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# Characteristics and Outcomes Among Adults Aged ≥60 Years Hospitalized with Laboratory-Confirmed Respiratory Syncytial Virus — RSV-NET, 12 States, July 2022–June 2023

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## Abstract

Respiratory syncytial virus (RSV) causes substantial morbidity and mortality in older adults. In May 2023, two RSV vaccines were approved for prevention of RSV lower respiratory tract disease in adults aged ≥60 years. In June 2023, CDC recommended RSV vaccination for adults aged ≥60 years, using shared clinical decision-making. Using data from the Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network, a population-based hospitalization surveillance system operating in 12 states, this analysis examined characteristics (including age, underlying medical conditions, and clinical outcomes) of 3,218 adults aged ≥60 years who were hospitalized with laboratory-confirmed RSV infection during July 2022–June 2023. Among a random sample of 1,634 older adult patients with RSV-associated hospitalization, 54.1% were aged ≥75 years, and the most common underlying medical conditions were obesity, chronic obstructive pulmonary disease, congestive heart failure, and diabetes. Severe outcomes occurred in 18.5% (95% CI = 15.9%–21.2%) of hospitalized patients aged ≥60 years. Overall, 17.0% (95% CI = 14.5%–19.7%) of patients with RSV infection were admitted to an intensive care unit, 4.8% (95% CI = 3.5%–6.3%) required mechanical ventilation, and 4.7% (95% CI = 3.6%–6.1%) died; 17.2% (95% CI = 14.9%–19.8%) of all cases occurred in long-term care facility residents. These data highlight the importance of prioritizing those at highest risk for severe RSV disease and suggest that clinicians and patients consider age (particularly age ≥75 years), long-term care facility residence, and underlying medical conditions, including chronic obstructive pulmonary disease and congestive heart failure, in shared clinical decision-making when offering RSV vaccine to adults aged ≥60 years.

## Introduction

Respiratory syncytial virus (RSV) causes substantial morbidity and mortality in older adults, resulting in approximately 60,000–160,000 hospitalizations and 6,000–10,000 deaths annually among adults aged ≥65 years (*1*). In May 2023, the Food and Drug Administration approved two RSV vaccines for prevention of RSV lower respiratory tract disease in adults aged ≥60 years.* In June 2023, CDC recommended RSV vaccination for adults aged ≥60 years using shared clinical

* GlaxoSmithKline vaccine: https://www.fda.gov/media/167806/download; Pfizer vaccine: https://www.fda.gov/media/168890/download

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decision-making between patient and clinicians;[†] adults at highest risk for severe RSV disease are most likely to benefit and should be prioritized for vaccination (*1*). To describe persons who experienced severe RSV disease requiring hospitalization, data from a large, geographically diverse surveillance system were analyzed to identify characteristics of adults aged ≥60 years hospitalized with laboratory-confirmed RSV infection during the 2022–23 respiratory virus season.

## Methods

The Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network (RSV-NET)[§] conducts population-based surveillance for RSV-associated hospitalizations in approximately 300 hospitals in 58 counties across 12 states,[¶] covering approximately 9% of the U.S. population. RSV-NET identifies residents within the network catchment area who are hospitalized with positive RSV tests results for provider-ordered reverse transcription–polymerase chain reaction (RT-PCR) or rapid antigen detection tests during their hospitalization or during the 14 days preceding admission.

Because the 2022–23 RSV season started earlier than did seasons preceding the COVID-19 pandemic (*2*), this description of demographic characteristics of hospitalized RSV-NET patients includes those hospitalized during July 1, 2022–June 30, 2023. Using previously described methods (*3*), clinical data were collected by trained surveillance officers from a random sample of medical charts for adults hospitalized during October 1, 2022–April 30, 2023, and stratified by age and site. Sampled data are presented as unweighted case counts and weighted percentages that were weighted for the probability of selection and adjusted to better represent the hospitalized population of the catchment area (*3*). Age distributions of patients aged ≥60 years who were hospitalized and experienced severe outcomes, defined as intensive care unit (ICU) admission, mechanical ventilation, and in-hospital death, were compared with the overall age distribution of persons ≥60 years in the RSV-NET catchment area. Underlying medical conditions among hospitalized patients and those with severe outcomes were assessed and described. Data were analyzed using SAS survey procedures (version 9.4; SAS Institute). Differences were assessed using chi-square tests; p-values <0.05 were considered statistically significant. This activity was reviewed by

[†] Unlike age- and risk-based recommendations, for which the default decision should be to vaccinate the patient unless vaccination is contraindicated, shared clinical decision-making recommendations have no default. The decision of whether to vaccinate may consider the best available evidence regarding who would benefit from vaccination; the individual patient's characteristics, values, and preferences; the vaccine characteristics; and the clinician's discretion. https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html

[§] RSV-NET is one of three Respiratory Virus Hospitalization Surveillance Network (RESP-NET) platforms that conduct population-based surveillance for hospitalizations for RSV (RSV-NET), COVID-19 (COVID-NET), and influenza (FluSurv-NET). https://www.cdc.gov/surveillance/resp-net/dashboard.html

[¶] Selected counties in California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah. https://www.cdc.gov/rsv/research/rsv-net/overview-methods.html

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CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.**

## Results

Among 3,218 adults aged ≥60 years with an identified RSV-associated hospitalization during July 2022–June 2023, a total of 1,738 (54.0%) were aged ≥75 years (this group constituted 29.0% of the catchment population of adults aged ≥60 years); 434 (13.5%) and 1,208 (37.5%) of RSV-associated hospitalizations occurred in persons aged 60–64 and ≥80 years, respectively. Overall, 222 (6.9%) patients were Hispanic or Latino (Hispanic), 2,159 (67.2%) patients were non-Hispanic White (White), 496 (15.4%) non-Hispanic Black or African American (Black), 228 (7.1%) non-Hispanic Asian or Pacific Islander (A/PI), 13 (0.4%) non-Hispanic American Indian or Alaska Native (AI/AN) persons, and 100 (3.2%) persons were of other or unknown race. The median patient age was 75 years (IQR = 68–84 years). The median age of White patients (77 years; IQR = 69–85 years) was significantly higher than that of patients who were Black (70 years; IQR = 65–77), Hispanic (74 years; IQR = 66–83 years), or AI/AN (72 years; IQR = 71–75 years) and was lower than that among A/PI (79 years; IQR = 71–87 years) patients (p-value <0.01 for all) (Supplementary Table 1; https://stacks.cdc.gov/view/cdc/133296). The proportion of hospitalized patients whose race was reported as Hispanic or Black decreased with increasing age (p-value <0.01); Black patients accounted for 28.2% of hospitalized patients aged 60–64 years and 8.2% of those aged ≥80 years (Supplementary Table 2; https://stacks.cdc.gov/view/cdc/133297).

Among a random sample of 1,634 adults aged ≥60 years hospitalized during October 2022–April 2023 whose medical charts were reviewed, 54.1% were aged ≥75 years, and 290 (17.2%) were long-term care facility (LTCF) residents, including 175 (26.9%) of those aged ≥80 years (Table). Nearly all patients (1,553 [95%]) had SARS-CoV-2 test results available, among which 39 (2.4%) were positive; 1,587 (97.1%) had influenza testing results, among which 23 (2.2%) were positive.†† Prevalence of severe outcomes was not higher among patients with viral codetections compared

** 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

†† Among 375 (24.2%) patients receiving testing for other viruses, nine rhinovirus, four seasonal coronavirus, and two parainfluenza virus codetections were identified.

**TABLE. Characteristics of a random sample of patients aged ≥60 years hospitalized with laboratory-confirmed respiratory syncytial virus infection* (N = 1,634), stratified by age and site — Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network, 12 states,† October 2022–April 2023**

| Characteristic | Overall | | Age group, yrs: 60–69 | | 70–79 | | ≥80 | |
|---|---|---|---|---|---|---|---|---|
| | No. | Weighted % (95% CI) | No. | Weighted % (95% CI) | No. | Weighted % (95% CI) | No. | Weighted % (95% CI) |
| **Total, row %** | **1,634** | **100** | **523** | **32** | **554** | **34** | **557** | **34** |
| **Sex** | | | | | | | | |
| Female | 975 | 60.5 (57.0–63.8) | 311 | 60.7 (54.8–66.4) | 317 | 57.5 (51.7–63.1) | 347 | 62.8 (56.7–68.7) |
| Male | 659 | 39.5 (36.2–43.0) | 212 | 39.3 (33.6–45.2) | 237 | 42.5 (36.9–48.3) | 210 | 37.2 (31.3–43.3) |
| **Race and ethnicity§** | | | | | | | | |
| AI/AN | 7 | 0.3 (0.1–0.7) | 3 | 0.5 (0.1–1.5) | 4 | 0.5 (0.1–1.5) | 0 | — |
| A/PI, NH | 95 | 7.1 (5.2–9.5) | 31 | 7.3 (3.6–12.8) | 23 | 3.9 (2.3–6.2) | 41 | 9.8 (6.1–14.6) |
| Black or African American, NH | 213 | 13.0 (11.0–15.2) | 111 | 22.4 (18.0–27.4) | 69 | 13.0 (9.6–17.0) | 33 | 5.7 (3.5–8.7) |
| White, NH | 1,181 | 70.2 (67.0–73.3) | 333 | 60.6 (54.6–66.4) | 404 | 70.2 (64.7–75.4) | 444 | 77.6 (72.1–82.4) |
| Hispanic or Latino | 92 | 6.7 (5.0–8.7) | 33 | 7.2 (4.4–11.0) | 33 | 9.1 (5.5–13.9) | 26 | 4.2 (2.4–6.7) |
| All other races¶ | 5 | 0.4 (0.1–1.3) | 1 | 0.1 (0.0–0.9) | 2 | 0.3 (0.0–1.2) | 2 | 0.7 (0.0–3.3) |
| Unknown | 41 | 2.3 (1.6–3.3 | 11 | 1.9 (0.8–3.6) | 19 | 3.0 (1.7–4.9) | 11 | 2.0 (0.9–3.9) |
| **LTCF residence**** | 290 | 17.2 (14.9–19.8) | 36 | 5.8 (3.8–8.5) | 79 | 16.1 (12.0–20.9) | 175 | 26.9 (22.2–32.0) |
| **Viral codetection††** | | | | | | | | |
| SARS-CoV-2 | 39 | 2.4 (1.5–3.6) | 11 | 1.6 (0.7–3.1) | 19 | 3.4 (1.7–5.9) | 9 | 2.2 (0.8–4.9) |
| Influenza | 23 | 2.2 (1.2–3.8) | 7 | 1.9 (0.4–5.0) | 9 | 2.3 (0.6–5.7) | 7 | 2.4 (0.8–5.5) |
| **Hospitalization outcome§§** | | | | | | | | |
| Hospital stay, days, median (IQR) | 4.1 (2.2–7.6) | — | 4.0 (2.0–7.4) | — | 4.1 (2.3–7.7) | — | 4.2 (2.2–7.7) | — |
| BiPAP/CPAP | 339 | 19.8 (17.3–22.6) | 116 | 23.3 (18.3–28.9) | 131 | 22.6 (18.1–27.6) | 92 | 14.8 (11.2–19.2) |
| High-flow nasal cannula | 80 | 4.3 (3.2–5.7) | 22 | 3.9 (2.1–6.7) | 31 | 5.4 (3.3–8.2) | 27 | 3.7 (2.2–5.8) |
| ≥1 severe outcome¶¶ | 332 | 18.5 (15.9–21.2) | 112 | 20.5 (16.3–25.3) | 124 | 22.3 (17.2–28.1) | 96 | 13.7 (10.2–17.8) |
| ICU admission | 297 | 17.0 (14.5–19.7) | 111 | 20.5 (16.2–25.2) | 110 | 20.6 (15.5–26.4) | 76 | 11.3 (8.0–15.4) |
| Invasive mechanical ventilation | 94 | 4.8 (3.5–6.3) | 42 | 6.4 (4.4–9.0) | 33 | 4.9 (2.9–7.7) | 19 | 3.5 (1.4–6.9) |
| In-hospital death | 98 | 4.7 (3.6–6.1) | 22 | 3.0 (1.7–4.8) | 39 | 5.8 (3.7–8.5) | 37 | 5.2 (3.2–7.9) |

See table footnotes on the next page.

**TABLE. (*Continued*) Characteristics of a random sample of patients aged ≥60 years hospitalized with laboratory-confirmed respiratory syncytial virus infection* (N = 1,634), stratified by age and site — Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network, 12 states,† October 2022–April 2023**

| Characteristic | Overall | | Age group, yrs: 60–69 | | 70–79 | | ≥80 | |
|---|---|---|---|---|---|---|---|---|
| | No. | Weighted % (95% CI) | No. | Weighted % (95% CI) | No. | Weighted % (95% CI) | No. | Weighted % (95% CI) |
| **Underlying medical condition** | | | | | | | | |
| ≥1 underlying medical condition*** | 1,584 | 95.5 (93.2–97.2) | 501 | 96.3 (94.0–97.9) | 540 | 97.2 (95.1–98.6) | 543 | 93.5 (87.3–97.2) |
| Chronic lung disease | 813 | 49.2 (45.7–52.7) | 290 | 54.4 (48.2–60.4) | 292 | 53.9 (48.0–59.7) | 231 | 41.2 (35.3–47.3) |
| COPD | 552 | 33.7 (30.5–37.0) | 197 | 38.9 (33.1–44.8) | 189 | 34.4 (28.9–40.4) | 166 | 29.1 (24.0–34.6) |
| Asthma | 332 | 19.1 (16.6–21.8) | 134 | 25.4 (20.4–31.0) | 108 | 16.5 (12.9–20.7) | 90 | 16.4 (12.3–21.2) |
| Other††† | 72 | 5.4 (3.8–7.3) | 17 | 3.0 (1.6–5.1) | 34 | 8.4 (5.0–13.1) | 21 | 4.6 (2.4–8.0) |
| Cardiovascular disease | 1,108 | 67.1 (63.7–70.5) | 304 | 55.0 (48.8–61.0) | 371 | 67.5 (61.8–72.8) | 433 | 76.3 (70.0–81.8) |
| CHF§§§ | 545 | 33.2 (30.0–36.5) | 165 | 31.5 (26.1–37.2) | 165 | 29.8 (24.4–35.7) | 215 | 37.4 (31.7–43.4) |
| CAD¶¶¶ | 435 | 26.4 (23.5–29.5) | 109 | 20.9 (16.3–26.3) | 151 | 28.8 (23.7–34.4) | 175 | 28.6 (23.6–34.1) |
| CVA**** | 253 | 13.7 (11.7–15.9) | 55 | 9.6 (6.9–13.0) | 90 | 14.0 (10.7–17.8) | 108 | 16.7 (12.8–21.1) |
| Immunocompromising condition | 292 | 18.6 (16.0–21.4) | 101 | 19.0 (14.5–24.1) | 121 | 22.8 (18.0–28.1) | 70 | 14.8 (10.8–19.6) |
| Diabetes mellitus | 553 | 32.6 (29.5–35.8) | 200 | 38.0 (32.4–43.9) | 195 | 32.7 (27.6–38.1) | 158 | 28.4 (23.1–34.2) |
| Neurologic condition | 439 | 27.3 (24.3–30.5) | 96 | 17.3 (13.4–21.7) | 135 | 25.2 (20.3–30.6) | 208 | 36.8 (31.0–42.9) |
| Dementia†††† | 183 | 12.4 (10.1–15.0) | 7 | 1.0 (0.4–2.4) | 40 | 8.5 (5.5–12.5) | 136 | 24.5 (19.4–30.1) |
| Other | 256 | 14.9 (12.6–17.4) | 89 | 16.2 (12.5–20.6) | 95 | 16.7 (12.6–21.4) | 72 | 12.3 (8.8–16.6) |
| Kidney disorder | 477 | 29.3 (26.3–32.5) | 134 | 24.7 (19.7–30.1) | 156 | 30.0 (24.8–35.5) | 187 | 32.3 (26.9–38.0) |
| Obesity | 572 | 37.8 (34.3–41.4) | 230 | 46.4 (40.3–52.5) | 213 | 42.4 (36.5–48.6) | 129 | 27.1 (21.3–33.6) |

**Abbreviations:** AI/AN = American Indian or Alaska Native; A/PI = Asian or other Pacific Islander; BiPAP/CPAP = bilevel positive airway pressure/continuous positive airway pressure; CAD = coronary artery disease; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; ICU = intensive care unit; LTCF = long-term care facility; NH = non-Hispanic.

* Data are from a weighted sample of hospitalized adults with completed medical record abstractions. Sample sizes presented are unweighted with weighted percentages.

† Includes persons admitted to a hospital with an admission date during October 1, 2022–April 30, 2023. Selected counties in California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah.

§ If ethnicity was unknown, NH ethnicity was assumed.

¶ Includes NH persons reported as other or multiple races.

** LTCF residents include hospitalized adults who were identified as residents of a nursing home or skilled nursing facility, rehabilitation facility, assisted living or residential care, long-term acute care hospital, group or retirement home, or other LTCF upon hospital admission. A free-text field for other types of residences was examined; patients with an LTCF-type residence were also categorized as LTCF residents.

†† Results reported among adults who received testing (as opposed to all hospitalized adults). Because of testing practices, denominators differed among the viral respiratory pathogens based on type of test results available: SARS-CoV-2 = 95% (1,553) and influenza (influenza A, influenza B, and flu [not subtyped]) = 97% (1,587). Among 375 (24.2%) patients who received testing for other viruses, 15 additional viruses were detected: nine rhinoviruses, four seasonal coronaviruses, and two parainfluenza viruses.

§§ Hospitalization outcomes are not mutually exclusive categories, and patients can be included in more than one category.

¶¶ Severe outcome is defined as requiring ICU admission or mechanical ventilation or experiencing in-hospital death.

*** Defined as one or more of the following: chronic lung disease, including asthma; chronic metabolic disease including diabetes mellitus; blood disorder or hemoglobinopathy; cardiovascular disease; neurologic disorder; immunocompromising condition; renal disease; gastrointestinal or liver disease; rheumatologic, autoimmune, or inflammatory condition; obesity; feeding tube dependency; and wheelchair dependency.

††† Other chronic lung diseases include interstitial lung disease, pulmonary fibrosis, restrictive lung disease, sarcoidosis, asbestosis, and chronic respiratory failure including oxygen dependence.

§§§ CHF includes cardiomyopathy, heart failure with preserved ejection fraction, and heart failure with reduced ejection fraction.

¶¶¶ CAD includes history of coronary artery bypass graft and myocardial infarction.

**** CVA includes history of stroke or transient ischemic attack.

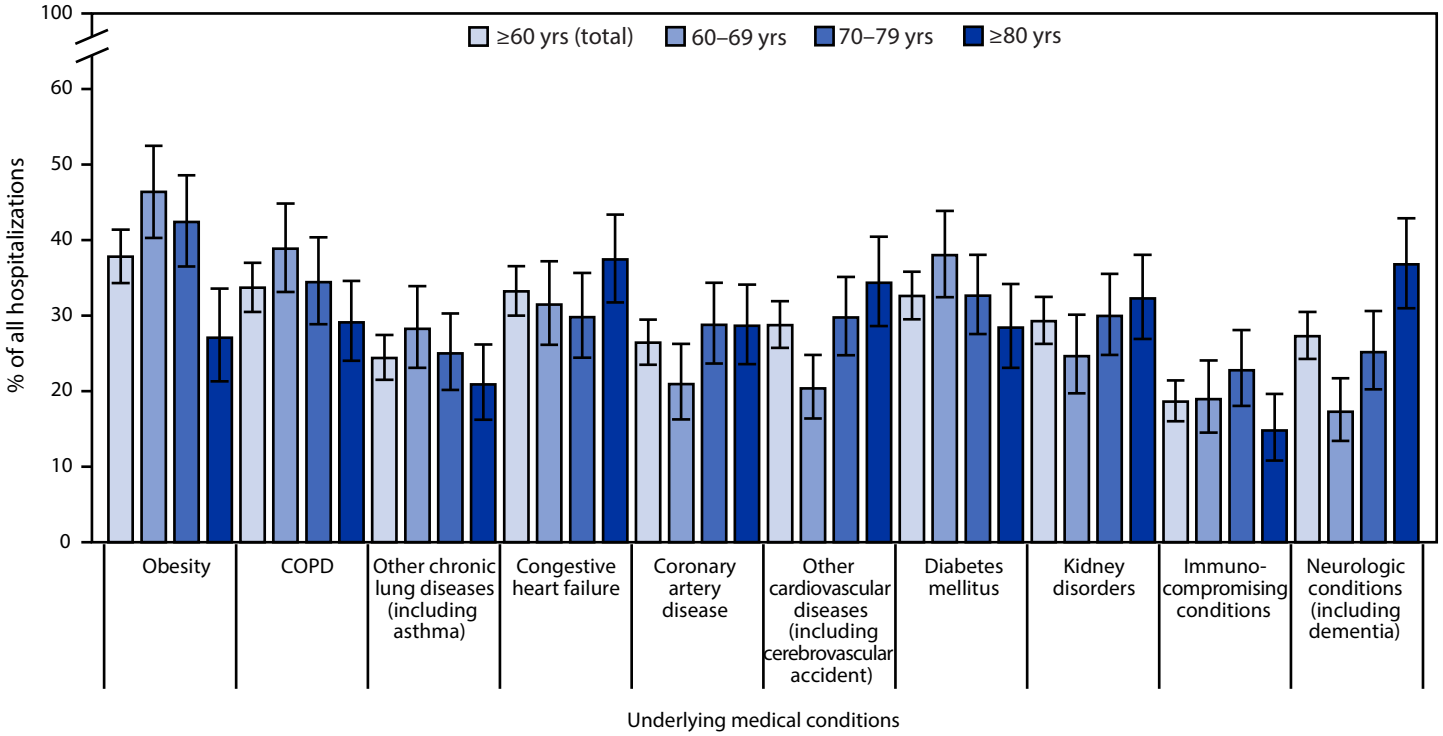
†††† Dementia includes Alzheimer disease and other types of dementia.

with those with RSV alone detected (p>0.5). The median length of hospitalization was 4.1 days (IQR = 2.2–7.6 days). A substantial proportion (332 [18.5%; 95% CI = 15.9%–21.2%]) of patients had at least one severe outcome, including 297 (17.0%) who required ICU admission, 94 (4.8%) who required mechanical ventilation, and 98 (4.7%) who died while hospitalized.

Almost all sampled patients (1,584; 95.5%) had at least one underlying medical condition, most commonly obesity (37.8%), chronic obstructive pulmonary disease (COPD) (33.7%), congestive heart failure (CHF) (33.2%), and diabetes mellitus (32.6%); 18.6% had an immunocompromising condition (Table) (Figure 1). The following underlying conditions were significantly more prevalent in patients with severe outcomes than in those without severe outcomes: COPD (40.0% versus 32.0%; p = 0.047), other chronic lung diseases excluding COPD and asthma (9.1% versus 4.4%; p = 0.04), and CHF (41.2% versus 31.4%; p = 0.01).

Whereas adults aged 75–79 years and ≥80 years accounted for 12.4% and 16.2% of the catchment area populations, respectively (Figure 2), they accounted for 16.0% (95% CI = 13.5%–18.8%) and 38.1% (95% CI = 34.7%–41.7%) of hospitalizations, 21.2% (95% CI = 13.2%–31.3%) and 25.5% (95% CI = 18.6%–33.5%) of ICU admissions, and 25.6%

**FIGURE 1. Underlying medical conditions*,† among patients hospitalized with laboratory-confirmed respiratory syncytial virus infection§ — Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network, 12 states,¶ October 2022–April 2023**




**Abbreviation:** COPD = chronic obstructive pulmonary disease.
* With 95% CIs indicated by error bars.
† Congestive heart failure includes cardiomyopathy; coronary artery disease includes history of coronary artery bypass graft and myocardial infarction; cerebrovascular accident includes history of stroke or transient ischemic attack; dementia includes Alzheimer disease and other types of dementia.
§ Data are from a weighted sample of hospitalized adults with completed medical record abstractions. Sample sizes presented are unweighted with weighted percentages.
¶ Select counties in California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah.

(95% CI = 14.8%–39%) and 42.1% (95% CI = 29.1%–55.9%) of in-hospital deaths, respectively. Orders to not resuscitate or intubate were in place for 321 (20%) patients, including 211 (35%) patients aged ≥80 years.

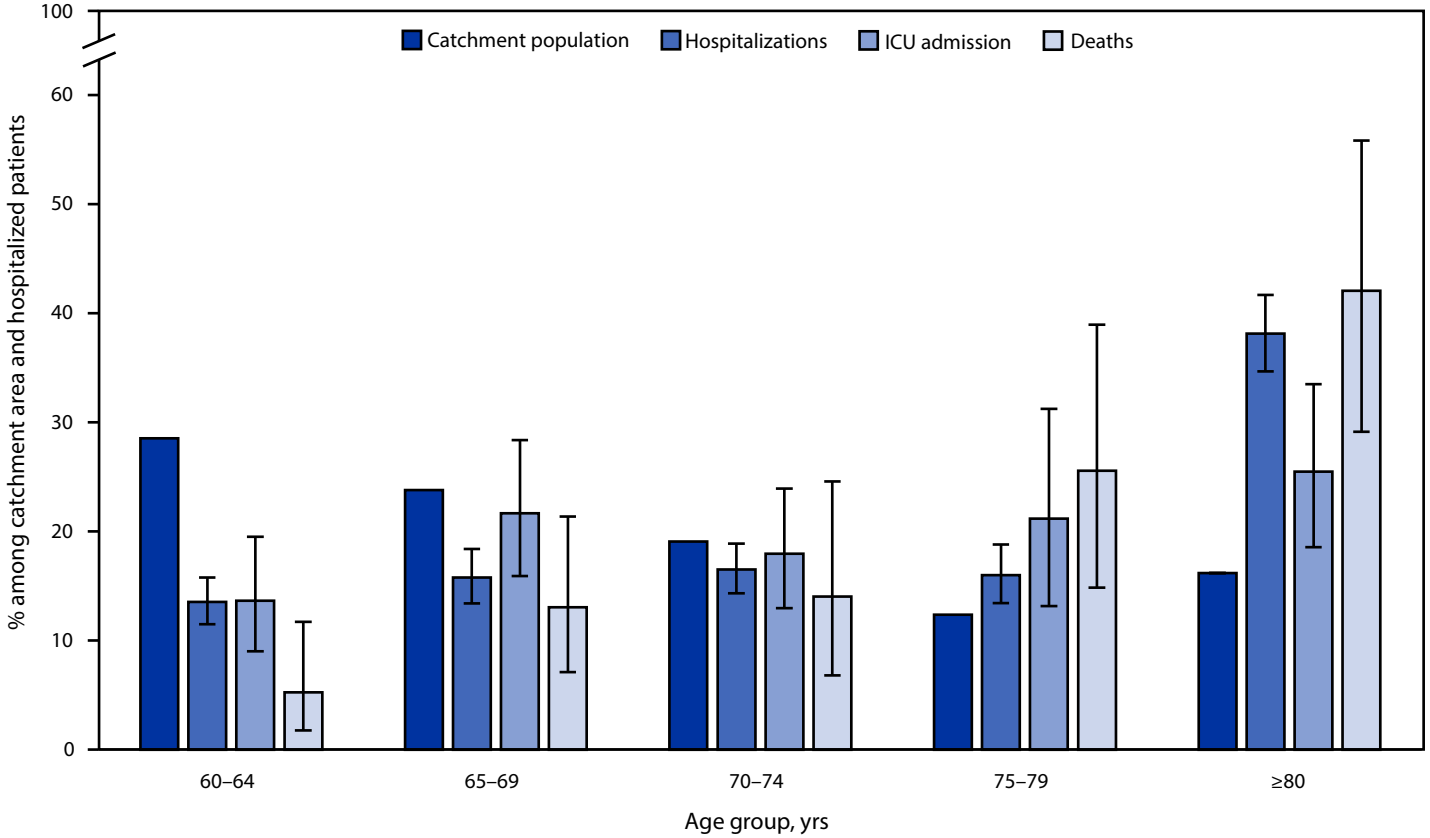
## Discussion

During July 2022–June 2023, RSV-associated hospitalizations among adults aged ≥60 years in a large population-based surveillance system occurred predominantly among those aged ≥75 years (54%); many (17.2%) of these patients resided in long-term care facilities. The median age of hospitalized AI/AN, Black, and Hispanic patients was lower than that of hospitalized White patients. Viral coinfections reported in RSV-NET were infrequent, despite comprehensive testing for SARS-CoV-2 and influenza, indicating that RSV alone caused substantial morbidity and mortality in this population. Most patients hospitalized with RSV had underlying medical conditions, notably CHF and COPD, which were associated with severe outcomes. Severe outcomes were common, with 17.0% of hospitalized patients requiring ICU admission and nearly 5% dying during their hospitalization.

CDC recommends RSV vaccination for adults aged ≥60 years using shared clinical decision-making, which may consider a patient's individual risk for severe disease (*1*). Adults aged ≥75 years were overrepresented among older adult RSV-NET hospitalizations, consistent with previous studies demonstrating increased RSV hospitalization rates with increasing age (*4*,*5*). However, the median age of hospitalized older adults who were AI/AN, Black, and Hispanic patients was lower than that for White patients, such that persons in these three groups accounted for a larger proportion of RSV-NET hospitalizations among the younger age groups. This finding likely reflects different age distributions, as well as life expectancy, within the catchment population, as well as potentially higher risk for hospitalization at younger ages resulting from racial and ethnic disparities in underlying medical conditions, access to medical care, and socioeconomic status (*6*–*8*).

The prevalence of underlying medical conditions among hospitalized patients was high, including CHF and COPD, both of which were disproportionately associated with severe outcomes in this analysis. Both CHF and COPD have been previously associated with increased RSV hospitalization rates

**FIGURE 2. Age distribution* among persons aged ≥60 years residing in the surveillance network catchment area† and among laboratory-confirmed respiratory syncytial virus–associated hospitalizations, intensive care unit admissions, and in-hospital deaths — Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network, 12 states, October 2022–April 2023**




**Abbreviations:** ICU = intensive care unit; RSV = respiratory syncytial virus; RSV-NET = Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network.
* With 95% CIs indicated by error bars.
† The RSV catchment area includes select counties in California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah. RSV-associated hospitalizations among RSV-NET catchment area residents have hospital admission dates from October 1, 2022 through April 30, 2023. Those with severe RSV disease might be more likely to receive RSV testing; therefore, these data could potentially overestimate the proportion of severe outcomes among hospitalized patients.

(*4*,*5*). One study indicated that older adults with COPD (aged ≥65 years) and CHF (aged 60–79 years) had RSV hospitalization rates that were 3.5–13.4 times and 5.9–7.6 times higher, respectively, than rates among those without those conditions (*5*). The large proportion of LTCF residents among RSV-NET hospitalizations is also consistent with published literature demonstrating this population's vulnerability to institutional outbreaks and hospitalization (*9*).

## Limitations

The findings in this report are subject to at least three limitations. First, RSV-associated hospitalizations might have been missed because of test availability or clinician testing practices that limit RSV testing among hospitalized adults. Second, and conversely, severely ill patients might have been more likely to undergo RSV testing, potentially overestimating the proportion of severe outcomes among hospitalized patients. Finally, because RSV-NET covers 9% of the U.S. population, these findings might not be nationally generalizable.

## Implications for Public Health Practice

RSV causes substantial morbidity and mortality in adults aged ≥60 years; these findings suggest that advanced age (particularly ≥75 years), LTCF residence, and the presence of underlying medical conditions, including COPD and CHF, might be risk factors for clinicians and patients to consider in shared decision-making regarding RSV vaccination. It is important that special attention be paid to equitable access to vaccines for AI/AN, Black, and Hispanic adults, who were hospitalized for RSV at younger ages than were White adults.

**Summary**

What is already known about this topic?

Respiratory syncytial virus (RSV) causes substantial morbidity and mortality in older adults. In June 2023, CDC recommended RSV vaccination for adults aged ≥60 years, using shared clinical decision-making and prioritizing those at highest risk for severe disease.

What is added by this report?

Among 1,634 patients aged ≥60 years hospitalized with RSV, 54% were aged ≥75 years, and 17% resided in long-term care facilities (LTCFs). Obesity, chronic obstructive pulmonary disease (COPD), and congestive heart failure (CHF) were common underlying conditions.

What are the implications for public health practice?

Clinicians and patients should consider age (particularly age ≥75 years), LTCF residence, and underlying medical conditions, including COPD and CHF, in shared decision-making regarding RSV vaccination to prevent severe RSV-associated outcomes.

## Acknowledgments

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# Disease Severity of Respiratory Syncytial Virus Compared with COVID-19 and Influenza Among Hospitalized Adults Aged ≥60 Years — IVY Network, 20 U.S. States, February 2022–May 2023

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## Abstract

On June 21, 2023, CDC's Advisory Committee on Immunization Practices recommended respiratory syncytial virus (RSV) vaccination for adults aged ≥60 years, offered to individual adults using shared clinical decision-making. Informed use of these vaccines requires an understanding of RSV disease severity. To characterize RSV-associated severity, 5,784 adults aged ≥60 years hospitalized with acute respiratory illness and laboratory-confirmed RSV, SARS-CoV-2, or influenza infection were prospectively enrolled from 25 hospitals in 20 U.S. states during February 1, 2022–May 31, 2023. Multivariable logistic regression was used to compare RSV disease severity with COVID-19 and influenza severity on the basis of the following outcomes: 1) standard flow (<30 L/minute) oxygen therapy, 2) high-flow nasal cannula (HFNC) or noninvasive ventilation (NIV), 3) intensive care unit (ICU) admission, and 4) invasive mechanical ventilation (IMV) or death. Overall, 304 (5.3%) enrolled adults were hospitalized with RSV, 4,734 (81.8%) with COVID-19 and 746 (12.9%) with influenza. Patients hospitalized with RSV were more likely to receive standard flow oxygen, HFNC or NIV, and ICU admission than were those hospitalized with COVID-19 or influenza. Patients hospitalized with RSV were more likely to receive IMV or die compared with patients hospitalized with influenza (adjusted odds ratio = 2.08; 95% CI = 1.33–3.26). Among hospitalized older adults, RSV was less common, but was associated with more severe disease than COVID-19 or influenza. High disease severity in older adults hospitalized with RSV is important to consider in shared clinical decision-making regarding RSV vaccination.

## Introduction

Respiratory syncytial virus (RSV) is increasingly recognized as an important cause of severe respiratory disease in older adults. In the United States, an estimated 60,000–160,000 RSV-associated hospitalizations and 6,000–10,000 RSV-associated deaths occur each year among adults aged ≥65 years (*1*). On June 21, 2023, CDC's Advisory Committee on Immunization Practices recommended RSV vaccination for adults aged ≥60 years using shared clinical decision-making[†] (*1*). Understanding the severity of RSV disease compared with that of other respiratory viral diseases in older adults is needed to guide this shared patient-provider clinical decision-making.

## Methods

During February 1, 2022–May 31, 2023, adults aged ≥60 years with acute respiratory illness[§] and laboratory-confirmed RSV, SARS-CoV-2, or influenza infection who were admitted to any of 25 hospitals in 20 U.S. states participating in the Investigating Respiratory Viruses in the Acutely Ill (IVY) Network[¶] were eligible for inclusion in this analysis. Demographic and clinical data were obtained from patient or proxy interview and medical records, including in-hospital outcomes observed by day 28 of hospitalization. Upper respiratory specimens were collected from enrolled patients near the time of admission and tested at a central laboratory (Vanderbilt University Medical Center, Nashville, Tennessee)

[*] These authors contributed equally to this report.

[†] Unlike age- and risk-based recommendations, for which the default decision should be to vaccinate the patient unless vaccination is contraindicated, shared clinical decision-making recommendations have no default. The decision whether to vaccinate may take into account the best available evidence regarding who would benefit from vaccination; the individual patient's characteristics, values, and preferences; the vaccine characteristics; and the clinician's discretion. https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html

[§] Acute respiratory illness was defined as one including any of the following signs and symptoms: fever, cough, shortness of breath, new or worsening findings on chest imaging consistent with pneumonia, or hypoxemia (defined as SpO2 <92% on room air or supplemental oxygen to maintain SpO2 ≥92%). For patients receiving chronic oxygen therapy, hypoxemia was defined as SpO2 below baseline or an escalation in supplemental oxygen use to maintain a baseline SpO2.

[¶] https://www.cdc.gov/flu/vaccines-work/ivy.htm

by reverse transcription–polymerase chain reaction for RSV, SARS-CoV-2, and influenza. Patients who received a positive RSV, SARS-CoV-2 or influenza result based on either hospital or central laboratory testing within 10 days of illness onset or within 3 days of hospital admission were included.

Severity of RSV disease was compared with COVID-19 and influenza severity using the following in-hospital outcomes: 1) standard flow oxygen therapy, defined as receipt of supplemental oxygen at <30 L/minute; 2) receipt of high-flow nasal cannula (HFNC) or noninvasive ventilation (NIV); 3) intensive care unit (ICU) admission; and 4) receipt of invasive mechanical ventilation (IMV) or death. For this analysis, enrolled patients were excluded if they had confirmed or inconclusive laboratory test results indicating coinfection with RSV, SARS-CoV-2, or influenza or if data for in-hospital outcomes were missing.

In-hospital outcomes were compared among patients hospitalized with RSV disease, COVID-19, and influenza using multivariable logistic regression. Models were adjusted for age, sex, self-reported race and Hispanic or Latino (Hispanic) ethnicity, number of organ systems associated with a chronic medical condition, and U.S. Department of Health and Human Services geographic region. Differences among respiratory viruses were assessed for each outcome; p-values <0.05 were considered statistically significant. All analyses were conducted using SAS software (version 9.4; SAS Institute). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.**

## Results

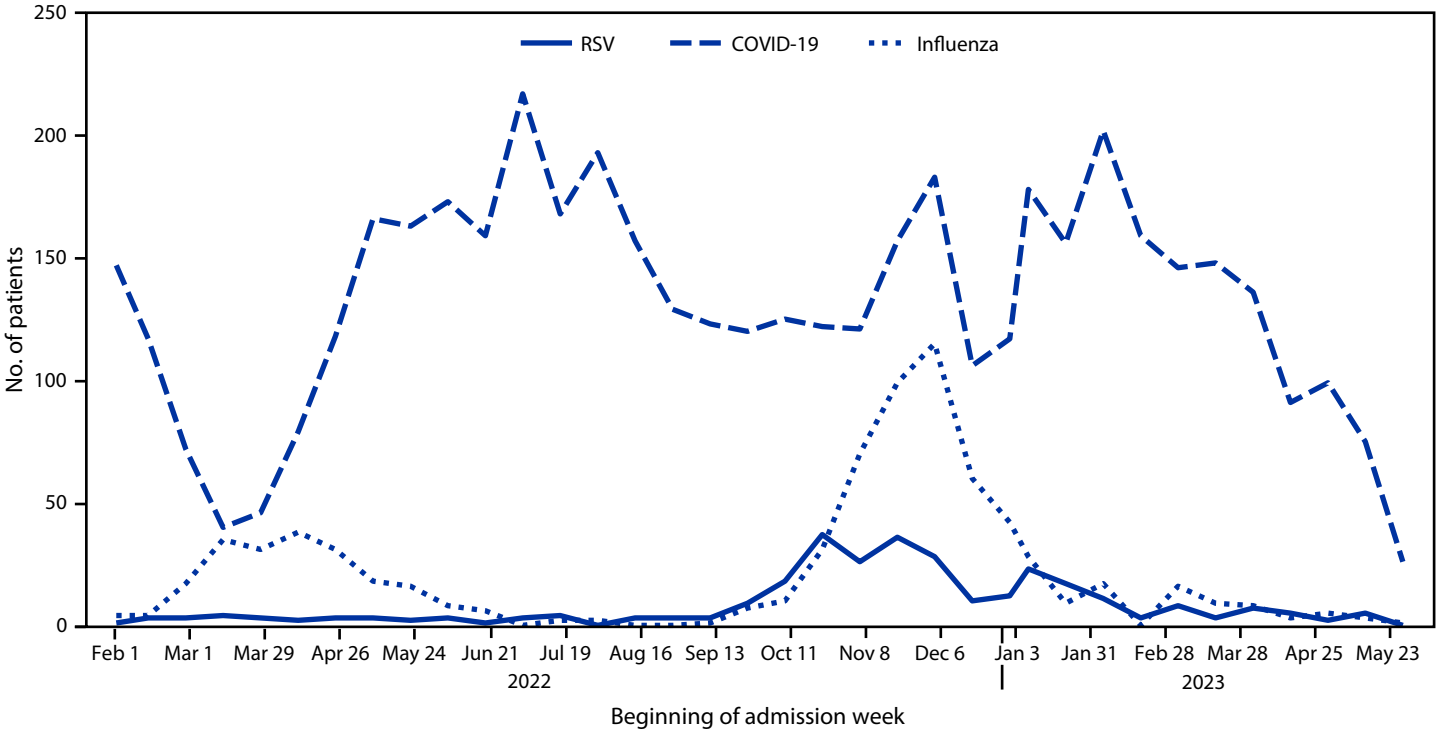
During February 1, 2022–May 31, 2023, a total of 6,061 adults aged ≥60 years were enrolled in IVY Network with acute respiratory illness and laboratory-confirmed infection with RSV, SARS-CoV-2, or influenza. After exclusion of 277 patients,†† 5,784 were included in this analysis, among whom 304 (5.3%) were hospitalized with RSV, 4,734 (81.8%) with COVID-19, and 746 (12.9%) with influenza. Substantial seasonal variation in hospital admissions was observed for RSV and influenza, but SARS-CoV-2 admissions exhibited less seasonal variation (Figure).

The median age of adults hospitalized with RSV (72 years) was similar to the age of those hospitalized with COVID-19 (74 years) and influenza (71 years) (Table 1). Among patients

** 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

†† A total of 120 patients were excluded because of laboratory-confirmed coinfections, 226 patients were excluded because of inconclusive laboratory test results, preventing confirmation of coinfections, and five patients were excluded because of missing in-hospital clinical outcomes, yielding 277 total exclusions. These 277 exclusions were not mutually exclusive.

**FIGURE. Date of admission for adults aged ≥60 years hospitalized with respiratory syncytial virus, COVID-19, or influenza — Investigating Respiratory Viruses in the Acutely Ill Network, 25 hospitals, 20 U.S. states,* February 1, 2022–May 31, 2023**




**Abbreviation:** RSV = respiratory syncytial virus.
* https://www.cdc.gov/flu/vaccines-work/ivy.htm

**TABLE 1. Characteristics of adults aged ≥60 years hospitalized with respiratory syncytial virus, COVID-19, or influenza — Investigating Respiratory Viruses in the Acutely Ill Network, 25 hospitals,* 20 U.S. states, February 1, 2022–May 31, 2023**

| Characteristic | No. (%) | | | |
|---|---|---|---|---|
| | **Total N = 5,784** | **RSV n = 304** | **COVID-19 n = 4,734** | **Influenza n = 746** |
| **Age, yrs, median (IQR)** | **74 (67–81)** | 72 (66–80) | 74 (67–82) | 71 (65–79) |
| **Age group, yrs** | | | | |
| 60–69 | **2,038 (35.2)** | 116 (38.2) | 1,601 (33.8) | 321 (43.0) |
| 70–79 | **1,978 (34.2)** | 110 (36.2) | 1,623 (34.3) | 245 (32.8) |
| ≥80 | **1,768 (30.6)** | 78 (25.7) | 1,510 (31.9) | 180 (24.1) |
| **Race and ethnicity** | | | | |
| Black or African American, non-Hispanic | **1,038 (17.9)** | 55 (18.1) | 795 (16.8) | 188 (25.2) |
| White, non-Hispanic | **3,659 (63.3)** | 178 (58.6) | 3,095 (65.4) | 386 (51.7) |
| Hispanic or Latino, any race | **702 (12.1)** | 44 (14.5) | 543 (11.5) | 115 (15.4) |
| Other race, non-Hispanic† | **293 (5.1)** | 22 (7.2) | 224 (4.7) | 47 (6.3) |
| Other§ | **92 (1.6)** | 5 (1.6) | 77 (1.6) | 10 (1.3) |
| **Sex** | | | | |
| Female | **2,898 (50.1)** | 173 (56.9) | 2,326 (49.1) | 399 (53.5) |
| Male | **2,886 (49.9)** | 131 (43.1) | 2,408 (50.9) | 347 (46.5) |
| **HHS region*** | | | | |
| 1 | **1,117 (19.3)** | 41 (13.5) | 971 (20.5) | 105 (14.1) |
| 2 | **337 (5.8)** | 27 (8.9) | 239 (5.0) | 71 (9.5) |
| 3 | **221 (3.8)** | 8 (2.6) | 199 (4.2) | 14 (1.9) |
| 4 | **998 (17.3)** | 59 (19.4) | 812 (17.2) | 127 (17.0) |
| 5 | **881 (15.2)** | 37 (12.2) | 712 (15.0) | 132 (17.7) |
| 6 | **676 (11.7)** | 25 (8.2) | 550 (11.6) | 101 (13.5) |
| 7 | **328 (5.7)** | 29 (9.5) | 246 (5.2) | 53 (7.1) |
| 8 | **731 (12.6)** | 51 (16.8) | 574 (12.1) | 106 (14.2) |
| 9 | **295 (5.1)** | 19 (6.3) | 257 (5.4) | 19 (2.6) |
| 10 | **200 (3.5)** | 8 (2.6) | 174 (3.7) | 18 (2.4) |
| **No. of organ systems with a chronic medical condition, median (IQR)¶** | **2 (2–3)** | 2 (2–3) | 2 (2–4) | 2 (2–3) |
| **COVID-19 vaccination status**** | | | | |
| Unvaccinated | **997 (17.2)** | 29 (9.5) | 837 (17.7) | 131 (17.6) |
| Vaccinated†† | **4,713 (81.5)** | 274 (90.1) | 3,834 (81.0) | 605 (81.1) |
| **Influenza vaccination status§§** | | | | |
| Unvaccinated | **2,548 (44.1)** | 131 (43.1) | 2,026 (42.8) | 391 (52.4) |
| Vaccinated¶¶ | **2,795 (48.3)** | 147 (48.4) | 2,343 (49.5) | 305 (40.9) |

**Abbreviations:** HHS = U.S. Department of Health and Human Services; RSV = respiratory syncytial virus.

* Hospitals by HHS region include *Region 1:* Baystate Medical Center (Springfield, Massachusetts), Beth Israel Deaconess Medical Center (Boston, Massachusetts), and Yale University (New Haven, Connecticut); *Region 2:* Montefiore Medical Center (New York, New York); *Region 3:* Johns Hopkins Hospital (Baltimore, Maryland); *Region 4:* Emory University Medical Center (Atlanta, Georgia), University of Miami Medical Center (Miami, Florida), Vanderbilt University Medical Center (Nashville, Tennessee), and Wake Forest University Baptist Medical Center (Winston-Salem, North Carolina); *Region 5:* Cleveland Clinic (Cleveland, Ohio), Hennepin County Medical Center (Minneapolis, Minnesota), Henry Ford Health (Detroit, Michigan); The Ohio State University Wexner Medical Center (Columbus, Ohio), and University of Michigan Hospital (Ann Arbor, Michigan); *Region 6:* Baylor Scott & White Medical Center (Temple, Texas) and Baylor University Medical Center (Dallas, Texas); *Region 7:* Barnes-Jewish Hospital (St. Louis, Missouri) and University of Iowa Hospitals (Iowa City, Iowa); *Region 8:* Intermountain Medical Center (Murray, Utah) and UCHealth, University of Colorado Hospital (Aurora, Colorado); *Region 9:* University of Arizona Medical Center (Phoenix, Arizona), Stanford University Medical Center (Stanford, California), and UCLA Medical Center (Los Angeles, California); and *Region 10:* Oregon Health & Science University Hospital (Portland, Oregon) and University of Washington (Seattle, Washington).

† Other race, non-Hispanic includes American Indian or Alaska Native, Asian, and Native Hawaiian or other Pacific Islander, which were combined because of small counts.

§ Other includes patients who self-reported their race and ethnicity as "other" and those for whom race and ethnicity were unknown.

¶ Organ systems with chronic medical conditions include cardiovascular disease, neurologic disease, pulmonary disease, gastrointestinal disease, endocrine disease, kidney disease, hematologic disease, autoimmune disease, and immunocompromising conditions.

** A total of 74 (1.3%) patients were missing COVID-19 vaccination status, including one (0.3%) among RSV patients, 63 (1.3%) among COVID-19 patients, and 10 (1.3) among influenza patients.

†† Includes patients with receipt of ≥1 dose of original (ancestral) monovalent vaccines, specifically BNT1262b2, (Pfizer-BioNTech), mRNA-1273 (Moderna), NVX-CoV2373 (Novavax), Ad26.COV2.S (Janssen [Johnson & Johnson]) or patients with receipt of ≥1 dose bivalent (ancestral and BA.4/5) vaccines, specifically BNT1262b2 bivalent vaccine (Pfizer-BioNTech) and mRNA-1273.222 (Moderna) bivalent vaccine. Patients who received bivalent vaccination might have previously received 1–6 doses of the original (ancestral) monovalent vaccines.

§§ A total of 441 (7.6%) patients were missing influenza vaccination status, including 26 (8.6%) RSV patients, 365 (7.7%) COVID-19 patients, and 50 (6.7%) influenza patients.

¶¶ Patients were classified as vaccinated against influenza if they received season-specific influenza vaccination based on the period in which they were enrolled.

hospitalized with RSV or COVID-19, percentages of non-Hispanic Black or African American (Black) patients were similar (18.1% and 16.8%, respectively); however, among patients hospitalized with influenza, the percentage of Black patients was higher (188; 25.2%). Patients hospitalized with RSV had chronic medical conditions associated with a median of two organ systems, a finding similar to that for patients hospitalized with COVID-19 or influenza. Among the

**TABLE 2. In-hospital outcomes among adults aged ≥60 years hospitalized with respiratory syncytial virus, COVID-19, or influenza — Investigating Respiratory Viruses in the Acutely Ill Network, 25 hospitals,* 20 U.S. states, February 1, 2022–May 31, 2023**

| In-hospital outcomes | No./Total no. (%) RSV patients n = 304 | COVID-19 patients n = 4734 | Influenza patients n = 746 | RSV vs. COVID-19 aOR† (95% CI) | p-value | RSV vs. influenza aOR† (95% CI) | p-value |
|---|---|---|---|---|---|---|---|
| Standard flow oxygen therapy§ | 157/197 (79.7) | 2,169/3,726 (58.2) | 390/593 (65.8) | 2.97 (2.07–4.27) | <0.001 | 2.07 (1.37–3.11) | <0.001 |
| HFNC or NIV¶ | 59/256 (23.0) | 495/4,223 (11.7) | 94/687 (13.7) | 2.25 (1.65–3.07) | <0.001 | 1.99 (1.36–2.90) | <0.001 |
| ICU admission | 74/304 (24.3) | 819/4,734 (17.3) | 125/746 (16.8) | 1.49 (1.13–1.97) | 0.005 | 1.55 (1.11–2.19) | 0.01 |
| IMV or death | 41/304 (13.5) | 481/4,734 (10.2) | 52/746 (7.0) | 1.39 (0.98–1.96) | 0.07 | 2.08 (1.33–3.26) | 0.001 |

**Abbreviations:** aOR = adjusted odds ratio; HFNC = high-flow nasal cannula; ICU = intensive care unit; IMV = invasive mechanical ventilation; NIV = noninvasive ventilation; RSV = respiratory syncytial virus.

* https://www.cdc.gov/flu/vaccines-work/ivy.htm

† Multivariable logistic regression models were adjusted for age, sex, race and ethnicity, number of organ systems with chronic medical conditions, and U.S. Department of Health and Human Services region.

§ Standard flow oxygen therapy was defined as receipt of supplemental oxygen therapy at a flow rate <30 L/minute as the highest level of oxygen support received during hospitalization.

¶ HFNC or NIV was defined as patients who received either HFNC (oxygen therapy at a flow rate ≥30 L/minute) or NIV as the highest level of oxygen support received during hospitalization.

5,784 included patients, 4,713 (81.5%) had received ≥1 dose of original (ancestral) monovalent or bivalent (ancestral and BA.4/5) COVID-19 vaccine, and 2,795 (48.3%) had received seasonal influenza vaccination.§§

In adjusted analyses comparing RSV severity with COVID-19, patients hospitalized with RSV were more likely than hospitalized COVID-19 patients or hospitalized influenza patients were to receive standard flow oxygen (adjusted odds ratio [aOR] = 2.97 [COVID-19] and 2.07 [influenza]), HFNC or NIV (aOR = 2.25 [COVID-19] and 1.99 [influenza]), or to be admitted to an ICU (aOR = 1.49 [COVID-19] and 1.55 [influenza]) (Table 2). The odds of the composite outcome of IMV or death between patients hospitalized with RSV and patients hospitalized with COVID-19 was similar (aOR 1.39; 95% CI = 0.98–1.96); however, among hospitalized adults aged ≥60 years with RSV, the odds of IMV or death were significantly higher compared with hospitalized influenza patients (aOR 2.08; 95% CI = 1.33–3.26).

## Discussion

The findings from this study demonstrate that RSV is an important cause of respiratory virus–associated morbidity and mortality in older adults. In this prospective, multicenter analysis in which all enrolled older adults hospitalized in 20 U.S. states during 2022–2023 received testing for RSV, SARS-CoV-2, and influenza, RSV-associated hospitalizations were less frequent than were COVID-19–associated and influenza-associated hospitalizations; however, clinical outcomes in patients hospitalized with RSV were worse than those among patients hospitalized with COVID-19 or influenza. Because RSV disease is less common than COVID-19 or influenza disease among hospitalized patients, clinicians might be less aware of RSV as a serious respiratory pathogen in older adults.

The findings in this analysis are consistent with those from earlier studies that compared RSV disease severity among hospitalized adults with influenza disease (*2*–*4*). Although outcome definitions vary across studies, most demonstrate that patients hospitalized with RSV disease are more likely to be treated with supplemental oxygen, mechanical ventilation, or ICU admission than are patients hospitalized with influenza disease (*2*–*4*).

An important finding in this analysis is that older adults hospitalized with RSV were also more likely to receive standard flow oxygen therapy, HFNC or NIV, or be admitted to an ICU, compared with patients hospitalized with COVID-19. Few studies have compared RSV severity with that associated with COVID-19, and those that have were completed in 2020, before emergence of the Omicron variant and introduction of COVID-19 vaccines (*4*,*5*). Those studies demonstrated that patients hospitalized with RSV were less likely to experience ICU admission, mechanical ventilation, and in-hospital death than were patients hospitalized with COVID-19. Higher RSV severity relative to that of COVID-19 observed in this analysis is likely due to a combination of factors, including 1) reduced severity of Omicron variant sublineages circulating during the period of this analysis, 2) substantial increases in vaccine- and infection-conferred immunity against SARS-CoV-2, and 3) increases in use of antiviral treatments (*6*,*7*).

The high RSV disease severity observed among older adults in this analysis is important to guide decision-making for RSV

§§ Patients were classified as having been vaccinated against COVID-19 based on receipt of ≥1 dose of original (ancestral) monovalent vaccines (BNT1262b2, [Pfizer-BioNTech], mRNA-1273 [Moderna], NVX-CoV2373 [Novavax], or Ad26.COV2.S [Janssen (Johnson & Johnson)]) or receipt of ≥1 dose of bivalent (ancestral and BA.4/5) vaccine (BNT1262b2 bivalent vaccine [Pfizer-BioNTech] or mRNA-1273.222 [Moderna] bivalent vaccine). Patients who received bivalent vaccine might have previously received 1–6 doses of the original (ancestral) monovalent vaccines. Patients were classified as having been vaccinated against influenza if they had received season-specific influenza vaccination based on the period during which they were enrolled.

**Summary**

What is already known about this topic?

In June 2023, CDC recommended the first respiratory syncytial virus (RSV) vaccines for adults aged ≥60 years using shared clinical decision-making. Understanding the severity of RSV disease is needed to guide this clinical decision-making.

What is added by this report?

During February 2022–May 2023, hospitalizations for RSV were less frequent but were associated with more severe disease than were hospitalizations for COVID-19 or influenza, including receipt of standard flow oxygen therapy, high-flow nasal cannula or noninvasive ventilation, and intensive care unit admission.

What are the implications for public health practice?

The potential for severe RSV disease among older adults is important to consider as part of shared clinical decision-making when assessing the benefit of RSV vaccination among adults aged ≥60 years.

vaccination in this population. Although neither of the two clinical trials that led to Food and Drug Administration (FDA) approval of RSV vaccines for older adults was powered to assess protection of RSV vaccination against hospitalization in adults aged ≥60 years, both trials showed moderate to high efficacy of RSV vaccination against lower respiratory tract disease, which is in the causal pathway leading to severe disease (*8*,*9*). Although additional studies are needed to assess protection of these vaccines against severe respiratory disease in older adults, RSV vaccination has the potential to prevent severe respiratory disease and is currently the only approved prevention product available for older adults.

## Limitations

The findings in this report are subject to at least three limitations. First, it is possible that RSV was preferentially detected among more severely ill patients who were more likely to receive clinical testing for RSV at participating hospitals and be subsequently enrolled. However, all patients with acute respiratory illness who were enrolled in IVY Network also received central testing for RSV, SARS-CoV-2, and influenza. During the period of this analysis, IVY Network enrolled 5,955 patients aged ≥60 years with acute respiratory illness who did not have a clinical diagnosis of RSV, SARS-CoV-2, or influenza, and only 25 (0.4%) received a positive RSV test result, based on central testing. Thus, any potential selection bias related to increased detection of RSV among more severely ill patients is likely minimal. In addition, the consistency of RSV severity findings in this analysis compared with findings from other studies that have used different methods lessens these concerns (*2*,*3*). Second, although COVID-19 and influenza vaccination, as well as antiviral or immunomodulatory treatments, have been shown to reduce severity of in-hospital outcomes, results were presented as unstratified respiratory virus groups to represent the overall population hospitalized with RSV, COVID-19, or influenza during the analysis period. Finally, although sample size was sufficient for the results presented, a larger sample size would have allowed for evaluation of mortality as an independent outcome or adjustment for additional patient characteristics (e.g., immunocompromising conditions).

## Implications for Public Health Practice

These findings suggest that although RSV hospitalizations occur less frequently than COVID-19 or influenza hospitalizations, RSV disease among hospitalized adults aged ≥60 years in the United States during February 2022–May 2023 was more severe than that associated with COVID-19 and influenza. New FDA-approved RSV vaccines for adults aged ≥60 years are expected to prevent lower respiratory tract disease (*1*). Health care providers and older adults should consider RSV disease severity when making a shared clinical decision about RSV vaccination (*1*).

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Morbidity and Mortality Weekly Report

# COVID-19–Associated Hospitalizations Among U.S. Adults Aged ≥65 Years — COVID-NET, 13 States, January–August 2023

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## Abstract

Adults aged ≥65 years remain at elevated risk for severe COVID-19 disease and have higher COVID-19–associated hospitalization rates compared with those in younger age groups. Data from the COVID-19–Associated Hospitalization Surveillance Network (COVID-NET) were analyzed to estimate COVID-19–associated hospitalization rates during January–August 2023 and identify demographic and clinical characteristics of hospitalized patients aged ≥65 years during January–June 2023. Among adults aged ≥65 years, hospitalization rates more than doubled, from 6.8 per 100,000 during the week ending July 15 to 16.4 per 100,000 during the week ending August 26, 2023. Across all age groups, adults aged ≥65 years accounted for 62.9% (95% CI = 60.1%–65.7%) of COVID-19–associated hospitalizations, 61.3% (95% CI = 54.7%–67.6%) of intensive care unit admissions, and 87.9% (95% CI = 80.5%–93.2%) of in-hospital deaths associated with COVID-19 hospitalizations. Most hospitalized adults aged ≥65 years (90.3%; 95% CI = 87.2%–92.8%) had multiple underlying conditions, and fewer than one quarter (23.5%; 95% CI = 19.5%–27.7%) had received the recommended COVID-19 bivalent vaccine. Because adults aged ≥65 years remain at increased risk for COVID-19–associated hospitalization and severe outcomes, guidance for this age group should continue to focus on measures to prevent SARS-CoV-2 infection, encourage vaccination, and promote early treatment for persons who receive a positive SARS-CoV-2 test result to reduce their risk for severe COVID-19–associated outcomes.

## Introduction

Since March 2020, population-based rates of COVID-19–associated hospitalization among all age groups have been highest among adults aged ≥65 years, with increasing age associated with higher hospitalization rates (*1*). During January–June 2023, rates of COVID-19–associated hospitalizations among all adults aged ≥18 years declined, including among adults aged ≥65 years. However, rates remained elevated among adults aged ≥65 years relative to younger age groups and increased beginning the week ending July 15, 2023.* Understanding the characteristics of this population who remain at increased risk for COVID-19–associated hospitalization can help guide appropriate prevention recommendations.

## Methods

COVID-NET† conducts population-based surveillance for laboratory-confirmed COVID-19–associated hospitalizations among catchment area residents in 98 counties and across 13 U.S. states.§ COVID-19–associated hospitalizations are defined as those among persons who have received a positive SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) or rapid antigen detection test result during or within the 14 days preceding hospitalization.

This analysis describes overall and age-stratified weekly COVID-19–associated hospitalization rates during January–August 2023, focusing on adults aged ≥65 years; rates (hospitalizations per 100,000 population) include all COVID-19–associated hospitalizations. Using previously described methods (*2*), trained surveillance officers abstracted demographic and clinical data from the medical charts of an age- and site-stratified random sample of hospitalized adults; data on sampled cases were available for January 1–June 30, 2023. Analyses of sampled cases were limited to hospitalizations for which COVID-19–related illness was the likely presenting complaint, based on information in the admission history and physical examination or face sheet¶ of the medical record at the time of admission.** Patient vaccination

* https://www.cdc.gov/coronavirus/2019-ncov/covidnetdashboard/de/powerbi/dashboard.html

† COVID-NET is one of three platforms comprising the Respiratory Virus Hospitalization Surveillance Network (RESP-NET). These platforms conduct population-based surveillance for hospitalization associated with respiratory syncytial virus (RSV) (RSV-NET), COVID-19 (COVID-NET) and influenza (FluSurv-NET). https://www.cdc.gov/surveillance/resp-net/dashboard.html

§ Selected counties in California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Ohio, Oregon, Tennessee, and Utah. https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm

¶ A one-page summary of important information about a patient.

** The likely presenting complaint upon admission is identified by trained COVID-NET surveillance officers using information in the admission history and physical examination or face sheet of the medical record. The likely presenting complaint is identified and categorized as 1) COVID-19–related illness, 2) inpatient surgery or procedures, 3) psychiatric admission requiring acute medical care, 4) trauma, 5) other (with an accompanying free-text field), or 6) unknown. CDC clinicians independently reviewed the free-text field of complaints classified as other to ascertain whether the complaint might be recategorized or remain in the other category (e.g., skin and soft tissue infections). Hospitalizations for which the likely primary presenting complaint was not COVID-19–related illness, including those for which the likely presenting complaint was unknown or remained classified as other, were categorized as having a presenting complaint not likely related to COVID-19.

status (unvaccinated [received no COVID-19 vaccine], partially vaccinated, received monovalent vaccine only, or received ≥1 bivalent dose since September 2022),[††] was obtained from state immunization information systems. Underlying conditions were chronic or preexisting medical conditions present at or before hospital admission.

Unweighted case counts and weighted percentages that better represent the hospitalized population of the catchment area (*2*) are presented for sampled data. Data were analyzed using SAS (version 9.4; SAS Institute); variances were estimated using Taylor series linearization method. Statistical differences between groups were assessed using chi-square tests; $p<0.05$ were considered statistically significant. This activity was reviewed by CDC, deemed not research, and was conducted in accordance with applicable federal law and CDC policy.[§§]

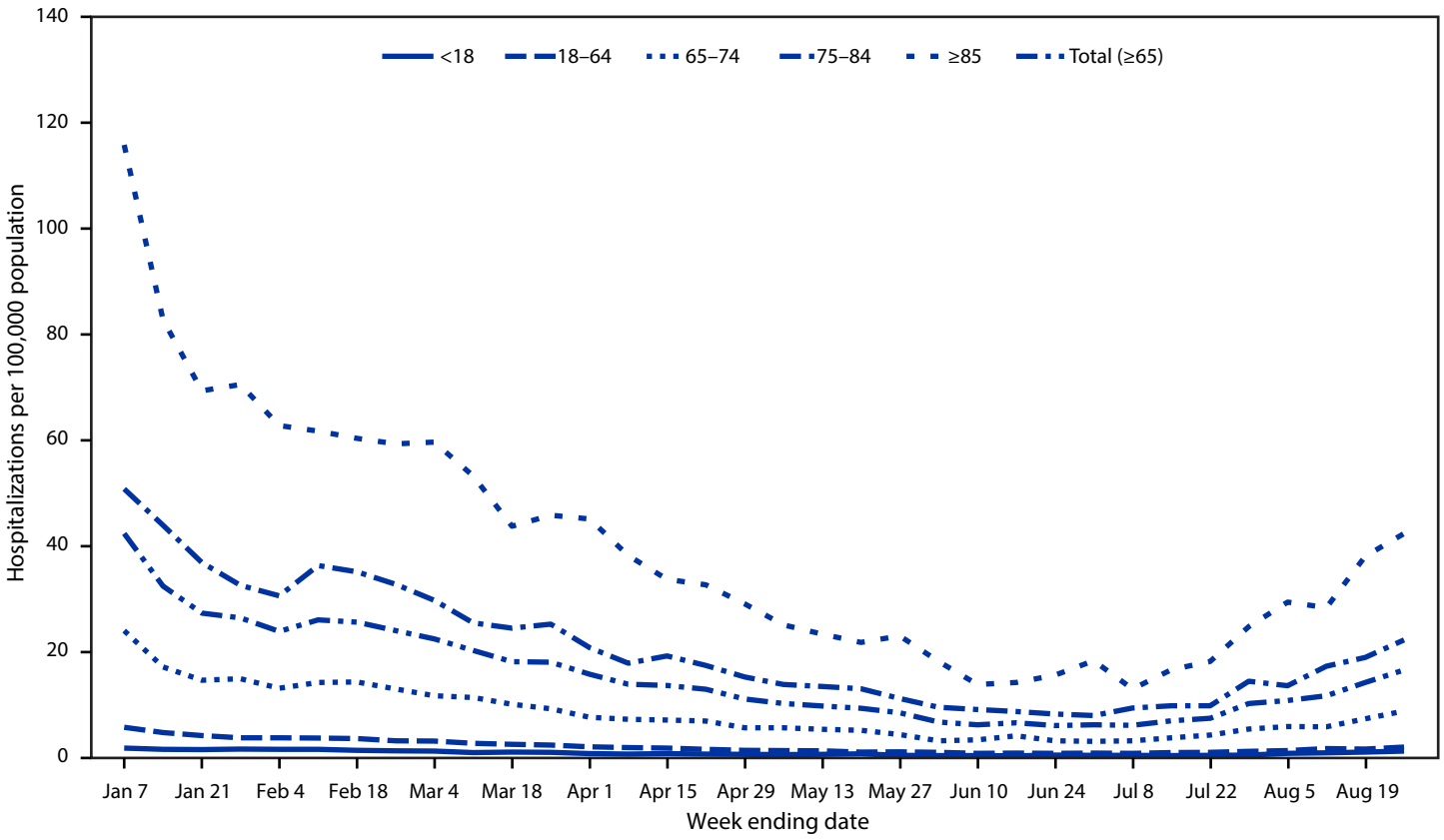
[††] Adults who had no record of receiving any COVID-19 vaccination were considered unvaccinated. Adults who started but did not complete a primary series ≤14 days before a positive test result for SARS-CoV-2 associated with their hospitalization were considered partially vaccinated. Adults who completed the primary COVID-19 vaccination series, including receipt of the second dose of a 2-dose primary vaccination series or a single dose of a 1-dose primary vaccine product ≥14 days before receipt of a positive SARS-CoV-2 test result associated with their hospitalization, regardless of any additional monovalent doses, but who received no bivalent doses, were considered to have received monovalent vaccine only. Adults vaccinated with ≥1 bivalent dose, regardless of primary vaccination series status, received ≥14 days before a positive test result for SARS-CoV-2 associated with their hospitalization, were considered to have received ≥1 bivalent dose. CDC first recommended vaccination of adults aged ≥65 years in September 2022, followed by a subsequent recommendation in April 2023 for adults aged ≥65 years to receive ≥1 additional bivalent dose.

## Results

During January 1–July 8, 2023, weekly rates of COVID-19–associated hospitalization among adults aged ≥65 years decreased 86%, from a high of 42.2 to 5.9 per 100,000, the lowest level since July 2021. Rates then increased to 6.8 for the week ending July 15 and continued to increase during subsequent weeks, to 16.4 for the week ending August 26, 2023 (Figure 1); during that week, the rate among adults aged ≥65 years was nine times as high as that among adults aged 18–64 years (1.8) and 16 times as high as that among persons aged <18 years (1.0). Among adults aged ≥65 years, COVID-19–associated hospitalization rates were highest among those aged ≥85 years (42.2) and lowest among adults aged 65–74 years (8.6).

[§§] 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

**FIGURE 1. Weekly COVID-19–associated hospitalization* rates, by age group — COVID-NET, 13 states, January 1–August 26, 2023**




**Abbreviation:** COVID-NET = COVID-19–Associated Hospitalization Surveillance Network.
* COVID-19–associated hospitalizations among patients who received a positive SARS-CoV-2 test result during hospitalization or ≤14 days before admission.

**TABLE. Demographic characteristics and clinical outcomes of hospitalized adults aged ≥65 years with laboratory-confirmed SARS-CoV-2 infection with COVID-19–related illness as the likely presenting complaint,* by age group — COVID-NET, 13 states, January–June 2023**

| Characteristic | Age group, yrs, no. (%) [95% CI] | | | |
|---|---|---|---|---|
| | Total (≥65) | 65–74 | 75–84 | ≥85 |
| **Total** | **1,133 (100)** | **544 (31.0) [27.1–35.0]** | **289 (36.5) [31.6–41.6]** | **300 (32.5) [28.0–37.4]** |
| **Sex** | | | | |
| Female | **544 (48.8) [44.0–53.7]** | 277 (49.8) [43.5–56.0] | 121 (42.1) [33.3–51.3] | 146 (55.4) [46.3–64.2] |
| Male | **(79.1) [72.2–86.0]** | (68.9) [66.4–71.6] | (87.9) [85.0–90.8] | (78.4) [76.4–80.8] |
| **Race and ethnicity†** | | | | |
| A/PI | **43 (4.7) [2.6–7.9]** | 25 (6.0) [2.6–11.4]§ | 11 (5.9) [1.7–14.1]§ | —¶ |
| Black or African American | **120 (14.4) [11.3–17.9]** | 69 (18.1) [13.5–23.3] | 22 (12.1) [6.7–19.5] | 29 (13.6) [7.8–21.4] |
| White | **851 (68.6) [63.9–73.1]** | 390 (64.7) [58.3–70.7] | 230 (68.9) [58.8–77.8] | 231 (72.1) [63.1–80.0] |
| Hispanic or Latino | **85 (7.8) [5.1–11.3]** | 47 (8.0) [5.2–11.6] | 17 (8.7) [3.2–18.3]§ | 21 (6.5) [3.1–11.8]§ |
| All other races** | **21 (2.3) [1.0–4.8]** | —¶ | —¶ | —¶ |
| Unknown race | **13 (2.1) [0.9–4.1]** | —¶ | —¶ | —¶ |
| **Resident of long-term care facility** | | | | |
| Yes | **202 (17.7) [14.3–21.5]** | 66 (11.6) [8.0–16.2] | 84 (25.5) [18.1–34.2] | 52 (14.7) [10.0–20.6] |
| No | **931 (82.3) [78.5–85.7]** | 478 (88.4) [83.8–92.0] | 205 (74.5) [65.8–81.9] | 248 (85.3) [79.4–90.0] |
| **Hospitalization intervention or outcome** | | | | |
| Length of stay, days, median (IQR) | **3.9 (2.2–7.7)** | 4.3 (2.1–9.4) | 3.8 (2.5–6.9) | 3.7 (2.1–7.1) |
| ICU admission | **176 (14.4) [11.4–17.9]** | 105 (19.9) [15.1–25.4] | 26 (8.2) [4.2–14.2] | 45 (16.2) [10.1–23.9] |
| IMV | **68 (5.9) [3.9–8.5]** | 48 (9.1) [5.7–13.7] | —¶ | 16 (6.8) [2.8–13.4]§ |
| In-hospital death | **63 (4.8) [3.2–6.8]** | 31 (5.7) [3.2–9.2] | 17 (4.4) [1.9–8.6]§ | 15 (4.3) [1.9–8.4]§ |

**Abbreviations:** A/PI = Asian or Pacific Islander; COVID-NET = COVID-19–Associated Hospitalization Surveillance Network; NH = non-Hispanic; ICU = intensive care unit; IMV = invasive mechanical ventilation.

* The likely presenting complaint upon admission is identified by trained COVID-NET surveillance officers using information in the admission history and physical or face sheet (one-page summary of the patient's important information) of the medical record. The likely presenting complaint is identified and categorized as COVID-19–related illness; inpatient surgery or procedures; psychiatric admission requiring acute medical care; trauma; other (with an accompanying free-text field); or unknown. CDC clinicians independently review the free-text field of complaints classified as other to determine if the complaint might be recategorized or remain in the other category (e.g., skin and soft tissue infections). Hospitalizations for which the likely primary complaint was not COVID-19–related illness, including those for which the likely presenting complaint was unknown or remained classified as other, were categorized as having a presenting complaint not likely related to COVID-19.

† If ethnicity was unknown, NH ethnicity was assumed. Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are NH.

§ Relative SE >30; estimates might be unstable because of small sample size.

¶ Data are not presented for cells with sample size <10.

** Includes NH American Indian or Alaska Native and multiracial persons.

Adults aged ≥65 years accounted for 62.9% of all COVID-19–associated hospitalizations during January–August 2023, a one third increase from 45.9% during March 2020–December 2022 (p<0.01) (Supplementary Figure 1; https://stacks.cdc.gov/view/cdc/133298). Persons aged ≥65 years accounted for 62.8% (95% CI = 60.1%–65.7%) of the 4,232 COVID-19–associated hospitalizations sampled during January–June 2023, for 61.3% (95% CI = 54.7%–67.6%) of all intensive care unit (ICU) admissions, and for 87.9% (95% CI = 80.5%–93.2%) of in-hospital deaths occurring during COVID-19–associated hospitalizations.

Of the 1,465 adults sampled from among the 21,445 COVID-19–associated hospitalizations in persons aged ≥65 years, COVID-19 was the likely presenting complaint upon admission for 1,133 (79.5%; 95% CI = 75.9%–82.9%) patients who were included in analyses of clinical data (Table).¶¶

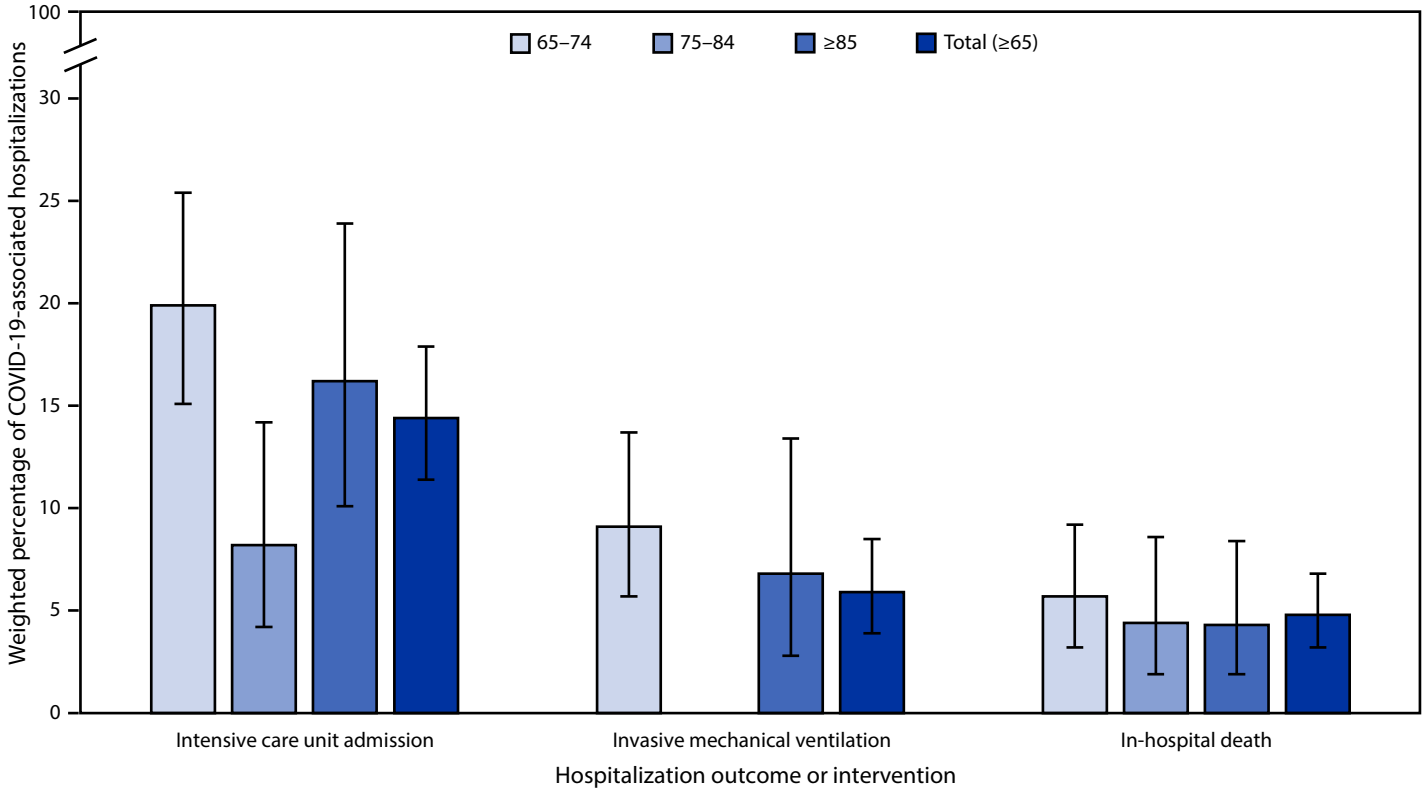
Among these patients, 31.0%, were aged 65–74 years, 36.5% were aged 75–84 years, and 32.5% were aged ≥85 years; overall, 202 (17.7%) patients were residents of a long-term care facility (LTCF). Among the sampled patients, 176 (14.4%) were admitted to an ICU, 68 (5.9%) received invasive mechanical ventilation, and 63 (4.8%) patients died during the hospitalization (Figure 2); these proportions did not differ substantially among subgroups of hospitalized patients aged ≥65 years (p>0.05 for all).

Nearly all sampled patients (1,112 [98.5%; 95% CI = 97.4%–99.2%]) had at least one underlying condition and most (1,015 [90.3%; 95% CI = 87.2%–92.8%]) had two or more. The most common specific conditions reported included diabetes (39.0%; 95% CI = 34.2%–43.9%), kidney disorders (28.0%; 95% CI = 23.8%–32.5), coronary artery disease*** (27.4%; 95% CI = 23.3%–31.8%), chronic heart failure or cardiomyopathy (26.1%; 95% CI = 22.1%–30.4%), and obesity (25.6%; 95% CI = 21.5%–30.1%) (Supplementary Figure 2; https://stacks.cdc.gov/view/cdc/133298).

¶¶ Among the 321 (20.0%) patients with other likely primary reasons for admission, 31 (2.5%) were admitted for trauma, 25 (2.0%) for planned surgery or procedure, 16 (<1%) for psychiatric admissions requiring acute medical care, and 243 (14.2%) with other reasons for admission, which included acute infections (e.g., abscess) likely not COVID-19–related. Admissions categorized as other were reviewed independently by at least two physicians using a standardized algorithm. Fewer than 10 hospitalized patients (<1%) had an unknown reason for admission.

*** Includes history of coronary artery bypass graft or myocardial infarction.

**FIGURE 2. Percentage[*,†,§,¶] of adults aged ≥65 years with laboratory-confirmed SARS-CoV-2 infection for which COVID-19–related illness was the likely presenting complaint with severe hospitalization interventions and outcomes, by age group — COVID-NET, 13 states, January–June 2023**




**Abbreviation:** COVID-NET = COVID-19–Associated Hospitalization Surveillance Network.
* With 95% CIs indicated by error bars.
† Proportions are from a weighted sample of hospitalized adults with completed medical chart abstraction and a discharge disposition.
§ Data are not presented when sample size <10 (invasive mechanical ventilation for persons aged 75–84 years).
¶ Relative SEs for estimated percentages of in-hospital deaths among patients aged 75–84 and ≥85 years and for invasive mechanical ventilation among persons aged ≥85 years are >30, and therefore, estimates might be unstable because of small sample sizes.

Overall, 159 (15.9%; 95% CI = 12.4%–19.9%) of sampled patients aged ≥65 years had not been vaccinated against COVID-19 at the time of hospital admission, 703 (58.6%; 95% CI = 53.7%–63.4%) had received only a monovalent vaccine, and 240 (23.5%; 95% CI = 19.5%–27.7%) had received ≥1 bivalent COVID-19 dose (Supplementary Figure 3, https://stacks.cdc.gov/view/cdc/133298).

## Discussion

During January–mid-July 2023, COVID-19–associated hospitalization rates among persons aged ≥65 years declined but then increased through the week ending August 26, 2023. Throughout the same period, adults aged ≥65 years continued to have the highest hospitalization rates of any age group, accounting for approximately one half of all COVID-19–associated hospitalizations and ICU admissions as well as nearly 90% of in-hospital deaths. Most adults aged ≥65 years who were hospitalized with a positive SARS-CoV-2 test result were likely admitted because of COVID-19 illness and, among these, a substantial proportion had severe outcomes, including ICU admission, receipt of invasive mechanical ventilation, and in-hospital death. Approximately one in six adults aged ≥65 years hospitalized for COVID-19 were LTCF residents. These findings suggest that COVID-19–associated hospitalization continues to predominantly affect adults aged ≥65 years and represent a continued public health threat.

Nearly all hospitalized adults aged ≥65 years had two or more underlying medical conditions. A previous COVID-NET analysis found that adults with two or more underlying medical conditions had a greater than fourfold increased risk for hospitalization after adjusting for age, sex, and race and ethnicity (*3*). Although asymptomatic or mildly ill patients with positive SARS-CoV-2 test results might be hospitalized for non-COVID reasons, based on information in the admission history and physical examination or face sheet of the medical record, approximately three quarters of hospitalized adults aged ≥65 years in this analysis were likely admitted primarily for COVID-19–related illness, which caused substantial morbidity and mortality in this age group.

**Summary**

What is already known about this topic?

Adults aged ≥65 years have increased risk for COVID-19–associated hospitalization and other severe outcomes compared with younger age groups.

What is added by this report?

During January–August 2023, adults aged ≥65 years accounted for 62.9% of all COVID-19–associated hospitalizations. Most hospitalized adults aged ≥65 had multiple underlying conditions. Only 23.5% had received the recommended COVID-19 bivalent vaccine.

What are the implications for public health practice?

Adults with increased risk for COVID-19–associated hospitalization, including all adults aged ≥65 years, should reduce their risk for severe COVID-19 by receiving recommended COVID-19 vaccinations, adopting measures to reduce risk for contracting COVID-19, and seeking prompt outpatient antiviral treatment after a positive SARS-CoV-2 test result.

In September 2022, the Advisory Committee on Immunization Practices (ACIP) recommended a bivalent COVID-19 vaccine dose (*4*) and in April 2023, recommended ≥1 additional bivalent dose for adults aged ≥65 years (*5*). However, this analysis found that approximately three quarters (76.5%) of adults aged ≥65 years hospitalized for COVID-19 during January–June 2023 had not received a bivalent dose, and 16% had not received any COVID-19 vaccine. Although bivalent vaccine effectiveness against COVID-19–associated hospitalization has been shown to decline over time, effectiveness in preventing hospitalization and severe outcomes, such as ICU admission, has been documented (*6*). ACIP recently recommended that all persons aged ≥6 months, including those aged ≥65 years, receive an updated (2023–2024 Formula) COVID-19 vaccine for the 2023–2024 respiratory season (*7*). In addition to vaccination and adoption of measures to reduce risk for contracting SARS-CoV-2, other strategies shown to reduce COVID-19–associated hospitalization risk include early outpatient treatment with ritonavir-boosted nirmatrelvir (Paxlovid), remdesivir (Veklury), or molnupiravir (Lagevrio) for persons with SARS-CoV-2 infection who are at high risk for progression to severe disease, including all adults aged ≥65 years (*8*,*9*). Prevention, vaccination, and early antiviral treatment are important tools in preventing hospitalization and severe associated outcomes in this high-risk age group.

## Limitations

The findings in this report are subject to at least three limitations. First, COVID-19–associated hospitalizations might have been missed because of hospital testing practices or test availability, and therefore, hospitalization rates might be underestimated. Second, a patient's likely presenting complaint at the time of admission is subject to misclassification and might have resulted in cases being unintentionally included or excluded from this analysis. Hospitalization records that do not specify COVID-19 or respiratory illness as a likely presenting complaint can still result in COVID-19–related illness and might affect clinical decision-making and the course of hospitalization. Finally, the COVID-NET catchment areas include approximately 10% of the U.S. population; thus, these findings might not be nationally generalizable.

## Implications for Public Health Practice

COVID-19–associated hospitalization rates declined among persons of all ages during January–July 2023 but increased starting in mid-July 2023. Rates among adults aged ≥65 years remained higher than those among younger age groups, and this older age group accounted for approximately 60% of all COVID-19–associated hospitalizations and nearly 90% of deaths during hospitalization. Many hospitalized adults aged ≥65 years had multiple underlying medical conditions, and most had not received the COVID-19 bivalent vaccine, which had been recommended before the period of this analysis.

COVID-19–associated hospitalizations continue to predominantly affect adults aged ≥65 years and represent a continued public health threat. All adults, especially those aged ≥65 years and others at high risk for progression to severe COVID-19 illness,[†††] should reduce their risk for COVID-19–related hospitalizations and severe outcomes by receiving recommended COVID-19 vaccines, adopting measures to reduce risk for contracting SARS-CoV-2,[§§§] and seeking early outpatient antiviral treatment after receipt of a positive SARS-CoV-2 test result.

[†††] https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/underlyingconditions.html

[§§§] https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html

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# Disparities in COVID-19 Vaccination Status Among Long-Term Care Facility Residents — United States, October 31, 2022–May 7, 2023

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## Abstract

Residents of long-term care (LTC) facilities constitute a population that is vulnerable to SARS-CoV-2 infection; COVID-19 vaccination effectively reduces severe COVID-19 in these settings. To examine demographic differences in primary and up-to-date vaccination status against COVID-19 among LTC facility residents, a descriptive analysis of COVID-19 vaccination data from the National Healthcare Safety Network (NHSN) COVID-19 vaccination data from October 31, 2022, to May 7, 2023, were analyzed. Being up to date was defined as having received a bivalent COVID-19 vaccine dose or having completed a primary vaccination series <2 months earlier. Geographic disparities in vaccination coverage were identified, with substantially lower prevalences of up-to-date status among LTC facility residents in the South (Region 6) (37.7%) and Southeast (Region 4) (36.5%) than among those in the Pacific Northwest (Region 10) (53.3%) and Mountain West (Region 8) (59.6%) U.S. Department of Health and Human Services regions. Up-to-date status was lowest among Black or African American (39.9%) and multiracial (42.2%) LTC facility residents. Strategies to increase up-to-date COVID-19 vaccination among LTC facility residents could include and address these geographic and racial differences.

## Introduction

Long-term care (LTC) facility residents are vulnerable to SARS-CoV-2 infection because of their often-advanced age, medical complexity, and congregate setting (*1*). Vaccination against COVID-19 effectively reduces severe COVID-19 among persons living in these environments (*2*). Previous work has demonstrated racial and ethnic differences in COVID-19 vaccination coverage among the general population (*3*). This is the first examination of the National Healthcare Safety Network's demographic data among LTC facility residents for COVID-19 vaccination allowing for the exploration of vaccination coverage differences by race, age, gender, and geography. The purpose of this analysis is to examine demographic differences in primary and up-to-date vaccination status against COVID-19 among LTC facility residents. Findings from this analysis can be used to better understand heterogenous vaccination coverage and guide the development and implementation of strategies to increase up-to-date COVID-19 vaccination status among this population.

## Methods

In March 2022, NHSN* began optional, person-level surveillance of COVID-19 vaccination status among LTC facility residents in addition to ongoing weekly aggregated facility-level COVID-19 vaccination surveillance (*4*). COVID-19 vaccination data collection includes a weekly count of residents in LTCs with a stay of >24 hours by vaccination status. This study represents a retrospective, descriptive analysis of LTC facility resident data from LTC facilities that voluntarily reported person-level data to NHSN during October 31, 2022–May 7, 2023. These facilities included nursing homes, assisted living, and intermediate care facilities for persons with intellectual disabilities.

Records from the most recent week of data submitted for each resident were included to prevent the inadvertent inclusion and analysis of duplicate records. Descriptive statistics were calculated for each demographic category by vaccination status, including completion of the primary COVID-19 vaccination series and up-to-date status. Being up to date was defined as having received a bivalent COVID-19 vaccine dose or having completed a primary vaccination series <2 months earlier.† Department of Health and Human Services regions§ were used for geographical categorization. Statistical significance was assessed using chi-square tests of independence, with $\alpha = 0.05$ considered statistically significant. All analyses were completed using SAS (version 9.4; SAS Institute). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.¶

## Results

Among the 15,571 facilities enrolled in NHSN, records from 1,797 (11%) were eligible for inclusion, and >99% of records were reported by nursing homes (Table). COVID-19 vaccination varied substantially by LTC resident demographic characteristics. Up-to-date COVID-19 vaccination status was lower among residents of facilities in U.S. Department of Health and Human Services (HHS) Regions 4 (Alabama,

* CDC's NHSN is the nation's leading health care associated–infections surveillance system. COVID-19 vaccination surveillance data are reported to NHSN through COVID-19 Vaccination Modules. https://www.cdc.gov/nhsn/ltc/weekly-covid-vac/index.html

† www.cdc.gov/nhsn/pdfs/hps/covidvax/UpToDateGuidance-508.pdf

§ https://www.hhs.gov/about/agencies/regional-offices/index.html

¶ 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

**TABLE. Characteristics of long-term care facility residents by COVID-19 vaccination status — National Healthcare Safety Network, United States, October 31, 2022–May 7, 2023**

| Characteristic | No. (%) | | | Mean no. of booster doses received (IQR)† | p-value§ |
|---|---|---|---|---|---|
| | Total | Completed primary series | Up to date* | | |
| **Facility type** | | | | | |
| Nursing home | **132,999 (99.2)** | 111,631 (83.9) | 57,998 (43.6) | 1.5 (0–2) | <0.001 |
| Assisted living | **943 (0.7)** | 888 (94.2) | 547 (58.0%) | 2.0 (1–3) | |
| Intermediate care for persons with intellectual disabilities | **170 (0.1)** | 163 (95.9) | 147 (86.5%) | 2.1 (2–3) | |
| **Age group, yrs** | **134,112** | 112,682 | 58,692 | — | — |
| Median (range) | **80.0 (0–122)** | 80.0 (0–122) | 81.0 (0–122) | — | — |
| 0–29 | **901 (0.7)** | 626 (69.5) | 288 (32.0) | 0.9 (0–2) | <0.001 |
| 30–49 | **2,886 (2.2)** | 2,050 (71.0) | 1,088 (37.7) | 1.0 (0–2) | |
| 50–64 | **14,560 (10.9)** | 11,201 (76.9) | 5,673 (39.0) | 1.2 (0–2) | |
| 65–74 | **28,148 (21.0)** | 22,746 (80.8) | 11,360 (40.4) | 1.3 (0–2) | |
| ≥75 | **87,617 (65.3)** | 76,059 (86.8) | 40,283 (46.0) | 1.5 (0–3) | |
| **Gender** | | | | | |
| Female | **81,474 (60.8)** | 69,081 (84.8) | 36,341 (44.6) | 1.5 (0–2) | <0.001 |
| Male | **52,246 (39.0)** | 43,258 (82.8) | 22,168 (42.4) | 1.4 (0–2) | |
| Other | **378 (0.3)** | 332 (87.8) | 179 (47.4) | 1.9 (1–3) | |
| **Ethnicity** | | | | | |
| Hispanic | **3,997 (3.0)** | 3,244 (81.2) | 1,457 (36.5) | 1.2 (0–2) | <0.001 |
| Not Hispanic | **116,752 (87.1)** | 98,392 (84.3) | 51,933 (44.5) | 1.5 (0–2) | |
| Declined | **1,201 (0.9)** | 971 (80.8) | 450 (37.5) | 1.2 (0–2) | |
| Unknown | **12,155 (9.0)** | 10,050 (82.7) | 4,848 (39.9) | 1.4 (0–2) | |
| **Race** | | | | | |
| AI only | **747 (0.6)** | 650 (87.0) | 408 (54.6) | 1.6 (1–3) | <0.001 |
| Asian only | **1,309 (1.0)** | 1,155 (88.2) | 736 (56.2) | 1.8 (1–3) | |
| Black or African American only | **13,912 (10.4)** | 11,199 (80.5) | 5,556 (39.9) | 1.3 (0–2) | |
| NHOPI only | **251 (0.2)** | 220 (87.6) | 152 (60.6) | 1.8 (1–3) | |
| White only | **106,214 (79.2)** | 89,919 (84.7) | 47,408 (44.6) | 1.5 (0–3) | |
| Multiracial | **386 (0.3)** | 302 (78.2) | 163 (42.2) | 1.3 (0–2) | |
| Unknown | **9,919 (7.4)** | 8,129 (82.0) | 3,785 (38.2) | 1.4 (0–2) | |
| Declined | **1,374 (1.0)** | 1,108 (80.6) | 484 (35.2) | 1.2 (0–2) | |
| **HHS region¶** | | | | | |
| 1 | **8,122 (6.1)** | 7,305 (89.9) | 4,317 (53.2) | 1.7 (1–3) | <0.001 |
| 2 | **5,609 (4.2)** | 5,053 (90.1) | 2,293 (40.9) | 1.5 (1–2) | |
| 3 | **15,556 (11.6)** | 13,431 (86.3) | 7,482 (48.1) | 1.6 (1–3) | |
| 4 | **41,993 (31.3)** | 33,798 (80.5) | 15,328 (36.5) | 1.2 (0–2) | |
| 5 | **22,417 (16.7)** | 19,078 (85.1) | 10,732 (47.9) | 1.6 (1–3) | |
| 6 | **12,909 (9.6)** | 10,310 (79.9) | 4,867 (37.7) | 1.2 (0–2) | |
| 7 | **12,843 (9.6)** | 11,263 (87.7) | 6,507 (50.7) | 1.7 (1–3) | |
| 8 | **4,415 (3.3)** | 3,936 (89.2) | 2,632 (59.6) | 1.9 (1–3) | |
| 9 | **7,789 (5.8)** | 6,380 (81.9) | 3,223 (41.4) | 1.4 (0–2) | |
| 10 | **2,459 (1.8)** | 2,128 (86.5) | 1,311 (53.3) | 1.7 (1–3) | |

**Abbreviations:** AI = American Indian; HHS = U.S. Department of Health and Human Services; NHOPI = Native Hawaiian or other Pacific Islander.
* Receipt of a bivalent booster dose or completion of the primary vaccination series <2 months earlier.
† Booster doses available include both monovalent and bivalent vaccination for this period.
§ Chi-square test of independence for up-to-date vaccination.
¶ https://www.hhs.gov/about/agencies/regional-offices/index.html

Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee) (36.5%) and 6 (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas) (37.7%) than among residents in HHS Region 10 (Alaska, Idaho, Oregon, and Washington) (53.3%) and 8 (Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming) (59.6%) (p<0.001). Although persons reporting American Indian, Asian, and Native Hawaiian or other Pacific Islander race represented <2% of the study population, the prevalences of up-to-date coverage among residents in these demographic groups were the highest overall (54.6%, 56.2%, and 60.6%, respectively), whereas coverage was lowest among residents who were Black or African American (39.9%) and multiracial (42.2%). A lower percentage of Hispanic or Latino (Hispanic) residents were up to date (36.5%) than were non-Hispanic residents (44.5%) (p<0.001). Up-to-date coverage increased with age: 46.0% of residents aged ≥75 years were up to date compared with 37.7% of residents aged 30–49 years. Up-to-date coverage was higher among female residents (44.6%) than among male residents (42.4%) (p<0.001).

**Summary**

What is already known about this topic?

Long-term care (LTC) facility residents are vulnerable to SARS-CoV-2 infection because of their advanced age, medical complexity, and congregate living situation; vaccination is an effective means for reducing COVID-19 incidence in this population.

What is added by this report?

COVID-19 vaccination coverage among residents of participating LTC facilities within the National Healthcare Safety Network differed by race and geography. Bivalent COVID-19 vaccination rates were lowest among LTC facility residents in the South and Southeast U.S. regions and among Black or African American and multiracial residents.

What are the implications for public health practice?

Strategies aimed at increasing COVID-19 vaccination coverage should consider these demographic disparities to develop and implement targeted strategies to reduce inequities in COVID-19 morbidity and vaccination coverage.

## Discussion

Results from this analysis, the first to assess demographic and geographic disparities in up-to-date COVID-19 vaccination coverage among LTC facility residents using person-level data reported to NHSN, highlight geographic and racial and ethnic disparities in coverage among residents. These findings underscore the importance of improving the understanding of factors contributing to these geographic and demographic differences to guide public health practice and resource allocation (*5*). These findings are consistent with previously reported substantial population-level demographic disparities in COVID-19 vaccination coverage between Hispanic and non-Hispanic White populations (*6*). Low vaccination coverage and high levels of vaccine hesitancy have been found in the general population of the southeastern United States, mirroring the findings in this analysis (*7*). Barriers to accessing vaccination, including vaccination clinic availability and low vaccine confidence and demand, might contribute to low coverage and might account for some of the differences in vaccination coverage observed within the LTC facility resident population (*7*).

Future efforts are underway to encourage additional facilities to report person-level data, which would facilitate further analyses of demographic disparities, such as in vaccine effectiveness and potential associations with rates of infection. A recent publication reported that vaccine effectiveness was 31% among nursing home residents who were up to date with COVID-19 vaccination (*8*). This analysis was limited to aggregate data at the facility level and could not stratify by resident characteristics. Increased reporting of person-level data would facilitate a better understanding of the effect of COVID-19 vaccination in LTC settings.

### Limitations

The findings in this report are subject to at least two limitations. First, because person-level reporting is optional, only 11% of LTC facilities that report to NHSN were included in this analysis. Thus, the facilities reflected in this analysis might not be representative of all LTC facilities in a given region. Second, the categorization of residents as "unknown" based on self-reported ethnic or racial status could bias some vaccination coverage results. However, less than 10% of residents were categorized as "unknown" in this analysis.

### Implications for Public Health Practice

Residents of LTC facilities should receive COVID-19 vaccination irrespective of their demographic characteristics to protect them from COVID-19 in congregate living environments. Most recent guidance indicates that persons who are aged ≥65 years or who are immunocompromised should consider additional bivalent vaccine doses. (*9*) Surveillance data reported to NHSN are an important tool to effectively monitor vaccination coverage among LTC facility residents as part of the COVID-19 public health response. As COVID-19 vaccination guidance evolves, strategic planning to increase vaccination coverage should include considerations to target and reduce demographic disparities.

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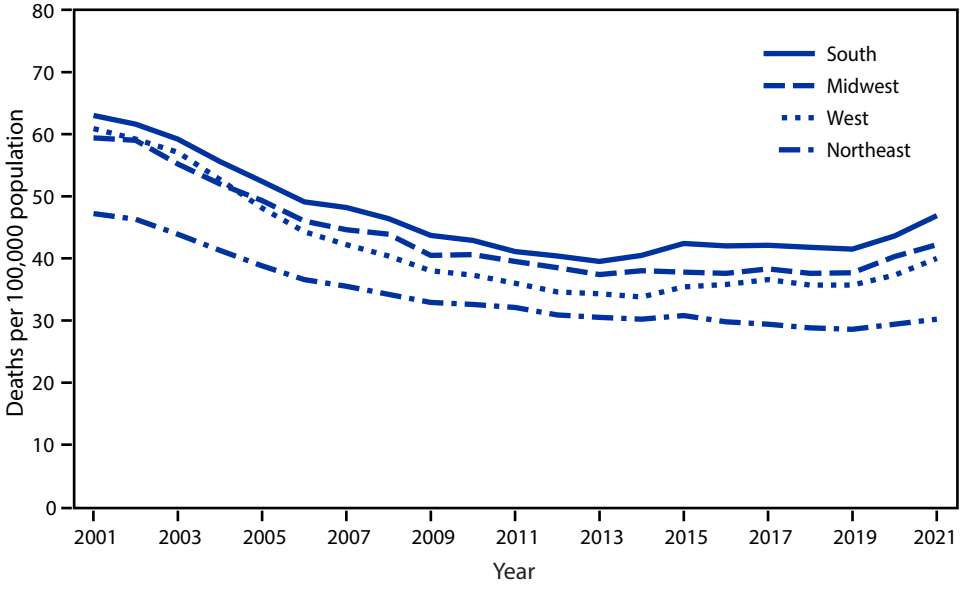
# QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

## Age-Adjusted Death Rates* for Stroke,† by Region§ — National Vital Statistics System, United States, 2001–2021




* Age-adjusted rates are based on the 2000 U.S. Census Bureau standard population.
† Deaths for stroke were identified using *International Classification of Diseases, Tenth Revision* underlying cause of death codes I60–I69.
§ Based on U.S. Census Bureau definition of four regions. https://www.census.gov/programs-surveys/popest/guidance-geographies/terms-and-definitions.html

The age-adjusted death rate for stroke declined for all regions from 2001 to 2021. Stroke death rates declined from 2001 through 2013 for persons living in the South (63.0 to 39.5 per 100,000 population) and Midwest (59.4 to 37.4), through 2014 for persons living in the West (60.9 to 33.8), and through 2019 for persons living in the Northeast (47.2 to 28.6). However, rates then increased through 2021 for all regions (South = 46.9, Midwest = 42.2, West = 40.0, and Northeast = 30.2). Despite these later increases, rates in all regions remained lower in 2021 compared with 2001. Throughout the period, stroke death rates were highest in the South and lowest in the Northeast.

**Source:** National Vital Statistics System, Mortality Data, 2001–2021. http://www.cdc.gov/nchs/nvss/deaths.htm

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