported by the WHO,[16] which states that the median time between the onset of COVID-19 symptoms and clinical recovery is approximately two weeks for mild cases and ranges from three to six weeks for severe and critical cases. Accordingly, we have assigned

[15] *Preliminary Estimates of the Prevalence of Selected Underlying Health Conditions Among Patients with Coronavirus Disease 2019 — United States, February 12–March 28, 2020*. Morbidity and Mortality Weekly Report. (4/8/2020) doi: http://dx.doi.org/10.15585/mmwr.mm6913e2

[16] WHO-China Joint Mission, *Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19),* (2/28/20), https://www.who.int/publications-detail/report-of-the-who-china-joint-mission-on-coronavirus-disease-2019-(covid-19)

[17] *COVID-19: U.S. At A Glance*. CDC Coronavirus 2019 (COVID-19) Cases & Surveillance (4/11/2020), https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html#weekly-surveillance-report

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average durations of two, three, and six weeks for the mild, moderate, and severe symptom groups, respectively. It is important to recognize that the figures reported by the WHO are median durations. To the extent that the mean (average) and median estimates materially differ, which may be more likely for the severe cohort, the resulting scenario impacts would be affected.

It should also be noted that these selections assume that the infected employee is released to work upon reaching clinical recovery. This assumption was made as the criteria that define clinical recovery overlap with the CDC's criteria for discontinuing isolation.[18] While the parallels between the WHO definition of clinical recovery and the CDC isolation guidelines support this assumption, it may understate the actual duration in instances where patients are instructed to self-isolate further after clinical recovery. In addition, certain jobs may lend themselves to a quicker return to work than others (e.g., occupations that allow telecommuting), thereby creating additional differences in the cost of claims across occupations.

For each NCCI state and duration, the expected temporary total disability benefit was estimated to account for each state's unique benefit structure[19] (see Appendix 1 for state-specific information). The expected benefit payments by state were then weighted by reported manual premiums[20] and trended to Accident Year 2020 (7/1/2020) to determine an overall estimate (see Table 6). Note that the effect of waiting and retroactive periods results in notably different rates of change between the displayed average durations and wage replacement benefits for the listed cohorts (e.g., moving from two to three weeks more than doubles the average wage replacement benefit).

Table 6: Wage Replacement Benefits per Case

Case	Average Duration	Estimated Average Wage Replacement Benefit
Mild	2 weeks	$688
Moderate	3 weeks	$1,403
Severe	6 weeks	$3,146

In severe cases, COVID-19 may result in permanent impairment (e.g., damage to the lungs, heart, or brain) which may bar workers from returning to their original occupation, particularly in physically demanding jobs. **In these instances, permanent partial or permanent total benefits may apply, but the potential frequency of these scenarios is currently unknown. In addition, the development of a mental illness, either as a direct result of recovering from COVID-19 or solely from exposure to traumatic situations (e.g., healthcare worker or first responder being diagnosed with post-traumatic stress disorder), may lead to an incapacity to work and thereby potentially additional WC benefit costs. Further, any potential liability that may surface related to coverage contained in Part Two-Employers Liability Insurance of the standard WC policy is unknown. Our scenario testing does NOT consider these benefits/costs when estimating the impact to expected losses.**

In addition to wage replacement benefits, some workers may ultimately pass away from COVID-19. To determine the severity of related fatal benefits per claim, we reviewed each state's published ultimate indemnity severity[21] for fatal claims

[18] *Discontinuation of Isolation for Persons with COVID-19 Not in Healthcare Settings (Interim Guidance),* CDC Coronavirus Disease 2019 (COVID-19) (4/10/2020), https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html
[19] Differences in benefit structures by state include, but are not limited to, waiting periods, retroactive periods, compensation rates, and average weekly injured worker's wages
[20] NCCI Unit Statistical Plan data reported for Policy Year 2017
[21] Exhibit 11 of NCCI's ***Annual Statistical Bulletin***, 2019 Edition, https://www.ncci.com/ASB#/Year/2019

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and trended these values forward so that they are applicable to claims occurring in Accident Year 2020 (see Appendix 1 for state-specific information). The trended amounts were then weighted by each state's reported manual premium,[22] which produced an overall estimated average indemnity benefit amount of $344,557 per fatal claim.

It should be noted that claims underlying NCCI's ***Annual Statistical Bulletin (ASB)*** may have different characteristics than COVID-19 claims.[23] To the extent that this is true, our estimate could vary. For the purposes of scenario testing, we assumed a benefit amount of $341,411 (= $344,557 - $3,146) was paid in addition to any previously estimated wage replacement benefits for claims that ultimately result in death. Hence, this value assumes all fatal claims are the result of cases with severe symptoms, though this assumption was not material to the analysis.

Average Medical Cost per COVID-19 Claim

The level of medical care and associated costs with treating COVID-19 varies depending on the severity of symptoms. Information from the NCCI Medical Data Call (MDC)[24] was used to produce cost estimates for medical services to approximate those costs that may result from treating COVID-19 cases. The following International Classification of Disease Codes were used to identify respiratory distress claims in the MDC:

- J00-J06: Acute upper respiratory infections
- J09-J18: Influenza and pneumonia
- J20-J22: Other acute lower respiratory infections

The applicable respiratory distress claims were then categorized as either with or without hospitalization. Due to the limited number of identified respiratory distress claims requiring hospitalization,[25] we did not attempt to develop distinct estimates for the moderate and severe claim symptom groups. The average total medical payment plus case reserve[26] for each scenario was trended forward to 2020 using the Chain-Weighted Personal Healthcare Index from the BLS to derive the final medical severity estimates. Based on these calculations, we derived the following severity estimates:

Table 7: MDC Medical Severity Estimate by Case

Case	Level of Medical Care	Estimated Average Medical Benefit Cost
Mild	Medical treatment for respiratory distress, no hospitalization required	$1,000
Moderate – Severe	Hospital stay for respiratory distress	$25,500

Because of the limited number of claims underlying the "moderate – severe" medical severity estimate, an alternative calculation was used for comparison based on the average inpatient cost per diem for ALL hospitalized claims from the MDC for Service Year 2018. The average inpatient cost per diem was trended to 2020 and the following assumptions were made by case.

[22] NCCI Unit Statistical Plan data reported for Policy Year 2017
[23] For example, a different distribution of dependents or duration of temporary total wage replacement benefits
[24] Medical Data Call, all NCCI states, services provided between Calendar Years 2014 and 2018 (i.e., Service Years 2014-2018)
[25] Less than 25 respiratory distress claims with associated hospital inpatient costs were reported on the Medical Data Call for Service Years 2014-2018
[26] Based on Unit Statistical Plan data for respiratory claims identified in the MDC, to reflect both paid and case reserve amounts

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For moderate cases:
- Assume a three-day hospital stay to approximate inpatient costs
- Use the average outpatient emergency room visit cost from the MDC for Service Year 2018, trended to 2020, as a proxy for the nonfacility and outpatient medical costs

For severe cases:
- Assume a seven-day hospital stay to approximate inpatient costs
- Use a multiplicative factor (1.45) to determine total severity from inpatient costs

The 1.45 factor was based on the percentage of inpatient costs-to-total costs for the hospitalized respiratory distress claims previously identified. The derived alternative set of severity estimates for moderate and severe claims is shown in Table 8.

Table 8: Alternative MDC Medical Severity Estimate by Case

Case	Level of Medical Care	Estimated Average Medical Benefit Cost
Moderate	3-day hospital stay with no ICU or ventilation	$19,000
Severe	7-day hospital stay with ICU or ventilation	$59,000
Moderate – Severe[27]	Hospital stay for respiratory distress	$25,000

It is important to note that actual COVID-19 medical reimbursements may vary from historical average payments for similar services due to the Coronavirus Aid, Relief, and Economic Security Act (CARES Act), which has multiple provisions that differ from the standard Medicare reimbursement rules. In particular, the CARES Act, if applied to WC reimbursement rates, would be expected to increase payments for inpatient facility costs related to COVID-19 by 20%. For this reason, we increased the moderate-to-severe severity estimates by 14% (shown below) based on the share of inpatient costs. Additionally, the severity estimates may vary to the extent that COVID-19 claims result in a different intensity or mix of services, compared with those assumed in these estimates, due to factors such as age, gender, or experimental therapies.

To further validate the reasonableness of the above estimates, we also reviewed those used by FAIR Health,[11] which estimated that the average allowed reimbursement amount for commercially-insured patients requiring an inpatient stay was between $21,936 and $38,775. **For purposes of scenario testing, we used the MDC estimates (Table 7) and multiplied the moderate-to-severe cases by 1.14, recognizing the CARES Act (mild severity of $1,000, moderate-to-severe severity of $29,000).**

[27] Based on the weighted average of the moderate and severe estimates using the critical care rate assumption of 15%

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Impact to Expected Losses by Scenario

Please note the following when reviewing potential impacts to WC losses for the below specified scenarios:

- Impacts assume **all cases with medical services would result in a compensable WC claim.** The actual percentage of COVID-19 cases that may ultimately be deemed compensable is unknown but is expected to be less than 100%. This parameter is expected to be modified by the user based on their expectations of compensability. **Table 9 highlights the sensitivity of this selection to the resulting scenario impacts.**

- Impacts assume **all cases with mild symptoms receive some medical services.** To the extent that cases with no medical services are found compensable, the illustrated scenario impact may be understated because the report rate assumes these are currently not compensable.

- Impacts assume **no expected losses for permanent partial disability, permanent total disability, or associated mental illnesses.** To the extent that these materially occur, the illustrated scenario impacts may be understated.

The following example calculation, Scenario #1, utilizes a randomly selected infection rate (10%) from the assumed range (less than 80%). A specific infection rate was used to better illustrate the calculation and does not imply that it is more accurate than others in the range. Note that Tables 9 and 10 highlight how the scenario impacts may vary using alternative selections for the infection rate.

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Hypothetical Scenario #1—Impact to Expected Losses

	Row Description	Scenario Assumption
(1)	Infection Rate	10%
(2)	Report Rate	50%
(3)	Hospitalization Rate	10%
(4)	Critical Care Rate	15%
(5)	Fatal Rate	0.5%
(6)	Average Fatal Indemnity Benefit	$341,411
(7)	Average Salary[1]	$50,258
(8)	Pure Premium Factor[2]	0.74

		Symptom Type			
	Row Description	Mild	Moderate	Severe	Overall[3]
(9)	COVID-19 Claim Frequency	4.5% = (1) x (2) x [1.0 – (3)]	0.425% = (1) x (2) x (3) x [1.0 – (4)]	0.075% = (1) x (2) x (3) x (4)	5% = (1) x (2)
(10)	Compensability Rate	100%	100%	100%	100%
(11)	Wage Replacement Severity	$688	$1,403	$3,146	$786
(12)	Medical Severity	$1,000	$29,000	$29,000	$3,800
(13)	Nonfatal Total Severity = (11) + (12)	$1,688	$30,403	$32,146	$4,586

	Row Description	Estimate	
(14)	Sample Workforce Population[4]	100,000	
(15)	Expected Payroll	$5,026M	= (14) x (7)
(16)	COVID-19 Total Severity	$6,293	= (13) Overall + (6) x (5)
(17)	COVID-19 Expected Losses	$31.5M	= (14) x (9) Overall x (10) x (16)
(18)	Current Expected Losses	$37.2M	= (15)/100 x (8)
(19)	Scenario Expected Losses	$68.7M	= (17) + (18)
(20)	**Scenario Impact**	**85%**	= (19) / (18) – 1.0

Displayed values not shown to full precision

[1]Annual mean wage through May 2019 from the US Bureau of Labor Statistics for all occupations in NCCI states

[2]Weighted average of the underlying pure premium factor in each approved loss cost/rate across NCCI states

[3]Overall (10) – (13) derived as the weighted average of the Mild/Moderate/Severe symptom values

[4]This has no effect on the calculation of the impact (%); it is used only to provide dollar amounts for rows (15), (17) – (19)

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As noted in Row (10) of the Scenario #1 calculation, all reported cases were assumed to be compensable under the WC system. This serves as a placeholder estimate because the actual percentage is unknown. The selection of this percentage for a specific jurisdiction or occupation should take into consideration the expected likelihood of compensability under the WC system.

To provide a more complete picture, the assumptions under **Scenario #1** will remain fixed, except that both the infection rate and compensability rate are varied. Doing this results in the following impacts to expected losses:

Table 9: Overall WC Loss Impacts by Infection and Compensability Rate

Impact to Expected Losses	Compensability Rate 20%	40%	60%	80%	100%
Infection Rate 1%	2%	3%	5%	7%	8%
2%	3%	7%	10%	14%	17%
3%	5%	10%	15%	20%	25%
4%	7%	14%	20%	27%	34%
5%	8%	17%	25%	34%	42%
10%	17%	34%	51%	68%	**85%**
15%	25%	51%	76%	102%	127%
20%	34%	68%	102%	135%	169%
30%	51%	102%	152%	203%	254%
40%	68%	135%	203%	271%	338%
50%	85%	169%	254%	338%	423%
60%	102%	203%	305%	406%	508%
70%	118%	237%	355%	474%	592%
80%	135%	271%	406%	541%	677%

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Another primary source of uncertainty is the assumption of the fatal rate. Varying the infection rate and fatal rate, while maintaining the assumptions in **Scenario #1**, we observe the following impacts to expected losses:

Table 10: Overall WC Loss Impacts by Infection and Fatal Rate

Impact to Expected Losses	Fatal Rate 0.25%	0.50%	0.75%	1.00%	1.25%	1.50%
Infection Rate 1%	7%	8%	10%	11%	12%	13%
2%	15%	17%	19%	22%	24%	26%
3%	22%	25%	29%	32%	36%	39%
4%	29%	34%	38%	43%	48%	52%
5%	37%	42%	48%	54%	60%	65%
10%	73%	**85%**	96%	108%	119%	130%
15%	110%	127%	144%	161%	179%	196%
20%	146%	169%	192%	215%	238%	261%
30%	219%	254%	288%	323%	357%	391%
40%	292%	338%	384%	430%	476%	522%
50%	366%	423%	480%	538%	595%	652%
60%	439%	508%	576%	645%	714%	783%
70%	512%	592%	673%	753%	833%	913%
80%	585%	677%	769%	860%	952%	1044%

It should be noted that the percentages shown in both Table 9 and Table 10 reflect the impact to expected losses due to the first wave of COVID-19 in Accident Year 2020. There is currently too much uncertainty to know how subsequent virus seasons could impact the US population due to the potential development of a vaccine or reinfection rates. Hence, the impacts shown here are specific to Accident Year 2020; it is unclear if subsequent years will have similar impacts.

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So far, the scenario testing has provided an illustration of the possible impact of COVID-19 on WC losses for the combined 38 states in which NCCI provides ratemaking services. **We now consider applying a similar calculation to a specific state in Scenario #2.** Doing so requires reassessment of the scenario assumptions. Please see Appendix 1 for a list of known parameter differences by state. In addition to those listed in Appendix 1, some other considerations when determining the reasonability of scenario assumptions likely include:

- **Age distribution and frequency of pre-existing health conditions** in the state. This may impact the report, hospitalization, critical care, and fatal rates assumed in the scenario.

- **Population density** of the state **and implementation of social distancing or isolation** policies. This may impact the infection rate of the disease.

- **Statutes related to compensability** may impact the likelihood of claims being found compensable, particularly in cases where the infected self-isolates with no hospitalization, which is expected to constitute most of infection cases. Again, the below impacts assume all cases with medical services result in a compensable WC claim. This parameter is expected to be modified by the user based on their expectations of compensability for COVID-19 cases in the state being analyzed.

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Hypothetical Scenario #2—Alabama—Impact to Expected Losses

Assumption Changes From Scenario #1 Are **Bolded**

	Row Description	Scenario Assumption
(1)	Infection Rate	10%
(2)	Report Rate	50%
(3)	Hospitalization Rate	10%
(4)	Critical Care Rate	15%
(5)	Fatal Rate	0.5%
(6)	**Average Fatal Indemnity Benefit**	**$139,981**
(7)	**Average Salary[1]**	**$44,930**
(8)	**Pure Premium Factor[2]**	**0.88**

		Symptom Type			
	Row Description	Mild	Moderate	Severe	Overall[3]
(9)	COVID-19 Claim Frequency	4.5% = (1) x (2) x [1.0 – (3)]	0.425% = (1) x (2) x (3) x [1.0 – (4)]	0.075% = (1) x (2) x (3) x (4)	5% = (1) x (2)
(10)	Compensability Rate	100%	100%	100%	100%
(11)	**Wage Replacement Severity**	**$754**	**$1,234**	**$2,880**	**$827**
(12)	**Medical Severity[4]**	**$640**	**$32,770**	**$32,770**	**$3,853**
(13)	Nonfatal Total Severity = (11) + (12)	$1,394	$34,004	$35,650	$4,680

	Row Description	Estimate	
(14)	**Workforce Population**	**1,974,170**	
(15)	Expected Payroll	$88,699M	= (14) x (7)
(16)	COVID-19 Total Severity	$5,380	= (13) Overall + (6) x (5)
(17)	COVID-19 Expected Losses	$531.0M	= (14) x (9) Overall x (10) x (16)
(18)	Current Expected Losses	$780.6M	= (15)/100 x (8)
(19)	Scenario Expected Losses	$1311.6M	= (17) + (18)
(20)	Scenario Impact	68%	= (19) / (18) – 1.0

Displayed values not shown to full precision

[1]Annual mean wage through May 2019 from the US Bureau of Labor Statistics for all occupations by state

[2]Underlying pure premium factor from latest approved NCCI loss cost/rate filing

[3]Overall (10) – (13) derived as the weighted average of the Mild/Moderate/Severe symptom values

[4](Scenario #1 severity estimate) x (Appendix A-I medical relativity)

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Extending the **Scenario #2** calculation, NCCI used the values found in Appendix 1 to determine the impact by state and infection rate. This results in the following impacts to expected losses:

Table 11: WC Loss Impact by State and Infection Rate
Where Compensability Rate = 100%

Impact to Expected Losses	Infection Rate										
	1%	2%	3%	4%	5%	10%	15%	20%	30%	40%	50%
Alabama	7%	14%	20%	27%	34%	**68%**	102%	136%	204%	272%	340%
Alaska	6%	12%	18%	23%	29%	59%	88%	117%	176%	234%	293%
Arizona	13%	25%	38%	50%	63%	126%	189%	252%	378%	505%	631%
Arkansas	8%	17%	25%	34%	42%	85%	127%	170%	255%	340%	425%
Colorado	8%	16%	24%	32%	40%	80%	120%	160%	240%	320%	400%
Connecticut	7%	14%	21%	29%	36%	72%	107%	143%	215%	286%	358%
District of Columbia	15%	31%	46%	62%	77%	154%	231%	308%	462%	617%	771%
Florida	7%	14%	21%	28%	35%	69%	104%	138%	208%	277%	346%
Georgia	6%	12%	18%	24%	30%	59%	89%	119%	178%	237%	297%
Hawaii	4%	8%	12%	16%	20%	39%	59%	78%	118%	157%	196%
Idaho	5%	11%	16%	22%	27%	54%	81%	108%	161%	215%	269%
Illinois	7%	14%	21%	28%	34%	69%	103%	138%	207%	276%	345%
Indiana	9%	18%	26%	35%	44%	88%	132%	176%	264%	352%	440%
Iowa	8%	16%	24%	32%	40%	80%	120%	160%	240%	320%	400%
Kansas	9%	17%	26%	35%	43%	87%	130%	173%	260%	347%	433%
Kentucky	6%	12%	18%	24%	31%	61%	92%	122%	183%	244%	306%
Louisiana	4%	8%	12%	16%	20%	40%	59%	79%	119%	159%	198%
Maine	5%	10%	15%	20%	25%	50%	76%	101%	151%	202%	252%
Maryland	7%	13%	20%	26%	33%	66%	99%	132%	197%	263%	329%
Mississippi	6%	12%	17%	23%	29%	58%	87%	116%	174%	232%	290%
Missouri	7%	15%	22%	30%	37%	74%	111%	148%	222%	295%	369%
Montana	4%	9%	13%	18%	22%	45%	67%	90%	135%	180%	225%
Nebraska	7%	15%	22%	30%	37%	75%	112%	149%	224%	299%	373%
Nevada	8%	15%	23%	30%	38%	75%	113%	151%	226%	302%	377%
New Hampshire	14%	28%	42%	56%	70%	139%	209%	279%	418%	558%	697%
New Mexico	5%	10%	15%	20%	26%	51%	77%	102%	154%	205%	256%
North Carolina	8%	16%	24%	32%	40%	80%	120%	161%	241%	321%	401%
Oklahoma	7%	14%	21%	28%	35%	70%	106%	141%	211%	282%	352%
Oregon	9%	19%	28%	37%	46%	93%	139%	186%	278%	371%	464%
Rhode Island	6%	12%	18%	23%	29%	59%	88%	117%	176%	235%	293%
South Carolina	5%	10%	15%	20%	25%	50%	76%	101%	151%	202%	252%
South Dakota	7%	14%	21%	28%	35%	71%	106%	142%	213%	284%	355%
Tennessee	9%	18%	27%	36%	45%	90%	134%	179%	269%	359%	448%
Texas	25%	49%	74%	98%	123%	245%	368%	491%	736%	981%	1227%

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Impact to Expected Losses	Infection Rate 1%	2%	3%	4%	5%	10%	15%	20%	30%	40%	50%
Utah	14%	27%	41%	54%	68%	136%	203%	271%	407%	543%	678%
Vermont	5%	10%	16%	21%	26%	52%	78%	104%	156%	209%	261%
Virginia	8%	17%	25%	33%	41%	83%	124%	166%	249%	332%	415%
West Virginia	12%	25%	37%	49%	62%	124%	185%	247%	371%	495%	618%
Overall	8%	17%	25%	34%	42%	85%	127%	169%	254%	338%	423%

The impacts shown by state in Table 11 serve only as a baseline scenario estimate, as it assumes all COVID-19 cases will result in a compensable WC claim and ignores any differences in scenario assumptions not otherwise listed in Appendix 1. It is expected that further refinement of assumptions would be required to get a true picture of the impact when focused on a specific state. For example, a compensability rate of less than 100% can be incorporated by multiplying the impact(s) shown in Table 11 by the selected compensability rate. Similar adjustments to alter the compensability rate can be used for all the baseline scenario estimates (Tables 10 to 13).

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In Scenarios #3 and #4, we begin to focus on first responders[28] and healthcare workers[29] since some states have looked to broaden compensability standards for these occupations amid the COVID-19 crisis. A new set of scenario assumptions can be found in Appendix 2 (first responders) and Appendix 3 (healthcare workers). These assumptions only adjust for some of the many differences between all occupations combined and these specific occupations. It should be noted that our adjustment to calculate fatal and wage replacement benefits used the relative average wages as a multiplicative factor. To the extent that first responders or healthcare workers reach the maximum/minimum benefits in place for various states, adjustments to the resulting scenario impacts may be warranted. Additionally, other considerations when applying this calculation to specific occupations likely include:

- **Age distribution or frequency of pre-existing health conditions** in the occupation. These factors would be expected to impact the severity of symptoms.
- **Amount of exposure to the public.** This may impact the infection rate of the disease. Additionally, some published literature has suggested that the potential for extended exposure to COVID-19 also impacts the severity of symptoms.
- **Nonstandard self-isolation guidelines.** This could vary the expected time for return to work.
- **Statutes related to compensability** for specific occupations, if they exist, such as first responders or healthcare workers. This may impact the likelihood of claims being found compensable.

Please note that the calculated impacts are specific to the expected losses for the associated occupations and NOT overall state expected losses.

[28] For the purposes of scenario testing, we assumed this group was made up of firefighter (7704, 7710, 7711) and police (7720) classifications

[29] For the purposes of scenario testing, we assumed this group was made up of the three largest healthcare-related (8832, 8833, 8835) classifications

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Hypothetical Scenario #3—Alabama—First Responders
Impact to Expected Losses

Assumption Changes From Scenario #2 Are **Bolded**

	Row Description	Scenario Assumption
(1)	Infection Rate	10%
(2)	Report Rate	50%
(3)	Hospitalization Rate	10%
(4)	Critical Care Rate	15%
(5)	Fatal Rate	0.5%
(6)	**Average Fatal Indemnity Benefit**	**$146,980**
(7)	**Average Salary[1]**	**$47,175**
(8)	**Pure Premium Factor[2]**	**1.93**

		Symptom Type			
	Row Description	Mild	Moderate	Severe	Overall[3]
(9)	COVID-19 Claim Frequency	4.5% = (1) x (2) x [1.0 – (3)]	0.425% = (1) x (2) x (3) x [1.0 – (4)]	0.075% = (1) x (2) x (3) x (4)	5% = (1) x (2)
(10)	Compensability Rate	100%	100%	100%	100%
(11)	**Wage Replacement Severity**	**$792**	**$1,296**	**$3,024**	**$868**
(12)	Medical Severity	$640	$32,770	$32,770	$3,853
(13)	Nonfatal Total Severity = (11) + (12)	$1,432	$34,066	$35,794	$4,721

	Row Description	Estimate	
(14)	**Workforce Population**	**27,070**	
(15)	Expected Payroll	$1,277M	= (14) x (7)
(16)	COVID-19 Total Severity	$5,456	= (13) Overall + (6) x (5)
(17)	COVID-19 Expected Losses[4]	$7.4M	= (14) x (9) Overall x (10) x (16)
(18)	Current Expected Losses[4]	$24.6M	= (15)/100 x (8)
(19)	Scenario Expected Losses[4]	$32.0M	= (17) + (18)
(20)	Scenario Impact[4]	30%	= (19) / (18) – 1.0

Displayed values not shown to full precision

[1]Annual mean wage through May 2019 from the US Bureau of Labor Statistics for a subset of "Protective Service Occupations" by state (occupation codes 33-1011, 33-1012, 33-1021, 33-1090, 33-2011, 33-2021, 33-2022, 33-3011, 33-3012, 33-3021, 33-3031, 33-3051, 33-9021, 33-3052)

[2]Weighted average pure premium factor in each approved loss cost/rate filing as of 4/10/2020 for the firefighter (7704, 7710, 7711) and police (7720) classifications

[3]Overall (10) – (13) derived as the weighted average of the Mild/Moderate/Severe symptom values

[4]Estimate for associated occupations, NOT the overall state

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Hypothetical Scenario #4—Alabama—Healthcare Workers
Impact to Expected Losses

Assumption Changes From Scenario #2 Are **Bolded**

	Row Description	Scenario Assumption
(1)	Infection Rate	10%
(2)	Report Rate	50%
(3)	Hospitalization Rate	10%
(4)	Critical Care Rate	15%
(5)	Fatal Rate	0.5%
(6)	**Average Fatal Indemnity Benefit**	**$166,577**
(7)	**Average Salary[1]**	**$53,602**
(8)	**Pure Premium Factor[2]**	**0.52**

		Symptom Type			
	Row Description	Mild	Moderate	Severe	Overall[3]
(9)	COVID-19 Claim Frequency	4.5% = (1) x (2) x [1.0 – (3)]	0.425% = (1) x (2) x (3) x [1.0 – (4)]	0.075% = (1) x (2) x (3) x (4)	5% = (1) x (2)
(10)	Compensability Rate	100%	100%	100%	100%
(11)	**Wage Replacement Severity**	**$897**	**$1,468**	**$3,427**	**$983**
(12)	Medical Severity	$640	$32,770	$32,770	$3,853
(13)	Nonfatal Total Severity = (11) + (12)	$1,537	$34,238	$36,197	$4,836

	Row Description	Estimate	
(14)	**Workforce Population**	**197,750**	
(15)	Expected Payroll	$10,600M	= (14) x (7)
(16)	COVID-19 Total Severity	$5,669	= (13) Overall + (6) x (5)
(17)	COVID-19 Expected Losses[4]	$56.1M	= (14) x (9) Overall x (10) x (16)
(18)	Current Expected Losses[4]	$55.1M	= (15)/100 x (8)
(19)	Scenario Expected Losses[4]	$111.2M	= (17) + (18)
(20)	Scenario Impact[4]	102%	= (19) / (18) – 1.0

Displayed values not shown to full precision

[1]Annual mean wage through May 2019 from the US Bureau of Labor Statistics for "Healthcare Practitioners and Technical Occupations" and "Healthcare Support Occupations" by state

[2]Weighted average pure premium factor in each approved loss cost/rate filing as of 4/10/2020 for the largest healthcare-related (8832, 8833, 8835) classifications

[3]Overall (10) – (13) derived as the weighted average of the Mild/Moderate/Severe symptom values

[4]Estimate for associated occupations, NOT the overall state

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The differences in impact between Scenario #2 (68%), Scenario #3 (30%), and Scenario #4 (102%) are not due to significant differences in the COVID-19 expected losses per worker (because we assumed the same infection rates). The primary difference is the current expected losses (determined by the pure premium factor) per worker in each occupation. This means that riskier classifications (relative to their payroll) will observe less of a percentage impact to their expected losses because the base (current expected losses) is larger.

Extending the **Scenario #3** calculation, we use the values found in Appendix 2 to determine the impact by state and infection rate. This results in the following impacts to expected losses for first responders:

Table 12: First Responder WC Loss Impacts by State and Infection Rate

Impact to Expected Losses	Infection Rate										
	1%	2%	3%	4%	5%	10%	15%	20%	30%	40%	50%
Alabama	3%	6%	9%	12%	15%	**30%**	45%	60%	90%	120%	150%
Alaska	3%	5%	8%	11%	13%	27%	40%	53%	80%	106%	133%
Arizona	4%	9%	13%	18%	22%	44%	67%	89%	133%	177%	222%
Arkansas	6%	11%	17%	22%	28%	56%	84%	112%	168%	224%	280%
Colorado	3%	5%	8%	10%	13%	26%	39%	52%	79%	105%	131%
Connecticut	2%	3%	5%	7%	8%	16%	25%	33%	49%	65%	82%
District of Columbia	4%	8%	12%	16%	20%	40%	60%	80%	119%	159%	199%
Florida	2%	5%	7%	9%	12%	23%	35%	47%	70%	93%	117%
Georgia	3%	6%	9%	12%	14%	29%	43%	58%	87%	116%	145%
Hawaii	2%	4%	6%	8%	10%	19%	29%	38%	57%	77%	96%
Idaho	3%	6%	9%	12%	15%	31%	46%	61%	92%	123%	153%
Illinois	4%	7%	11%	15%	19%	37%	56%	75%	112%	149%	186%
Indiana	4%	9%	13%	17%	22%	43%	65%	87%	130%	174%	217%
Iowa	3%	5%	8%	10%	13%	26%	39%	52%	78%	104%	131%
Kansas	4%	8%	12%	16%	20%	41%	61%	81%	122%	162%	203%
Kentucky	3%	7%	10%	13%	16%	33%	49%	65%	98%	130%	163%
Louisiana	2%	3%	5%	7%	9%	17%	26%	35%	52%	70%	87%
Maine	2%	5%	7%	10%	12%	24%	36%	48%	72%	96%	120%
Maryland	2%	4%	6%	8%	10%	20%	30%	39%	59%	79%	98%
Mississippi	4%	8%	12%	16%	20%	40%	60%	80%	119%	159%	199%
Missouri	3%	6%	8%	11%	14%	28%	41%	55%	83%	111%	138%
Montana	2%	5%	7%	10%	12%	25%	37%	50%	75%	100%	125%
Nebraska	3%	6%	9%	12%	15%	29%	44%	59%	88%	118%	147%
Nevada	2%	4%	7%	9%	11%	22%	33%	44%	66%	87%	109%
New Hampshire	6%	12%	19%	25%	31%	62%	93%	124%	185%	247%	309%
New Mexico	3%	7%	10%	14%	17%	35%	52%	69%	104%	138%	173%
North Carolina	4%	8%	11%	15%	19%	38%	57%	76%	114%	152%	189%
Oklahoma	3%	5%	8%	11%	13%	27%	40%	54%	81%	108%	135%
Oregon	3%	6%	10%	13%	16%	32%	49%	65%	97%	130%	162%
Rhode Island	2%	5%	7%	10%	12%	24%	36%	49%	73%	97%	122%

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Impact to Expected Losses	Infection Rate										
	1%	2%	3%	4%	5%	10%	15%	20%	30%	40%	50%
South Carolina	3%	6%	9%	12%	15%	30%	45%	60%	91%	121%	151%
South Dakota	3%	6%	9%	13%	16%	31%	47%	63%	94%	125%	157%
Tennessee	4%	8%	12%	17%	21%	42%	62%	83%	125%	166%	208%
Texas	10%	21%	31%	41%	52%	104%	156%	207%	311%	415%	519%
Utah	6%	11%	17%	22%	28%	56%	84%	111%	167%	223%	278%
Vermont	2%	4%	5%	7%	9%	18%	27%	36%	54%	72%	90%
Virginia	3%	6%	9%	12%	15%	29%	44%	58%	88%	117%	146%
West Virginia	6%	12%	18%	23%	29%	58%	88%	117%	175%	234%	292%
Overall	3%	7%	10%	14%	17%	34%	51%	68%	102%	136%	170%

Extending the **Scenario #4** calculation, we use the values found in Appendix 3 to determine the impact by state and infection rate. This results in the following impacts to expected losses for healthcare workers:

Table 13: Healthcare Workers WC Loss Impacts by State and Infection Rate

Impact to Expected Losses	Infection Rate										
	1%	2%	3%	4%	5%	10%	15%	20%	30%	40%	50%
Alabama	10%	20%	31%	41%	51%	**102%**	153%	203%	305%	407%	508%
Alaska	10%	20%	30%	40%	50%	100%	150%	200%	300%	401%	501%
Arizona	22%	45%	67%	90%	112%	224%	336%	448%	672%	895%	1119%
Arkansas	17%	34%	51%	69%	86%	171%	257%	343%	514%	686%	857%
Colorado	11%	23%	34%	45%	57%	113%	170%	226%	339%	452%	565%
Connecticut	10%	20%	30%	40%	50%	100%	150%	201%	301%	401%	501%
District of Columbia	12%	23%	35%	47%	59%	117%	176%	235%	352%	470%	587%
Florida	12%	25%	37%	50%	62%	124%	187%	249%	373%	498%	622%
Georgia	11%	21%	32%	43%	53%	106%	160%	213%	319%	426%	532%
Hawaii	7%	15%	22%	30%	37%	74%	111%	148%	221%	295%	369%
Idaho	11%	21%	32%	42%	53%	106%	158%	211%	317%	422%	528%
Illinois	15%	31%	46%	61%	77%	153%	230%	307%	460%	613%	766%
Indiana	18%	36%	54%	72%	90%	179%	269%	358%	537%	716%	895%
Iowa	19%	39%	58%	78%	97%	194%	291%	388%	582%	776%	970%
Kansas	21%	42%	63%	84%	105%	209%	314%	419%	628%	838%	1047%
Kentucky	14%	27%	41%	55%	68%	137%	205%	273%	410%	547%	683%
Louisiana	8%	16%	24%	32%	41%	81%	122%	162%	244%	325%	406%
Maine	8%	16%	25%	33%	41%	82%	123%	164%	245%	327%	409%
Maryland	15%	30%	45%	60%	75%	151%	226%	301%	452%	602%	753%
Mississippi	12%	24%	36%	48%	60%	120%	180%	240%	360%	480%	600%
Missouri	13%	26%	39%	52%	65%	129%	194%	258%	387%	516%	645%
Montana	8%	16%	24%	32%	40%	80%	121%	161%	241%	322%	402%
Nebraska	16%	32%	49%	65%	81%	162%	243%	323%	485%	647%	809%

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Impact to Expected Losses	Infection Rate 1%	2%	3%	4%	5%	10%	15%	20%	30%	40%	50%
Nevada	17%	33%	50%	66%	83%	165%	248%	330%	496%	661%	826%
New Hampshire	18%	36%	54%	72%	90%	181%	271%	361%	542%	722%	903%
New Mexico	11%	22%	32%	43%	54%	108%	162%	216%	324%	432%	540%
North Carolina	14%	28%	42%	56%	69%	139%	208%	278%	417%	555%	694%
Oklahoma	13%	26%	39%	52%	65%	130%	195%	260%	389%	519%	649%
Oregon	18%	36%	53%	71%	89%	178%	267%	356%	533%	711%	889%
Rhode Island	9%	17%	26%	34%	43%	86%	128%	171%	257%	342%	428%
South Carolina	10%	20%	30%	40%	50%	100%	150%	200%	300%	400%	500%
South Dakota	19%	38%	57%	76%	95%	189%	284%	379%	568%	758%	947%
Tennessee	17%	34%	50%	67%	84%	168%	251%	335%	503%	670%	838%
Texas	65%	129%	194%	259%	324%	647%	971%	1295%	1942%	2590%	3237%
Utah	28%	57%	85%	114%	142%	284%	426%	569%	853%	1137%	1421%
Vermont	8%	15%	23%	31%	38%	76%	114%	153%	229%	305%	381%
Virginia	13%	27%	40%	54%	67%	134%	201%	268%	402%	535%	669%
West Virginia	29%	57%	86%	115%	144%	287%	431%	574%	862%	1149%	1436%
Overall	16%	32%	47%	63%	79%	158%	237%	316%	473%	631%	789%

The impacts shown above by state (Tables 12 and 13) serve as a baseline-scenario estimate for first responders and healthcare workers, as they assume all symptomatic COVID-19 cases for these occupations will result in a compensable WC claim.

An initial look at a broader group of occupations that may be considered essential during the initial wave of infection suggests between 49 million and 62 million individuals in the workforce (33% to 42%) could potentially qualify.[30] To the extent that the essential workers' share of the workforce is comparable to their share of statewide expected losses, the corresponding scenario estimate of expected losses related to COVID-19 for these occupations would be between 33% and 42% of the estimate for all workers in the applicable jurisdiction.

[30] Adie Tomer and Joseph Kane. *How to protect essential workers during COVID-19.* Brookings (3/31/2020). https://www.brookings.edu/research/how-to-protect-essential-workers-during-covid-19/

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Summary

There is a substantial amount of uncertainty when determining the ultimate impact of COVID-19 on WC expected losses either on a national, state, or occupation-specific level. Depending on the number of infected workers, severity of symptoms, and compensability standards, the degree of variation in estimated impacts may be extreme. However, there is a reasonable likelihood for COVID-19 to result in significant WC claim costs during Accident Year 2020.

Additional Considerations

As it relates to loss costs/rates, ratemaking itself is prospective in nature. If a vaccine becomes available or negligible cases of reinfection occur, it may be more predictive to use historical premium and loss experience not impacted by COVID-19 in the prospective ratemaking process. However, if such exposures persist going forward, as well as occupation-specific presumptions regarding compensability, then COVID-19-related experience would need to be reflected accordingly in future loss costs and/or rate filings. It is therefore extremely important to continue monitoring this exposure to determine how best to estimate future losses. At the same time, other factors resulting from the COVID-19 crisis, such as the increased usage of telecommuting and longer-term effects to the economy, may also have significant, potentially offsetting, impacts to the WC system.

As it relates to proposed COVID-19 legislation, the ultimate impact of any legislation will depend not only on the various assumptions discussed here but also on differences between current and proposed handling of COVID-19 claims in the associated context. The scenario testing included in this document serves to provide insight into the potential impact to expected losses for such claims.

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Appendix 1: Scenario Inputs by State

State	Employee Count[1]	Average Salary[1]	Pure Premium Factor[2]	Fatal Claim Severity[3]	Wage Replacement Benefits			Medical Severity Relativity	
					Mild 2 Weeks	Moderate 3 Weeks	Severe 6 Weeks	Mild[4]	Moderate to Severe[5]
Alabama	1,974,170	44,930	0.88	139,981	754	1,234	2,880	0.64	1.13
Alaska	317,090	59,290	1.22	388,774	899	1,472	3,434	1.72	1.38
Arizona	2,866,820	50,930	0.62	551,071	511	1,533	3,067	1.12	1.23
Arkansas	1,217,420	42,690	0.51	132,643	412	1,442	2,884	0.81	0.61
Colorado	2,678,490	57,690	0.66	362,848	827	1,578	3,157	1.01	0.84
Connecticut	1,665,100	62,350	0.77	285,089	1,014	1,521	3,042	1.07	1.17
District of Columbia	723,510	89,800	0.28	716,315	1,074	2,051	4,101	0.88	0.75
Florida	8,794,050	47,750	0.90	121,118	505	1,010	3,030	0.74	1.41
Georgia	4,471,860	49,620	0.89	183,836	451	902	2,706	1.00	1.00
Hawaii	635,500	54,930	1.28	130,646	775	1,268	2,748	0.98	1.08
Idaho	727,160	44,890	1.35	163,026	624	1,456	2,912	1.31	1.31
Illinois	6,025,790	55,130	0.88	349,445	884	1,688	3,375	0.75	1.13
Indiana	3,073,680	46,770	0.61	150,992	516	1,032	3,096	1.11	0.92
Iowa	1,549,460	47,330	1.16	718,363	856	1,634	3,268	1.12	1.11
Kansas	1,392,480	46,520	0.68	212,639	449	898	2,694	0.98	1.04
Kentucky	1,896,900	44,020	0.77	274,346	525	1,575	3,150	0.87	0.46
Louisiana	1,921,950	44,170	1.15	230,650	930	1,395	2,790	0.67	0.44
Maine	611,170	48,470	1.09	138,702	518	1,554	3,109	1.15	1.02
Maryland	2,701,010	60,230	0.64	228,517	942	1,799	3,597	0.94	0.70
Mississippi	1,128,280	40,090	0.89	93,024	767	1,151	2,301	0.82	0.73
Missouri	2,820,610	47,820	0.97	335,058	796	1,521	3,041	1.12	1.13
Montana	468,000	45,370	1.33	248,142	674	1,146	2,831	1.24	0.80
Nebraska	982,040	48,250	0.88	372,394	511	1,023	3,068	0.90	1.06
Nevada	1,392,680	47,210	1.24	1,090,762	990	1,485	2,969	0.84	0.54
New Hampshire	660,480	53,950	0.64	502,557	1,124	1,686	3,372	1.48	1.58
New Mexico	823,570	47,040	1.01	306,413	500	1,001	3,002	1.00	0.64
North Carolina	4,462,800	48,550	0.61	256,392	519	1,038	3,114	0.87	0.72
Oklahoma	1,617,390	45,620	1.10	520,865	851	1,393	3,019	0.83	0.96
Oregon	1,905,860	53,890	0.77	675,823	858	1,639	3,278	1.38	0.73
Rhode Island	483,580	57,220	0.78	368,738	816	1,336	2,895	0.88	0.59
South Carolina	2,107,760	44,380	1.06	195,312	494	1,482	2,963	0.83	0.83
South Dakota	425,140	42,920	1.04	330,753	1,044	1,565	3,131	0.70	1.01
Tennessee	3,007,710	45,650	0.60	205,003	519	1,557	3,113	0.86	0.85
Texas	12,431,200	50,490	0.33	723,912	607	1,820	3,639	1.00	1.00
Utah	1,504,070	49,420	0.53	275,278	898	1,715	3,429	0.90	1.35
Vermont	306,300	51,120	1.24	393,207	1,183	1,775	3,550	0.66	0.96
Virginia	3,878,770	56,740	0.62	196,532	532	1,064	3,192	1.00	1.15
West Virginia	702,100	43,420	0.58	508,291	1,098	1,646	3,293	0.79	0.62
Countrywide[6]	86,351,950	50,258	0.74	341,411	688	1,403	3,146	1.00	1.00

[1] US Bureau of Labor Statistics for all occupations by state

[2] Underlying pure premium factor in each approved loss cost/rate filing as of 4/10/2020

[3] NCCI's Exhibit 11, ***Annual Statistical Bulletin***, 2019 Edition. Average of 1st through 3rd reports, trended to 2020, less the severe case duration wage replacement benefit

[4] State to Countrywide average amount paid per transaction for physician's CPT Code 99213 from NCCI's Medical Data Call, Service Year 2018 (Not Available for Texas)

[5] State to Countrywide average amount paid per day for hospital inpatient services from NCCI's Medical Data Call, Service Year 2018 (Not Available for Texas)

[6] Countrywide estimate for all figures, except medical relativities, reflect a weighted average of NCCI states shown on this exhibit

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Appendix 2: Scenario Inputs by State for First Responders

State	Employee Count[1]	% of Total Employees	Average Salary[1]	Pure Premium Factor[2]	Fatal Claim Severity[3]	Wage Replacement Benefits[3] Mild 2 Weeks	Moderate 3 Weeks	Severe 6 Weeks
Alabama	27,070	1.4%	47,175	1.93	146,980	792	1,296	3,024
Alaska	4,420	1.4%	75,346	2.32	493,743	1,142	1,869	4,361
Arizona	46,550	1.6%	60,072	1.61	650,264	603	1,809	3,619
Arkansas	18,970	1.6%	41,990	0.78	129,990	404	1,413	2,826
Colorado	30,840	1.2%	68,465	1.84	431,789	984	1,878	3,757
Connecticut	19,280	1.2%	72,149	3.08	330,703	1,176	1,764	3,529
District of Columbia	7,940	1.1%	81,355	1.13	651,847	977	1,866	3,732
Florida	129,190	1.5%	56,690	2.33	144,130	601	1,202	3,606
Georgia	70,410	1.6%	46,287	1.92	170,967	419	839	2,517
Hawaii	8,010	1.3%	75,418	2.10	178,985	1,062	1,737	3,765
Idaho	8,630	1.2%	50,750	2.16	184,219	705	1,645	3,291
Illinois	82,270	1.4%	72,200	1.40	457,773	1,158	2,211	4,421
Indiana	35,500	1.2%	51,725	1.15	167,601	573	1,146	3,437
Iowa	13,490	0.9%	58,058	3.24	883,586	1,053	2,010	4,020
Kansas	18,560	1.3%	49,112	1.40	225,397	476	952	2,856
Kentucky	23,310	1.2%	43,370	1.46	271,603	520	1,559	3,119
Louisiana	35,290	1.8%	42,920	2.65	223,731	902	1,353	2,706
Maine	7,400	1.2%	51,300	2.20	147,024	549	1,647	3,296
Maryland	35,880	1.3%	69,658	1.98	265,080	1,093	2,087	4,173
Mississippi	20,330	1.8%	38,002	1.35	88,373	729	1,093	2,186
Missouri	37,470	1.3%	51,496	2.48	361,863	860	1,643	3,284
Montana	5,170	1.1%	56,309	2.10	307,696	836	1,421	3,510
Nebraska	9,500	1.0%	55,470	2.05	428,253	588	1,176	3,528
Nevada	15,260	1.1%	71,757	3.90	1,657,958	1,505	2,257	4,513
New Hampshire	8,510	1.3%	57,378	1.39	532,710	1,191	1,787	3,574
New Mexico	15,480	1.9%	50,680	1.44	330,926	540	1,081	3,242
North Carolina	67,340	1.5%	45,731	1.34	241,008	488	976	2,927
Oklahoma	21,010	1.3%	49,798	2.75	567,743	928	1,518	3,291
Oregon	18,280	1.0%	71,145	1.97	892,086	1,133	2,163	4,327
Rhode Island	6,700	1.4%	68,050	1.74	438,798	971	1,590	3,445
South Carolina	29,090	1.4%	43,730	1.79	193,359	489	1,467	2,933
South Dakota	4,490	1.1%	48,942	2.19	377,058	1,190	1,784	3,569
Tennessee	39,230	1.3%	48,009	1.25	215,253	545	1,635	3,269
Texas	174,320	1.4%	58,617	0.73	839,738	704	2,111	4,221
Utah	12,110	0.8%	55,305	1.20	308,311	1,006	1,921	3,840
Vermont	2,340	0.8%	58,033	3.37	448,256	1,349	2,024	4,047
Virginia	57,940	1.5%	58,503	1.72	202,428	548	1,096	3,288
West Virginia	8,530	1.2%	43,110	1.23	503,208	1,087	1,630	3,260
Countrywide[4]	1,176,110	1.4%	55,929	1.73	378,966	764	1,557	3,492

[1]US Bureau of Labor Statistics for a subset of "Protective Service Occupations" by state (occupation codes 33-1011, 33-1012, 33-1021, 33-1090, 33-2011, 33-2021, 33-2022, 33-3011, 33-3012, 33-3021, 33-3031, 33-3051, 33-9021, 33-3052)

[2]Weighted average pure premium factor in each approved loss cost/rate filing as of 4/10/2020 for the firefigther (7704, 7710, 7711) and police (7720) classifications

[3]Derived as Appendix-I value multiplied by a salary relativity (occupation-specific salary / overall state salary)

[4]Countrywide estimate for all figures reflect a weighted average of NCCI states shown on this exhibit

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Appendix 3: Scenario Inputs by State for Healthcare Workers

State	Employee Count[1]	% of Total Employees	Average Salary[1]	Pure Premium Factor[2]	Fatal Claim Severity[3]	Wage Replacement Benefits[3] Mild 2 Weeks	Moderate 3 Weeks	Severe 6 Weeks
Alabama	197,750	10.0%	53,602	0.52	166,577	897	1,468	3,427
Alaska	31,960	10.1%	74,428	0.62	489,855	1,133	1,855	4,327
Arizona	291,960	10.2%	63,268	0.31	683,328	634	1,901	3,803
Arkansas	132,390	10.9%	52,680	0.22	163,151	507	1,774	3,547
Colorado	240,240	9.0%	64,484	0.44	406,390	926	1,767	3,536
Connecticut	183,730	11.0%	68,044	0.52	310,747	1,105	1,658	3,316
District of Columbia	49,140	6.8%	76,757	0.39	608,868	913	1,743	3,486
Florida	842,460	9.6%	61,685	0.41	156,242	651	1,303	3,909
Georgia	381,060	8.5%	60,920	0.43	226,118	555	1,109	3,328
Hawaii	54,200	8.5%	74,597	0.55	177,679	1,054	1,724	3,737
Idaho	75,050	10.3%	56,509	0.58	205,413	786	1,835	3,669
Illinois	571,580	9.5%	61,859	0.37	391,378	990	1,891	3,780
Indiana	307,970	10.0%	60,456	0.25	194,780	666	1,331	3,994
Iowa	145,360	9.4%	56,763	0.44	862,036	1,027	1,961	3,922
Kansas	149,860	10.8%	52,076	0.26	238,156	503	1,006	3,017
Kentucky	193,660	10.2%	54,875	0.31	342,933	656	1,969	3,938
Louisiana	219,210	11.4%	50,060	0.53	260,635	1,051	1,576	3,153
Maine	77,990	12.8%	60,769	0.57	173,378	648	1,943	3,886
Maryland	266,950	9.9%	69,002	0.26	262,795	1,083	2,069	4,137
Mississippi	124,240	11.0%	50,459	0.37	117,210	966	1,450	2,899
Missouri	327,050	11.6%	53,349	0.52	375,265	892	1,704	3,406
Montana	48,330	10.3%	61,348	0.62	334,992	910	1,547	3,822
Nebraska	99,990	10.2%	59,288	0.36	458,045	629	1,258	3,774
Nevada	105,620	7.6%	68,505	0.52	1,581,605	1,436	2,153	4,305
New Hampshire	64,610	9.8%	68,515	0.43	638,247	1,427	2,141	4,282
New Mexico	97,520	11.8%	54,795	0.44	355,439	580	1,161	3,482
North Carolina	453,770	10.2%	57,543	0.32	305,106	618	1,235	3,706
Oklahoma	159,240	9.8%	56,218	0.54	640,664	1,047	1,713	3,713
Oregon	177,060	9.3%	70,300	0.36	878,570	1,115	2,131	4,261
Rhode Island	58,180	12.0%	69,350	0.49	446,173	987	1,617	3,503
South Carolina	204,150	9.7%	56,261	0.46	248,046	627	1,882	3,763
South Dakota	45,100	10.6%	58,855	0.33	453,132	1,430	2,144	4,289
Tennessee	299,640	10.0%	56,603	0.28	254,204	644	1,931	3,860
Texas	1,220,290	9.8%	55,429	0.12	796,303	668	2,002	4,003
Utah	115,100	7.7%	57,260	0.23	319,322	1,042	1,989	3,978
Vermont	33,320	10.9%	62,097	0.77	475,780	1,431	2,148	4,296
Virginia	352,130	9.1%	62,209	0.36	216,185	585	1,170	3,511
West Virginia	92,450	13.2%	53,899	0.23	630,281	1,362	2,041	4,083
Countrywide[4]	8,490,310	9.8%	59,350	0.36	402,865	812	1,656	3,712

[1]US Bureau of Labor Statistics for all "Healthcare Practitioners and Technical Occupations" and "Healthcare Support Occupations" by state

[2]Weighted average pure premium factor in each approved loss cost/rate filing as of 4/10/2020 for the largest healthcare-related (8832, 8833, 8835) classifications

[3]Derived as Appendix-I value multiplied by a salary relativity (occupation-specific salary / overall state salary)

[4]Countrywide estimate for all figures reflect a weighted average of NCCI states shown on this exhibit

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