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Influenza Incidence and Vaccine Effectiveness During the Southern Hemisphere Influenza Season — Chile, 2022

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The COVID-19 pandemic has affected influenza virus transmission, with historically low activity, atypical timing, or altered duration of influenza seasons during 2020–22 (*1*,*2*). Community mitigation measures implemented since 2020, including physical distancing and face mask use, have, in part, been credited for low influenza detections globally during the pandemic, compared with those during prepandemic seasons (*1*). Reduced population exposure to natural influenza infections during 2020–21 and relaxed community mitigation measures after introduction of COVID-19 vaccines could increase the possibility of severe influenza epidemics. Partßners in Chile and the United States assessed Southern Hemisphere influenza activity and estimated age-group–specific rates of influenza-attributable hospitalizations and vaccine effectiveness (VE) in Chile in 2022. Chile's most recent influenza season began in January 2022, which was earlier than during prepandemic seasons and was associated predominantly with influenza A(H3N2) virus, clade 3C.2a1b.2a.2. The cumulative incidence of influenza-attributable pneumonia and influenza (P&I) hospitalizations was 5.1 per 100,000 person-years during 2022, which was higher than that during 2020–21 but lower than incidence during the 2017–19 influenza seasons. Adjusted VE against influenza A(H3N2)-associated hospitalization was 49%. These findings indicate that influenza activity continues to be disrupted after emergence of SARS-CoV-2 in 2020. Northern Hemisphere countries might benefit from preparing for an atypical influenza season, which could include early influenza activity with potentially severe disease during the 2022–23 season, especially in the absence of prevention measures, including vaccination. Health authorities should encourage all eligible persons to seek influenza vaccination and take precautions to reduce transmission of influenza (e.g., avoiding close contact with persons who are ill).

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Influenza incidence was estimated using Chile's Ministry of Health (Ministerio de Salud [MINSAL]) Department of Statistics and Health Information hospital discharge data and viral surveillance data from the National Influenza Centre (NIC). Chile registers all public and private hospital patient discharge diagnoses in a central data set. A subset of respiratory specimens from these patients was tested using CDC reverse transcription–polymerase chain reaction (RT-PCR) protocols[†] for influenza virus during routine clinical care or as part of national respiratory virus surveillance. The epidemic threshold used to delineate the influenza season was defined as the mean of weekly percentage of positive specimens tested through NIC during 2017–19. The start of the influenza season for each calendar year during 2017–19 and in 2022 was defined as the epidemiologic week during which the percentage of influenza-positive specimens had exceeded the historical epidemic threshold for ≥3 weeks. Previously described methods (*3*) were used to estimate cumulative incidence of influenza hospitalization. Only certain *International Classification of Diseases, Tenth Revision* (ICD-10) P&I discharge diagnosis codes (J09–18) were considered to be attributable to influenza viruses because providers typically make these diagnoses in the absence of laboratory testing. To attribute P&I diagnoses to influenza, the percentage of patients with severe acute respiratory infections (SARIs) enrolled from nine sentinel sites[§] with influenza-positive specimens tested at NIC was applied to untested patients with a P&I diagnosis. The percentage of SARI patients with an influenza-positive specimen was calculated for each month and for each age group (<5, 5–18, 19–64, and ≥65 years). A similar proportion of persons with P&I diagnoses were assumed to have a positive influenza test result (Supplementary Table; https://stacks.cdc.gov/view/cdc/121863). To minimize misclassification, only cases for which P&I was the principal diagnosis associated with hospitalization were included in calculations estimating the influenza-attributable proportion of P&I cases. The age group–specific proportion was calculated by age group and by month, totaled for each age group, divided by the number of persons in that age group for that year, and then multiplied by 100,000 to derive incidence per 100,000 person-years.

In 2022, Chile used Abbott INFLUVAC, a Southern Hemisphere, trivalent egg-based influenza vaccine formulation containing antigens from an A/Victoria/2570/2019 (H1N1)pdm09–like virus, A/Darwin/9/2021 (H3N2)–like virus, and B/Austria/1359417/2021 (B/Victoria lineage)–like virus (*4*). SARI sentinel data submitted to the Pan American

[†] https://www.cdc.gov/coronavirus/2019-ncov/lab/multiplex.html

[§] SARI sentinel surveillance implemented in nine tertiary care hospitals in northern, central, and southern Chile (Hospital de Antofagasta, Antofagasta; Hospital de Magallanes, Punta Arenas; Hospital de Puerto Montt, Puerto Montt; Hospital Ernesto Torres Galdámez, Iquique; Hospital Guillermo Gran Benavente, Concepción; Hospital Gustavo Fricke, Viña del Mar; Hospital Hernán Enriquez Aravena, Temuco; Hospital Militar, Santiago; and Hospital San Juan de Dios, Santiago).

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Health Organization's Network for the Evaluation of Vaccine Effectiveness in Latin America and the Caribbean — influenza (REVELAC-i) were used to estimate this vaccine's effectiveness in preventing influenza hospitalizations using previously described methods (*5*). REVELAC-i used a test-negative, case-control design to determine the likelihood that a hospitalized patient with severe respiratory infection and a positive influenza test result (case-patient) had been previously vaccinated against influenza compared with the odds that a patient hospitalized with a similar illness, but with a negative influenza test result (control-patient), had been vaccinated. Patients with positive SARS-CoV-2 RT-PCR test results were excluded from the control group (*6*). VE estimates were calculated as 1 – odds ratio x 100 and adjusted for age, month of symptom onset, and preexisting conditions. This report was reviewed by MINSAL and conducted consistent with relevant laws.¶ This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.**

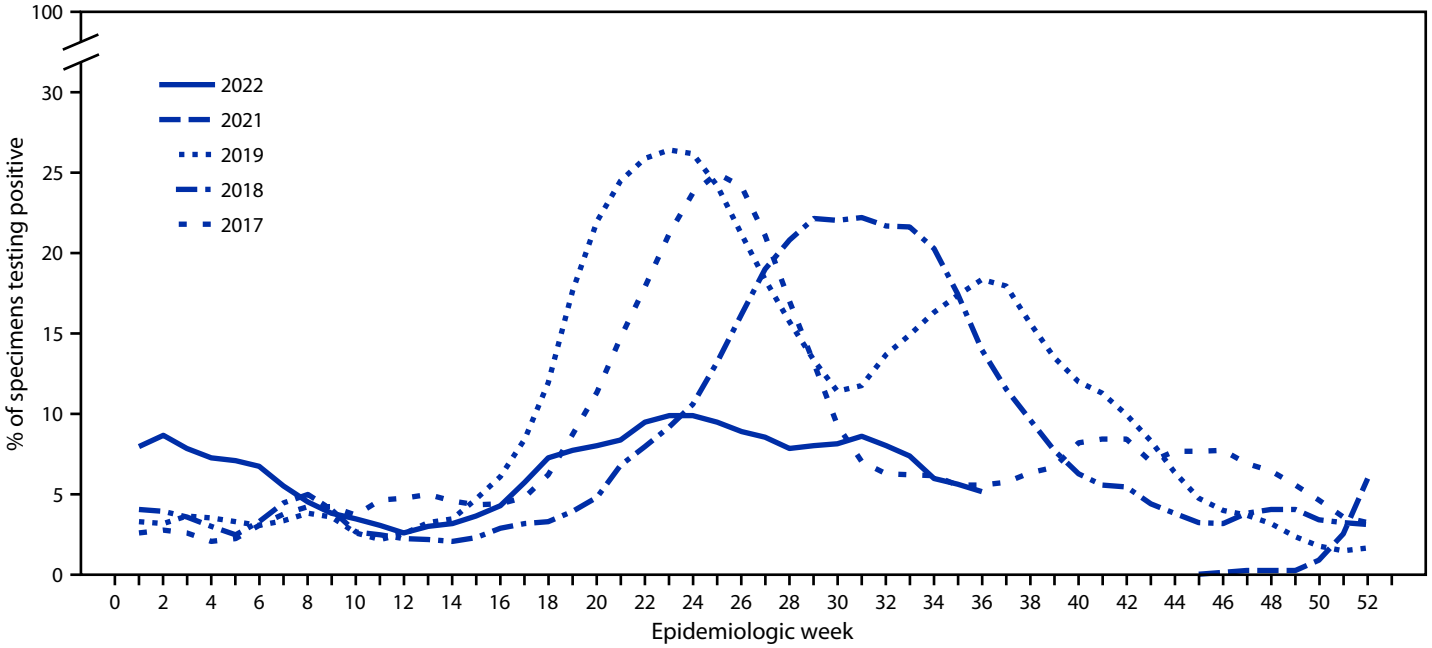
During 2022, Chile's NIC tested 59,392 respiratory specimens through its national laboratory network, 3,140 (5.3%) of which were positive for SARS-CoV-2, and 4,070 (6.9%) of which were positive for influenza. Among influenza-positive specimens, 2,204 (54%) were typed, and all but one (2,203; >99.9%) were influenza A(H3N2) virus; the remaining one specimen was an influenza A(H1N1) virus. During 2017, 2018, and 2019, the influenza epidemic threshold was 6.2%, and the start of influenza season occurred during weeks 18, 21, and 17, respectively, corresponding to an influenza season beginning during April–May. In contrast, in 2022, the percentage of influenza-positive specimens first surpassed and remained above this epidemic threshold during weeks 1–6 (January–February), was below the epidemic threshold during weeks 7–17, and then surpassed it again starting in week 18 (May); peak activity was during week 24 (June) (Figure). All 280 (12.7%) influenza virus specimens sequenced by next-generation sequencing were influenza A(H3N2), clade 3C.2a1b.2a.2.

During January–August 2022, a total of 17,752 (0.1%) persons in Chile's population (19,828,563) were hospitalized for treatment of P&I; among these patients, 4,911 (27.7%) were aged <5 years, 929 (5.2%) were aged 5–18 years, 3,342 (18.8%) were aged 19–64 years, and 8,570 (48.3%) were aged ≥65 years (Table). A total of 6,025 SARI patients were enrolled at nine Chile sentinel surveillance sites in 2022. Among these, respiratory specimens from 5,731 (95.1%) patients were tested by RT-PCR; 301 (5.3%) of these were positive for influenza virus.

¶ This report does not violate Chilean Law No. 20.584 that "Regulates the rights and duties that people have in relation to actions related to their health care," because MINSAL obtains all the information in compliance with its role according to previous laws DFL No. 1/2005 of the MINSAL and Law No. 19.628 on sensitive data.

** 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.

FIGURE. Percentage of respiratory specimens testing positive for influenza virus,* by epidemiologic week — National Influenza Centre, Chile, 2017–2019 and 2021–2022†



* Data lines represent right-aligned, 3-week moving averages of the percentage of specimens testing positive for influenza virus.
† 2022 data as of epidemiologic week 36.

Overall, 1,002 (5.6%) of 17,752 P&I hospitalizations were attributable to influenza; among these, 132 (12.8%) were among persons aged <5 years, 79 (7.6%) were among persons aged 5–18 years, 302 (29.2%) were among adults aged 19–64 years, and 521 (50.4%) were among adults aged ≥65 years.[††] The cumulative incidence of influenza-attributable P&I hospitalizations during weeks 1–32 was 5.1 per 100,000 person-years during 2022. The highest incidence (20.3 per 100,000 person-years) was among adults aged ≥65 years. Among persons aged <5 years, 5–18 years, and 19–64 years, incidences were 11.2, 2.2, and 2.4, respectively. Incidence of influenza-attributable P&I hospitalizations during 2022 was substantially higher than that in 2021 (0.01) and 2020 (0.6), but substantially lower than that in 2017 (28.7), 2018 (23.0), and 2019 (30.4).

Among persons prioritized to receive influenza vaccination in Chile during 2022 (adults aged ≥65 years, persons aged 11–64 years with chronic conditions, pregnant women, infants and children aged 6 months–10 years, and certain other persons[§§]) who accounted for 41% of the total population, 92.5% were vaccinated. Although 2022 Southern Hemisphere formulation vaccines were not available before the first unseasonal influenza wave during weeks 1–6, approximately 88% of vaccinated persons received their vaccine before the peak of 2022 influenza activity in week 24.

Sentinel surveillance data submitted to REVELAC-i used to estimate VE for Chile included 717 test-negative control-patients and 175 case-patients. Among 175 case-patients, 118 (67%) received a positive test result for A(H3N2) virus, and one received a positive test result for A(H1N1)pdm09 virus. The crude and adjusted estimates of VE against influenza A(H3N2)-associated hospitalization were 46% (95% CI = 17%–65%) and 49% (95% CI = 23%–67%), respectively.

Discussion

The influenza epidemic in Chile during 2022 began months earlier than in a typical influenza season (*7*) and resulted in 1,002 influenza-associated P&I hospitalizations. Whereas 2022 incidence of influenza-associated hospitalization was four to six times lower than during 2017–19 pre–COVID-19 pandemic seasons, it was much higher than incidence in 2020–21 when influenza virus detection in Chile was low. Chile's influenza activity in 2022, including an early unseasonal start and A(H3N2) virus predominance, was consistent with trends in other countries in the Southern Hemisphere in 2022, including Australia, Argentina, and Peru; the start of South Africa's influenza seasons was consistent with prepandemic seasons and was characterized by an initial predominance of A(H1N1)pdm09, followed by B/Victoria viruses.[¶¶]

To reduce influenza-associated morbidity, the government of Chile vaccinated >90% of persons prioritized for vaccination free of charge. Although these vaccines only became available after the first influenza wave (weeks 1–6), Chilean health authorities successfully vaccinated 88% of the target population before peak influenza activity in week 24. Influenza vaccines

[††] Age-specific numbers do not sum to total because of rounding when calculating influenza-attributable P&I diagnoses from P&I hospitalizations and SARI data.

[§§] Influenza vaccination priority groups in Chile include health care personnel, persons aged ≥65 years, persons aged 11–64 years with chronic conditions, pregnant women, infants and children aged 6 months–10 years, premature infants with specific pathologies, educations workers, and agricultural workers who work with poultry or swine.

[¶¶] https://www.who.int/tools/flunet (Accessed September 22, 2022).

TABLE. Influenza-attributable hospitalizations by age group — Chile, epidemiologic weeks 1–32, 2022

Age group, yrs	No. of patients (column %)		No. (%)[§] of SARI patients with respiratory specimens tested[†]	No. (%)[¶] of influenza-positive specimens[†]	No. of P&I diagnoses attributable to influenza**	Population[††]	Incidence[§§] (95% CI)
	With P&I clinical influenza discharge diagnosis*	With SARI, enrolled at sentinel sites[†]					
Total	**17,752 (100.0)**	**6,025 (100.0)**	**5,731 (95.1)**	**301 (5.3)**	**1,002**	**19,828,563**	**5.1 (4.8–5.4)**
<5	4,911 (27.7)	1,927 (32.0)	1,880 (97.6)	49 (2.6)	132	1,177,286	11.2 (9.4–13.3)
5–18	929 (5.2)	424 (7.0)	401 (94.6)	31 (7.7)	79	3,542,159	2.2 (1.8–2.8)
19–64	3,342 (18.8)	1,315 (21.8)	1,217 (92.5)	99 (8.1)	302	12,548,497	2.4 (2.2–2.7)
≥65	8,570 (48.3)	2,359 (39.2)	2,233 (94.7)	122 (5.5)	521	2,560,621	20.3 (18.7–22.2)

Abbreviations: P&I = pneumonia and influenza; SARI = severe acute respiratory infection.

* National-level hospital discharge data from Department of Statistics and Health Information, Chile's Ministry of Health (Ministerio de Salud), with *International Classification of Diseases, Tenth Revision* hospital discharge codes J09–J18. https://deis.minsal.cl

† SARI sentinel surveillance implemented in nine tertiary care hospitals in northern, central, and southern Chile (Hospital de Antofagasta, Antofagasta; Hospital de Magallanes, Punta Arenas; Hospital de Puerto Montt, Puerto Montt; Hospital Ernesto Torres Galdámez, Iquique; Hospital Guillermo Gran Benavente, Concepción; Hospital Gustavo Fricke, Viña del Mar; Hospital Hernán Enriquez Aravena, Temuco; Hospital Militar, Santiago; and Hospital San Juan de Dios, Santiago).

§ Percentage of enrolled SARI patients.

¶ Percentage of tested specimens from SARI patients.

** Age-specific numbers in this column do not sum to total because of rounding when calculating influenza-attributable P&I diagnoses from P&I hospitalizations and SARI data.

†† Population projections and estimates calculated based on 2017 census data from the National Institute of Statistics, Santiago, Chile.

§§ Cases per 100,000 person-years; incidence estimated using World Health Organization-recommended methods. https://apps.who.int/iris/handle/10665/178801

Summary

What is already known about this topic?

Influenza transmission has changed during the COVID-19 pandemic.

What is added by this report?

In 2022, influenza A(H3N2) virus, clade 3C.2a1b.2a.2, circulated in Chile months earlier than during prepandemic influenza seasons and was associated with 1,002 hospitalizations. Influenza vaccination reduced risk for A(H3N2) virus hospitalization by 49%.

What are the implications for public health practice?

Like certain Southern Hemisphere countries during the 2022 influenza season, Northern Hemisphere countries might face influenza activity with atypical timing and intensity during the 2022–23 season. Health authorities should encourage all eligible persons to seek influenza vaccination and take precautions to reduce transmission of influenza (e.g., avoiding close contact with persons who are ill).

were 49% effective at preventing hospitalizations during this predominantly A(H3N2) clade 3C.2a1b.2a.2 season. The Northern Hemisphere 2022–23 influenza vaccine formulation contains the same A(H3N2) clade and antigen (3C.2a1b.2a.2 and A/Darwin/9/2021, respectively) used in the 2022 Southern Hemisphere vaccine; if the A(H3N2) clade 3C.2a1b.2a.2 also predominates during 2022–23 Northern Hemisphere influenza season, this Northern Hemisphere formulation might be similarly effective at preventing severe influenza illnesses. Like certain Southern Hemisphere jurisdictions, Chile identified a limited number of influenza B virus cases, none of which was subtyped as B/Yamagata. The global absence of B/Yamagata might indicate that this subtype has become rare (*8*); however, continued surveillance is needed to learn whether it will reemerge in future seasons.

The findings in this report are subject to at least three limitations. First, the dominant circulating subtype was determined based on the typing of 54% (2,204 of 4,070) of respiratory specimens that tested positive for influenza virus, and the dominant clade was determined from sequencing 13% of specimens (280 of 2,203); thus, it is possible that other virus types and clades were not identified. Second, VE estimates are based on a limited number of hospitalized case-patients and control-patients from nine hospitals, and unmeasured confounding, including confounding associated with hospitalization or vaccination, might be present in this data set. Finally, testing and hospitalization data could have been affected by changes in health care–seeking behavior because of the COVID-19 pandemic which was not assessed in these analyses.

These data from Chile's 2022 influenza season indicate that influenza activity in the Southern Hemisphere was atypical, likely because of continued effects of emergence of SARS-CoV-2 in 2020. Strict observance of community mitigation measures (*9*) and high influenza vaccination coverage likely mitigated influenza incidence in Chile during the 2022 season. Northern Hemisphere countries could benefit from preparing for an atypical season, which could include early influenza activity with potentially severe disease for the 2022–23 season, especially in the absence of prevention measures, including vaccination. Health officials should encourage communities to protect themselves by seeking influenza vaccination in accordance with CDC recommendations and taking precautions to reduce transmission of influenza, including avoiding close contact with persons who are ill (*10*).

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Racial and Ethnic Disparities in Outpatient Treatment of COVID-19 — United States, January–July 2022

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In December 2021 and early 2022, four medications received emergency use authorization (EUA) by the Food and Drug Administration for outpatient treatment of mild-to-moderate COVID-19 in patients who are at high risk for progressing to severe disease; these included nirmatrelvir/ritonavir (Paxlovid) and molnupiravir (Lagevrio) (both oral antivirals), expanded use of remdesivir (Veklury; an intraveneous antiviral), and bebtelovimab (a monoclonal antibody [mAb]).* Reports have documented disparities in mAb treatment by race and ethnicity (*1*) and in oral antiviral treatment by zip code–level social vulnerability (*2*); however, limited data are available on racial and ethnic disparities in oral antiviral treatment.† Using electronic health record (EHR) data from 692,570 COVID-19 patients aged ≥20 years who sought medical care during January–July 2022, treatment with Paxlovid, Lagevrio, Veklury, and mAbs was assessed by race and ethnicity, overall and among high-risk patient groups. During 2022, the percentage of COVID-19 patients seeking medical care who were treated with Paxlovid increased from 0.6% in January to 20.2% in April and 34.3% in July; the other three medications were used less frequently (0.7%–5.0% in July). During April–July 2022, when Paxlovid use was highest, compared with White patients, Black or African American (Black) patients were prescribed Paxlovid 35.8% less often, multiple or other race patients 24.9% less often, American Indian or Alaska Native and Native Hawaiian or other Pacific Islander (AIAN/NHOPI) patients 23.1% less often, and Asian patients 19.4% less often; Hispanic patients were prescribed Paxlovid 29.9% less often than non-Hispanic patients. Racial and ethnic disparities in Paxlovid treatment were generally somewhat higher among patients at high risk for severe COVID-19, including those aged ≥50 years and those who were immunocompromised. The expansion of programs focused on equitable awareness of and access to outpatient COVID-19 treatments, as well as COVID-19 vaccination, including updated bivalent booster doses, can help protect persons most at risk for severe illness and facilitate equitable health outcomes.

This study used EHR data from 30 sites (each representing one or more health care systems) participating in PCORnet, the National Patient-Centered Clinical Research Network (PCORnet).§ The PCORnet distributed data infrastructure was queried¶ and returned aggregate demographic and clinical data for all COVID-19 patients and those treated with Paxlovid, Lagevrio, Veklury,** or mAbs†† during January–July 2022. COVID-19 patients were persons aged ≥20 years who sought medical care and had EHR documentation of a positive SARS-CoV-2 viral test result, an *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) diagnostic code for COVID-19 (U07.1 and U07.2), or treatment with an assessed COVID-19 medication.§§ Treated COVID-19 patients had EHR documentation of a Paxlovid

* Paxlovid and Lagevrio received Food and Drug Administration EUA in late December 2021, Veklury in January 2022 (for outpatient use), and bebtelovimab in February 2022. mAb treatments that previously received EUAs for treatment of COVID-19 had those EUAs revoked when they were no longer effective against SARS-CoV-2 variants. https://www.fda.gov/emergency-preparedness-and-response/mcm-legal-regulatory-and-policy-framework/emergency-use-authorization#coviddrugs

† https://www.medrxiv.org/content/10.1101/2022.06.22.22276782v2

§ PCORnet is a national network of networks that facilitates access to health care data and interoperability through use of a common data model across participating sites (https://pcornet.org/data). These sites represent academic and community health care systems serving self-pay or publicly or privately insured patients. The list of 30 PCORnet sites that provided data is available through download. https://github.com/PCORnet-DRN-OC/Query-Details/tree/master/Therapeutics%20Query

¶ A query is a single statistical program package that runs at participating PCORnet sites to generate aggregate site-level data; results are returned to the PCORnet coordinating center and combined into a single aggregate report with data from all responding sites.

** To the extent possible, Veklury treatment was restricted to outpatient administration as approved under the January 2022 EUA; patients hospitalized during the 7 days before or after the administration of Veklury were excluded from the assessment. Among 4,721 patients treated with Veklury, 61% had an emergency department and 16% had an inpatient encounter in the 14 days before or after the administration.

†† Among 18,949 patients treated with mAbs, 11,729 (62%) received bebtelovimab, 6,379 (34%) received sotrovimab (EUA revoked April 2022), and 1,084 (6%) received other mAbs (bamlanivimab [EUA revoked April 2021]; bamlanivimab/etesevimab or casirivimab/imdevimab [EUAs revoked January 2022]). A small percentage of patients (243; 1%) had documentation of treatment with more than one mAb.

§§ SARS-CoV-2 viral tests included nucleic acid amplification test/polymerase chain reaction (NAAT/PCR) (96%) and rapid antigen (4%) tests. National Drug Code and RxNorm codes were used to identify medication prescriptions (Paxlovid and Lagevrio) and administrations (mAb and Veklury) and ICD-10 Procedure Coding System and Healthcare Common Procedure Coding System/Current Procedural Terminology codes were used to identify mAb and Veklury administrations. Codes are available through download. https://github.com/PCORnet-DRN-OC/Query-Details/tree/master/Therapeutics%20Query

or Lagevrio prescription or Veklury or mAb administration.[¶¶] High-risk patient groups were defined based on age (50–64, 65–79, and ≥80 years) and immunocompromise (previous organ transplant, active cancer treatment, corticosteroid use, and immunosuppressive medication use).[***]

The percentage of COVID-19 patients treated with each medication was calculated by age group, sex (male and female), race (White, Black, Asian, AIAN/NHOPI, multiple or other race, and missing), ethnicity (Hispanic, non-Hispanic, and other or missing),[†††] immunocompromise, and underlying medical conditions.[§§§] Disparities were assessed using absolute differences (percentage treated in the racial or ethnic minority group minus the percentage treated in the majority group [i.e., White race and non-Hispanic ethnicity, respectively]) and relative differences (absolute difference divided by the percentage treated in the majority group). Statistical differences in the percentage treated by race and ethnicity were quantified using Pearson's chi-square tests comparing patients in the minority groups with those in the majority group. Disparities in percentage treated overall and by age group were assessed during April–July 2022, when Paxlovid use was highest; disparities by immunocompromise could only be assessed during January–July 2022 because of restrictions in the PCORnet distributed data infrastructure. P-values <0.05 were considered statistically significant. This activity was reviewed by CDC and conducted consistent with applicable federal law and CDC policy.[¶¶¶]

During January–July 2022, a total of 692,570 COVID-19 patients aged ≥20 years were identified.[****] Among these, 22.2% were aged ≥65 years, 60.5% were female, 68.2% were White, and 79.6% were non-Hispanic (Table 1). Overall, 11.7% of COVID-19 patients were treated with Paxlovid, 2.7% with mAbs, 1.0% with Lagevrio, and 0.7% with Veklury. The percentage treated with Paxlovid exceeded the overall average of 11.7% for the following patient groups: aged ≥50 years, White, non-Hispanic,[††††] active cancer treatment, corticosteroid use, immunosuppressive medication use, and presence of underlying medical conditions (except chronic kidney disease, cirrhosis, congestive heart failure, and dementia). mAb treatment was more common than Paxlovid treatment among patients with a previous organ transplant.

During 2022, the percentage of COVID-19 patients treated with Paxlovid increased from 0.6% in January to 20.2% in April and 34.0% in July (Supplementary Figure, https://stacks.cdc.gov/view/cdc/121864). Treatment with other medications occurred less frequently and varied less during the study period (mAbs [monthly range = 1.2%–5.0%], Lagevrio [0.4%–2.5%], and Veklury [0.6%–0.9%]). Racial and ethnic differences in monthly Paxlovid treatment were observed (Figure).

During April–July 2022, Paxlovid treatment among adults aged ≥20 years was 35.8% lower among Black patients (20.5% treated) than it was among White patients (31.9% treated) (Table 2). Paxlovid treatment was 24.9%, 23.1%, and 19.4% lower among multiple or other race, AIAN/NHOPI, and Asian patients, respectively, than among White patients, and 29.9% lower among Hispanic than among non-Hispanic patients. In age-stratified analyses, the percentage of patients aged 20–49, 50–64, 65–79, and ≥80 years who were prescribed Paxlovid was 20.9%, 34.3%, 39.9%, and 30.7%, respectively. Disparities for Black, multiple or other race, and Hispanic patients were present across all age strata; the largest relative difference (44.0%) was between Black and White patients aged 65–79 years.

Racial and ethnic disparities existed for treatment with other medications, but absolute differences were small, given the low treatment percentages. Racial and ethnic minority patients were

[¶¶] Treatment groups were not mutually exclusive. For example, among 81,373 patients prescribed Paxlovid, 579 (0.7%) were also treated with mAbs (491 bebtelovimab), 619 (0.8%) with Lagevrio, and 203 (0.2%) with Veklury. Among patients prescribed Paxlovid, 71% had either a diagnostic code for COVID-19 or a documented positive SARS-CoV-2 viral test (NAAT/PCR or rapid antigen); 28% had a documented positive viral test, and 66% had a diagnostic code. There were no systematic differences in age, sex, race, or ethnicity between patients prescribed Paxlovid who had a diagnostic code or positive test compared with those who did not.

[***] The presence of immunocompromise was based on available information in the patients' EHR before COVID-19: previous organ transplant (one or more ICD-10-CM codes at any time before COVID-19); active cancer treatment (three or more ICD-10-CM codes for cancer during the 6 months preceding COVID-19); corticosteroid use (two or more prescriptions during the year preceding COVID-19); and immunosuppressive medication use (one or more prescriptions or administrations in the year preceding COVID-19, not including corticosteroids). Codes are available through download. https://github.com/PCORnet-DRN-OC/Query-Details/tree/master/Therapeutics%20Query

[†††] In the PCORnet common data model, Hispanic is defined as Cuban, Mexican, Puerto Rican, South or Central American or other Spanish culture or origin, regardless of race, and is compatible with the Office of Management and Budget definition of Hispanic ethnicity (Hispanic or Latino and not Hispanic or Latino). Data by race and ethnicity are presented separately because the PCORnet distributed query statistical program only allows for assessment of combined race and ethnicity during the full study period (January–July 2022) and not by month or for shorter periods (April–July 2022).

[§§§] The presence of an underlying medical condition required at least two ICD-10-CM codes for that condition during the 3 years preceding COVID-19. A subset of underlying medical conditions that increase risk for severe COVID-19 outcomes was assessed. https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/underlyingconditions.html

[¶¶¶] 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. Sect. 3501 et seq.

[****] Sixty-four percent of COVID-19 patients were identified by a positive SARS-CoV-2 viral test result, 33% by a diagnostic code (without a positive viral test result), and 4% by treatment with one of four medications indicated only for treatment of COVID-19 (without a diagnostic code or a positive viral test result).

[††††] Combined race and ethnicity could only be assessed during the full study period. During January–July 2022, Paxlovid treatment was 14.3% among non-Hispanic White (combined race and ethnicity) patients compared with 13.5% among White (race) patients and 12.8% among non-Hispanic (ethnicity) patients.

TABLE 1. Demographic and clinical characteristics of patients with COVID-19* and those treated with four outpatient medications† and the percentage of COVID-19 patients treated with each medication among adults aged ≥20 years — PCORnet, the National Patient-Centered Clinical Research Network, 30 U.S. sites, January–July 2022

Characteristic	No. (column %)					% of COVID-19 patients treated (row %), by medication type§			
	Patients with COVID-19	COVID-19 patients treated, by medication type							
		Paxlovid	mAbs	Lagevrio	Veklury	Paxlovid	mAbs	Lagevrio	Veklury
Total	**692,570 (100)**	**81,373 (100)**	**18,949 (100)**	**7,262 (100)**	**4,721 (100)**	**11.7**	**2.7**	**1.0**	**0.7**
Age group, yrs									
20–49	366,552 (52.9)	26,290 (32.3)	5,008 (26.4)	1,775 (24.4)	835 (17.7)	7.2	1.4	0.5	0.2
50–64	172,654 (24.9)	24,825 (30.5)	5,028 (26.5)	2,188 (30.1)	1,227 (26.0)	14.4	2.9	1.3	0.7
65–79	118,109 (17.1)	24,645 (30.3)	6,568 (34.7)	2,560 (35.3)	1,685 (35.7)	20.9	5.6	2.2	1.4
≥80	35,255 (5.1)	5,608 (6.9)	2,345 (12.4)	739 (10.2)	974 (20.6)	15.9	6.7	2.1	2.8
Missing	0 (—)	5 (0)	0 (—)	0 (—)	0 (—)	NC	NC	NC	NC
Sex									
Male	273,401 (39.5)	32,596 (40.1)	8,085 (42.7)	3,122 (43.0)	2,445 (51.8)	11.9	3.0	1.1	0.9
Female	418,911 (60.5)	48,764 (59.9)	10,861 (57.3)	4,140 (57.0)	2,276 (48.2)	11.6	2.6	1.0	0.5
Missing	253 (0)	13 (0)	1 (0)	0 (—)	0 (—)	NC	NC	NC	NC
Race									
AIAN/NHOPI¶	7,631 (1.1)	606 (0.7)	120 (0.6)	25 (0.3)	27 (0.6)	7.9	1.6	0.3	0.4
Asian	27,673 (4.0)	3,287 (4.0)	458 (2.4)	149 (2.1)	125 (2.6)	11.9	1.7	0.5	0.5
Black	95,792 (13.8)	6,714 (8.3)	1,914 (10.1)	860 (11.8)	1,027 (21.8)	7.0	2.0	0.9	1.1
White	472,329 (68.2)	63,715 (78.3)	15,373 (81.1)	5,682 (78.2)	3,072 (65.1)	13.5	3.3	1.2	0.7
Multiple or other**	38,447 (5.6)	3,250 (4.0)	674 (3.6)	220 (3.0)	27 (0.6)	8.5	1.8	0.6	0.8
Missing	50,698 (7.3)	3,790 (4.7)	405 (2.1)	326 (4.5)	303 (6.4)	5.1	0.8	0.6	0.3
Ethnicity									
Hispanic	81,609 (11.8)	5,390 (6.6)	914 (4.8)	314 (4.3)	418 (8.9)	6.6	1.1	0.4	0.5
Non-Hispanic	551,052 (79.6)	70,537 (86.7)	17,299 (91.3)	6,491 (89.4)	4,178 (88.5)	12.8	3.1	1.2	0.8
Missing	59,909 (8.7)	5,443 (6.7)	736 (3.9)	457 (6.3)	125 (2.6)	9.1	1.2	0.8	0.2
Immunocompromise††,§§									
Previous organ transplant	9,457 (1.4)	406 (0.5)	2,025 (10.7)	453 (6.2)	411 (8.7)	4.3	21.4	4.8	4.3
Active cancer treatment	17,967 (2.6)	2,917 (3.6)	2,255 (11.9)	328 (4.5)	548 (11.6)	16.2	12.6	1.8	3.1
Corticosteroid use	35,737 (5.2)	5,139 (6.3)	3,078 (16.2)	857 (11.8)	1,059 (22.4)	14.4	8.6	2.4	3.0
Immunosuppressive medication use	23,538 (3.4)	3,904 (4.8)	3,572 (18.9)	788 (10.9)	693 (14.7)	16.6	15.2	3.3	2.9
Underlying medical condition§§,¶¶									
Asthma	49,780 (7.2)	8,309 (10.2)	26 (0.1)	819 (11.3)	364 (7.7)	16.7	0.1	1.6	0.7
Autism	961 (0.1)	124 (0.2)	26 (0.1)	15 (0.2)	5 (0.1)	12.9	2.7	1.6	0.5
Cancer	39,868 (5.8)	7,484 (9.2)	3,742 (19.7)	783 (10.8)	799 (16.9)	18.8	9.4	2.0	2.0
Chronic kidney disease	33,512 (4.8)	3,319 (4.1)	3,067 (16.2)	890 (12.3)	930 (19.7)	9.9	9.2	2.7	2.8
Chronic obstructive pulmonary disease	19,860 (2.9)	2,193 (2.7)	1,224 (6.5)	441 (6.1)	610 (12.9)	11.0	6.2	2.2	3.1
Chronic pulmonary disorder	75,574 (10.9)	11,532 (14.2)	3,714 (19.6)	1,384 (19.1)	1,027 (21.8)	15.3	4.9	1.8	1.4
Cirrhosis	4,591 (0.7)	417 (0.5)	402 (2.1)	104 (1.4)	112 (2.4)	9.1	8.8	2.3	2.4
Congestive heart failure	27,345 (3.9)	2,530 (3.1)	2,117 (11.2)	652 (9.0)	967 (20.5)	9.3	7.7	2.4	3.5
Coronary artery disease	40,249 (5.8)	6,176 (7.6)	3,201 (16.9)	1,009 (13.9)	963 (20.4)	15.3	8.8	2.5	2.4
Cystic fibrosis	533 (0.1)	148 (0.2)	69 (0.4)	27 (0.4)	9 (0.2)	27.8	12.9	5.1	1.7
Dementia	6,687 (1.0)	598 (0.7)	339 (1.8)	125 (1.7)	285 (6.0)	8.9	5.1	1.9	4.3
Diabetes, type 1	5,102 (0.7)	852 (1.0)	356 (1.9)	101 (1.4)	66 (1.4)	16.7	7.0	2.0	1.3
Diabetes, type 2	76,372 (11.0)	10,984 (13.5)	4,235 (22.3)	1,475 (20.3)	1,216 (25.8)	14.4	5.5	1.9	1.6
Down syndrome	319 (0)	63 (0.1)	15 (0.1)	2 (0)	5 (0.1)	19.7	4.7	0.6	1.6
Hemiplegia	2,692 (0.4)	274 (0.3)	134 (0.7)	45 (0.6)	82 (1.7)	10.2	5.0	1.7	3.0
HIV	4,201 (0.6)	626 (0.8)	140 (0.7)	53 (0.7)	49 (1.0)	14.9	3.3	1.3	1.2
Mental health disorder	79,080 (11.4)	10,489 (12.9)	3,095 (16.3)	1,110 (15.3)	621 (13.2)	13.3	3.9	1.4	0.8
Obesity (BMI ≥30 kg/m^2)	192,559 (27.8)	25,425 (31.2)	6,727 (35.5)	2,923 (40.3)	1,816 (38.5)	13.2	3.5	1.5	0.9
Smoking, current or former	136,852 (19.8)	15,926 (19.6)	5,007 (26.4)	2,053 (28.3)	1,611 (34.1)	12.2	3.8	1.6	1.2

See table footnotes on the next page.

TABLE 1. (*Continued*) Demographic and clinical characteristics of patients with COVID-19* and those treated with four outpatient medications† and the percentage of COVID-19 patients treated with each medication among adults aged ≥20 years — PCORnet, the National Patient-Centered Clinical Research Network, 30 U.S. sites, January–July 2022

Abbreviations: AIAN/NHOPI = American Indian or Alaska Native and Native Hawaiian or other Pacific Islander; BMI = body mass index; ICD-10-CM = *International Classification of Diseases, Tenth Revision, Clinical Modification;* mAbs = monoclonal antibodies; NC = not calculated.

* COVID-19 patients were identified by a positive SARS-CoV-2 viral test result, an ICD-10-CM diagnostic code for COVID-19 (U07.1 and U07.2), or treatment with a COVID-19 medication (Paxlovid, Lagevrio, mAbs, or Veklury).

† Patients were considered treated if they were prescribed Paxlovid or Lagevrio or administered Veklury or mAbs.

§ Receipt of any outpatient treatment was not calculated but can be estimated by summing the percentage of COVID-19 patients treated across the four medication types. This will overestimate receipt of any outpatient treatment because treatment groups were not mutually exclusive. For example, among 81,373 patients prescribed Paxlovid, 579 (0.7%) were also treated with mAbs (491 bebtelovimab), 619 (0.8%) with Lagevrio, and 203 (0.2%) with Veklury.

¶ Among 7,631 patients of AIAN/NHOPI race, 67% were AIAN and 33% were NHOPI.

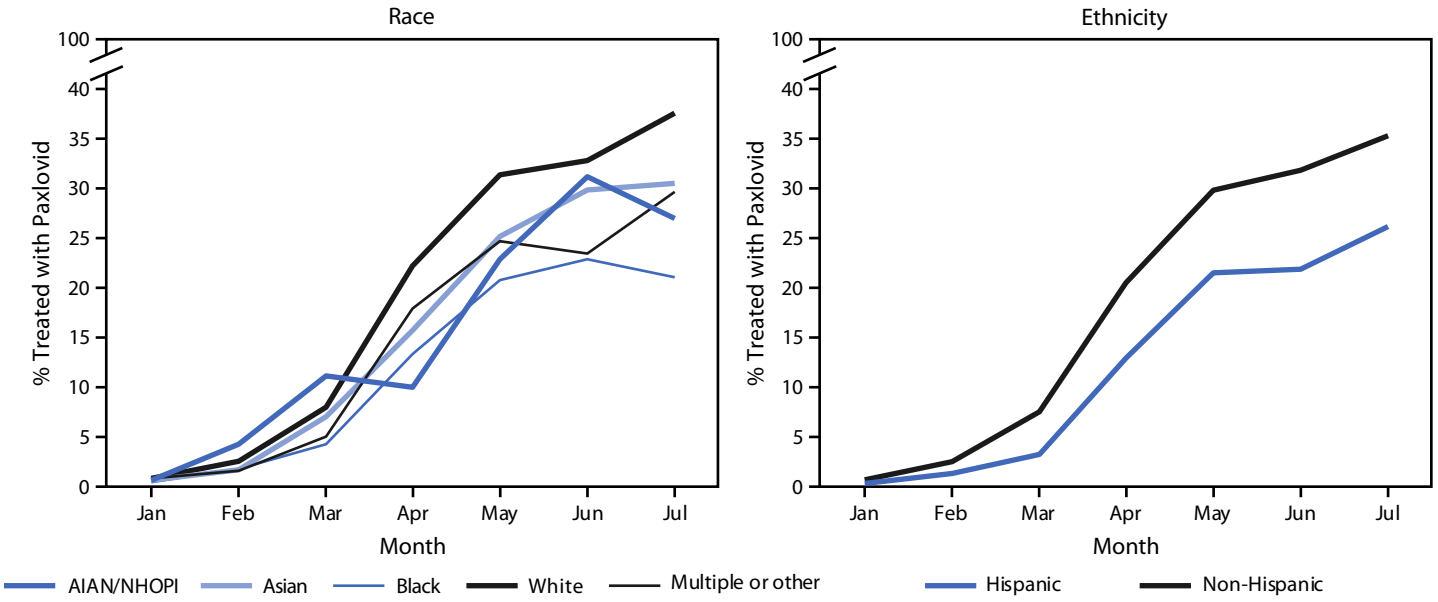
** Among 38,447 patients of multiple or other race, 19% were multiple race and 81% were other race. Approximately 58% of multiple and other race patients were of Hispanic ethnicity.

†† Patients with immunocompromise were identified as follows: previous organ transplant (one or more ICD-10-CM codes at any time preceding COVID-19); active cancer treatment (three or more ICD-10-CM codes for cancer during the 6 months preceding COVID-19); corticosteroid use (two or more prescriptions during the year preceding COVID-19); and immunosuppressive medication use (one or more prescriptions for or administrations of a noncorticosteroid immunosuppressive medication during the year preceding COVID-19).

§§ Some conditions can result in a contraindication to Paxlovid use or require treatment with medications that have drug-drug interactions resulting in inability to use Paxlovid. https://www.covid19treatmentguidelines.nih.gov/therapies/antiviral-therapy/ritonavir-boosted-nirmatrelvir--paxlovid-/paxlovid-drug-drug-interactions/

¶¶ Presence of an underlying medical condition required the presence of at least two ICD-10-CM codes for that condition during the 3 years preceding COVID-19. A subset of underlying medical conditions that increase risk for severe COVID-19 outcomes was assessed. https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/underlyingconditions.html

FIGURE. Monthly percentage of COVID-19 patients aged ≥20 years prescribed Paxlovid,* by race and ethnicity† — PCORnet, the National Patient-Centered Clinical Research Network, 30 U.S. sites, January–July 2022



Abbreviations: AIAN/NHOPI = American Indian or Alaska Native and Native Hawaiian or other Pacific Islander; ICD-10-CM = *International Classification of Diseases, Tenth Revision, Clinical Modification*; PCORnet = PCORnet, the National Patient-Centered Clinical Research Network.

* COVID-19 patients were identified by a positive SARS-CoV-2 viral test result, an ICD-10-CM diagnostic code for COVID-19 (U07.1 and U07.2), or treatment with a COVID-19 medication (Paxlovid, Lagevrio, monoclonal antibodies, or Veklury). Patients were considered treated if they were prescribed Paxlovid.

† Race and ethnicity were assessed as separate variables because the PCORnet distributed query statistical program does not allow for assessment of combined race and ethnicity by month. Among 7,631 patients of AIAN/NHOPI race, 67% were AIAN and 33% were NHOPI. Among 38,447 patients of multiple or other race, 19% were multiple race and 81% were other race; 58% of multiple and other race patients were of Hispanic ethnicity.

treated with mAbs and Lagevrio less often than were White and non-Hispanic patients (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/121865). AIAN/NHOPI, Asian, and Hispanic patients received Veklury less often than did White and non-Hispanic patients; Black patients received Veklury more often than White patients.

During January–July 2022, racial and ethnic disparities also existed for the four immunocompromised patient groups. In general, immunocompromised Black, multiple or other race, and Hispanic patients were treated with Paxlovid and mAbs less often than were immunocompromised White and non-Hispanic

TABLE 2. Absolute and relative differences in the percentage of COVID-19 patients aged ≥20 years prescribed Paxlovid,* by race, ethnicity,† and age group — PCORnet, the National Patient-Centered Clinical Research Network, 30 U.S. sites, April–July 2022

Age group/Race and ethnicity	No. of COVID-19 patients§	No. (%) treated	P-value¶	Absolute difference in % treated**	Relative difference in % treated**
≥20 yrs					
Total	**260,055**	**76,167 (29.3)**	**NC**	**NC**	**NC**
Race					
AIAN/NHOPI	2,145	526 (24.5)	<0.001	−7.4	−23.1
Asian	12,062	3,100 (25.7)	<0.001	−6.2	−19.4
Black	30,482	6,239 (20.5)	<0.001	−11.4	−35.8
White	187,369	59,752 (31.9)	NC	Ref	Ref
Multiple or other	12,396	2,967 (23.9)	<0.001	−8.0	−24.9
Ethnicity					
Hispanic	23,711	5,042 (21.3)	<0.001	−9.1	−29.9
Non-Hispanic	217,739	66,043 (30.3)	NC	Ref	Ref
20–49 yrs					
Total	**117,372**	**24,501 (20.9)**	**NC**	**NC**	**NC**
Race					
AIAN/NHOPI	1,207	254 (21.0)	0.240	−1.4	−6.3
Asian	7,271	1,259 (17.3)	<0.001	−5.1	−22.9
Black	15,632	2,709 (17.3)	<0.001	−5.1	−22.8
White	77,223	17,344 (22.5)	NC	Ref	Ref
Multiple or other	7,161	1,374 (19.2)	<0.001	−3.3	−14.6
Ethnicity					
Hispanic	14,157	2,410 (17.0)	<0.001	−4.5	−20.8
Non-Hispanic	93,734	20,145 (21.5)	NC	Ref	Ref
50–64 yrs					
Total	**67,844**	**23,246 (34.3)**	**NC**	**NC**	**NC**
Race					
AIAN/NHOPI	554	156 (28.2)	<0.001	−8.5	−23.2
Asian	2,567	890 (34.7)	0.045	−2.0	−5.4
Black	8,724	2,104 (24.1)	<0.001	−12.5	−34.2
White	49,406	18,105 (36.6)	NC	Ref	Ref
Multiple or other	2,847	863 (30.3)	<0.001	−6.3	−17.3
Ethnicity					
Hispanic	5,940	1,617 (27.2)	<0.001	−7.9	−22.5
Non-Hispanic	57,186	20,087 (35.1)	NC	Ref	Ref
65–79 yrs					
Total	**58,097**	**23,197 (39.9)**	**NC**	**NC**	**NC**
Race					
AIAN/NHOPI	318	96 (30.2)	<0.001	−12.0	−28.5
Asian	1,717	777 (45.3)	0.014	3.0	7.2
Black	5,024	1,188 (23.6)	<0.001	−18.6	−44.0
White	46,831	19,777 (42.2)	NC	Ref	Ref
Multiple or other	1,815	591 (32.6)	<0.001	−9.7	−22.9
Ethnicity					
Hispanic	2,830	820 (29.0)	<0.001	−11.7	−28.8
Non-Hispanic	51,734	21,050 (40.7)	NC	Ref	Ref
≥80 yrs					
Total	**16,974**	**5,213 (30.7)**	**NC**	**NC**	**NC**
Race					
AIAN/NHOPI	67	20 (29.9)	0.810	−2.1	−6.6
Asian	484	174 (36.0)	0.072	4.0	12.5
Black	1,124	217 (19.3)	<0.001	−12.7	−39.6
White	14,080	4,501 (32.0)	NC	Ref	Ref
Multiple or other	544	140 (25.7)	0.003	−6.2	−19.5
Ethnicity					
Hispanic	766	195 (25.5)	0.001	−5.6	−18.1
Non-Hispanic	15,279	4,751 (31.1)	NC	Ref	Ref

See table footnotes on the next page.

TABLE 2. (*Continued*) Absolute and relative differences in the percentage of COVID-19 patients aged ≥20 years prescribed Paxlovid,* by race, ethnicity,† and age group — PCORnet, the National Patient-Centered Clinical Research Network, 30 U.S. sites, April–July 2022

Abbreviations: AIAN/NHOPI = American Indian or Alaska Native and Native Hawaiian or other Pacific Islander; ICD-10-CM = *International Classification of Diseases, Tenth Revision, Clinical Modification*; NC = not calculated; PCORnet = PCORnet, the National Patient-Centered Clinical Research Network; Ref = referent group.

* COVID-19 patients were identified by a positive SARS-CoV-2 viral test result, an ICD-10-CM diagnostic code for COVID-19 (U07.1 and U07.2), or treatment with a COVID-19 medication (Paxlovid, Lagevrio, monoclonal antibodies, or Veklury). Patients were considered treated if they were prescribed Paxlovid.

† Race and ethnicity were assessed as separate variables because the PCORnet distributed query statistical program does not allow for assessment of combined race and ethnicity by month or for shorter periods (April–July 2022). Approximately 58% of multiple and other race patients were of Hispanic ethnicity.

§ Number of patients with missing race and missing ethnicity are not shown, but can be calculated by subtracting the number of patients with known race or ethnicity from the total number of patients.

¶ Pearson's chi-square tests comparing percentage treated in the minority racial and ethnic groups with percentage treated in the majority or referent group (i.e., White race and non-Hispanic ethnicity).

** Absolute difference was calculated as the percentage treated in the minority racial and ethnic group minus the percentage treated in the majority or referent group (i.e., percentage point difference). Relative difference was calculated as the absolute difference divided by the percentage treated in the majority or referent group.

patients. Treatment differences between immunocompromised White and both AIAN/NHOPI and Asian patients were small or not statistically significant (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/121865).

Discussion

In this study of nearly 700,000 COVID-19 patients who sought medical care, the proportion who were treated with an outpatient COVID-19 medication increased substantially over time, primarily driven by increased Paxlovid use; however, treatment gaps exist among racial and ethnic minority groups. During April–July 2022, Paxlovid treatment was 35.8% lower among Black patients relative to White patients and 29.9% lower among Hispanic patients relative to non-Hispanic patients. This study corroborates previous reports of inequitable outpatient COVID-19 treatment (*1*,*2*) and documents the persistence of racial and ethnic disparities through July 2022. Disparities in pharmacy dispensing of oral antiviral medications between zip codes with high and with low social vulnerability began narrowing during July–August 2022, after the current study ended (*3*). Additional analyses can determine whether this recent ecological trend will result in reduced racial and ethnic disparities.

Multiple factors likely contributed to the observed disparities. Persons living in counties that are both high-poverty areas and majority Black, Hispanic, or American Indian or Alaska Native are less likely to have access to COVID-19 treatment facilities.§§§§ Limited access to treatment is particularly detrimental when patients need timely services, as is required for COVID-19 medications that must be initiated soon after symptom onset (5 days for oral antivirals, 7 days for mAbs and Veklury, as authorized by EUAs). In addition, minority patients' previous negative experiences with health care services could influence their decisions regarding use of treatments (*4*), or racism and implicit biases among health care providers might have contributed to treatment disparities (*5*). Race and ethnicity also could be proxies for other barriers, such as limited knowledge of treatment options, lack of internet access for telemedicine services (*6*), limited transportation, and language barriers (*7*).

Lessons learned from the COVID-19 pandemic¶¶¶¶ offer opportunities to reduce outpatient treatment disparities (*8*), including prioritizing medication distribution to and raising awareness about treatment options among local health care providers and members of disproportionately affected communities. Communication campaigns, especially those that use trusted messengers, have been effective in reaching racial and ethnic minority populations and might facilitate increased awareness and use of COVID-19 treatments (*9*). Several initiatives have been implemented at the federal and state levels to improve equitable dispensing of COVID-19 medications (*3*). One example is the federal Test-to-Treat initiative that provides COVID-19 testing, medical evaluation, and treatment at a single location and was expanded in May 2022 to better reach vulnerable communities.*****

The findings in this report are subject to at least six limitations. First, the aggregate data structure did not allow for adjustment of demographic or clinical factors that might be correlated with race and ethnicity or for assessment of combined race and ethnicity over time. Second, this study assessed treatment disparities among COVID-19 patients who sought medical care; the percentage treated and magnitude of disparities among COVID-19 patients who are eligible for treatment or among all persons with COVID-19 is unknown. Third, patients treated with oral antiviral medications at community treatment programs (e.g., Test-to-Treat) were not captured in this study; thus, actual disparities could be lower than those reported if community treatment programs were differentially used by racial and ethnic minority groups. Fourth, the reasons for nontreatment (e.g., too long since symptom onset, not at risk for severe illness, treatment not offered, or

§§§§ https://www.kff.org/coronavirus-covid-19/issue-brief/how-equitable-is-access-to-covid-19-treatments

¶¶¶¶ https://www.cdc.gov/vaccines/covid-19/downloads/guide-community-partners.pdf

***** https://aspr.hhs.gov/TestToTreat/Pages/default.aspx

Summary

What is already known about this topic?

Outpatient medications are effective at preventing severe COVID-19 and are important to pandemic mitigation. Paxlovid is the most commonly prescribed medication and the preferred outpatient therapeutic for eligible patients.

What is added by this report?

Racial and ethnic disparities persisted in outpatient COVID-19 treatment through July 2022. During April–July 2022, the percentage of COVID-19 patients aged ≥20 years treated with Paxlovid was 36% and 30% lower among Black and Hispanic patients than among White and non-Hispanic patients, respectively. These disparities existed among all age groups and patients with immunocompromise.

What are the implications for public health practice?

Expansion of programs to increase awareness of and access to available outpatient COVID-19 treatments can help protect persons at high risk for severe illness and facilitate equitable health outcomes.

treatment refused) are unknown. Fifth, small sample sizes for some race and immunocompromised patient groups led to unstable estimates. Finally, PCORnet data are derived from a convenience sample of health care facilities and captured approximately 2% of COVID-19 patients reported to CDC during January–July 2022; thus, the results might not be nationally generalizable.

Early access to effective COVID-19 treatments and staying up to date with COVID-19 vaccination, including use of updated bivalent boosters,[†††††] are critical components of the public health response to the pandemic, especially for protecting persons most at risk for severe illness (*10*). Racial and ethnic disparities persist in outpatient COVID-19 treatment, even among older adults and patients with immunocompromise. Expansion of programs focused on equitable outpatient COVID-19 treatment, including raising patient awareness using trusted sources, educating clinicians and other prescribers, and expanding patient access to prescribers, can facilitate equitable health outcomes.

[†††††] https://www.cdc.gov/coronavirus/2019-ncov/vaccines/stay-up-to-date.html

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Vital Signs: Influenza Hospitalizations and Vaccination Coverage by Race and Ethnicity—United States, 2009–10 Through 2021–22 Influenza Seasons

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Abstract

On October 18, 2022, this report was posted as an MMWR Early Release on the MMWR website (https://www.cdc.gov/mmwr).

Introduction: CDC estimates that influenza resulted in 9–41 million illnesses, 140,000–710,000 hospitalizations, and 12,000–52,000 deaths annually during 2010–2020. Persons from some racial and ethnic minority groups have historically experienced higher rates of severe influenza and had lower influenza vaccination coverage compared with non-Hispanic White (White) persons. This report examines influenza hospitalization and vaccination rates by race and ethnicity during a 12–13-year period (through the 2021–22 influenza season).

Methods: Data from population-based surveillance for laboratory-confirmed influenza-associated hospitalizations in selected states participating in the Influenza-Associated Hospitalization Surveillance Network (FluSurv-NET) from the 2009–10 through 2021–22 influenza seasons (excluding 2020–21) and influenza vaccination coverage data from the Behavioral Risk Factor Surveillance System (BRFSS) from the 2010–11 through 2021–22 influenza seasons were analyzed by race and ethnicity.

Results: From 2009–10 through 2021–22, age-adjusted influenza hospitalization rates (hospitalizations per 100,000 population) were higher among non-Hispanic Black (Black) (rate ratio [RR] = 1.8), American Indian or Alaska Native (AI/AN; RR = 1.3), and Hispanic (RR = 1.2) adults, compared with the rate among White adults. During the 2021–22 season, influenza vaccination coverage was lower among Hispanic (37.9%), AI/AN (40.9%), Black (42.0%), and other/multiple race (42.6%) adults compared with that among White (53.9%) and non-Hispanic Asian (Asian) (54.2%) adults; coverage has been consistently higher among White and Asian adults compared with that among Black and Hispanic adults since the 2010–11 season. The disparity in vaccination coverage by race and ethnicity was present among those who reported having medical insurance, a personal health care provider, and a routine medical checkup in the past year.

Conclusions and Implications for Public Health Practice: Racial and ethnic disparities in influenza disease severity and influenza vaccination coverage persist. Health care providers should assess patient vaccination status at all medical visits and offer (or provide a referral for) all recommended vaccines. Tailored programmatic efforts to provide influenza vaccination through nontraditional settings, along with national and community-level efforts to improve awareness of the importance of influenza vaccination in preventing illness, hospitalization, and death among racial and ethnic minority communities might help address health care access barriers and improve vaccine confidence, leading to decreases in disparities in influenza vaccination coverage and disease severity.

Introduction

Influenza is a contagious respiratory disease that can lead to serious illness, hospitalization, and death. CDC estimates that influenza resulted in 9–41 million illnesses, 140,000–710,000 hospitalizations, and 12,000–52,000 deaths annually during 2010–2020 (*1*,*2*). Annual vaccination against seasonal influenza is recommended for all persons aged ≥6 months except when contraindicated (*3*). Vaccination provides important protection from influenza illness and its potential complications. For example, during the 2019–20 season, influenza vaccination prevented an estimated 7.5 million influenza illnesses, 105,000 influenza-associated hospitalizations, and 6,300 influenza-associated deaths (*4*). Persons from some racial and ethnic minority groups experience higher rates of severe influenza and have lower influenza vaccination coverage rates compared with White persons (*5*,*6*). This report presents 1) influenza hospitalization rates by race and ethnicity from the 2009–10 through 2021–22 seasons; 2) trends in influenza vaccination coverage by race and ethnicity from the 2010–11 through 2021–22 seasons; and 3) influenza vaccination coverage stratified by race and ethnicity and health care access variables for the 2021–22 season and possible reasons for observed disparities.

Methods

FluSurv-NET. The Influenza-Associated Hospitalization Surveillance Network (FluSurv-NET) has been previously described (*5*,*7*). Briefly, FluSurv-NET conducts all-age, population-based surveillance for laboratory-confirmed influenza-associated hospitalizations in selected states

representing approximately 8%–9% of the U.S. population. Persons met the FluSurv-NET case definition if they resided in the FluSurv-NET catchment area,* were admitted to a hospital during October 1–April 30† and received a positive influenza test result ≤14 days before hospitalization or during hospitalization. Cases in persons aged <18 years and cases from the 2020–21 season were excluded from this analysis because case counts during this season were too low to calculate rates by race and ethnicity.

Population denominators used for rate estimation were obtained from the National Center for Health Statistics.§ Unadjusted rates, stratified by age group (18–49, 50–64, 65–74, and ≥75 years), race and ethnicity,¶ and influenza season were calculated by dividing the number of hospitalizations by the total catchment population. Unadjusted rates by race, ethnicity, and age group were multiplied by the age distribution of the total FluSurv-NET catchment population to obtain age-adjusted rates; the age groups referenced previously were used for the age adjustment. For rates and rate ratios (RRs), 95% CIs were calculated assuming a simple random sample design and a normal distribution via the SAS STDRATE procedure. All analyses were conducted using SAS software (version 9.4; SAS Institute).

Influenza Vaccination Coverage. The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based random-digit–dialed cellular and landline telephone survey that collects information on various health conditions and risk behaviors from one randomly selected adult aged ≥18 years in a household.** BRFSS data for adults aged ≥18 years were analyzed to estimate influenza vaccination coverage for the 2010–11 through 2021–22 influenza seasons. The analysis includes data collected from interviews completed during September–June of each season and vaccine doses received during July–May. Respondents were asked if they had received an influenza vaccine in the past 12 months, and if so, in which month and year. Vaccination coverage estimates were calculated using Kaplan-Meier survival analysis, as previously described (*6*). For the 2021–22 season, for which more detailed data stratified by race and ethnicity and access to care variables are presented, vaccination coverage estimates are based on 291,839 completed interviews; 28,007 respondents were excluded from the analysis because there was no information on whether they had received an influenza vaccine in the past 12 months. The median state BRFSS response rate for a complete or partially complete interview was 42.5% for September–December 2021 and 45.4% for January–June 2022. All estimates were weighted and analyzed using SAS (version 9.4; SAS Institute) and SAS-callable SUDAAN (version 11.0.3; RTI International) statistical software to account for the complex survey design. Differences between estimates were determined using t-tests with p-values <0.05 considered statistically significant.

For each data system, activities were reviewed by CDC and were conducted consistent with applicable federal law and CDC policy.†† Sites participating in FluSurv-NET obtained approval from their respective state and local institutional review boards, as applicable. The requirement for informed consent was waived per 45 CFR 46.

Results

From 2009–10 through 2021–22 (excluding 2020–21), age-adjusted influenza-associated hospitalization rates per 100,000 population among adults, by race and ethnicity were as follows: Black, 78.2; AI/AN, 54.6; Hispanic, 50.3; White, 43.0; and Asian or Pacific Islander (API), 34.5 (Figure 1). Compared with age-adjusted rates among White adults, rates were higher among Black (RR = 1.8), AI/AN (RR = 1.3), and Hispanic adults (RR = 1.2) (Supplementary Table, https://stacks.cdc.gov/view/cdc/121713) with some variation by influenza season. During most influenza seasons, age-adjusted hospitalization rates were highest among Black adults, ranging from 1.5 to 2.4 times the rates among White adults. During the 2011–2012 and 2021–22 seasons, the highest influenza-associated hospitalization rates were among AI/AN adults,

* Emerging Infections Program sites include selected counties in California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee, and FluSurv-NET sites include selected counties in Idaho (2009–10 to 2010–11 only), Iowa (2009–10, 2012–13, 2020–21, and 2021–22 only), Michigan and North Dakota (2009–10 only), Ohio (2010–11 to 2021–22), Oklahoma (2009–10 to 2010–11 only), Rhode Island (2010–11 to 2012–13 only), South Dakota (2009–10 only) and Utah (2010–11 to 2021–22). Across these seasons, approximately 25–29 million persons (8%–9% of the U.S. population) were in the FluSurv-NET catchment area.

† Period for the 2009–10 season was April 15, 2009, through April 30, 2010, and the period for 2021–22 was October 1, 2021, through June 11, 2022.

§ https://www.cdc.gov/nchs/nvss/bridged_race.htm

¶ For FluSurv-NET data, race and ethnicity were categorized using the National Center for Health Statistics categories as non-Hispanic White, non-Hispanic Black, Hispanic or Latino, non-Hispanic Asian or Pacific Islander, and non-Hispanic American Indian or Alaska Native. Persons of more than one race or of unknown race were excluded from the FluSurv-NET analysis because population denominators were not available for these groups. Persons of any race (including unknown race) but of Hispanic ethnicity were classified as Hispanic. In 17% of included persons (across all seasons), ethnicity was unknown, but race was known; these persons were assumed to be of non-Hispanic ethnicity. In the 2017–18 season, race and ethnicity were collected on a stratified random sample of hospitalized adult influenza patients aged ≥50 years, so sampling weights were used to calculate the weighted number of hospitalizations by race and ethnicity that season. For BRFSS data, race and ethnicity were categorized similarly in the vaccination coverage analyses with two exceptions: 1) non-Hispanic persons reporting more than one race were categorized along with persons reporting Native Hawaiian/Other Pacific Islander and "other" race into a "Non-Hispanic other/multiple race" category; and 2) persons of unknown ethnicity or race were excluded from the analysis (2.8% of BRFSS respondents in the 2021–22 season).

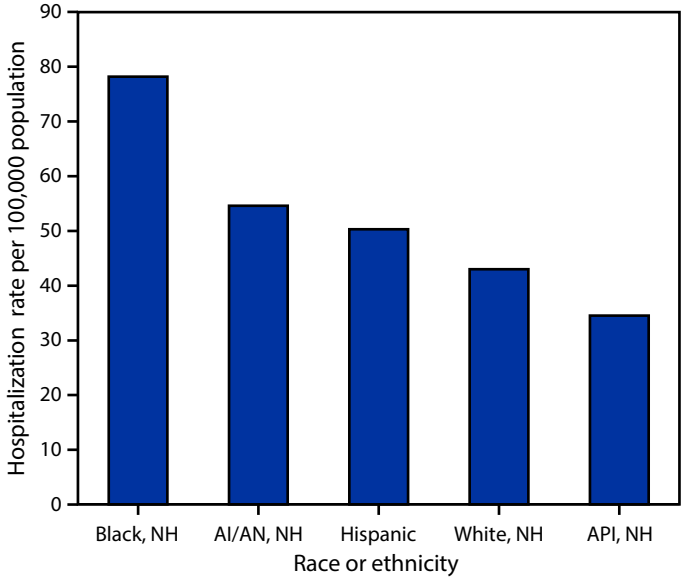
** https://www.cdc.gov/brfss

†† 45 CFR. part 46.102[l][2], 21 CFR part 56; 42 USC Sect. 241[d]; 5 USC Sect. 552a; 44 USC Sect. 3501 et seq.

with age-adjusted rates 2.7 times those in White adults. Age-adjusted hospitalization rates among Hispanic adults were 2.1 times those among White adults in 2009–10 and 2021–22 (Figure 2) (Supplementary Table, https://stacks.cdc.gov/view/cdc/121713). In every season except 2011–12, API adults had the lowest hospitalization rates among all racial and ethnic groups, from 60% to 90% of those among White adults.

Overall vaccination coverage in the 2021–22 influenza season was 49.4% among adults aged ≥18 years and varied by race and ethnicity. Coverage was higher among White adults (53.9%) than among AI/AN (40.9%), Hispanic (37.9%), Black (42.0%), and multiracial and adults of other races (42.6%) and was similar to that among Asian adults (54.2%) (Table). From the 2010–11 through 2021–22 seasons, overall adult influenza vaccination coverage increased from 40.5% to 49.4% and increased within all racial and ethnic groups except AI/AN adults (Figure 3). Between the 2020–21 and 2021–22 seasons, coverage decreased among all adults by 0.8 percentage points and among White adults by 1.6 percentage points. In all other racial and ethnic groups, coverage was stable during the 2018–19 through 2021–22 influenza seasons. Since the 2010–11 influenza season, coverage has been consistently higher among White and Asian adults compared with that among Black and Hispanic adults.

FIGURE 1. Age-adjusted Influenza-associated hospitalization rates* among adults aged ≥18 years, by race and ethnicity — Influenza-Associated Hospitalization Surveillance Network, United States, 2009–10 through 2021–22†



Abbreviations: AI/AN = American Indian or Alaska Native; API = Asian or Pacific Islander; NH = non-Hispanic.
* Hospitalizations per 100,000 population.
† Excluding 2020–21 season.

During the 2021–22 influenza season, vaccination coverage among all racial and ethnic groups was higher among adults aged ≥65 years than among younger adults and among the following groups: those with medical insurance compared with those without medical insurance; those who had a personal health care provider compared with those without a personal health care provider; and those who had had a routine medical checkup in the past year compared with those who had not. However, compared with White adults, Hispanic adults were less likely to have medical insurance, and Hispanic, AI/AN, and multiracial and adults of other races were less likely to have a personal health care provider and a medical checkup in the past year. In addition, among adults with medical insurance, a personal health care provider, and a routine medical checkup in the past year, and in most age and education strata, influenza vaccination coverage was higher among White adults than among Black, Hispanic, AI/AN, and multiracial and adults of other races (Table).

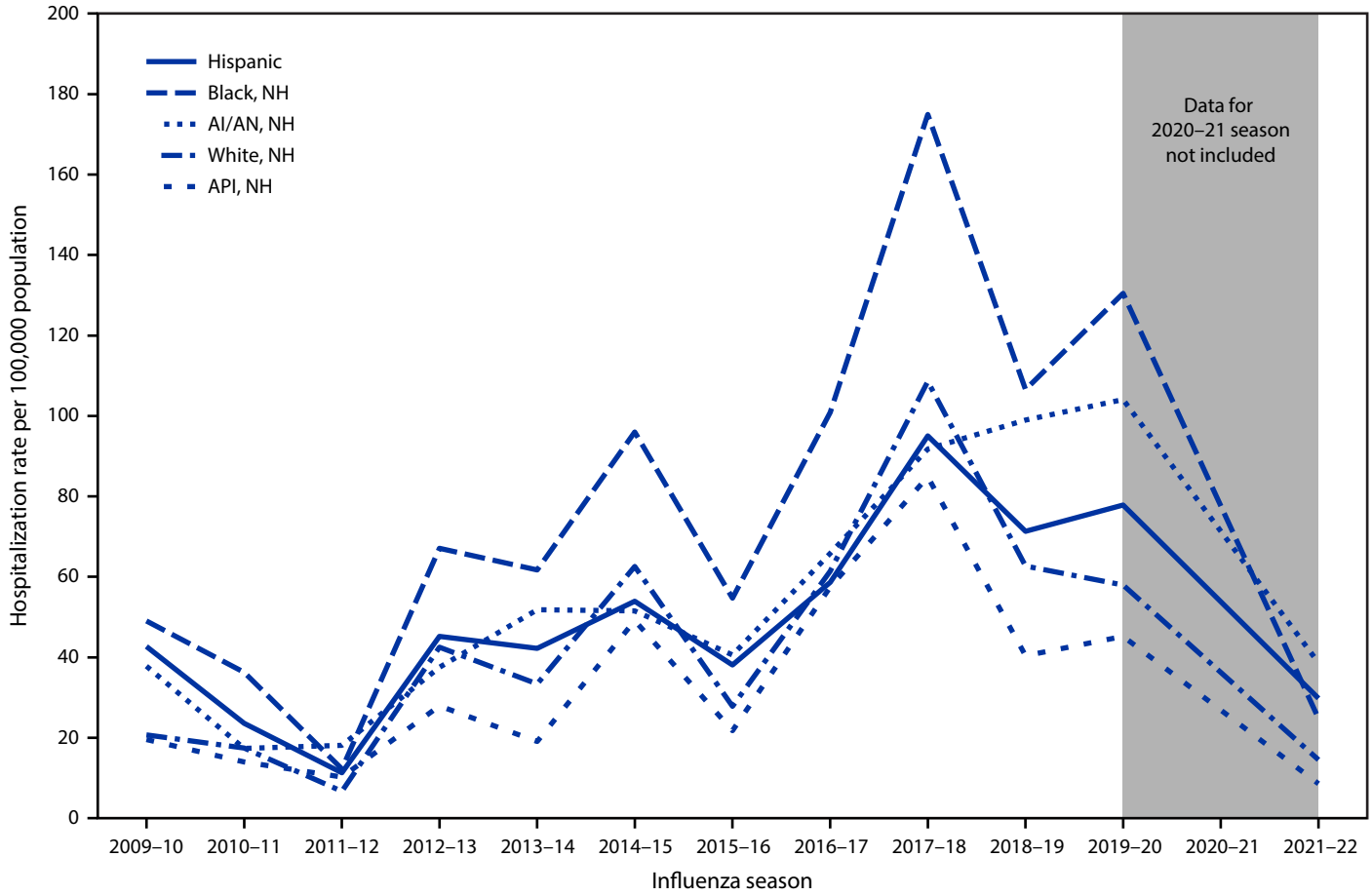
Discussion

Racial and ethnic disparities in influenza-associated hospitalizations were consistently observed among Black, AI/AN, and Hispanic adults compared with White adults, with hospitalization rates an average of 1.2 to 1.8 times those in White adults during the past 13 seasons. Similar disparities have been observed for COVID-19 hospitalizations (*8*). The reasons for these disparities in severe respiratory disease are likely multifactorial. Influenza vaccination coverage continues to be lower among Black, AI/AN, and Hispanic adults compared with coverage among White and Asian adults. Distrust of the medical system, misperceptions about vaccine safety, and higher levels of concern about side effects have contributed to lower coverage (*9*). Members of racial and ethnic minority groups might face barriers to affordable, quality health care, including access to health insurance, transportation to health providers, and child care; therefore, they might have fewer opportunities for preventive health care and increased vulnerability to chronic medical conditions (*10*). Higher prevalences of chronic medical conditions have been independently associated with more severe influenza outcomes (*11*,*12*), and downstream effects of structural racism have been demonstrated to affect economic stability, housing, and education (*10*,*13*,*14*). In addition, poverty, crowded housing, and community exposure to respiratory diseases are associated with more severe influenza disease (*15*,*16*).

In contrast to the decline in influenza vaccination observed among children during the COVID-19 pandemic (*6*), recent coverage among adults has not decreased compared with prepandemic estimates. However, longstanding disparities in coverage by race and ethnicity remain. The finding that adults

of some minority racial and ethnic groups were less likely than White adults to have medical insurance and a personal health care provider suggests that access to influenza vaccination likely plays a role in lower coverage among these groups. Racial and ethnic disparities in COVID-19 vaccination coverage that were evident early in the COVID-19 vaccination program have decreased or been eliminated over time, likely related to efforts by immunization programs to provide equitable access to COVID-19 vaccination, such as making vaccines available free of charge at varied and nontraditional locations (*17*,*18*). However, disparities in COVID-19 booster vaccination are now evident, and differences in influenza vaccination coverage within most socioeconomic and access-to-care strata suggest that in addition to access limitations, other factors contributed to disparities in coverage. A provider recommendation and offer of vaccination is strongly associated with vaccination (*19*). BRFSS does not collect information on receipt of provider recommendations or offers of vaccination; however, variables such as having a medical checkup in the past year and having a personal health care provider can serve as proxies for these data. Overall, adults who reported having a medical checkup in the past year were twice as likely to be vaccinated as those who did not. Hispanic, AI/AN, and multiracial and adults of other races were less likely than were White adults to report having a personal health care provider and a routine medical checkup in the past 12 months. Moreover, even among Black, Hispanic, AI/AN, and multiracial and adults of other races who reported a recent medical checkup, influenza vaccination coverage was <50% and was also lower than coverage among White adults with a recent medical checkup, suggesting that missed opportunities for influenza vaccination occurred during these visits. Following the standards for adult immunization practice, providers should assess patient vaccination status at all medical visits and offer (or provide a referral for) all recommended vaccines (*20*). Meeting this standard in a culturally responsive manner could help reduce observed disparities in vaccination coverage.

FIGURE 2. Age-adjusted Influenza-associated hospitalization rates among adults, by race and ethnicity and influenza season — Influenza-Associated Hospitalization Surveillance Network, United States, 2009–10 through 2019–20 and 2021–22*



Abbreviations: AI/AN = American Indian or Alaska Native; API = Asian or Pacific Islander; NH = non-Hispanic.
* Data for 2020–21 season are not included.

TABLE. Influenza vaccination coverage, by race and ethnicity and demographic and access-to-care variables — Behavioral Risk Factor Surveillance System, United States, 2021–22 influenza season*

Characteristic	Overall		Race or ethnicity†											
			White		Black		Hispanic		Asian		AI/AN		Other/Multiple races	
	Sample no. (weighted %)	Influenza vaccination coverage % (95% CI)	Sample no. (weighted %)	Influenza vaccination coverage, % (95% CI)	Sample no. (weighted %)	Influenza vaccination coverage, % (95% CI)	Sample no. (weighted %)	Influenza vaccination coverage, % (95% CI)	Sample no. (weighted %)	Influenza vaccination coverage, % (95% CI)	Sample no. (weighted %)	Influenza vaccination coverage, % (95% CI)	Sample no. (weighted %)	Influenza vaccination coverage, % (95% CI)
Overall	319,846 (100.0)	49.4 (49.0–49.9)	239,619 (63.6)	53.9 (53.4–54.4)	25,046 (12.2)	42.0 (40.6–43.6)§	25,032 (15.6)	37.9 (36.3–39.5)§	8,035 (4.1)	54.2 (51.5–57.0)	5,250 (1.1)	40.9 (37.0–45.1)§	9,095 (3.4)	42.6 (39.8–45.5)§
Age group, yrs														
18–49	116,719 (52.9)	37.1 (36.5–37.8)¶	75,723 (45.1)	39.6 (38.9–40.4)¶	9,969 (55.5)§	29.4 (27.5–31.3)§,¶	16,024 (72.5)§	32.0 (30.2–33.9)§,¶	5,212 (78.9)§	52.1 (48.9–55.4)§,¶	2,279 (56.5)§	32.5 (27.5–38.1)§,¶	4,750 (68.4)§	37.1 (33.5–40.9)¶
50–64	85,144 (24.6)	52.4 (51.5–53.3)¶	64,980 (26.7)	54.2 (53.2–55.3)¶	7,319 (26.6)	50.5 (47.8–53.2)§,¶	5,559 (18.4)§	47.0 (43.5–50.7)§,¶	1,506 (14.2)§	55.5 (49.6–61.5)§	1,692 (27.7)	40.5 (34.2–47.4)§,¶	2,156 (18.1)§	45.5 (40.7–50.6)§,¶
≥65 (Ref)	117,983 (22.5)	73.9 (73.1–74.8)	98,916 (28.2)	75.7 (74.8–76.5)	7,758 (17.9)§	67.8 (64.4–71.1)§	3,449 (9.1)§	65.2 (60.5–69.9)§	1,317 (7.0)§	79.4 (74.4–84.0)	1,279 (15.8)§	76.4 (65.7–85.8)	2,189 (13.5)§	68.8 (62.6–74.8)§
High-risk condition (among persons aged 18–64 yrs)**														
Yes (Ref)	53,244 (24.4)	50.4 (49.3–51.6)	37,567 (25.1)	52.6 (51.2–53.9)	5,189 (28.2)§	47.0 (43.7–50.4)§	4,852 (21.5)§	46.6 (43.1–50.3)§	1,001 (12.7)§	53.6 (46.6–60.9)	1,398 (32.2)§	43.8 (36.1–52.3)§	2,039 (26.3)§	46.0 (40.4–52.0)§
No	145,674 (75.6)	39.4 (38.8–40.1)¶	101,444 (74.9)	42.6 (41.9–43.3)¶	11,829 (71.8)§	32.2 (30.4–34.1)§,¶	16,274 (78.5)§	32.3 (30.5–34.2)§,¶	5,545 (87.3)§	52.5 (49.4–55.7)§	2,497 (67.8)§	31.7 (27.2–36.7)§,¶	4,734 (73.7)	36.8 (33.1–40.7)§,¶
Education level														
High school or less	98,563 (39.8)	40.4 (39.5–41.2)¶	67,326 (35.0)	43.8 (42.8–44.9)¶	9,455 (45.3)§	38.5 (36.1–41.0)§,¶	12,796 (58.9)§	32.9 (30.9–35.0)§,¶	1,379 (21.4)§	50.1 (43.5–57.0)	2,273 (50.9)§	36.6 (31.2–42.7)§,¶	2,976 (38.8)§	32.5 (28.2–37.2)§,¶
Some college or technical school	88,077 (23.8)	47.5 (46.6–48.4)¶	66,866 (24.2)	50.2 (49.2–51.1)¶	7,082 (25.3)§	43.7 (40.6–46.8)§	5,850 (21.0)§	41.6 (38.0–45.3)§,¶	1,482 (16.8)§	49.5 (43.5–55.8)¶	1,724 (29.1)§	43.8 (37.2–51.0)	2,970 (28.1)§	42.0 (36.7–47.7)§,¶
College (Ref)	132,098 (36.5)	60.2 (59.5–60.9)	104,892 (40.8)	64.6 (63.8–65.4)	8,425 (29.4)§	46.0 (43.7–48.3)§	6,232 (20.0)§	47.2 (44.1–50.3)§	5,122 (61.8)§	57.1 (53.7–60.5)§	1,237 (20.0)§	49.2 (39.7–59.6)§	3,122 (33.1)§	55.2 (50.5–59.9)§
U.S. Census Bureau Region††														
Northeast (Ref)	68,359 (19.4)	55.5 (54.4–56.6)	52,959 (19.9)	60.2 (58.9–61.6)	3,791 (17.2)§	45.0 (41.4–48.7)§	5,869 (18.3)§	43.4 (40.4–46.5)§	1,935 (25.5)§	55.4 (51.2–59.8)§	412 (10.9)§	43.5 (29.8–60.1)§	1,538 (14.7)§	56.5 (48.8–64.4)
Midwest	84,306 (22.9)	51.3 (50.5–52.2)¶	69,655 (27.8)	54.1 (53.2–55.1)¶	4,427 (16.8)§	42.3 (39.0–45.7)§	3,828 (10.7)§	38.9 (35.4–42.5)§	1,222 (16.6)§	53.3 (48.0–58.7)	1,793 (20.9)§	45.9 (37.4–55.4)	1,704 (18.8)§	38.2 (32.6–44.5)§,¶
South	93,057 (38.8)	45.5 (44.7–46.3)¶	63,694 (35.5)	50.5 (49.6–51.4)¶	15,506 (58.8)§	41.5 (39.6–43.5)§	6,649 (40.7)§	33.8 (31.3–36.5)§,¶	1,510 (26.4)§	52.7 (46.3–59.4)	1,132 (40.7)§	35.2 (29.1–42.0)§	2,366 (36.2)	37.3 (32.6–42.5)§,¶
West	74,124 (19.0)	49.4 (48.3–50.5)¶	53,311 (16.9)	53.8 (52.6–55.0)¶	1,322 (7.1)§	37.3 (31.4–44.0)§,¶	8,686 (30.3)§	40.4 (37.4–43.5)§	3,368 (31.4)§	54.7 (49.7–60.0)	1,913 (27.5)§	45.4 (39.0–52.2)§	3,487 (30.3)§	46.9 (42.4–51.7)§,¶
Medical insurance														
Yes (Ref)	291,594 (91.5)	52.7 (52.2–53.2)	223,925 (95.2)	56.2 (55.7–56.8)	22,374 (91.9)§	44.3 (42.7–45.9)§	18,676 (75.4)§	43.5 (41.7–45.5)§	7,314 (95.4)	57.0 (54.1–59.9)	4,636 (90.8)§	44.8 (40.4–49.4)§	8137 (91.6)§	45.6 (42.6–48.7)§
No	16,195 (8.5)	17.6 (16.2–19.1)¶	7,985 (4.8)	13.9 (12.4–15.5)¶	1,401 (8.1)§	18.1 (14.5–22.5)¶	5,130 (24.6)§	21.2 (18.5–24.2)§,¶	285 (4.6)	22.0 (14.7–32.2)¶	381 (9.2)§	8.7 (5.2–14.4)§,¶	541 (8.4)§	17.8 (8.2–36.0)¶
Personal health care provider														
Yes (Ref)	278,538 (82.8)	54.8 (54.2–55.3)	214,307 (87.0)	58.3 (57.8–58.9)	21,966 (84.2)§	45.9 (44.2–47.5)§	17,730 (67.4)§	46.1 (44.1–48.1)§	6,499 (77.7)§	59.2 (56.1–62.4)	4,174 (77.5)§	45.1 (40.4–50.0)§	7,542 (78.9)§	48.3 (45.3–51.4)§
No	38,567 (17.2)	23.9 (22.8–24.9)¶	23,624 (13.0)	24.9 (23.7–26.1)¶	2,856 (15.8)§	21.9 (18.5–25.8)¶	7,004 (32.6)§	20.7 (18.4–23.1)§,¶	1,365 (22.3)§	36.9 (32.1–42.2)§,¶	1,001 (22.5)§	25.9 (19.9–33.3)¶	1,453 (21.1)§	23.4 (16.8–32.1)¶
Yrs since last routine checkup														
<1 (Ref)	251,361 (76.1)	56.6 (56.0–57.1)	190,656 (77.1)	61.2 (60.6–61.8)	21,124 (82.2)§	46.2 (44.6–48.0)§	17,388 (69.9)§	46.1 (44.1–48.1)§	5,775 (70.5)§	60.6 (57.3–64.0)	3,929 (73.2)§	48.7 (43.8–53.8)§	6,643 (71.4)§	49.7 (46.3–53.2)§
≥1	62,589 (23.9)	28.4 (27.6–29.3)¶	45,183 (22.9)	30.8 (29.9–31.8)¶	3,572 (17.8)§	23.0 (20.1–26.3)§,¶	6,810 (30.1)§	21.7 (19.6–24.1)§,¶	1,998 (29.5)§	39.9 (35.2–45.0)§,¶	1,177 (26.8)§	23.8 (17.8–31.3)§,¶	2,239 (28.6)§	27.6 (22.6–33.3)¶

Abbreviations: AI/AN = American Indian or Alaska Native; Ref = referent group.

* Data from respondents interviewed during September 2021–June 2022 were analyzed to estimate influenza vaccination received during July 2021–May 2022. Influenza vaccination coverage estimates are based on a sample size of 291,839; 28,007 respondents were excluded from analyses of vaccination coverage because of missing influenza vaccination status.

† White, Black, Asian, AI/AN, and other/multiple race persons are non-Hispanic; Hispanic persons could be of any race.

§ p<0.05 when compared with non-Hispanic White (column comparisons).

¶ p<0.05 when compared with referent category (row comparisons).

** Includes people with asthma, diabetes, heart disease, chronic obstructive pulmonary disease, or cancers other than skin cancer.

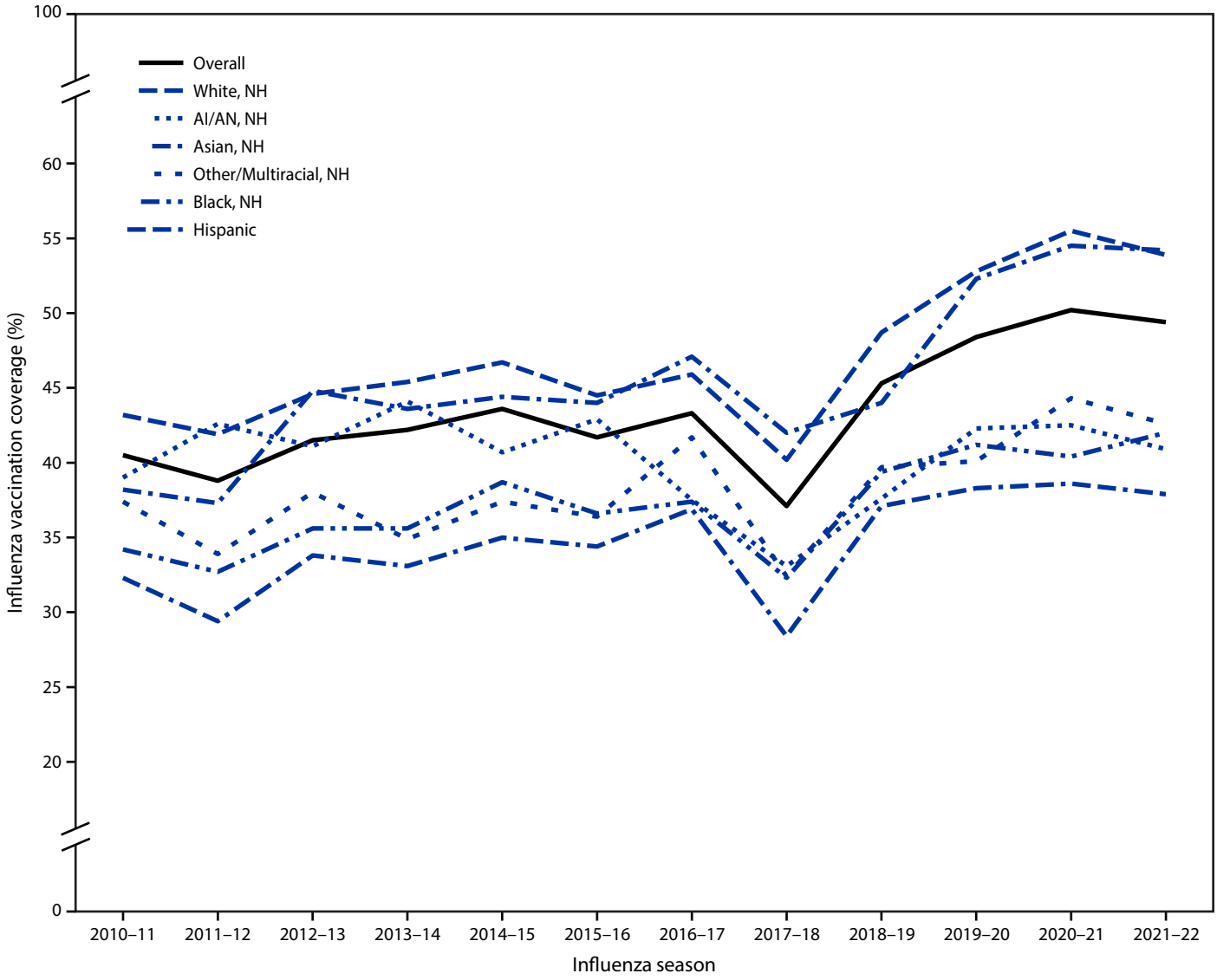
†† https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

Programmatic efforts and communication campaigns, such as Partnering for Vaccine Equity: Equity in Adult vaccination, that have brought COVID-19 vaccines to communities through nontraditional settings (local libraries, local businesses [e.g., barber shops/salons, thrift stores, restaurants, and grocery stores], and school-based events) likely contributed to decreased disparities in COVID-19 vaccination and might also decrease disparities in influenza vaccination.[§§] Surveys collected after 2 years of a tailored vaccination campaign[¶¶] collaboratively led by the Ad Council, the American Medical Association, and CDC indicated that concerns about influenza vaccine risks or side effects were reduced from 43% to 33% among Black adults and from 41% to 32% among Hispanic adults.

The findings in this report are subject to at least seven limitations. First, because FluSurv-NET surveillance is conducted in selected counties within the United States, findings might not represent the entire U.S. population. Second, influenza-associated hospitalizations reported to FluSurv-NET are identified by clinician-directed testing; hospitalization rates might be underestimated, as they have not been adjusted for testing practices, which differ by surveillance site, age group, and timing during influenza seasons (*2*) and might also vary by race

[§§] https://www.cdc.gov/vaccines/health-equity/
[¶¶] https://getmyflushot.org/

FIGURE 3. Influenza vaccination coverage among adults aged ≥18 years, by race and ethnicity and influenza season — Behavioral Risk Factor Surveillance System, United States, 2010–11 through 2021–22



Abbreviations: AI/AN = American Indian or Alaska Native; NH = non-Hispanic.

Summary

What is already known about this topic?

Historically, persons from some racial and ethnic minority groups have had higher rates of influenza hospitalization and death and lower influenza vaccination coverage than White persons.

What is added by this report?

Racial and ethnic disparities in influenza disease severity and vaccination coverage, along with disparities in access to care, have persisted since the 2009–10 and 2010–11 influenza seasons.

What are the implications for public health practice?

Tailored efforts to increase access to influenza vaccination and improve vaccine confidence among racial and ethnic minority communities, including creating culturally relevant communication campaigns and offering vaccination in nontraditional settings, are critical and might decrease disparities in influenza vaccination and disease severity.

and ethnicity. Third, within FluSurv-NET data, approximately 17% of persons were missing ethnicity and were classified based only on their reported race; 7% were missing race. Fourth, weighting adjustments for BRFSS survey data used to assess influenza vaccination coverage might not eliminate all possible bias from incomplete sample frame because households with no telephones are excluded. Fifth, survey response rates were low, and influenza vaccination coverage might differ between survey respondents and nonrespondents; survey weighting adjustments might not adequately control for these differences. Sixth, influenza vaccination status was self-reported and subject to recall error and social desirability bias. Finally, errors in BRFSS data from incomplete sample frame, nonresponse, and accuracy of reported influenza vaccination status might change over time, which could lead to inaccurate assessment of trends in vaccination coverage.

The findings in this report highlight persistent disparities in influenza disease severity among adults in some racial and ethnic minority groups during 2009–2022, as well as continued disparities in influenza vaccination coverage among adults during the same period. Increasing influenza vaccination coverage among racial and ethnic minorities could reduce disparities in the risk for severe disease. National, state, and community-level efforts to build trust, increase access to vaccination services, and combat misinformation among racial and ethnic minority communities are important actions for increasing vaccination coverage in these groups. Interventions that support and promote partnerships at the community level to effectively reduce racial and ethnic disparities in influenza vaccination include creating and training (or partnering with) a network of local community trusted messengers reflecting the communities served; using trusted messengers to address misinformation and promote accurate, culturally responsive vaccine messages, including through social media; and working with culturally competent health care providers to provide a strong recommendation for influenza vaccination. National, tailored influenza vaccination campaigns can reinforce local efforts to increase awareness of the importance of influenza vaccination among target audiences to encourage increased vaccination coverage among these groups.

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Receipt of First and Second Doses of JYNNEOS Vaccine for Prevention of Monkeypox — United States, May 22–October 10, 2022

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On October 21, 2022, this report was posted as an MMWR Early Release on the MMWR website (https://www.cdc.gov/mmwr).

Vaccination with JYNNEOS vaccine (Modified Vaccinia Ankara vaccine, Bavarian Nordic) to prevent monkeypox commenced shortly after confirmation of the first monkeypox case in the current outbreak in the United States on May 17, 2022 (*1*). To date, more than 27,000 cases have been reported across all 50 states, the District of Columbia (DC), and Puerto Rico.* JYNNEOS vaccine is licensed by the Food and Drug Administration (FDA) as a 0.5-mL 2-dose series administered subcutaneously 28 days apart to prevent smallpox and monkeypox infections (*2*) and has been found to provide protection against monkeypox infection during the current outbreak (*3*). The U.S. Department of Health and Human Services (HHS) allocated 1.1 million vials of JYNNEOS vaccine from the Strategic National Stockpile, with doses allocated to jurisdictions based on case counts and estimated size of population at risk (*4*). However, initial vaccine supplies were severely constrained relative to vaccine demand during the expanding outbreak. Some jurisdictions with highest incidence responded by prioritizing first dose administration during May–July (*5*,*6*). The FDA emergency use authorization (EUA) of 0.1 mL dosing for intradermal administration of JYNNEOS for persons aged ≥18 years on August 9, 2022, substantially expanded available vaccine supply† (*7*). The U.S. vaccination strategy focuses primarily on persons with known or presumed exposures to monkeypox (*8*) or those at high risk for occupational exposure (*9*). Data on monkeypox vaccine doses administered and reported to CDC by U.S. jurisdictions were analyzed to assess vaccine administration and completion of the 2-dose series. A total of 931,155 doses of JYNNEOS vaccine were administered and reported to the CDC by 55 U.S. jurisdictions during May 22–October 10, 2022. Among persons who received ≥1 dose, 51.4% were non-Hispanic White (White), 22.5% were Hispanic or Latino (Hispanic), and 12.6% were non-Hispanic Black or African American (Black). The percentages of vaccine recipients who were Black (5.6%) and Hispanic (15.5%) during May 22–June 25 increased to 13.3% and 22.7%, respectively, during July 31–October 10. Among 496,888 persons who received a first dose and were eligible for a second dose during the study period, 57.6% received their second dose. Second dose receipt was highest among older adults, White persons, and those residing in the South U.S. Census Bureau Region. Tracking and addressing disparities in vaccination can reduce inequities, and equitable access to and acceptance of vaccine should be an essential factor in planning vaccination programs, events, and strategies. Receipt of both first and second doses is necessary for optimal protection against *Monkeypox virus* infection.

The system for reporting monkeypox vaccination data was adapted from existing infrastructure and data flow structures developed for reporting COVID-19 vaccine administration data.§ Providers submitted monkeypox vaccination data to their jurisdiction's immunization information systems (IIS); state, local, and territorial jurisdictions reported vaccine administration data to CDC. Monkeypox vaccine doses administered to persons in 49 states, New York City, Philadelphia, DC, Puerto Rico, the U.S. Virgin Islands, and the Northern Mariana Islands during May 22–October 10, 2022, and reported to CDC as of October 12, 2022, were analyzed to assess vaccination by sex, age group, race and ethnicity, U.S. Census Bureau region, and urbanicity.¶

The proportion of persons who received a second JYNNEOS vaccine dose was calculated from among all persons who received a first dose and were due for their second dose during the study period.** First and second doses were linked by

* https://www.cdc.gov/poxvirus/monkeypox/response/2022/us-map.html

† During May–September 2022, 833,293 vials of JYNNEOS vaccine were shipped to U.S. jurisdictions. Before the EUA for intradermal administration of JYNNEOS on August 9, 2022, one vial contained 1 dose of vaccine; under the EUA, when 0.1 mL dosing and intradermal administration are used, one vial contains up to 5 doses of vaccine. The U.S. jurisdictions that received vaccine were the 50 states, DC, five local jurisdictions that received vaccine separately from their respective states (Los Angeles, California; Chicago, Illinois; New York, New York; Philadelphia, Pennsylvania; and Houston, Texas), and eight U.S. territories or freely associated states (American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, Palau, Puerto Rico, and the U.S. Virgin Islands).

§ https://www.cdc.gov/coronavirus/2019-ncov/vaccines/distributing/about-vaccine-data.html

¶ Urbanicity was classified based on the vaccine recipient's county of residence using the National Center for Health Statistics' 2013 Urban-Rural Classification Scheme for Counties: urban includes large central metropolitan, medium metropolitan, and small metropolitan counties; suburban includes large fringe metropolitan counties; and rural includes micropolitan and noncore counties. https://www.cdc.gov/nchs/data_access/urban_rural.htm

** Persons were considered to be due for their second dose if they received their first dose ≥28 days earlier. Analysis of second dose receipt incorporates a 7-day lag to account for reporting delays between vaccine administration and data report to CDC.

CDC based on a recipient identifier assigned by the reporting entity and the three-digit reporting entity code.[††] The interval in days between first and second doses was calculated using date of administration for each dose. Analyses were conducted using SQL Server Management Studio (version 18; Microsoft) and SAS software (version 9.4; SAS Institute). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[§§]

During May 22–October 10, 2022, a total of 931,155 JYNNEOS vaccine doses were administered and reported to CDC by U.S. jurisdictions, including 628,610 (67.5%) first doses, 301,770 (32.4%) second doses, and 775 (0.1%) third, fourth, or fifth doses.[¶¶] Weekly first dose administration peaked at 102,262 during the week August 7–13 (Supplementary Figure, https://stacks.cdc.gov/view/cdc/121818). The majority of vaccine doses (63%) were administered in the six states reporting the highest monkeypox case counts (California, Florida, Georgia, Illinois, New York, and Texas).[***]

Among 628,610 persons who received ≥1 dose of vaccine, 91.9% were male, and 65.4% were aged 25–49 years (Table 1). Most vaccine recipients were residents of urban counties (82.5%); 15.9% and 1.6% lived in suburban and

[††] Texas did not submit person-level vaccination data; therefore, the 23,264 persons who received ≥1 dose in Texas were excluded from the analysis of second dose receipt.

[§§] 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.

[¶¶] Third, fourth, or fifth doses might have been administered if an administration error occurred and a dose had to be repeated; alternatively, if the same recipient identifier was assigned to multiple persons in a jurisdiction, doses might have been erroneously considered to be third, fourth, or fifth doses. https://www.cdc.gov/poxvirus/monkeypox/interim-considerations/errors-deviations.html

[***] https://www.cdc.gov/poxvirus/monkeypox/response/2022/us-map.html

TABLE 1. Characteristics of persons who have received first and second doses of JYNNEOS vaccine — United States, May 22–October 10, 2022

Characteristic	No. (%)* First dose[†]	Second dose
Total	**628,610 (100)**	**301,770 (100)**
Sex		
Male	567,457 (91.9)	282,486 (94.8)
Female	49,944 (8.1)	15,405 (5.2)
Unknown	11,209 (—)	3,879 (—)
Age group, yrs		
0–4	218 (0.03)	39 (0.01)
5–11	315 (0.1)	55 (0.02)
12–17	418 (0.1)	80 (0.03)
18–24	48,824 (7.8)	16,358 (5.4)
25–39	296,931 (47.2)	137,787 (45.7)
40–49	114,337 (18.2)	59,021 (19.6)
50–64	132,942 (21.1)	70,496 (23.4)
≥65	34,619 (5.5)	17,934 (5.9)
Unknown	6 (—)	0 (—)
Race and ethnicity[§]		
AI/AN, non-Hispanic	2,194 (0.4)	882 (0.3)
Asian, non-Hispanic	43,266 (7.6)	20,308 (7.2)
Black or African American, non-Hispanic	71,855 (12.6)	33,948 (12.1)
Hispanic or Latino	128,853 (22.5)	58,288 (20.8)
NH/OPI, non-Hispanic	1,486 (0.3)	659 (0.2)
White, non-Hispanic	293,853 (51.4)	152,435 (54.3)
Multiracial/Other, non-Hispanic	30,643 (5.4)	14,298 (5.1)
Unknown	56,460 (—)	20,952 (—)
U.S. Census Bureau region[¶]		
Northeast	164,357 (26.3)	74,526 (24.8)
Midwest	70,419 (11.3)	33,640 (11.2)
South	173,783 (27.8)	98.695 (32.9)
West	217,276 (34.7)	93,503 (31.1)
Urbanicity[**]		
Urban	482,865 (82.5)	228,685 (80.5)
Suburban	93,113 (15.9)	51,041 (18.0)
Rural	9,418 (1.6)	4,297 (1.5)
Unknown	40,439 (—)	16,341 (—)
Location type of vaccine administration		
Public health provider, public health clinic	225,040 (41.5)	103,818 (39.7)
Commercial vaccination service provider	73,783 (13.6)	47,835 (18.3)
Medical practice	50,659 (9.3)	22,504 (8.6)
Hospital	49,400 (9.1)	16,767 (6.4)
Public health provider, FQHC	34,118 (6.3)	17,049 (6.5)
Health center, community	17,311 (3.2)	9,470 (3.6)
Health center, other	16,835 (3.1)	7,439 (2.8)
Pharmacy	16,834 (3.1)	9,039 (3.5)
Other	58,065 (10.7)	27,279 (10.4)
Unknown	86,565 (—)	40,570 (—)

Abbreviations: AI/AN = American Indian or Alaska Native; FQHC = Federally Qualified Health Center; NH/OPI = Native Hawaiian or other Pacific Islander.

* Percentages calculated using nonmissing data.

† Overall, 775 doses were reported as third, fourth, or fifth doses.

§ Persons with Hispanic or Latino (Hispanic) ethnicity were categorized as Hispanic and might be of any race; persons with non-Hispanic ethnicity were categorized as non-Hispanic American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White, multiracial (more than one race category selected), or other. Persons with missing data for either race or ethnicity were categorized as unknown race and ethnicity.

¶ For each U.S. Census Bureau region, vaccine allocations (vials) were 251,150 (Northeast); 404,026 (South); 148,419 (Midwest); and 281,975 (West) (https://aspr.hhs.gov/SNS/Pages/JYNNEOS-Distribution.aspx). A total of 2,775 vaccine recipients were in U.S. territories and freely associated states and were not categorized in a U.S. Census Bureau region.

** Urbanicity was classified based on the vaccine recipient's county of residence using the National Center of Health Statistics' 2013 Urban-Rural Classification Scheme for Counties: urban includes large central metropolitan, medium metropolitan, and small metropolitan counties; suburban includes large fringe metropolitan counties; and rural includes micropolitan and noncore counties (https://www.cdc.gov/nchs/data_access/urban_rural.htm). A total of 40,439 vaccine recipients had an unknown or missing county of residence; 2,775 vaccine recipients were in U.S. territories and freely associated states and were not categorized as urban, suburban, or rural.

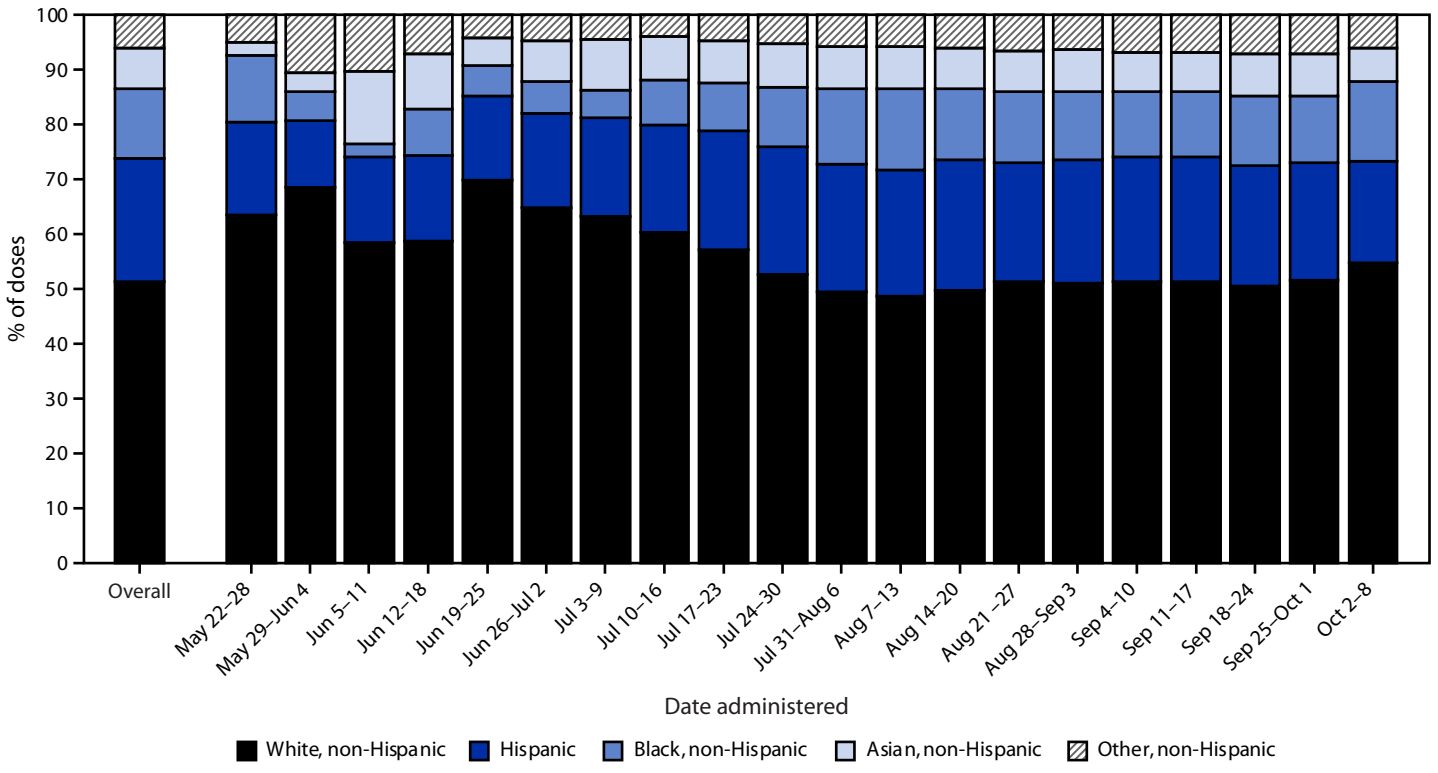
rural counties, respectively. Race and ethnicity were reported for 91.0% of vaccinated persons; among those, 51.4% were White, 22.5% were Hispanic, 12.6% were Black, and 7.6% were Asian persons. The percentages of vaccine recipients who were Black (5.6%) and Hispanic (15.5%) during May 22–June 25, increased to 9.4% and 21.9%, respectively, during June 26–July 30, and to 13.3% and 22.7%, respectively, during July 31–October 10 (Figure) (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/121816). The most common provider sites where persons received vaccines were public health clinics (41.5%), commercial vaccination service providers (13.6%), medical practices (9.3%), and hospitals (9.1%) (Table 1).

Among 496,888 first-dose vaccine recipients who were eligible to receive a second dose during the study period, 285,964 (57.6%) had received the second dose as of October 10 (Table 2). Receipt of a second dose was highest in the South (70.0%) and lowest in the Northeast (51.8%). The percentage of persons who received a second dose varied across jurisdictions (range = 22.4%–82.5%) (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/121817). In New York City and Philadelphia, where administration of second doses was delayed because of prioritization of first doses (5,6), fewer than one half of first-dose recipients had received a second dose. Second dose receipt was lower among females (39.4%) than among males (59.3%), was highest among White persons (61.4%), was lowest among persons of Hispanic (53.9%) or unknown race or ethnicity (51.2%), and increased with increasing age. More than one half of eligible Black, Asian, American Indian or Alaska Native, and Native Hawaiian or other Pacific Islander persons received a second dose. Among persons who received a second dose, 68.7% received the dose within the recommended interval of 24–35 days after the first dose (median = 31 days; IQR = 28–38 days) (Table 2).

Discussion

This report documents the first large-scale effort to provide JYNNEOS vaccine to persons at higher risk for exposure to *Monkeypox virus* in the United States. More than 900,000 doses of JYNNEOS vaccine were administered during the first 5 months of the vaccination effort, with approximately 628,000 persons receiving ≥1 dose, and 302,000 persons receiving the complete 2-dose series. Although a peak in

FIGURE. Race and ethnicity*,† of persons who received ≥1 dose of JYNNEOS vaccine, by week of administration — United States, May 22–October 8, 2022



* Race and ethnicity were missing for 56,460 (9.0%) vaccinated persons.
† Persons with Hispanic or Latino (Hispanic) ethnicity were categorized as Hispanic and might be of any race; persons with non-Hispanic ethnicity were categorized as non-Hispanic American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White, multiracial (more than one race category selected), or other. Persons with missing data for either race or ethnicity were categorized as unknown race and ethnicity.

TABLE 2. Receipt of second dose of JYNNEOS vaccine among persons who initiated the JYNNEOS vaccination series — United States, May 22–October 10, 2022

Characteristic	No. (%) who received a second dose*,†	Median interval between first and second dose (days)§	% of second doses administered within recommended interval¶
Total**	**285,964 (57.6)**	**31**	**68.7**
Sex			
Male	267,508 (59.3)	31	68.3
Female	14,382 (39.4)	29	76.1
Unknown	4,074 (45.3)	30	68.6
Age group, yrs			
0–4	38 (26.0)	28	84.2
5–11	52 (25.2)	29	90.4
12–17	75 (31.9)	28	88.0
18–24	15,486 (41.2)	31	68.2
25–39	130,618 (54.2)	32	64.5
40–49	55,805 (61.6)	31	69.3
50–64	66,849 (65.6)	29	73.9
≥65	17,041 (67.1)	29	78.5
Race and ethnicity††			
AI/AN, non-Hispanic	883 (55.9)	30	71.8
Asian, non-Hispanic	19,559 (55.5)	33	60.2
Black or African American, non-Hispanic	31,590 (55.4)	30	72.0
Hispanic or Latino	54,483 (53.9)	31	68.0
NH/OPI, non-Hispanic	653 (54.1)	31	69.1
White, non-Hispanic	144,112 (61.4)	31	68.8
Multiracial/Other, non-Hispanic	11,611 (55.8)	31	68.9
Unknown	23,073 (51.2)	31	71.6
U.S. Census Bureau region§§			
Northeast	73,324 (51.8)	37	47.1
Midwest	32,433 (59.3)	29	77.1
South	85,859 (70.0)	28	83.8
West	93,003 (52.9)	31	68.5

Abbreviations: AI/AN = American Indian or Alaska Native; NH/OPI = Native Hawaiian or other Pacific Islander.

* Among persons who received a first dose ≥28 days earlier (496,888).

† Analysis of second dose receipt incorporates 7-day lag to account for reporting delays between vaccine administration and data report to CDC.

§ Among persons who received a second dose.

¶ 24–35 days after the first dose.

** Texas did not submit person-level vaccination data; therefore, persons who received ≥1 dose in Texas (23,264) were excluded from analysis of second dose receipt.

†† Persons with Hispanic or Latino (Hispanic) ethnicity were categorized as Hispanic and might be of any race; persons with non-Hispanic ethnicity were categorized as non-Hispanic American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White, multiracial (more than one race category selected), or other. Persons with missing data for either race or ethnicity were categorized as unknown race and ethnicity.

§§ A total of 1,345 persons were in U.S. territories and freely associated states and were not categorized in a U.S. Census Bureau region.

first dose administration occurred in mid-August, administration of first and second vaccine doses is continuing. More than one half of persons who initiated the vaccination series and were eligible for a second dose during the study period have received their second dose; completion of the second dose is necessary for optimal protection against *Monkeypox virus* infection. Importantly, there was substantial progress in increasing the proportion of Black and Hispanic persons vaccinated during the more recent period. Increasing the availability of vaccine at community events, including a focus on health equity, has contributed to these improvements.

The findings in this report are subject to at least four limitations. First, it was not possible to assess vaccination based on gender identity because this information is not routinely collected during vaccine administration, and existing IIS systems do not include this variable. Second, race or ethnicity was unknown for 9.0% of persons who received JYNNEOS vaccine, which could limit ability to interpret differences by race and ethnicity. Third, linkage of an individual person's first and second doses depends on the accuracy of recipient identifiers in a jurisdiction's IIS. Persons who received their second dose in a different jurisdiction than where they received their first dose might not be able to be linked to their first dose, resulting in an underestimation of second dose receipt. Finally, second-dose status was unknown for 23,264 (3.7%) first-dose recipients who lived in a jurisdiction that did not submit person-level vaccination data; vaccine recipients from this jurisdiction were not included in the analysis of second dose receipt.

HHS allocated and distributed vaccine doses to prioritize persons at highest risk for exposure to *Monkeypox virus* and in jurisdictions with the highest case counts and size of priority population. The multiphase allocation and distribution of vaccines was necessary because of initial supply limitations during the period of most rapid epidemic growth. Jurisdictions developed vaccination strategies based on local epidemiology and availability of resources. Early constraints might have limited vaccine access for populations who could not travel long distances, had inflexible work schedules, or could not access online appointment scheduling. Over time, jurisdictions have worked to improve vaccine access, including increasing the number of vaccine events and providers. Many persons with increased risk factors during the current monkeypox outbreak have received ≥1 dose of monkeypox vaccine. However, analysis of the demographic characteristics of persons who have received vaccine indicates that there are certain demographic groups who were less likely to be vaccinated, including Hispanic and Black persons, despite being disproportionately affected by the monkeypox outbreak (*10*). Monitoring and addressing disparities in vaccine administration can reduce health inequities. CDC's monkeypox vaccine equity pilot program provides

Summary

What is already known about this topic?

In the United States, JYNNEOS vaccine is recommended for persons exposed to or at high risk for exposure to *Monkeypox virus*.

What is added by this report?

By October 10, 2022, a total of 931,155 JYNNEOS vaccine doses were administered in the United States. Among persons who received ≥1 vaccine dose, 51.4% were non-Hispanic White, 12.6% were non-Hispanic Black or African American (Black), and 22.5% were Hispanic persons. The percentages of vaccine recipients who were Black (5.6%) and Hispanic (15.5%) during May 22–June 25 increased to 13.3% and 22.7%, respectively, during July 31–October 10.

What are the implications for public health practice?

Tracking and addressing disparities in vaccination can reduce inequities and help ensure that disproportionately affected populations are protected.

an opportunity to implement and evaluate novel strategies to reach populations most affected by the monkeypox outbreak but who might face barriers to getting vaccinated.[†††] Equitable access to and acceptance of vaccine should be an essential factor in planning vaccination programs, events, and strategies. Receipt of both first and second doses is necessary for optimal protection against *Monkeypox virus* infection. Improving equity in vaccination for both first and second doses is important to protect persons who are most at risk and to end the current monkeypox outbreak.

[†††] https://www.cdc.gov/poxvirus/monkeypox/health-departments/vaccine-equity-pilot.html

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Characteristics of JYNNEOS Vaccine Recipients Before and During a Large Multiday LGBTQIA+ Festival — Louisiana, August 9–September 5, 2022

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On October 21, 2022, this report was posted as an MMWR Early Release on the MMWR website (https://www.cdc.gov/mmwr).

Since May 2022, 27,558 monkeypox cases have been identified in the United States (*1*). Gay, bisexual, and other men who have sex with men (MSM) represent the most affected demographic group in the current multinational outbreak (*2*). As of October 18, 2022, Louisiana had reported 273 monkeypox cases with 187 (68.5%) among residents of the Louisiana Department of Health (LDH) Southeast Region, which includes the city of New Orleans (*3*).

Southern Decadence is an annual multiday festival in New Orleans catering to persons who are lesbian, gay, bisexual, transgender, queer or questioning, intersex, asexual, and others (LGBTQIA+) that draws 150,000–300,000 participants annually. To prepare for the 2022 festival (September 1–5), LDH requested CDC collaboration for preparedness planning, including statewide pre-event administration of JYNNEOS vaccine to prevent monkeypox. CDC helped acquire 1,500 vials (≤6,000 intradermal doses) of JYNNEOS vaccine through a federal monkeypox large event vaccine pilot in addition to the state's Phase 3 allocation of 4,400 doses.* Concurrently, LDH staff members used multiple strategies to reach out to the LGBTQIA+ community to provide education and increase vaccination coverage among eligible persons, based on local vaccination eligibility criteria (*3*).

Vaccination was available free of charge through public and private health clinics (clinics) beginning in July 2022.† As part of the state's prevention strategy to increase vaccination among eligible Louisiana residents in advance of Southern Decadence, LDH hosted a series of community vaccination events, including large volume events in central locations and smaller, more focused events. The smaller events, organized in collaboration with community partners, were aimed at removing barriers (e.g., stigma and mistrust) and reducing disparities by reaching populations at highest risk, especially persons with limited access to medical care. These community vaccination events were held across the state before and during the festival (August 9–September 5, 2022). Vaccination venues were purposefully selected at locations where MSM would feel comfortable seeking vaccination, such as gay-owned or gay-frequented venues. Patient demographic information was collected at the time of vaccination by the LDH Immunization Program. Aggregate data were shared with CDC. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.§

More than one half (58.6%) of Louisiana monkeypox cases have occurred among persons who identify as non-Hispanic Black or African American (Black) (*3*). Selection of community vaccination venues included a focus on gay bars and clubs with primarily Black patrons to help ensure more equitable access to vaccines. Community vaccination efforts continued during Southern Decadence and were held daily in a central venue (the Health Hub) three blocks from the main festival area. The Health Hub offered vaccines and testing for monkeypox and COVID-19, HIV screening, condoms, safe injection kits, fentanyl test strips, naloxone, and other health resources.

During August 9–September 5, 2022, a total of 6,854 doses of JYNNEOS were administered in Louisiana (Table), with 53.0%, 34.8%, and 12.2% administered at clinics, non–Health Hub community vaccination events, and the Health Hub, respectively.¶ Among persons who received vaccine outside the Health Hub, 90.1% were Louisiana residents; 54%, 24.0%, and 6.7% were non-Hispanic White (White), Black, and Hispanic or Latino (Hispanic) persons, respectively. Among Health Hub vaccine recipients, 45.5% were Louisiana residents, and 52.3%, 13.9%, and 10.3% were White, Black, and Hispanic persons, respectively. Residents of California,

*The Administration for Strategic Preparedness and Response and CDC used a phased distribution strategy to prioritize monkeypox vaccines for areas with higher numbers of cases. Jurisdictions began ordering Phase 3 allocations for vaccines to be distributed in August 2022 on July 29, 2022. https://aspr.hhs.gov/monkeypox/OperationalGuidance/Pages/distribution.aspx

†LDH maintains an updated list of public and private health clinics offering monkeypox vaccine and community vaccination events. https://ldh.la.gov/assets/oph/monkeypox/vaccine-locations/MonkeypoxVaccineLocations.pdf

§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.

¶Louisiana providers began using intradermal administration of JYNNEOS vaccine on August 10, 2022, after a Food and Drug Administration emergency use authorization for intradermal injection among persons aged ≥18 years who are determined to be at high risk for monkeypox to increase the total number of doses available for use up to fivefold on August 9, 2022. Subcutaneous administration was used at the first two community vaccination events on August 9 and August 11. Intradermal administration at community vaccination events began on August 13. https://www.fda.gov/news-events/press-announcements/monkeypox-update-fda-authorizes-emergency-use-jynneos-vaccine-increase-vaccine-supply

TABLE. Characteristics of JYNNEOS vaccine recipients at health clinics,* community vaccination events,† and at the Southern Decadence Health Hub§ (N = 6,854) — Louisiana, August 9–September 5, 2022

Characteristic	% of Vaccine administrations by vaccination setting, no. (column %)			
	Non–Southern Decadence Health Hub,¶ Aug 9–Sep 2			
	Health clinic	Community vaccination event	Total	Southern Decadence Health Hub, Sep 1–5
Total (row %)	**3,633 (53.0)**	**2,384 (34.8)**	**6,017 (87.8)**	**837 (12.2)**
Sex				
Male	3,145 (86.6)	2,003 (84.0)	**5,148 (85.6)**	697 (83.3)
Female	478 (13.2)	352 (14.8)	**830 (13.8)**	121 (14.5)
Other	6 (0.2)	20 (0.8)	**26 (0.4)**	18 (2.2)
Unknown	4 (0.1)	9 (0.4)	**13 (0.2)**	1 (0.1)
Age group, yrs				
0–17	15 (0.4)	0 (0.0)	**15 (0.2)**	3 (0.4)
18–29	631 (17.4)	455 (19.1)	**1,086 (18.1)**	108 (12.9)
30–49	1,878 (51.7)	1,228 (51.5)	**3,106 (51.6)**	429 (51.3)
50–64	832 (22.9)	535 (22.4)	**1,367 (22.7)**	233 (27.8)
≥65	277 (7.6)	166 (7.0)	**443 (7.4)**	64 (7.7)
Race and ethnicity**				
Black or African American, NH	929 (25.6)	516 (21.6)	**1,445 (24.0)**	116 (13.9)
White, NH	2,051 (56.5)	1,218 (51.1)	**3,269 (54.3)**	438 (52.3)
Other, NH	327 (9.0)	278 (11.7)	**605 (10.1)**	84 (10.0)
Hispanic or Latino	245 (6.7)	157 (6.6)	**402 (6.7)**	86 (10.3)
Unknown	81 (2.2)	215 (9.0)	**296 (4.9)**	113 (13.5)
State of residence				
Louisiana	3,373 (92.8)	2,045 (85.8)	**5,418 (90.1)**	381 (45.5)
Other	129 (3.6)	214 (9.0)	**343 (5.7)**	373 (44.6)
Unknown	131 (3.6)	125 (5.2)	**256 (4.3)**	83 (9.9)
Dose				
First	2,979 (82.0)	2,339 (98.1)	**5,318 (88.4)**	769 (91.9)
Second	654 (18.0)	45 (1.9)	**699 (11.6)**	68 (8.1)

Abbreviation: NH = non-Hispanic.

* Public or private health clinic offering monkeypox vaccine.

† Vaccination event organized by Louisiana Department of Health at locations purposefully selected to improve vaccine equity, such as gay-owned or -frequented venues.

§ A pop-up venue centrally located within three blocks from the main festival area offering monkeypox and COVID-19 vaccines and testing, HIV screening, condoms, safe injection kits, fentanyl test strips, naloxone, and other health resources.

¶ Community vaccination events on September 1–2 included in this category occurred at venues outside the Health Hub.

** Other includes persons who identify as Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, or multiracial, and persons who declined to report. Persons reporting Hispanic or Latino ethnicity could be of any race.

Florida, New York, and Texas accounted for 26.0% of Health Hub vaccine recipients.

Achieving vaccine equity among communities disproportionately affected by the outbreak is critical to stopping the spread of *Monkeypox virus* (*4*). Large LGBTQIA+ gatherings that attract substantial media and social media attention, such as Southern Decadence, provide an opportunity to build vaccine demand among local members of the LGBTQIA+ community through outreach regarding the importance of vaccination, engagement of racial and ethnic minority groups, and stimulation of pre-event local vaccination efforts. Community-based monkeypox vaccination events can provide an accessible safe space for vaccination while minimizing judgment and stigma. Increased availability of vaccines ahead of the festival, including at clinics and community vaccination events, and during the festival at the Health Hub, increased overall vaccine access while reaching different demographic groups. Vaccinations at non–Health Hub settings more frequently reached Louisiana residents who identified as racial and ethnic minorities, whereas vaccination at the Health Hub increased reach to residents of other states. Although vaccination has not reached parity with racial and ethnic case distribution, the percentage of vaccine recipients who identified as Black at non–Health Hub settings (24.0%) was higher than that before August 9 (16.0%)** and at the Health Hub (13.9%). These data suggest that community engagement, targeted messaging, and selection of venues catering primarily to racial and ethnic minorities for community vaccination events can improve vaccine equity and reduce health disparities.

** Data from vaccine recipients during July 22–August 8, when JYNNEOS vaccine became available to Louisianans under expanded postexposure prophylaxis (1,106).

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A Health Equity Approach for Implementation of JYNNEOS Vaccination at Large, Community-Based LGBTQIA+ Events — Georgia, August 27–September 5, 2022

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Gay, bisexual, and other men who have sex with men (MSM) have been disproportionately affected during the 2022 U.S. monkeypox outbreak, with Black or African American (Black) MSM being the most affected demographic group (*1*). As of September 28, 2022, Georgia had reported 1,784 monkeypox cases; 98% of which occurred in males and 77% among Black persons (*2*). As of September 13, 2022, 60% of reported cases were among persons with HIV infection, and 50% of persons with monkeypox had a sexually transmitted infection within the past year (*3*). Because of racial disparities in the incidence of monkeypox cases and a large proportion of cases among MSM in Georgia, early vaccination beginning in July focused on improving equitable access by establishing new and leveraging existing partnerships with community-based organizations that serve affected populations, including persons with HIV infection. Despite these efforts, disparities persisted because of high demand and limited vaccine supply. The Georgia Department of Public Health (DPH) requested CDC support for a vaccine pilot and received an additional allocation of 5,500 doses of JYNNEOS vaccine for administration at events leading up to and throughout a Black gay Pride festival in Atlanta, a multiday event held Labor Day weekend (September 2–5, 2022). The event celebrates lesbian, gay, bisexual, transgender, queer or questioning, intersex, asexual, and other (LGBTQIA+) communities of color and hosts more than 125,000 attendees each year. Before the festival (as of August 24), 17,546 persons had been vaccinated in Georgia, of whom 96% were male, 34% aged 25–36 years, 44% Black, and 8% Hispanic or Latino (Hispanic) (*4*).

During August 27–September 5, Georgia DPH, in conjunction with metropolitan Atlanta local public health departments in five counties[†] and local community-based organizations, administered the additional allocation of JYNNEOS vaccine. Vaccination events held before the festival (August 27–September 1) were located at local health department clinics and at venues acceptable and convenient for Black MSM, such as familiar large event spaces, bars, and clubs. During the festival (September 2–5), vaccine events were held during the day and after hours at health department clinics and at bars and clubs via mobile vans to increase broad reach and access. Georgia DPH staff members used social media, community-based organizations, and field outreach to promote vaccination events. Vaccines were administered by Georgia DPH, partner organizations, and local health departments. Patient demographic data were collected at the time of vaccination and entered into the Georgia Immunization Registry. Aggregate data were shared with CDC. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[§]

During August 27–September 5, a total of 4,282 JYNNEOS vaccine doses (78% of the additional allocation) were administered. Two thirds (2,874) of doses were administered before the festival and one third (1,408) during the event. Overall, 2,886 (67%) doses were administered at 22 routine vaccination events at health department clinics, 702 (16%) doses at 20 mobile, community pop-up events, and 694 (16%) doses at one fixed location (a Georgia DPH-sponsored mass vaccination event). Among vaccine recipients, 93% were male, 55% were aged 30–49 years, 48% were Black, and 8% were Hispanic (Table). The proportion of Black persons receiving vaccine was higher during the festival (53%) than before the event (46%), but the proportion of Hispanic recipients was similar (7% versus 8%). Nearly one third (31%) of records were missing data on state of residence.

Vaccinating communities disproportionately affected by the monkeypox outbreak is important in stopping spread of *Monkeypox virus* and ending the outbreak (*5*). A community-based approach by a coalition of festival organizers, government entities, and LGBTQIA+ community advocates was successful at improving equitable monkeypox vaccination. This work highlights the value of health department and community-based organization in-person and virtual outreach to increase health equity. Challenges to an equitable approach to monkeypox vaccination included decreasing trends in vaccine demand by the time of the event (possibly attributable to historical vaccine hesitancy or stigma), ensuring second

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

TABLE. Characteristics of recipients of JYNNEOS vaccine before and during a Black gay Pride festival in Atlanta (N = 4,282) — Georgia, August 27–September 5, 2022

Characteristic	No. (%)		
	Total Aug 27–Sep 5	Before festival Aug 27–Sep 1	During festival Sep 2–5
Total	**4,282**	**2,874**	**1,408**
Self-reported sex			
Female	**205 (4.8)**	153 (5.3)	52 (3.7)
Male	**3,970 (92.7)**	2,639 (91.8)	1,331 (94.5)
Other/Unknown	**107 (2.5)**	82 (2.9)	25 (1.8)
Age group, yrs			
0–17	**5 (<1)**	4 (<1)	1 (<1)
18–29	**614 (14.3)**	410 (14.3)	204 (14.5)
30–49	**2,353 (55.0)**	1,571 (54.7)	782 (55.5)
50–64	**920 (21.5)**	630 (21.9)	290 (20.6)
≥65	**390 (9.1)**	259 (9.0)	131 (9.3)
Ethnicity*			
Hispanic or Latino	**328 (7.7)**	224 (7.8)	104 (7.4)
Non-Hispanic or Latino	**3,872 (90.4)**	2,585 (89.9)	1,287 (91.4)
Unknown	**82 (1.9)**	65 (2.3)	17 (1.2)
Race*			
Asian	**132 (3.1)**	89 (3.1)	43 (3.1)
Black or African American	**2,069 (48.3)**	1,322 (46.0)	747 (53.1)
White	**1,625 (37.9)**	1,144 (39.8)	481 (34.2)
Other	**396 (9.2)**	276 (9.6)	120 (8.5)
Unknown	**60 (1.4)**	43 (1.5)	17 (1.2)
State of residence			
Georgia	**2,893 (67.6)**	1,996 (69.5)	897 (63.7)
Other	**52 (1.2)**	29 (1)	23 (1.6)
Unknown	**1,337 (31.2)**	849 (29.5)	488 (34.7)
Dose			
First	**2,516 (58.8)**	1,765 (61.4)	751 (53.3)
Second	**1,766 (41.2)**	1,109(38.6)	657 (46.7)

* Hispanic or Latino persons can be of any race. Other includes persons who identify as Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, or multiracial, and persons who declined to report.

doses for out-of-state travelers, and recent concerns about receiving second doses because of skin discoloration associated with intradermal vaccine administration.[¶] Georgia DPH is implementing additional events to help ensure that persons in Georgia receive their second JYNNEOS vaccine dose. As the vaccine supply increases, distribution strategies should continue to focus on eliminating disparities and removing barriers, especially for persons who might be hesitant to be vaccinated or uncomfortable being vaccinated at a large event.

[¶] Updated clinical considerations for intradermal administration of JYNNEOS vaccine allow for more discrete anatomic locations such as the upper back below the scapula or at the deltoid.

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Notes From the Field

Dispensing of Oral Antiviral Drugs for Treatment of COVID-19 by Zip Code–Level Social Vulnerability — United States, December 23, 2021–August 28, 2022

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Equitable access to COVID-19 therapeutics is a critical aspect of the distribution program led by the U.S. Department of Health and Human Services (HHS).* Two oral antiviral products, nirmatrelvir/ritonavir (Paxlovid)† and molnupiravir (Lagevrio),§ received emergency use authorization (EUA) from the Food and Drug Administration (FDA) in December 2021, to reduce the risk for COVID-19–associated hospitalization and death for those patients with mild to moderate COVID-19 who are at higher risk for severe illness (*1*,*2*). HHS has been distributing these medications at no cost to recipients since their authorization. Data collected from provider sites during December 23, 2021–May 21, 2022, indicated substantial disparities in the population-adjusted dispensing rates in high social vulnerability (high-vulnerability) zip codes compared with those in medium- and low-vulnerability zip codes (*3*). Specifically, dispensing rates for the 4-week period during April 24–May 21, 2022, were 122 per 100,000 residents (19% of overall population-adjusted dispensing rates) in high-vulnerability zip codes compared with 247 (42%) in medium-vulnerability and 274 (39%) in low-vulnerability zip codes. This report provides an updated analysis of dispensing rates by zip code–level social vulnerability and highlights important intervention strategies.

Data on dispensed numbers of COVID-19 oral antiviral treatment courses are obtained at regular intervals (at least twice per week) from each provider site receiving medications. The HHS Health Partner Ordering Portal is used by oral antiviral provider partners, including those in all U.S. states and jurisdictions, the Federal Retail Pharmacy Therapeutics Program, and Federal entities (e.g., Indian Health Service, Federal Bureau of Prisons, and the U.S. Department of Defense), to order oral antivirals at no cost and to report inventory and product use.¶ Total courses of Paxlovid and Lagevrio dispensed were analyzed by week and zip-code social vulnerability level, using the zip code of the dispensing site. Zip codes were classified as having low, medium, or high social vulnerability, using the same methodology that was used in a previous report**,†† (*3*).This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.§§

Overall dispensing of oral antivirals increased 57%, from 643 per 100,000 persons during April 24–May 21, 2022, to 1,012 during July 31–August 28. Compared with data collected during April 24–May 21, dispensing during the most recent 4-week period (July 31–August 28) increased to 315 per 100,000 persons (31% of overall population-adjusted dispensing rates) in high vulnerability zip codes, 367 (36%) in medium-vulnerability zip codes, and 331 (33%) in low-vulnerability zip codes (Figure), representing increases in dispensing rates of 159%, 48%, and 21%, respectively. These data indicate a narrowing of the dispensing gap among high-vulnerability and medium-and low-vulnerability zip codes; at the same time, overall dispensing increased.

HHS worked closely with states and territories to improve equitable dispensing, with a focus on increasing education and awareness¶¶ and enhancing distribution efforts, including COVID-19–focused teleprescribing programs, mobile test-to-treat sites, prepositioning of oral antivirals at provider sites in high-vulnerability zip codes, and increased distribution to federally qualified health centers. These efforts were designed to reduce barriers to access by making it easier to satisfy the

* https://aspr.hhs.gov/COVID-19/Therapeutics
† www.fda.gov/media/155050/download
§ www.fda.gov/media/155054/download
¶ https://aspr.hhs.gov/COVID-19/Therapeutics/Distribution/Pages/process-for-ordering.aspx

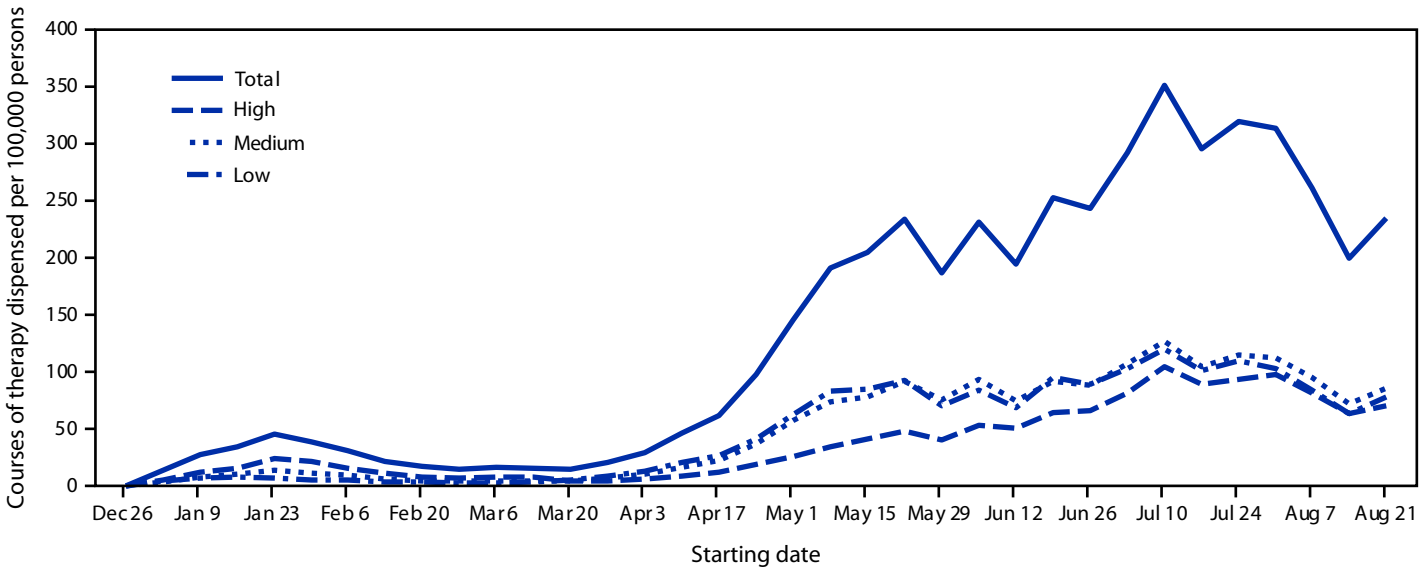
** Zip code–level social vulnerability was based on the Equitable Distribution Index (EDI) score, used by the federal COVID-19 response because zip code–level data offer a more detailed characterization of population vulnerability than do county level–data and provide sufficient geographic granularity to accomplish operational goals not achievable using U.S. Census Bureau tract–level data. To map U.S. Census Bureau tracts to zip codes, EDI uses a crosswalk file published by the U.S. Department of Housing and Urban Development (https://www.huduser.gov/portal/datasets/usps_crosswalk.html). EDI is not generated for zip codes in which any of the 15 indicators are suppressed within the American Community Survey. This represents <1% of all zip codes mapped to U.S. Census Bureau tract data. https://www.census.gov/programs-surveys/acs

†† Similar to the CDC Social Vulnerability Index (https://www.atsdr.cdc.gov/placeandhealth/svi/index.html), which produces county-level and U.S. Census Bureau tract–level estimates of social vulnerability, EDI uses 15 indicators categorized into four themes: 1) socioeconomic status, 2) household composition and disability, 3) racial and ethnic minority status and language, and 4) housing type and transportation. EDI includes all 15 indicators as a composite measure, and a final score is ranked from lowest (0) to highest (1) vulnerability. A percent rank function is used, such that an equal number of geographic components are in each percentile of the index.

§§ 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.

¶¶ Outreach and awareness efforts have included augmentation of direct messaging to communities and partnerships with community-based organizations, collaboration with professional medical associations, development of focused COVID-19 therapeutics webinars and clinical decision toolkits, dissemination of Health Alert Network communications, and National Institutes of Health updates to clinical guidance.

FIGURE. Courses of oral antiviral COVID-19 therapy dispensed per 100,000 persons, by zip code–level social vulnerability — United States, December 23, 2021–August 28, 2022*



* Oral antivirals included nirmatrelvir/ritonavir (Paxlovid) (www.fda.gov/media/155050/download) and molnupiravir (Lagevrio) (www.fda.gov/media/155054/download). Zip codes were classified as having low, medium, or high social vulnerability based on ranking within the lower, middle, and upper tertiles of the Equitable Distribution Index score.

requirements necessary to receive a clinical assessment to obtain a prescription and begin oral antiviral medication within 5 days of symptom onset. Although both oral antivirals continue to be prescribed primarily by physicians or advanced practice providers, on July 6, 2022, FDA updated the Paxlovid EUA to allow state-licensed pharmacists to prescribe it for an individual patient under certain conditions, including having sufficient data on the patient's medical history and use of other medications.*** However, pharmacy prescribing of Paxlovid has not yet been widely implemented because of these limitations on prescribing and unclear reimbursement structure for pharmacists to prescribe. Increased dispensing in high-vulnerability zip codes represents valuable progress toward improving access to COVID-19 medications among populations disproportionately affected by the pandemic; however, additional work is needed. Limitations of this analysis include reliance on sites' self-reported dispensing data, lack of patient-specific data (including demographic and clinical outcome data), and lack of correlative analysis of COVID-19 incidence to overall dispensing rates in specific zip codes.

The COVID-19 therapeutics program represents the largest scale HHS distribution of antivirals, with approximately 16 million COVID-19 treatment courses delivered through August 2022. Ensuring equitable access to antivirals is essential to improving patient outcomes.

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*** https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-pharmacists-prescribe-paxlovid-certain-limitations

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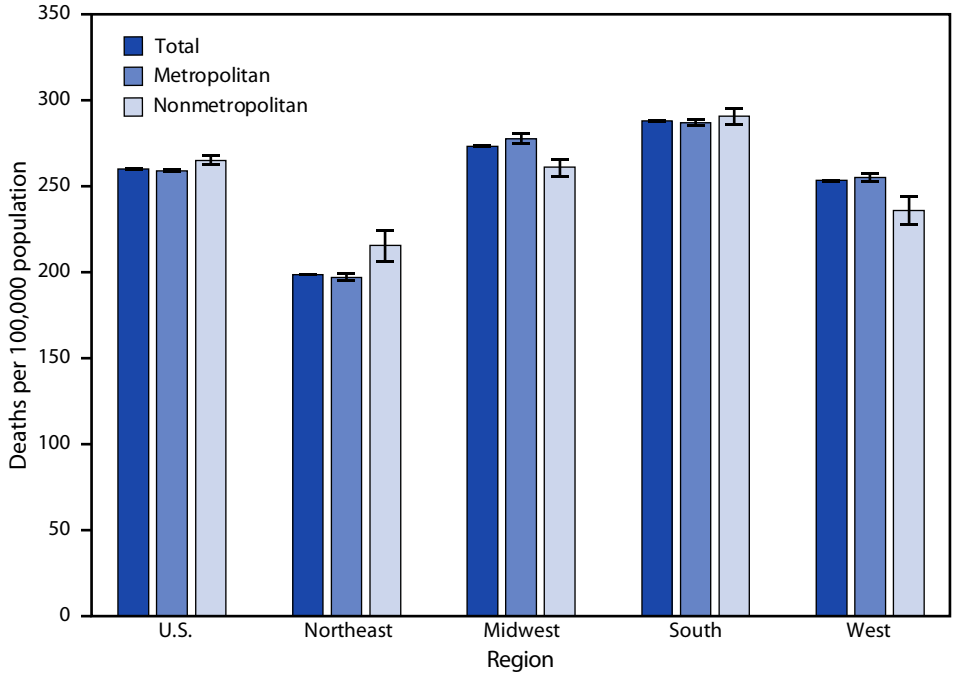
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Death Rates* for Stroke† Among Adults Aged ≥ 65 Years, by Region§ and Metropolitan Status¶ — National Vital Statistics System, United States, 2020



* Age-adjusted rates are based on the 2000 U.S. Census Bureau standard population, using age groups 65–74, 75–84, and ≥85 years, with 95% CIs indicated by error bars.
† 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
¶ Based on the Office of Management and Budget's February 2013 delineation of metropolitan statistical areas. https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf

In 2020, the age-adjusted death rate for stroke among adults aged ≥65 years was 260.5 deaths per 100,000 population with rates lower in metropolitan compared with nonmetropolitan areas (259.4 versus 265.5). The rate was highest among those living in the South (288.2) and lowest among those living in the Northeast (199.1). In the Northeast, the death rate for stroke was lower among adults in metropolitan areas (197.4) than in nonmetropolitan areas (215.7). In the Midwest and West, death rates for stroke were higher among adults in metropolitan areas (278.0 and 255.4, respectively) than in nonmetropolitan areas (261.4 and 236.4, respectively). No statistically significant difference was observed between metropolitan and nonmetropolitan areas in the South (287.4 versus 290.9).

Source: National Center for Health Statistics, National Vital Statistics System, Mortality Data, 2020. https://www.cdc.gov/nchs/nvss/deaths.htm

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