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).
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

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1. https://www.eers.usda.gov/data-products/rural-urban-continuum-codes.aspx
2. 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 metro area; rural remote counties are those that are not in or adjacent to metropolitan areas.

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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                      | 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

| Characteristic                      | No.    | Unadjusted % | p-value | Adjusted % | 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                 | 1,950  | 31.1         | <0.001  | 28.9       | 0.083   |
| Metro-adjacent rural               | 882    | 40.2         | <0.001  | 37.5       | 0.018   |
| Remote rural                       | 1,233  | 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...
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.**

§ 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 multifamily 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.

* 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

‡ 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 higher compared with those in Quartile 1.

### 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 |
|---------------------------------------------|----------------------|-----------------------------------|------------|------------|-----------------------------------|-----------------------------|
| **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)                  |
| 25–34                                       | 3,985 (39.0)         | 315 (7.9)                         | 108.2      | 591 (14.8) | 114.2                             | 1,026 (25.7)               |
| 35–44                                       | 1,494 (14.6)         | 133 (8.9)                         | 44.8       | 205 (13.7) | 45.4                              | 384 (25.7)                 |
| 45–54                                       | 1,010 (9.9)          | 68 (6.7)                          | 22.5       | 144 (14.3) | 32.5                              | 229 (22.7)                 |
| ≥55                                         | 769 (7.5)            | 75 (9.8)                          | 18.7       | 91 (11.8)  | 14.1                              | 171 (22.2)                 |
| **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-female 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)                          | 169 (11.6) | 324 (22.2) | 52.0                               | 876 (60.0)                 |
| Midwest                                     | 1,539 (15.1)         | 120 (7.8)                         | 261 (13.7) | 385 (25.0) | 58.0                               | 804 (52.2)                 |
| South                                       | 6,351 (62.2)         | 556 (8.8)                         | 940 (14.8) | 1,659 (26.1) | 71.7                             | 3,056 (48.1)               |
| West                                        | 858 (8.4)            | 61 (7.1)                          | 117 (13.6) | 215 (25.1) | 57.6                               | 452 (52.7)                 |
| **Subtotal**                                | 10,208 (100)         | 812 (8.1)                         | 1,437 (14.1) | 2,583 (25.3) | 65.0                             | 5,188 (50.8)               |
| **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)                 |
| 25–34                                       | 946 (26.3)           | 65 (6.9)                          | 23.2       | 100 (10.6) | 19.6                               | 204 (21.6)                 |
| 35–44                                       | 866 (24.1)           | 48 (5.5)                          | 15.6       | 112 (12.9) | 22.8                               | 227 (26.2)                 |
| 45–54                                       | 689 (19.1)           | 48 (7.0)                          | 15.2       | 88 (12.8)  | 18.1                               | 160 (23.2)                 |
| ≥55                                         | 620 (17.2)           | 45 (7.3)                          | 9.6        | 85 (13.7)  | 10.4                               | 148 (23.9)                 |
| **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)                 |
| Midwest                                     | 440 (12.2)           | 44 (10.0)                         | 16.2       | 41 (9.3)   | 10.0                               | 103 (23.4)                 |
| South                                       | 2,251 (62.5)         | 147 (6.5)                         | 15.4       | 278 (12.4) | 17.3                               | 530 (23.5)                 |
| West                                        | 278 (7.7)            | 17 (6.1)                          | 12.5       | 39 (14.0)  | 15.2                               | 74 (26.6)                  |
| **Subtotal**                                | 3,599 (100)          | 233 (6.5)                         | 44 (12.3)  | 16.6       | 840 (23.3)                          | 2,017 (56.0)               |
| Total                                       | 13,807 (100)         | 1,045 (7.6)                       | 1,881 (13.6) | 3,423 (24.8) | 40.8                          | 7,205 (52.2)               |

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.

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**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.

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

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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

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*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 (Jansen [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-Definitions/20169theditionfinal.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 81.4%, respectively) than women (80.5% and 74.2%, respectively) reported receiving ≥1 dose of COVID-19 vaccine (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**

| Characteristic | Unweighted no. | % (95% CI)* |
|----------------|---------------|-------------|
|                | >=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.
By urbani**city**,†‡ 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

| Characteristic | Heterosexual/ Straight | Gay or lesbian | Bisexual | Something else | Not transgender or nonbinary | Total |
|----------------|------------------------|---------------|----------|---------------|-----------------------------|-------|
| Overall        | 76.3 (75.8–76.8)       | 85.4 (82.5–88.7) | 80.5 (75.6–84.5) | 76.3 (73.6–78.9) | 75.3 (71.7–78.7) | 76.7 (72.2–77.2) | 73.3 (78.0–73.0) |
| Gender identity | 73.8 (73.0–74.5)       | 88.9 (85.2–91.8) | 74.2 (70.8–77.3) | 81.7 (76.6–85.9) | 75.3 (71.7–78.7) | 75.7 (72.2–77.2) | 73.3 (78.0–73.0) |
| Household income | 61.1–88.6 | 70.1–91.0 | 65.0–91.0 | 63.2–97.3 | 58.7–92.3 | 64.7–82.3 | 66.4–81.5 |
| Below poverty | 62.7 (61.9–63.7)       | 62.0 (60.0–66.8) | 62.4 (61.8–68.6) | 51.7 (58.3–73.9) | 60.1 (63.4–58.7) | 60.4 (59.6–61.5) | 63.9 (58.7–71.4) |
| Above poverty, <575,000 | 78.4 (77.8–79.4) | 79.3 (78.0–79.8) | 80.0 (79.0–81.0) | 77.7 (74.9–80.5) | 77.8 (74.9–80.5) | 78.4 (74.9–80.5) | 76.6 (74.9–78.2) |
| Above poverty, ≥575,000 | 78.3 (77.8–78.9) | 80.0 (79.0–81.0) | 81.0 (79.0–82.0) | 78.7 (75.9–81.5) | 78.9 (75.9–81.5) | 80.0 (77.9–83.1) | 77.3 (75.9–78.7) |
| U.S. Census region | 84.7 (83.9–85.5) | 88.5 (87.6–93.1) | 91.9 (87.3–96.3) | 84.4 (83.8–85.5) | 87.8 (84.3–89.8) | 87.8 (84.3–89.8) | 83.7 (79.3–88.3) |
| Northeast | 82.1 (81.7–82.7) | 93.4 (92.7–94.8) | 92.0 (90.5–93.5) | 84.6 (83.8–85.3) | 87.8 (84.7–89.1) | 87.8 (84.7–89.1) | 83.7 (79.3–88.3) |
| Midwest | 80.3 (79.2–81.5) | 88.8 (88.0–90.0) | 93.8 (92.9–94.9) | 81.2 (79.6–82.8) | 86.8 (85.9–90.4) | 86.8 (85.9–90.4) | 83.7 (79.3–88.3) |
| South | 78.0 (77.8–80.0) | 82.0 (80.1–83.9) | 89.0 (87.4–92.0) | 84.0 (82.8–85.3) | 87.8 (86.1–90.0) | 87.8 (86.1–90.0) | 83.7 (79.3–88.3) |
| West | 79.6 (79.0–80.1) | 84.3 (82.5–86.7) | 91.6 (89.7–95.3) | 77.5 (75.8–80.4) | 75.8 (73.5–78.1) | 75.8 (73.5–78.1) | 83.7 (79.3–88.3) |
| Urbanicity§ | 78.3 (77.7–78.9) | 86.6 (84.9–90.0) | 92.2 (90.5–93.5) | 80.1 (78.3–81.8) | 87.8 (86.1–90.0) | 87.8 (86.1–90.0) | 83.7 (79.3–88.3) |
| MSA, principal city | 79.9 (79.3–80.5) | 88.0 (86.3–90.0) | 92.4 (90.7–94.3) | 81.7 (80.0–83.5) | 88.3 (86.5–90.4) | 88.3 (86.5–90.4) | 84.3 (79.8–88.8) |
| MSA, nonprincipal city | 77.8 (77.2–78.4) | 81.0 (79.3–82.6) | 89.3 (87.6–92.0) | 80.8 (79.1–82.5) | 77.7 (76.0–79.5) | 77.7 (76.0–79.5) | 75.7 (69.8–81.6) |
| Non-MSA | 66.6 (65.2–68.0) | 69.9 (68.5–71.3) | 72.2 (70.8–74.6) | 71.9 (69.4–74.5) | 71.2 (68.6–73.8) | 71.2 (68.6–73.8) | 68.3 (62.9–73.8) |
| SVI¶ | 79.3 (78.4–80.2) | 81.6 (79.8–83.4) | 89.3 (87.6–91.5) | 85.7 (83.9–87.5) | 78.7 (76.9–80.5) | 78.7 (76.9–80.5) | 79.3 (77.9–81.7) |
| Low SVI | 77.6 (76.7–78.4) | 80.0 (78.2–82.0) | 89.2 (87.5–91.5) | 80.3 (78.5–82.1) | 79.5 (77.7–81.3) | 79.5 (77.7–81.3) | 77.9 (76.0–79.8) |
| Moderate SVI | 77.6 (76.8–78.4) | 80.0 (78.2–82.0) | 89.2 (87.5–91.5) | 80.3 (78.5–82.1) | 79.5 (77.7–81.3) | 79.5 (77.7–81.3) | 77.9 (76.0–79.8) |
| High SVI | 73.3 (72.5–74.2) | 78.2 (76.5–80.0) | 88.3 (86.6–90.6) | 85.7 (83.9–87.5) | 78.7 (76.9–80.5) | 78.7 (76.9–80.5) | 74.2 (69.5–79.3) |

** Abbreviations: MSA = metropolitan statistical area; SVI = Social Vulnerability Index.
* Weighted estimate.
† Poverty was 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 nonprincipal 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.atsdrcdc.gov/placeandhealth/svi/index.html
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). 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 |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| **Central attitudes and experiences** | **Overall** | **Heterosexual/ Straight** | **Gay or lesbian** | **Bisexual** | **Something else** | **Not transgender or nonbinary** | **Transgender or nonbinary** |
| **Concerned about COVID–19 (very or moderately)** | 153,062 | 132,608 | 3,941 | 4,395 | 2,532 | 136,929 | 5,594 |
| Male | 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) |
| Female | 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 |
| **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 | 61.2 (60.5–61.9) | 61.2 (60.5–61.9) | 79.2 (77.9–80.7)† | 72.7 (70.1–75.3)† | 72.7 (70.2–75.2)† | NA | NA |
| Female | 66.6 (66.0–67.2) | 65.1 (64.5–65.7) | 82.4 (81.6–83.3)† | 81.2 (78.5–83.9)† | 81.2 (78.5–83.9)† | 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 (80.8–86.6) | 80.7 (80.3–81.2) | 83.2 (81.1–85.1)§ |
| Male | 80.3 (79.8–80.9) | 80.0 (79.6–80.5) | 90.9 (88.6–92.7)† | 86.8 (84.8–88.8)† | 83.5 (80.8–86.6) | 80.7 (80.3–81.2) | 83.2 (81.1–85.1)§ |
| Female | 81.4 (81.0–81.8) | 81.0 (80.6–81.4) | 91.2 (89.0–93.6)† | 86.6 (84.5–88.6)† | 83.5 (80.8–86.6) | 80.7 (80.3–81.2) | 83.2 (81.1–85.1)§ |
| **Had friends/family who were vaccinated (almost all or many)** | 70.2 (69.7–70.6) | 70.0 (69.5–70.5) | 76.4 (74.3–78.5)† | 71.2 (68.4–74.0) | 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 (77.5–81.8)† | 71.5 (68.2–74.8) | 71.4 (65.9–76.4) | NA | NA |
| Female | 71.9 (71.3–72.6) | 72.1 (71.4–72.8) | 72.4 (67.7–76.9) | 71.0 (67.7–74.1) | 73.5 (68.7–78.7) | 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.

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

### 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.
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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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

5 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.

5 Vaccine 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.

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

† https://www.medrxiv.org/content/10.1101/2022.01.07.22268919v2
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 a booster (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). 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...
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                                                                 | 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) | 40,660 (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.
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 the findings in this report.
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.

This summary highlights findings from a recent study in Los Angeles County (LAC) evaluating the impact of COVID-19 vaccination on SARS-CoV-2 incidence and hospitalization rates during periods of Delta and Omicron variant predominance. The study utilized hospitalization data from the Los Angeles County Department of Health and Human Services, CDC and SARS-CoV-2–associated outcomes, including those caused by the Delta variant.

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.

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*** https://www.medrxiv.org/content/10.1101/2022.01.11.22269045v1
COVID-19 Vaccination Among Persons Living with Diagnosed HIV Infection — New York, October 2021

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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-approved or -authorized 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%).

** 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

†† 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.

* 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).
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. | 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://www.cdc.gov/media/releases/2021/p1021-covid-booster.html (Accessed November 16, 2021).
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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, PhD1,2; Megan E. Gerdes, MPH1; Dallas S. Shi, MD, PhD1,2; Rewa Choudhary, MD1,2; Theresa M. Dulske, MD1,2; Sophia Hsu, MSN, MPH1; Osatohanwen I. Idubor, MD1; Bryant J. Webber, MD1,2; Arthur M. Wendel, MD1; Nickolas T. Agathis, MD1,2; Kristi Anderson, MD1; Tricia Boyles, MHA1; Sophia K. Chiu, MD1; Eleanor S. Click, MD, PhD1; Juliana Da Silva, MD1; Hannah Dupont, MPH1; Mary Evans, MD1; Jeremy A.W. Gold, MD1; Julia Haston, MD1,2; Pamela Logan, MD1; Susan A. Maloney, MD1; Marisol Martinez, PharmD1; Pavithra Natarajan, BMBS1; Kevin B. Spicer, MD, PhD1; Mark Swancutt, MD1; Valerie A. Stevens1; Jessica Brown, PhD1; Gyan Chandra, MBA1; Megan Light, MPH1; Frederick E. Barr, MD3; Jessica Snowden, MD3; Larry K. Kociolek, MD4; Matthew McHugh, MPH4; David Wessel, MD5; Joelle N. Simpson, MD5; Kathleen C. Gorman, MSN5; Kristen A. Breslin, MD5; Roberta L. DeBiasi, MD5; Aaron Thompson, MD6,7; Mark W. Kline, MD6,7; Julie A. Boom, MD8,10; Ila R. Singh, MD, PhD9,10; Michael Dowlin7; Mark Wietecha, MS, MBA11; Beth Schweitzer, MS1; Sapna Bamrah Morris, MD1; Emily H. Koumans, MD1; Jean Y. Ko, PhD1; Anne A. Kimball, MD1,*; Roberta L. DeBiasi, MD5; Aaron Thompson, MD6,7; Mark W. Kline, MD6,7; Julie A. Boom, MD8,10; Ila R. Singh, MD, PhD9,10; Michael Dowlin7; Mark Wietecha, MS, MBA11; Beth Schweitzer, MS1; Sapna Bamrah Morris, MD1; Emily H. Koumans, MD1; Jean Y. Ko, PhD1; Anne A. Kimball, MD1,*; David A. Siegel, MD1,*”

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

“1 CDC COVID-19 Emergency Response Team; 2 Epidemic Intelligence Service, CDC; 3 Arkansas Children’s, Little Rock, Arkansas; 4 Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago, Illinois; 5 Children’s National Hospital, Washington, DC; 6 Children’s Hospital New Orleans, New Orleans, Louisiana; 7 Tulane University School of Medicine and LSU Health, New Orleans, Louisiana; 8 Department of Pediatrics, Baylor College of Medicine, Houston, Texas; 9 Department of Pathology and Immunology, Baylor College of Medicine, Houston, Texas; 10 Texas Children’s Hospital, Houston, Texas; 11 Children’s Hospital Association, Washington, DC.”
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§

| MHD category                  | Visits per 1,000 persons |
|-------------------------------|--------------------------|
| Any MHD                       | 52.9                     |
| Psychoactive substance use disorders | 17.5                     |
| Anxiety disorders             | 14.4                     |
| Mood disorders                | 12.6                     |
| Other MHD                     | 5.3                      |
| Schizophrenia                 | 4.0                      |

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

Reported by: Zachary J. Peters, MPH, zpeters@cdc.gov, 301-458-4130; Danielle Davis, MPH; Loredana Santo, MD.

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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