WHITE PAPER

Patients Diagnosed with Post-COVID Conditions

An Analysis of Private Healthcare Claims Using the Official ICD-10 Diagnostic Code

A FAIR Health White Paper, May 18, 2022

Summary

Post-COVID conditions, also known by such terms as long COVID and post-acute sequelae of COVID-19, have become an issue of growing national concern. Until recently, researchers were limited by the lack of a specific ICD-10 diagnosis code for post-COVID conditions. Effective October 1, 2021, ICD-10 code U09.9 was introduced for "post COVID-19 condition, unspecified." This report is among the first to use the U09.9 code for research purposes. Drawing on longitudinal data from FAIR Health's repository of billions of private healthcare claims, this report studies the population of 78,252 patients in the repository who were diagnosed with the U09.9 code from October 1, 2021, to January 31, 2022. That population is analyzed by COVID-19 hospitalizations, age, gender, number of days from initial COVID-19 diagnosis to last post-COVID diagnosis during the study period, preexisting chronic comorbidities, co-occurring diagnoses and risk scores. Among the key findings:

- The majority (75.8 percent) of patients diagnosed with a U09.9 post-COVID condition had not been hospitalized for COVID-19.
- Among patients who presented with a U09.9 post-COVID diagnosis, 81.6 percent of females had not had a COVID-19 hospitalization compared to 67.5 percent of males.
- The age group 36 to 50 was the most likely to be diagnosed with U09.9 post-COVID conditions; 34.6 percent of patients with that diagnosis were in that age group.
- Females were more likely than males to be diagnosed with U09.9 post-COVID conditions. Females made up 59.8 percent of the population of patients with that diagnosis, while males made up 40.2 percent. By comparison, within the cohort of people diagnosed with COVID-19 in the FAIR Health repository, 53.8 percent of patients were female and 46.2 percent were male.
- Of patients who presented with a U09.9 post-COVID condition, 30.7 percent had no identified preexisting chronic comorbidities.
- The three diagnoses most commonly co-occurring on the same claim line with the U09.9 post-COVID diagnosis in patients across all ages and genders were abnormalities of breathing (23.2 percent of patients with post-COVID conditions), cough (18.9 percent) and malaise and fatigue (16.7 percent).
- In patients with a U09.9 post-COVID diagnosis, certain co-occurring diagnoses were more common in some age groups than across all age groups: for example, multisystem inflammatory syndrome in patients aged 0 to 12; abnormalities of heartbeat in the age group 13 to 22; generalized anxiety disorder in patients aged 23 to 35; and hypertensive diseases in the age group 65 and older.
- "Other and unspecified myopathies" (diseases that affect the muscles that control voluntary movement) occurred in patients in the post-COVID population 11.1 times more often than in the same population prior to COVID-19. Pulmonary embolism occurred 2.6 times more often. "Other disorders of brain," including post-viral fatigue syndrome and certain forms of encephalopathy, occurred two times more often.
- On average, in all age groups, patients with a U09.9 post-COVID condition had higher Department of Health & Human Services-Hierarchical Condition Category (HHS-HCC) risk scores after their diagnosis of COVID-19 than before. HHS-HCC risk scores identify which patients are likely to consume more healthcare resources and potentially incur more healthcare-related costs in the long run.

Background

Post-COVID conditions comprise a wide range of health problems that may occur four weeks or more after infection with the virus that causes COVID-19.[1] The symptoms may be new, ongoing or returning, and may appear even in people who did not have symptoms of COVID-19 when they were infected. Post-COVID conditions are known by various terms, including long COVID, long-haul COVID, long-term effects of COVID-19 and post-acute sequelae of COVID-19 or of SARS-CoV-2 infection (PASC).[2,3,4] Commonly reported post-COVID conditions include fatigue, shortness of breath, cough, headache, loss of taste or smell, and cognitive or mental health impairments (such as anxiety or depression).[5] Systematic reviews have found that the worldwide prevalence of post-COVID conditions in patients who have had COVID-19 is 43 percent[6] to 54 percent.[7]

Post-COVID conditions have become an issue of growing national concern. Dr. Kristin Englund, Founder and Director of Cleveland Clinic's post-COVID reCOVer Clinic, has called long COVID the "pandemic after the pandemic."[8] In a memorandum on April 5, 2022, President Joe Biden tasked the Secretary of Health and Human Services with coordinating a federal government-wide response to the long-term effects of COVID-19, including the development of a National Research Action Plan on long COVID.[9]

A national, independent nonprofit organization dedicated to bringing transparency to healthcare costs and health insurance information, FAIR Health began its contribution to the study of post-COVID conditions with a white paper published on June 15, 2021.[10] Drawing on longitudinal data from its database of billions of private healthcare claims, FAIR Health studied a total of 1,959,982 COVID-19 patients for the prevalence of post-COVID conditions 30 days or more after their initial diagnosis with COVID-19.

At the time, FAIR Health and other researchers were limited by the lack of a specific ICD-10 diagnosis code for post-COVID conditions. Since then, effective October 1, 2021, ICD-10 code U09.9 was introduced for "post COVID-19 condition, unspecified."[11] Enabling the establishment of a link with COVID-

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[1] "Post-COVID Conditions," Centers for Disease Control and Prevention (CDC), updated September 16, 2021, https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/index.html.
[2] "Post-COVID Conditions," CDC.
[3] Josalyn L. Cho et al., "Quantitative Chest CT Assessment of Small Airways Disease in Post-Acute SARS-CoV-2 Infection," *Radiology* (March 15, 2022): 212170, https://doi.org/10.1148/radiol.212170.
[4] Ann M. Parker et al., "Addressing the Post-Acute Sequelae of SARS-CoV-2 Infection: A Multidisciplinary Model of Care," *The Lancet Respiratory Medicine* 9, no. 11 (November 1, 2021): P1328-41, https://doi.org/10.1016/S2213-2600(21)00385-4.
[5] Parker, "Addressing the Post-Acute Sequelae of SARS-CoV-2 Infection."
[6] Chen Chen et al., "Global Prevalence of Post-Acute Sequelae of COVID-19 (PASC) or Long COVID: A Meta-Analysis and Systematic Review," medRxiv, posted November 16, 2021, https://doi.org/10.1101/2021.11.15.21266377.
[7] Destin Groff et al., "Short-Term and Long-Term Rates of Postacute Sequelae of SARS-CoV-2 Infection: A Systematic Review," *JAMA Network Open* 4, no. 10 (October 13, 2021): e2128568, https://doi.org/10.1001/jamanetworkopen.2021.28568.
[8] David Levine, "Long COVID Has Become the 'Pandemic after the Pandemic,'" *U.S. News & World Report*, March 10, 2022, https://www.usnews.com/news/health-news/articles/2022-03-10/long-covid-has-become-the-pandemic-after-the-pandemic.
[9] Joseph R. Biden Jr., "Memorandum on Addressing the Long-Term Effects of COVID-19," the White House, April 5, 2022, https://www.whitehouse.gov/briefing-room/presidential-actions/2022/04/05/memorandum-on-addressing-the-long-term-effects-of-covid-19/.
[10] FAIR Health, *A Detailed Study of Patients with Long-Haul COVID: An Analysis of Private Healthcare Claims*, A FAIR Health White Paper, June 15, 2021, https://s3.us-east-1.amazonaws.com/media2.fairhealth.org/whitepaper/asset/A%20Detailed%20Study%20of%20Patients%20with%20Long-Haul%20COVID--An%20Analysis%20of%20Private%20Healthcare%20Claims--A%20FAIR%20Health%20White%20Paper.pdf.
[11] "CDC Announces Approval of ICD-10 Code for Post-Acute Sequelae of COVID-19," American Academy of Physical Medicine and Rehabilitation (AAPM&R), July 20, 2021, https://www.aapmr.org/members-publications/member-news/member-news-details/2021/07/20/cdc-announces-approval-of-icd-10-code-for-post-acute-sequelae-of-covid-19.

19, the new code was not to be used in cases that still were presenting with active COVID-19, although an exception could be made in cases of reinfection with COVID-19, occurring with a condition related to prior COVID-19.[12] One of the advocates of the new coding, the American Academy of Physical Medicine and Rehabilitation, hailed it "as a critical step for long term patient care as well as for tracking and research purposes."[13]

The present report is among the first studies to use the U09.9 code for just such research purposes.[14] Like the first FAIR Health study of post-COVID conditions, this report draws on longitudinal data from FAIR Health's repository of over 36 billion private healthcare claim records, the largest such repository in the country. In this report, FAIR Health studies the 78,252 patients diagnosed with the U09.9 code from October 1, 2021, to January 31, 2022. This study analyzes that population by COVID-19 hospitalizations, age, gender, number of days from initial COVID-19 diagnosis to last post-COVID diagnosis during the study period, preexisting chronic comorbidities, co-occurring diagnoses and risk scores.

Aside from its two white papers on post-COVID conditions, FAIR Health has published eight other studies on the COVID-19 pandemic. These studies have:

- Projected the costs of inpatient services for COVID-19 patients[15] and reported on treatment and hospitalization costs[16];
- Analyzed the impact of COVID-19 on hospitals and health systems,[17] healthcare professionals,[18] dental services[19] and pediatric mental health[20];

[12] "U09.9 Post COVID-19 condition, unspecified," Find-A-Code, accessed April 6, 2022, https://www.findacode.com/code.php?set=ICD10CM&c=U09.9.
[13] "CDC Announces Approval of ICD-10 Code for Post-Acute Sequelae of COVID-19," AAPM&R.
[14] Emily R. Pfaff et al., "Coding Long COVID: Characterizing a New Disease through an ICD-10 Lens," medRxiv, posted April 19, 2022, https://doi.org/10.1101/2022.04.18.22273968.
[15] FAIR Health, *COVID-19: The Projected Economic Impact of the COVID-19 Pandemic on the US Healthcare System*, A FAIR Health Brief, March 25, 2020, https://s3.amazonaws.com/media2.fairhealth.org/brief/asset/COVID-19%20-%20The%20Projected%20Economic%20Impact%20of%20the%20COVID-19%20Pandemic%20on%20the%20US%20Healthcare%20System.pdf.
[16] FAIR Health, *COVID-19 Treatment and Hospitalization Costs: A Descriptive Analysis of the FAIR Health COVID-19 Cost Tracker*, A FAIR Health Brief, December 15, 2021, https://s3.amazonaws.com/media2.fairhealth.org/brief/asset/COVID-19+Cost+Tracker+Brief.pdf.
[17] FAIR Health, *Illuminating the Impact of COVID-19 on Hospitals and Health Systems: A Comparative Study of Revenue and Utilization*, A FAIR Health Brief, May 12, 2020, https://s3.amazonaws.com/media2.fairhealth.org/brief/asset/Illuminating%20the%20Impact%20of%20COVID-19%20on%20Hospitals%20and%20Health%20Systems%20-%20A%20Comparative%20Study%20of%20Revenue%20and%20Utilization%20-%20A%20FAIR%20Health%20Brief.pdf.
[18] FAIR Health, *Healthcare Professionals and the Impact of COVID-19: A Comparative Study of Revenue and Utilization*, A FAIR Health Brief, June 10, 2020, https://s3.amazonaws.com/media2.fairhealth.org/brief/asset/Healthcare%20Professionals%20and%20the%20Impact%20of%20COVID-19%20-%20A%20Comparative%20Study%20of%20Revenue%20and%20Utilization%20-%20A%20FAIR%20Health%20Brief.pdf.
[19] FAIR Health, *Dental Services and the Impact of COVID-19: An Analysis of Private Claims*, A FAIR Health Brief, September 16, 2020, https://s3.amazonaws.com/media2.fairhealth.org/brief/asset/Dental%20Services%20and%20the%20Impact%20of%20COVID-19%20-%20An%20Analysis%20of%20Private%20Claims%20-%20A%20FAIR%20Health%20Brief.pdf.
[20] FAIR Health, *The Impact of COVID-19 on Pediatric Mental Health: A Study of Private Healthcare Claims*, A FAIR Health White Paper, March 2, 2021, https://s3.amazonaws.com/media2.fairhealth.org/whitepaper/asset/The%20Impact%20of%20COVID-19%20on%20Pediatric%20Mental%20Health%20-%20A%20Study%20of%20Private%20Healthcare%20Claims%20-%20A%20FAIR%20Health%20White%20Paper.pdf.

- Profiled COVID-19 patients[21]; and
- Reported on risk factors for COVID-19 mortality.[22]

Methodology

FAIR Health identified all patients in its longitudinal dataset who had a claim line with a U09.9 diagnosis code (post COVID-19 condition, unspecified) from October 1, 2021, to January 31, 2022. During this four-month study period, there were a total of 78,252 patients with that diagnosis. This was the study population.

FAIR Health then reviewed the history of these patients to find their initial COVID-19 diagnosis and determine:

1) Their index date of COVID-19 diagnosis[23];
2) Whether they were hospitalized for their COVID-19 diagnosis;
3) Whether they were in the intensive care unit for their COVID-19 diagnosis;
4) Whether they were on a ventilator for their COVID-19 diagnosis; and
5) How many preexisting chronic comorbidities they had prior to their COVID-19 diagnosis, based on the Centers for Medicare & Medicaid Services Chronic Conditions Data Warehouse (CCW)[24] diagnosis categories.

FAIR Health analyzed the study population by such variables as age and gender. From each claim line that occurred with a U09.9 diagnosis code, FAIR Health captured the co-occurring diagnoses on that claim line.

In the same study population, FAIR Health quantified the number of occurrences of the co-occurring diagnoses prior to the COVID-19 diagnoses. FAIR Health calculated how many patients in the cohort had the diagnoses prior to their COVID-19 diagnoses and how many had them co-occurring with their U09.9 post-COVID diagnoses. This was used to form ratios of patients post-COVID to patients pre-COVID for each post-COVID co-occurring diagnosis.

FAIR Health measured the Department of Health & Human Services-Hierarchical Condition Category (HHS-HCC) risk scores of patients in the study population. The risk scores were calculated for all claims up to 90 days before their COVID-19 diagnosis (pre-COVID HCC) and also for 30 days and more after their COVID-19 diagnosis (post-COVID HCC). This was used to calculate the average difference in risk scores before and after COVID-19 diagnosis.

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[21] FAIR Health, *Key Characteristics of COVID-19 Patients: Profiles Based on Analysis of Private Healthcare Claims*, A FAIR Health Brief, July 14, 2020, https://s3.amazonaws.com/media2.fairhealth.org/brief/asset/Key%20Characteristics%20of%20COVID-19%20Patients%20-%20Profiles%20Based%20on%20Analysis%20of%20Private%20Healthcare%20Claims%20-%20A%20FAIR%20Health%20Brief.pdf.

[22] FAIR Health, *Risk Factors for COVID-19 Mortality among Privately Insured Patients: A Claims Data Analysis*, A FAIR Health White Paper in Collaboration with the West Health Institute and Marty Makary, MD, MPH, from Johns Hopkins University School of Medicine, November 11, 2020, https://s3.amazonaws.com/media2.fairhealth.org/whitepaper/asset/Risk%20Factors%20for%20COVID-19%20Mortality%20among%20Privately%20Insured%20Patients%20-%20A%20Claims%20Data%20Analysis%20-%20A%20FAIR%20Health%20White%20Paper.pdf.

[23] FAIR Health included in the study only those patients with a U09.9 diagnosis who had had a COVID-19 diagnosis.

[24] "Chronic Conditions Data Warehouse," Centers for Medicare & Medicaid Services (CMS), accessed April 26, 2022, https://www2.ccwdata.org/web/guest/condition-categories.

Limitations

The data used in this report comprise claims data for privately insured patients who are covered by insurers and third-party administrators who voluntarily participate in FAIR Health's data contribution program. Medicare Advantage (Medicare Part C) enrollees from contributing insurers are included, but not participants in Medicare Parts A, B and D.[25] In addition, data from Medicaid, CHIP and other state and local government insurance programs are not included, nor are data collected regarding uninsured patients.

This is an observational report based on the data FAIR Health receives from private payors regarding care rendered to covered patients.

The report was not subject to peer review.

[25] FAIR Health also receives the entire collection of claims for traditional Medicare Parts A, B and D under the CMS Qualified Entity Program, but those data are not a source for this report.

Results

COVID-19 Hospitalizations

Overall, in the FAIR Health data from April 1, 2020, to January 31, 2022, 8.4 percent of all patients diagnosed with COVID-19 were hospitalized for their acute COVID-19 diagnosis (ICD-10 code U07.1). The share of patients who were hospitalized varied by age group (figure 1). The age group 65 and older accounted for the greatest percentage of patients hospitalized for COVID-19 (24.3 percent). In the age group 51 to 64, 13.1 percent of all COVID-19 cases resulted in a hospitalization, while in the age group 36 to 50, 7.6 percent of all COVID-19 patients were hospitalized.

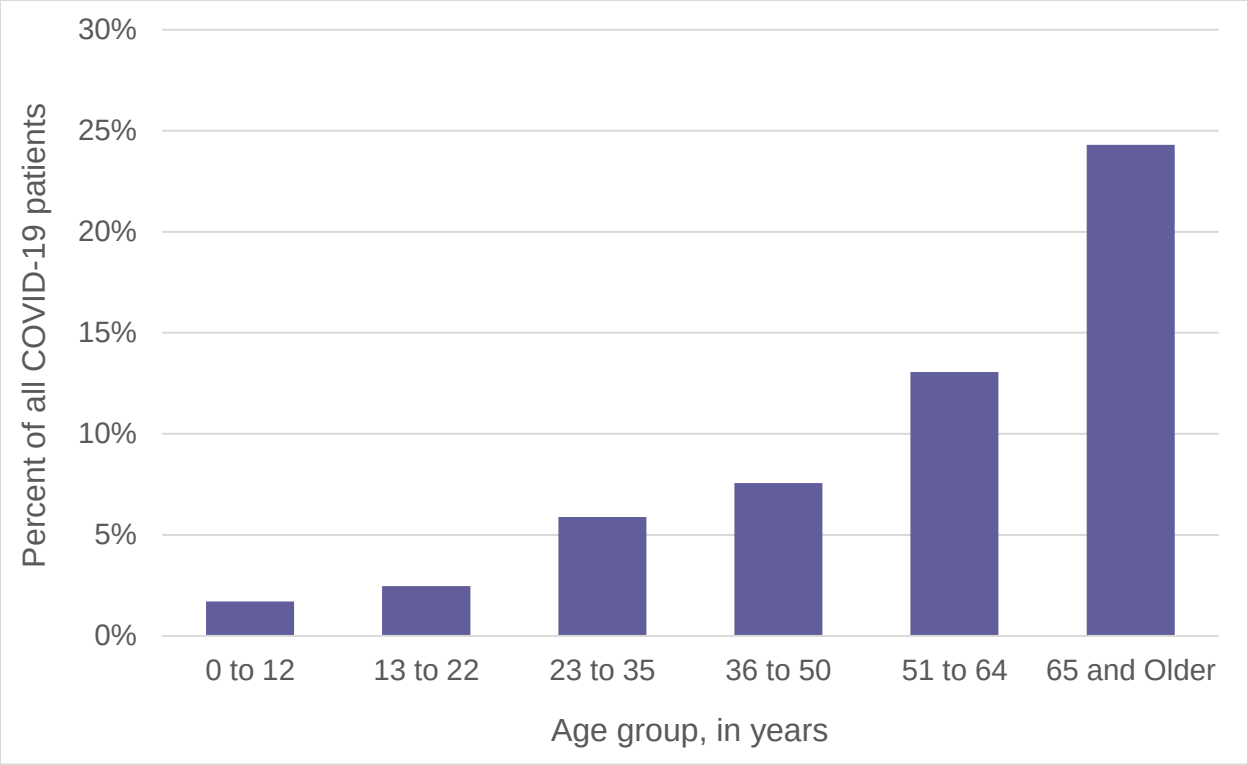

Figure 1. COVID-19 hospitalizations by age, April 2020-January 2022

Of patients diagnosed with a U09.9 post-COVID condition from October 1, 2021, to January 31, 2022, 24.2 percent had been hospitalized for their COVID-19 diagnosis. This was nearly three times the percentage (8.4 percent) of COVID-19 patients overall hospitalized for COVID-19 from April 1, 2020, to January 31, 2022. It should be noted, however, that the two populations differed, with the latter encompassing more individuals over a longer period. In addition, some of the non-hospitalized patients may have had a post-COVID diagnosis with a shorter duration, which would not be captured if it occurred well before the existence of the U09.9 diagnosis.

This finding suggests that, in the COVID-19 population, the risk of post-COVID conditions is much higher among those who are hospitalized than among those who are not. However, because the vast majority of COVID-19 patients (91.6 percent) were not hospitalized, most patients with post-COVID conditions (75.8 percent) were never hospitalized for COVID-19.

Many previous studies of patients with post-COVID conditions have focused heavily on patients who were hospitalized. In one systematic review of 57 studies, 79 percent of patients studied for post-COVID conditions had been hospitalized for acute COVID-19.[26] However, the studies in that review predated the U09.9 diagnosis code and therefore did not include it. A more recent study using that code found that 21.3 percent of patients diagnosed with U09.9 were hospitalized for acute COVID-19.[27]

Like the share of COVID-19 patients overall who were hospitalized, the share of post-COVID patients who had been hospitalized varied by age group (figure 2). In all age groups, the percentage share of hospitalizations was greater for post-COVID patients than for COVID-19 patients overall. For example, 40.1 percent of post-COVID patients aged 65 and older had been hospitalized for COVID-19, compared to 24.3 percent of all COVID-19 patients in that age group.

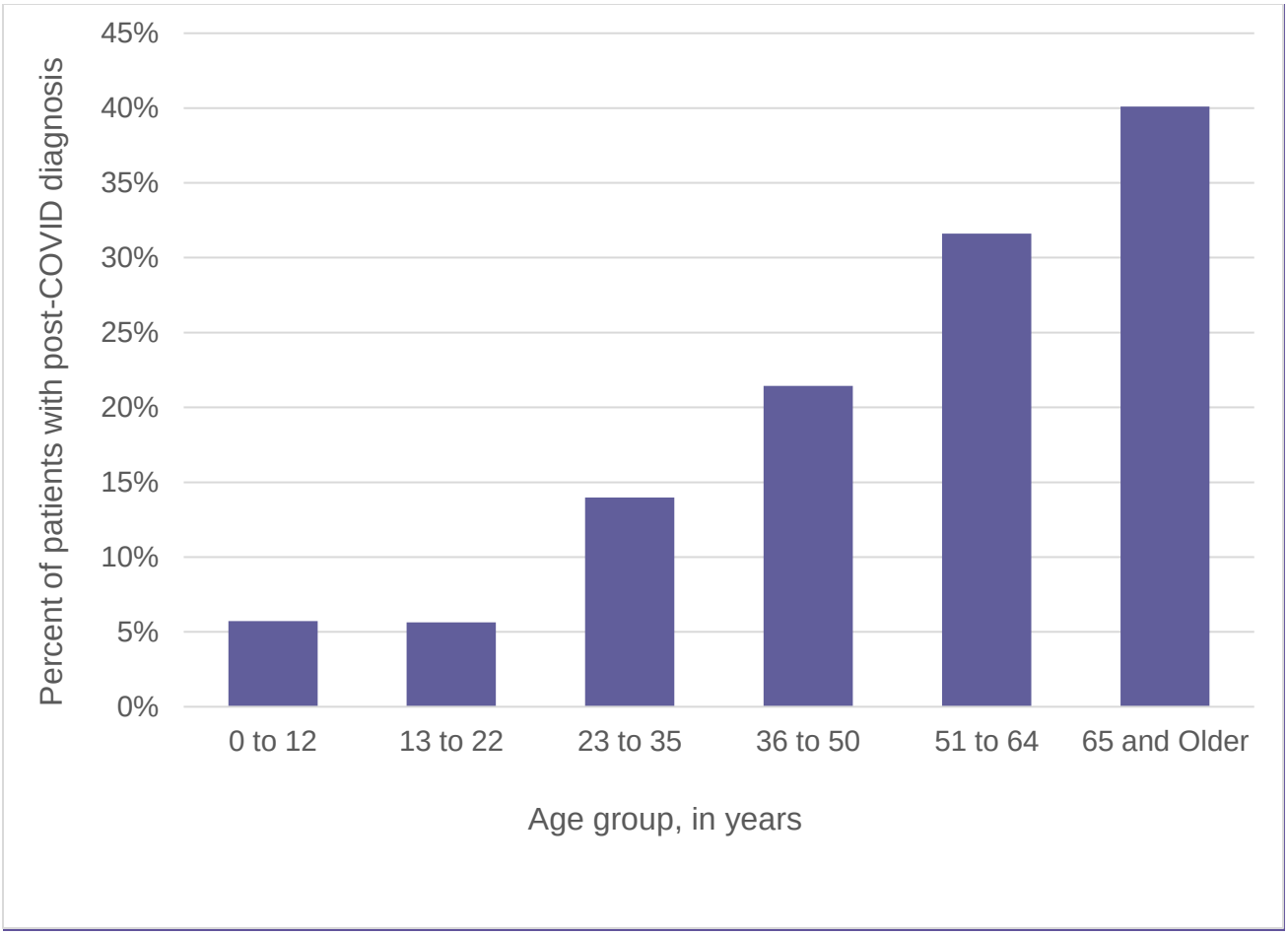

Figure 2. COVID-19 hospitalizations in patients with U09.9 post-COVID diagnosis by age, October 2021-January 2022

[26] Groff et al., "Short-Term and Long-Term Rates of Postacute Sequelae of SARS-CoV-2 Infection."
[27] Pfaff et al., "Coding Long COVID."

The average length of stay for each age group of patients who were hospitalized for their COVID-19 diagnosis, and later had a U09.9 post-COVID diagnosis, was fairly similar across the age groups in the range 13 to 50 (figure 3). The age group 13 to 22 had an average length of stay of 8.7 days; the age group 23 to 35, 8.1 days; and the age group 36 to 50, 8.6 days. For younger and older age groups, however, length of stay showed greater variation. The age group 0 to 12 had an average length of stay of 5.3 days; the age group 51 to 64, 9.5 days; and the age group 65 and older, 10 days.

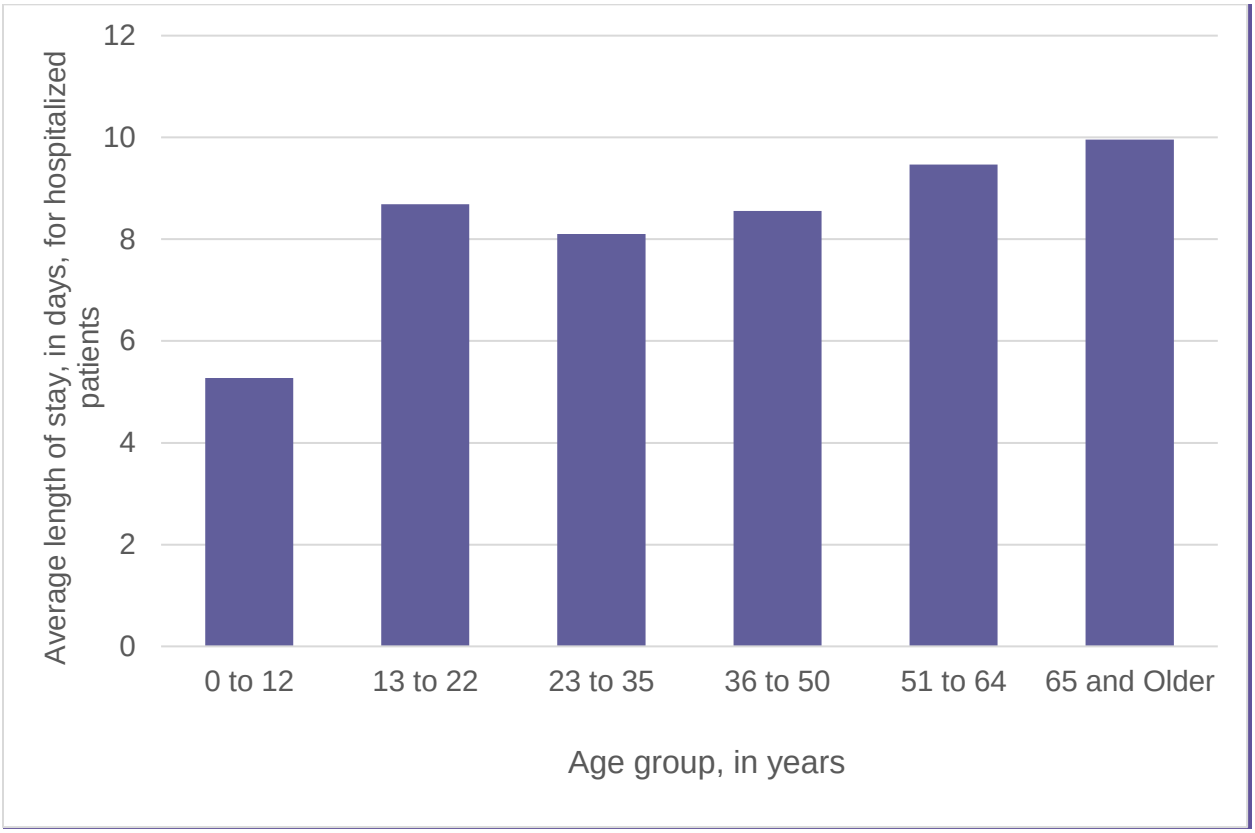

Figure 3. Average length of stay, in days, for COVID-19 hospitalizations in patients with U09.9 post-COVID diagnosis by age, October 2021-January 2022

Among patients who presented with a U09.9 post-COVID diagnosis, 18.4 percent of the female patients had had a COVID-19 hospitalization compared to 32.5 percent of the male patients (figure 4). Thus, 81.6 percent of females had not had a COVID-19 hospitalization compared to 67.5 percent of males.

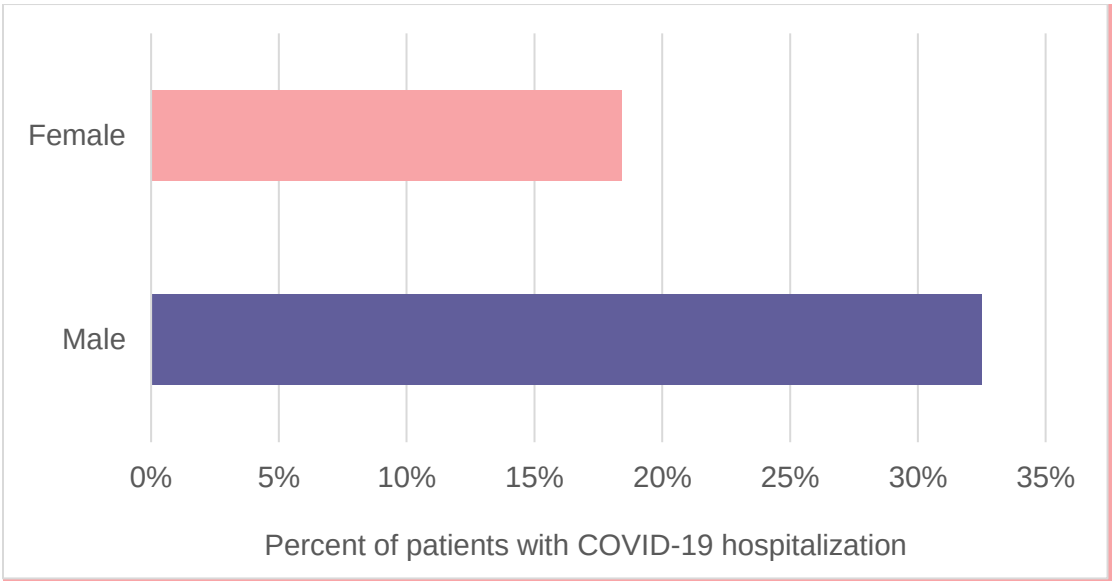

Figure 4. COVID-19 hospitalizations in patients with U09.9 post-COVID diagnosis by gender, October 2021-January 2022

Figure 5 shows the number of patients who had a U09.9 post-COVID diagnosis and a COVID-19 hospitalization within a certain gender and age group divided by the number of patients who had a U09.9 post-COVID diagnosis within that gender and age group. Gender disparity varied by age group. In patients aged 0 to 12, similar shares of males (5.3 percent) and females (5.8 percent) had a COVID-19 hospitalization prior to their post-COVID diagnosis. In older age groups, there was greater gender disparity, with males rather than females having the larger share of COVID-19 hospitalizations. Patients in the age group 36 to 50 had the greatest gender difference: 31.5 percent of males with a post-COVID diagnosis had been hospitalized for COVID-19, compared to 15.2 percent of females.

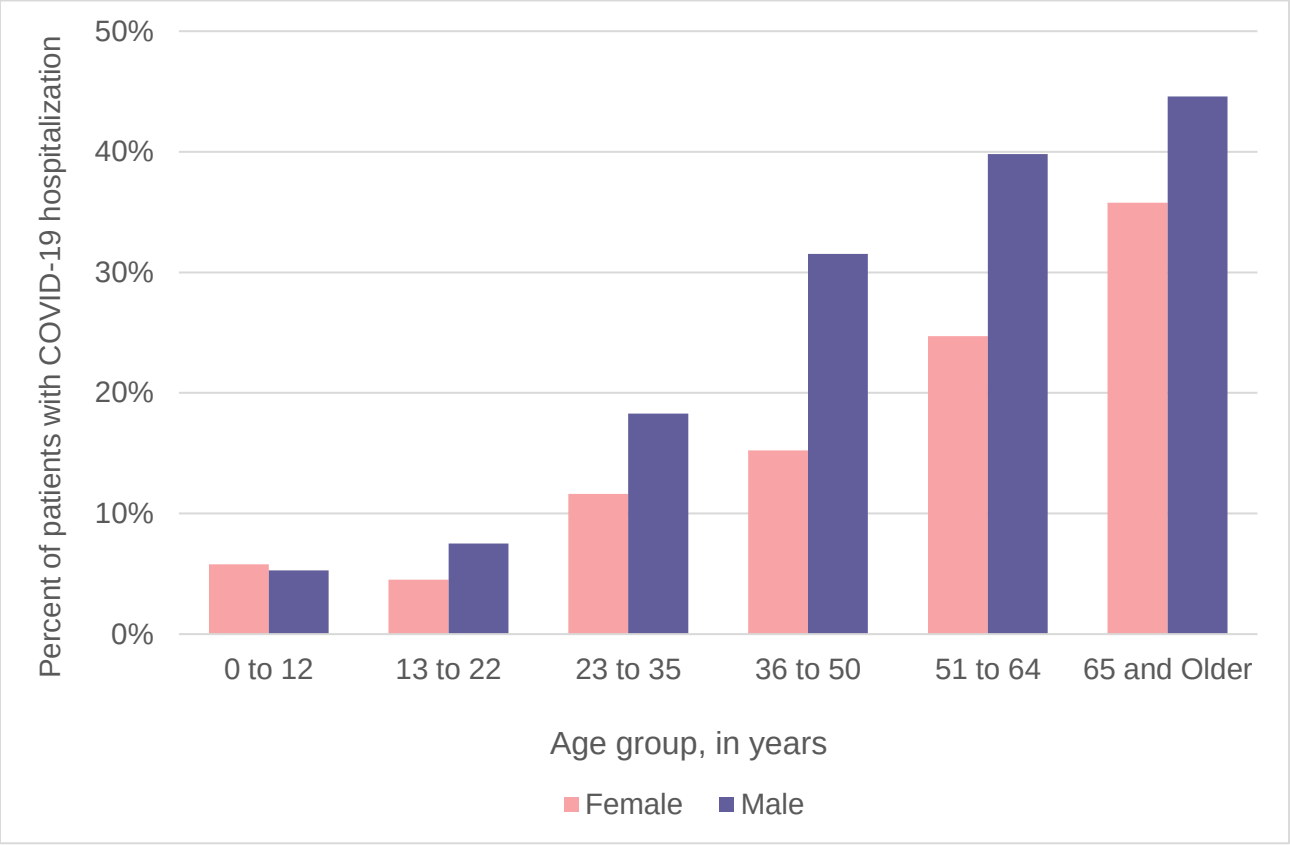

Figure 5. COVID-19 hospitalizations in patients with U09.9 post-COVID diagnosis by age and gender, October 2021-January 2022

Age and Gender

Of the 78,252 patients from October 2021 to January 2022 who were diagnosed with a post-COVID condition using the ICD-10 diagnosis code U09.9, the largest share (34.6 percent) was in the age group 36 to 50 years (figure 6). The next largest percentage (31.9 percent) was in the age group 51 to 64. The two youngest age groups—0 to 12 and 13 to 22—jointly constituted 10.5 percent of the distribution. The finding about the age group 36 to 50 years is consistent with a study from the Centers for Disease Control and Prevention showing higher odds of post-COVID conditions in persons aged 40 to 54.[28] Other researchers have found generally that post-COVID conditions are more likely with increasing age.[29]

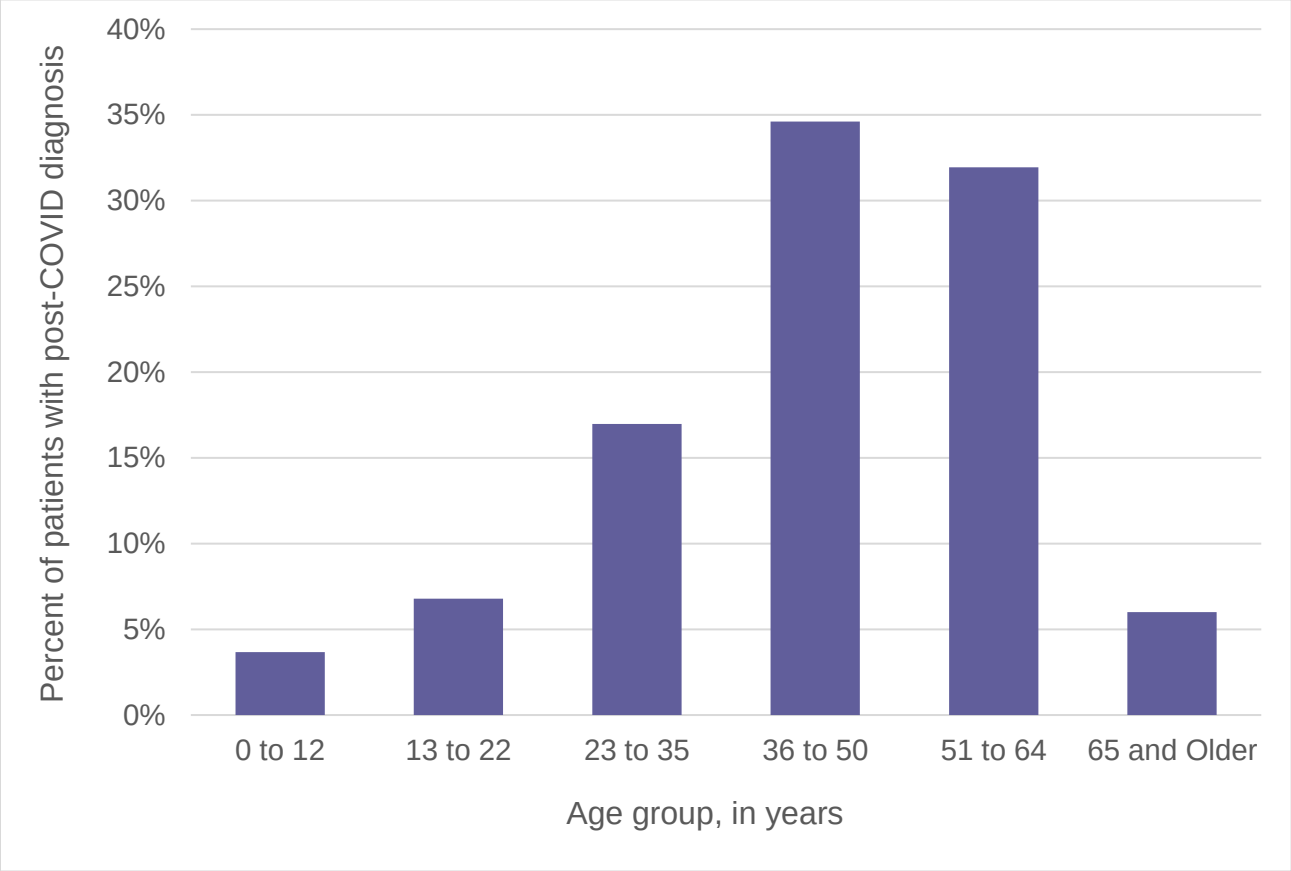

Figure 6. Patients with U09.9 post-COVID diagnosis by age, October 2021-January 2022

[28] Kyle Yomogida et al., "Post-Acute Sequelae of SARS-CoV-2 Infection among Adults Aged ≥18 Years — Long Beach, California, April 1–December 10, 2020," *Morbidity and Mortality Weekly Report (MMWR)* 70, no. 37 (September 17, 2021): 1274-77, http://dx.doi.org/10.15585/mmwr.mm7037a2.
[29] Carole H. Sudre et al., "Attributes and Predictors of Long COVID," *Nature Medicine* 27 (March 10, 2021): 626-31, https://doi.org/10.1038/s41591-021-01292-y.

Females made up 59.8 percent of the population of patients with U09.9 post-COVID conditions, while males made up 40.2 percent (figure 7). This is consistent with other researchers' findings that those with post-COVID conditions are more likely to be female.[30,31] By comparison, within the cohort of people diagnosed with COVID-19 in the FAIR Health repository, 53.8 percent of patients were female and 46.2 percent were male. Thus, both COVID-19 and post-COVID diagnoses were more prevalent among females.

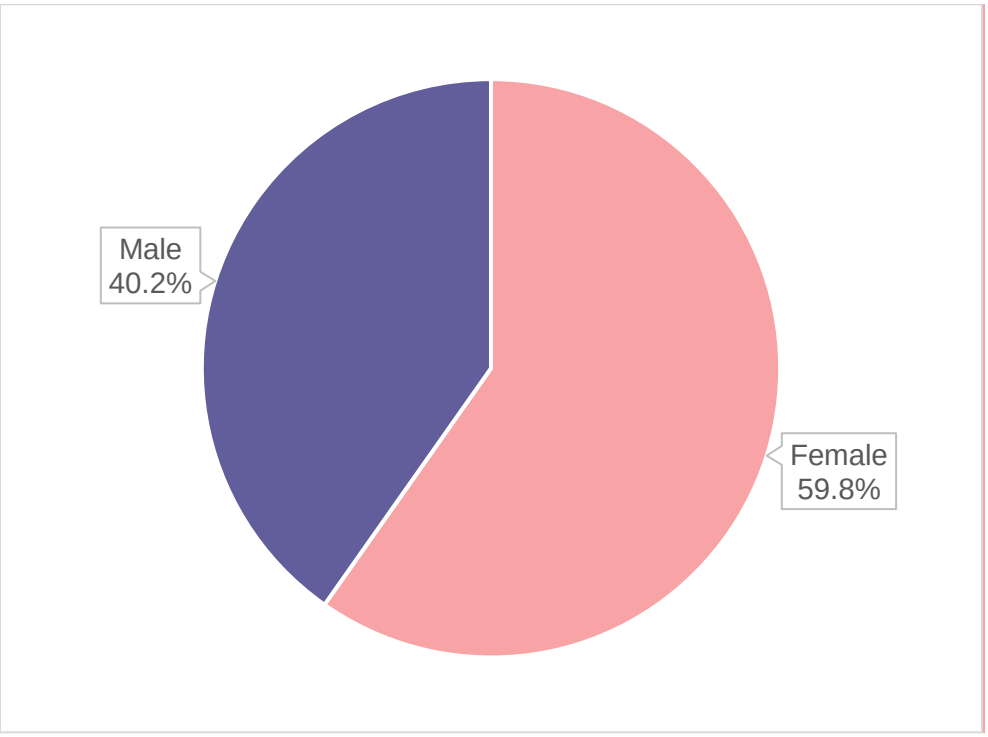

Figure 7. Patients with U09.9 post-COVID diagnosis by gender, October 2021-January 2022

[30] Sudre et al., "Attributes and Predictors of Long COVID."
[31] Yomogida et al., "Post-Acute Sequelae of SARS-CoV-2 Infection among Adults Aged ≥18 Years."

The gender distribution of patients with a U09.9 post-COVID diagnosis differed depending on age group (figure 8). In individuals aged 0 to 12, the percentage of males (50.5 percent) was slightly greater than that of females (49.5 percent), though they were almost equal. Similarly, among patients aged 65 and older, males (49.1 percent) and females (50.9 percent) were almost equal in share. But in the range 13 to 50 years of age, females constituted more than 60 percent of the distribution in every age group, reaching 64.7 percent in the age group 23 to 35, with males constituting 35.3 percent. In the age group 51 to 64, females accounted for 54.3 percent of the distribution, while males accounted for 45.7 percent.

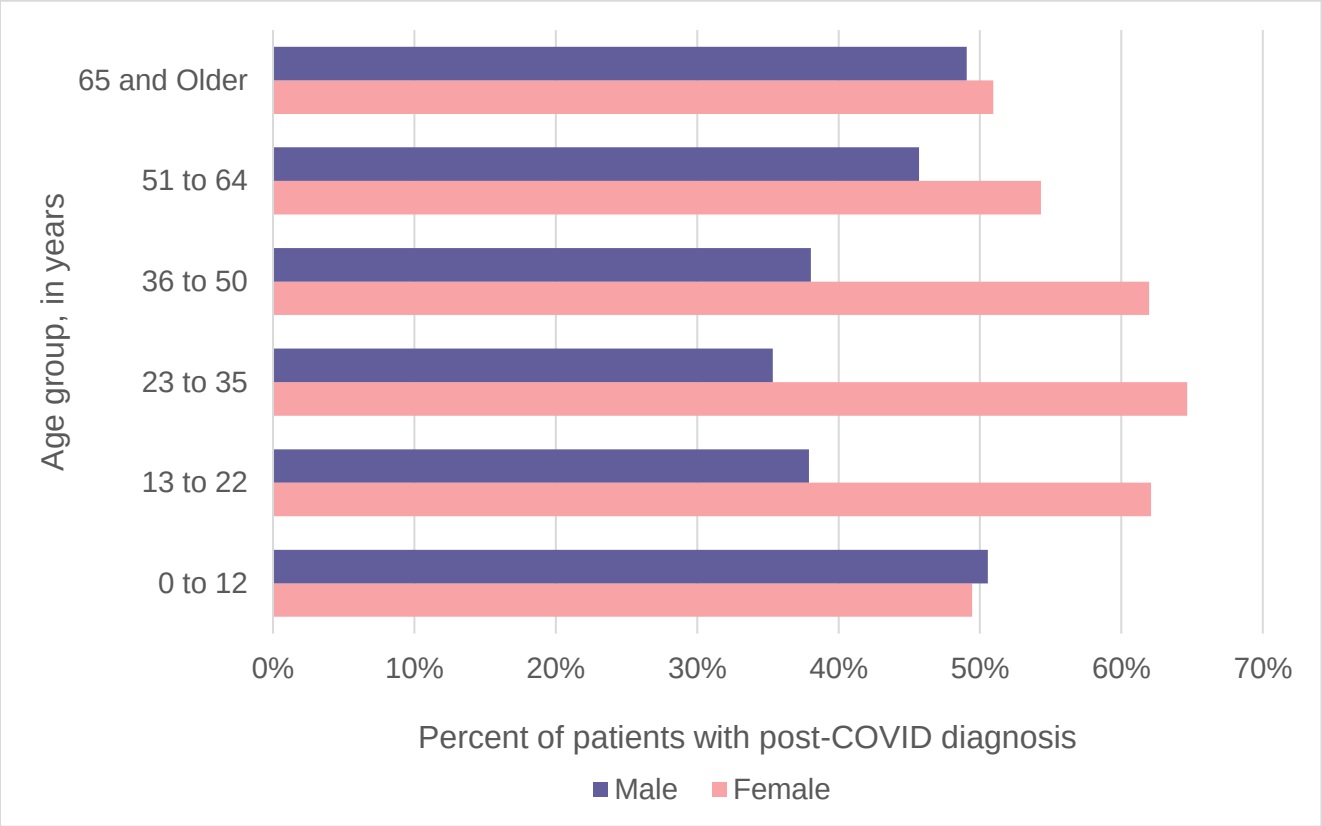

Figure 8. Patients with U09.9 post-COVID diagnosis by age and gender, October 2021-January 2022

The average number of days from the initial COVID-19 diagnosis to the last date in the study period on which the patient had a claim line with a U09.9 diagnosis varied by age and gender (figure 9). In almost all age groups, the average number of days was longer in females than males. The one exception was the age group 13 to 22, in which males had an average of 141 days compared to 136.7 days for females. That was the longest duration for males from initial COVID-19 diagnosis to last post-COVID diagnosis; for females, the longest duration was in the age group 51 to 64 years (145.6 days). Note that this was the longest duration within the circumscribed study period; post-COVID symptoms may have continued after that period.

The average number of days was lowest in patients aged 0 to 12. In that age group, females persisted with post-COVID conditions an average of 82.2 days after their index COVID-19 diagnosis, and males an average of 75.2 days.

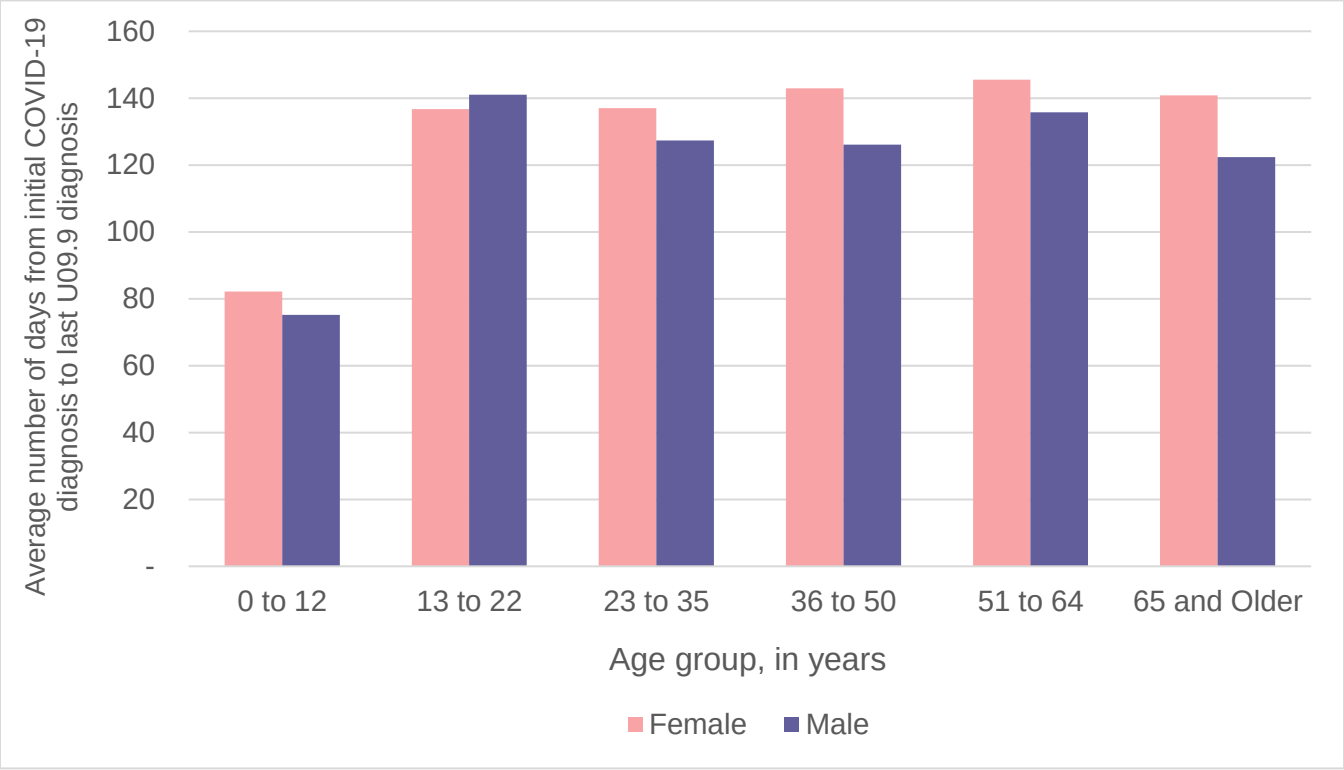

Figure 9. Average number of days from initial COVID-19 diagnosis to last U09.9 post-COVID diagnosis, by age and gender, October 2021-January 2022

Preexisting Chronic Comorbidities

Of patients who presented with a U09.9 post-COVID condition, 30.7 percent had no identified preexisting chronic comorbidities; the remainder had one or more (figure 10). The smallest share (13.2 percent) had one preexisting chronic condition; 20.6 percent had two to three; 14.9 percent had four to five; and 20.7 percent had six or more. While FAIR Health focused on patients who had U09.9 post-COVID conditions and had preexisting conditions, the results resonate with previous research that made a similar finding: Individuals with preexisting conditions were more likely to have post-COVID conditions.[32]

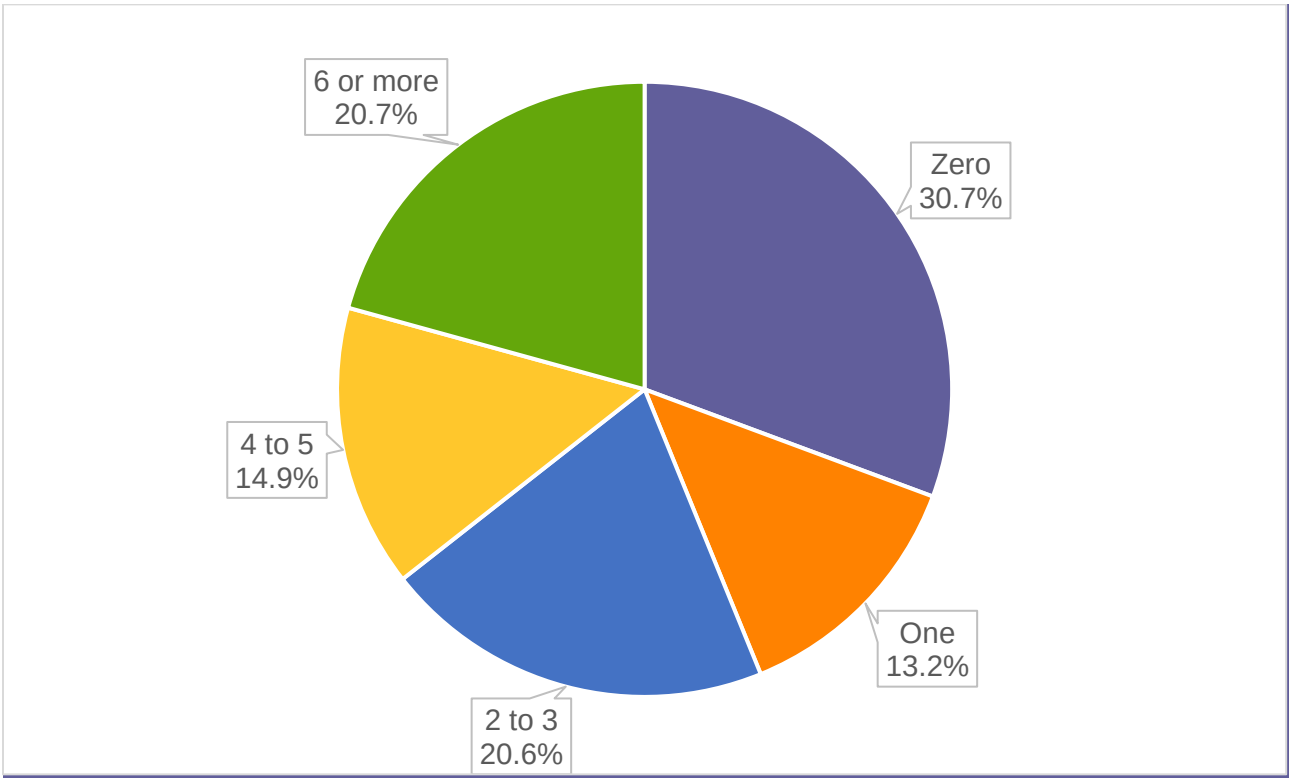

Figure 10. Preexisting chronic comorbidities in patients with U09.9 post-COVID condition, October 2021-January 2022

[32] Yomogida et al., "Post-Acute Sequelae of SARS-CoV-2 Infection among Adults Aged ≥18 Years."

The distribution of preexisting chronic comorbidities in patients with a U09.9 post-COVID condition varied by age group (figure 11). Of individuals aged 65 and older who presented with the U09.9 diagnosis, 56 percent had six or more preexisting chronic conditions, the largest share of any age group. That was because this population, in general, has more chronic conditions than others.[33]

Conversely, the youngest age group had the largest percentage (64 percent) with zero preexisting chronic comorbidities. Even in the population aged 23 to 35, 42 percent had zero preexisting chronic conditions.

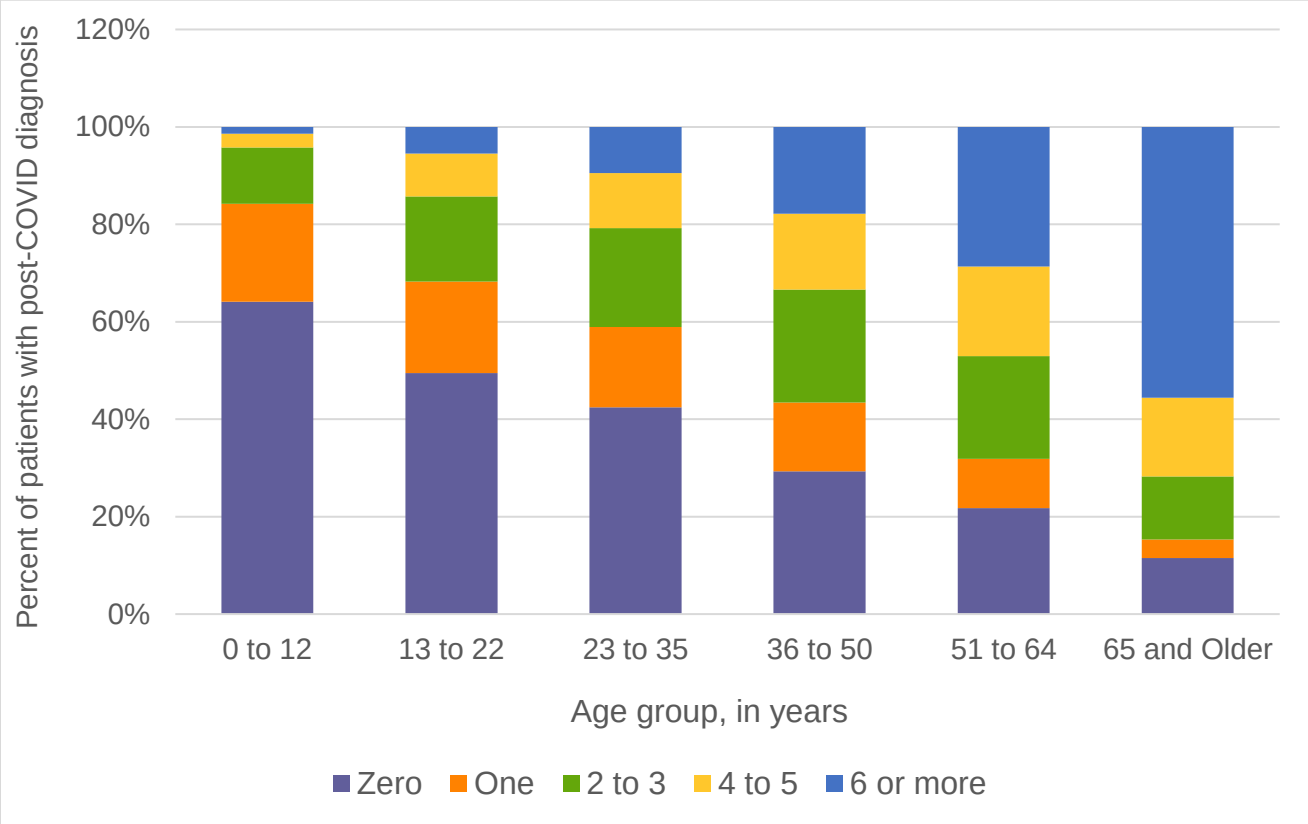

Figure 11. Preexisting chronic comorbidities in patients with U09.9 post-COVID condition by age, October 2021-January 2022

[33] "Promoting Health for Older Adults," CDC, page last reviewed January 24, 2022, https://www.cdc.gov/chronicdisease/resources/publications/factsheets/promoting-health-for-older-adults.htm.

Co-occurring Diagnoses

Figure 12 shows the 15 diagnoses most commonly co-occurring with the U09.9 post-COVID diagnosis in patients across all ages and genders. The leading diagnosis that co-occurred on the same claim line with U09.9, abnormalities of breathing, occurred in 23.2 percent of patients with post-COVID conditions; within that category, almost 92 percent had shortness of breath or dyspnea, the medical term for shortness of breath. In second place was cough, diagnosed in 18.9 percent of patients with a post-COVID diagnosis. In third place was malaise and fatigue, diagnosed in 16.7 percent of such patients. All three diagnoses have been widely noted as post-COVID conditions.[34] Lower-ranking but still common diagnoses included abnormalities of heartbeat, in 10th place, and sleep disorders, in 12th place. Abnormalities of heartbeat have been noted as a post-COVID condition by other researchers,[35] as have sleep disorders.[36]

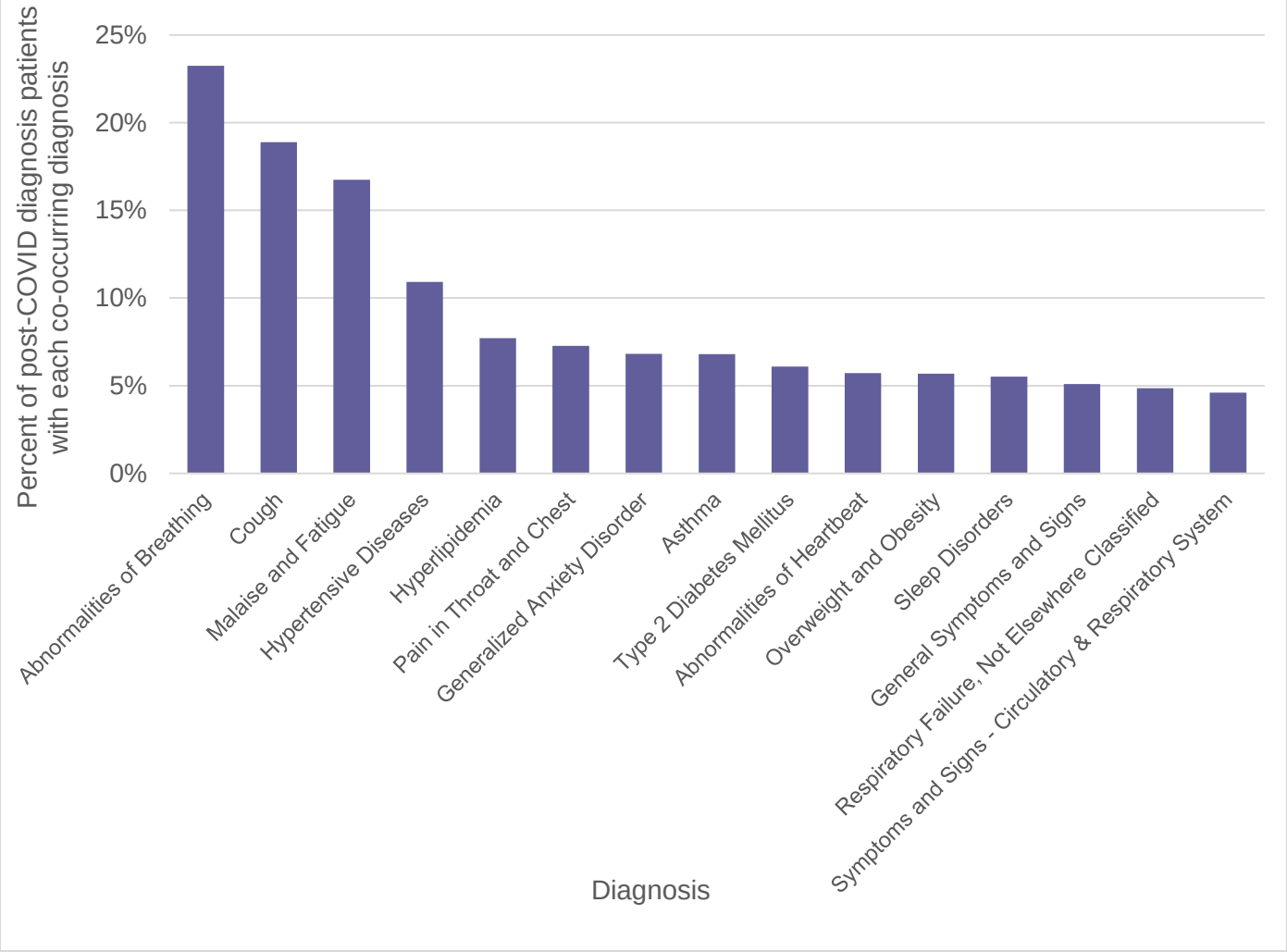

Figure 12. Fifteen diagnoses most commonly co-occurring with U09.9 post-COVID diagnosis, October 2021-January 2022

[34] "Post-COVID Conditions," CDC.
[35] Marcus Ståhlberg et al., "Post-COVID-19 Tachycardia Syndrome: A Distinct Phenotype of Post-Acute COVID-19 Syndrome," *American Journal of Medicine* 134, no. 12 (December 1, 2021): P1451-56, https://doi.org/10.1016/j.amjmed.2021.07.004.
[36] Olalekan Lee Aiyegbusi et al., "Symptoms, Complications and Management of Long COVID: A Review," *Journal of the Royal Society of Medicine* 114, no. 9 (September 2021): 428-42, https://doi.org/10.1177/01410768211032850.

Within the category abnormalities of breathing, the top distinct diagnoses co-occurring with the U09.9 post-COVID diagnosis were shortness of breath, which made up 47.2 percent of the category, and dyspnea, unspecified, which is also shortness of breath, or difficult or labored breathing, making up 44.4 percent (figure 13). Wheezing accounted for 4.1 percent of the category and snoring 2 percent. While it made up only 0.3 percent of the category, acute respiratory distress was also on the list.

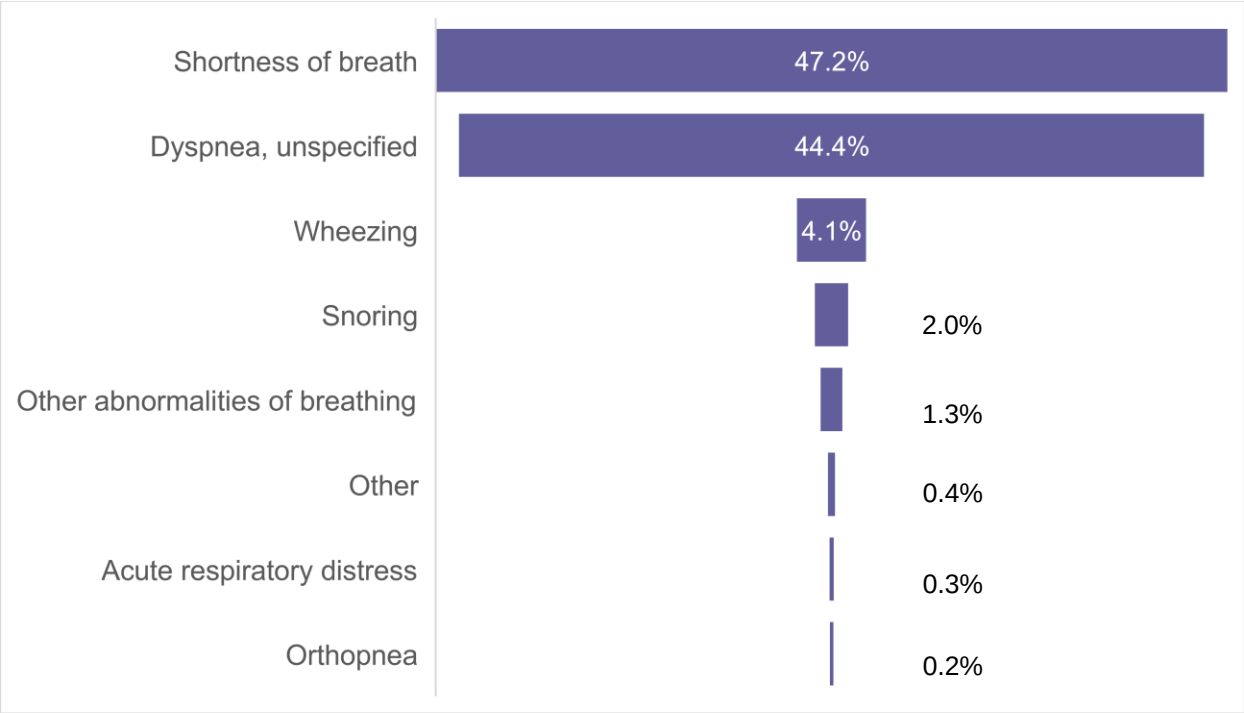

Figure 13. Diagnoses within the category abnormalities of breathing most commonly co-occurring with U09.9 post-COVID diagnosis, October 2021-January 2022

Within the category malaise and fatigue, which was the third most common diagnosis co-occurring with the U09.9 post-COVID diagnosis, 54.3 percent of the diagnoses were “other fatigue” and 27.2 percent were chronic fatigue, unspecified (figure 14). “Other malaise” constituted 9.5 percent of the category and weakness accounted for 9 percent.

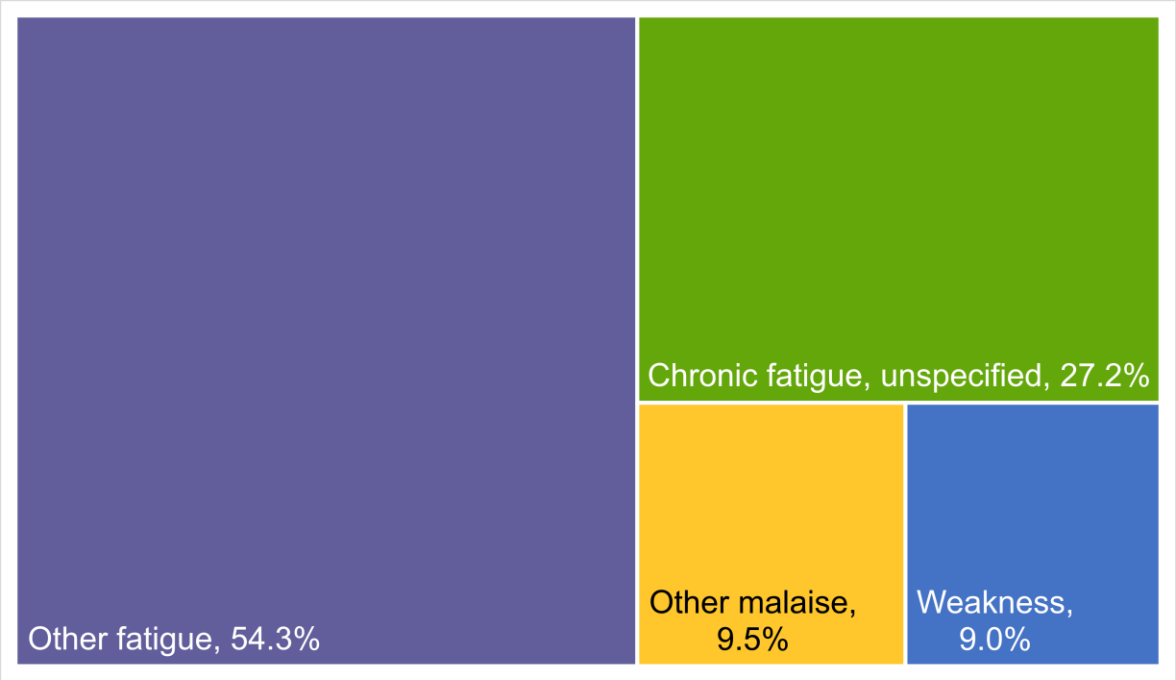

Figure 14. Diagnoses within the category malaise and fatigue most commonly co-occurring with U09.9 post-COVID diagnosis, October 2021-January 2022

Within the category sleep disorders, which was the 12th most common diagnosis co-occurring with the U09.9 post-COVID diagnosis, the most frequently occurring specific diagnosis was obstructive sleep apnea, making up 46.1 percent of the category (figure 15). Insomnia accounted for 30.4 percent of the category, while sleep apnea made up 8 percent. Hypersomnia (excessive daytime sleepiness with prolonged nighttime sleep) constituted 5.4 percent of the diagnoses.

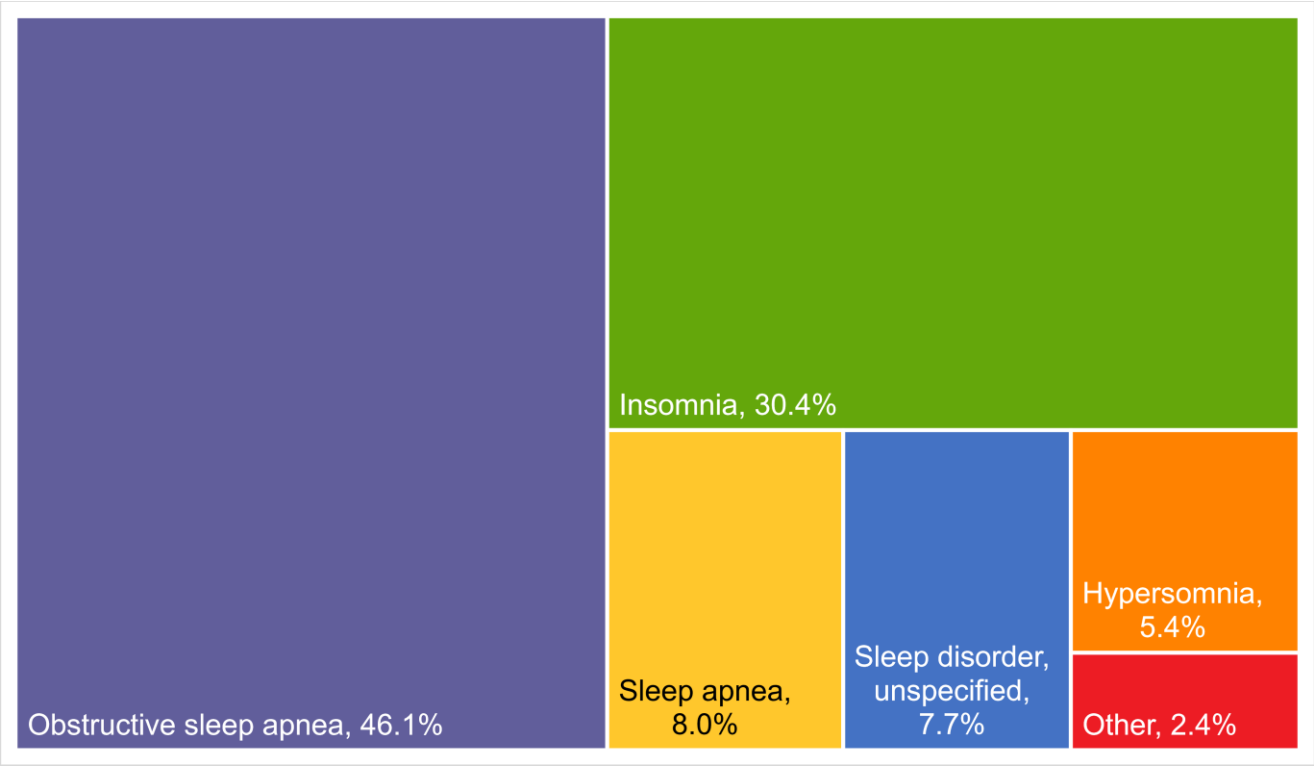

Figure 15. Diagnoses within the category sleep disorders most commonly co-occurring with U09.9 post-COVID diagnosis, October 2021-January 2022

Co-occurring Diagnoses by Age

In patients with a U09.9 post-COVID diagnosis who were aged 0 to 12, the top five co-occurring diagnoses (figure 16) differed somewhat from the top five across all age groups (figure 12). In patients aged 0 to 12, cough was the most common diagnosis co-occurring with the U09.9 diagnosis (as opposed to being second), and abnormalities of breathing were in second place (as opposed to first). Most notably, multisystem inflammatory syndrome was in fourth place, though it was not even in the top 15 across all age groups. A condition in which different body parts can become inflamed, including the heart, lungs, kidneys, brain and others, multisystem inflammatory syndrome has been documented especially in children who have had COVID-19, though it also can occur in adults who have had that infection.[37]

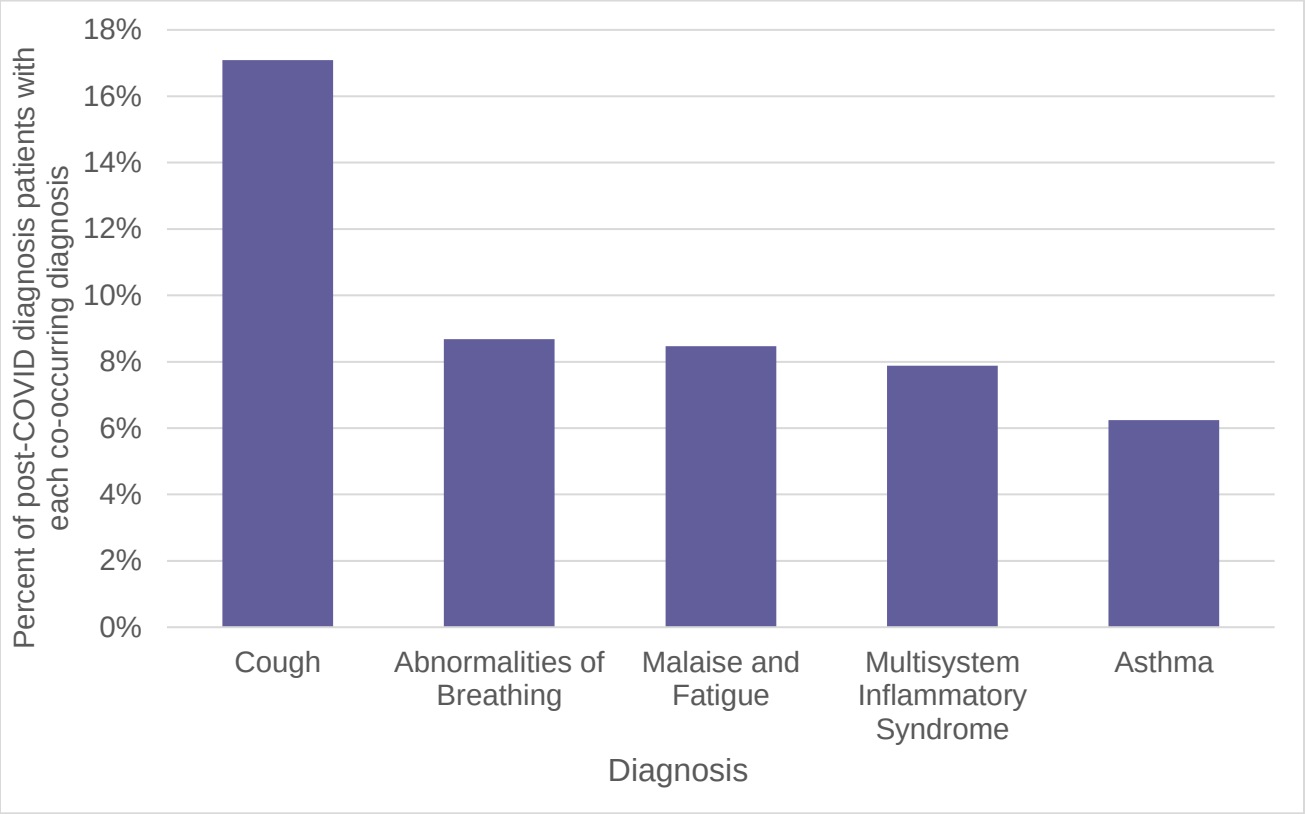

Figure 16. Five diagnoses most commonly co-occurring with U09.9 post-COVID diagnosis in patients aged 0 to 12, October 2021-January 2022

[37] "Multisystem Inflammatory Syndrome in Children (MIS-C) and Adults (MIS-A)," CDC, page last reviewed June 25, 2021, https://www.cdc.gov/mis/about.html.

In patients aged 13 to 22 who had a U09.9 post-COVID diagnosis, the top three co-occurring diagnoses (figure 17) were the same as they were across all age groups: abnormalities of breathing, cough, and malaise and fatigue (figure 12). But further down the ranks, the diagnoses co-occurring with U09.9 differed in the age group 13 to 22. Pain in throat and chest was the diagnosis in fourth place, with chest pain as the diagnosis most commonly found in this category; by contrast, pain in throat and chest was in sixth place across all age groups. Asthma was in fifth place in patients aged 13 to 22, compared to eighth place across all age groups. The 6th most common diagnosis co-occurring with the U09.9 post-COVID diagnosis and the age group 13 to 22 was abnormalities of heartbeat, including palpitations and tachycardia; this was in 10th place across all age groups. One study found that young adults recovering from COVID-19 had changes in heart rate and sympathetic nerve activity compared to a control group of healthy young adults.[38]

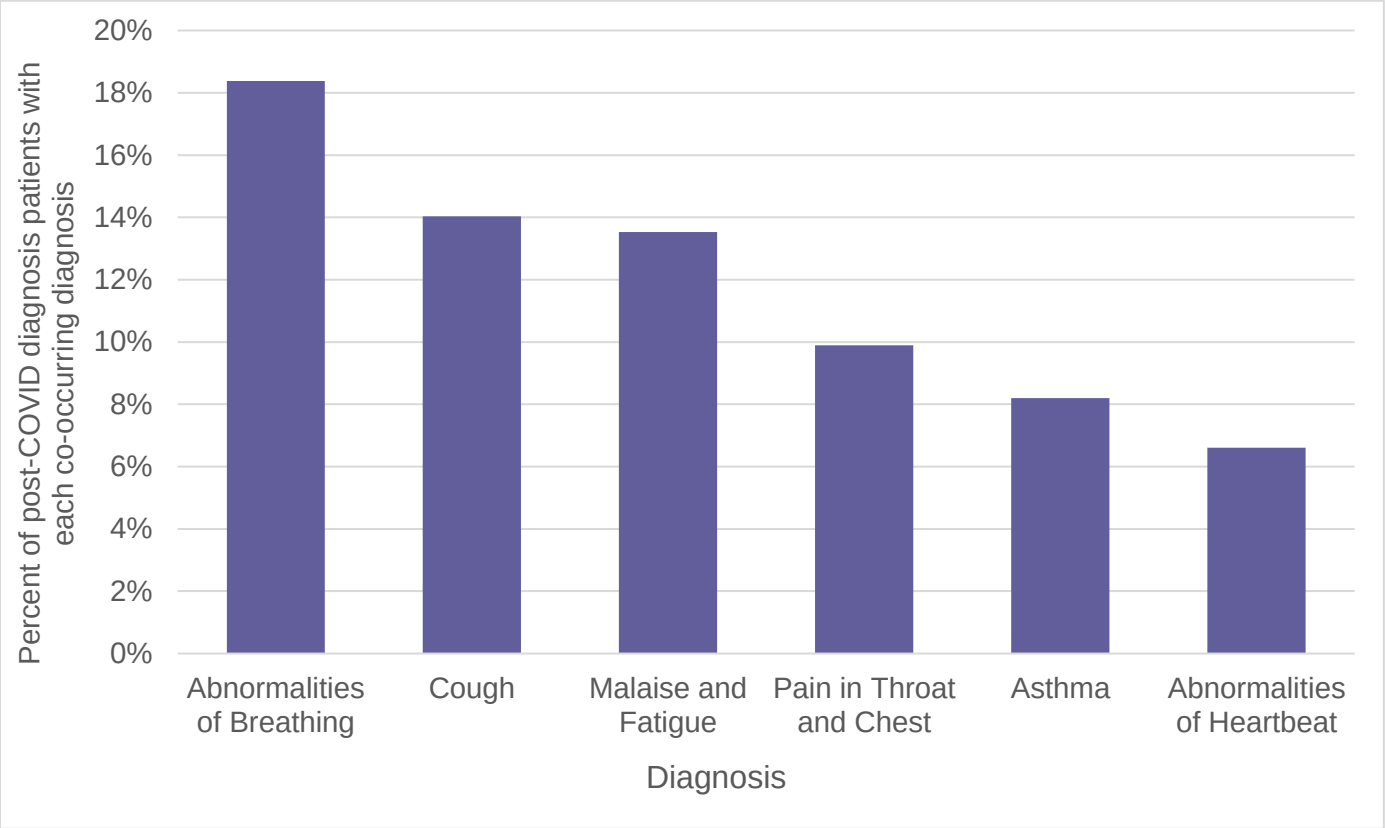

Figure 17. Six diagnoses most commonly co-occurring with U09.9 post-COVID diagnosis in patients aged 13 to 22, October 2021-January 2022

[38] Nina L. Stute et al., "COVID-19 Is Getting on Our Nerves: Sympathetic Neural Activity and Haemodynamics in Young Adults Recovering from SARS-CoV-2," *Journal of Physiology* 599, no. 18 (September 15, 2021): 4269-85, https://doi.org/10.1113/JP281888.

In patients aged 23 to 35 who had a U09.9 post-COVID diagnosis, the top three co-occurring diagnoses (figure 18) again were the same as across all age groups: abnormalities of breathing, cough, and malaise and fatigue (figure 12). As in the age group 13 to 22 (figure 17), pain in throat and chest and abnormalities of heartbeat were, respectively, in fourth and sixth place. One difference was that generalized anxiety disorder was in fifth place, compared to seventh place across all age groups.

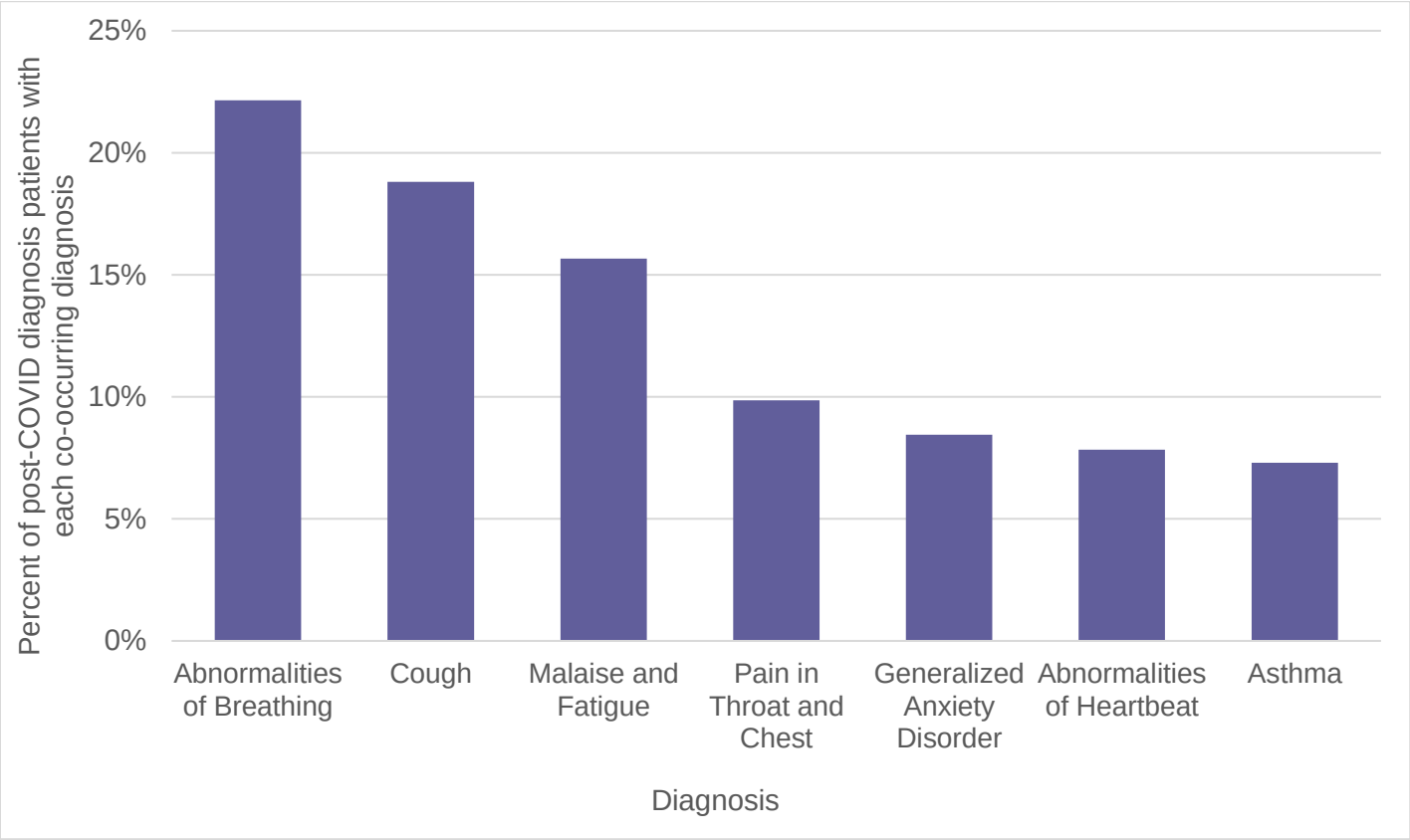

Figure 18. Seven diagnoses most commonly co-occurring with U09.9 post-COVID diagnosis in patients aged 23 to 35, October 2021-January 2022

In the age groups 36 to 50 and 51 to 64, the top five diagnoses co-occurring with the U09.9 diagnosis were the same or very similar to those across all age groups (figure 12). In the age group 65 and older, however, there were differences (figure 19). In this age group, hypertensive diseases most often co-occurred with the U09.9 diagnosis (21.5 percent of patients), whereas across all age groups they were in fourth place. Among patients 65 and older, hyperlipidemia was the fourth most common diagnosis, compared to fifth place across all age groups. Other researchers have found elevated age to be a factor in the development of hypertension as a post-COVID condition.[39]

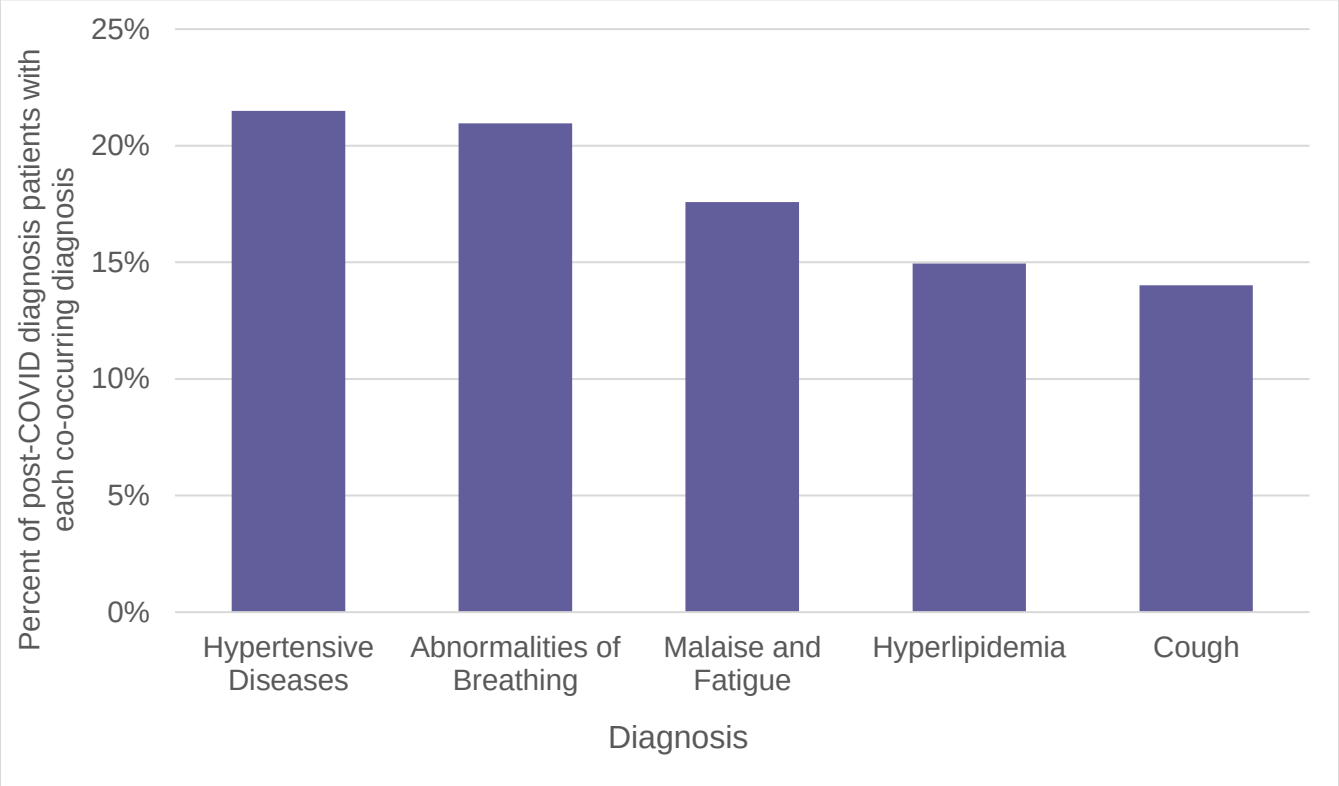

Figure 19. Five diagnoses most commonly co-occurring with U09.9 post-COVID diagnosis in patients aged 65 and older, October 2021-January 2022

[39] Ganxiao Chen et al., "Hypertension as a Sequela in Patients of SARS-CoV-2 Infection," *PLOS One* (April 28, 2021), https://doi.org/10.1371/journal.pone.0250815.

Co-occurring Diagnoses Compared Post-COVID to Pre-COVID

For each post-COVID co-occurring diagnosis in the study population, FAIR Health calculated the ratio of patients who had that diagnosis with a U09.9 code (i.e., post-COVID) to patients in the study population who had it pre-COVID. Table 1 shows those ratios for selected diagnoses not found among the 15 most common co-occurring diagnoses (figure 12). The ratios are not shown for the 15 most common co-occurring diagnoses because those diagnoses are likely to occur for other reasons prior to a COVID-19 diagnosis; for example, coughs may occur due to allergies. The diagnoses in table 1 have been selected because they are generally uncommon, potentially serious and show a large differential between post-COVID and pre-COVID. While not occurring in the same volumes as the 15 most common co-occurring diagnoses, they each occurred in at least 200 patients.

Table 1. Selected post-COVID co-occurring diagnoses, with ratio of patients post-COVID to pre-COVID, October 2021-January 2022

Post-COVID Co-occurring Diagnosis	Ratio of Patients Post-COVID to Pre-COVID
Other and Unspecified Myopathies	11.1
Other Respiratory Diseases Principally Affecting the Interstitium	4.8
Pulmonary Embolism	2.6
Disturbances of Smell and Taste	2.4
Other Interstitial Pulmonary Diseases	2.2
Other Disorders of Brain	2.0
Pneumothorax and Air Leak	1.6
Other Symptoms and Signs – Cognitive Function/Awareness	1.1

"Other and unspecified myopathies" (a disease that affects the muscles that control voluntary movement and that can cause muscle weakness due to dysfunction of the muscle fibers) occurred in patients in the post-COVID population 11.1 times more often than in the same population prior to COVID-19. Other researchers have reported myopathies in patients with COVID-19 or post-COVID conditions.[40,41,42]

"Other respiratory diseases principally affecting the interstitium" occurred 4.8 times more often after COVID-19 than before. The sole specific diagnosis in this category is acute respiratory distress syndrome.

[40] J. Agergaard et al., "Myopathic Changes in Patients with Long-Term Fatigue after COVID-19," *Clinical Neurophysiology* 132, no. 8 (August 2021): 1974-81, https://doi.org/10.1016/j.clinph.2021.04.009.
[41] Tom Aschman et al., "Association between SARS-CoV-2 Infection and Immune-Mediated Myopathy in Patients Who Have Died," *JAMA Neurology* 78, no. 8 (June 11, 2021): 948-60, https://doi.org/10.1001/jamaneurol.2021.2004.
[42] Giovanna S. Manzano, Jared K. Woods and Anthony A. Amato, "Covid-19–Associated Myopathy Caused by Type I Interferonopathy," *New England Journal of Medicine* 383 (December 10, 2020): 2389-90, https://doi.org/10.1056/NEJMc2031085.

Pulmonary embolism occurred 2.6 times more often after COVID-19 than before. This again is consistent with other literature showing pulmonary embolism in patients at the time of COVID-19 infection or afterward.[43,44,45]

"Other disorders of brain" occurred two times more often after COVID-19 than before. The specific diagnoses included in this category are shown in figure 20. Post-viral fatigue syndrome accounted for 65.8 percent of cases; encephalopathy, unspecified, and metabolic encephalopathy jointly accounted for 25.5 percent. Encephalopathy, any diffuse brain disease that alters brain function or structure, has been found to co-occur with COVID-19 and post-COVID conditions in the research literature.[46,47]

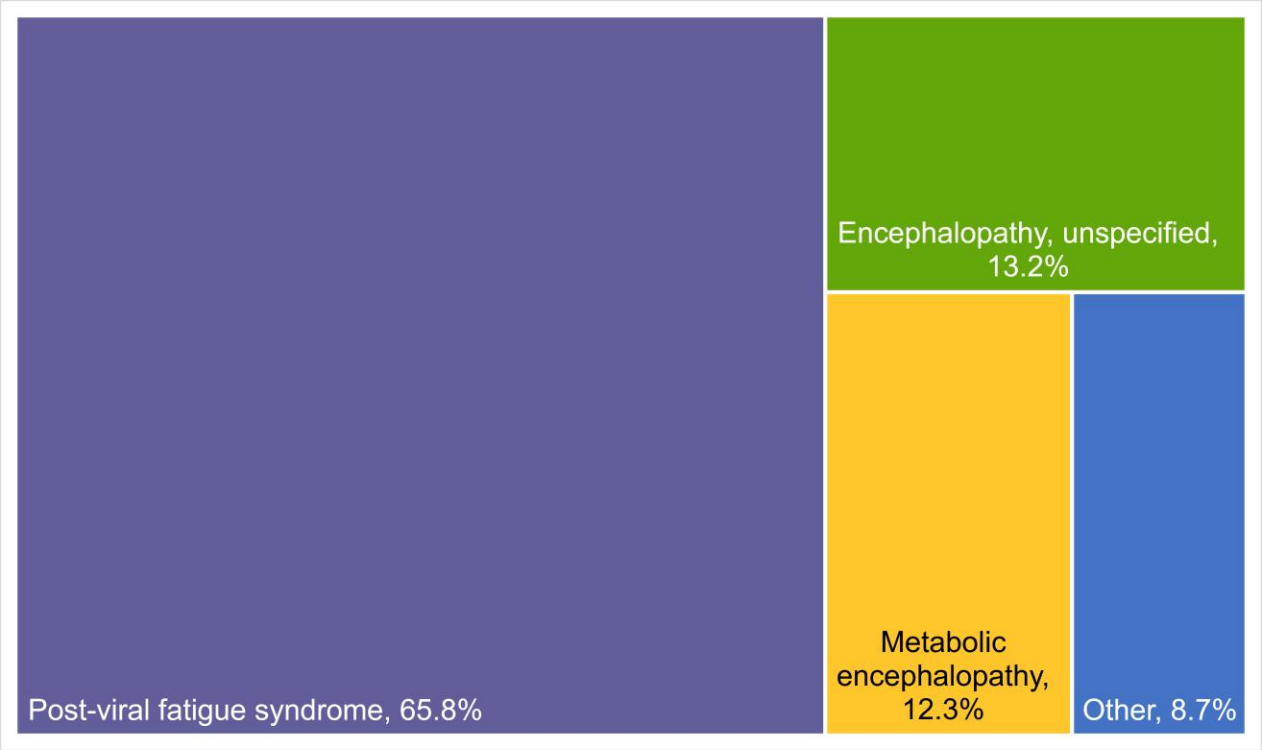

Figure 20. Diagnoses in the category "other disorders of brain" in patients with U09.9 post-COVID conditions, October 2021-January 2022

[43] Ioannis Katsoularis et al., "Risks of Deep Vein Thrombosis, Pulmonary Embolism, and Bleeding after Covid-19: Nationwide Self-Controlled Cases Series and Matched Cohort Study," *BMJ* 377 (April 6, 2022): e069590, https://www.bmj.com/content/377/bmj-2021-069590.
[44] Xiaowei Gong, Boyun Yuan and Yadong Yuan, "Incidence and Prognostic Value of Pulmonary Embolism in COVID-19: A Systematic Review and Meta-analysis," *PLOS One* (March 14, 2022), https://doi.org/10.1371/journal.pone.0263580.
[45] Sadjad Riyahi et al., "Pulmonary Embolism in Hospitalized Patients with COVID-19: A Multicenter Study," *Radiology* 301, no. 3 (July 13, 2021), https://pubs.rsna.org/doi/10.1148/radiol.2021210777.
[46] Cristina Valencia Sanchez et al., "Autoimmune Encephalitis after SARS-CoV-2 Infection: Case Frequency, Findings, and Outcomes," *Neurology* 97, no. 23 (December 7, 2021), https://doi.org/10.1212/WNL.0000000000012931.
[47] Marjolaine Uginet et al., "COVID-19 Encephalopathy: Clinical and Neurobiological Features," *Journal of Medical Virology* 93, no. 7 (July 2021): 4374-81, https://doi.org/10.1002/jmv.26973.

Risk Scores

HHS-HCC risk scores are based on a risk adjustment model that uses the diagnoses and demographics of health plan enrollees to predict the risk of medical expenditures.[48] The resulting risk scores identify which patients are likely to consume more healthcare resources and potentially incur more healthcare-related costs in the long run. In general, individuals with risk scores lower than 1.0 are regarded as relatively healthy.[49]

On average, HHS-HCC risk scores increased by 1.02 for patients with a U09.9 post-COVID condition, measured from before their COVID-19 diagnosis to 30 days and more after their COVID-19 diagnosis. An example of a risk score increase would be a patient who previously did not have a chronic condition, and had an original risk score of 0.5, who now presented with asthma or another chronic respiratory condition that increased his or her score to 0.7; the difference would be 0.2. As seen in table 2, the average increase in risk scores in patients with U09.9 post-COVID conditions varied by age. Even so, on average, in all age groups, patients with a post-COVID condition had higher risk scores after their diagnosis of COVID-19 than before.

Table 2. Average increase in HHS-HCC risk scores in patients with U09.9 post-COVID condition by age, comparing risk scores before and after COVID-19 diagnosis, October 2021-January 2022

Age Group, in Years	Average Increase in Risk Scores
0 to 12	0.16
13 to 22	0.43
23 to 35	0.73
36 to 50	0.84
51 to 64	1.20
65 and older	1.80

Conclusion

This study of patients diagnosed with U09.9 post-COVID conditions in the first four months since that diagnosis code became effective makes several notable findings. Most patients with that diagnosis (75.8 percent) had not been hospitalized for COVID-19. The proportion differed by gender: 81.6 percent of females had not had a COVID-19 hospitalization compared to 67.5 percent of males. Of patients with a U09.9 post-COVID diagnosis, the largest share (34.6 percent) was aged 36 to 50, and the majority were female (59.8 percent). Nearly a third of the study population (30.7 percent) had no identified preexisting chronic comorbidities.

The three diagnoses most commonly co-occurring with the U09.9 post-COVID diagnosis in patients across all ages and genders were abnormalities of breathing, cough, and malaise and fatigue. Lower-ranking but still common co-occurring diagnoses included abnormalities of heartbeat and sleep disorders.

[48] John Kautter et al., "The HHS-HCC Risk Adjustment Model for Individual and Small Group Markets under the Affordable Care Act," *Medicare & Medicaid Research Review* 4, no. 3 (May 9, 2014): mmrr2014-004-03-a03, https://doi.org/10.5600/mmrr.004.03.a03.

[49] John P. Yeatts and Devdutta G. Sangvai, "HCC Coding, Risk Adjustment, and Physician Income: What You Need to Know," *Family Practice Management* 23, no. 5 (September-October 2016): 24-27, https://www.aafp.org/fpm/2016/0900/p24.html.

Certain co-occurring diagnoses were more common in particular age groups than across all age groups: for example, multisystem inflammatory syndrome in patients aged 0 to 12; abnormalities of heartbeat in the age group 13 to 22; generalized anxiety disorder in patients aged 23 to 35; and hypertensive diseases in the age group 65 and older.

Some co-occurring diagnoses were less common but still occurred more often in patients in the post-COVID population than in the same population prior to COVID-19. These included “other and unspecified myopathies,” pulmonary embolism and “other disorders of brain.” Overall, patients with a U09.9 post-COVID condition had higher HHS-HCC risk scores after their diagnosis of COVID-19 than before.

The findings in this report are important for all individuals diagnosed with U09.9 post-COVID conditions, as well as for providers, payors and policy makers. Additionally, FAIR Health hopes that these findings will be starting points for further studies, including those using the U09.9 diagnosis code.

About FAIR Health

FAIR Health is a national, independent nonprofit organization dedicated to bringing transparency to healthcare costs and health insurance information through data products, consumer resources and health systems research support. FAIR Health qualifies as a public charity under section 501(c)(3) of the federal tax code. FAIR Health possesses the nation's largest collection of private healthcare claims data, which includes over 36 billion claim records and is growing at a rate of over 2 billion claim records a year. FAIR Health licenses its privately billed data and data products—including benchmark modules, data visualizations, custom analytics and market indices—to commercial insurers and self-insurers, employers, providers, hospitals and healthcare systems, government agencies, researchers and others. Certified by the Centers for Medicare & Medicaid Services (CMS) as a national Qualified Entity, FAIR Health also receives data representing the experience of all individuals enrolled in traditional Medicare Parts A, B and D; FAIR Health includes among the private claims data in its database, data on Medicare Advantage enrollees. FAIR Health can produce insightful analytic reports and data products based on combined Medicare and commercial claims data for government, providers, payors and other authorized users. FAIR Health's free, award-winning, national consumer websites are fairhealthconsumer.org and fairhealthconsumidor.org. For more information on FAIR Health, visit fairhealth.org.

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