

A Bright Side: Hospitalizations for COVID-19 Might Be Overcounted, Especially Among Kids

Team A: Johnston Thayer, MBA, RN; Kara Wynkoop Hirz, RN; Neil Sandberg; Dylan Vander Berg

Team B: Anna R. Miller, RN; Xander Posner, MPH; Alex Dalecki

Last updated 03 May 2022 • Check for updates at EpicResearch.org

Abstract: Most adult patients admitted with COVID-19 need treatment for the infection, but more pediatric patients are diagnosed with COVID-19 incidentally at admission.

Key Findings:

- Not all hospitalized patients who had COVID-19 were treated for COVID-19. Many were likely hospitalized for an unrelated reason and happened to have COVID-19.
- These incidental COVID-19 hospitalizations were highest during the omicron period when more than one-third of all COVID-19 hospitalizations did not include treatment for COVID-19.
- Less than half of hospitalized pediatric patients who had COVID-19 were treated for COVID-19.

Most COVID-19 hospitalization statistics include all patients who are admitted to the hospital with a COVID-19 diagnosis or COVID-19 positive lab test. However, it's possible for patients to test positive for COVID-19 while admitted for an unrelated problem, such as a head injury or a heart attack, and experience a mild or asymptomatic case of COVID-19 that might not require hospitalization on its own. Some studies and recent media reports suggest that this might lead experts to overcount COVID-19-related admissions, especially for children.¹

We investigated data from 814,672 hospital admissions between March 1, 2020, and January 31, 2022, to determine how many patients fall into one of the following categories:

- Primary COVID-19 patients. These patients were admitted to the hospital with only COVID-19 diagnoses and were treated for COVID-19 as part of their admissions.
- Concurrent COVID-19 patients. These patients were admitted to the hospital with COVID-19 diagnoses in addition to other problems and were treated for both COVID-19 and other problems as part of their admission.
- Incidental COVID-19 patients. These patients received a COVID-19 diagnosis at admission but weren't treated for COVID-19, either because their infection was asymptomatic or because their symptoms were mild.

We considered patients as primary or concurrent COVID-19 patients rather than incidental COVID-19 patients if they met any of the following criteria:

- The patient's admitting diagnosis was COVID-19 infection.
- All of the diagnoses listed on the patient's hospital problem list during the admission were either COVID-19 infection or another respiratory diagnosis.
- The patient received an antiviral treatment during admission.
- The patient had respiratory problems and was treated with a COVID-19 therapeutic drug during admission as categorized by NIH COVID-19 guidelines.²

Our investigation determined that, except for the early weeks of the pandemic, between 60% and 80% of all hospitalized COVID-19 patients were treated for COVID during their hospital admission. This percentage was highest in March of 2020, but then dropped in April and May with the introduction of

mass testing at admission. From November 2021 to January 2022, the rate dropped further to 64%, likely because of the milder symptoms seen with the omicron variant.

COVID-19 Admissions: Primary, Concurrent, and Incidental COVID-19 Patients

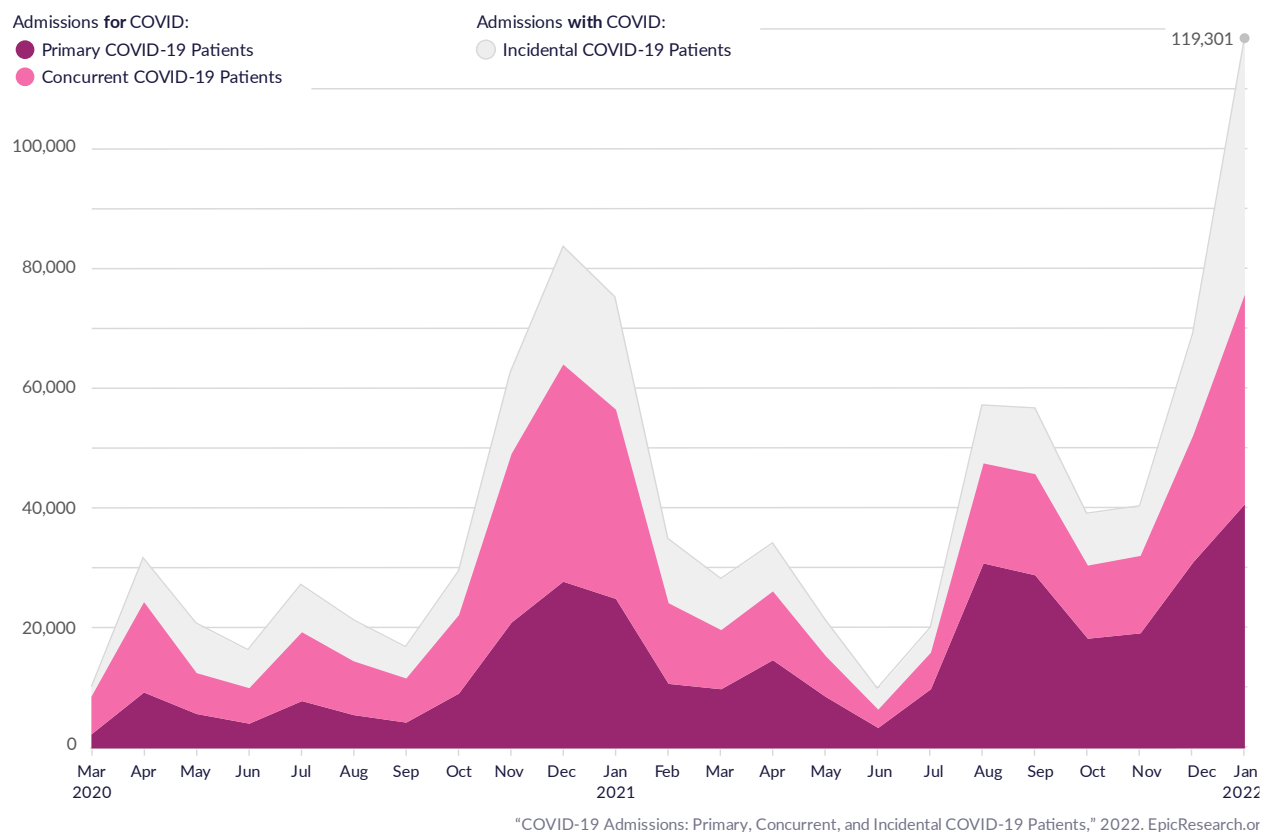


Figure 1. Number of patients who test positive for COVID-19 at admission who are treated for COVID-19, either alone or at the same time as other problems, compared to patients with asymptomatic or mild infections.

Importantly, we found that the average percentage of pediatric primary or concurrent patients was only 38%. The higher proportion of incidental COVID-19 seen in the pediatric population points to an overall lower rate of symptomatic infections in patients 18 and younger.

Primary and Concurrent Patients by Age Group

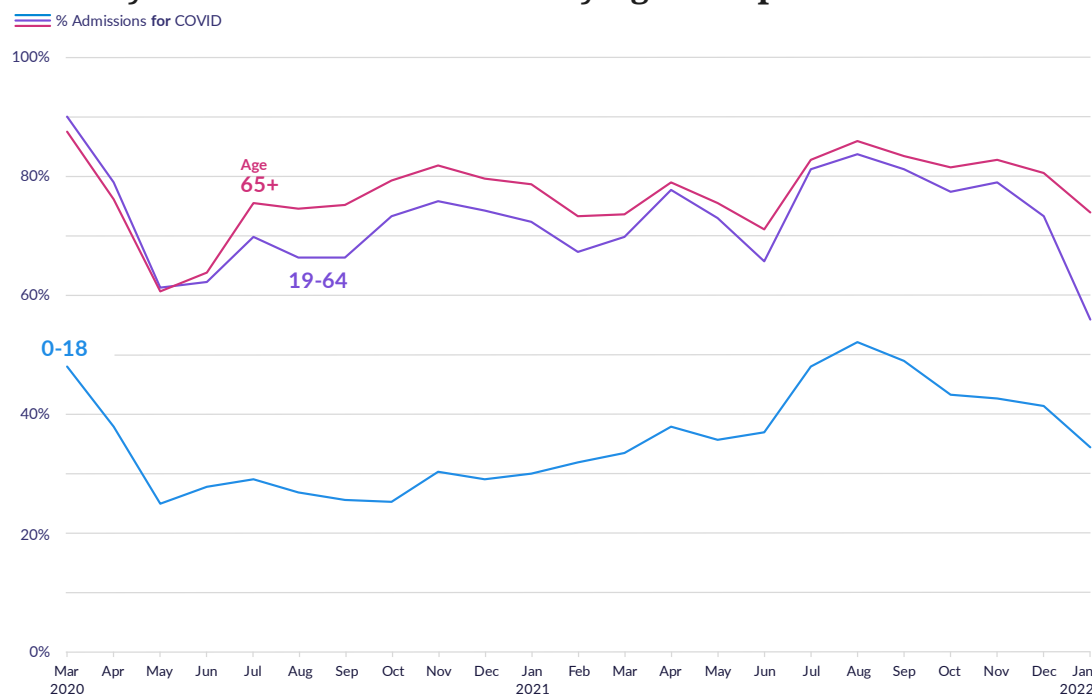


Figure 2. Percentage of pediatric patients admitted with a COVID-19 diagnosis who were admitted or treated for COVID-19, compared to that percentage in the adult admitted population.

These data come from Cosmos, a HIPAA-defined Limited Data Set of more than 138 million patients from 161 Epic organizations including 960 hospitals and more than 20,000 clinics, serving patients in all 50 states. This study was completed by two teams, each composed of a clinician and research scientists who worked independently. The two teams came to similar conclusions.

References

1. Zweig, D. (2021). New Research Suggests Number of Kids Hospitalized for COVID Is Overcounted. New York Magazine. <https://nymag.com/intelligencer/2021/05/study-number-of-kids-hospitalized-for-covid-is-overcounted.html>
2. National Institutes for Health (NIH) (2022). COVID:19 Treatment Guidelines: [Therapies. Therapies | COVID-19 Treatment Guidelines \(nih.gov\)](https://www.covid19treatmentguidelines.nih.gov/)

Data Definitions

Term	Definition
COVID-19 diagnosis	An ICD-10 diagnosis with code U07.1.
Respiratory diagnosis	Any ICD-10 diagnosis starting with "J."
COVID-19 admissions	Hospital admissions with either a documented COVID-19 diagnosis (ICD-10 diagnosis code U07.01) on the hospitalization record or admissions with other respiratory diagnoses involving a patient who tested positive for COVID-19 within 14 days of admission. When a patient has multiple admissions for COVID-19, each admission is counted as a unique observation.

	Due to technical limitations, we weren't able to exclude patients who received a positive antigen test but a subsequent negative PCR test. However, this subset of patients was less than 2% of the sample and would not significantly affect the findings.
Primary COVID-19 patients	The only problems linked to the admission with an active date during the patient's hospital admission are either COVID-19 or a respiratory diagnosis.
Concurrent COVID-19 patients	COVID-19 admissions in which patients also had non-respiratory problems linked to the encounter with an active date during the hospital admission. Treatment for COVID is strictly limited to medication administrations (not oxygen therapy or ventilation) and is defined as either of the following: • The patient was treated with an antiviral during their admission. These antivirals include: ○ Remdesivir ○ Ivermectin ○ Interferons ○ Nitazoxanide ○ Hydroxychloroquine ○ Chloroquine ○ Azithromycin ○ Lopinavir • The patient was treated with another therapeutic drug during their admission and had an SpO2 less than 95 within 24 hours of the administration of the medication. These include: ○ Dexamethasone (only oral or systemic) ○ Prednisone (only oral or systemic) ○ Methylprednisolone (only oral or systemic) ○ Hydrocortisone (only oral or systemic) ○ Baricitinib ○ Tofacitinib ○ Tocilizumab ○ Sarilumab ○ Fluvoxamine ○ Colchicine ○ Budesonide ○ Albuterol ○ Bamlanivimab ○ Casirivimab ○ Sotrovimab
Incidental COVID-19 patients	COVID-19 admissions in which patients also had non-respiratory problems linked to the encounter with an active date during the hospital admission and did not receive one of the therapeutics listed above. Patients could have still been treated with oxygen therapy or ventilation.