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Long COVID Affects People with Higher Medical Needs and is Associated with Higher Per Person Health Spending

The Health Care Cost Institute (HCCI) has published data illustrating the impact of the COVID-19 pandemic on the health care system. Although most people who experience an acute COVID infection recover without long-term effects, a substantial proportion of people [experience symptoms](#) long after their initial infection (Long COVID).

Important research is underway to understand the prevalence of Long COVID and how Long COVID intersects with people's risk factors. Studies about the clinical pathways, patient-specific needs, and treatment for Long COVID are highlighting necessary medical care and intervention. To inform public and private decisionmakers' efforts to support and treat patients, this study uses HCCI's unique health care claims dataset to better understand who suffers from Long COVID.

Specifically, we identify impacts of Long COVID on the health care system and health care service use and costs, including:

- The percentage of people with acute COVID that experience Long COVID symptoms.
- How the characteristics of people with Long COVID differ from people who do not develop Long COVID.

- The most common symptoms experienced by people with Long COVID.
- Spending patterns among people with Long COVID compared to people with acute COVID who did not develop Long COVID.

1 in 4 People with Acute COVID Infection Experienced Long COVID Symptoms

In HCCI's data, more than 1.3 million people who were continuously enrolled for 18 months had an acute COVID infection between April 1, 2020, and June 30, 2021. (See methods section for more details about our analytical approach.) Of those, more than 300,000 experienced commonly reported Long COVID symptoms a month or more after the acute COVID infection. See Figure 3 below.

Sex and Age Affect Likelihood of Long COVID

As shown in Figures 1 and 2, the people in our sample experiencing Long COVID symptoms were more likely to be female and were slightly older when they had their initial acute COVID diagnosis.

Figure 1. People with Long COVID symptoms by sex

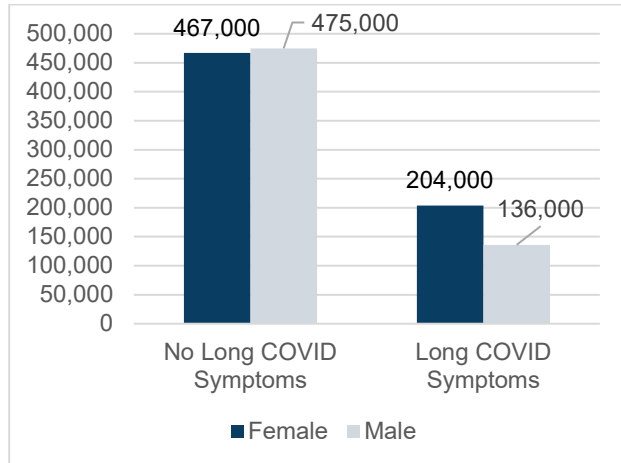
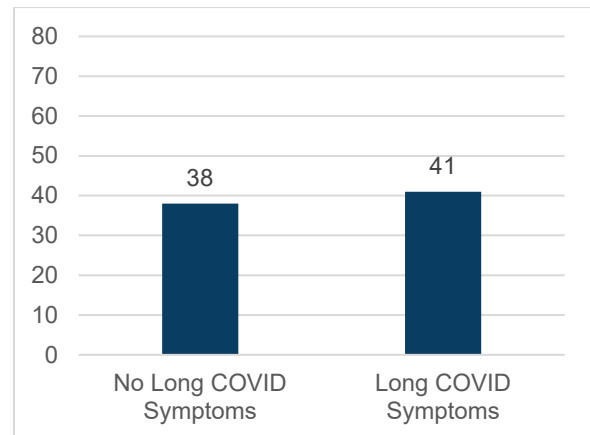


Figure 2. Average age when diagnosed with acute COVID



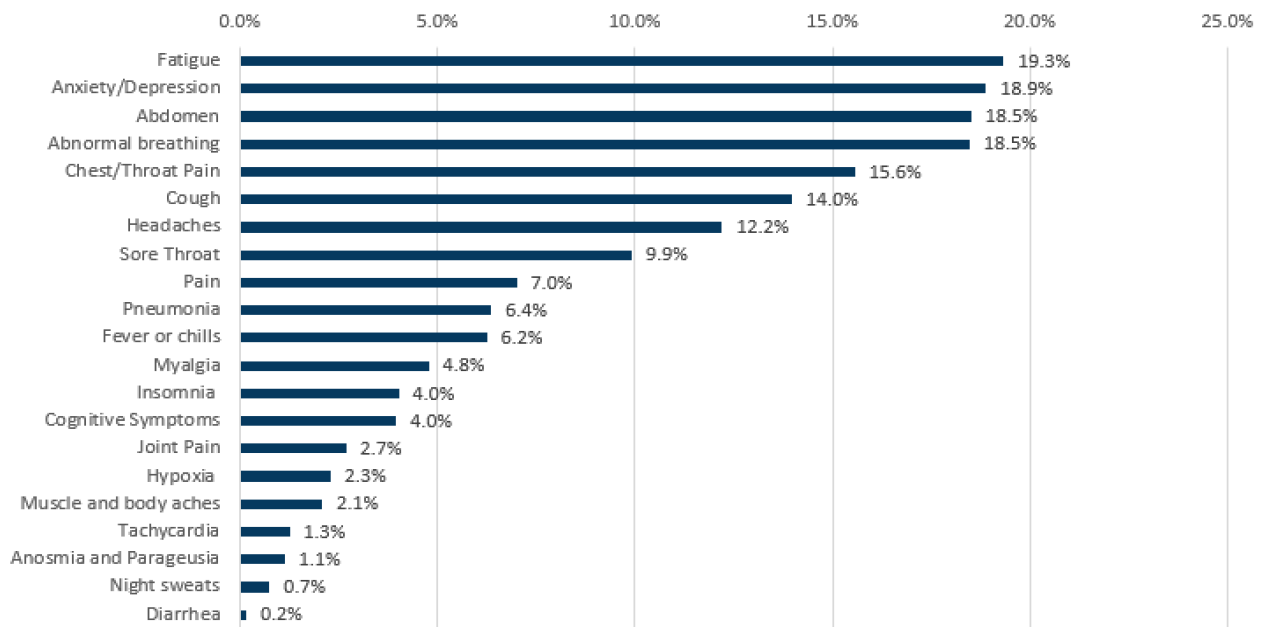
People Experienced Long COVID Symptoms Whether or Not They Were Hospitalized with Acute COVID

Overall, few (0.5%) of the people with an acute COVID diagnosis in our sample were hospitalized during the acute COVID period. People with Long COVID symptoms were not more likely to have been hospitalized during their acute COVID period than those without Long COVID symptoms. In fact, people with Long COVID symptoms were slightly less likely to have been hospitalized during their acute COVID diagnosis (0.4% of people with Long COVID symptoms compared to 0.53% of people without Long COVID symptoms).

Fatigue and Anxiety/Depression Were the Most Common Long COVID Symptoms

Among the more than 300,000 people in our cohort who experienced Long COVID symptoms, the most frequently reported symptoms were fatigue, anxiety/depression, abdominal symptoms, and abnormal breathing. About 19% of people had each of these symptoms diagnosed on a claim. (Note: HCCI's data include only symptoms captured in health insurance claims, which may not reflect the full range of symptoms people experience. Additionally, one person could experience multiple symptoms.). Figure 3 shows the frequency of Long COVID symptoms among people in HCCI's cohort.

Figure 3. Percent of Individuals with Specific Long COVID symptoms



The Majority of Long COVID Patients Experienced Only One Symptom

Most people in the HCCI cohort experienced only one Long COVID symptom (65%). About 23% of people experienced two symptoms, and 8% had 3 symptoms. A small number of people in our sample (less than 0.1%) had eight or more symptoms.

People with More than One Symptom Were Most Likely to Experience Abnormal Breathing, Fatigue, and Chest/Throat Pain

Figure 4 shows that people with one Long COVID symptom most frequently experienced Anxiety/Depression and Abdominal Symptoms. Among people with two, three, or four Long COVID symptoms, however, Abnormal Breathing and Fatigue were the most common.

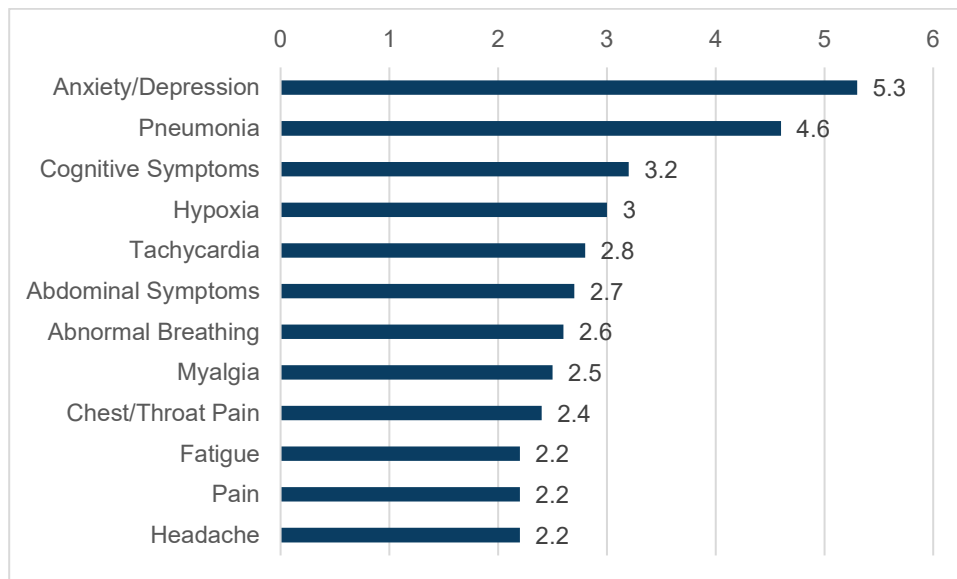
Figure 4. Most common symptoms for people with Long COVID

One Symptom	Two Symptoms
Anxiety/Depression 15%	Abnormal Breathing 24%
Abdominal Symptoms 15%	Fatigue 23%
Fatigue 11%	Chest/Throat Pain 20%
Cough 8%	Anxiety/Depression 20%
Three Symptoms	Four Symptoms
Abnormal Breathing 40%	Abnormal Breathing 54%
Fatigue 35%	Fatigue 45%
Chest/Throat Pain 32%	Chest/Throat Pain 41%
Cough 29%	Cough 37%

Some People with One Long COVID Symptom Still Had Multiple Follow-Up Visits

Even if people with Long COVID experienced only one symptom, that symptom could lead to multiple follow-up visits. Although most symptoms required fewer than three follow-up visits, the most common symptoms averaged two or more. Specifically, people with fatigue averaged 2.2 follow-up visits, and people with depression/anxiety averaged more than 5 visits. Symptoms such as sore throat, night sweats, and muscle and body aches, averaged closer to one follow-up visit. Figure 5 shows the symptoms associated with the most follow-up visits. (The full list is available in downloadable data.)

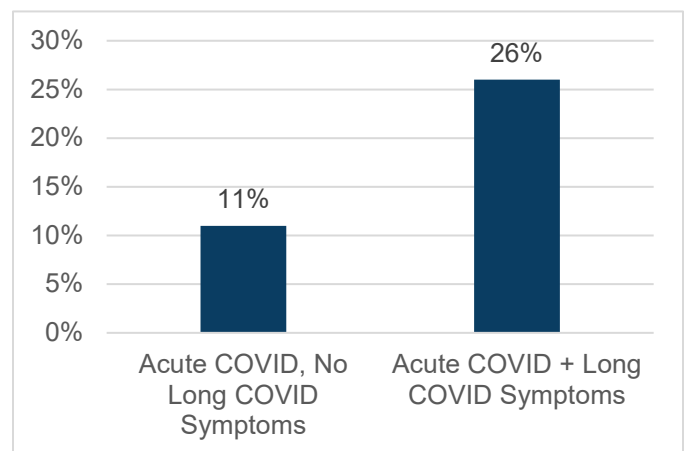
Figure 5. Follow up visits associated with Long COVID symptoms



Subsequent COVID Diagnoses More Common Among People with Long COVID

In addition to Long COVID symptoms, it appears that people with Long COVID were more likely to be re-diagnosed with acute COVID following their initial diagnosis. Among patients with an acute diagnosis, nearly 15% had a subsequent acute COVID diagnosis. When looking just at the people with Long COVID symptoms, we find that almost 26% had a subsequent acute COVID diagnosis. In contrast, only approximately 11% of people without Long COVID symptoms had an additional acute COVID diagnosis.

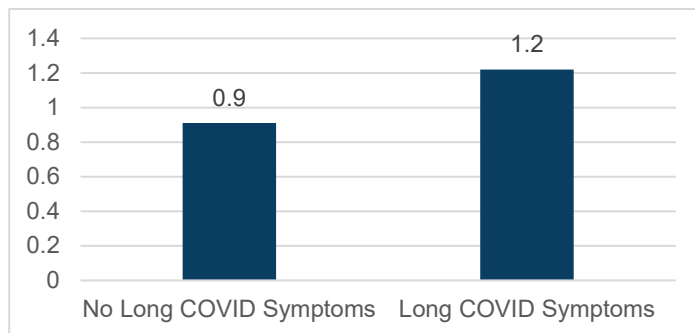
Figure 6. Percentage of people with acute COVID who had a subsequent COVID diagnosis



People with Long COVID Symptoms Appear to have Higher Medical Needs

One measure of chronic medical need is the Charlson comorbidity index, a weighted index that accounts for the number and severity of chronic conditions that could affect a person's inpatient mortality. A score of 0 represents lowest comorbidity burden, and an increasing score reflects an increasing number and/or severity of comorbid conditions an individual has. People with Long COVID symptoms had slightly higher medical needs as measured by the Charlson comorbidity index. Specifically, people with Long COVID symptoms had an average score of 1.2 (indicating evidence of mild comorbidity health burden) while people without Long COVID symptoms had a slightly lower Charlson score of 0.9.

Figure 7. Average Charlson Score for people with Long COVID symptoms



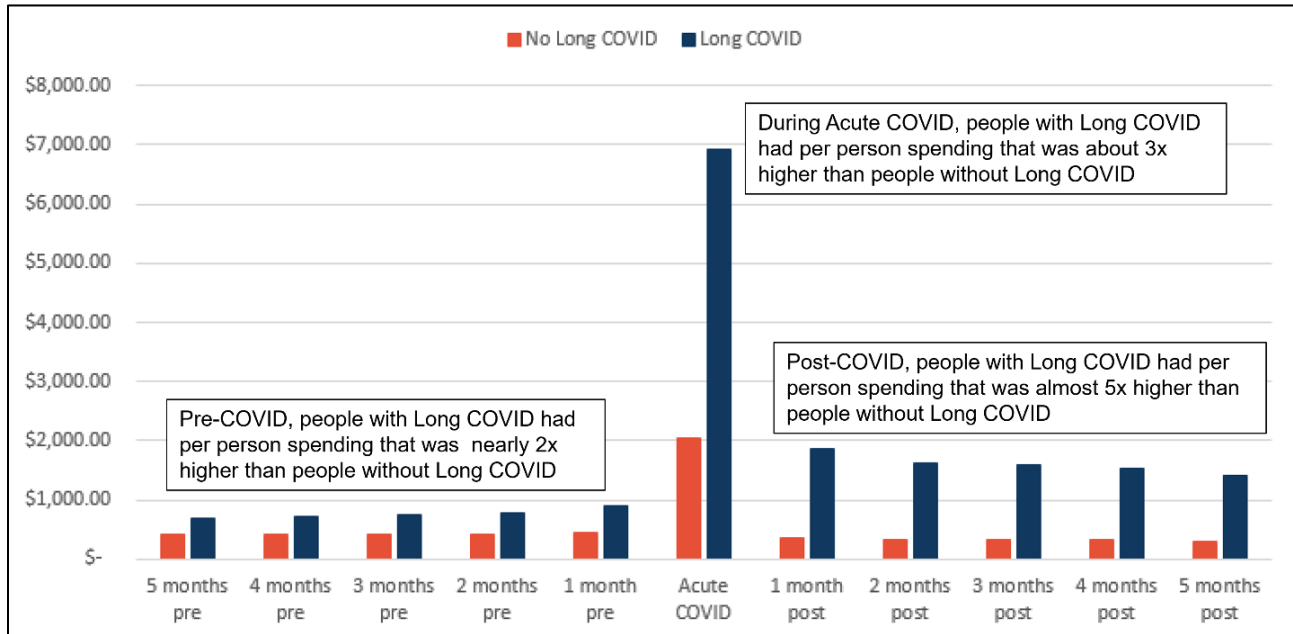
Additionally, as discussed in the next section, people with Long COVID symptoms had higher per person health care spending before their acute COVID diagnosis than people without Long COVID symptoms. Higher spending before acute COVID diagnosis suggests greater use of health care services and greater medical needs.

People with Long COVID Symptoms Had Higher Health Care Spending

We calculated per-person spending for everyone in the HCCI cohort with an acute COVID diagnosis over three distinct periods: the five months prior to an acute COVID diagnosis (Pre-COVID), the one-month period including the acute COVID diagnosis (COVID), and the five months after the initial acute COVID diagnosis (Post-COVID). Per person spending represents total spending (amount paid by insurance and amount paid out-of-pocket).

People with Long COVID symptoms had higher per person spending in each of the three periods. In the five-month period before they had acute COVID, people who later experienced Long COVID symptoms had per person spending nearly twice as high as people who did not have Long COVID symptoms. During COVID, people who later developed Long COVID symptoms had spending that was about three times higher. The greatest difference in per person spending occurred in the post-COVID period. People with Long COVID symptoms had spending that was almost five times higher than people without Long COVID symptoms.

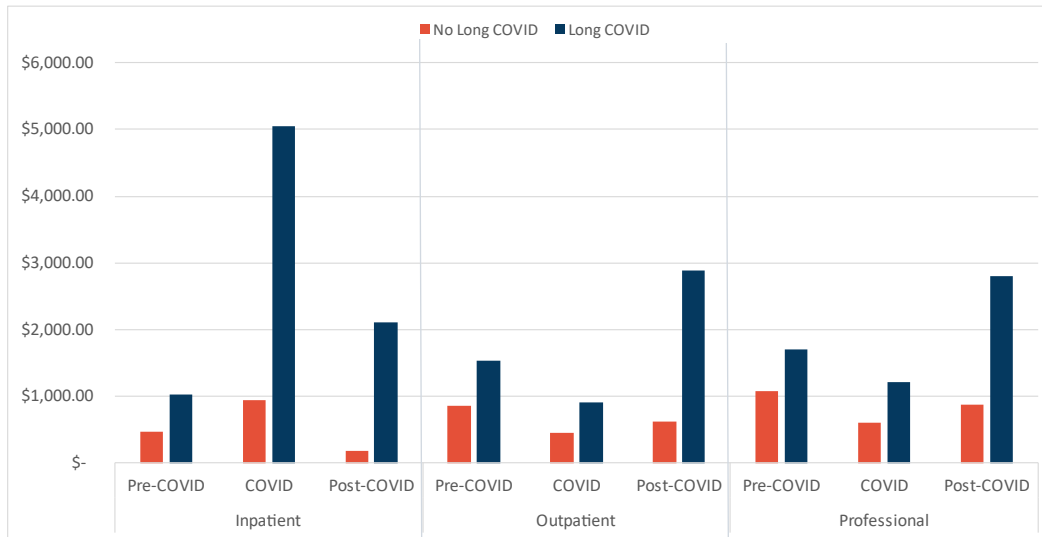
Figure 8. Average per person spending, people with Long COVID symptoms and people without Long COVID symptoms



Per Person Spending Differences Found Across All Care Settings

The people in HCCI’s COVID cohort that had Long COVID symptoms had higher per person spending in all categories of medical spending: inpatient, outpatient, and professional. As shown in Figure 9, the per person spending was higher across all three time periods and across all three categories of spending. For example, people with Long COVID symptoms had \$2,114 in inpatient per person spending, \$2,887 in outpatient per person spending, and \$2,797 in professional per person spending following their acute COVID diagnosis. People without Long COVID symptoms, in contrast, had inpatient per person spending of \$192, outpatient per person spending of \$620, and professional per person spending of \$885 in the post-COVID period.

Figure 9. Per person spending over time by service category



Conclusion

The analysis of HCCI’s unique claims dataset suggests that Long COVID seems to affect older people and people with medical needs. Additional research and study of the dimensions of this differential impact will be critical as public and private decisionmakers determine how to support people affected by Long COVID now and to reduce the impact of Long COVID in the future.

This analysis also demonstrates the value of claims data in understanding a variety of phenomena affecting patients and the health care system more broadly. Because health care providers and payers rely on claims data for standard operations and monitoring resource use and health care costs, it is a readily available resource for them to use to respond to newly emerging challenges, such as Long COVID. As additional years of claims data become available, we will expand this analysis to look at timing of COVID variants and the availability of vaccines and treatment.

Acknowledgements

Jessica Chang, Katie Martin, Tanya Natwick, and Aditi Sen authored this brief. HCCI would like to thank AHIP¹ for their partnership on this analysis. The association and its members have been monitoring the impact of the COVID virus on specific populations and its long-term impact since the emergence of the virus. As health insurance providers routinely use their claims data to track incidence, prevalence and utilization of resources for specific conditions, AHIP engaged HCCI to use their existing health care claims-based dataset to better understand the incidence of long COVID, associated risk factors, cost, and resources needed to treat and support this patient population.

¹ AHIP is a national association whose members provide health care coverage, services and solutions to hundreds of millions of Americans every day. The association and its members are committed to market-based solutions and public-private partnerships that make health care better and coverage more affordable and accessible for everyone.

Data

HCCI's commercial claims database includes health care claims for services received by more than one-third of people in the U.S. with employer-sponsored health insurance over the 2012-2021 period, including those who receive health insurance through their employer as well as their dependents. In total, the HCCI data includes more than 50 million enrollees across the 50 states and DC. Existing work suggests that analyses in the HCCI data are generalizable to the full population with ESI. HCCI data include fields that enable granular analyses, such as the five-digit zip codes where patients reside and where they received care, encrypted provider identifiers (NPI), and ICD and CPT/DRG/NDC codes to identify acute and Long COVID and related services.

Methods and Limitations

The cohort in this brief consisted of patients with evidence of incident acute COVID-19 infection (index date) between April 1, 2020, and June 30, 2021. We did not include patients with incident COVID-19 infection on and after July 1, 2021, because we wanted to include at least 6 months of health care spending and use observations following acute COVID. For inclusion in our final cohort sample, patients were required to be continuously enrolled for at least 365 days prior and at least 180 days following acute COVID infection index date.

To identify Long COVID symptoms, we adapted diagnosis code lists from Devries et al. (2023) and Song et al. (2023). We then cross-referenced the categories of Long COVID symptoms and confirmed consistency with World Health Organization and Centers for Disease Control and Prevention definitions of Long COVID. For a given Long COVID symptom to be included as evidence of Long COVID, the first incident of that symptom (defined as at least one service date with diagnosis of interest) must have occurred *after* the index acute COVID infection. In other words, we did not attribute a patient's anxiety to Long COVID if they had evidence of anxiety prior to incident acute COVID-19 infection. We did not include the Long COVID diagnosis code of U09.9 in this study because it was in effect for only 3 months (October-December 2021) of the study period.

There are two primary limitations in our study methodology due to the retrospective nature of administrative claims data: 1) We could only include in our cohort patients diagnosed with acute COVID based on an interaction with a health care provider. Given high use of at-home tests and prevalence patients recovering at home without formal health care, we, therefore, are likely undercounting patients with acute COVID; and 2) We can only identify Long COVID symptoms included in health care claims. Therefore, we may be undercounting Long COVID in cases where patients discussed symptoms during a health care encounter, but the corresponding diagnosis codes were not billed by health care providers.

Definition of study time periods

Time Period	Definition	Notes
Baseline	(Index date – 180) to (index date – 15)	Claims between 6 months and 2 weeks prior to acute COVID diagnosis
Acute COVID	(Index date – 14) to (Index date + 27)	Claims in 2 weeks prior and 27 days following acute COVID diagnosis
Follow-up	(Index date + 28) to (Index date + 180)	Claims 28 days and up to 6 months following acute COVID diagnosis

Additional COVID-Related Research Resources from HCCI

[COVID Tests Cost \\$0 for Most People in 2020](#)

[As COVID-19 Hit, Birthing People Spent Less Time in the Hospital for Delivery](#)

[Effects of COVID-19 on Health Care Spending were Concentrated in April-May 2020](#)

[COVID-19 Disrupted On-Time Vaccination Rates in ESI and Medicaid in 2020](#)

[COVID-19 Hospitalizations in 2020 were Highest for People Living in the Most Socially Vulnerable Areas and American Indian and Alaska Native People](#)

[Telehealth Use Increased more than 50-fold for the Primary Care Visits and Behavioral Health Services in Early Months of the COVID-19 Pandemic](#)

[Seasonal Trends in Antibiotic Use were Disrupted by COVID-19](#)

[HCCI Data Byte: Unintended Effect of Federal COVID vaccine policy on claims billing patterns](#)