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Self-Rated Physical Health Among Working-Aged Adults Along the Rural-Urban Continuum — United States, 2021

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Poor self-rated physical health is strongly associated with morbidity and premature mortality (*1*,*2*). Studies that are now a decade old report worse self-rated health among rural than among urban residents (*3*,*4*). Whether the rural disadvantage persists in 2021 is uncertain and the contributing factors to contemporary rural-urban variations in self-rated health are not known. Rural America is diverse by population size and adjacency to metropolitan areas, and rural populations vary demographically and socioeconomically. This analysis used data from the National Well-being Survey (NWS), a national sample of approximately 4,000 U.S. working-aged adults conducted during February and March 2021 to examine differences in self-rated physical health among residents of large urban; medium/small urban; metro-adjacent rural; and remote rural counties. Residents of medium/small urban, metro-adjacent rural, and remote rural counties had significantly higher probabilities of reporting fair/poor self-rated physical health than their large urban county peers. There were no significant differences by sex or race/ethnicity in self-rated physical health. Individual-level socioeconomic resources (including higher educational attainment, higher household income, and higher probability of employment) contributed to the advantage among residents of large urban counties. Although there is no single solution to reducing rural-urban health disparities, these findings suggest that reducing socioeconomic disparities is essential.

NWS is a national, cross-sectional, web-based survey of U.S. adults aged 18–64 years (working-aged adults). The survey was created and administered by the Syracuse University Lerner Center for Public Health Promotion during February and March of 2021. Recruitment was conducted by Qualtrics Panels, which uses a database of several million U.S. adults to recruit survey participants through nonprobability sampling.* Data collection included an oversample of rural residents to enable robust analyses. Poststratification demographic weights were used to allow generalizability to the broader U.S. working-aged population. Weights account for differential response by

* Qualtrics Panels owns a database that includes data from several million U.S. adults who have agreed to participate in surveys. Participants are recruited using website intercept recruitment, member referrals, targeted email lists, gaming sites, customer loyalty web portals, permission-based networks, and social media. Names, addresses, and dates of birth are typically validated via third party-verification. For NWS data collection, panel members received an invitation with a hyperlink to NWS. Respondents were compensated in several different ways (e.g., airline miles or gift cards).

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age, race/ethnicity, sex, educational attainment, and rural-urban residence. The NWS completion rate (i.e., completed surveys among those who viewed the landing page and the informed consent section) was 40.4%.

In addition to a standard set of demographic and socioeconomic questions, respondents were asked to answer the following standard self-rated physical health question: "In general, would you say your physical health is excellent, very good, good, fair, or poor?" Responses were dichotomized into fair/poor versus good, very good, or excellent. Survey responses were linked to county-level rural-urban continuum codes (RUCCs) from the U.S. Department of Agriculture Economic Research Service using county Federal Information Processing Standards codes.[†] RUCCs were recoded into four categories: large urban counties (RUCC 1), medium/small urban counties (RUCCs 2 and 3), metro-adjacent rural counties (RUCCs 4, 6, and 8), and remote rural counties (i.e., not adjacent to a metro area) (RUCCs 5, 7, and 9).[§] The recoded RUCC categories were used as the primary independent variable. Individual-level covariates included sex, age, race/ethnicity, marital status, household income, education, health insurance coverage, and employment status.[¶] Given that data collection occurred approximately 1 year into the COVID-19 pandemic, models also control for respondents' perceived impact of COVID-19 on their lives.

Among 4,014 persons in the original sample, 167 participants had missing information on variables of interest and their data were not used, resulting in a final analytic sample of 3,847. Descriptive statistics for self-rated physical health and model covariates are reported by rural-urban status. Logistic regression analyses predicting self-reported fair/poor physical health with clustered standard errors for states were used to calculate predicted probabilities of fair/poor physical health as a function of the rural-urban continuum and individual-level characteristics. All analyses were weighted with the poststratification weight and conducted using SAS software (version 9.4; SAS Institute). NWS survey and recruitment design were approved by the Syracuse University Institutional Review Board.

In the weighted sample of U.S. working-aged adults, the prevalence of reporting fair/poor physical health was significantly higher in medium/small urban (31.1%), metro-adjacent rural (40.2%), and remote rural (34.0%) counties than in large urban counties (23.4%) (Table 1). Rural-urban variation in

[†] https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx

[§] Large urban counties are those in metropolitan areas of ≥1 million persons; medium/small urban counties are those in metropolitan areas of <1 million persons; metro-adjacent rural counties are those that are not in but adjacent to a metropolitan area; rural remote counties are those that are not in or adjacent to metropolitan areas.

[¶] Respondents could select all that apply for the employment status question. Responses were recoded into four mutually exclusive groups: all those who indicated any disability; those who indicated unemployment, but no disability; those who indicated employment but no disability or unemployment; and those who did not indicate unemployment, employment, or disability (i.e., retired, homemakers, or students).

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several characteristics that might drive the observed variation in self-rated physical health was observed. Compared demographically with residents of large urban counties, those residing in metro-adjacent rural and remote rural counties were more likely to be female, older, and non-Hispanic White. In terms of socioeconomic differences, residents of metro-adjacent and remote rural counties were significantly more likely than residents of large urban counties to be on disability, have a high school diploma or less, be uninsured, and have annual household incomes <$25,000.

Predicted probabilities of self-rated fair/poor physical health in the fully adjusted model indicate that the differences between large urban, medium/small urban, and remote rural counties were no longer statistically significant; however, a significantly higher probability of reporting fair/poor health persisted among residents of metro-adjacent rural counties (Table 2). Stepwise regression models demonstrated that the remote rural disadvantage observed in the unadjusted model is associated with lower income, lower educational attainment, and higher rates of disability in remote rural counties compared with those in large urban counties.

Several other characteristics were also associated with likelihood of self-reporting fair/poor health. Adjusted probabilities were higher among the following comparison groups: those who were unemployed (37.6%) or on disability (66.8%) versus those who were employed (18.3%), those with a high school diploma or less (35.0%) and some college (35.1%) versus those with a bachelor's degree or more (14.9%), and those with household income <$25,000 (41.2%) or $25,000–$49,999 (36.1%) versus those with household income ≥$50,000 (15.4%).

TABLE 1. Characteristics of U.S. adults aged 18–64 years, by rural-urban status* — National Well-being Survey, United States, 2021

Characteristic	County classification (weighted unadjusted %)					
	Large urban (n = 1,770)	Medium/Small urban (n = 985)	Metro-adjacent rural (n = 687)	Remote rural (n = 405)	Chi-square statistic	p-value
Self-rated physical health						
Fair/Poor	23.4	31.1	40.2	34.0	57.3	<0.001
Sex						
Female	45.3	54.1	62.0	62.7	57.9	<0.001
Age group, yrs						
18–29	23.5	24.1	20.3	18.0	19.0	0.004
30–49	46.1	40.7	41.3	48.5		
50–64	30.5	35.3	38.3	33.5		
Race/Ethnicity						
White, non-Hispanic	53.5	63.7	87.0	85.1	202.9	<0.001
Black, non-Hispanic	14.5	13.0	3.9	4.5		
Hispanic	22.9	16.0	5.0	6.0		
Other race	9.1	7.3	4.2	4.4		
Marital status						
Not married	55.8	58.7	58.3	56.4	2.7	0.564
Employment status						
Employed	61.0	52.6	44.8	45.2	78.2	<0.001
Unemployed	16.0	17.6	17.1	17.6		
Disability	6.5	10.4	16.3	15.1		
Retired/Homemaker/Student	16.5	19.3	21.9	22.0		
Educational attainment						
Bachelor's degree or more	39.0	25.3	17.3	19.8	129.8	<0.001
Some college	29.0	33.4	32.2	32.5		
High school diploma or less	32.0	41.3	50.5	47.8		
Health insurance						
Uninsured	15.5	21.4	24.4	19.5	28.1	<0.001
Household income, USD						
≥50,000	50.2	38.4	30.7	27.0	127.4	<0.001
25,000–49,999	22.6	25.3	27.5	27.2		
<25,000	22.6	32.3	39.9	42.2		
Not reported	3.6	4.1	2.0	3.5		

Abbreviation: USD = U.S. dollars.

* Large urban counties are those in metropolitan areas of ≥1 million persons; medium/small urban counties are those in metropolitan areas of <1 million persons; metro-adjacent rural counties are those that are not in, but adjacent to, a metropolitan area; rural remote counties are those that are not in or adjacent to metropolitan areas.

TABLE 2. Characteristics of U.S. adults aged 18–64 years, by unadjusted and adjusted probabilities of reporting fair/poor physical health* — National Well-being Survey, United States, 2021

		Unadjusted		Adjusted	
Characteristic	**No.**	**%**	**p-value**	**%**	**p-value**
Overall	**3,847**	**29.5**	**<0.001**	**27.4**	**<0.001**
Rural-urban status†					
Large urban	1,770	23.4	Ref	21.7	Ref
Medium/Small urban	985	31.1	<0.001	28.9	0.083
Metro-adjacent rural	687	40.2	<0.001	37.5	0.018
Remote rural	405	34.0	<0.001	31.6	0.575
Sex					
Male	1,897	—	—	23.1	Ref
Female	1,950	—	—	32.0	0.205
Age group, yrs					
18–29	882	—	—	26.9	Ref
30–49	1,732	—	—	24.7	0.562
50–64	1,233	—	—	31.5	0.407
Race/Ethnicity					
White, non-Hispanic	2,339	—	—	28.0	Ref
Black, non-Hispanic Black	494	—	—	25.9	0.076
Hispanic	710	—	—	27.8	0.826
Other	304	—	—	24.0	0.871
Marital status					
Married	1,730	—	—	20.6	Ref
Not married	2,117	—	—	33.0	0.079
Employment status					
Employed	2,268	—	—	18.3	Ref
Unemployed	567	—	—	37.6	<0.001
On disability	344	—	—	66.8	<0.001
Retired/Homemaker/Student	668	—	—	29.4	0.002
Educational attainment					
Bachelor's degree or more	1,459	—	—	14.9	Ref
Some college	1,263	—	—	35.1	<0.001
High school degree or less	1,125	—	—	35.0	<0.001
Health insurance					
Insured	3,182	—	—	26.7	Ref
Uninsured	665	—	—	30.5	0.994
Income, USD					
≥50,000	1,777	—	—	15.4	Ref
25,000–49,999	901	—	—	36.1	<0.001
<25,000	1,040	—	—	41.2	<0.001
Not reported	129	—	—	20.8	0.747
c-statistic§	—	0.57	—	0.74	—

Abbreviations: Ref = referent group; USD = U.S. dollars.
* Logistic regression models are weighted and control for respondents' self-report of impact of the COVID-19 pandemic on their lives and adjusted for clustered SEs for states.
† Large urban counties are those in metropolitan areas of ≥1 million persons; medium/small urban counties are those in metropolitan areas of <1 million persons; metro-adjacent rural counties are those that are not in, but adjacent to, a metropolitan area; rural remote counties are those that are not in or adjacent to metropolitan areas.
§ The c-statistic is a measure of goodness of fit for binary outcomes and ranges from 0.5 to 1.0.

Discussion

Several important findings emerge from these analyses. Large differences in self-reported physical health exist among working-aged adults in the United States along the rural-urban continuum. Residents of medium/small urban, metro-adjacent rural, and remote rural counties are significantly more likely to self-rate their physical health as fair/poor than are residents of large urban counties. Given that self-rated health has been determined to be strongly associated with chronic health conditions and premature mortality, the limited city and rural disadvantage portends broader consequences for population health disparities. Recent studies report a large and growing rural mortality penalty (i.e., the long running trend of higher mortality rates in rural areas compared with those in urban areas) (*5*). A recent report from the National Academies of Sciences, Engineering, and Medicine (*6*) found that recent working-aged mortality increases have been most pronounced outside of large metropolitan areas. Adjusted models indicated

Summary

What is already known about this topic?

Self-rated physical health is strongly associated with morbidity and premature mortality. Decade-old studies report worse self-rated health among rural residents, but no recent reports exist on current rural-urban differences.

What is added by this report?

During 2021, working-aged adults in small/medium urban counties and rural counties reported worse physical health compared with residents of large urban counties. These differences are largely explained by differences in socioeconomic status (including lower educational attainment, household income, and probability of employment).

What are the implications for public health practice?

Policies addressing intersecting socioeconomic factors, including those that increase access to livable wage jobs, especially for those without a college degree, likely would reduce rural-urban health disparities.

that socioeconomic factors (e.g., lower education, lower income, lower rates of health insurance coverage, and lower levels of employment) account for much of the remote rural disadvantage in self-reported health. These findings are consistent with fundamental cause theory, wherein socioeconomic status affects disease outcomes through multiple risk pathways over time (*7*) and align with previous work illustrating a rural disadvantage in self-rated health that is in part tied to rural-urban differences in sociodemographic characteristics (*3*,*4*). The persistent metro-adjacent rural disadvantage might speak to the fact that counties in this category are more likely to be located in the South where a myriad of macro and structural factors produce worse health outcomes (e.g., lower access to care and higher place-level poverty rates) (*8*).

The findings in this report are subject to at least three limitations. First, the data are cross-sectional, and causality should not be inferred. Second, the data were collected approximately 1 year into the COVID-19 pandemic. Reports of self-rated physical health might have been affected by pandemic-related impacts. The models control for respondents' self-perceived impact of the pandemic on their lives, but the findings should be viewed in the context of this enduring public health disruption. Finally, the sample is based on an opt-in web panel. Pew Research Center recently compared survey response estimates on 406 survey items for mail versus Internet-based responses and found that estimates differed by ≥5 percentage points on only nine items, all having to do with Internet access. Their report concluded that coverage bias associated with web surveys is modest for most kinds of measures (*9*).

A large body of research demonstrates that multiple factors are responsible for the worse rural health profile in the United States, suggesting that multiple policy strategies will be needed to address these disparities (*5*,*6*). Policies focused on reducing socioeconomic disparities, such as increasing the availability of livable wage jobs, especially for persons without a college degree, likely would address poor health outcomes in rural areas.

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Association Between Social Vulnerability and Rates of HIV Diagnoses Among Black Adults, by Selected Characteristics and Region of Residence — United States, 2018

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During 2018, Black or African American (Black) persons accounted for 43% of all new diagnoses of HIV infection in the United States (*1*). The annual diagnosis rate (39.2 per 100,000 persons) among Black persons was four times the rate among all other racial/ethnic groups combined, indicating a profound disparity in HIV diagnoses (*1*,*2*). Community-level social and structural factors, such as social vulnerability, might help explain the higher rate of HIV diagnoses among Black persons. Social vulnerability refers to the potential negative health effects on communities caused by external stresses (*3*). CDC used National HIV Surveillance System (NHSS)* and Social Vulnerability Index (SVI)† data to examine the association between diagnosed HIV infections and social vulnerability among Black adults aged ≥18 years. Black adults in communities in the highest quartile of SVI were 1.5 times (rate ratio [RR] = 1.5; 95% CI = 1.4–1.6) as likely to receive a diagnosis of HIV infection as were those in communities in the lowest quartile. Because of a history of racial discrimination and residential segregation, some Black persons in the United States reside in communities with the highest social vulnerability (*4*,*5*), and this finding is associated with experiencing increased risk for HIV infection. The development and prioritization of interventions that address social determinants of health (i.e., the conditions in which persons are born, grow, live, work, and age), are critical to address the higher risk for HIV infection among Black adults living in communities with high levels of social vulnerability. Such interventions might help prevent HIV transmission and reduce disparities among Black adults.

Data on diagnoses of HIV infection among Black adults and reported to CDC through December 2019 were obtained from NHSS. Cases were geocoded to the U.S. Census Bureau tract level based on a person's residential address at the time of diagnosis. Census tract level social vulnerability data were obtained from the 2018 CDC SVI, which was developed to identify communities with the most potential needs (i.e., highest social vulnerability), before, during, and after public health events. Scores for overall SVI were generated using 15 population-based measures§ and were presented as percentile rankings by census tract, with higher scores indicating more vulnerability. SVI scores ranged from 0 to 1 and were categorized as quartiles based on their distribution among all U.S. Census tracts.

NHSS data for Black adults with HIV diagnosed during 2018 were linked with SVI data. Data were analyzed by sex at birth with stratifications by age group and region of residence¶ at time of diagnosis to assess differences in HIV diagnosis rates by SVI quartile. HIV diagnosis rates were calculated per 100,000 persons. RRs with 95% CIs were calculated comparing communities with the lowest SVI scores (Quartile 1) to those with the highest scores (Quartile 4) by sex at birth for age group and region of residence. Rates were considered significantly different if the 95% CIs of RRs excluded 1. Differences in numbers of diagnoses across the quartiles were analyzed by sex at birth and transmission category (i.e., male-to-male sexual contact, injection drug use, and heterosexual contact.) Rates and RRs were not calculated for transmission categories because of lack of population data. Data were statistically adjusted using multiple imputation techniques to account for missing HIV transmission categories (*6*). Analyses were conducted using SAS software (version 9.4; SAS Institute, Inc). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.**

* NHSS is the primary source for monitoring HIV trends in the United States. Assisted by CDC, state and local health departments collect and report deidentified data regarding HIV infection cases to CDC.

† https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

§ The 15 population-based social factors incorporated into SVI measures were from four domains: 1) socioeconomic status (based on poverty, employment, income, and educational attainment); 2) household composition and disability (based on age [pediatric and elderly populations], civilians aged >5 years with a disability, and single-parent households); 3) racial and ethnic minority residents (i.e., do not identify as non-Hispanic or Latino White) and English proficiency (based on representation of racial and ethnic minority residents and actual proficiency); and 4) housing type and transportation (based on multiunit structures, mobile homes, crowding, no household vehicle access, and institutionalized group quarters). https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

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

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

Among the 13,807 diagnoses of HIV infection among Black adults in 2018, the number and percentage of diagnoses by SVI quartile was 1,045 (7.6%) in Quartile 1; 1,881 (13.6%) in Quartile 2; 3,423 (24.8%) in Quartile 3; and 7,205 (52.2%) in Quartile 4 (Table); SVI scores were missing for 253 persons (1.8%). Black adults in Quartile 4 (rate = 52.1) were 1.5 times (RR = 1.5) as likely to receive a diagnosis of HIV infection compared with those in Quartile 1 (rate = 33.7). In addition, for all within-group comparisons (except for Black persons aged ≥55 years and Black females in the Midwest) there was a higher likelihood of HIV diagnosis in Quartile 4 compared with Quartile 1. Among Black males, the highest disparities in HIV diagnosis rates (i.e., approximately twice as likely in Quartile 4 compared with Quartile 1) were for males aged 45–54 years (RR = 2.3), residing in the Northeast (RR = 2.3) or the West (RR = 2.1). Among males with HIV attributed to male-to-male sexual contact and injection drug use, the number of diagnoses among males in Quartile 4 was 11.6 times

TABLE. Associations between new diagnoses of HIV infection among Black adults and Social Vulnerability Index* of Census tract, by selected characteristics — United States, 2018

Characteristic	Total no. (column %)	Quartile 1 (lowest vulnerability)		Quartile 2		Quartile 3		Quartile 4 (highest vulnerability)		Quartile 4 versus Quartile 1
		No. (row %)	Rate	No. (row %)	Rate	No. (row %)	Rate	No. (row %)	Rate	RR† (95% CI)
Male (sex at birth)										
Age group at diagnosis, yrs										
18–24	2,950 (28.9)	221 (7.5)	95.8	406 (13.8)	100.4	773 (26.2)	115.4	1,477 (50.1)	145.3	1.5 (1.3–1.7)
25–34	3,985 (39.0)	315 (7.9)	108.2	591 (14.8)	114.2	1,026 (25.7)	120.3	1,998 (50.1)	153.6	1.4 (1.3–1.6)
35–44	1,494 (14.6)	133 (8.9)	44.8	205 (13.7)	45.4	384 (25.7)	54.8	746 (49.9)	72.8	1.6 (1.3–2.0)
45–54	1,010 (9.9)	68 (6.7)	22.5	144 (14.3)	32.5	229 (22.7)	33.7	545 (54.0)	51.8	2.3 (1.8–3.0)
≥55	769 (7.5)	75 (9.8)	18.7	91 (11.8)	14.1	171 (22.2)	16.0	422 (54.9)	22.9	1.2 (1.0–1.6)
Transmission category§										
Male-to-male sexual contact	8,140 (79.7)	674 (8.3)	—	1,158 (14.2)	—	2,113 (26.0)	—	4,039 (49.6)	—	—
Injection drug use	335 (3.3)	20 (6.1)	—	39 (11.7)	—	78 (23.4)	—	189 (56.4)	—	—
Male-to-male sexual contact and injection drug use	215 (2.1)	10 (4.8)	—	35 (16.1)	—	48 (22.3)	—	116 (53.9)	—	—
Heterosexual contact	1,510 (14.8)	107 (7.1)	—	204 (13.5)	—	341 (22.6)	—	840 (55.6)	—	—
Other	9 (0.1)	0 (3.5)	—	1 (14.0)	—	3 (30.2)	—	5 (52.3)	—	—
Region of residence										
Northeast	1,460 (14.3)	75 (5.1)	34.3	169 (11.6)	44.9	324 (22.2)	52.0	876 (60.0)	79.0	2.3 (1.8–2.9)
Midwest	1,539 (15.1)	120 (7.8)	42.6	211 (13.7)	54.4	385 (25.0)	58.0	804 (52.2)	74.2	1.7 (1.4–2.1)
South	6,351 (62.2)	556 (8.8)	64.3	940 (14.8)	66.5	1,659 (26.1)	71.7	3,056 (48.1)	87.4	1.4 (1.2–1.5)
West	858 (8.4)	61 (7.1)	38.8	117 (13.6)	41.5	215 (25.1)	57.6	452 (52.7)	81.8	2.1 (1.6–2.8)
Subtotal	**10,208 (100)**	**812 (8)**	**53.3**	**1,437 (14.1)**	**58.4**	**2,583 (25.3)**	**65.0**	**5,188 (50.8)**	**83.1**	**1.6 (1.4–1.7)**
Female (sex at birth)										
Age group at diagnosis, yrs										
18–24	478 (13.3)	27 (5.6)	13.4	59 (12.3)	15.8	101 (21.1)	15.9	284 (59.4)	27.1	2.0 (1.4–3.0)
25–34	946 (26.3)	65 (6.9)	23.2	100 (10.6)	19.6	204 (21.6)	24.1	557 (58.9)	37.0	1.6 (1.2–2.1)
35–44	866 (24.1)	48 (5.5)	15.6	112 (12.9)	22.8	227 (26.2)	30.0	465 (53.7)	37.6	2.4 (1.8–3.3)
45–54	689 (19.1)	48 (7.0)	15.2	88 (12.8)	18.1	160 (23.2)	20.8	381 (55.3)	30.4	2.0 (1.5–2.7)
≥55	620 (17.2)	45 (7.3)	9.6	85 (13.7)	10.4	148 (23.9)	10.5	330 (53.2)	13.0	1.4 (1.0–1.8)
Transmission category§										
Injection drug use	264 (7.3)	13 (4.9)	—	32 (12.2)	—	56 (21.0)	—	160 (60.8)	—	—
Heterosexual contact	3,315 (92.1)	218 (6.6)	—	409 (12.3)	—	780 (23.5)	—	1,847 (55.7)	—	—
Other	20 (0.6)	2 (10.9)	—	3 (13.9)	—	5 (24.4)	—	10 (49.3)	—	—
Region of residence										
Northeast	630 (17.5)	25 (4.0)	11.9	86 (13.7)	21.3	133 (21.1)	18.9	383 (60.8)	27.0	2.3 (1.5–3.4)
Midwest	440 (12.2)	44 (10.0)	16.2	41 (9.3)	10.0	103 (23.4)	14.4	243 (55.2)	18.0	1.1 (0.8–1.5)
South	2,251 (62.5)	147 (6.5)	15.4	278 (12.4)	17.3	530 (23.5)	20.0	1,248 (55.4)	29.6	1.9 (1.6–2.3)
West	278 (7.7)	17 (6.1)	12.5	39 (14.0)	15.2	74 (26.6)	21.1	143 (51.4)	23.8	1.9 (1.1–3.1)
Subtotal	**3,599 (100)**	**233 (6.5)**	**14.8**	**444 (12.3)**	**16.6**	**840 (23.3)**	**19.0**	**2,017 (56.0)**	**26.6**	**1.8 (1.6–2.1)**
Total¶	**13,807 (100)**	**1,045 (7.6)**	**33.7**	**1,881 (13.6)**	**36.6**	**3,423 (24.8)**	**40.8**	**7,205 (52.2)**	**52.1**	**1.5 (1.4–1.6)**

Abbreviations: RR = rate ratio; SVI = Social Vulnerability Index.

* SVI scores represent percentile rankings by Census tract, ranging from 0–1, with higher scores indicating more vulnerability. Scores were categorized into quartiles based on distribution among all U.S. Census tracts. https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

† Two rates are statistically different if the 95% CI does not include 1.0.

§ Numbers have been adjusted for missing transmission category and rounded to integers. Rates and RRs for transmission categories were not calculated because of lack of population data.

¶ Total includes 253 cases without SVI rankings.

the number in Quartile 1. Among Black females, the highest disparities in HIV diagnosis rates (i.e., at least twice as likely in Quartile 4 compared with Quartile 1) were for females aged 18–24 years (RR = 2.0), 35–44 years (RR = 2.4), 45–54 years (RR = 2.0) and those residing in the Northeast (RR = 2.3). Among females with HIV infection attributed to injection drug use, the number of diagnoses in Quartile 4 was 12.3 times the number in Quartile 1.

Discussion

During 2018, the rate of new HIV diagnoses per 100,000 population among Black adults was higher in communities with the highest SVI (Quartile 4; 52.1) than in communities with the lowest SVI (Quartile 1; 33.7). Approximately one half (52.2%) of Black adults with newly diagnosed HIV infection resided in the most socially vulnerable census tracts, which are often racially segregated communities comprising predominately Black persons (*5*,*7*). The social and economic marginalization of Black persons, including residential segregation, is correlated with factors associated with higher social vulnerability and higher rates of HIV diagnosis (*7*). Residential segregation contributes to higher rates of HIV diagnosis and poor health outcomes among Black persons because isolation limits access to important resources and affects neighborhood quality; populations residing in lower-income and relatively more isolated areas experience vulnerability to negative health outcomes, including HIV infection (*5*,*7*,*8*). In addition, persons lacking basic economic and social support in communities with higher social vulnerability are more likely to be overwhelmed by routine life demands (e.g., addressing issues with unstable housing or unable to take time off from minimum-wage job because of lack of paid leave (*9*). Although social vulnerability does not explain all the disparity in HIV diagnosis (*5*), Black adults in communities with the highest social vulnerability might find it harder to obtain HIV prevention and care services because of various factors, such as poverty, limited access to health care, substance use disorder, transportation to services, housing insecurity, HIV stigma, racism, discrimination, and high rates of sexually transmitted diseases (*7*,*10*). These factors directly and indirectly affect the health of Black adults with HIV infection and those who experience risk for infection (*10*).

The findings in this report are subject to at least four limitations. First, data on diagnoses of HIV infection might not be representative of all persons with HIV because not all persons with HIV have been tested or tested at a time when the infection could be detected and diagnosed. Second, because results of anonymous and self-tests are not reported, surveillance case reports might not include all persons who received positive HIV test results. Third, testing patterns are influenced by many factors, including the extent to which testing is routinely offered to specific groups and the availability of, and access to, medical care and testing services. Finally, HIV infection might have occurred in a place other than the person's residence at the time of diagnosis.

HIV strategies, interventions, and programs that address the needs and challenges of Black adults in communities with the highest social vulnerability are needed. The development and prioritization of interventions that address social determinants of health[††] (i.e., the conditions in which persons are born, grow, live, work, and age), are critical to addressing the higher risk for HIV infection among Black adults living in communities with high levels of social vulnerability. Such interventions might help prevent HIV transmission and reduce disparities among Black adults.

Summary

What is already known about this topic?

In 2018, Black persons accounted for nearly one half of all new diagnoses of HIV infection in the United States. The annual diagnosis rate among Black persons was four times the rate among all other racial or ethnic groups combined.

What is added by this report?

Rates of new HIV diagnoses among Black adults were higher in communities with the highest social vulnerability. Approximately one half of Black adults with diagnosed HIV reside in the upper quartile of socially vulnerable U.S. Census tracts in the United States.

What are the implications for public health practice?

Intensified prevention efforts are needed to reduce HIV transmission among Black persons in communities with the highest social vulnerability.

[††] https://www.cdc.gov/socialdeterminants/docs/sdh-white-paper-2010.pdf

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COVID-19 Vaccination Coverage and Vaccine Confidence by Sexual Orientation and Gender Identity — United States, August 29–October 30, 2021

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Lesbian, gay, bisexual, and transgender (LGBT) populations have higher prevalences of health conditions associated with severe COVID-19 illness compared with non-LGBT populations (*1*). The potential for low vaccine confidence and coverage among LGBT populations is of concern because these persons historically experience challenges accessing, trusting, and receiving health care services (*2*). Data on COVID-19 vaccination among LGBT persons are limited, in part because of the lack of routine data collection on sexual orientation and gender identity at the national and state levels. During August 29–October 30, 2021, data from the National Immunization Survey Adult COVID Module (NIS-ACM) were analyzed to assess COVID-19 vaccination coverage and confidence in COVID-19 vaccines among LGBT adults aged ≥18 years. By sexual orientation, gay or lesbian adults reported higher vaccination coverage overall (85.4%) than did heterosexual adults (76.3%). By race/ethnicity, adult gay or lesbian non-Hispanic White men (94.1%) and women (88.5%), and Hispanic men (82.5%) reported higher vaccination coverage than that reported by non-Hispanic White heterosexual men (74.2%) and women (78. 6%). Among non-Hispanic Black adults, vaccination coverage was lower among gay or lesbian women (57.9%) and bisexual women (62.1%) than among heterosexual women (75.6%). Vaccination coverage was lowest among non-Hispanic Black LGBT persons across all categories of sexual orientation and gender identity. Among gay or lesbian adults and bisexual adults, vaccination coverage was lower among women (80.5% and 74.2%, respectively) than among men (88.9% and 81.7%, respectively). By gender identity, similar percentages of adults who identified as transgender or nonbinary and those who did not identify as transgender or nonbinary were vaccinated. Gay or lesbian adults and bisexual adults were more confident than were heterosexual adults in COVID-19 vaccine safety and protection; transgender or nonbinary adults were more confident in COVID-19 vaccine protection, but not safety, than were adults who did not identify as transgender or nonbinary. To prevent serious illness and death, it is important that all persons in the United States, including those in the LGBT community, stay up to date with recommended COVID-19 vaccinations.

NIS-ACM collects data from adults aged ≥18 years using a random-digit–dialed sample of cellular telephone numbers (*3*). Data collected during August 29–October 30, 2021 from 153,062 respondents were weighted to represent the noninstitutionalized U.S. adult population and to match the number of adults who received ≥1 dose* of COVID-19 vaccine as reported by jurisdictions to CDC.† The response rate was 20.9% in both September and October.§ Sexual orientation was assessed with the question, "What best describes your sexual orientation? Is it heterosexual or straight; lesbian or gay; bisexual; or something else?" Gender identity was assessed with the question, "Would you consider yourself as transgender or nonbinary?" Adults who answered "don't know" or "refused" to the sexual orientation (9,586, 6.3%) or gender identity (10,539, 6.9%) questions were excluded from the analysis.

Self-reported data on COVID-19 vaccination coverage by sociodemographic characteristics, and behavioral and social drivers of vaccination were analyzed by sexual orientation and gender identity.¶ Assessed drivers of vaccination were concerns about COVID-19, and importance of and confidence in COVID-19 vaccines. Data were stratified by male or female sex for heterosexual, gay or lesbian, and bisexual respondents. Because persons who describe themselves as nonbinary do not identify as male or female, gender identity was not stratified by male or female sex. Analyses used t-tests and 95% CIs to detect differences in percentages between groups, using a threshold of $\alpha = 0.05$ for statistical significance. Analyses

* Vaccination was defined as receipt of ≥1 dose of BNT162b2 (Pfizer-BioNTech), mRNA-1273 (Moderna), or other COVID-19 vaccine, or 1 dose of Ad.26.COV2.S (Janssen [Johnson & Johnson]) COVID-19 vaccine.

† Survey weights were calibrated to match the number of persons reported in each jurisdiction by sex and age group as of mid-month, as reported by jurisdictions to CDC.

§ Response rate was calculated according to the American Association for Public Opinion Research type 3 response rate. https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf

¶ Survey respondents were asked a series of questions on perceived COVID-19 risk, current COVID-19 vaccination status, and attitudes and perceived barriers to getting vaccinated (https://www.cdc.gov/vaccines/imz-managers/nis/downloads/NIS-ACM-Questionnaire-Q2-2021_508.pdf). These questions are based on the Behavioral and Social Drivers framework for increasing vaccine confidence. https://www.cdc.gov/vaccines/covid-19/downloads/vaccination-strategies.pdf.

were performed using SAS (version 9.4; SAS Institute) and SUDAAN (version 11.0.3; RTI International). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.**

Among 143,476 survey respondents with nonmissing responses to the sexual orientation question, 3,941 (2.7%) identified as gay or lesbian and 4,395 (3.1%) as bisexual; of the 142,523 survey respondents with nonmissing responses to the gender identity question, 5,594 (3.9%) identified as transgender or nonbinary. Receipt of ≥1 dose of a COVID-19 vaccine was higher among gay or lesbian adults (85.4%) than among heterosexual (76.3%; $p<0.05$) or bisexual (76.3%) adults (Table 1). Among gay or lesbian adults and bisexual adults, a higher percentage of men (88.9% and 81.7%, respectively) than women (80.5% and 74.2%, respectively) reported receiving ≥1 COVID-19 vaccine dose (Table 2). The percentage of transgender or nonbinary adults who reported receiving ≥1 dose of COVID-19 vaccine (75.7%) was statistically similar to that among adults who did not identify as transgender or nonbinary (76.7%).

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

Among non-Hispanic White adults, the percentage who reported receiving ≥1 COVID-19 vaccine dose was higher among gay or lesbian adults (91.7%) than among heterosexual adults (76.5%), higher among gay men (94.1%) and bisexual men (81.4%) than among heterosexual men (74.2%), and higher among gay or lesbian women (88.5%) than among heterosexual women (78.6%) (all $p<0.05$). The percentage of non-Hispanic White bisexual women who reported receiving ≥1 COVID-19 vaccine dose (74.6%) was lower than that among heterosexual women ($p<0.05$). Among Hispanic adults, the percentage who reported receiving ≥1 COVID-19 vaccine dose was higher among gay men (82.9%) than among heterosexual men (72.0%; $p<0.05$). Among non-Hispanic Black adults, coverage was lower among gay or lesbian women (57.9%) and bisexual women (62.1%) than among heterosexual women (75.6%) ($p<0.05$). Receipt of ≥1 COVID-19 vaccine dose was highest among non-Hispanic White gay men (94.1%) and lowest among non-Hispanic Black gay or lesbian women (57.9%). There were no statistically significant differences by race/ethnicity among adults who identified as transgender or nonbinary compared with those who did not identify as transgender or nonbinary.

TABLE 1. COVID–19 vaccination status and intent, by sex, gender identity, sexual orientation, and race/ethnicity — National Immunization Survey Adult COVID Module, United States, August 29–October 30, 2021

		% (95% CI)*				
		Vaccinated (n= 131,215)		Unvaccinated (n = 21,176)		
Characteristic	Unweighted no.	≥1 dose	Fully vaccinated†	Definitely plan to get vaccinated	Probably will get vaccinated or unsure	Probably or definitely will not get vaccinated
Sex						
Male (Ref)	74,387	74.5 (73.8–75.2)	71.5 (70.7–72.2)	2.3 (2.1–2.6)	8.0 (7.5–8.4)	15.2 (14.6–15.8)
Female	77,372	78.8 (78.2–79.4)§	76.1 (75.5–76.7)§	2.0 (1.8–2.3)	7.0 (6.6–7.4)§	12.2 (11.7–12.7)§
Transgender or nonbinary						
No (Ref)	136,929	76.7 (76.2–77.2)	73.9 (73.4–74.4)§	2.1 (2.0–2.3)	7.4 (7.1–7.7)	13.8 (13.4–14.2)
Yes	5,594	75.7 (73.3–78.0)	71.4 (68.8–73.8)	2.8 (2.0–3.8)	8.0 (6.7–9.6)	13.5 (11.7–15.5)
Sexual orientation						
Heterosexual/Straight (Ref)	132,608	76.3 (75.8–76.8)	73.5 (73.0–74.0)	2.1 (1.9–2.3)	7.4 (7.1–7.7)	14.2 (13.8–14.6)
Gay or lesbian	3,941	85.4 (82.5–87.8)§	83.1 (80.2–85.6)§	1.5 (0.9–2.5)	4.9 (3.5–7.0)§	8.2 (6.3–10.5)§
Bisexual	4,395	76.3 (73.6–78.9)	72.6 (69.8–75.2)	4.1 (3.0–5.6)§	9.4 (7.6–11.7)	10.2 (8.6–12.1)§
Something else	2,532	75.3 (71.7–78.7)	71.9 (68.2–75.4)	4.2 (2.7–6.5)§	8.6 (6.6–11.0)	11.9 (9.5–15.0)
Race/Ethnicity						
White, non-Hispanic (Ref)	96,923	76.9 (76.3–77.5)	74.5 (73.9–75.1)	1.8 (1.6–2.0)	6.4 (6.1–6.8)	14.9 (14.4–15.4)
Black, non-Hispanic	17,159	74.1 (72.7–75.5)§	69.7 (68.3–71.1)§	3.2 (2.7–3.8)§	10.9 (10.0–11.9)§	11.8 (10.7–12.9)§
Hispanic	19,344	76.4 (75.1–77.6)	72.5 (71.2–73.8)§	3.1 (2.6–3.7)§	9.1 (8.3–10.0)§	11.4 (10.5–12.4)§
Other, non-Hispanic	15,037	80.1 (78.6–81.6)§	78.0 (76.5–79.5)§	1.8 (1.3–2.3)	6.5 (5.6–7.5)	11.6 (10.4–12.9)§

Abbreviation: Ref = referent group.
* Weighted estimate.
† Respondents self-reported receipt of ≥2 doses of BNT162b2 (Pfizer-BioNTech), mRNA-1273 (Moderna), or other COVID-19 vaccine, or 1 dose of Ad.26.COV2.S (Janssen [Johnson & Johnson]) COVID-19 vaccine.
§ Compared with ref, $p<0.05$.

TABLE 2. COVID-19 vaccination (≥1 dose) coverage, by demographic characteristics stratified by sexual orientation, gender identity, and sex — National Immunization Survey Adult COVID Module, United States, August 29–October 30, 2021

	% (95% CI)*											
	Sexual orientation										Gender identity	
	Heterosexual/Straight			Gay or lesbian			Bisexual			Something else	Not transgender or nonbinary	Transgender or nonbinary
Characteristic	Overall	Men	Women	Overall	Men	Women	Overall	Men	Women	Total		
Total	**76.3 (75.8–76.8)**	**73.8 (73.0–74.5)**	**78.9 (78.2–79.6)**	**85.4 (82.5–87.8)**	**88.9 (85.2–91.8)**	**80.5 (75.6–84.5)**	**76.3 (73.6–78.9)**	**81.7 (76.6–85.9)**	**74.2 (70.8–77.3)**	**75.3 (71.7–78.7)**	**76.7 (76.2–77.2)**	**75.7 (73.3–78.0)**
Race/Ethnicity												
White, non-Hispanic	76.5 (75.8–77.1)	74.2 (73.3–75.1)	78.6 (77.7–79.5)	91.7 (89.1–93.8)	94.1 (90.9–96.2)	88.5 (83.4–92.1)	76.4 (73.0–79.5)	81.4 (74.3–86.9)	74.6 (70.6–78.2)	78.8 (73.7–83.1)	76.9 (76.3–77.5)	77.5 (74.1–80.6)
Black, non-Hispanic	74.2 (72.7–75.6)	72.5 (70.3–74.6)	75.6 (73.6–77.4)	66.8 (54.9–76.9)	76.6 (58.3–88.5)	57.9 (41.9–72.3)	68.6 (59.6–76.3)	79.8 (62.9–90.3)	62.1 (51.2–71.9)	77.9 (68.2–85.3)	74.0 (72.5–75.4)	69.3 (63.2–74.7)
Hispanic	76.1 (74.6–77.4)	72.0 (69.9–74.0)	80.5 (78.6–82.3)	79.6 (71.7–85.8)	82.9 (71.1–90.6)	72.6 (60.3–82.3)	80.4 (74.1–85.4)	82.4 (70.8–90.0)	79.5 (71.7–85.6)	71.2 (61.9–79.0)	76.3 (74.8–77.6)	78.1 (72.5–82.8)
Other, non-Hispanic	80.3 (78.6–81.9)	76.9 (74.4–79.3)	84.4 (82.3–86.2)	80.7 (70.1–88.1)	80.1 (64.5–90.0)	81.2 (65.0–91.0)	75.6 (63.2–84.7)	83.3 (62.5–93.7)	73.0 (57.2–84.6)	74.5 (64.7–82.3)	80.6 (79.0–82.1)	74.7 (66.4–81.5)
Household income												
Below poverty†	64.6 (62.7–66.3)	64.6 (61.9–67.3)	64.4 (62.0–66.8)	74.3 (62.4–83.5)	77.7 (61.1–88.6)	70.2 (51.7–83.9)	60.1 (52.6–67.1)	63.4 (48.6–76.1)	58.7 (49.9–67.0)	68.0 (59.6–75.4)	63.9 (62.1–65.7)	65.3 (58.7–71.4)
Above poverty, <$75,000	74.7 (73.8–75.6)	72.0 (70.7–73.3)	77.2 (76.0–78.4)	82.9 (77.8–87.0)	87.7 (80.5–92.5)	76.0 (68.0–82.5)	77.7 (73.4–81.5)	83.9 (76.2–89.5)	75.3 (69.9–80.0)	74.5 (68.0–80.0)	74.9 (74.0–75.8)	78.2 (74.4–81.5)
Above poverty, ≥$75,000	82.7 (82.0–83.4)	79.1 (78.0–80.2)	86.8 (85.9–87.8)	94.3 (91.8–96.0)	96.3 (94.2–97.6)	91.3 (85.4–95.0)	90.3 (86.6–93.1)	94.5 (89.3–97.3)	88.8 (83.8–92.3)	85.2 (77.1–90.8)	83.5 (82.8–84.2)	80.0 (74.7–84.4)
Unknown income	73.9 (72.8–75.1)	70.8 (69.1–72.5)	76.9 (75.3–78.4)	77.4 (67.6–84.8)	78.5 (63.8–88.3)	75.1 (60.4–85.7)	71.0 (63.9–77.1)	79.3 (66.7–88.0)	67.8 (59.3–75.3)	75.7 (68.0–82.0)	74.1 (73.0–75.2)	74.8 (69.5–79.4)
U.S. Census region												
Northeast	84.7 (83.9–85.5)	82.2 (80.9–83.5)	87.1 (85.9–88.2)	88.5 (82.1–92.9)	95.3 (87.6–98.3)	78.4 (66.3–87.0)	84.4 (79.0–88.5)	88.6 (79.2–94.1)	82.2 (75.3–87.5)	78.8 (71.4–84.6)	84.7 (83.8–85.5)	83.7 (79.3–87.3)
Midwest	70.7 (69.4–72.0)	68.0 (66.1–69.8)	73.4 (71.6–75.2)	83.0 (74.6–89.0)	83.5 (70.4–91.5)	82.1 (70.9–89.6)	74.1 (67.1–80.1)	92.5 (85.9–96.2)	68.2 (59.7–75.7)	68.9 (59.4–77.0)	71.0 (69.8–72.3)	73.5 (67.8–78.5)
South	72.6 (71.8–73.4)	69.8 (68.6–70.9)	75.4 (74.3–76.5)	80.2 (74.9–84.6)	85.7 (79.3–90.4)	72.1 (62.7–79.8)	69.8 (64.7–74.4)	71.9 (61.5–80.4)	69.0 (63.0–74.3)	76.4 (70.8–81.1)	72.9 (72.1–73.6)	71.2 (67.1–74.9)
West	80.7 (79.6–81.7)	78.5 (77.0–80.0)	83.0 (81.5–84.4)	92.0 (87.4–95.0)	92.5 (84.7–96.5)	91.6 (85.3–95.3)	82.0 (77.5–85.8)	84.0 (74.4–90.4)	81.2 (75.8–85.6)	74.9 (65.7–82.4)	81.2 (80.2–82.2)	79.3 (73.7–84.0)
Urbanicity§												
MSA, principal city	78.3 (77.4–79.1)	76.6 (75.3–77.8)	79.9 (78.7–81.1)	86.8 (82.8–90.0)	92.2 (88.0–95.0)	77.2 (69.1–83.7)	80.1 (76.1–83.7)	88.3 (82.0–92.6)	76.6 (71.3–81.1)	80.7 (75.0–85.4)	79.0 (78.1–79.8)	73.9 (69.5–77.8)
MSA, nonprincipal city	77.8 (77.1–78.4)	74.9 (73.9–75.9)	80.6 (79.7–81.5)	85.3 (80.5–89.1)	87.9 (80.8–92.6)	82.4 (75.0–87.9)	76.6 (72.7–80.1)	77.7 (69.0–84.5)	76.2 (71.7–80.2)	73.6 (68.3–78.3)	77.9 (77.2–78.5)	79.0 (75.7–82.0)
Non-MSA	66.6 (65.2–67.9)	63.3 (61.3–65.3)	69.9 (68.0–71.7)	77.9 (67.2–85.9)	72.9 (55.3–85.4)	84.2 (74.9–90.6)	61.6 (51.9–70.4)	73.0 (56.7–84.8)	58.1 (46.8–68.7)	64.6 (53.3–74.5)	66.4 (65.1–67.8)	68.3 (62.0–73.9)
SVI¶												
Low SVI	79.3 (78.4–80.2)	76.9 (75.6–78.2)	81.6 (80.4–82.8)	89.3 (84.4–92.8)	92.2 (85.7–95.9)	85.7 (77.0–91.4)	79.5 (74.0–84.2)	87.4 (78.3–93.0)	76.7 (69.6–82.5)	78.7 (70.9–84.8)	79.7 (78.9–80.6)	79.3 (74.4–83.5)
Moderate SVI	77.6 (76.7–78.4)	75.2 (73.9–76.4)	80.0 (78.8–81.1)	87.2 (83.1–90.4)	93.7 (89.6–96.2)	78.5 (70.7–84.6)	75.9 (71.3–79.9)	76.9 (67.1–84.5)	75.4 (70.1–80.0)	75.2 (68.5–80.8)	77.9 (77.0–78.7)	77.9 (73.8–81.5)
High SVI	74.3 (73.3–75.2)	71.9 (70.5–73.3)	76.5 (75.2–77.8)	83.7 (77.5–88.5)	86.3 (78.1–91.7)	79.2 (68.2–87.1)	75.8 (70.7–80.3)	85.6 (77.9–90.9)	72.3 (66.0–77.9)	73.9 (66.6–80.0)	74.7 (73.7–75.6)	74.2 (69.5–78.3)

Abbreviations: MSA = metropolitan statistical area; SVI = Social Vulnerability Index.
* Weighted estimate.
† Poverty was derived based on the number of persons reported in the household, the reported household income, and the 2020 U.S. Census poverty thresholds.
§ Urbanicity status was derived based on the centroid of the zip code of residence, categorized as MSA principal city, MSA non-principal city, or non-MSA.
¶ SVI was categorized as low, moderate, or high based on county of residence using tertiles of SVI score as cut-points. https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

By urbanicity,†† among adults residing in a Metropolitan Statistical Area (MSA) principal city, ≥1-dose vaccination coverage was higher among gay men (92.2%) and bisexual men (88.3%) than among heterosexual men (76.6%); a lower percentage of persons who identified as transgender or nonbinary (73.9%) reported receiving ≥1 dose compared with persons who did not identify as transgender or nonbinary (79.0%) (all $p<0.05$). Among adults residing in an MSA nonprincipal city, the percentage of gay men who reported receiving ≥1 dose (87.9%) was higher than that among heterosexual men

†† Urbanicity status was derived based on the centroid of the zip code of residence, categorized as MSA principal city, MSA nonprincipal city, or non-MSA. An MSA is defined by the U.S. Office of Management and Budget (OMB) as consisting of "at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties." MSAs are geographically delineated by groupings of neighboring counties and can cross state boundaries; names are assigned by OMB based on the names of one to three principal cities or places within each MSA. https://www.census.gov/topics/housing/housing-patterns/about/core-based-statistical-areas.html

(74.9%); among bisexual women, ≥1-dose coverage (76.2%) was lower than that among heterosexual women (80.6%) (all p<0.05). For adults living in a non-MSA, coverage was higher among gay or lesbian women (84.2%) and lower among bisexual women (58.1%) than among heterosexual women (69.9%) (all p<0.05).

Among both vaccinated and unvaccinated respondents, a higher percentage of gay or lesbian adults and bisexual adults reported they were very or moderately concerned about COVID-19 (56.8% and 51.3%, respectively) than were heterosexual adults (48.1%) (all p<0.05) (Table 3). Higher percentages of gay and bisexual men reported they were completely confident or very confident in vaccine safety (82.4% and 76.3%, respectively) than were heterosexual men (63.2%), as were bisexual women (68.1%) compared with heterosexual women (64.5%) (all p<0.05). Higher percentages of gay or lesbian adults and bisexual adults reported that they thought COVID-19 vaccine was very or somewhat important to protect oneself (90.8% and 86.8%, respectively) compared with heterosexual adults (80.4%), and higher percentages of adults who identified as transgender or nonbinary reported they thought COVID-19 vaccine was very or somewhat important to protect oneself (83.2%) compared with those who did not identify as transgender or nonbinary (80.7%) (all p<0.05).

Discussion

In this assessment of self-reported COVID-19 vaccination coverage and beliefs about COVID-19 vaccines among NIS-ACM survey respondents, receipt of ≥1 COVID-19 vaccine

TABLE 3. Behavioral and social drivers of COVID-19 vaccination, by sexual orientation and gender identity — National Immunization Survey Adult COVID Module, United States, August 29–October 30, 2021

	% (95% CI)*						
		Sexual orientation				Gender identity	
Central attitudes and experiences	Overall	Heterosexual/ Straight	Gay or lesbian	Bisexual	Something else	Not transgender or nonbinary	Transgender or nonbinary
Total	**153,062**	**132,608**	**3,941**	**4,395**	**2,532**	**136,929**	**5,594**
Concerned about COVID–19 (very or moderately)	48.5 (48.0–49.0)	48.1 (47.6–48.7)	56.8 (53.5–60.0)†	51.3 (48.5–54.1)†	52.8 (48.9–56.6)†	48.4 (47.9–49.0)	49.4 (46.8–52.0)
Male	42.6 (41.9–43.4)	42.2 (41.5–43.0)	55.0 (50.8–59.3)†	42.0 (37.1–47.1)	45.3 (39.4–51.4)	NA	NA
Female	53.9 (53.2–54.6)	54.0 (53.2–54.7)	59.1 (53.9–64.2)†	54.9 (51.6–58.3)	57.8 (52.8–62.6)	NA	NA
Confidence in vaccine safety (completely or very)	64.4 (63.8–64.9)	63.9 (63.3–64.4)	76.3 (73.1–79.3)†	70.4 (67.6–73.1)†	69.3 (65.5–72.8)†	64.7 (64.2–65.2)	62.8 (60.2–65.4)
Male	64.1 (63.4–64.9)	63.2 (62.4–64.0)	82.4 (78.3–85.9)†	76.3 (71.0–80.8)†	72.7 (67.2–77.6)†	NA	NA
Female	64.6 (63.9–65.3)	64.5 (63.7–65.3)	67.4 (62.2–72.3)	68.1 (64.7–71.4)†	66.9 (61.8–71.7)	NA	NA
Vaccine important to protect self (very or somewhat)	80.9 (80.5–81.3)	80.4 (80.0–80.9)	90.8 (88.5–92.7)†	86.8 (84.7–88.6)†	83.5 (80.0–86.5)	80.7 (80.3–81.2)	83.2 (81.1–85.1)§
Male	77.7 (77.0–78.3)	76.9 (76.2–77.6)	92.9 (89.9–95.1)†	87.6 (82.7–91.2)†	80.8 (75.4–85.3)	NA	NA
Female	83.9 (83.4–84.5)	83.9 (83.2–84.4)	87.8 (83.9–90.9)†	86.4 (84.2–88.5)†	85.4 (80.5–89.2)	NA	NA
Had friends/family who were vaccinated (almost all or many)	70.2 (69.7–70.6)	70.0 (69.5–70.5)	76.4 (73.4–79.2)†	71.2 (68.4–73.8)	72.7 (69.1–76.0)	70.6 (70.1–71.1)	67.6 (65.1–70.1)§
Male	68.3 (67.6–69.0)	67.8 (67.1–68.6)	79.3 (75.5–82.8)†	71.5 (66.2–76.4)	71.4 (65.9–76.4)	NA	NA
Female	71.9 (71.3–72.6)	72.1 (71.4–72.8)	72.4 (67.4–76.9)	71.0 (67.7–74.1)	73.5 (68.7–77.8)	NA	NA
Difficulty getting vaccinated (very or somewhat)¶	14.9 (14.6–15.3)	14.9 (14.6–15.3)	18.9 (16.3–21.8)†	12.0 (10.4–13.8)†	16.1 (13.4–19.2)	15.1 (14.7–15.5)	13.2 (11.6–15.0)§
Health care provider recommended the vaccine	41.2 (40.7–41.7)	41.3 (40.8–41.9)	47.3 (44.1–50.6)†	38.1 (35.4–40.8)†	40.3 (36.7–44.1)	41.3 (40.8–41.8)	38.4 (35.9–40.9)§
Male	37.5 (36.8–38.2)	37.3 (36.5–38.0)	49.0 (44.7–53.3)†	34.2 (29.3–39.5)	37.2 (31.7–43.0)	NA	NA
Female	44.7 (44.0–45.4)	45.3 (44.6–46.1)	45.0 (40.0–50.1)	39.6 (36.4–42.8)†	42.5 (37.8–47.3)	NA	NA
Work or school requires the vaccine	22.6 (22.1–23.0)	22.1 (21.7–22.6)	26.4 (23.8–29.2)†	26.5 (24.2–29.0)†	29.4 (25.8–33.3)†	22.5 (22.1–23.0)	25.9 (23.6–28.2)§

Abbreviation: NA = not applicable.
* Weighted estimate.
† Compared with heterosexual persons, p<0.05.
§ Compared with persons who were not transgender or nonbinary, p<0.05.
¶ Vaccinated respondents were asked, "How difficult was it for you to get a COVID-19 vaccine?"; unvaccinated respondents were asked "How difficult would it be for you to get a COVID-19 vaccine?"

dose and vaccine confidence were higher among gay or lesbian adults than among heterosexual adults. In another large U.S. survey conducted during May–June 2021, 92% of LGBT respondents reported receiving ≥1 dose of a COVID-19 vaccine (*4*), but non-LGBT persons were not included; therefore, comparisons between LGBT and non-LGBT populations could not be made. In this assessment, disparities were also noted across subpopulations. Regardless of race or ethnicity, bisexual women were more confident in vaccine safety than were heterosexual women, and a higher percentage of gay or lesbian and bisexual women compared with heterosexual women thought COVID-19 vaccine was important to protect oneself. However, vaccination coverage was lower among non-Hispanic Black gay or lesbian and bisexual women than among non-Hispanic Black heterosexual women. Increasing availability of education about COVID-19 vaccine in local communities of color that promotes the benefits of vaccinations and provide opportunities to answer questions and receive COVID-19 vaccine might increase coverage among gay or lesbian and bisexual women.

With a higher prevalence of comorbidities that increase the risk for severe COVID-19 illness (*1*) LGBT persons might be at disproportionate risk for COVID-19 illness. Although awareness of these risks and disparities is essential for public health intervention, data on these populations are currently not widely available. Only two federally funded national surveys collect data on both sexual orientation and gender identity (*5*), with eight federally funded national surveys only collecting data on sexual orientation (*6*). Inclusion of sexual orientation and gender identity in surveys, as well as in COVID-19 testing, case reporting, and vaccination administration systems, can guide strategies to improve access to health care and prevention services among LGBT populations. This information could be used at the local level to reduce disparities in vaccination coverage among persons at highest risk for severe COVID-19–associated illness, such as non-Hispanic Black and Hispanic LGBT persons (*1*).

In addition to better characterizing the demographic characteristics of infected persons, information on sexual orientation and gender identity could potentially aid in response activities in the event of a COVID-19 outbreak among vaccinated persons. One such outbreak occurred in Barnstable County, Massachusetts in July 2021, which has a large population of LGBT residents and visitors, in which 74.0% of infections were among persons who were fully vaccinated and had traveled from 22 other states (*7*). Therefore, if the impact of an outbreak among LGBT persons is known, messaging to the LGBT community at the national level could help enhance appropriate test seeking or health care.

Summary

What is already known about this topic?

Lesbian, gay, bisexual, and transgender (LGBT) persons are at increased risk for severe COVID-19 illness because of a higher prevalence of comorbidities.

What is added by this report?

COVID-19 vaccination coverage and vaccine confidence were higher among gay or lesbian adults than among heterosexual adults and higher among gay men than gay or lesbian women. There were no significant differences in vaccination coverage among persons based on gender identity. Vaccination coverage was lowest among non-Hispanic Black LGBT persons across all categories of sexual orientation and gender identity.

What are the implications for public health practice?

To prevent serious illness and death, all persons in the United States, including those in the LGBT community, should stay up to date with recommended COVID-19 vaccinations.

The findings in this report are subject to at least six limitations. First, NIS-ACM had a low response rate (20.9% in both September and October 2021), which can increase the potential for bias if systematic differences exist between respondents and nonrespondents, even after adjusting for nonresponse. Second, COVID-19 vaccination was self-reported and is therefore subject to recall or social desirability bias. Third, receipt of ≥1 doses of COVID-19 vaccine was assessed versus receipt of all recommended COVID-19 vaccinations. Fourth, survey respondents might not have identified as one of the sexual orientation categories provided or as transgender or nonbinary, and therefore might not have selected lesbian, gay, bisexual, or transgender or nonbinary. Fifth, the survey excluded institutionalized persons and those with no access to cellular telephones; however, 97.0% of Americans own some type of cellular phone (*8*). Finally, smaller sample sizes of LGBT persons might have yielded low statistical power to detect differences by sexual orientation and gender identity in stratified analyses. To mitigate possible bias, survey weights were calibrated to COVID-19 vaccine administration data by age group and sex within jurisdictions.

To prevent serious illness, hospitalization, and death, which are more common in unvaccinated persons than in those who have been vaccinated (*9*), it is important that all persons in the United States, including those in the LGBT community, stay up to date with recommended COVID-19 vaccinations. Understanding COVID-19 vaccination coverage and confidence among LGBT populations, and identifying the conditions under which disparities exist, can help tailor local efforts to increase vaccination coverage. Identifying drivers of vaccine acceptance in populations with high vaccine coverage, such as non-Hispanic White gay men, or drivers of vaccine hesitancy in populations with low vaccine coverage, such as non-Hispanic Black gay or lesbian women, could guide strategies to increase coverage among populations with lower vaccination coverage. Adding sexual orientation and gender identity to national data collection systems would be a major step toward monitoring disparities and developing a better-informed public health strategy to achieve health equity for the LGBT population.

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SARS-CoV-2 Infection and Hospitalization Among Adults Aged ≥18 Years, by Vaccination Status, Before and During SARS-CoV-2 B.1.1.529 (Omicron) Variant Predominance — Los Angeles County, California, November 7, 2021–January 8, 2022

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COVID-19 vaccines are effective at preventing infection with SARS-CoV-2, the virus that causes COVID-19, as well as severe COVID-19–associated outcomes in real-world conditions (*1*,*2*). The risks for SARS-CoV-2 infection and COVID-19–associated hospitalization are lower among fully vaccinated than among unvaccinated persons; this reduction is even more pronounced among those who have received additional or booster doses (boosters) (*3*,*4*). Although the B.1.1.529 (Omicron) variant spreads more rapidly than did earlier SARS-CoV-2 variants, recent studies suggest that disease severity is lower for Omicron compared with that associated with the B.1.617.2 (Delta) variant; but the high volume of infections is straining the health care system more than did previous waves (*5*).[*,†] The Los Angeles County (LAC) Department of Public Health (LACDPH) used COVID-19 surveillance and California Immunization Registry 2 (CAIR2) data to describe age-adjusted 14-day cumulative incidence and hospitalization rates during November 7, 2021–January 8, 2022, by COVID-19 vaccination status and variant predominance. For the 14-day period ending December 11, 2021, the last week of Delta predominance, the incidence and hospitalization rates among unvaccinated persons were 12.3 and 83.0 times, respectively, those of fully vaccinated persons with a booster and 3.8 and 12.9 times, respectively, those of fully vaccinated persons without a booster. These rate ratios were lower during Omicron predominance (week ending January 8, 2022), with unvaccinated persons having infection and hospitalization rates 3.6 and 23.0 times, respectively, those of fully vaccinated persons with a booster and 2.0 and 5.3 times, respectively, those of fully vaccinated persons without a booster. In addition, during the entire analytic period, admission to intensive care units (ICUs), intubation for mechanical ventilation, and death were more likely to occur among unvaccinated persons than among fully vaccinated persons without or with a booster (p<0.001). Incidence and hospitalization rates were consistently highest for unvaccinated persons and lowest for fully vaccinated persons with a booster. Being up to date with COVID-19 vaccination is critical to protecting against SARS-CoV-2 infection and associated hospitalization.

LACDPH conducted a cross-sectional analysis of LAC residents aged ≥18 years with laboratory-confirmed SARS-CoV-2 infection (a positive SARS-CoV-2 result from a nucleic acid amplification or antigen test) during November 7, 2021–January 8, 2022.[§] Persons were considered fully vaccinated ≥14 days after receipt of the final dose in the primary series of a BNT162b2 (Pfizer-BioNTech), mRNA-1273 (Moderna), or Ad.26.COV2.S (Janssen [Johnson & Johnson]) vaccine and considered unvaccinated if <14 days had elapsed since receipt of the first dose in the primary series of an mRNA or Janssen vaccine or if no matching immunization record was found in CAIR2.[¶] Fully vaccinated persons who received a booster were considered fully vaccinated with a booster ≥14 days after the date of the booster.[**] Infections occurring in partially vaccinated persons (persons who had received the first dose in a 2-dose series >14 days earlier, but who were either missing a second dose or <14 days had elapsed since receipt of the second dose) were excluded because of small sample size.[††] COVID-19–associated hospitalizations were

* https://www.medrxiv.org/content/10.1101/2021.12.30.21268495v1

† https://www.medrxiv.org/content/10.1101/2022.01.07.22268919v2

§ The population of Los Angeles County residents is based on 2019 population estimates prepared for Los Angeles County Internal Services Department. These population estimates exclude the populations of Pasadena and Long Beach, which have independent public health departments.

¶ Vaccination status was determined using a deterministic and probabilistic matching algorithm to link cases with immunization records in CAIR2 and followed CDC guidelines. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html

** CDC recommends that persons aged ≥5 years who are moderately or severely immunocompromised receive a third dose of an mRNA COVID-19 vaccine 28 days after completion of the primary series to enhance the likelihood of mounting an adequate immune response. A booster is recommended for persons aged ≥12 years to protect against waning of vaccine-induced immunity. Recommendations for booster timing and vaccine manufacturer differs by age group and vaccine product received during the primary series (https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/immuno.html). This analysis does not distinguish between fully vaccinated persons who are immunocompromised and received a booster and fully vaccinated persons who are not immunocompromised and received a booster.

†† Partially vaccinated persons were those who had received the first dose in a 2-dose series ≥14 days earlier, but who were either missing a second dose or <14 days had elapsed since receipt of the second dose. Recipients of the Janssen vaccine <14 days earlier were considered unvaccinated. Partially vaccinated persons accounted for 4% of the sample (18,988). It was also not possible to differentiate between persons who received 1 dose in a 2-dose series (Pfizer-BioNTech or Moderna vaccines) and persons who were misclassified because of missing data.

defined as hospital admissions occurring ≤14 days after the first laboratory-confirmed positive SARS-CoV-2 test result (*6*). Whole genome sequencing data from laboratories conducting routine genomic surveillance for LAC were used to calculate weekly variant proportions.[§§] All available variant data were reported by date of specimen collection and used to assess periods of predominance (>50% of sequenced specimens) for the Delta and Omicron variants.

Demographic and clinical characteristics of SARS-CoV-2 infections were compared by vaccination status using Pearson's chi-square tests for categorical variables and Kruskal-Wallis tests for medians. P-values <0.05 were considered statistically significant. Age-adjusted rolling 14-day SARS-CoV-2 infection and hospitalization rates and rate ratios among LAC residents aged ≥18 years were estimated by vaccination status using 2019 population estimates and standardized using the year 2000 U.S. standard population.[¶¶] Analyses were conducted using SAS (version 9.4; SAS Institute) and R (version 3.6.2; R Foundation). This activity was determined by LACDPH's Institutional Review Board to be a surveillance activity necessary for public health work and therefore did not require Institutional Review Board review.

From mid-August 2021 until the emergence of Omicron in November 2021, nearly 100% of SARS-CoV-2 infections among LAC residents with sequenced specimens were caused by the Delta variant. The earliest known Omicron variant infection in LAC was identified in a specimen collected during the final week of November 2021. As Omicron emerged in LAC, Delta prevalence decreased 95% during the week ending December 11. Omicron became the predominant SARS-CoV-2 variant in LAC during the week ending December 18, accounting for 57% of all sequenced specimens; Omicron prevalence continued to increase, accounting for 99% of all sequenced specimens for the week ending January 8, 2022 (Supplementary Figure, https://stacks.cdc.gov/view/cdc/113859).

Among 422,966 reported SARS-CoV-2 infections in LAC residents aged ≥18 years during November 7, 2021–January 8, 2022, a total of 141,928 (33.6%) were in unvaccinated persons, 56,185 (13.3%) were in fully vaccinated persons with a booster, and 224,853 (53.2%) were in fully vaccinated persons without a booster (Table). Unvaccinated persons were most likely to be hospitalized (2.8%), admitted to an ICU (0.5%), and require intubation for mechanical ventilation (0.2%); these outcomes were less common in fully vaccinated persons with a booster (0.7%, 0.08%, and 0.03%, respectively) and fully vaccinated persons without a booster (1.0%, 0.12%, and 0.05%, respectively) (p<0.001). Deaths were also more likely to occur among unvaccinated persons (0.3%) than among fully vaccinated persons with a booster (0.07%) or without (0.08%) (p<0.001).

During the last week of Delta predominance (week ending December 11), age-adjusted 14-day cumulative incidence and hospitalization rates were highest among unvaccinated persons (443.9 and 45.9 per 100,000 persons, respectively), and lower among fully vaccinated persons with a booster (36.1 and 0.6, respectively) and fully vaccinated persons without a booster (115.9 and 3.6, respectively). As Omicron became predominant, age-adjusted incidence and hospitalization rates increased in all groups, irrespective of vaccination status, compared with rates during the Delta predominant period (Figure 1). As of January 8, 2022, age-adjusted 14-day cumulative incidence and hospitalization rates remained highest among unvaccinated persons (6,743.5 and 187.8 per 100,000, respectively), and lowest among fully vaccinated persons with a booster (1,889.0 and 8.2, respectively) and fully vaccinated persons without a booster (3,355.5 and 35.4, respectively).

Overall, during November 7, 2021–January 8, 2022, incidence and hospitalization rates were highest among unvaccinated persons. During the last week of Delta predominance, compared with fully vaccinated persons with a booster, incidence and hospitalization rates among unvaccinated persons were 12.3 and 83.0 times higher, respectively (Figure 2), and compared with rates for fully vaccinated persons without a booster, incidence and hospitalization rates among unvaccinated persons were 3.8 and 12.9 times higher, respectively. As of January 8, 2022, during Omicron predominance, these rate ratios were lower for both comparisons, with infection and hospitalization rates among unvaccinated persons 3.6 times and 23.0 times, respectively, those in fully vaccinated persons with a booster, and 2.0 and 5.3 times, respectively, those in fully vaccinated persons without a booster.

Discussion

During November 7, 2021–January 8, 2022, SARS-CoV-2 infections increased rapidly among LAC adults with the largest

§§ Whole genome sequencing lineage data were from all sequencing results reported to LACDPH or sequenced after specimens were referred to LACDPH laboratories. Additional variant data were available for specimens sequenced for enhanced Omicron variant surveillance. During the Delta predominant period, sequencing data were available for 20%–25% of SARS-CoV-2 specimens. As infections increased during the Omicron predominant period, capacity for whole genome sequencing did not increase proportionally; sequencing data were available for 1%–18% of SARS-CoV-2 specimens.

¶¶ Adjusted rates were calculated using methods documented by CDC (https://www.cdc.gov/cancer/uscs/technical_notes/stat_methods/rates.htm). A continuity correction was applied to estimates of the unvaccinated population to ensure that ≥5% of the population remains unvaccinated using the methods outlined elsewhere (https://kingcounty.gov/depts/health/covid-19/data/~/media/depts/health/communicable-diseases/documents/C19/calculation-method-technical-appendix.ashx). Adjusted rate ratios were calculated as the cumulative incidence among unvaccinated persons divided by the cumulative incidence among those fully vaccinated with or without booster.

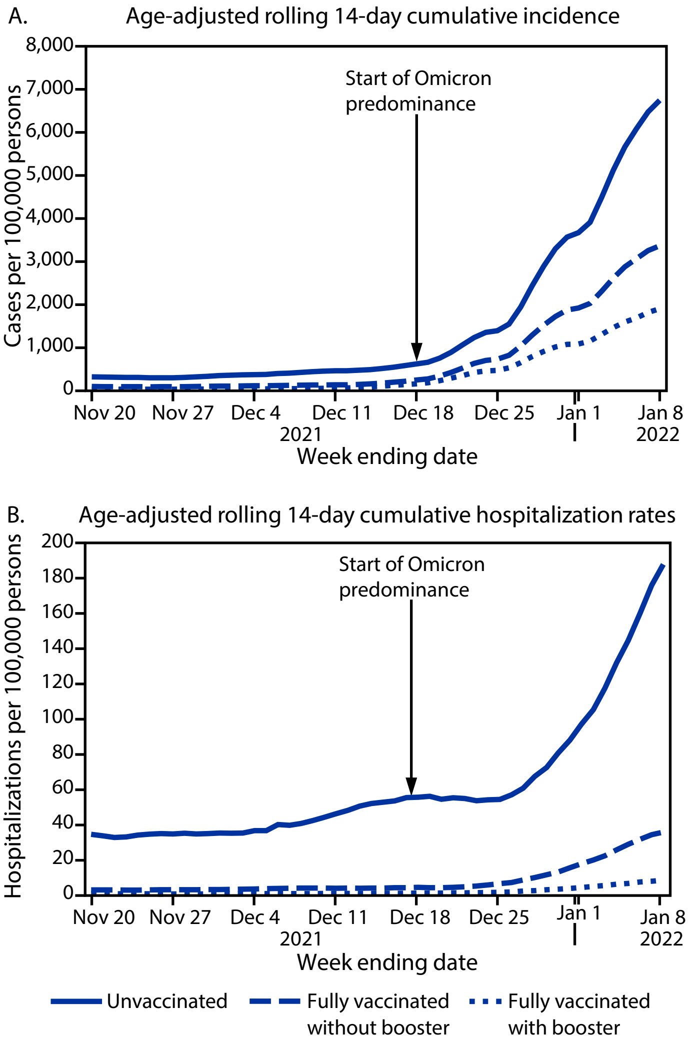
TABLE. Selected characteristics of cases of SARS-CoV-2 infection in residents aged ≥18 years (N = 422,966), by vaccination status — Los Angeles County, California, November 7, 2021–January 8, 2022*,†

Characteristic	Vaccination status, no. (column %)		
	Unvaccinated	Fully vaccinated without booster	Fully vaccinated with booster
Total no. of cases (row %)	**141,928 (33.6)**	**224,853 (53.2)**	**56,185 (13.3)**
Median age, yrs (IQR)	**35 (27–48)**	**36 (27–49)**	**46 (33–59)**
18–29	48,940 (34.5)	74,352 (33.1)	9,523 (16.9)
30–49	61,380 (43.2)	97,771 (43.5)	22,649 (40.3)
50–64	22,338 (15.7)	40,680 (18.1)	14,580 (25.9)
65–79	7,253 (5.1)	9,796 (4.4)	7,960 (14.2)
≥80	2,017 (1.4)	2,254 (1.0)	1,473 (2.6)
Sex			
Women	69,382 (48.9)	123,927 (55.1)	30,864 (54.9)
Men	66,163 (46.6)	94,258 (41.9)	23,713 (42.2)
Other or unknown	6,383 (4.5)	6,668 (3)	1,608 (2.8)
Race/Ethnicity§			
American Indian or Alaska Native	342 (0.2)	426 (0.1)	104 (0.2)
Asian	7,451 (5.2)	18,043 (8.0)	8,341 (14.8)
Black or African American	12,319 (8.7)	13,359 (5.9)	2,632 (4.6)
Hispanic or Latino	42,973 (30.3)	79,198 (35.2)	14,023 (25.0)
Multiple race	494 (0.3)	968 (0.4)	210 (0.3)
Native Hawaiian or Other Pacific Islander	1,429 (1.0)	1,740 (0.7)	608 (1.0)
Other	18,720 (13.2)	32,552 (14.5)	6,808 (12.1)
White	20,529 (14.5)	34,108 (15.2)	12,504 (22.3)
Missing	37,671 (26.5)	44,459 (19.8)	10,955 (19.5)
Previously documented SARS-CoV-2 infection	12,360 (8.7)	22,153 (9.9)	3,246 (5.8)
Hospitalized	3,989 (2.8)	2,295 (1.0)	413 (0.7)
Admitted to an intensive care unit	641 (0.5)	276 (0.12)	47 (0.08)
Required mechanical ventilation	256 (0.2)	116 (0.05)	15 (0.03)
Died	485 (0.3)	172 (0.08)	40 (0.07)
Vaccine manufacturer¶			
Johnson & Johnson	—	18,543 (8.2)	4,869 (8.7)
Moderna	—	82,435 (36.7)	19,742 (35.1)
Pfizer-BioNTech	—	123,875 (55.1)	31,574 (56.2)
Median interval between final vaccine dose and infection, days (IQR)**	—	241 (200–271)	49 (31–70)
Sequencing result available	7,087 (5.0)	9,663 (4.3)	1,296 (2.3)
Sequencing result			
Delta	3,817 (53.9)	3,471 (35.9)	128 (9.9)
Omicron	3,248 (45.8)	6,180 (64.0)	1,164 (89.8)
Other	22 (0.3)	12 (0.1)	4 (0.3)

* Partially vaccinated persons were excluded from this analysis.
† A Pearson's chi-square test was conducted for categorical variables and Kruskal-Wallis test for medians; p<0.001.
§ Race and ethnicity were defined as mutually exclusive categories. Hispanic or Latino includes all persons with ethnicity reported as "Hispanic or Latino" regardless of reported race. "Other" Race/Ethnicity includes persons of multiple races, and persons for whom reported race was "Other." Missing values were included in statistical testing.
¶ The primary vaccine series was used to categorize persons by vaccine manufacturer type regardless of which vaccine manufacturer was received for the booster dose.
** Infection date refers to the earliest of either the date of symptom onset, diagnosis, death, report received, or specimen collection.

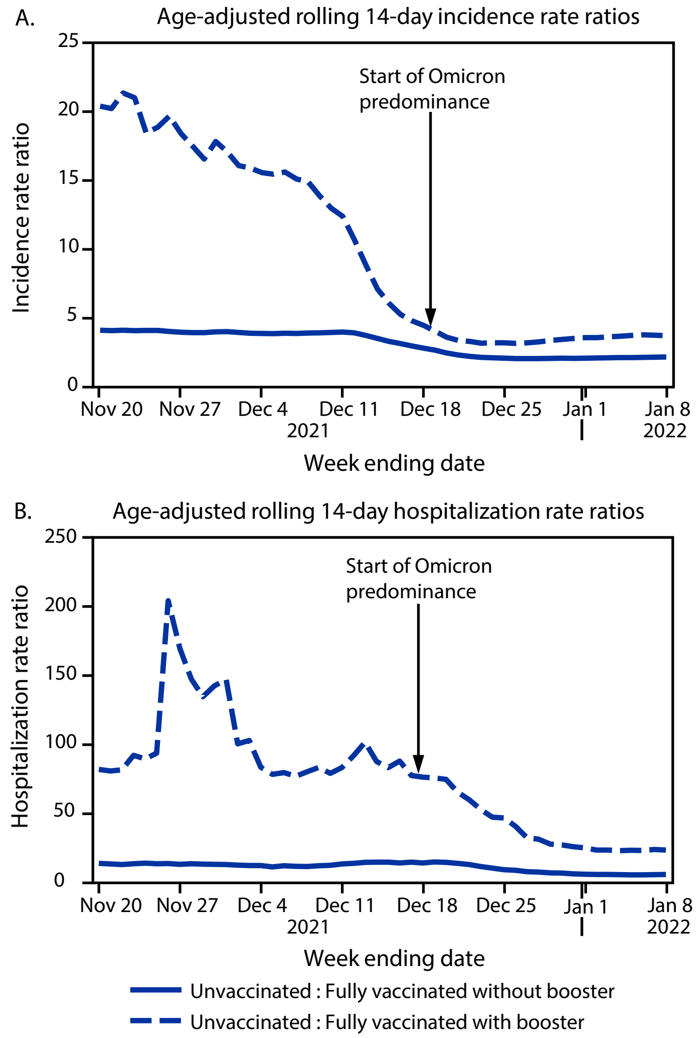
increase occurring as Omicron displaced Delta as the predominant circulating variant, leading to decreased incidence and hospitalization rate ratios among unvaccinated persons relative to vaccinated persons with and without a booster. Whereas incidence and hospitalization rates were higher during the Omicron-predominant weeks compared with those during Delta predominance, rate ratios indicated continued protection conferred by vaccine against severe disease, especially among those who had received a booster, although reduced for Omicron compared with Delta. All incidence and hospitalization rate ratios exceeded 1, regardless of predominant variant, indicating that the risks were consistently highest for unvaccinated persons and that COVID-19 vaccines were protective against SARS-CoV-2 infection and COVID-19–associated hospitalization among fully vaccinated persons, and most protective among those with a booster.

FIGURE 1. Age-adjusted rolling 14-day SARS-CoV-2 cumulative incidence* (A) and hospitalization rates (B), by vaccination status — Los Angeles County, California, November 7, 2021–January 8, 2022



* Rates were estimated using 2019 population estimates and standardized using the year 2000 standard population.

FIGURE 2. Age-adjusted rolling 14-day SARS-CoV-2–associated incidence rate ratios* (A) and hospitalization rate ratios (B), by vaccination status — Los Angeles County, California, November 7, 2021–January 8, 2022



* Rate ratios were estimated by comparing rates in unvaccinated persons with those in vaccinated persons with and without a booster dose, using 2019 population estimates and standardized using the year 2000 standard population.

Although disease severity appears to be lower for Omicron, a rapid increase in infections during Omicron predominance has resulted in a relatively substantial volume of hospitalizations (*5*). The high volume of hospitalizations during a surge can compound the effects of staffing shortages and staff member burnout, which puts a strain on the health care sector. The rise in hospitalization rates in LAC was most pronounced among unvaccinated persons, whereas hospitalization rates remained lower among those who were fully vaccinated, and lowest among those who had received a booster. Being up to date with COVID-19 vaccinations is a critical component of reducing the strain on health care facilities.

The findings in this report are subject to at least five limitations. First, vaccination data for persons who lived in LAC at the time of their laboratory-confirmed infection, but who were vaccinated outside of California, were unavailable, leading to misclassification of their vaccination status; if vaccinated persons without accessible records were considered unvaccinated, the incidence in unvaccinated persons could be underestimated. Some boosters might have been misclassified as first doses, and the persons receiving these might have been incorrectly classified as partially vaccinated and excluded. Second, aside from age adjustment, it was not possible to control for other factors that are associated with vaccine coverage, such as sex and race/ethnicity. Differences in vaccination and booster coverage by these characteristics, especially if proportionally different from that of SARS-CoV-2 infections, could affect

Summary

What is already known about this topic?

COVID-19 vaccines are highly effective against severe SARS-CoV-2–associated outcomes, including those caused by the Delta variant.

What is added by this report?

As of January 8, 2022, during Omicron predominance, COVID-19 incidence and hospitalization rates in Los Angeles County among unvaccinated persons were 3.6 and 23.0 times, respectively, those of fully vaccinated persons with a booster, and 2.0 and 5.3 times, respectively, those among fully vaccinated persons without a booster. During both Delta and Omicron predominance, incidence and hospitalization rates were highest among unvaccinated persons and lowest among vaccinated persons with a booster.

What are the implications for public health practice?

Being up to date with COVID-19 vaccination is critical to protecting against SARS-CoV-2 infection and hospitalization.

generalizability of these results to LAC and other populations or jurisdictions. Third, the risks for SARS-CoV-2 infection are not equal for everyone; the likelihood of exposure might influence the likelihood of COVID-19 vaccine acceptance and coverage. External risk factors related to the possibility of infection and hospitalization, such as sample characteristics and social determinants of health, are important to consider when interpreting these findings. Fourth, COVID-19–associated hospitalizations were determined based on hospital admission and SARS-CoV-2 test dates alone, potentially leading to the inclusion of incidental positive SARS-CoV-2 test results in patients whose hospitalizations were not caused by COVID-19. Finally, genomic sequencing data were available for only a sample of SARS-CoV-2 specimens and not representative of all infections; however, the variant predominance trends were consistent with what has been reported nationally during these periods.

These findings align with those from recent studies, indicating that COVID-19 vaccination protects against severe COVID-19 caused by SARS-CoV-2 variants, including Omicron (*7*,*8*).*** Efforts to promote COVID-19 vaccination and boosters are critical to preventing COVID-19–associated hospitalizations and severe outcomes. Ongoing COVID-19 surveillance with data linkages to vaccination and SARS-CoV-2 variant genomic sequencing data are critical for monitoring vaccine effectiveness and increased protection from boosters, particularly during the Omicron predominant period.

*** https://www.medrxiv.org/content/10.1101/2022.01.11.22269045v1

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Notes from the Field

COVID-19 Vaccination Among Persons Living with Diagnosed HIV Infection — New York, October 2021

James M. Tesoriero, PhD[1]; Wendy Patterson, MPH[1]; Demetre Daskalakis, MD[2]; Joyce Chicoine[1]; Johanne Morne, MS[1]; Sarah Braunstein PhD[3]; Deepa T. Rajulu, MS[1]; Eli Rosenberg, PhD[4]

During March 1, 2020–October 26, 2021, approximately 2,500,000 COVID-19 cases and 58,000 COVID-19–associated deaths occurred in the state of New York.* New York has the highest U.S. per capita rate of persons living with diagnosed HIV infection (PLWDH),† and population-level analyses adjusting for age, sex, and region have shown that PLWDH are more likely to be hospitalized for and to experience an in-hospital death from COVID-19 than are those not known to be PLWDH (*1*). CDC considers PLWDH who have a low CD4 cell count or who are not receiving HIV treatment to be at elevated risk for severe COVID-19–associated outcomes (*2*).

COVID-19 vaccines have been shown to be effective against symptomatic infection and hospitalization in New York, including during the period when the B.1.617.2 (Delta) and B.1.1.529 (Omicron) variants of SARS-CoV-2, the virus that causes COVID-19, predominated (*3*,*4*). PLWDH were an early priority group for vaccine eligibility, in part because of elevated COVID-19 risks. However, little is known about vaccination coverage among PLWDH.

Data from the New York State HIV surveillance registry were matched with the New York City Citywide Immunization Registry and New York State Immunization Information System. A deterministic matching algorithm§ was used to ascertain, as of October 24, 2021, COVID-19 vaccination status for PLWDH aged ≥18 years who were alive on December 31, 2020. Because death data were available only through December 2020, deaths in PLWDH reported in previous years in New York State, including 2020, were used to estimate that this analysis likely includes 500–1,000 PLWDH who died during the early part of 2021, precluding the opportunity for these decedents to begin or complete vaccination.

Persons were categorized as having received either a single dose of the Food and Drug Administration-authorized or -approved Ad.26.COV2.S (Janssen [Johnson & Johnson]) COVID-19 vaccine or 2 doses of the BNT162b2 (Pfizer BioNTech) or mRNA-1273 (Moderna) COVID-19 vaccines ≥14 days before October 24, 2021; only the first of a 2-dose series vaccine (Pfizer-BioNTech or Moderna); or having no matching vaccine record.¶ Booster and additional doses were not considered in this analysis. Consultation with the New York State Department of Health Institutional Review Board indicated that this work constitutes public health surveillance. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.**

Among 101,205 PLWDH included in the analysis,†† 64,278 (63.5%) had received either a single dose of Janssen vaccine or 2 doses of Pfizer-BioNTech or Moderna vaccine, 4,349 (4.3%) had received only 1 dose of Pfizer-BioNTech or Moderna vaccines, and 32,578 (32.2%) were unvaccinated (Table).

Receipt of either a single dose of Janssen vaccine or 2 doses of Pfizer-BioNTech or Moderna vaccine increased with age, including 71.4% of PLWDH aged ≥65 years and 54.3% of those aged 18–49 years. Coverage was higher among men (64.8%) than women (60.5%), and among persons who identified as nonbinary or nonconforming (58.1%). Among racial/ethnic groups, coverage was highest among non-Hispanic White PLWDH (70.8%), and lowest among non-Hispanic Black (58.6%) and American Indian or Alaska Native persons (58.4%). Coverage was substantially lower among PLWDH who were not virally suppressed§§ at last test in 2020 (38.1%) compared with those who were (72.0%), and among those with no surveillance-based evidence of HIV care in 2020 (29.1%) than among those receiving care (69.2%).

* https://coronavirus.health.ny.gov/covid-19-data-new-york (Accessed October 27, 2021).
† https://www.cdc.gov/hiv/library/reports/hiv-surveillance.html (Accessed January 23, 2022).
§ Data were matched using a deterministic matching algorithm implemented in SAS DataFlux (version 2.7; SAS Institute Inc.), which is used to link all routine and supplemental matches with the New York State HIV surveillance registry. https://www.sas.com/en_us/home. html (Accessed October 15, 2020).
¶ After a period of phased COVID-19 vaccine eligibility based on age, occupation, setting, or comorbidities beginning in December 2020, all New York residents aged ≥60 years were eligible for vaccination by March 10, 2021; eligibility was expanded to persons aged ≥30 years by March 30, and to all adults aged ≥18 years by April 6. HIV became a specific qualifying condition on February 15, 2021. https://www.governor.ny.gov/news/governor-cuomo-announces-new-yorkers-30-years-age-and-older-will-be-eligible-receive-covid-19
** 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.
†† Analyses excluded 4,163 PLWDH who were possible but not confirmed matches to the COVID vaccine registry. Analyses included 49 persons with a first vaccination date before December 1, 2020.
§§ Viral suppression is defined as <200 HIV RNA copies/mL at the last viral load test reported to the New York State HIV surveillance registry in 2020.

TABLE. Characteristics of persons living with diagnosed HIV infection in 2020 and COVID-19 vaccination status — New York, December 14, 2020–October 24, 2021

Characteristic	Study population, no.	COVID-19 vaccination status, no. (row %)* Received 1 dose of Janssen vaccine or 2 doses of Pfizer-BioNTech or Moderna vaccine	Received only 1 dose of Pfizer-BioNTech or Moderna vaccine	Not vaccinated
Total	**101,205**	**64,278 (63.5)**	**4,349 (4.3)**	**32,578 (32.2)**
Age group, yrs†				
18–49	42,714	23,199 (54.3)	2,324 (5.4)	17,191 (40.2)
50–64	43,428	30,324 (69.8)	1,565 (3.6)	11,539 (26.6)
≥65	15,063	10,755 (71.4)	460 (3.1)	3,848 (25.5)
Gender†				
Men	70,636	45,788 (64.8)	2,836 (4.0)	22,012 (31.2)
Women	30,476	18,436 (60.5)	1,511 (5.0)	10,529 (34.5)
Nonconforming or nonbinary	93	54 (58.1)	2 (2.2)	37 (39.8)
Race/Ethnicity				
Black, non-Hispanic	45,534	26,691 (58.6)	2,413 (5.3)	16,430 (36.1)
White, non-Hispanic	23,208	16,420 (70.8)	677 (2.9)	6,111 (26.3)
Asian or Pacific Islander	2,519	1,728 (68.6)	54 (2.1)	737 (29.3)
Hispanic	29,075	18,906 (65.0)	1,172 (4.0)	8,997 (30.9)
Multiracial	590	359 (60.8)	24 (4.1)	207 (35.1)
American Indian or Alaska Native	190	111 (58.4)	7 (3.7)	72 (37.9)
Unknown	89	63 (70.8)	2 (2.2)	24 (27.0)
Residence in 2020§				
New York City	79,433	50,015 (63.0)	3,547 (4.5)	25,871 (32.6)
Rest of state of New York	21,772	14,263 (65.5)	802 (3.7)	6,707 (30.8)
Virally suppressed in 2020¶				
No	25,307	9,650 (38.1)	1,326 (5.2)	14,331 (56.6)
Yes	75,898	54,628 (72.0)	3,023 (4.0)	18,247 (24.0)
HIV care in 2020**				
No	14,415	4,201 (29.1)	473 (3.3)	9,741 (67.6)
Yes	86,790	60,077 (69.2)	3,876 (4.5)	22,837 (26.3)

* Based on a Pearson chi-square test of statistical significance (p<0.001).
† Current age and gender were determined as of March 31, 2021.
§ Residency was determined as last known residence in 2020.
¶ Viral suppression (<200 HIV RNA copies/mL) was determined at the last viral load test reported to the New York State HIV surveillance registry in 2020.
** HIV care was defined as any CD4, viral load, or genotype test reported to the New York State HIV surveillance registry in 2020.

This study found that COVID-19 vaccination coverage among PLWDH overall (63.5%) was lower than that in the general adult New York population (75.0%).¶¶ Differences in demographic composition between PLWDH and the general population might partly explain lower coverage; however, coverage was <75% across all examined PLWDH subgroups. Unmeasured factors, including socioeconomic status, might further explain the lower COVID-19 vaccination coverage among PLWDH.

Members of non-Hispanic Black and Hispanic communities are more likely to acquire SARS-CoV-2 and experience severe COVID-19–related outcomes than are those of other non-Hispanic and White communities (*5*,*6*). Gaps in vaccination coverage could thus serve to amplify disparities in COVID-19 outcomes among PLWDH. Addressing the large disparity in vaccination coverage by HIV care and viral suppression status is of particular importance, given the increased likelihood of severe COVID-19–related outcomes among PLWDH who experience immunocompromising conditions and considering the specific recommendation for additional doses for this group (*2*).

In addition to primary vaccination coverage, ensuring that PLWDH receive booster doses is critically important moving forward.*** Including COVID-19 vaccination in HIV-related service delivery might be effective at reducing disparities in vaccination coverage among PLWDH. For example, incorporating COVID-19 vaccination into existing HIV Data to Care††† programming might help increase vaccination rates among PLWDH being relinked to HIV care. Similarly, leveraging HIV providers serving communities of color and sexual minority populations to promote COVID-19 vaccination could help to mitigate racial/ethnic and gender-based disparities in vaccination coverage.

¶¶ https://coronavirus.health.ny.gov/covid-19-breakthrough-data (Accessed October 24, 2021).

*** https://www.cdc.gov/media/releases/2021/p1021-covid-booster.html (Accessed November 16, 2021).

††† https://wwwdev.cdc.gov/hiv/effective-interventions/treat/data-to-care/index.html?Sort=Title%3A%3Aasc&Intervention%20Name=Data%20to%20CareName=Data%20to%20Care (Accessed November 17, 2021).

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All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

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Erratum

Vol. 70, No. 51–52

In the report, "Characteristics and Clinical Outcomes of Children and Adolescents Aged <18 Years Hospitalized with COVID-19 — Six Hospitals, United States, July–August 2021," on page 1766, the list of authors should have read,

"Valentine Wanga, PhD[1,2]; Megan E. Gerdes, MPH[1]; Dallas S. Shi, MD, PhD[1,2]; Rewa Choudhary, MD[1,2]; Theresa M. Dulski, MD[1,2]; Sophia Hsu, MSN, MPH[1]; Osatohamwen I. Idubor, MD[1]; Bryant J. Webber, MD[1,2]; Arthur M. Wendel, MD[1]; Nickolas T. Agathis, MD[1,2]; Kristi Anderson, MD[1]; Tricia Boyles, MHA[1]; Sophia K. Chiu, MD[1]; Eleanor S. Click, MD, PhD[1]; Juliana Da Silva, MD[1]; Hannah Dupont, MPH[1]; Mary Evans, MD[1]; Jeremy A.W. Gold, MD[1]; Julia Haston, MD[1,2]; Pamela Logan, MD[1]; Susan A. Maloney, MD[1]; Marisol Martinez, PharmD[1]; Pavithra Natarajan, BMBS[1]; Kevin B. Spicer, MD, PhD[1]; Mark Swancutt, MD[1]; Valerie A. Stevens[1]; Jessica Brown, PhD[1]; Gyan Chandra, MBA[1]; Megan Light, MPH[1]; Frederick E. Barr, MD[3]; Jessica Snowden, MD[3]; Larry K. Kociolek, MD[4]; Matthew McHugh, MPH[4]; David Wessel, MD[5]; Joelle N. Simpson, MD[5]; Kathleen C. Gorman, MSN[5]; Kristen A. Breslin, MD[5]; Roberta L. DeBiasi, MD[5]; Aaron Thompson, MD[6,7]; Mark W. Kline, MD[6,7]; **Julie A. Boom, MD[8,10]**; **Ila R. Singh, MD, PhD[9,10]**; Michael Dowlin[9]; **Mark Wietecha, MS, MBA[11]**; Beth Schweitzer, MS[1]; Sapna Bamrah Morris, MD[1]; Emily H. Koumans, MD[1]; Jean Y. Ko, PhD[1]; Anne A. Kimball, MD[1,*]; David A. Siegel, MD[1,*]"

In addition, on page 1771, the list of author affiliations should have read,

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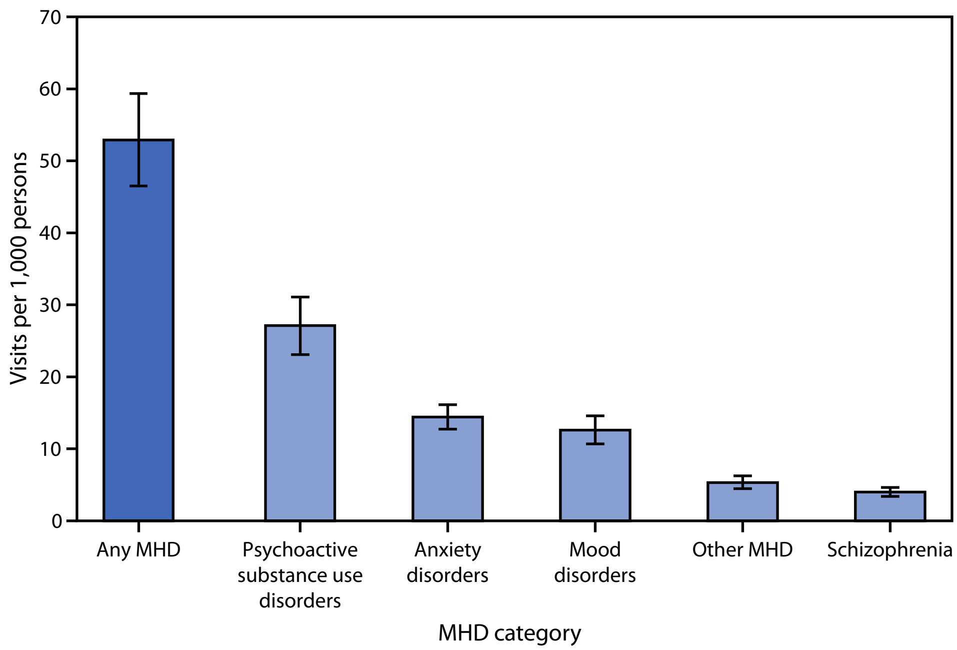
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Rates* of Emergency Department Visits Related to Mental Health Disorders Among Adults Aged ≥18 Years, by Disorder Category† — National Hospital Ambulatory Medical Care Survey, United States, 2017–2019§



Abbreviations: ED = emergency department; MHD = mental health disorder.

* Visit rates are based on the July 1, 2017–July 1, 2019, estimates of the civilian, noninstitutionalized population as developed by the U.S. Census Bureau Population Division; 95% CIs are indicated by error bars.

† ED visits with diagnosed MHDs were identified using *International Classification of Diseases, Tenth Revision, Clinical Modification* codes F01–F99 and were categorized into the following disorder categories: psychoactive substance use disorders (F10–F19); anxiety, stress-related, or other nonpsychotic mental disorders (F40–F48); mood (affective) disorders (F30–F39); other MHD (F01–F09 or F50–F99); and schizophrenia, schizotypal, delusional, or other nonmood psychotic disorders (F20–F29). A visit could be included in more than one disorder category.

§ Based on a sample of visits by adults aged ≥18 years to EDs in noninstitutional general and short-stay hospitals located in the 50 states and the District of Columbia, excluding federal, military, and Veterans Administration hospitals.

During 2017–2019, 52.9 ED visits per 1,000 persons were related to a diagnosed MHD in the United States per year. Approximately one half of mental health–related visits had a diagnosis of a psychoactive substance use disorder at a rate of 27.1 visits per 1,000 persons per year, followed by an anxiety, stress-related, or other nonpsychotic mental disorder (14.4), mood (affective) disorder (12.6), other MHD (5.3), and schizophrenia, schizotypal, delusional, or other nonmood psychotic disorder (4.0).

Source: National Center for Health Statistics. National Hospital Ambulatory Medical Care Survey, 2017–2019. https://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm

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For more information on this topic, CDC recommends the following link: https://www.cdc.gov/mentalhealth/tools-resources/individuals/index.htm.

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