Long COVID in the California Workers' Compensation System – 2024 Update

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Summary of Key Findings

Prevalence of Long COVID

>1 in 7 COVID-19 workers' compensation claims with medical payments filed between April 2020 and July 2021 were estimated to involve long COVID over a 30-month post-acute care period (**Chart 1**).
The estimate is reasonably consistent with the estimate from the California group health data (**Chart 9**).

5% of all COVID-19 claims filed between April 2020 and July 2021, including indemnity-only claims, were estimated to involve long COVID (**Chart 1**).

> 40% of COVID-19 claims involving hospitalization were estimated to involve long COVID over a 30-month post-acute care period (**Chart 1**).

Long COVID symptoms remain particularly persistent for hospital claims:
- **60%** involved treatment for long COVID for at least 3 consecutive months (**Chart 3**).
- **8%** continued to involve treatment for long COVID after 27 months following acute care (**Chart 2**).

>50% higher likelihood of long COVID for patients who were treated for any comorbidities over the two years preceding the pandemic, based on the California group health data (**Chart 8**).

Summary of Key Findings

Long-Term Impacts of Long COVID on Disability Outcomes

Compared to other COVID-19 claims, long COVID claims have a **higher share of indemnity claims (Chart 10) and higher average incurred indemnity losses (Chart 14)** at approximately 30 months after policy inception, driven by:

- A longer average duration of temporary disability (TD) benefits (Chart 11).
- A higher share of claims involving permanent disability (PD) benefits (Chart 10).

Compared to other COVID-19 claims, long COVID claims have a **higher share of claims involving nontrivial allocated loss adjustment expense (ALAE) costs**, with higher average ALAE payments (Chart 15).

Long-Term Patterns of Medical Treatment and Costs of Long COVID Claims

Higher average incurred medical losses at approximately 30 months after policy inception, particularly among long COVID claims involving PD (Chart 16).

A large share of payments for medical-legal services on long COVID claims that involved a mild initial COVID-19 infection (Chart 17).

Background: Trends of Long COVID Globally, in the U.S. and in California

Globally, the cumulative incidence of long COVID by the end of 2023 is estimated at **~400 Million**, according to an August 2024 report published in *Nature Medicine*.

~16% of adults in California reported ever experiencing long COVID as of July 2024 based on estimates from the U.S. Census Bureau's Household Pulse Survey.

~30% of California adults who ever had long COVID reported activity limitations from long COVID in the U.S. Census Bureau's Household Pulse Survey.

>2 Million U.S. adults were out of work because of long COVID in 2022 according to the Brookings Institution estimates.
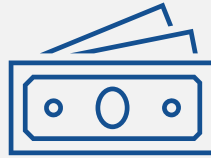
The economic cost of long COVID in the U.S. is estimated to be **$3.7 Trillion**, including lost quality of life, lost earnings and increased spending on healthcare, according to David M. Cutler of Harvard University.

Prior studies, including two published by the WCIRB, estimated the prevalence of long COVID in workers' compensation systems. However, information on the long-term impacts of COVID-19 on disability and system costs were limited due to data availability.

Background: Key Findings of Prior WCIRB Studies of Long COVID in 2022 and 2023
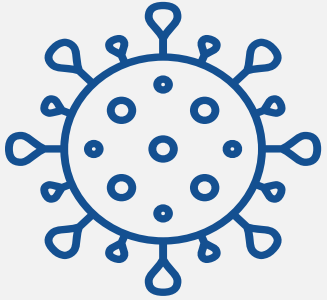
Estimated long COVID prevalence in the California workers' compensation system:

- Over 4 months after acute care: 11% of COVID-19 claims with medical payments.
- Over 1 year after acute care: 13%
  - Symptoms particularly persistent for hospital claims.
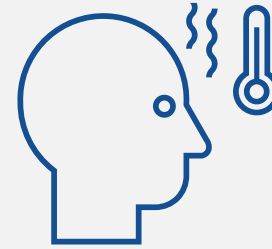
Leading long COVID symptoms:

- Include respiratory, musculoskeletal and neurological conditions and fatigue.
- The leading symptoms are consistent in the prior two studies.

Characteristics of workers experiencing long COVID:

- Higher risk for female workers, workers ≥ 40 years old and workers with pre-existing comorbidities.
- Higher prevalence in health care, manufacturing and retail industries.
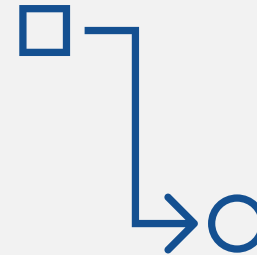
Early assessment of PD on long COVID claims (compared to other COVID-19 claims without long COVID):

- Higher share of PD claims.
- Higher average PD rating.
- Higher average incurred medical losses.

Research Questions

1

What is the estimated prevalence of long COVID over a 30-month post-acute care period in the California workers' compensation system? How does it compare to that in the California group health insurance system?

- Information on the prevalence estimates based on available data offers insights into the duration of long COVID symptoms overall and by different factors, such as accident year, industry and comorbidity status
- The comparison between the workers' compensation system and the group health insurance system is intended to validate the reasonableness of the estimated long COVID prevalence in the workers' compensation system

2

What are the long-term disability outcomes of workers experiencing long COVID?

- Information highlights the impacts of long COVID on individual workers and on system costs at approximately 30 months after policy inception

3

What are the long-term medical treatment and cost patterns for workers experiencing long COVID?

- Information highlights medical cost differentials between long COVID claims and other COVID-19 claims, as well as the potential underlying drivers

Research Methods: Analysis Framework for Acute Care for COVID-19 Infections and Post-Acute Care for Long COVID Symptoms

Medical Care for Acute COVID-19 Infection

(Acute Care Phase)

Recovery

Post-Acute Care for Long COVID Symptoms

(Post-Acute Care Phase)

Recovery

Mild
No hospitalization

Severe
Hospitalization, no intensive care unit (ICU)

Critical
with ICU

Death

Medical care
(30 days from initial medical treatment for COVID-19)

Pre-hospital care

Inpatient care

First 30 days following discharge

31-120 days

121-210 days

841-930 days

Share of COVID-19 patients with medical treatments for at least 1 long COVID symptom

For mild claims, post-acute care starts on day 31 after the first medical visit and lasts through day 930; for severe and critical claims, post-acute care starts on day 31 after the hospital discharge and lasts through day 930.

Research Methods: Distribution of COVID-19 and Non-COVID-19 Workers' Compensation Claims Included in the Study by Clinical Severity

Clinical Severity of Acute COVID-19	Share of COVID-19 Claims with Medical Payments (N = 11,793)			Share of Non-COVID-19 Claims with Medical Payments (N = 755,398)
	Accident Year (AY) 2020	AY 2021	AY 2022	AY 2020-2022
Mild Claims (no hospital care)	91.1%	91.6%	97.6%	98.7%
Severe Claims (w/ hospital care but w/o ICU care)	3.3%	3.7%	1.3%	1.0%
Critical Claims (w/ ICU care)	3.3%	2.3%	0.7%	0.3%
Death Claims	2.3%	2.3%	0.4%	0.05%
Total	**100%**	**100%**	**100%**	**100%**

The distribution of COVID-19 claims by clinical severity is similar between AY2020 and AY2021, with mild claims accounting for more than 90% of all COVID-19 claims. However, among hospital claims, those in AY2021 have a higher share of severe and a lower share of critical claims.

For AY2022, the proportion of mild claims increased to almost 98%, primarily due to changes during the pandemic. The availability of therapies and higher population immunity in California resulting from vaccinations and prior infections both contributed to a lower risk of hospitalization from COVID-19 infections.

Compared to non-COVID-19 claims, COVID-19 claims in AY2022 continued to be more likely to involve hospitalization (57% more likely) and fatality (6 times more likely).

Research Methods: Definition of Long COVID Claims in the Study

For the purpose of the study, long COVID claims in the workers' compensation system are defined as COVID-19 claims involving medical treatment for at least one long COVID symptom during the post-acute care period – same as the definition of long COVID claims in prior WCIRB studies on long COVID.

Similar to the prior WCIRB studies, long COVID symptoms are identified by the International Classification of Diseases (ICD) information reported in the WCIRB medical transaction data and in the group health data (**Technical Appendix A**). These symptoms represent the leading long COVID symptoms based on published research and do not include all long COVID symptoms ever identified.

The definition of long COVID claims in the California group health insurance system in this study is similar to the definition used in the prior WCIRB studies on long COVID. The data source is Merative™ MarketScan® Research Databases, including the Commercial Claims and Encounters Database and the Medicare Supplemental and Coordination of Benefits Database (collectively referred to as "group health data" in this report). The methodology and more information on the dataset are detailed in **Technical Appendix B**.

As of July 2024, the National Academies of Sciences, Engineering and Medicine updated the definition of long COVID to require any long COVID symptom to last for at least three months. However, it is challenging to identify workers experiencing long COVID symptoms continuously for three months in the workers' compensation data. Instead of revising our previous definition, we conducted additional analysis on the duration of treatment for long COVID symptoms and included the distribution of workers with long COVID that required continuous medical treatment for 1 month, 2 months and 3 months or more (**Chart 3**). It is possible that workers with medical treatment for less than 3 months continued to experience long COVID symptoms for a much longer period.

Prevalence of Long COVID in the California Workers' Compensation System

Chart 1: More than 1 in 7 Claims with Medical Payments Involved Long COVID in the California Workers' Compensation System

Prevalence of Long COVID Over a 30-Month Post-Acute Care Period

13%	41%	44%	15%	5%
Mild	Severe	Critical	COVID-19 Claims with Medical Payments	All COVID-19 Claims

Clinical Severity of Acute Infection of COVID-19 Claims with Medical Payments
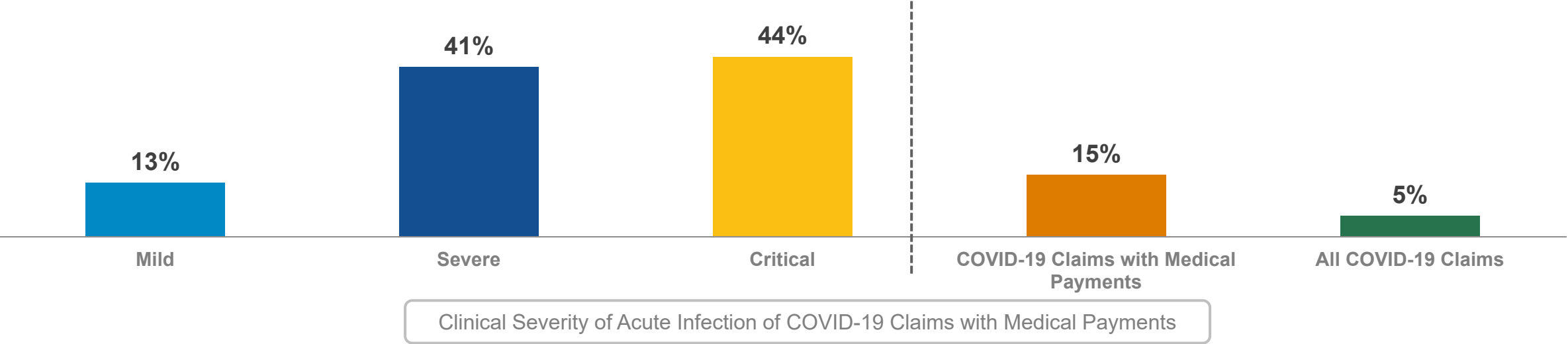
Overall, more than 1 out of 7, or 15%, of COVID-19 claims with medical payments involved treatment for long COVID symptoms over a 30-month post-acute care period. Among all COVID-19 claims, only 5% were identified as involving long COVID due to the low prevalence among indemnity-only claims (0.3%), which represented over 40% of COVID-19 claims. Our estimates are consistent with published research using workers' compensation data.

The prevalence of long COVID differs by clinical severity of acute COVID-19, with 13% among mild claims and over 40% among severe and critical claims that involved hospitalization. Therefore, COVID-19 claims that involved hospitalization for acute infection have a higher risk of long COVID than mild claims, consistent with published research and our previous research on long COVID.

Since most COVID-19 claims involved mild initial infections, these constitute more than 80% of long COVID claims identified.

Chart 2: Long COVID Symptoms Particularly Persistent on Claims Involving Hospitalization for the Initial Infection

Prevalence of Long COVID Over a 30-Month Post-Acute Care Period

Mild Claims ● Hospital Claims

Hospital Claims: 42%, 30%, 25%, 22%, 19%, 18%, 16%, 13%, 11%, 8%

Mild Claims: 13%, 8%, 6%, 5%, 4%, 4%, 3%, 2%, 2%, 1%

Months following Acute Care: 1-30, 4-30, 7-30, 10-30, 13-30, 16-30, 19-30, 22-30, 25-30, 28-30

~ 1 in 5 hospital claims continued to involve medical care for long COVID symptoms after about 1 year of post-acute care

8% of hospital claims continued to involve care for long COVID symptoms after 27 months of post-acute care

The share of mild COVID-19 claims that involved treatment for long COVID symptoms decreased from 13% in the first quarter to 1% by the last quarter of the 30-month post-acute care period.

Long COVID symptoms are more persistent for hospital claims. By the first year of the post-acute care period, about 1 in 5 claims involved treatment for long COVID symptoms. By the last quarter of the 30-month period, about 8% of hospital claims continued to involve medical care for long COVID symptoms. The leading types of treatment for persistent long COVID symptoms on hospital claims included office visits, home health care, use of portable oxygen and inpatient care for acute respiratory failure.
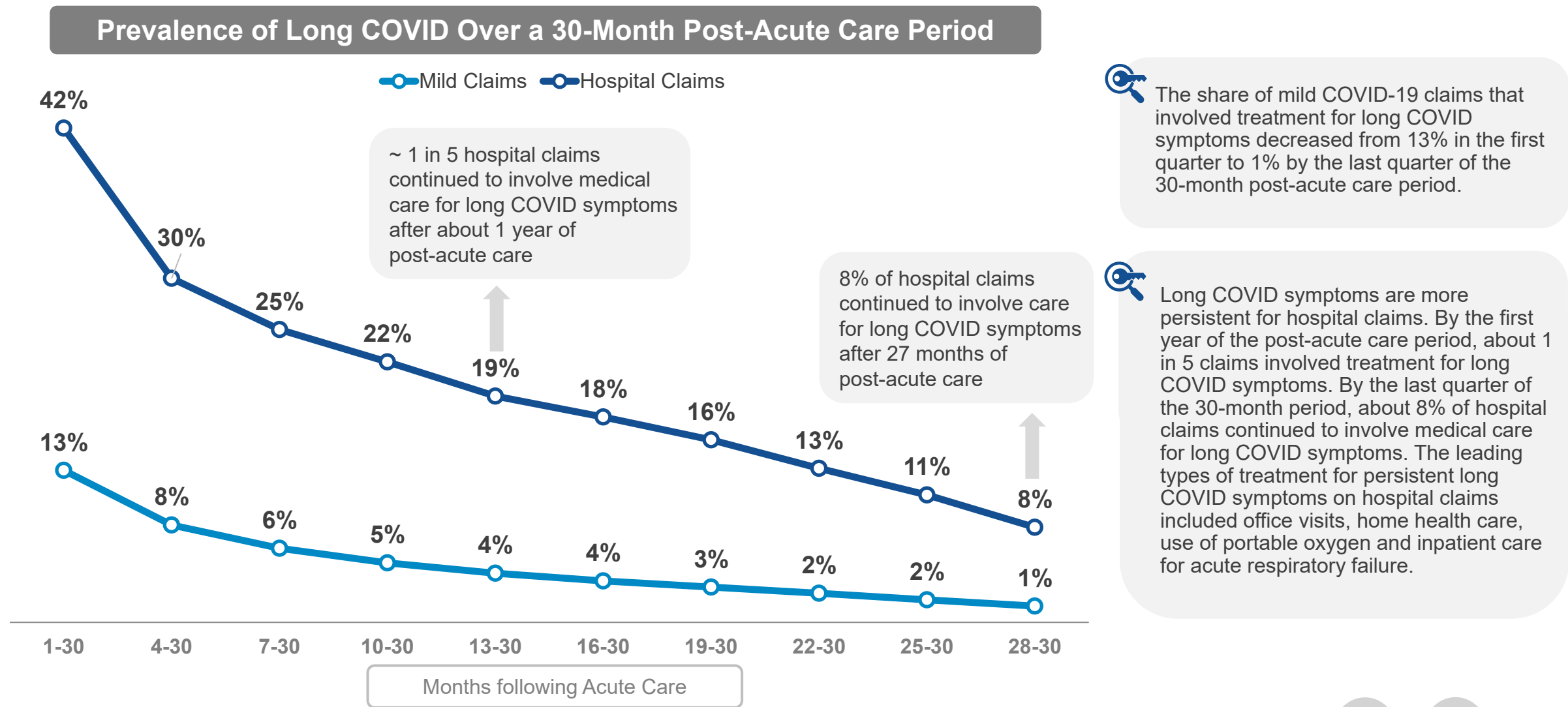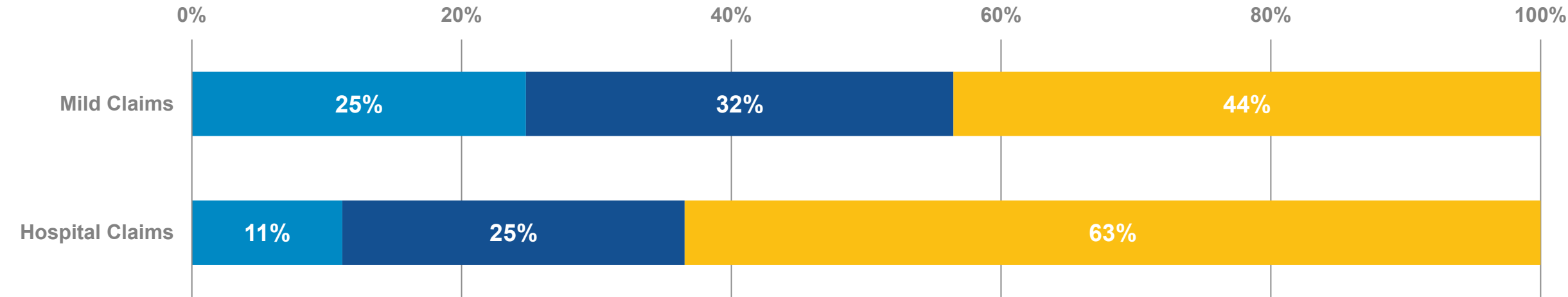
Chart 3: Over 60% of Long COVID Hospital Claims Involved Treatment for Long COVID Symptoms for at Least 3 Consecutive Months

Share of Long COVID Claims by Longest Treatment Duration

■ 1 Month ■ 2 Months ■ 3 Months or More

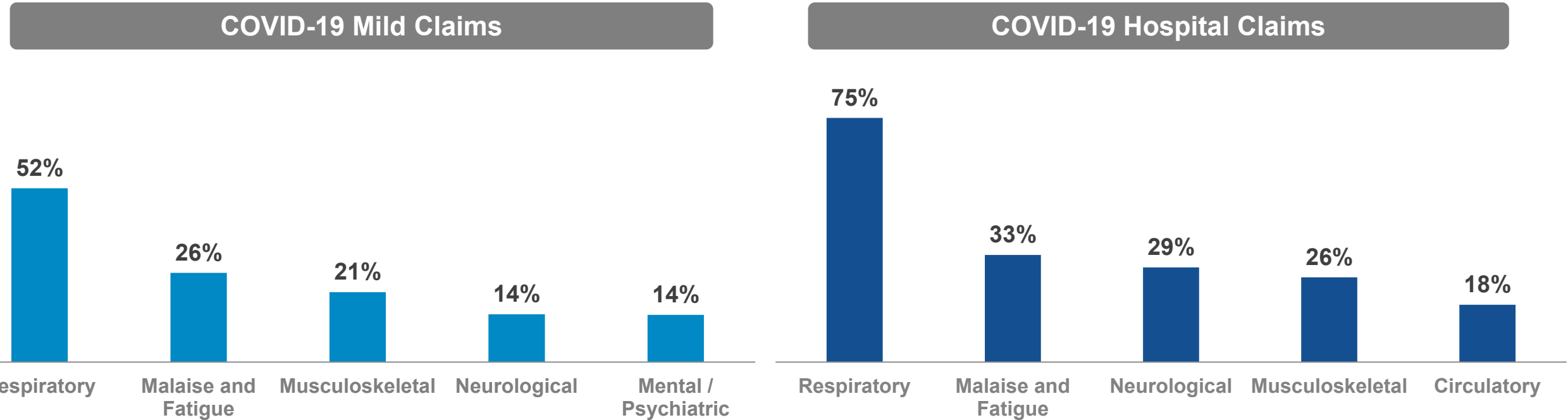|	0%	20%	40%	60%	80%	100%
Mild Claims	25%	32%	44%			
Hospital Claims	11%	25%	63%			

🔑 More than 6 of 10 long COVID claims involving hospitalization for the initial infection had treatment for the same long COVID symptom for at least 3 consecutive months over a 30-month post-acute care period, highlighting the persistence and clinical severity of long COVID symptoms. For these claims, the leading long COVID symptoms treated were respiratory conditions (e.g., abnormalities of breathing, respiratory failure) and neurological issues (e.g., cognitive impairment).

🔑 Even for long COVID claims with a mild initial infection, more than 40% had medical treatment for at least 3 months and about a third involved medical treatment for 2 months.

🔑 Our findings indicate that while some people may see their long COVID symptoms resolve weeks or months after illness, others may need longer treatment. However, our results did not capture workers who experience persistent long COVID symptoms but did not seek or receive continuing medical treatment within the system.

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Chart 4: Higher Share of Hospital Claims Involving Treatment for Long COVID Symptoms

COVID-19 Mild Claims

52%	26%	21%	14%	14%
Respiratory	Malaise and Fatigue	Musculoskeletal	Neurological	Mental / Psychiatric

COVID-19 Hospital Claims

75%	33%	29%	26%	18%
Respiratory	Malaise and Fatigue	Neurological	Musculoskeletal	Circulatory

The most common long COVID symptoms treated in the workers' compensation system are respiratory-related issues, such as shortness of breath, cough and chest pain. These symptoms were treated in over half of long COVID claims with a mild initial infection and three-quarters of long COVID claims involving hospitalization.

Fatigue is another common symptom treated in more than 1 in 4 mild claims, while hospital claims are more likely than mild claims to involve treatment for neurological conditions, such as cognitive impairment and mobility impairment, and circulatory conditions, such as strokes and arrhythmia.

Overall, long COVID claims involve a wide range of symptoms affecting multiple body systems. Workers initially hospitalized for the acute infection were more likely to have multiple long COVID symptoms and symptoms in multiple body systems.

Chart 5: Estimated Prevalence of Long COVID Remained Similar over Time Among Mild Claims but Increased Among Hospital Claims
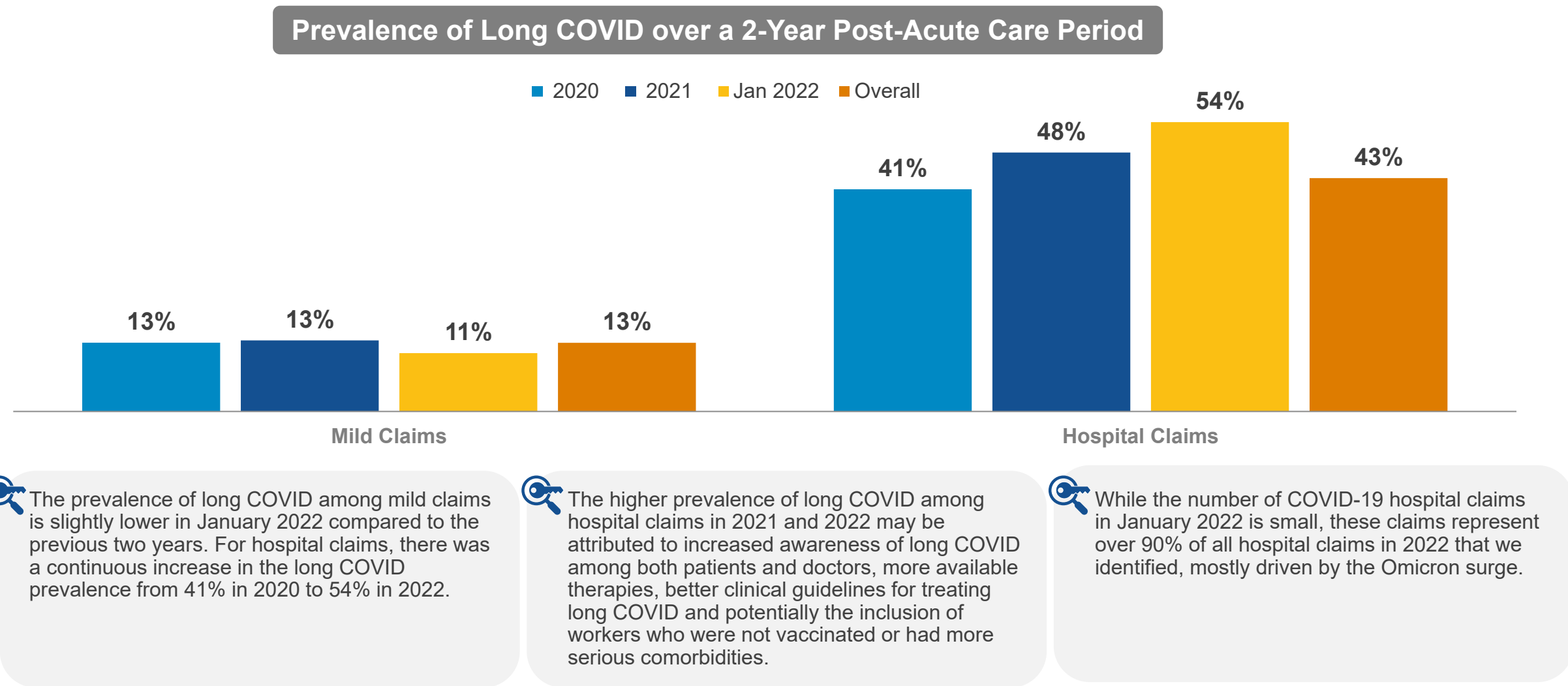
Prevalence of Long COVID over a 2-Year Post-Acute Care Period

Legend: ■ 2020 ■ 2021 ■ Jan 2022 ■ Overall

Mild Claims
- 2020: 13%
- 2021: 13%
- Jan 2022: 11%
- Overall: 13%

Hospital Claims
- 2020: 41%
- 2021: 48%
- Jan 2022: 54%
- Overall: 43%

🔑 The prevalence of long COVID among mild claims is slightly lower in January 2022 compared to the previous two years. For hospital claims, there was a continuous increase in the long COVID prevalence from 41% in 2020 to 54% in 2022.

🔑 The higher prevalence of long COVID among hospital claims in 2021 and 2022 may be attributed to increased awareness of long COVID among both patients and doctors, more available therapies, better clinical guidelines for treating long COVID and potentially the inclusion of workers who were not vaccinated or had more serious comorbidities.

🔑 While the number of COVID-19 hospital claims in January 2022 is small, these claims represent over 90% of all hospital claims in 2022 that we identified, mostly driven by the Omicron surge.

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Chart 6: Health Care Industry with the Highest Prevalence of Long COVID, Followed by the Manufacturing and Retail Industries

**Prevalence of Long COVID by Leading Industry Sectors**
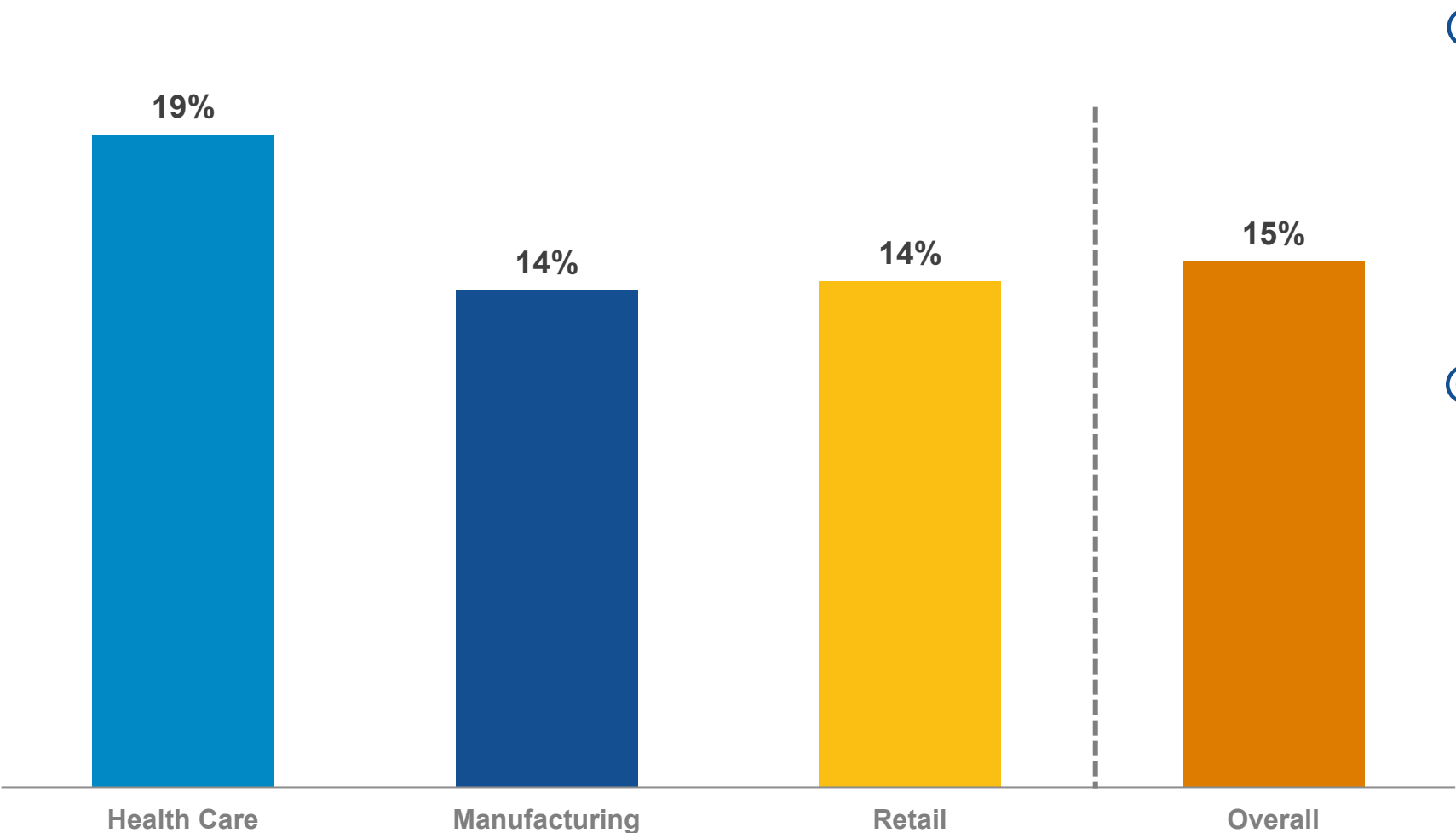
The health care industry has a higher-than-average prevalence of long COVID, primarily because health care workers have more exposure to the virus and an increased risk of developing long COVID. The higher risk of long COVID is more pronounced among those working in outpatient settings and hospitals.

The relatively high prevalence of long COVID among workers in the manufacturing and retail industries could be related to a slightly higher share of hospital claims than the statewide average, indicating more severe COVID-19. The pattern among manufacturing workers is consistent with published research.

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Chart 7: Prevalence of Long COVID Varies by Different Vaccine Periods

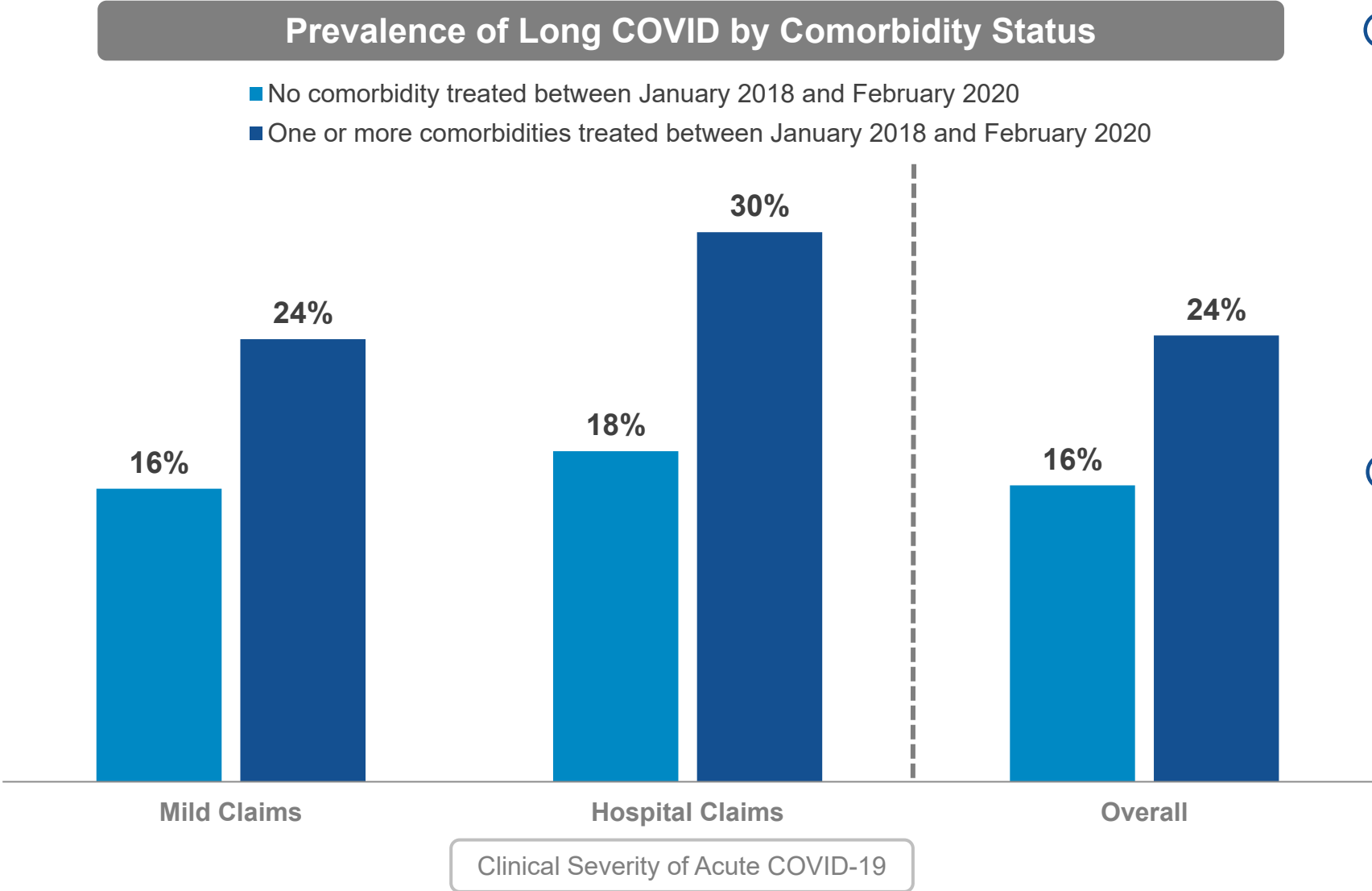**Prevalence of Long COVID over a 30-Month Post-Acute Care Period**

- ■ Accident Date: April through December 2020 (pre-vaccine period)
- ■ Accident Date: January through May 2021 (vaccine period)

Health Care: 19%, 16%
Other Sectors: 12%, 13%
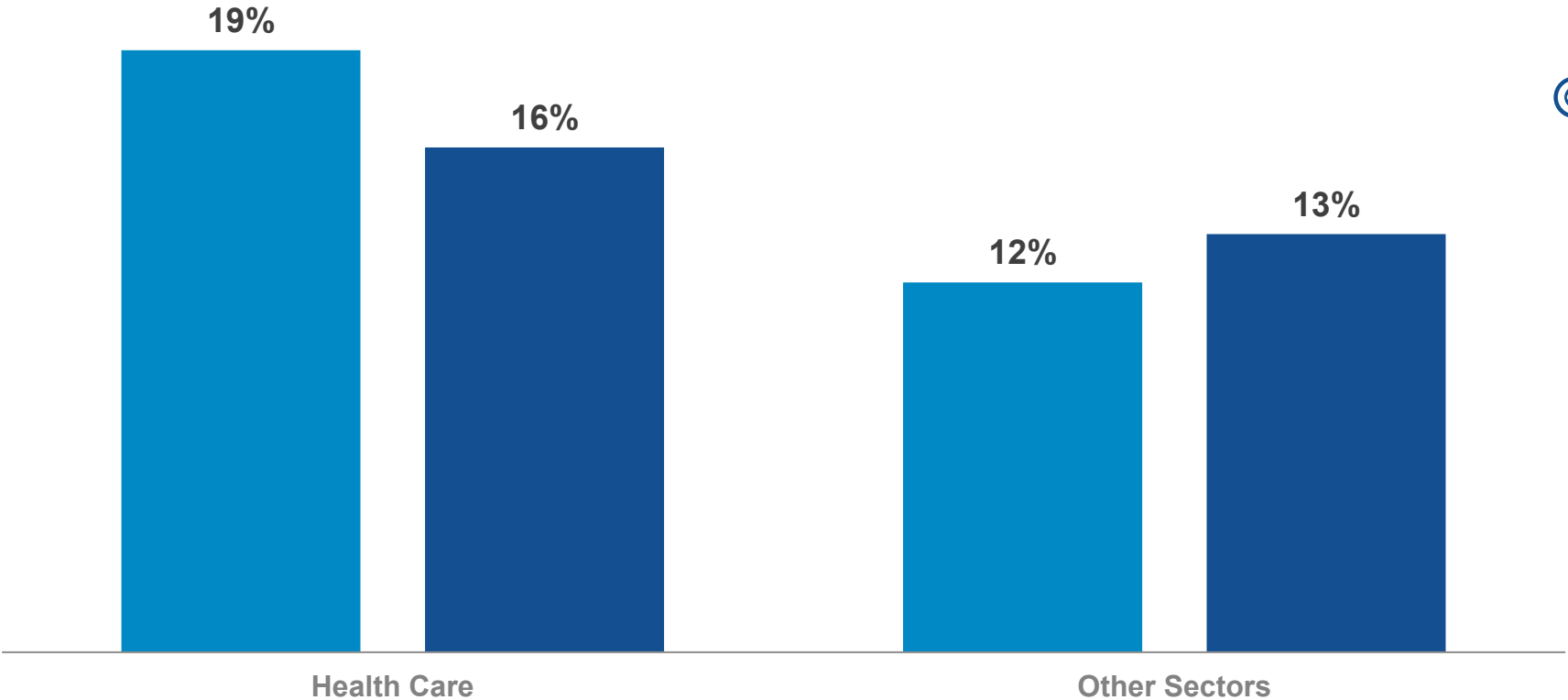
🔑 While individual worker vaccination status is not available in the WCIRB data, we explored the effect of vaccines against long COVID by comparing the prevalence of long COVID between health care workers and workers in other sectors with COVID-19 claims.

🔑 We assumed that health care workers were more likely to be vaccinated in early 2021 because of vaccination requirements in California, whereas workers in other sectors were less likely to be vaccinated during the same period due to the limited availability of vaccines. Based on these assumptions, we found that the prevalence of long COVID among health care workers over a 30-month post-acute care period dropped by 16% from AY2020 to early AY2021, while workers in other industries had a 13% increase in prevalence of long COVID. These different trajectories suggest vaccination may affect the prevalence of long COVID.

Chart 8: 50% Higher Prevalence of Long COVID for Patients with Pre-Existing Comorbidities
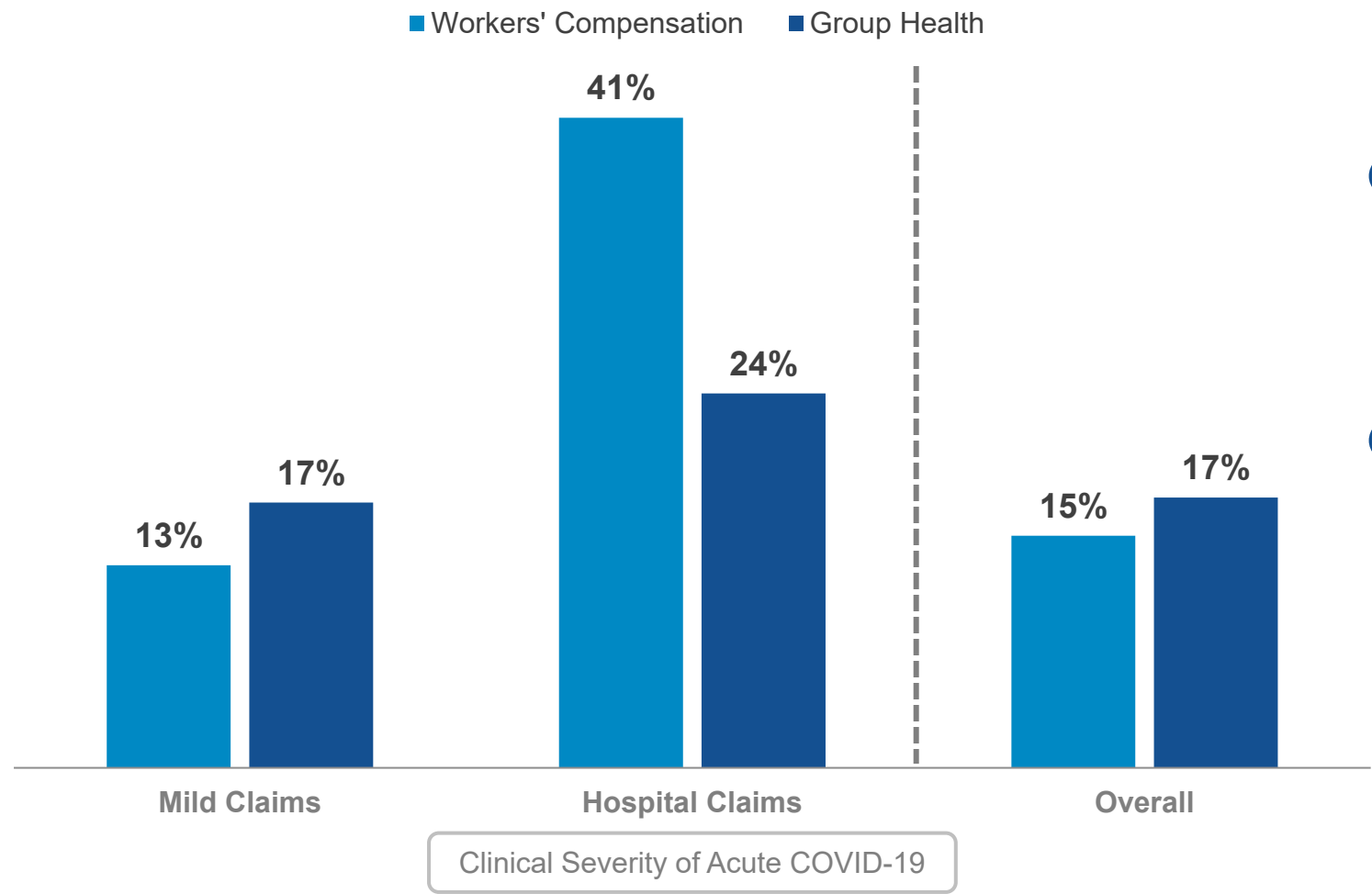
Prevalence of Long COVID by Comorbidity Status

■ No comorbidity treated between January 2018 and February 2020
■ One or more comorbidities treated between January 2018 and February 2020

	Mild Claims	Hospital Claims	Overall
No comorbidity	16%	18%	16%
One or more comorbidities	24%	30%	24%

Clinical Severity of Acute COVID-19

Patients with pre-existing comorbidities tend to have a higher risk of developing long COVID. Based on the medical transaction data of a sample of about 37,000 patients treated in the California group health insurance system, we found that the overall estimated prevalence of long COVID over a 30-month post-acute care period for patients with treatment for comorbidities prior to the infection is about 50% higher than those without. This pattern is consistent across clinical severities of the acute COVID-19 infection.

The leading risk factors for long COVID among patients with a mild initial infection include hypertension and use of corticosteroids, while diabetes and obesity increase risks for developing long COVID among hospital patients. Given that the comorbidity status for each patient was identified based on treatment for comorbidity in the two years prior to the pandemic, it may not capture comorbidities that were not treated within this time frame.

Chart 9: Overall Prevalence of Long COVID Among California Workers Reasonably Similar Between the Workers' Compensation and Group Health Insurance Systems

Prevalence of Long COVID over a 30-Month Post-Acute Care Period

■ Workers' Compensation ■ Group Health

Mild Claims: Workers' Compensation 13%, Group Health 17%
Hospital Claims: Workers' Compensation 41%, Group Health 24%
Overall: Workers' Compensation 15%, Group Health 17%

Clinical Severity of Acute COVID-19

The estimated prevalence of long COVID is 17% among patients who had a COVID-19 infection in 2020 and 2021 and were treated in the California group health insurance system. The estimate reasonably validates the overall estimate (15%) in the workers' compensation system.

There are, however, differences in the estimated prevalence of long COVID for mild and hospital claims between the two insurance systems. Specifically, the estimated prevalence for mild claims in the group health insurance system is somewhat higher, while that for hospital claims is much lower.
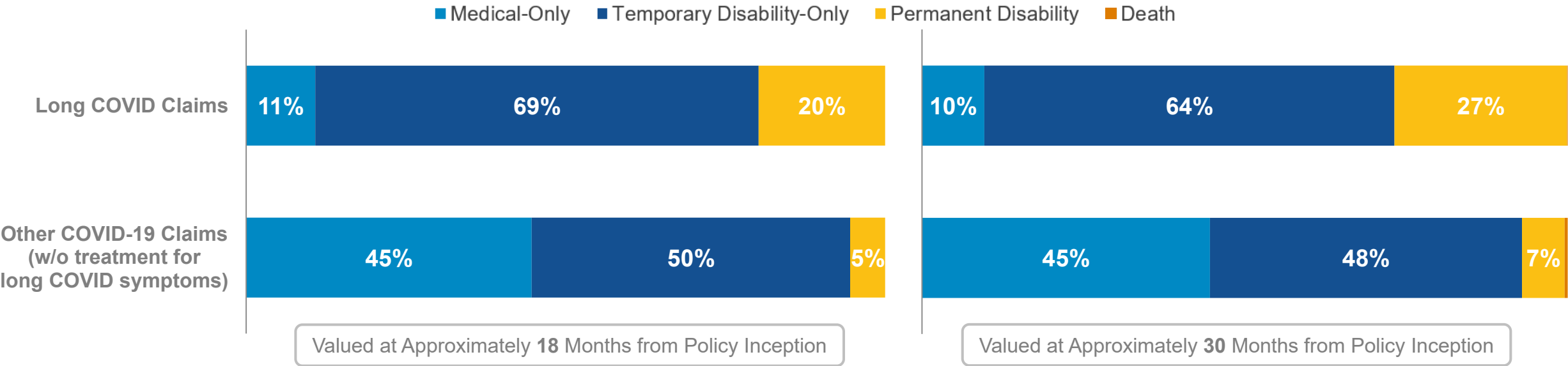
The lower estimated prevalence among hospital claims in the group health system may be due to:
- Differences in the insurance coverage and cost-sharing between the two systems.
- Some individuals may have shifted from group health to a public insurance program due to changes in their employment according to the U.S. Census Bureau. Patients hospitalized due to COVID-19 may be more likely to lose their jobs and, consequently, their employment-based group health insurance. Therefore, the group health data may underestimate long COVID cases among this population.

Long-Term Disability Outcomes of Long COVID Claims

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Chart 10: Share of Long COVID Claims Involving PD Benefits Is 4 Times Other COVID-19 Claims

Legend: ■ Medical-Only ■ Temporary Disability-Only ■ Permanent Disability ■ Death

Valued at Approximately 18 Months from Policy Inception

Category	Medical-Only	Temporary Disability-Only	Permanent Disability
Long COVID Claims	11%	69%	20%
Other COVID-19 Claims (w/o treatment for long COVID symptoms)	45%	50%	5%

Valued at Approximately 30 Months from Policy Inception

Category	Medical-Only	Temporary Disability-Only	Permanent Disability
Long COVID Claims	10%	64%	27%
Other COVID-19 Claims (w/o treatment for long COVID symptoms)	45%	48%	7%

Overall, about 90% of long COVID claims involved disability benefits (either temporary or permanent), compared to about 55% among other COVID-19 claims without any treatment for long COVID symptoms. The pattern has been consistent over time.

Long COVID claims were more likely to involve PD benefits than other COVID-19 claims. At approximately 18 months from policy inception, the share of long COVID claims involving PD benefits was 4 times the share of other COVID-19 claims (20% vs. 5%). The difference remained consistent at approximately 30 months from policy inception. The higher share of long COVID claims with PD benefits results from claims that initially involved TD only later receiving PD benefits.

For other COVID-19 claims, the share of PD claims remained similar over time.

Chart 11: Average Duration of TD Benefits on Long COVID TD Claims Is More than 6 Times Longer than Other COVID-19 Claims
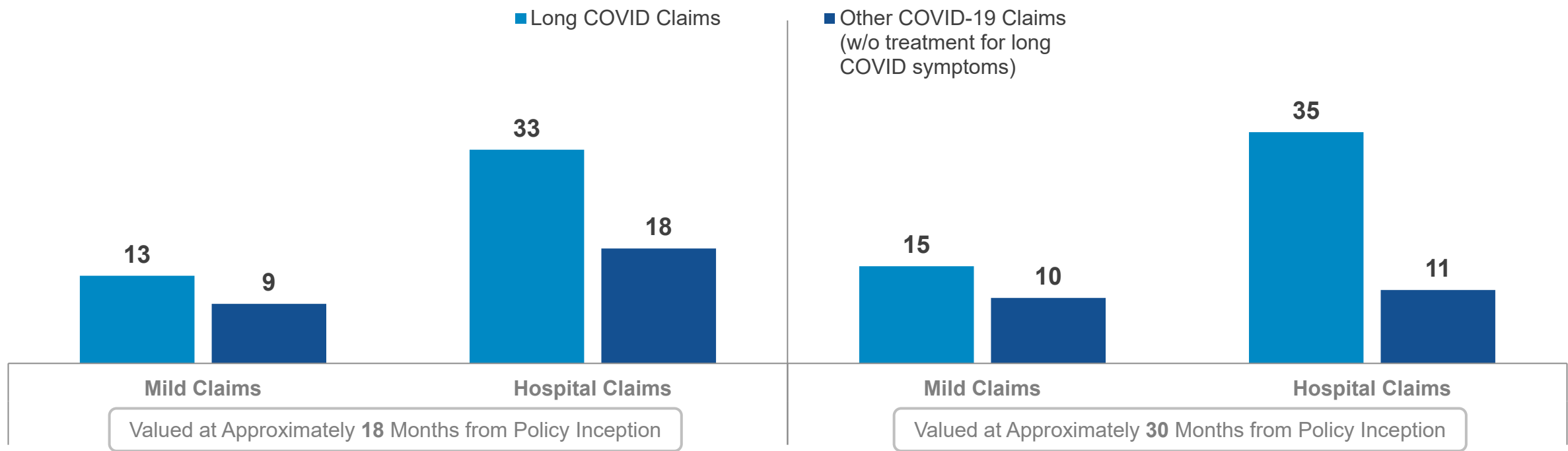
Duration of Temporary Disability Benefits (Weeks)

Legend: ■ Median ■ Average

Long COVID Claims
- Median: 11
- Average: 27

Other COVID-19 Claims (w/o treatment for long COVID symptoms)
- Median: 2
- Average: 4
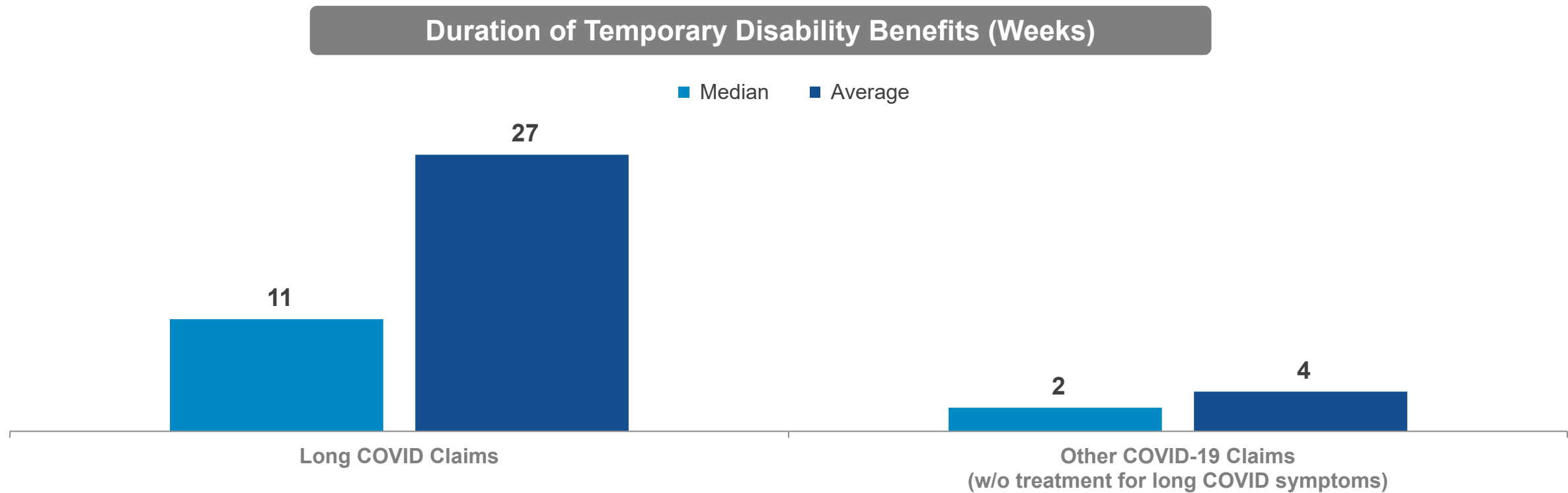
For claims involving TD benefits only, the average duration of TD benefits on long COVID claims is estimated to be 27 weeks, or more than half a year. This estimated duration is more than 6 times longer than for other COVID-19 claims.

The median duration is 11 weeks for long COVID claims, suggesting 50% of workers experiencing long COVID who received TD benefits needed to take almost 3 months off from work to recover.

Our results are consistent with other published research on long COVID using workers' compensation data.

Chart 12: Average PD Rating of Long COVID PD Claims Is More than 2 Times Higher than That of Other COVID-19 PD Claims

■ Long COVID Claims   ■ Other COVID-19 Claims (w/o treatment for long COVID symptoms)

Valued at Approximately 18 Months from Policy Inception

Mild Claims: 13, 9
Hospital Claims: 33, 18

Valued at Approximately 30 Months from Policy Inception

Mild Claims: 15, 10
Hospital Claims: 35, 11

Regardless of the clinical severity of the initial COVID-19 infection, long COVID PD claims had a much higher average estimated PD rating than other COVID-19 PD claims. The difference increased over time for both mild and hospital claims, highlighting the long-term impacts of COVID-19 on work disability.

For hospital claims, the average PD rating for long COVID claims at 18 months from policy inception is 86% higher than that for other COVID-19 claims. At 30 months, the difference grew to more than 2 times, driven by an increase in the PD rating for long COVID claims and a decrease for other COVID-19 claims. The decrease in the PD rating for other COVID-19 hospital claims is partly due to shifts in the PD claim mix, where some smaller PD claims at 30 months were those that transitioned from having TD benefits at 18 months.

Chart 13: Long COVID PD Claims Closed Much More Slowly than Other COVID-19 Claims

Claim Closure Rate of Permanent Disability Claims

— Long COVID PD Claims   —— Other COVID-19 PD Claims (w/o treatment for long COVID symptoms)

68%

55%

31%

39%

27%

17%

| 18 | 30 | 42 |

Months after Policy Inception
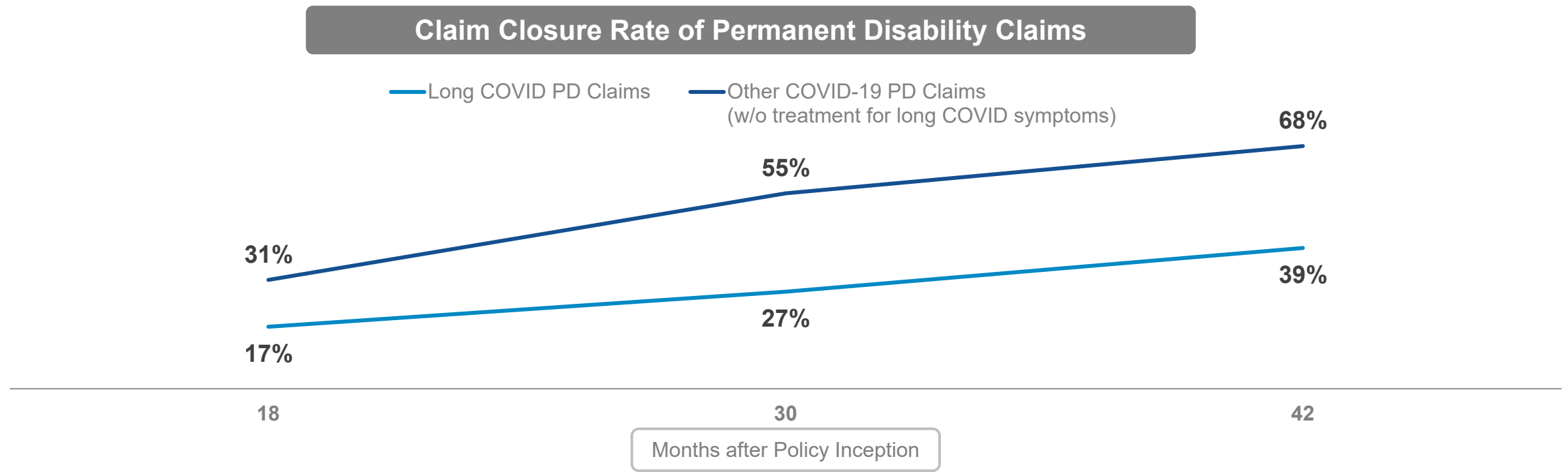
Among claims involving PD benefits, long COVID claims consistently close more slowly than other COVID-19 claims over time. At 30 months from policy inception, long COVID claims closed at less than half the rate of other COVID-19 claims.

While data valued at approximately 42 months is preliminary, only about 40% of long COVID claims involving PD benefits had closed, compared to about 70% of other COVID-19 claims.

The slow closure rate among long COVID claims involving PD benefits is a key underlying driver for the higher incurred indemnity losses (**Chart 14**) and higher incurred medical losses on these claims (**Chart 16**).

Chart 14: Average Incurred Indemnity Losses on Long COVID PD Claims Are More than 2 Times Higher Compared to Other COVID-19 PD Claims
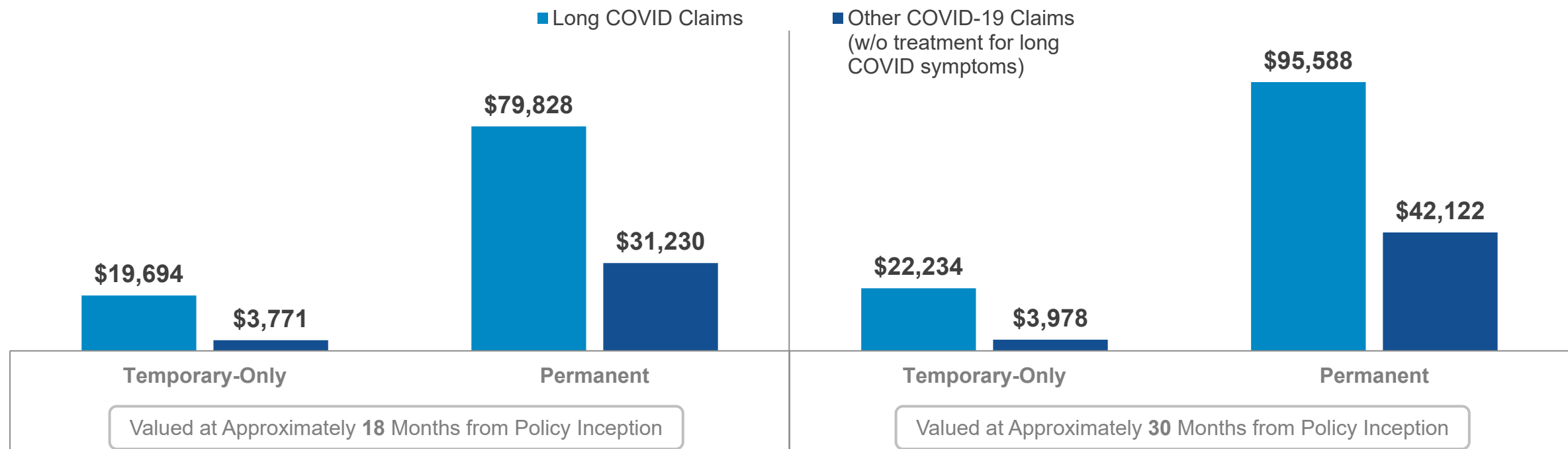
■ Long COVID Claims   ■ Other COVID-19 Claims (w/o treatment for long COVID symptoms)

Valued at Approximately 18 Months from Policy Inception

- Temporary-Only: $19,694 / $3,771
- Permanent: $79,828 / $31,230

Valued at Approximately 30 Months from Policy Inception

- Temporary-Only: $22,234 / $3,978
- Permanent: $95,588 / $42,122

The average incurred indemnity losses on long COVID claims with disability benefits are significantly higher than other COVID-19 claims. The percent difference is more pronounced for TD claims, while the absolute difference in indemnity losses is much larger on PD claims.

At 18 months, long COVID claims incurred about 5 times as much indemnity losses on TD claims compared to other COVID-19 claims, and more than 2 times on PD claims. At 30 months, the difference between long COVID and other COVID-19 claims remained consistent for both TD and PD claims, with the average incurred losses on long COVID PD claims approaching $100K.

The higher average incurred indemnity losses on long COVID claims are largely driven by a significantly higher share of PD claims, higher average PD rating and slower claim closure rate (**Charts 10**, **12** and **13**). These factors reflect the extent of disability associated with long COVID as well as a longer average duration of TD benefits that workers needed to fully recover (**Chart 11**).

Chart 15: Long COVID Claims More Likely to Involve Litigation and Have Higher ALAE Payments

Share of Claims with Nontrivial ALAE Payments (> $1,000)

- Long COVID Claims: **59%**
- Other COVID-19 Claims (w/o treatment for long COVID symptoms): **19%**
- Non-COVID-19 Claims: **28%**

Average Paid ALAE for Claims with Nontrivial ALAE Payments (>$1,000)

- Long COVID Claims: **$11,653**
- Other COVID-19 Claims (w/o treatment for long COVID symptoms): **$8,405**
- Non-COVID-19 Claims: **$8,038**
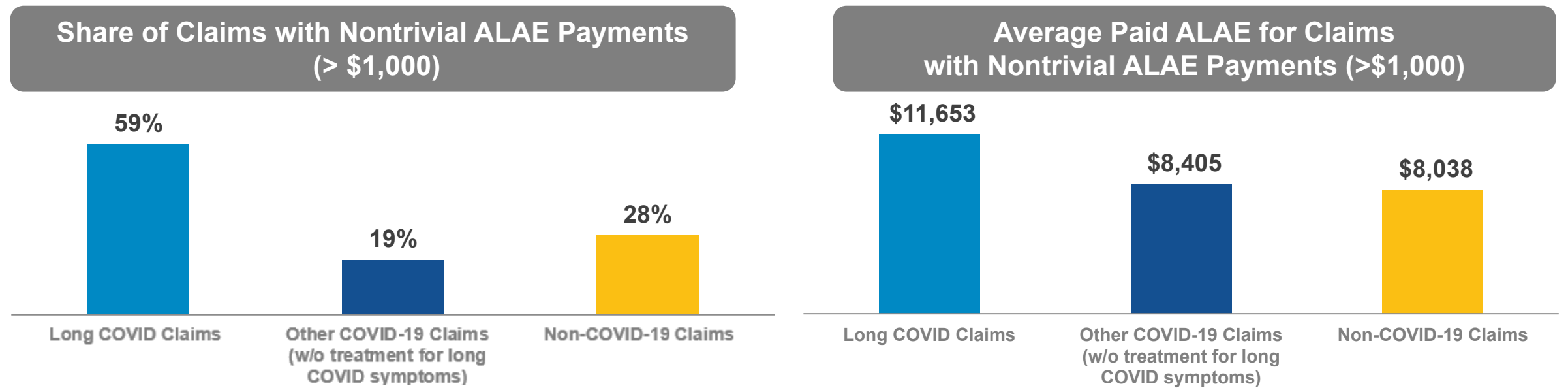
About 60% of long COVID claims involved nontrivial ALAE greater than $1,000, a proxy for litigation based on the WCIRB study on frictional costs. The higher likelihood of disputes on long COVID claims is consistent with the increasing share of payments for medical-legal services on these claims during the post-acute care period (**Charts 17** and **18**). In contrast, less than 30% of non-COVID-19 claims are estimated to be litigated, with the rate for other COVID-19 claims being even lower.

The higher proportion of long COVID claims involving nontrivial ALAE may be partly due to the current lack of diagnostic tests for long COVID and concerns about its long-term impacts on disability. As a result, more medical evidence may be needed to determine whether the symptoms are a result of COVID-19 infections and if treatments of these symptoms are warranted in the workers' compensation system. In addition, since long COVID claims are different from those typically adjudicated within the system, they may take more investigation to assess the associated disability.

Among claims with nontrivial ALAE payments, long COVID claims had significantly higher ALAE costs by about 40% than both non-COVID-19 claims and other COVID-19 claims.

Patterns of Long-Term Medical Costs and Treatments for Long COVID Claims

WCIRB California
Objective. Trusted. Integral.

Chart 16: Average Incurred Medical Losses on Long COVID PD Claims Are About 4 Times as High as Those on Other COVID-19 PD Claims

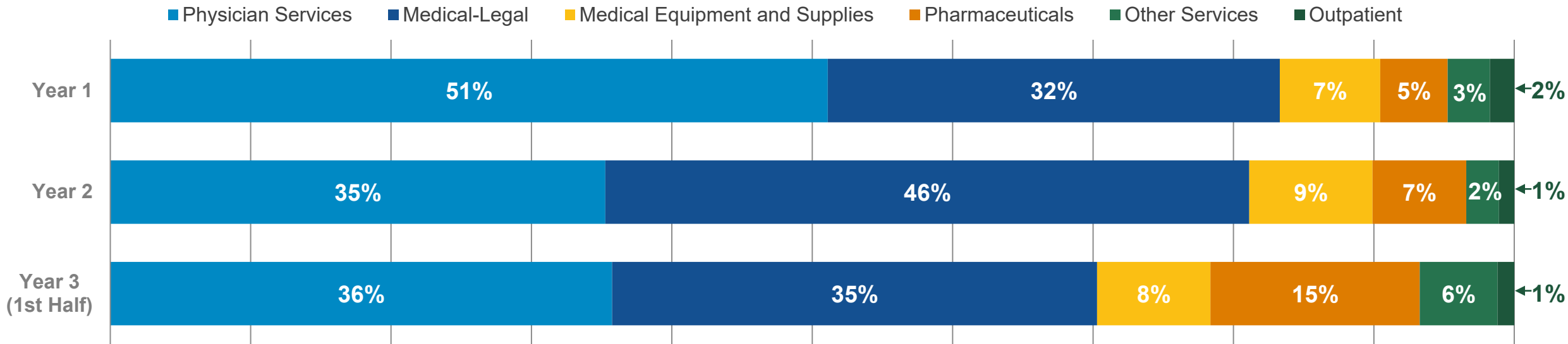Long COVID Claims ■ Other COVID-19 Claims (w/o treatment for long COVID symptoms) ■

$147,285 — Permanent (Long COVID, 18 months)
$170,725 — Permanent (Long COVID, 30 months)
$41,447 — Permanent (Other COVID-19, 18 months)
$41,848 — Permanent (Other COVID-19, 30 months)
$39,900 — Temporary-Only (Long COVID, 18 months)
$5,490 — Temporary-Only (Other COVID-19, 18 months)
$35,804 — Temporary-Only (Long COVID, 30 months)
$4,896 — Temporary-Only (Other COVID-19, 30 months)

Temporary-Only | Permanent

Valued at Approximately **18 Months** from Policy Inception

Valued at Approximately **30 Months** from Policy Inception

The average incurred medical losses on long COVID claims with disability benefits are significantly higher than other COVID-19 claims, with the difference growing over time.

At 18 months, long COVID claims incurred about 7 times as much medical losses on TD claims compared to other COVID-19 claims and almost 4 times as much on PD claims. At 30 months, the difference between long COVID and other COVID-19 claims grew for PD claims, with the average incurred losses on long COVID PD claims exceeding $170K.

Key drivers of the incurred medical losses on these long COVID claims include the use of home health care, ambulance services and portable oxygen systems. These services are often necessary to manage more severe symptoms and help patients recover.

Chart 17: Physician Services and Medical-Legal Services Together Account for Over 70% of Medical Payments for Long COVID Mild Claims

Share of Medical Payments for Mild Claims with Long COVID over a 30-Month Post-Acute Care Period

Legend: ■ Physician Services ■ Medical-Legal ■ Medical Equipment and Supplies ■ Pharmaceuticals ■ Other Services ■ Outpatient

Period	Physician Services	Medical-Legal	Medical Equipment and Supplies	Pharmaceuticals	Other Services	Outpatient
Year 1	51%	32%	7%	5%	3%	2%
Year 2	35%	46%	9%	7%	2%	1%
Year 3 (1st Half)	36%	35%	8%	15%	6%	1%

For long COVID claims with an initial mild infection, physician services, such as office visits and physical therapies, was the leading service type in the first year, accounting for more than half of medical payments.

In the second year, the share of payments for medical-legal services began to grow, representing the highest share (46%) of medical payments among all service types. This suggests that long COVID claims with an initial mild infection involved significant litigation or disputes. About 70% of medical-legal costs come from comprehensive evaluations, with a notable proportion attributed to additional record review costs.

Starting in the third year, pharmaceutical costs represent a growing share (15%) of medical payments, mostly driven by medications to treat heart disease, respiratory symptoms, migraines and blood clots.

Chart 18: Medical Payments for Long COVID Hospital Claims Concentrated in Medical Treatment in Inpatient and Outpatient Settings

Share of Medical Payments on Hospital Claims with Long COVID over a 30-Month Post-Acute Care Period

Legend: ■ Inpatient ■ Outpatient ■ Medical Equipment and Supplies ■ Physician Services ■ Pharmaceuticals ■ Medical-Legal ■ Other Services

	Inpatient	Outpatient	Medical Equipment and Supplies	Physician Services	Pharmaceuticals	Medical-Legal	Other Services
Year 1	28%	21%	18%	23%	4%	4%	◄1%
Year 2	19%	22%	18%	15%	13%	11%	◄1%
Year 3 (1st Half)	13%	20%	25%	10%	16%	16%	◄1%
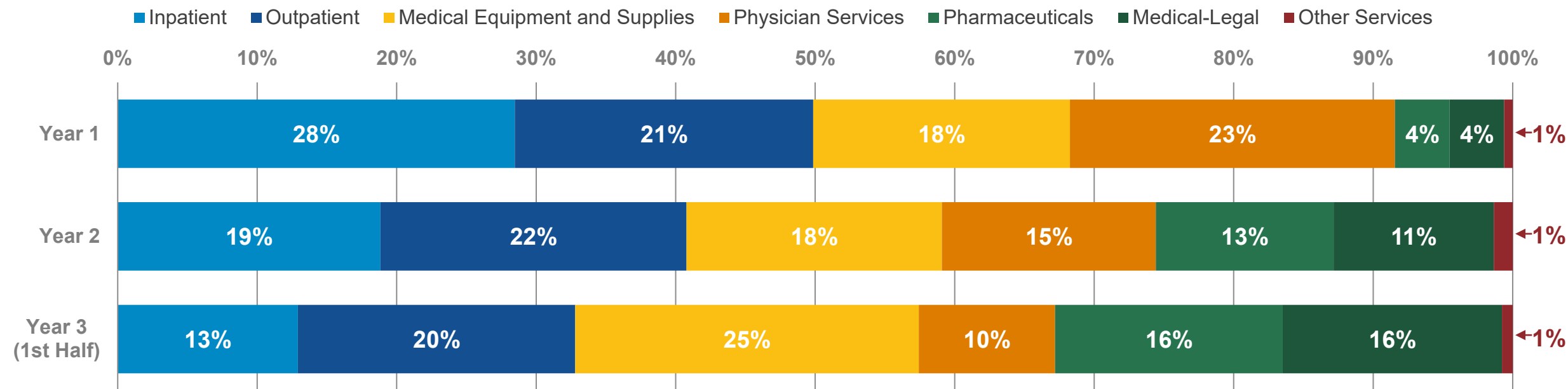
🔑 For long COVID claims involving hospitalization for the initial infection, medical treatments in both inpatient and outpatient settings accounted for over 90% of the medical payments in the first year. About 30% of medical payments are related to inpatient care, largely driven by re-admissions for complex medical conditions. Medical-legal services accounted for only 4% of the payments in the first year.

🔑 Starting in the second year, however, there is a noticeable uptick in the payment share of both pharmaceuticals and medical-legal services, reaching 16% in the first half of the third year. The increased share of pharmaceutical payments was driven by medications to treat complex medical conditions, such as heart disease. The medical-legal payments were concentrated in comprehensive evaluations. The increase in the payment shares for pharmaceuticals and medical-legal services is also partly driven by decreases in the share of medical payments for active treatment, such as inpatient and physician services.

Technical Appendix

A. List of Leading Long COVID Symptoms Used to Identify Claims Involving Medical Treatment for Long COVID

Long COVID Symptom Category	ICD Code
Cardiac	B332, I05-I09, I20-I25, I40-I43, I47-I49, I514, J108, J118, O903, Z986
Circulatory	D473, D65, D68-D69, D758, G46, I63, I67-I68, I74, I82, M362, R00-R01, R030
Diabetes	E102
General Symptoms	Malaise and Fatigue (R531, R538), Fever (R50), Headache (R51), Unspecified pain (R52), Digestive symptoms (R19), Migraine (G43), Constipation (K590), Bloating (R140), Lightheadedness (R42)
Mental / Psychiatric	F063-F064, F325, F334, F348-F349, F39, F40-F41, G47, R063, R45-R46
Musculoskeletal	M255-M256, M546-M549, M62-M63, M791, M796
Neurological	A85-A86, F01-F03, F05, G04-G05, G26, G31, G50-G59, G61-G65, G933, R26-R29, R400, R41, R438, R439, R44
Renal	N17-N19
Respiratory	I26, J06, J09, J12, J22, J80-J84, J90-J99, R05-R09, R91
Continued Care for Post-COVID-19 Conditions	B948, U071, U099

B. Methodology of Long COVID Analysis in the Group Health Data

The Group Health Data

Similar to the previous WCIRB studies on long COVID, we analyzed de-identified COVID-19 patient data in the Merative™ MarketScan® Research Databases, including the Commercial Claims and Encounters Database and the Medicare Supplemental and Coordination of Benefits Database (collectively referred to as "group health data" in this report). The group health data does not include Medi-Cal data but does include medical data on a sample of Medicare-eligible California workers receiving both Medicare benefits and employer-sponsored health insurance coverage. Our analysis is based on a sample of about 37,000 patients treated for COVID-19 and 74,000 non-COVID-19 patients treated in the California group health insurance system between 2018 and 2023.

Definition of COVID-19 Claims

COVID-19 claims represent patients who were aged 16 and above, had active employment and had at least one paid medical service with an ICD code for COVID-19 (U07.1) between April 2020 and March 2021. We excluded patients with only COVID-19 test or vaccine transactions reported in the dataset.

Patients who were hospitalized for COVID-19 are defined as those with an ICD code for COVID-19 (U07.1) at hospital admission and with inpatient diagnostic-related group (DRG) code for respiratory or viral infections, including 003-004, 166-168, 177-179, 189, 193-195, 199-201, 204-208, 865-866, 870-872. The distribution of COVID-19 claims by clinical severity is shown on page 37.

Definition of Long COVID Claims

Long COVID claims represent patients with a COVID-19 infection and subsequently two medical treatments separately for a minimum of two distinct long COVID symptoms (represented by two distinct ICD codes) over a 30-month post-acute care period. The adjustment is necessary for improving the accuracy of identifying long COVID cases and reducing false positives as the group health insurance system is more likely to capture a broad range of medical conditions beyond those specific to COVID-19.

The group health data includes pre-pandemic longitudinal medical transaction data of COVID-19 patients; therefore, we were able to identify claims with long COVID symptoms that had not been treated during the two years preceding the pandemic (January 2018 through February 2020). As a result, long COVID claims in the group health data are those that involved treatment for new long COVID symptoms after the initial COVID-19 infection.

Estimation of Long COVID Prevalence

Similar to the 2023 WCIRB study on long COVID, we used a matched case-control study design and analyzed the excess prevalence of long COVID between COVID-19 claims (cases) and non-COVID-19 claims (control). The case group consisted of all workers with COVID-19 treatment identified in the group health data. The non-COVID-19 claims in the control group represent California workers who were aged 16 and above, had active employment and had at least one medical visit for non-COVID-19 medical conditions from April 2020 through March 2021 (no ICD code U07.1 reported on any medical transaction in the group health data). The non-COVID-19 claims in the control group were categorized in the mild (no hospital care), severe (required hospital care without ICU care) and critical (required ICU care) groups, using the same methodology as the COVID-19 claims in the case group. The control group was then matched to the case group separately for mild, severe and critical groups based on age, gender and the time (service month) of initial care, using propensity score matching.

The prevalence of long COVID over a 30-month post-acute care period in the group health insurance system is estimated as the difference in the prevalence of long COVID between the case group and control group as shown on page 38. This is to account for the background rates of symptoms in the absence of the pandemic.

For more details on the methodology, please see the Research Methods section of the study report *Medical Treatments and Costs of COVID-19 Claims and "Long COVID" in the California Workers' Compensation System – 2023 Update.*

B. Methodology of Long COVID Analysis in the Group Health Data
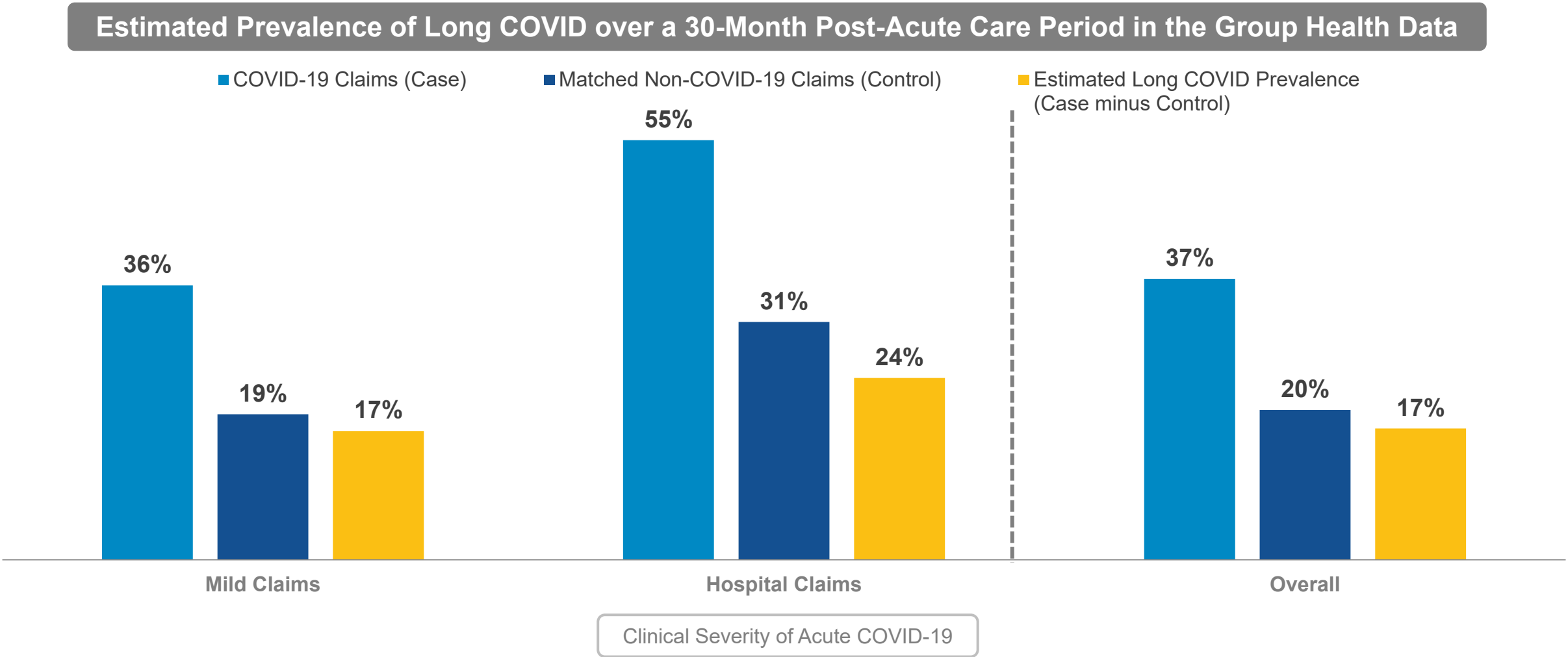
Comparison of the Distribution of COVID-19 Claims by Clinical Severity

Clinical Severity of Acute COVID-19	Share of COVID-19 Claims in the Workers' Compensation Data (N = 8,836)	Share of COVID-19 Claims in the California Group Health Data (N = 36,999)
Mild Claims (no hospital care)	93.4%	95.4%
Severe Claims (w/ hospital care but w/o ICU care)	3.3%	2.3%
Critical Claims (w/ ICU care)	3.3%	2.3%
Total	100%	100%

Note: Accident date range for COVID-19 claims in the workers' compensation data and group health data is April 2020 – March 2021.
Source: WCIRB medical transaction data, WCIRB unit statistical data, WCIRB indemnity transaction data, Merative™ MarketScan® Research Databases.

B. Methodology of Long COVID Analysis in the Group Health Data

Estimated Prevalence of Long COVID over a 30-Month Post-Acute Care Period in the Group Health Data

- ■ COVID-19 Claims (Case)
- ■ Matched Non-COVID-19 Claims (Control)
- ■ Estimated Long COVID Prevalence (Case minus Control)

Mild Claims
- 36%
- 19%
- 17%

Hospital Claims
- 55%
- 31%
- 24%

Overall
- 37%
- 20%
- 17%

Clinical Severity of Acute COVID-19

Note: Accident date range for COVID-19 claims and matched non-COVID-19 claims is April 2020 – March 2021.
Source: Merative™ MarketScan® Research Databases.

C. Leading Pre-Existing Comorbidities Among COVID-19 Patients Treated in the California Group Health Insurance System

Share of COVID-19 Claims by Leading Type of Comorbidities Treated Between January 2018 and February 2020

■ Mild Claims ■ Hospital Claims
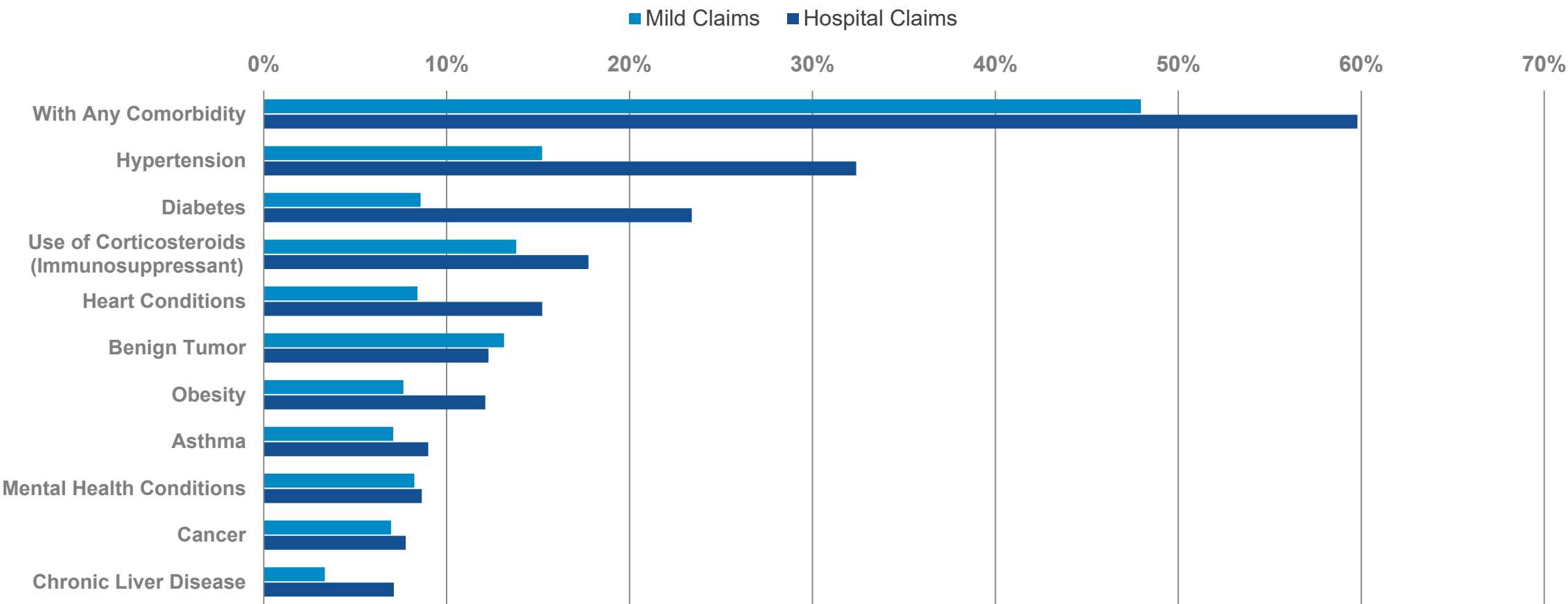
Note: The categories of comorbidities are not mutually exclusive (e.g., one claim can have multiple comorbidities).
"With Any Comorbidity" represents the share of COVID-19 claims with any specific comorbidity identified in the group health data.
Source: CDC. Underlying Conditions and the Higher Risk for Severe COVID-19

D. More Info and Sources by Chart

Background: Trends of Long COVID Globally, in the U.S. and in California

Source:
- Al-Aly, Z., Davis, H., McCorkell, L., Soares, L., Wulf-Hanson, S., Iwasaki, A., & Topol, E. J. (2024). Long COVID science, research and policy. *Nature medicine*, *30*(8), 2148–2164.
- U.S. Census Bureau's Household Pulse Survey on Long COVID, accessed on August 28, 2024. Long COVID is defined as any new symptoms lasting for at least 3 months after a COVID-19 infection.
- Bach, K. (2022) New data shows Long COVID is keeping as many as 4 million people out of work. The Brookings Institution.
- Cutler, DM (2002) The Costs of Long COVID. JAMA Health Forum 3, e221809.
- Cutler, DM (2002) The Economic Cost of Long COVID: an update. Harvard Kennedy School.
- Savych, B (2023) Long COVID in the workers' compensation system in 2020 and 2021. Workers' Compensation Research Institute.
- Choo M, Moss RJ and Arnautović N (2022). Long COVID in Workers' Compensation: A First Look. NCCI.
- Zhang J, Chen L and Yu Y (2022). Medical Treatments and Costs of COVID-19 Claims and an Early Look at "Long COVID" in the California Workers' Compensation System. WCIRB.
- Zhang J, Yu Y and Chen L (2023). Medical Treatments and Costs of COVID-19 Claims and "Long COVID" in the California Workers' Compensation System – 2023 Update. WCIRB.

Research Methods

- This study analyzed COVID-19 workers' compensation insured claims that had an accident date between April 2020 and January 2022 with paid transactions in the WCIRB's medical transaction database and with medical payments in either the Unit Statistical Report (USR) or indemnity transaction database as of June 7, 2024.
- COVID-19 claims in the workers' compensation system are defined for the purpose of this study as those reported with a Cause of Injury or Nature of Injury Code 83 in the WCIRB indemnity transaction data or the WCIRB USR data, or those reported with a Catastrophe Number 12 in the WCIRB USR data.
- Non-COVID-19 claims are defined as claims in the WCIRB USR, indemnity transaction and medical transaction databases with an accident date during the same period.
- Paid medical services were provided between April 2020 and May 2024 for both COVID-19 and non-COVID-19 claims as of June 7, 2024.
- COVID-19 claims are categorized as mild, severe and critical by clinical severity of acute COVID-19 based on the primary medical procedure code information in the WCIRB medical transaction data.
- Death claims are identified based on WCIRB indemnity transaction data or injury type in the USR data.
- Denied claims are excluded from the analysis.

Source:
- U.S. Centers for Disease Control and Prevention (CDC): Clinical overview of Long COVID. July 12, 2024. https://www.cdc.gov/covid/hcp/clinical-overview/index.html
- Ely, E. W., Brown, L. M., & Fineberg, H. V. (2024). Long Covid Defined. New England Journal of Medicine.
- National Academies of Sciences, Engineering, and Medicine. 2024. Long-Term Health Effects of COVID-19: Disability and Function Following SARS-CoV-2 Infection. Washington, DC: The National Academies Press.

D. More Info and Sources by Chart
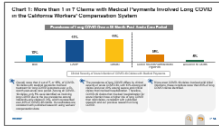
Chart 1: More than 1 in 7 Claims with Medical Payments Involved Long COVID

- Prevalence of long COVID by clinical severity and among claims with medical payments is calculated as the number of long COVID claims relative to COVID-19 claims with medical payments over a 30-month post-acute care period for each category.
- Prevalence of long COVID among all COVID-19 claims is calculated as the number of long COVID claims relative to all COVID-19 claims over a 30-month post-acute care period.
- The share of indemnity-only claims of non-COVID-19 claims is less than 1%, much lower than that of COVID-19 claims.

Source:
- Item 1 of the September 12, 2023 WCIRB Actuarial Committee Meeting Presentation: https://www.wcirb.com/sites/default/files/documents/20230912_ac_presentations.pdf;
- Savych, B (2023) Long COVID in the workers' compensation system in 2020 and 2021. Workers' Compensation Research Institute.
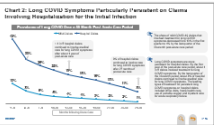
Chart 2: Long COVID Symptoms Particularly Persistent on Claims Involving Hospitalization for the Initial Infection

- Hospital claims include both severe claims that involved hospitalization without an intensive care unit (ICU) stay and critical claims that involved an ICU stay.
- Prevalence of long COVID is calculated as the number of claims with any long COVID treatment during each time period relative to COVID-19 claims with medical payments over a 30-month post-acute care period for mild and hospital claims.
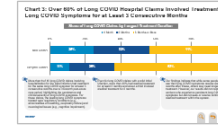
Chart 3: Over 60% of Hospital Claims Involved Treatment for Long COVID for at Least 3 Consecutive Months

- Multiple long COVID symptoms can be treated on a long COVID claim in the workers' compensation system. The treatment duration is based on the long COVID symptom with the longest treatment duration for each claim.
- The share of long COVID mild or hospital claims is calculated as the number of long COVID claims involving the treatment lasting for the duration relative to all long COVID mild or hospital claims.
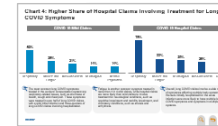
Chart 4: Higher Share of Hospital Claims Involving Treatment for Long COVID Symptoms

- The share of claims for each long COVID symptom category is calculated as the number of claims with any long COVID symptom in the long COVID symptom category relative to the total number of long COVID claims. One long COVID claim can be in multiple symptom categories.
- The continued care for post-COVID-19 conditions (represented by ICD codes B948, U071 and U099) was not included in the chart.
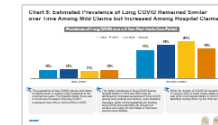
Chart 5: Prevalence of Long COVID Remained Similar over Time Among Mild Claims but Increased Among Hospital Claims

- Prevalence of long COVID is calculated as the number of long COVID claims relative to COVID-19 claims with medical payments for each accident year over a 2-year post-acute care period. The 2-year post-acute care period is the longest available duration for long COVID claims with an accident date in January 2022.

D. More Info and Sources by Chart
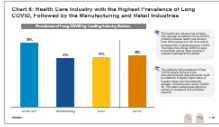
Chart 6: Health Care Industry with the Highest Prevalence of Long COVID, Followed by Manufacturing and Retail

- Industry sectors are based on the North American Industry Classification System (NAICS) sectors. The NAICS sector assigned to each claim is derived from a crosswalk between the NAICS sector codes and the reported classification codes in the WCIRB USR data and WCIRB indemnity transaction data.
- Prevalence of long COVID by leading industry sector is calculated as the total number of long COVID claims in each industry sector relative to COVID-19 claims with medical payments in the same industry sector.

Source: Murti, M., Achonu, C., Smith, B. T., Brown, K. A., Kim, J. H., Johnson, J., Ravindran, S., & Buchan, S. A. (2021). COVID-19 Workplace Outbreaks by Industry Sector and Their Associated Household Transmission, Ontario, Canada, January to June, 2020. *Journal of occupational and environmental medicine*, *63*(7), 574–580.
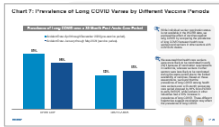
Chart 7: Prevalence of Long COVID Varies by Different Vaccine Periods

- Prevalence of long COVID by vaccine period is calculated as the total number of long COVID claims in each vaccine period relative to COVID-19 claims with medical payments in the same vaccine period.

Source:
- Xie Y, Choi T, Al-Aly Z (2024) Post-acute Sequelae of SARS-CoV-2 in the Predelta, Delta and Omicron eras. The New England Journal of Medicine.
- Sauerwein K (2014) Risk of long COVID declined over course of pandemic: Drop attributed mostly to vaccination but remaining risk still significant. Washington University School of Medicine in St. Louis.
- California Department of Public Health Order on August 5, 2021.https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/Order-of-the-State-Public-Health-Officer-Health-Care-Worker-Vaccine-Requirement.aspx

Source data for Charts 8 and 9:
Merative™ MarketScan® Research Databases, the group health data. COVID-19 claims in the data had at least one paid medical service with an ICD code for COVID-19 (U07.1) between April 2020 and March 2021. **Chart 9** includes WCIRB medical transaction data, WCIRB indemnity transaction data and WCIRB USR data on COVID-19 claims with an accident date between April 2020 and March 2021.
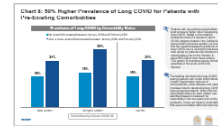
Chart 8: 50% Higher Prevalence of Long COVID for Patients with Pre-Existing Comorbidities

- Patients with comorbidities are defined as those with at least one comorbidity that was treated between January 2018 and February 2020 based on the medical service information in the group health data. The prevalence of long COVID by comorbidity status are estimated following the methodology described in the **Technical Appendix B**.
- The list of comorbidities is based on the published information from the CDC (see **Technical Appendix C**).
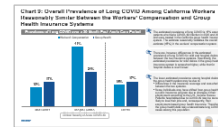
Chart 9: Prevalence of Long COVID Reasonably Similar Between the Workers' Compensation and Group Health Insurance Systems

- The estimation of the prevalence of long COVID in the group health data follows the methodology described in the **Technical Appendix B**, while the estimation of the long COVID prevalence in the workers' compensation system used the same methodology as **Chart 1**.
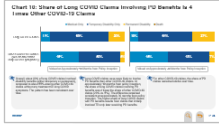
D. More Info and Sources by Chart

Chart 10: Share of Long COVID Claims Involving Permanent Disability Benefits is 4 Times Other COVID-19 Claims

- Claims involving temporary disability (TD) only include indemnity claims that do not involve permanent disability (PD) or fatality. Claims involving PD include those involving permanent partial disability and those involving permanent total disability.
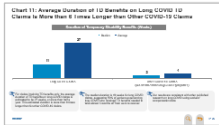

Chart 11: Average Duration of Temporary Disability Benefits on Long COVID Claims is More than 6 Times Longer than Other COVID-19 Claims

- TD duration is based on the number of weeks/days paid for TD or the difference between the start date and end date of TD benefits reported in the Subsequent Reports of Injury (SROI) in the WCIRB indemnity transaction data. If such information is not reported, TD duration is calculated as the cumulative indemnity payments reported for TD divided by two-thirds of the injured workers' pre-injury weekly wage reported in SROI, subject to the maximum and minimum weekly TD benefit rates set by the Division of Workers' Compensation.

Source: DWC workers' compensation benefits (ca.gov)
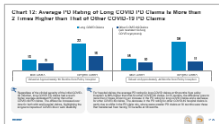
Chart 12: Average Permanent Disability Rating of Long COVID PD Claims Is More than 2 Times Higher than That of Other COVID-19 PD Claims

- In California, the PD rating is based on the extent of PD and determines the amount of PD benefits the injured worker receives.
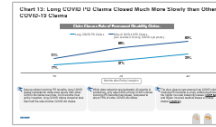
Chart 13: Long COVID PD Claims Closed Much More Slowly than Other COVID-19 Claims

- Claim closure rate on PD claims represents number of closed PD claims relative to all PD claims over each period.

Chart 14: Average Incurred Indemnity Losses on Long COVID Claims Are More Than 2 Times Higher Compared to Other COVID-19 Claims

- Incurred indemnity losses include indemnity payments and reserves.
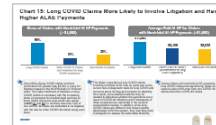
Chart 15: Long COVID Claims More Likely to Involve Litigation and Have Higher ALAE Payments

- Claim share is calculated as the number of claims with paid ALAE greater than $1,000 valued at approximately 30 months from policy inception relative to all claims in each category.
- Average paid ALAE is calculated as the total paid ALAE divided by number of all claims in each category.

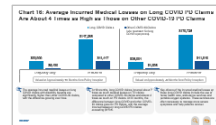**Source:** Frictional Cost in the Workers' Compensation System. WCIRB.

Chart 16: Average Incurred Medical Losses on Long COVID PD Claims Are 4 Times as High as Those on Other COVID-19 PD Claims

- Incurred medical losses include medical payments and reserves.
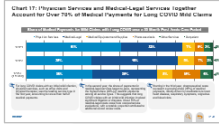
D. More Info and Sources by Chart

Chart 17: Physician Services and Medical-Legal Services Together Account for Over 70% of Medical Payments for Long COVID Mild Claims

- Medical equipment and supplies include ambulance services, durable medical equipment, prosthetics, orthotics and supplies used outside a physician's office, home health services and interpreter services.
- Other services include copy services, dental and medical liens.
- Over 90% of medical-legal services in year 1 of the post-acute care period were provided after the April 1, 2021 Medical-Legal Fee Schedule became effective.
- The chart includes COVID-19 claims with an accident date between April 2020 and July 2021.
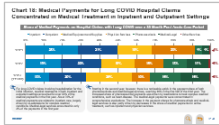
Chart 18: Medical Payments for Long COVID Hospital Claims Concentrated in Medical Treatment in Inpatient and Outpatient Settings

- Medical equipment and supplies include ambulance services, durable medical equipment, prosthetics, orthotics and supplies used outside a physician's office, home health services and interpreter services.
- Other services include copy services, dental and medical liens.
- Physician services, pharmaceuticals, HCPCS and outpatient services were considered medical services provided in the outpatient settings.
- The chart includes COVID-19 claims with an accident date between April 2020 and July 2021.

Conditions and Limitations

1 The analysis of the California workers' compensation claims is based solely on the experience of insured employers and does not reflect self-insured employer experience. The analysis of COVID-19 claims in the group health data is based on a sample of workers of both insured and self-insured employers in California and does not reflect the entire group health care system.

2 The COVID-19 workers' compensation claims included in the analysis are, unless otherwise specified, COVID-19 claims with paid transactions in the WCIRB's medical transaction database and with medical payments in either the USR or indemnity transaction database as of June 7, 2024. We conducted reasonableness checks on these claims, such as age and industry mix, and believe this group of claims is a good representation of COVID-19 claims in the workers' compensation system.

3 The estimated prevalence of long COVID using medical transaction data in both the workers' compensation system and group health insurance system represents medically treated long COVID symptoms among workers in either system, which may be those with more serious health complications of COVID-19 that warranted medical attention. However, it is important to note that our estimates do not capture workers who received care for long COVID symptoms outside either system or chose to not seek care for their symptoms. Furthermore, the clinical guidelines for diagnosing and treating long COVID are still evolving, and the biological mechanisms and full range of long COVID symptoms are not yet fully understood. Therefore, our long COVID analysis, which relied on the ICD information reported on the medical service records in the two datasets, was based on published scientific information available at the time of the analysis.

4 The workers' compensation data in this study reflects information on claims submitted by insurers to the WCIRB through submissions of USR data, indemnity transaction data and medical transaction data. While the individual insurer data submissions are regularly checked for consistency and comparability with other data submitted by the insurer, as well as with data submitted by other insurers, the source information underlying each insurer's data submission is not audited by the WCIRB.

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