



COVID-19 AND WORKERS COMPENSATION: SEVERITY ASSUMPTIONS UPDATE

BACKGROUND

In April 2020, NCCI published a white paper¹ with the purpose of aiding the workers compensation (WC) industry in understanding the potential impacts of the novel coronavirus (COVID-19) pandemic on WC system costs.² At the time the paper was written, COVID-19 had been officially declared a pandemic for approximately six weeks. Due to the infancy of the pandemic and the unprecedented nature of such a crisis, there was a substantial amount of uncertainty surrounding the potential short- and long-term effects of such a crisis. NCCI leveraged its available data at the time to illustrate potential impacts using frequency and severity assumptions, relying on external research for assumptions pertaining to infection, report, hospitalization, critical care, and fatal rates, as well as the duration of hospitalization and recovery. NCCI presented four detailed, hypothetical scenarios using a broad range of assumptions to demonstrate the potential scope of impacts COVID-19 could have on WC expected losses.

Since releasing the white paper, data for COVID-19 claims has begun to emerge in NCCI's Medical Data Call (MDC). There continues to be uncertainty in how these claims will ultimately develop and how many more will occur before the pandemic is over. This research brief combines the reported data with development assumptions from claims with similar types of respiratory conditions to reflect future medical development and elements of permanent disability in **determining ultimate severity estimates for Mild, Moderate, and Severe COVID-19 cases**. We've incorporated these updated severities into our COVID-19 Hypothetical Scenarios Tool.³

¹ "COVID-19 and Workers Compensation: Modeling Potential Impacts." NCCI (April 2020).

www.ncci.com/Articles/Pages/Insights-COVID-19-WorkersComp-Modeling-Potential-Impacts.pdf

² In this document, the use of the terms "WC system costs" and "WC losses" are considered synonymous. In particular, other costs, such as taxes or loss adjustment expenses, are excluded.

³ "COVID-19 Hypothetical Scenarios Tool." NCCI (May 2020).

www.ncci.com/Articles/Pages/Insights-COVID-19-Hypothetical-Scenarios-Tool.aspx

Data

NCCI derived claims data utilized in this analysis from its MDC. The analysis includes reported medical transactions occurring in Service Years 2020 and part of 2021 (January 1, 2020, through March 29, 2021), except where otherwise noted. The Centers for Medicare & Medicaid Services and the National Center of Health Statistics provide guidelines for coding and reporting medical transactions using the International Classification of Diseases (ICD-10-CM).⁴ NCCI used the following ICD-10-CM codes to identify COVID-19 claims in the MDC with the requirement that total medical payments related to COVID-19 exceed \$120:⁵

- U07.1: COVID-19
- B97.29: Other coronavirus as the cause of diseases classified elsewhere

This resulted in 5,198 claims identified as COVID-19-related in the MDC.⁶ We then reviewed which services on these claims were for COVID-19-related treatments to split them into two groups:

- (1) Claims in which the injured worker was receiving treatment as a direct result of exposure to COVID-19
- (2) Claims in which the injured worker was exposed to COVID-19 while receiving treatment for a non-COVID-19-related injury

Cases in which the injured worker was exposed to COVID-19 during treatment for a non-COVID-19-related WC injury made up 626 of the total claims identified. For the purposes of this analysis, NCCI excluded these claims in order to analyze severities for claims that were a direct result of COVID-19. Additionally, we removed claims observed in service months January and February in Service Year 2020 (prior to the pandemic) and for all months in Service Year 2021 (very immature data), which removed an additional 151 claims.

We then separated the remaining claims into the three symptom groups defined in the white paper and used in the Hypothetical Scenarios Tool.

Table 1: COVID-19 Claim Counts by Symptom Group

Symptom Group	Description	Claim Count
Mild	Requires some medical treatment but no hospitalization	3,629
Moderate	Requires a hospital stay without the intensive care unit (ICU) or ventilation	621
Severe	Requires a hospital stay involving the ICU and/or ventilation	171

⁴ "International Classification of Diseases, Tenth Revision, Clinical Modification." National Center for Health Statistics (March 2021) www.cdc.gov/nchs/icd/icd10cm.htm

⁵ Claims with less than \$120 of COVID-19-related services are assumed to be quarantine-only claims, or claims where the worker tests negative for COVID-19 but the cost of the test is borne by WC. The calculation framework only focuses on claims that receive medical treatment for the contraction of COVID-19 and therefore these claims were removed from the analysis.

⁶ This does not reflect the entirety of transactions occurring through March 29, 2021 as there can be a lag in the reporting of such data to NCCI through the MDC.

Average Medical Cost per COVID-19 Claim for Mild Cases

The Mild symptom group consists of claims that do not require any hospital inpatient treatment and are expected to be the least severe among claims considered. Originally, the Hypothetical Scenarios Tool assumed a default medical severity of \$1,000 for Mild cases, which NCCI determined using historical respiratory distress claims reported on the MDC along with NCCI Unit Statistical Plan data as detailed in the white paper.

Based on actual COVID-19 claims reported on the MDC,⁷ we observe average monthly severities generally ranging between \$1,000 and \$2,000, depending on which service months are considered.

Table 2: Mild Case As-Reported

Paid Medical Severity by Service Month in 2020

Month	Claim Count	Paid per Claim
March	106	\$4,997
April	618	\$2,028
May	403	\$1,565
June	341	\$1,663
July	481	\$2,418
August	375	\$1,360
September	229	\$1,160
October	286	\$1,258
November	491	\$1,122
December	299	\$1,091

The severities shown in Table 2 are as-reported paid amounts and do not include any consideration for medical paid development. Therefore, the lower severities in more recent months are expected.

Additionally, we note that the severity in March is much higher relative to the subsequent service months. One potential reason for the decline in severity relative to that observed at the onset of the pandemic is improvements in COVID-19 treatment protocols. Considering we want to determine average costs for the entirety of the pandemic, NCCI gives less weight to the initial costs observed that are higher than what would be subsequently expected.

Based on these observations, we restrict our data to consider only claims in service months April through December in determining the actual observed medical severity. Using this data, we estimate a weighted average medical severity of \$1,600 in the first year for Mild cases of COVID-19.

Considering NCCI assumes Mild cases are not to result in a permanent disability as detailed in the COVID-19 and Workers Compensation—Permanent Disability Research Brief (PD Research Brief),⁸ we assume little to no development for Mild cases beyond the as-reported paid amount.

For the purposes of the Hypothetical Scenarios Tool, we revised the default medical severity to be \$1,600 for Mild COVID-19 claims.

⁷ Recall that claims with less than \$120 in COVID-19-related medical payments are not included in this analysis; the inclusion of such claims would reduce the magnitude of the displayed average claims costs.

⁸ “COVID-19 and Workers Compensation—Permanent Disability.” NCCI (October 2020).

www.ncci.com/Articles/Documents/COVID-19-Workers-Compensation-Permanent-Disability.pdf

Average Medical Cost per COVID-19 Claim for Moderate Cases

The Moderate symptom group consists of those claims that require a hospital inpatient stay but do not require the intensive care unit (ICU) or ventilation. The Hypothetical Scenarios Tool originally used a default medical severity of \$22,300 based on an assumed three-day inpatient stay.

Based on actual COVID-19 claims reported on the MDC for claims meeting the above criteria, we observe higher average severities generally ranging between \$30,000 and \$55,000.

Table 3: Moderate Case As-Reported Paid Medical Severity by Service Month in 2020

Month	Claim Count	Paid per Claim
March	45	\$134,730
April	193	\$47,607
May	85	\$44,162
June	46	\$35,890
July	83	\$71,385
August	51	\$33,909
September	26	\$52,418
October	35	\$27,566
November	40	\$24,883
December	17	\$26,787

Similar to the Mild cases, we restrict our data to service months April through December. Based on the as-reported paid medical costs per claim, we estimate a weighted average medical severity of approximately \$45,000 for Moderate COVID-19 cases.

One reason for the difference between actual observed costs and those in the white paper is the difference in the average inpatient length-of-stay. The claims included in Table 3 average an eight-day inpatient stay, over twice the length of stay assumed in the white paper. Considering the increased duration in hospital inpatient stays for COVID-19 claims reported to the MDC, it follows that the average medical costs are higher than that initially assumed.

For the purposes of the Hypothetical Scenarios Tool, a base medical severity of \$45,000 will be utilized for Moderate cases.

Unlike the Mild cases, some Moderate cases are assumed to have the potential to result in a permanent disability as detailed in the PD Research Brief.⁸ It follows that further medical treatment is expected beyond the as-reported paid amounts shown here. Therefore, a medical severity relativity⁹ greater than 1.00 is justified to account for such outcomes.

Since COVID-19 claims are not yet mature enough to directly observe permanent disability outcomes, we must rely on other types of claims to serve as a proxy. As in the analyses performed in the PD Research Brief, we look to NCCI Unit Statistical Reports for historical Lung¹⁰ and Infection¹¹ claims for Policy Years 2002 through 2015 to serve as a proxy. Based on a comparison of the paid medical losses at first report to the incurred medical losses at the latest report available,¹² we can estimate the additional medical costs expected to be incurred over time on claims that result in a permanent partial disability (PPD) or permanent total disability (PTD).

⁹ Severity relativities are user inputs in the Hypothetical Scenarios Tool and are applied as a multiplicative factor to the base severity for a given scenario. This means that a selected relativity of 2.00 doubles the base severity for the given hypothetical scenario.

¹⁰ Lung defined as claims with a reported part of body code 60 (Trunk: Lung)

¹¹ Infection defined as claims with a reported nature of injury code 36 (Specific Injury: Infection), 65 (Occupational Disease or Cumulative Injury: Respiratory Disorders), 71 (Occupational Disease or Cumulative Injury: All Other), or 73 (Occupational Disease or Cumulative Injury: Contagious Disease).

¹² The latest available report is restricted to be at a 5th through 10th report. This was done to remove immature permanent disability claims that may understate the ultimate loss development.

Table 4: Implied Medical Development by Claim and Injury Type

Claim Type	PPD Claim Count	PPD Medical Development	PTD Claim Count	PTD Medical Development
Lung Claims	287 to 1,169	3.5 to 6.0	29 to 64	6.0 to 11.0
Infection Claims	1,068 to 3,182	3.0 to 5.0	54 to 93	4.0 to 6.0

Lower estimate¹³ determined by restricting analysis to claims with at least \$10,000 paid at 1st report

Upper estimate determined by using all claims observed at 1st report

While Table 4 reflects the potential for observed COVID-19 claims to experience adverse medical loss development due to permanent disability injuries, there are a few limitations to such an analysis beyond an assumption that COVID-19 claims will develop similarly to the proxy Infection or Lung claims.

- (1) Unit Statistical data only captures information up to a 10th report; therefore, there is potential for the implied development factor to differ to the extent that incurred medical losses at the latest report do not reflect the ultimate cost of these claims.
- (2) The implied loss development factor assumes that reported paid losses are at a 1st report, whereas the base severities we observed for COVID-19 are based on as-reported paid medical losses, which may understate the actual 1st report paid losses that will result for these claims.
- (3) The implied loss development factors are for permanent disability outcomes only. They do not consider potential medical loss development on temporary disability claims after a 1st report.

For PPD, we have a larger volume of data available even after restricting our analysis to those claims with at least \$10,000 of medical paid at 1st report. The implied development using just the restricted analysis ranges between 3.0 (Infection claims) and 3.5 (Lung claims). Based on this range we select a PPD medical loss development factor of 3.0.

For PTD, there is a limited volume of data available, so we rely instead on all claims observed at 1st report. The implied development factor ranges between 6.0 (Infection claims) and 11.0 (Lung claims). Considering NCCI anticipates PTD outcomes to result from Severe cases only, which according to the PD Research Brief are assumed to act more like Lung claims, something closer to the upper end of the range is likely appropriate. Additionally, the limitations of this analysis listed above likely are more pronounced for permanent total injuries, particularly for potential development after the latest observed report. Based on this, we select a PTD development factor of 10.0.

Using the default frequency assumptions noted in the PD Research Brief, we assume a 20% PPD rate and 0% PTD rate for Moderate cases. **For the purposes of the Hypothetical Scenarios Tool, NCCI is utilizing a medical severity relativity of 1.4 (= 20% x 3.0 + 0% x 10.0 + 80% x 1.0) as the default selection for Moderate cases.** This results in an overall medical severity for moderate cases of \$63,000 (= \$45,000 x 1.4).

¹³ Because the COVID-19 claims we are applying the implied development factors to are defined by those claims that have an inpatient stay in the as-reported losses it follows that claims with significant paid amounts may be a better proxy. However, this restricts the volume of data and limits credibility of the implied development factor.

Average Medical Cost per COVID-19 Claim for Severe Cases

The Severe symptom group consists of those claims that require a hospital inpatient stay and involve the ICU and/or the use of a ventilator. The Hypothetical Scenarios Tool originally used a default medical severity of \$67,000 based on an assumed seven-day inpatient stay as detailed in the white paper.

Table 5: Severe Case As-Reported Paid Medical Severity by Service Month in 2020

Month	Claim Count	Paid per Claim
March	13	\$139,079
April	52	\$130,379
May	24	\$83,651
June	20	\$83,791
July	26	\$93,479
August	14	\$38,818
September	6	\$29,916
October	6	\$42,917
November	6	\$57,902
December	4	\$60,380

Similar to the above symptom groups, we first look to limit the data that is not representative of the average COVID-19 claim cost. The severity in March and April appears high relative to the other months, with a sharp decline starting in August. Considering the longer duration of medical treatment for more severe cases, it follows that the change in severities over time would have a steeper decline compared to what is observed in the other symptom groups.

A majority of Severe cases are expected to result in muscle atrophy¹⁴ and other conditions that require the use of a rehabilitation facility. This is likely a contributing factor to the decrease in average severity occurring in more recent months (i.e., due to claim maturity). For these reasons, we allow for an additional two months since diagnosis to reflect medical payments and, therefore, restrict our analysis to service months April through October.

In general, we observe average medical severities ranging between \$30,000 and \$100,000 during these service months. The average inpatient length of stay varies dramatically from claim to claim averaging 15 days, with a median length of stay of 9 days for the 148 claims in consideration. The larger average length of stay explains why the observed severities are high compared to that assumed in the white paper.

For the purposes of the Hypothetical Scenarios Tool, NCCI is utilizing a base medical severity of \$95,000 for Severe cases.

We then look to reflect further medical care over time due to the potential for permanent disability outcomes. Consistent with the assumptions used in the PD Research Brief,⁸ we assume a 40% PPD rate and a 3% PTD rate to weight the previously selected PPD development factor of 3.0 and PTD development factor of 10.0.

For the purposes of the Hypothetical Scenarios Tool, NCCI is utilizing a medical severity relativity of 2.1 (= 40% x 3.0 + 3% x 10.0 + 57% x 1.0) as the default selection for Severe cases. This results in an overall medical severity for Severe cases of \$199,500 (= \$95,000 x 2.1).

¹⁴ Tiantian Sun, Liyun Guo, Fei Tian, et al. "Rehabilitation of patients with COVID-19." *Expert Review of Respiratory Medicine* (July 2020) doi: 10.1080/17476348.2020.1811687

Severity Impacts

In addition to updating the medical severity estimates previously discussed, NCCI also updated the following values in the Hypothetical Scenarios Tool:

- The underlying pure premium factors to reflect each approved loss cost/rate filing in NCCI states as of 4/1/2021,
- The first responder pure premium factors to include ambulance drivers' classifications,
- The state medical severity relativities to reflect an additional service year, and
- The wage replacement benefits to reflect the latest state average weekly wage.

All revised values are shown explicitly in the COVID-19 Hypothetical Scenarios Tool³ appendices.

The update to the medical severities is by far the largest contributing change to the impact on overall severity in the calculation framework. Incorporating these changes into the Hypothetical Scenarios Tool results in an increase of the overall total severity from \$6,707 to \$12,722 (+90%).

Please note that the impacts shown are limited to the severity alone and do not consider any potential offsetting impact due to the limited number of cases reported to date as noted in NCCI's COVID-19 and Workers Compensation: Frequency Assumptions Update¹⁵ and COVID-19 and Workers Compensation: What We Know Now.¹⁶ NCCI expects the limited frequency to more than offset any increase in severity when considering the impact on overall costs relative to initial estimates.

¹⁵ "COVID-19 and Workers Compensation: Frequency Assumptions Update." NCCI (November 2020). www.ncci.com/Articles/Pages/Insights-COVID-19-WCFrequencyAssumptionsUpdate.pdf

¹⁶ "COVID-19 and Workers Compensation: What We Know Now." NCCI (May 2021). www.ncci.com/Articles/Pages/Insights-COVID-19-WorkersComp-What-We-Know-Now.aspx

Hospitalization and Critical Care Rates

The MDC data also provides insight into the actual observed hospitalization and critical care rates. NCCI defines the hospitalization rate as the percentage of symptomatic COVID-19 claimants admitted to a hospital.

Table 6: Hospitalization Rate by Service Month in 2020

Month	Claim Count	Hospital Rate
March	164	35%
April	863	28%
May	512	21%
June	407	16%
July	590	18%
August	440	15%
September	261	12%
October	327	13%
November	537	9%
December	320	7%

The Hypothetical Scenarios Tool assumes a default hospitalization rate of 10%, with an expected range between 4% and 20% based on the Frequency Assumptions Update¹⁵ published in November.

As in the severity discussions above, we limit our data to include the months of April through October. Based on this, we observe a hospitalization rate that ranges between 13% and 28%. Additionally, we note a clear downward trend in the rate by month. It is difficult to distinguish if the decline is due to the maturity of claims reported or an improvement in treatment protocols/outcomes for injured workers.

For the purposes of the Hypothetical Scenarios Tool, we increased the default hospitalization rate from 10% to 15%.

The critical care rate is defined as the percentage of hospitalized COVID-19 claimants that require the use of an ICU or ventilator.

Table 7: Critical Care Rate by Service Month in 2020

Month	Claim Count	Critical Rate
March	58	22%
April	245	21%
May	109	22%
June	66	30%
July	109	24%
August	65	22%
September	32	19%
October	41	15%
November	46	13%
December	21	19%

The Hypothetical Scenarios Tool assumes a 15% default critical care rate, though the Frequency Assumptions Update suggests a higher range between 21% and 42%.

Similar to the severity discussion above, we restrict the data to service months April through October. Based on this, we observe an actual critical care rate that ranges between 15% and 30%.

For the purposes of the Hypothetical Scenarios Tool, we increased the default critical care rate from 15% to 20%.

Indemnity Data Call COVID-19 Claims

Another rich data source available for review is the Indemnity Data Call (IDC), which contains both quarterly and transactional COVID-19 claim information. We identify pandemic claims in the data through the cause of injury code (83). In particular, we can get a first look at the severity and frequency of claims previously not considered: claims with little to no associated medical costs, which we will refer to as quarantine-only claims. This cohort of claims may constitute a large proportion of claims in some states and be less severe compared to claims in which medical services were received, as discussed in the three symptom groups above. A preliminary look at the data indicates that of the 16,976 lost-time COVID-19 claims observed in the IDC, **over half had less than \$120 of medical incurred losses associated with them, which we are considering quarantine-only for the purposes of this analysis.**

Table 8: Quarantine Only Claims As-Reported* Total Paid + Case Severity by Service Month in 2020

Month	Claim Count	Paid+Case Severity
March	615	\$3,837
April	1,669	\$2,402
May	1,113	\$2,031
June	935	\$1,659
July	1,293	\$2,561
August	788	\$844
September	386	\$952
October	594	\$979
November	932	\$856
December	251	\$1,099

**Caution should be used when reviewing this data as it is preliminary in nature*

Table 8 shows the total average severity by month for quarantine-only claims using the quarterly data reported through March 4, 2021 from the IDC. **Please use caution when reviewing this data as it is preliminary in nature and shown as-reported.** However, we observe that the as-reported severity of such claims generally ranges between \$800 and \$2,000 after March 2020.

For comparison, we note that the revised nonfatal severity for the Mild symptom group in all NCCI states is \$2,286, where \$686 is for wage replacement benefits and \$1,600 is for medical services. This implies that quarantine-only claims are expected to have severities of a little more than \$700, which is more comparable to what we observe in August through November. At the onset of the pandemic, we observe significantly higher severities of \$1,500 or more. Considering the short duration of quarantine-only claims, claim maturity is not expected to be a significant factor. Hence, it is unclear what is driving the decline in costs for more recent service months.

Conclusion

While there remains significant uncertainty surrounding the long-term impacts of COVID-19, we are able to use the claim data observed to date to refine the severity values included in the white paper. We note an increase in medical severities, that ranges between +60% to +198% depending on the symptom group.

Table 10: Changes in Medical Severity Estimates

Symptom Group	Current Base Medical Severity	Revised Base Medical Severity	Revised Relativity	Revised Total Medical Severity
Mild	\$1,000	\$1,600	1.0	\$1,600
Moderate	\$22,300	\$45,000	1.4	\$63,000
Severe	\$67,000	\$95,000	2.1	\$199,500

After incorporating the revised medical severity estimates into the Hypothetical Scenarios Tool, we note an overall average increase in total (indemnity plus medical) severity of +90%. The primary cause for the increase in severity over initial estimates is the longer-than-expected inpatient stays for Moderate and Severe claims. Actual observed data indicates that inpatient stays are around double initial estimates, averaging 8 days for Moderate cases and 15 days for Severe cases. Additionally, the consideration for further medical care over time as a result of permanent disability outcomes also contributes materially to this increase.

Table 11: Changes in Total (Indemnity + Medical) Nonfatal Severity* Estimates

Symptom Group	Current Total Nonfatal Severity	Revised Total Nonfatal Severity
Mild	\$1,700	\$2,300
Moderate	\$28,300	\$69,000
Severe	\$103,500	\$236,000

*Shown to the nearest hundred dollars

While the severity of COVID-19 claims is higher than initial expectations, **please note that according to NCCI's COVID-19 and Workers Compensation: Frequency Assumptions Update,¹⁵ cases have been low relative to initial projections. This is further discussed in NCCI's COVID-19 and Workers Compensation: What We Know Now,¹⁶ which also illustrates that the limited frequency more than offsets the higher severities indicated in this research brief relative to initial cost estimates.**

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