BRIEF

Key Characteristics of COVID-19 Patients

Profiles Based on Analysis of Private Healthcare Claims

A FAIR Health Brief, July 14, 2020

Summary

This fourth study, in a series of FAIR Health briefs on COVID-19, focuses on patients, using the nation's largest repository of private healthcare claims to illuminate some of the key characteristics of patients diagnosed with COVID-19. These characteristics include age, gender, rural versus urban area by age, venue of care where first diagnosed, venue of care by age, comorbidities of hospitalized patients and median costs of hospitalization (both charge amounts[1] and estimated allowed amounts[2]). The patient characteristics are analyzed nationally and also by US census region.[3] The data studied are from the period January-May 2020. Among the findings:

- Nationally and in every region, chronic kidney disease and kidney failure were the most common comorbidity in hospitalized COVID-19 patients, present in 13 percent of all hospitalized patients with COVID-19.
- All regions except one resembled the nation in having type 2 diabetes as the second most common comorbidity; the exception, the South, had hypertension in that rank.
- Nationally, the median charge amount for hospitalization of a COVID-19 patient ranged from $34,662 for the 23-30 age group to $45,683 for the 51-60 age group. The median estimated allowed amounts ranged from $17,094 for people over 70 years of age to $24,012 for people aged 51-60 years.
- The West was the region with the widest range of costs for COVID-19 hospitalizations. There, median charge amounts ranged from $21,407 for the 19-22 age group to $93,459 for the over 70 age group. Median estimated allowed amounts ranged from $15,289 for the 19-22 age group to $60,205 for the over 70 age group.
- Nationally, an office was the most common setting for initial presentation of patients with COVID-19: 33.3 percent of COVID-19 patients presented to an office and 23.0 percent presented to an inpatient facility. However, older people (age 61 and above) most commonly presented first to an inpatient setting.
- In the Northeast, telehealth was more common for initial diagnosis of COVID-19 than emergency rooms (6.7 versus 6.2 percent of COVID-19 patients), and the Northeast was the region with the highest percentage of COVID-19 patients who received their initial diagnosis via telehealth.
- Nationally, males were associated with a larger share (54 percent) of the distribution of COVID-19 claim lines than females (46 percent).
- Nationally, during the January-May time frame, COVID-19 was most commonly associated with the age group 51-60, which accounted for 29.9 percent of the distribution of claim lines with this diagnosis. Children (0-18 years) accounted for the smallest share, 1.5 percent. (It should be noted, however, that the age distribution may be in flux, with the average age of new COVID-19

[1] A charge amount is the amount charged to a patient who is uninsured or obtaining an out-of-network service.

[2] An allowed amount is the total fee negotiated between an insurance plan and a provider for an in-network service; the allowed amount includes both the insurer's and the member's share of the total fee. Because payors' contracted network rates are proprietary, FAIR Health employs an imputation methodology to determine benchmarks for allowed amounts. First, FAIR Health calculates the ratios of actual allowed amounts to charges for groups of procedure codes on a regional basis. The resulting ratios are applied to the actual charges for each specific procedure at the local (geozip) level to develop an "imputed" or "estimated" allowed amount for each claim line.

[3] The states in the US census regions are:

- **Northeast:** Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont;
- **Midwest:** Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin;
- **South:** Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; and
- **West:** Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

patients in the United States having dropped by about 15 years compared with a few months ago, according to recent reports.)[4]

- In the South, Midwest and West, the age groups 19-30 and 31-40 accounted for larger shares of the distribution of claim lines than in the Northeast and the nation as a whole.
- Across age groups on the national level, rural and urban areas were similar in their association with COVID-19 claim lines. In the largest age group by claim line volume, 51-60, rural and urban areas had almost identical shares of the COVID-19 claim line distribution, respectively 30.2 percent and 30.3 percent.

Background

Millions of Americans have contracted COVID-19 since the disease reached the United States in January, yet much remains unknown about these patients. Reports of the average age of patients have varied by month.[5] Information about gender disparities in morbidity and mortality varies by state.[6] COVID-19 was at first associated with urban areas, then began growing rapidly in rural areas.[7] It is difficult to find adequate statistics about some topics, such as the most common venues of care where COVID-19 patients were initially diagnosed. Statistics have been compiled for others, such as the underlying medical conditions of patients hospitalized with COVID-19,[8] but full understanding of their meaning remains elusive. And the cost of COVID-19 hospitalization is still a subject of debate.[9]

A series of studies from FAIR Health have examined several aspects of the COVID-19 pandemic. The first brief projected the costs to the nation of inpatient services for COVID-19 patients, and delved into the potential of telehealth for helping to cope with the pandemic.[10] The second brief analyzed the impact of COVID-19 on hospitals and health systems.[11] The third brief concerned the impact of COVID-19 on non-

[4] Noah Higgins-Dunn and Will Feuer, "Dr. Anthony Fauci Says the Average Age of U.S. Coronavirus Patients Has Dropped by 15 Years as Sun Belt States Gets Hit," CNBC, July 6, 2020, https://www.cnbc.com/2020/07/06/dr-anthony-fauci-says-the-average-age-of-us-coronavirus-patients-has-dropped-by-15-years-as-sun-belt-states-gets-hit.html.

[5] Whet Moser, "Why Changing COVID-19 Demographics in the US Make Death Trends Harder to Understand," COVID Tracking Project at *The Atlantic* (blog), June 26, 2020, https://covidtracking.com/blog/why-changing-covid-19-demographics-in-the-us-make-death-trends-harder-to.

[6] "US Gender/Sex COVID-19 Data Tracker," Harvard GenderSci Lab, GenderSci Lab COVID Project, 2020, https://www.genderscilab.org/gender-and-sex-in-covid19/#CaseDeathbySex.

[7] S. J. Goetz et al., *Rural COVID-19 Cases Lag Urban Areas but Are Growing Much More Rapidly*, Northeast Regional Center for Rural Development (NERCRD) COVID-19 Issues Brief No. 2020-3, April 3, 2020 (revised April 9, 2020), https://aese.psu.edu/nercrd/publications/covid-19-issues-briefs/rural-covid-19-cases-lag-urban-areas-but-are-growing-much-more-rapidly.

[8] COVID-NET: COVID-19-Associated Hospitalization Surveillance Network, Centers for Disease Control and Prevention, accessed on July 2, 2020, https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html.

[9] Anna Elizabeth, "Listen: How Much Does It Cost to Get COVID-19?," *The Atlantic—Social Distance* (podcast), April 27, 2020, https://www.theatlantic.com/health/archive/2020/04/how-much-does-it-cost-to-get-covid-19/610813/.

[10] 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.

[11] 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.

facility providers, or healthcare professionals.[12] This fourth brief focuses on patients, profiling COVID-19 patients by illuminating some of their key characteristics.

To study these characteristics, FAIR Health analyzed data from its database of over 31 billion private healthcare claim records, the largest such repository in the nation, which is growing by over 2 billion claim records per year. The characteristics elucidated include age, gender, rural versus urban area by age, venue of care where first diagnosed, venue of care by age, comorbidities of hospitalized patients and median costs of hospitalization. The costs given are both charge amounts and estimated allowed amounts. The characteristics are analyzed nationally and also by US census region, with an emphasis on notable regional variations.

A national, independent nonprofit organization dedicated to bringing transparency to healthcare costs and health insurance information, FAIR Health based this study, as noted, on its repository of private healthcare claims data. The data are contributed by over 60 payors and third-party administrators who insure or process claims for private insurance plans covering more than 150 million individuals—an estimated 75 percent of the nation's privately insured population. The dataset includes data on fully insured and employer self-funded plans and Medicare Advantage (Medicare Part C) enrollees, but not on uninsured individuals or those on Medicare Parts A, B and D.[13] Those insured under other government programs, such as Medicaid, CHIP, and state and local government programs, are also not included.

Methodology

FAIR Health analyzed private insurance claims (both longitudinal and non-longitudinal) associated with COVID-19 diagnoses and evaluated claim characteristics (such as age and gender of patient, location of service, charge amount and estimated allowed amount) and patients' comorbidities. Trends and patterns in utilization were then identified.

FAIR Health used the International Classification of Diseases (ICD-10-CM) diagnostic codes reported on claims in the FAIR Health dataset to identify claims that were indicative of COVID-19. FAIR Health used both U07.1, 2019-nCoV acute respiratory disease, which was established to be used starting on March 18, 2020; and B97.29, other coronavirus as the cause of diseases classified elsewhere, which was the *de facto* code that was recommended for use to diagnose patients until the new code was available.[14]

Data were evaluated by stratifying them by gender and age, as well as by a combination of the US Census Bureau's classification categorizations, including the urban-rural data, and the FAIR Health geozip paradigm, which divides the United States into 493 separate geographic regions, to provide results by US census regions.

Using longitudinal data, FAIR Health created an index date of the longitudinal patients' first diagnoses of COVID-19, then identified where the patient was first diagnosed and presumed to be treated for COVID-19 (e.g., nationally, 33.3 percent of patients were first diagnosed in the office location, and 23.0 percent

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[12] 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.

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

[14] COVID-19, or novel coronavirus disease, did not have an official ICD-10 diagnosis code until March 18, 2020. Many electronic medical record (EMR) and electronic health record (EHR) systems were not completely set up to accept this code until April 1, 2020, or later.

were first diagnosed in an inpatient setting). The patient distribution was then striated by age band and by which settings were most common by age.

Evaluating only those patients who were hospitalized for COVID-19 (at any time—regardless of whether it was the index date diagnosis setting), FAIR Health then looked back at least 15 days prior to the index date of the diagnosis (not the inpatient stay) for all additional comorbid diagnoses that were associated with the patients between January 1, 2018, and the index date minus 15 days. The data were then aggregated by the comorbid diagnostic code categories. The aggregation was done to identify trends and patterns in utilization as well as patient correlations.

Except for the analysis of comorbid diagnoses, the claims studied for COVID-19 diagnoses were received from January 1, 2020, through June 30, 2020, with dates of service from January 1, 2020, through mid-May 2020. The claims studied for the analysis of comorbid diagnoses were received from January 1, 2018, through July 7, 2020, with dates of service from January 1, 2018, through May 16, 2020.

The data in this study were evaluated with single and multiple variables to look for distinct trends, associations and correlations. In the graphical representations below, the term “claim lines” refers to the individual procedures or services listed on an insurance claim. One claim may have multiple claim lines. “Percent of claim lines” is the percent of all claim lines associated with a given grouping of diagnosis codes in a given time period.

Results

Age

Nationally, COVID-19 in the period January-May 2020 was most commonly associated with the age group of individuals aged 51-60, which accounted for 29.9 percent of the distribution of claim lines with this diagnosis (figure 1). Second in prominence was the age group 61-70 (20.9 percent) and third was the age group 41-50 (19.3 percent). The pediatric population (0-18 years) accounted for the smallest share, 1.5 percent, in keeping with other researchers' findings that children are at relatively low risk of infection.[15]

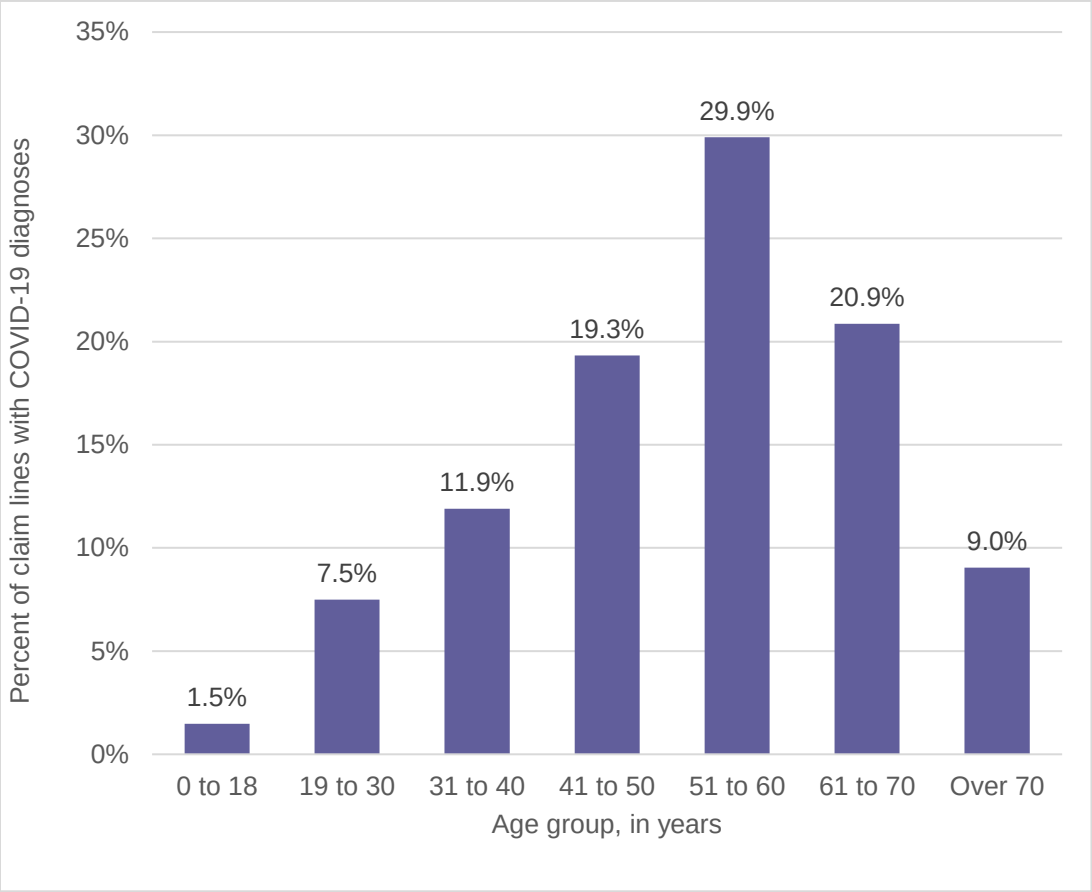

Figure 1. Distribution of claim lines associated with COVID-19 diagnoses by age group, nationally, January-May 2020

FAIR Health findings are consistent with World Health Organization data showing that the median age of confirmed COVID-19 cases is 51, with an interquartile range of 36-65.[16] Similarly, in the United States, the Centers for Disease Control and Prevention (CDC) has reported a median age of 48, with an

[15] Erin Garcia de Jesus, "Here's What We've Learned in Six Months of COVID-19—and What We Still Don't Know," *Science News*, June 30, 2020, https://www.sciencenews.org/article/coronavirus-covid-19-pandemic-six-months-what-we-know.

[16] World Health Organization, *Coronavirus Disease 2019 (COVID-19) Situation Report – 89*, April 18, 2020, https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200418-sitrep-89-covid-19.pdf?sfvrsn=3643dd38_2.

interquartile range of 33-63.[17] It should be noted, however, that the age distribution may be in flux, with the average age of new COVID-19 patients in the United States having dropped by about 15 years compared with a few months ago, according to recent reports.[18]

Researchers have found that the age group most at risk of severe or fatal cases of COVID-19 is that of adults aged 60 and older,[19] but the FAIR Health findings represented in figure 1 do not show severity, only presence of the diagnosis.

[17] Erin K. Stokes et al., "Coronavirus Disease 2019 Case Surveillance—United States, January 22–May 30, 2020," *Morbidity and Mortality Weekly Report* 69, no. 24 (June 19, 2020): 759–765, http://dx.doi.org/10.15585/mmwr.mm6924e2.

[18] Higgins-Dunn and Feuer, "Dr. Anthony Fauci Says the Average Age of U.S. Coronavirus Patients Has Dropped by 15 Years as Sun Belt States Gets Hit."

[19] The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, "Vital Surveillances: The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19)—China, 2020," *China CDC Weekly* 2, no. 8 (2020): 113-122, http://weekly.chinacdc.cn/en/article/id/e53946e2-c6c4-41e9-9a9b-fea8db1a8f51.

US census regions were generally similar in age distribution to the nation, with 51-60 as the largest age group in all regions and 0-18 the smallest. But there were differences. In the Northeast, for example, the age group 61-70 had a larger share of the distribution (22.2 percent) than it did in any other region or the nation as a whole. In the nation and most regions, the age group 0-18 accounted for less than 2 percent of the distribution, but in the West it accounted for 2.5 percent.

In the South, as in the Midwest and West, the age group 41-50 was in second place, but it ranked third in the Northeast and the nation (figure 2). In the South, Midwest and West, the age groups 19-30 and 31-40 accounted for larger shares of the distribution of claim lines than in the Northeast and the nation as a whole.

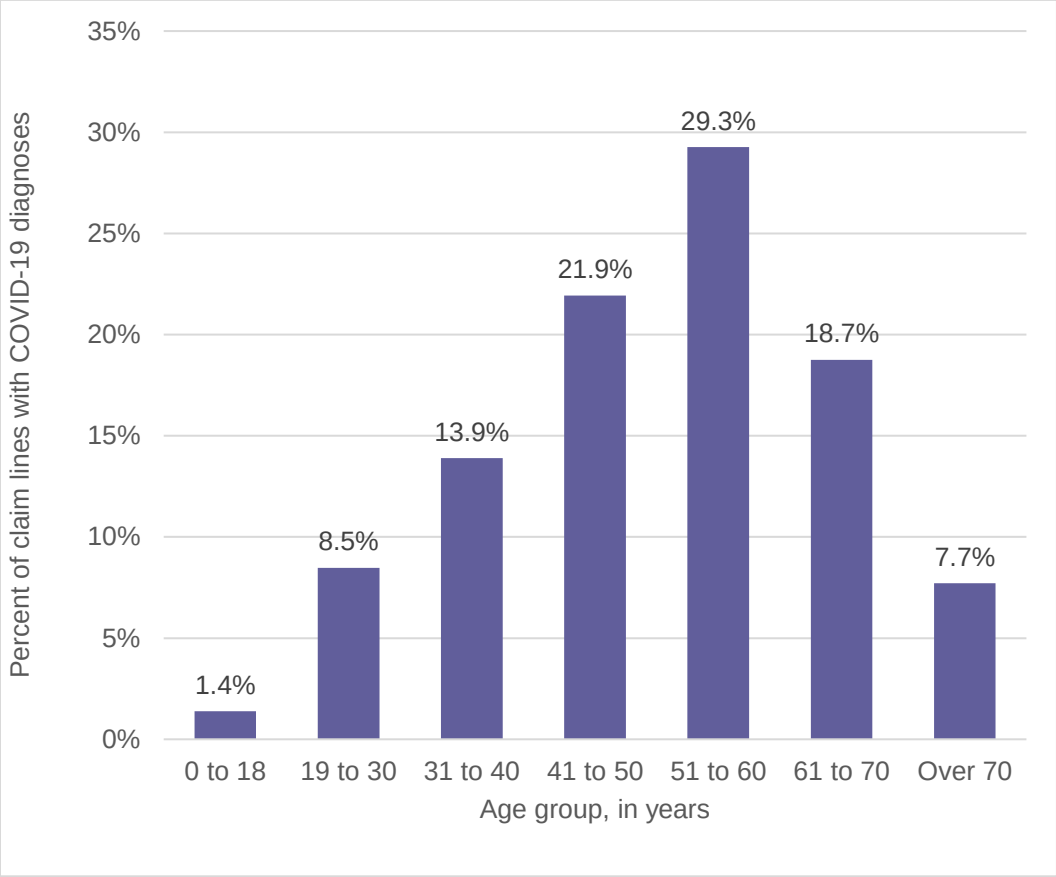

Figure 2. Distribution of claim lines associated with COVID-19 diagnoses by age group, South, January-May 2020

Gender

Nationally, males were associated with a larger share (54 percent) of the distribution of COVID-19 claim lines than females (46 percent; figure 3). This finding is striking in two respects. First, women are generally more likely than men to visit physicians[20] and make use of healthcare services,[21] yet the opposite appears true for COVID-19. Second, most previous research has suggested that males and females have similar odds of being diagnosed with COVID-19, though there is variation among countries.[22] CDC data show that persons with laboratory-confirmed COVID-19 are 51 percent female and 49 percent male.[23] Yet FAIR Health data show a somewhat higher incidence of COVID-19 diagnosis in males in the United States. The difference between FAIR Health findings and other results may be attributable to differences in data sources and methodology. For example, the CDC bases its findings on case surveillance reports, while FAIR Health findings are based on private insurance claims.

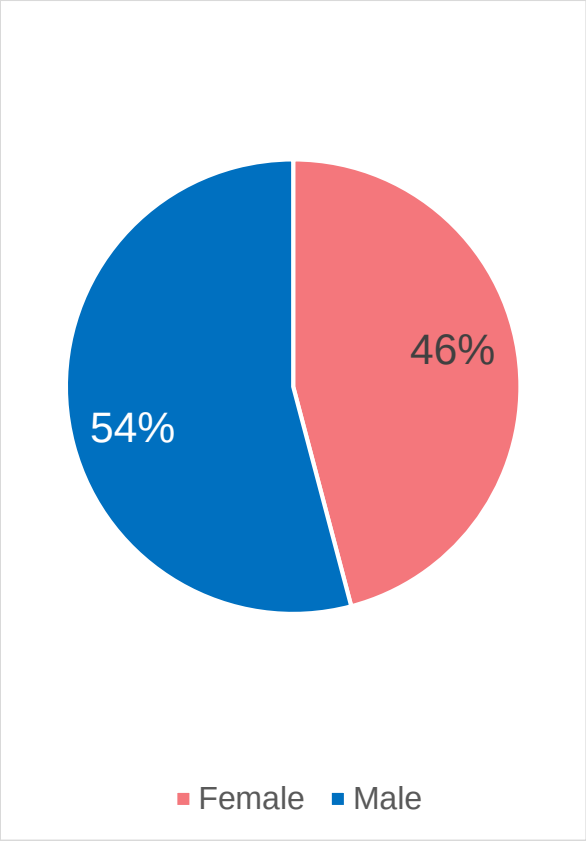

Figure 3. Distribution of claim lines associated with COVID-19 diagnoses by gender, nationally, January-May 2020

[20] Jill J. Ashman, Esther Hing and Anjali Talwalkar, "Variation in Physician Office Visit Rates by Patient Characteristics and State, 2012," NCHS Data Brief, no. 212 (Hyattsville, MD: National Center for Health Statistics, 2015), https://www.cdc.gov/nchs/data/databriefs/db212.pdf.
[21] Klea D. Bertakis et al., "Gender Differences in the Utilization of Health Care Services," *Journal of Family Practice* 49, no. 2 (2000):147-52, https://www.ncbi.nlm.nih.gov/pubmed/10718692.
[22] Richard V. Reeves and Tiffany Ford, "COVID-19 Much More Fatal for Men, Especially Taking Age into Account," Brookings, Up Front (blog), May 15, 2020, https://www.brookings.edu/blog/up-front/2020/05/15/covid-19-much-more-fatal-for-men-especially-taking-age-into-account/.
[23] Stokes et al., "Coronavirus Disease 2019 Case Surveillance—United States, January 22–May 30, 2020."

Previous research has indicated that men have a higher risk of death from COVID-19 than women, though this was not examined in the present study.[24]

FAIR Health data showed that the stronger association of COVID-19 claim lines with males was consistent in every region, though the strength varied. It was weakest in the South, where the gender distribution was almost equal: 51 percent male to 49 percent female. In the Midwest, it was 53 percent male to 47 percent female; in the West, it was 54 percent male to 46 percent female. The Northeast had the strongest association of COVID-19 claim lines with males: 55 percent male to 45 percent female (figure 4).

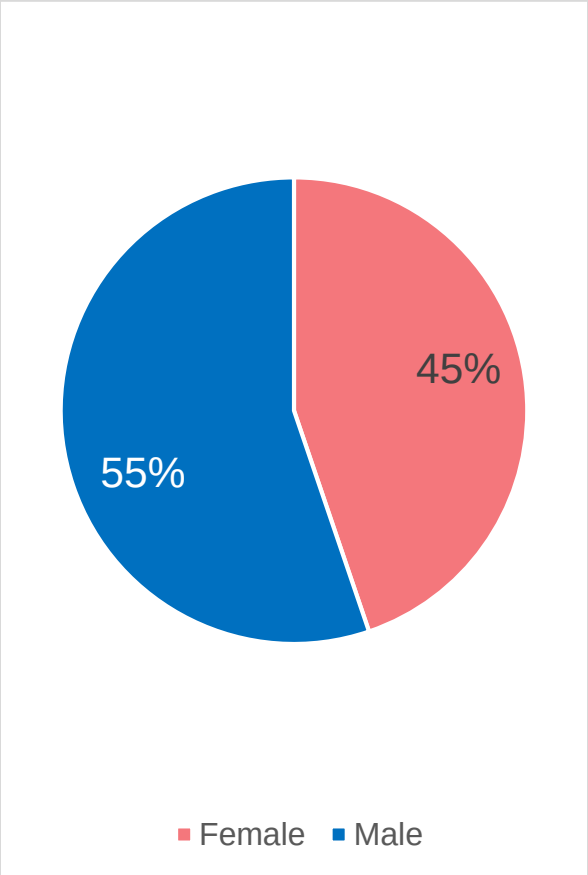

Figure 4. Distribution of claim lines associated with COVID-19 diagnoses by gender, Northeast, January-May 2020

[24] Reeves and Ford, "COVID-19 Much More Fatal for Men, Especially Taking Age into Account."

Rural versus Urban

Across age groups on the national level, rural and urban areas were similar in their association with COVID-19 claim lines (figure 5). In the age group that is largest by claim line volume, 51-60, rural and urban areas had almost identical shares of the COVID-19 claim line distribution, respectively 30.2 percent and 30.3 percent. Urban areas predominated (21.3 percent compared to 18.1 percent for rural areas) in the 61-70 age group; in most other age groups, rural areas exceeded urban areas. In the pediatric age group (0-18), rural and urban areas each accounted for 1.9 percent of COVID-19 claim lines.

Early in the pandemic, most reports associated COVID-19 with urban areas (especially New York City), where the population density was highest.[25] Since then the infection has grown rapidly in rural areas as well, as is reflected in the FAIR Health data.

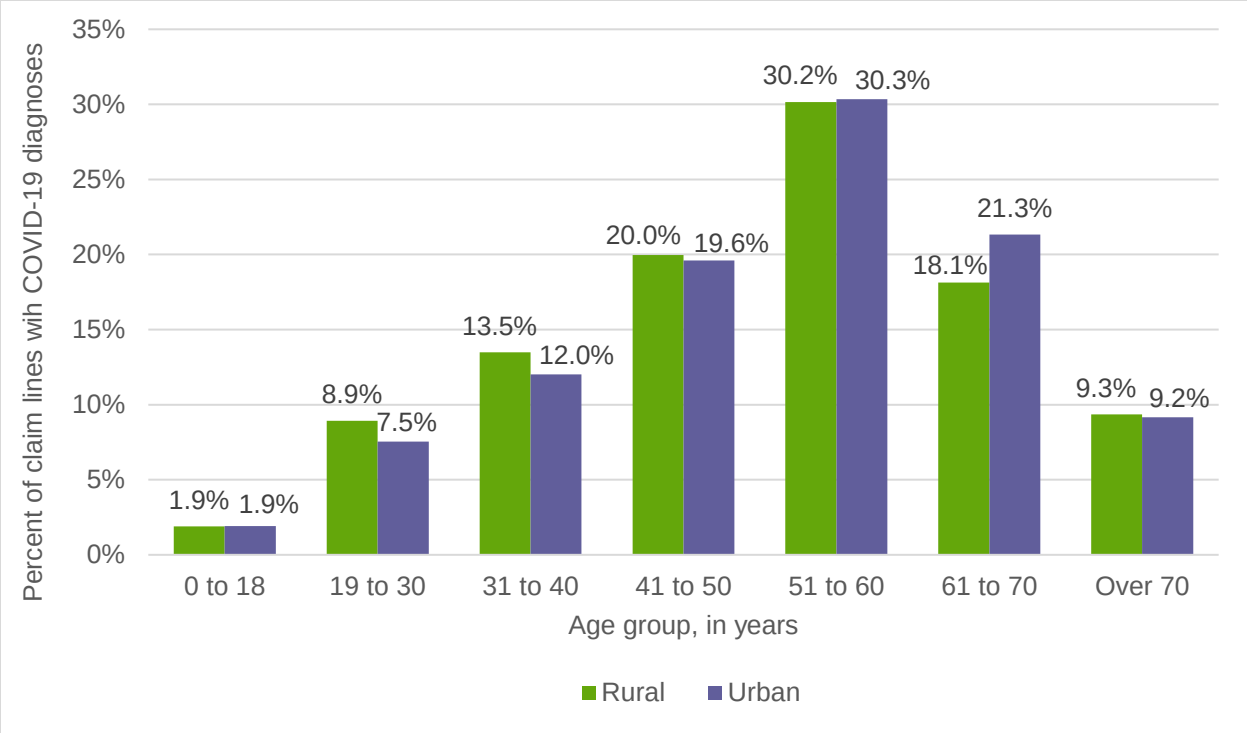

Figure 5. Distribution of claim lines associated with COVID-19 diagnoses by rural versus urban area, nationally, January-May 2020

[25] Goetz et al., *Rural COVID-19 Cases Lag Urban Areas but Are Growing Much More Rapidly*.

The four census regions of the United States were similar in rural/urban profile to the nation, but with some differences. The Midwest offers an example of the kinds of differences (figure 6). In the 51-60 age group in the Midwest, rural areas outstripped urban areas by 33.8 percent to 31.1 percent of COVID-19 claim lines, compared to the near equivalence of rural and urban areas in that age group nationally (30.2 percent to 30.3 percent—see figure 5). In the age groups 19-30 and 31-40, in which rural areas predominated slightly on the national level, the predominance was stronger in the Midwest. And in the age group 41-50, in which rural areas were slightly more commonly associated with COVID-19 than urban areas nationally, urban areas had a larger share (21.6 percent) than rural areas (18.3 percent) in the Midwest.

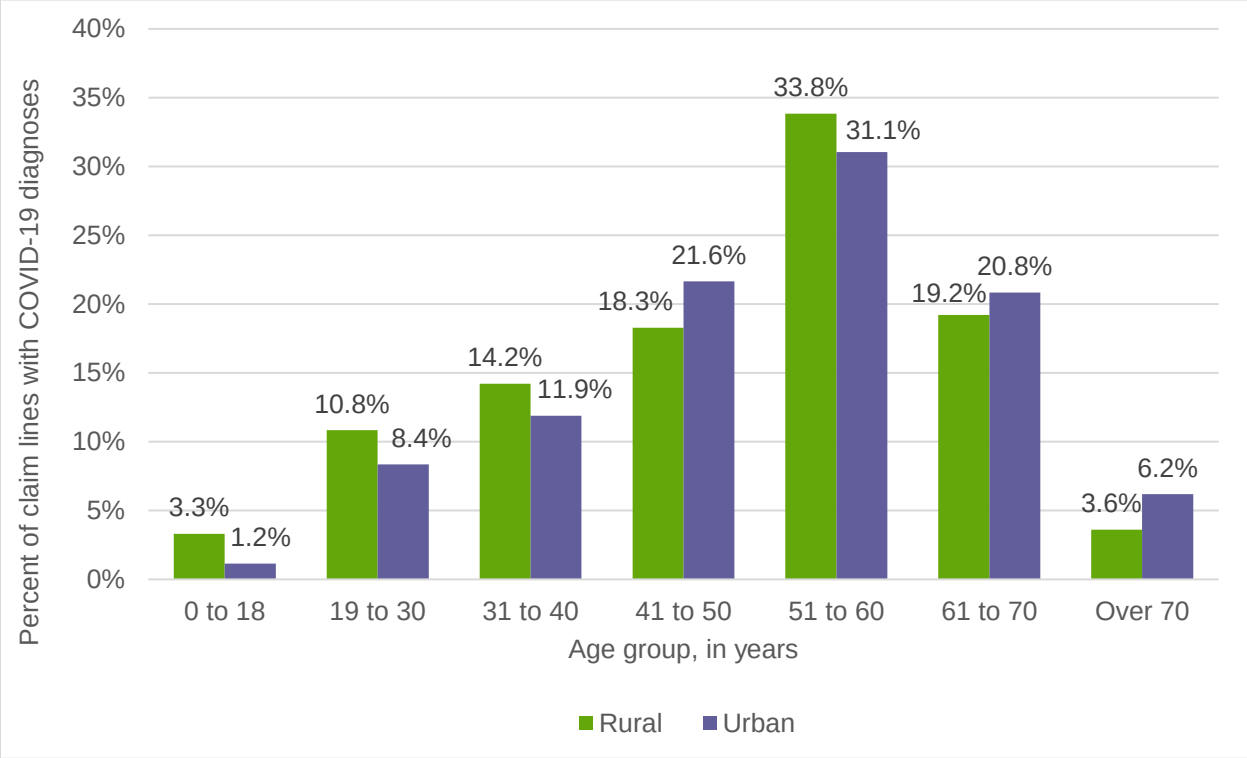

Figure 6. Distribution of claim lines associated with COVID-19 diagnoses by rural versus urban area, Midwest, January-May 2020

Venue of Care

Despite the importance of hospitals in treating severe cases of COVID-19, nationally, the most common first venue of care for diagnosing patients with a COVID-19 diagnosis was an office (figure 7). For 33.3 percent of COVID-19 patients, that was the venue associated with the patient's index date diagnosis. The second most common setting was an inpatient facility, with 23.0 percent of COVID-19 patients. Third, fourth and fifth in rank, respectively, were outpatient facility (11.4 percent), emergency room (6.8 percent) and telehealth (6.1 percent). All others, including such settings as laboratory, urgent care center and ambulance, accounted for 19.4 percent of patients.

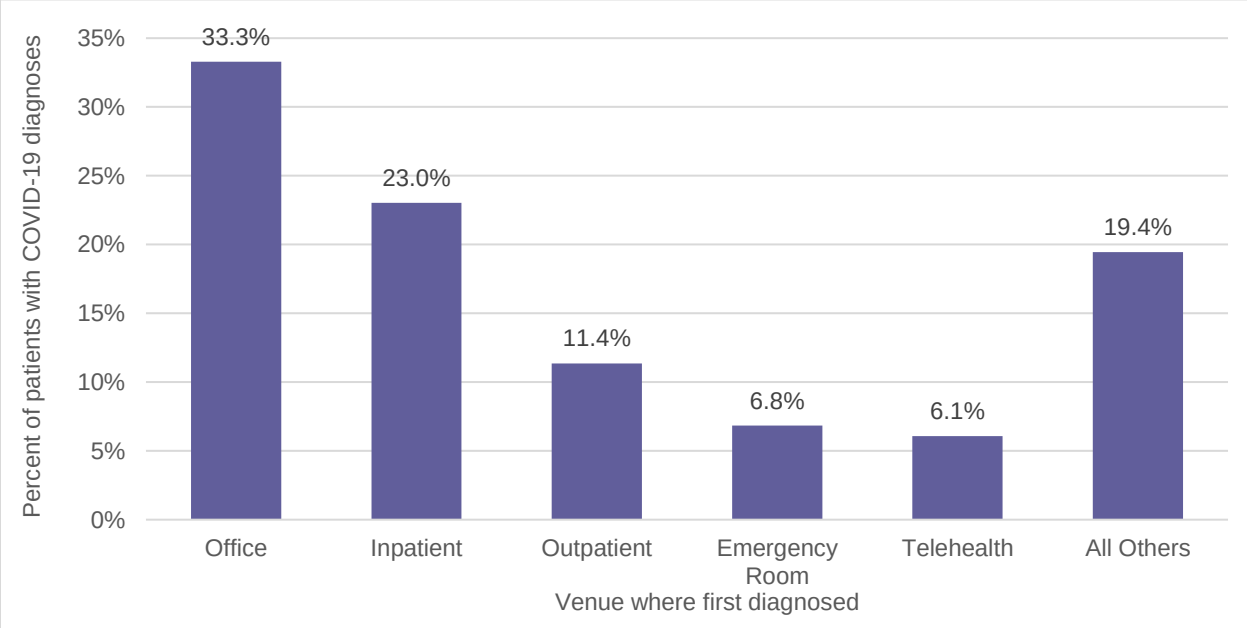

Figure 7. Distribution of patients with COVID-19 diagnoses by venue of care where first diagnosed, nationally, January-May 2020

In all the regions except one—the Midwest—the most common setting for initial diagnosis of COVID-19 patients was the office, just as on the national level. In the Midwest, by contrast, the inpatient setting was the most common, with 31.7 percent of COVID-19 patients compared to 25.2 percent of COVID-19 patients for the office setting (figure 8). The Midwest was also distinctive for having the lowest percentage of COVID-19 patients (2.5 percent) first diagnosed via telehealth of any region or the nation.

The region with the highest percentage of COVID-19 patients who received their initial diagnosis via telehealth (6.7 percent) was the Northeast, the only region where telehealth ranked ahead of emergency rooms (6.2 percent). The Northeast also had the highest percentage of COVID-19 patients first diagnosed in the office (35.0 percent).

In the West, the office ranked first (25.8 percent), but the inpatient setting was a close second (24.2 percent).

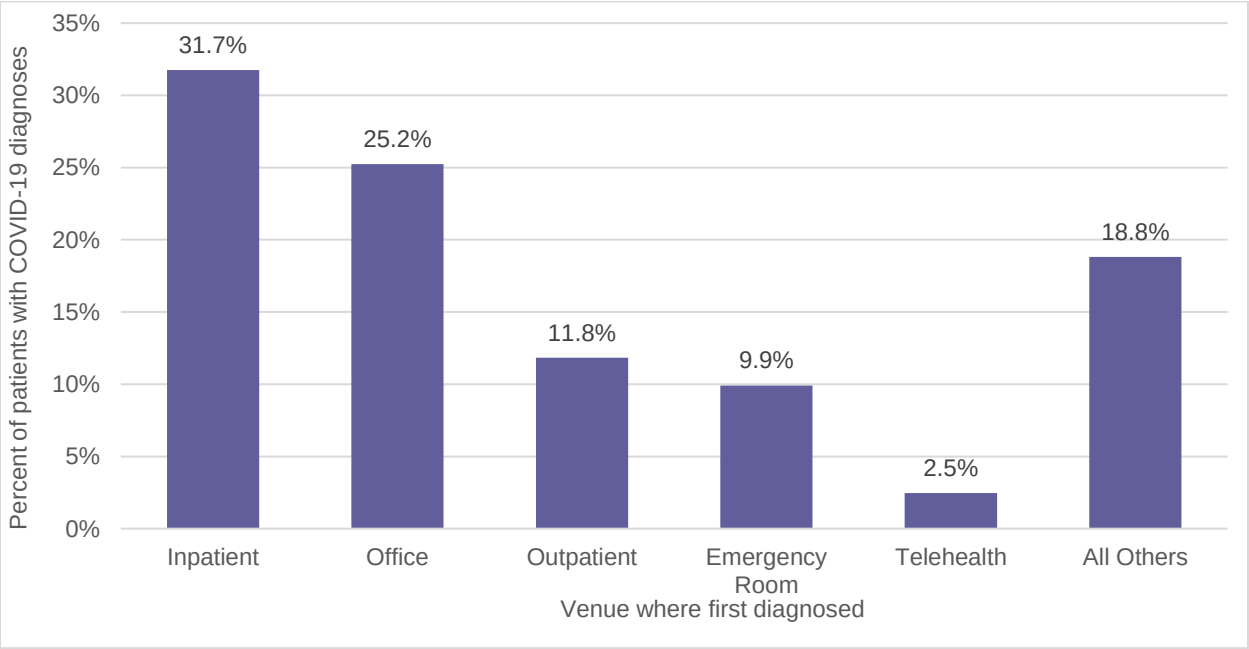

Figure 8. Distribution of patients with COVID-19 diagnoses by venue of care where first diagnosed, Midwest, January-May 2020

Venue of Care by Age

Nationally, COVID-19 patients in most age groups were most commonly diagnosed initially in an office, except for patients aged 61 and older, who were most commonly diagnosed initially in an inpatient setting (figure 9). Of patients aged 61-70, 34 percent were first diagnosed in an inpatient setting; of patients over 70, 46 percent were first diagnosed there. Patients over 70 were the peak age group for the inpatient setting (the group with the largest percentage), whereas patients aged 23-30 were the peak age group for the office (44 percent).

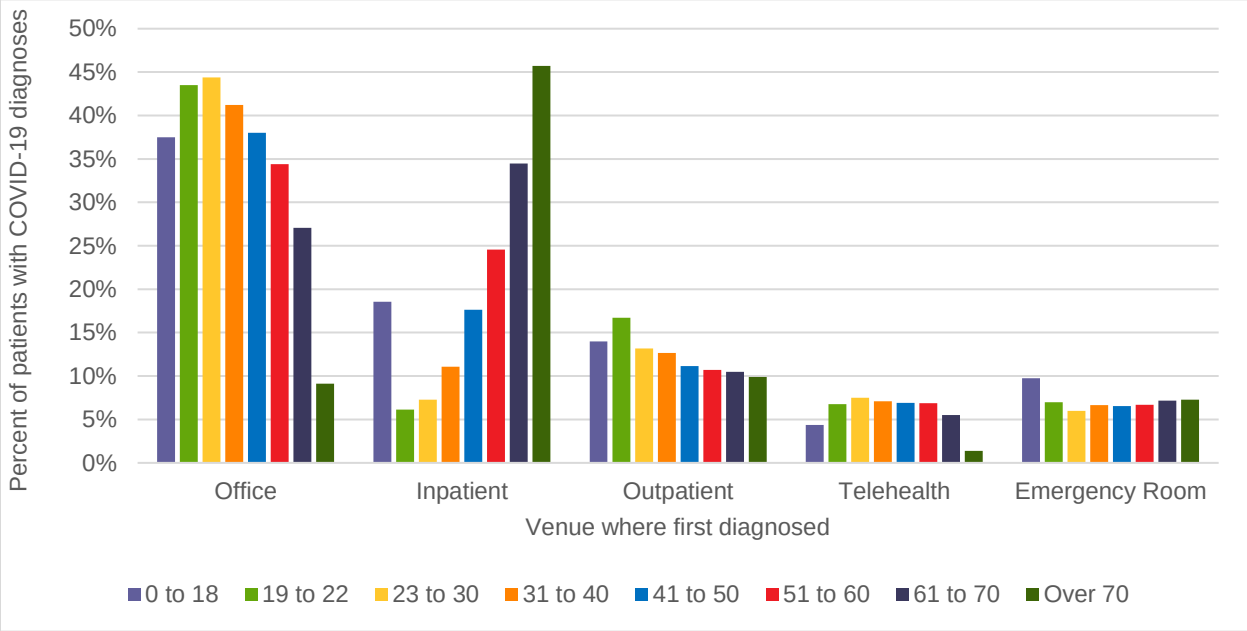

Figure 9. Distribution of patients with COVID-19 diagnoses by age and venue of care where first diagnosed, nationally, January-May 2020

The West differed from the nation in several aspects of the distribution of COVID-19 patients by age and initial venue of care (figure 10). As on the national level, patients aged 61 and older in the West most commonly received their initial diagnosis in an inpatient setting, but, unlike nationally, so did two other age groups: 0-18 (19 percent) and 51-60 (25 percent). Telehealth in the West had a more varied distribution than the nation as a whole. Nationally, the five telehealth age groups in the age range from 19 to 60 each accounted for about seven percent of COVID-19 patients, but in the West, those five age groups ranged from four percent (for 31-40) to eight percent (for 19-22 and 51-60).

In the Midwest and the South, like the West, patients aged 0-18 and 51 and older were most commonly diagnosed initially in an inpatient setting. The Northeast resembled the nation as a whole in that patients aged 0-18 and 51-60 were most commonly diagnosed initially in an office.

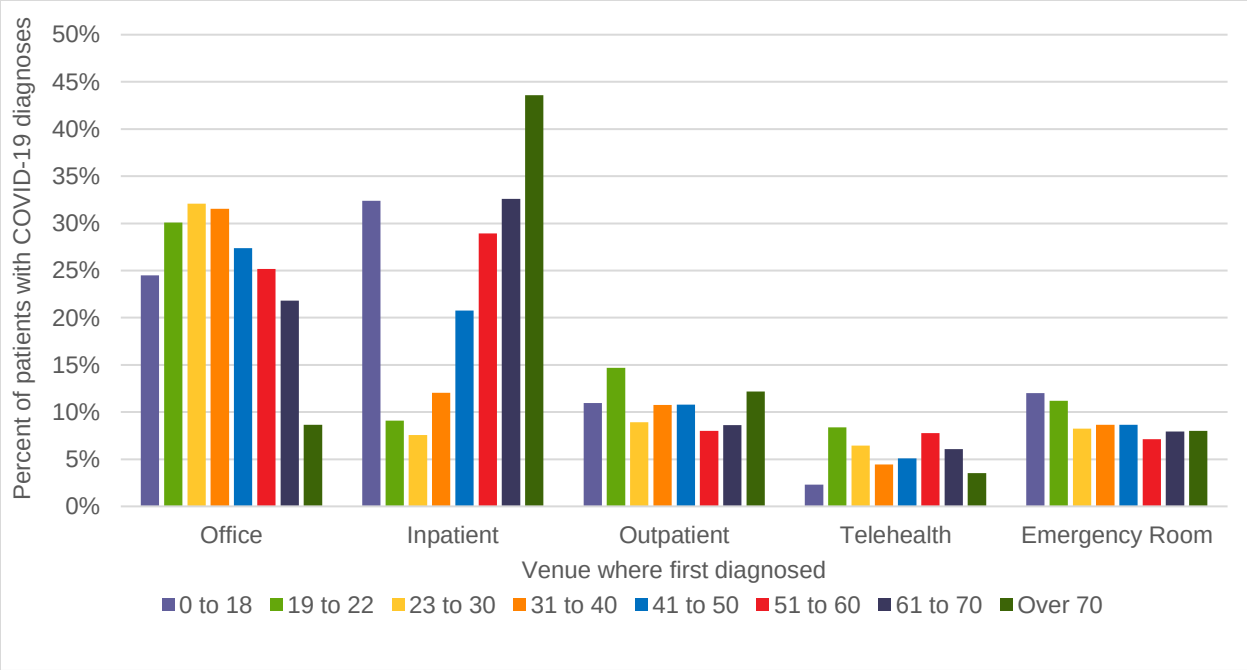

Figure 10. Distribution of patients with COVID-19 diagnoses by age and venue of care where first diagnosed, West, January-May 2020

Comorbidities of Hospitalized COVID-19 Patients

Patients hospitalized for COVID-19 generally have more severe illness than other COVID-19 patients. Since the beginning of the pandemic in China, severity of illness has been linked to underlying conditions, such as hypertension, respiratory system disease and cardiovascular disease.[26] Different studies have yielded different findings about which comorbidities are most common. A systematic review and meta-analysis, for example, found that the most prevalent comorbidities associated with COVID-19 severity were, in first and second place respectively, hypertension and diabetes.[27] A case series in the New York City area found the most common comorbidities in hospitalized COVID-19 patients to be, in descending order, hypertension, obesity and diabetes.[28]

FAIR Health examined its longitudinal data on patients who had been hospitalized for COVID-19 to look for comorbidities that had been present at least 15 days prior to the index COVID-19 diagnosis. The most common comorbidities nationally are presented in table 1, ranked by percent of hospitalized COVID-19 patients.

Table 1. Most common comorbidities of patients hospitalized for COVID-19, nationally, January-May 2020

Comorbidity	Ranking	Percent of Hospitalized COVID-19 Patients
Chronic Kidney Disease and Kidney Failure	1	13%
Type 2 Diabetes	2	10%
Hypertension	3	7%
Atrial Fibrillation and Flutter	4	7%
Heart Failure	5	6%
Sleep Disorders	6	6%
Chronic Obstructive Pulmonary Disease	7	5%
Asthma	8	4%
Anxiety Disorders	9	4%
Other Cardiac Arrhythmias	10	4%

The most common comorbidity, accounting for 13 percent of hospitalized COVID-19 patients, was chronic kidney disease and kidney failure. Type 2 diabetes was in second place with 10 percent and hypertension

[26] Jing Yang et al., "Prevalence of Comorbidities and Its Effects in Patients Infected with SARS-CoV-2: A Systematic Review and Meta-analysis," *International Journal of Infectious Diseases* 94 (May 2020): 91-95, https://doi.org/10.1016/j.ijid.2020.03.017.
[27] Yong Hu et al., "Prevalence and Severity of Corona Virus Disease 2019 (COVID-19): A Systematic Review and Meta-analysis," *Journal of Clinical Virology* 127 (June 2020): 104371, https://doi.org/10.1016/j.jcv.2020.104371.
[28] Safiya Richardson et al., "Presenting Characteristics, Comorbidities, and Outcomes among 5700 Patients Hospitalized with COVID-19 in the New York City Area," *JAMA* 323, no. 20 (April 22, 2020): 2052-59, https://doi.org/10.1001/jama.2020.6775.

in third place with 7 percent. Atrial fibrillation and flutter were in fourth place with seven percent and heart failure in fifth place with six percent. Sleep disorders, chronic obstructive pulmonary disease (COPD), asthma, anxiety disorders and other cardiac arrhythmias (i.e., other than atrial fibrillation and flutter) rounded out the top 10.

As in previous studies, hypertension and diabetes ranked high in the list of comorbidities, but unlike in some studies,[29,30] chronic kidney disease and kidney failure ranked higher than either. Other researchers have found an association between chronic kidney disease and COVID-19 severity,[31] and the CDC lists people with chronic kidney disease at increased risk of severe illness from COVID-19.[32] Indeed, the first two reported US deaths due to COVID-19 were both patients with kidney failure.[33]

The presence of cardiovascular diseases (such as heart failure) and respiratory system diseases (such as COPD) among the most common comorbidities in FAIR Health's data regarding hospitalized COVID-19 patients is consistent with prior studies by other researchers.[34] The high rank of anxiety disorders (ninth place) may seem more unusual. This may be due in part to the commonness of anxiety disorders among chronic conditions. It has been argued, however, in the context of COVID-19, that people with mental health disorders are generally more susceptible to epidemic infection and may encounter more barriers in accessing health services in a timely way.[35]

Obesity was not one of the 10 most common comorbidities for hospitalized COVID-19 patients, but obesity is frequently associated with type 2 diabetes and sleep apnea, the most common sleep disorder. (Most of the FAIR Health data for sleep apnea were for the most common type, obstructive sleep apnea.) This may be due to the well-known under-coding of obesity as a comorbidity in claims data. However, colinear conditions, including both type 2 diabetes and sleep disorders, were among the 10 most common comorbidities. For type 2 diabetes, 47 percent of hospitalized COVID-19 patients had a secondary diagnosis of obesity in the preceding two years. For sleep apnea, 10 percent of hospitalized COVID-19 patients had a secondary diagnosis of obesity in the preceding two years.[36]

Other researchers have indicated that a potential contributor to high morbidity among obese COVID-19 patients might be the high prevalence of undiagnosed obstructive sleep apnea.[37]

The regional lists of top 10 comorbidities for hospitalized COVID-19 patients are similar in some respects to the national list but different in others. In all regions, as in the nation, chronic kidney disease and kidney failure were the most common comorbidity. All regions except one resembled the nation in having type 2 diabetes as the second most common comorbidity; the exception, the South, had hypertension in that rank. The Northeast and West, but not the Midwest and South, included anxiety disorders in the top

[29] Hu et al., "Prevalence and Severity of Corona Virus Disease 2019 (COVID-19)."
[30] Richardson et al., "Presenting Characteristics, Comorbidities, and Outcomes among 5700 Patients Hospitalized with COVID-19 in the New York City Area."
[31] Brandon Michael Henry and Giuseppe Lippi, "Chronic Kidney Disease Is Associated with Severe Coronavirus Disease 2019 (COVID-19) Infection," *International Urology and Nephrology* 52 (March 28, 2020): 1193-94, https://doi.org/10.1007/s11255-020-02451-9.
[32] Centers for Disease Control and Prevention, "Coronavirus Disease 2019 (COVID-19)—Your Health: People of Any Age with Underlying Medical Conditions," updated June 25, 2020, https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html.
[33] Raghu Durvasula et al., "COVID-19 and Kidney Failure in the Acute Care Setting: Our Experience from Seattle," *American Journal of Kidney Diseases* 76, no. 1 (July 2020): 4-6, https://doi.org/10.1053/j.ajkd.2020.04.001.
[34] Yang et al., "Prevalence of Comorbidities and Its Effects in Patients Infected with SARS-CoV-2."
[35] Hao Yao, Jian-Hua Chen and Yi-Feng Xu, "Patients with Mental Health Disorders in the COVID-19 Epidemic," *Lancet Psychiatry* 7, no. 4 (April 2020): e21, https://doi.org/10.1016/S2215-0366(20)30090-0.
[36] The analysis of obesity associated with type 2 diabetes and sleep apnea is based on data received from January 1, 2020, through June 30, 2020, with dates of service from January 1, 2020, through mid-May 2020.
[37] Stavros G. Memtsoudis et al., "Obesity as a Risk Factor for Poor Outcome in COVID-19-Induced Lung Injury: The Potential Role of Undiagnosed Obstructive Sleep Apnoea," *British Journal of Anaesthesia* (May 1, 2020), https://doi.org/10.1016/j.bja.2020.04.078.

10 comorbidities. The West also included another mental health condition, adjustment disorders, in its top 10.

Sleep disorders appeared in the top 10 comorbidities in every region, but they ranked highest—at number three, with 12 percent of hospitalized COVID-19 patients—in the Midwest (table 2). At number 10 in the Midwest was hypercholesterolemia (high cholesterol), which did not appear in the top 10 of any other region or the nation.

Table 2. Most common comorbidities of patients hospitalized for COVID-19, Midwest, January-May 2020

Comorbidity	Ranking	Percent of Hospitalized COVID-19 Patients
Chronic Kidney Disease and Kidney Failure	1	16%
Type 2 Diabetes	2	13%
Sleep Disorders	3	12%
Hypertension	4	11%
Atrial Fibrillation and Flutter	5	10%
Heart Failure	6	10%
Asthma	7	9%
Other Cardiac Arrhythmias	8	7%
Chronic Obstructive Pulmonary Disease	9	6%
Hypercholesterolemia (High Cholesterol)	10	5%

Median Costs of COVID-19 Hospitalization

Nationally, the median costs of hospitalization of a COVID-19 patient varied by age and by whether the costs were charge amounts or estimated allowed amounts (figure 11). The median charge amounts ranged from a low of $34,662 for the age group of patients 23 to 30 years old to a high of $45,683 for the 51-60 age group. For median estimated allowed amounts, the low was $17,094 for the age group of individuals over 70 and the high $24,012 for the 51-60 age group.

It is difficult to compare these results with previous estimates, because the latter have varied so greatly. In part this is because some estimates were based not on actual data about COVID-19 hospitalizations but on projections from cases of other types of respiratory disease.[38,39] Even when a study was based on COVID-19 data, differences in data sources and methodology have yielded disparate findings. For example, one study based on Medicare fee-for-service data estimated an average cost per commercially insured hospitalization of $38,059,[40] in the range of FAIR Health's median charge amounts but higher than the range of FAIR Health's median estimated allowed amounts.

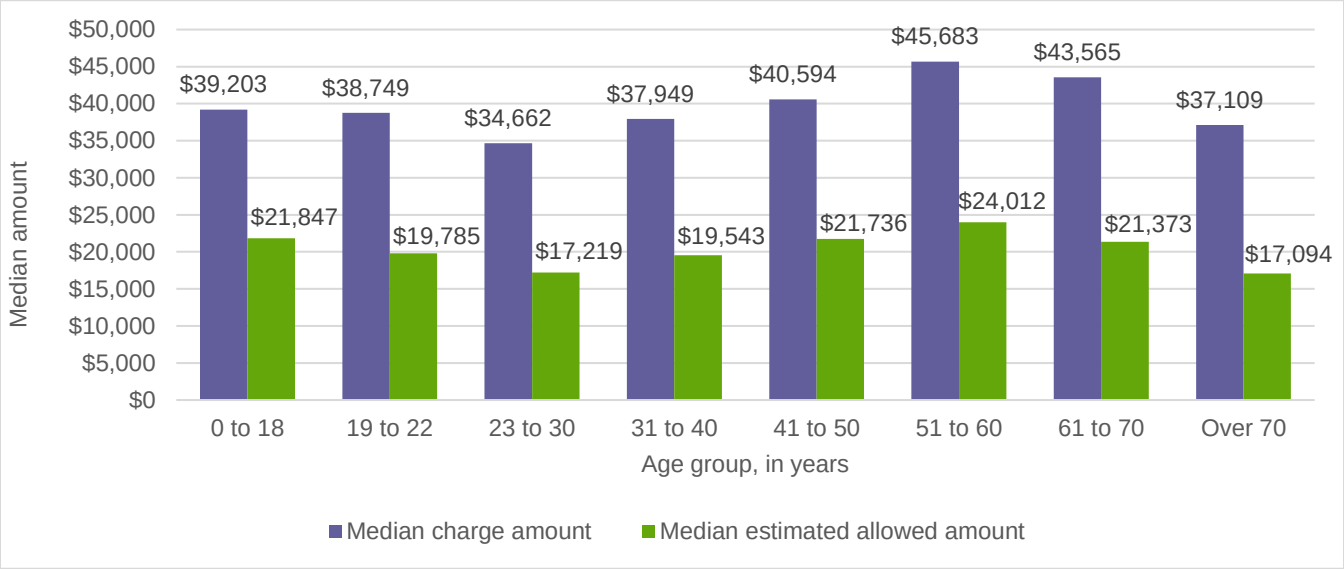

Figure 11. Median COVID-19 hospitalization charge amounts and estimated allowed amounts by age, nationally, January-May 2020

[38] Sarah M. Bartsch et al., "The Potential Health Care Costs and Resource Use Associated with COVID-19 in the United States," *Health Affairs* 39, no. 6 (April 23, 2020), https://doi.org/10.1377/hlthaff.2020.00426.
[39] Larry Levitt, Karyn Schwartz and Eric Lopez, "Estimated Cost of Treating the Uninsured Hospitalized with COVID-19," KFF, April 7, 2020, https://www.kff.org/coronavirus-covid-19/issue-brief/estimated-cost-of-treating-the-uninsured-hospitalized-with-covid-19/.
[40] Chris Sloan et al., "COVID-19 Hospitalizations Projected to Cost up to $17B in US in 2020," Avalere, June 19, 2020, https://avalere.com/insights/covid-19-hospitalizations-projected-to-cost-up-to-17b-in-us-in-2020.

Median costs of a COVID-19 hospitalization in the FAIR Health data varied by region. In all regions except the Northeast, the highest costs were in the over 70 age group; in the Northeast, this age group had among the lowest costs, and the Northeast values reduced the national average significantly, making the costs for the over 70 group the lowest on average nationally. The West was the region with the widest range of costs (figure 12). There, median charge amounts ranged from $21,407 for the 19-22 age group to $93,459 for the over 70 age group. Median estimated allowed amounts ranged from $15,289 for the 19-22 age group to $60,205 for the over 70 age group.

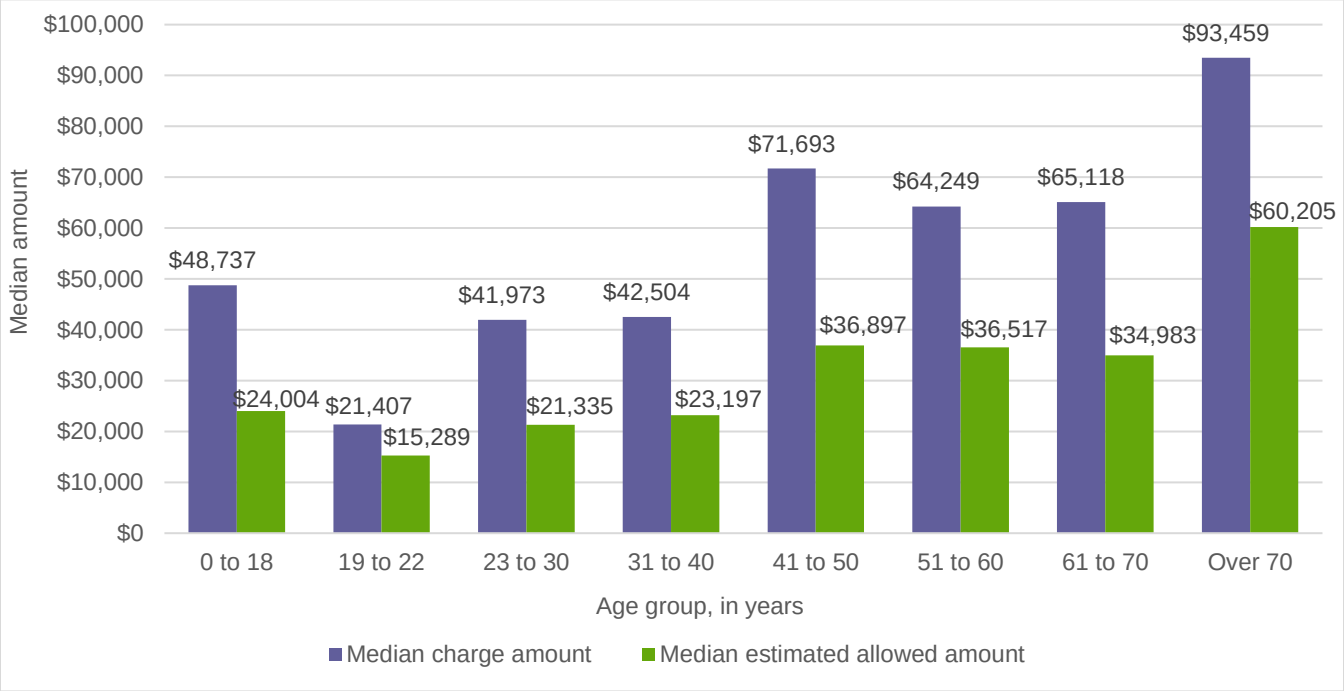

Figure 12. Median COVID-19 hospitalization charge amounts and estimated allowed amounts by age, West, January-May 2020

Conclusion

There is no one profile of COVID-19 patients. COVID-19 affects all age groups, genders and regions and both rural and urban areas. COVID-19 patients receive their initial diagnosis for the disease across a spectrum of venues of care. Hospitalized COVID-19 patients have diverse comorbidities, and the costs of hospitalization vary. For each patient characteristic, there is considerable regional variety as compared to the national level.

Nevertheless, some patient characteristics are widespread. In the period examined in this study (January-May 2020), COVID-19 was most commonly associated on the national level with the age group 51-60. Nationally, males were associated with a larger share (54 percent) of the distribution of COVID-19 claim lines than females (46 percent). Across age groups on the national level, rural and urban areas were similar in their association with COVID-19 claim lines.

Nationally and in every region except one, the office setting was the most common venue of care for initial diagnosis of patients with a COVID-19 diagnosis. The exception was the Midwest, where the inpatient setting was the most common. The emergency room was more common than telehealth for

initial COVID-19 diagnosis in every region except the Northeast, which had the highest percentage of COVID-19 patients first diagnosed via telehealth. Nationally, patients 61 and older were the only age group that most commonly received their first diagnosis in an inpatient setting.

Nationally and in every region, the most common comorbidity of hospitalized COVID-19 patients was chronic kidney disease and kidney failure. All regions except one resembled the nation in having type 2 diabetes as the second most common comorbidity; the exception, the South, had hypertension in that rank.

Nationally, the median charge amount for hospitalization of a COVID-19 patient ranged from a low of $34,662 for the 23-30 age group to a high of $45,683 for the 51-60 age group. For median estimated allowed amounts, the low was $17,094 for the over 70 age group and the high $24,012 for the 51-60 age group. The West was the region with the widest range of costs for COVID-19 hospitalizations.

Profiles of COVID-19 patients have many potential applications, including determining risk factors that make some patients more vulnerable, influencing treatment protocols, setting priorities for eventual vaccination distribution, inspiring further research, and planning and budgeting for use of healthcare resources. FAIR Health presents the information in this report to help support that broad range of applications by stakeholders throughout the healthcare sector, including providers, payors, policy makers and researchers.

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 tax code. FAIR Health possesses the nation's largest collection of private healthcare claims data, which includes over 31 billion claim records contributed by payors and administrators who insure or process claims for private insurance plans covering more than 150 million individuals. 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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