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National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, 2019

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Three vaccines are recommended by the Advisory Committee on Immunization Practices (ACIP) for routine vaccination of adolescents aged 11–12 years to protect against 1) pertussis; 2) meningococcal disease caused by types A, C, W, and Y; and 3) human papillomavirus (HPV)-associated cancers (*1*). At age 16 years, a booster dose of quadrivalent meningococcal conjugate vaccine (MenACWY) is recommended. Persons aged 16–23 years can receive serogroup B meningococcal vaccine (MenB), if determined to be appropriate through shared clinical decision-making. CDC analyzed data from the 2019 National Immunization Survey-Teen (NIS-Teen) to estimate vaccination coverage among adolescents aged 13–17 years in the United States.* Coverage with ≥1 dose of HPV vaccine increased from 68.1% in 2018 to 71.5% in 2019, and the percentage of adolescents who were up to date† with the HPV vaccination series (HPV UTD) increased from 51.1% in 2018 to 54.2% in 2019. Both HPV vaccination coverage measures improved among females and males. An increase in adolescent coverage with ≥1 dose of MenACWY (from 86.6% in 2018 to 88.9% in 2019) also was observed. Among adolescents aged 17 years, 53.7% received the booster dose of MenACWY in 2019, not statistically different from 50.8% in 2018; 21.8% received ≥1 dose of MenB, a 4.6 percentage point increase from 17.2% in 2018. Among adolescents living at or above the poverty level,§

Continuing Education examination available at https://www.cdc.gov/mmwr/mmwr_continuingEducation.html

* Eligible participants were born during January 2001–February 2007. Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) represents coverage with ≥1 Tdap dose at age ≥10 years. Meningococcal conjugate vaccine (MenACWY) represents coverage with the quadrivalent meningococcal conjugate vaccine or meningococcal-unknown type vaccine. Human papillomavirus (HPV) vaccination coverage includes receipt of any HPV vaccine and does not distinguish between nine-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV) vaccines. Some adolescents might have received more than the two or three recommended HPV vaccine doses. Estimates for hepatitis A, hepatitis B, and measles, mumps, and rubella vaccines represent coverage based on the catch-up schedule for adolescents who are not up to date with these vaccinations. Except as noted, coverage estimates for ≥1 and ≥2 varicella vaccine doses were obtained among adolescents with no history of varicella disease. Influenza vaccination coverage data are not included in this report but are available online at https://www.cdc.gov/flu/fluvaxview/index.htm.

† Adolescents were considered to be up to date with HPV vaccination if they had received ≥3 doses, or if each of the following applied: 1) they had received 2 doses; 2) the first dose was received before their 15th birthday; and 3) the difference between dates of first and second doses was ≥5 months minus 4 days, the absolute minimum interval between the first and second doses. https://www.cdc.gov/vaccines/programs/iis/cdsi.html.

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those living outside a metropolitan statistical area (MSA)[¶] had lower coverage with ≥1 dose of MenACWY and with ≥1 HPV vaccine dose, and a lower percentage were HPV UTD, compared with those living in MSA principal cities. In early 2020, the coronavirus disease 2019 (COVID-19) pandemic changed the way health care providers operate and provide routine and essential services. An examination of Vaccines for Children (VFC) provider ordering data showed that vaccine orders for HPV vaccine; tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap); and MenACWY decreased in mid-March when COVID-19 was declared a national emergency (Supplementary Figure 1, https://stacks.cdc.gov/view/cdc/91795). Ensuring that routine immunization services for adolescents are maintained or reinitiated is essential to continuing progress in protecting persons and communities from vaccine-preventable diseases and outbreaks.

NIS-Teen is a random-digit-dial telephone survey[**] conducted annually to monitor vaccination coverage among adolescents aged 13–17 years in the 50 states, the District of Columbia, selected local areas, and selected U.S. territories.[††] Sociodemographic information is collected during the telephone interview with a parent or guardian, and a request is made for consent to contact the adolescent's vaccination provider(s). If consent is obtained, a questionnaire is mailed to the vaccination provider(s) to request the adolescent's vaccination history. Vaccination coverage estimates are determined from these provider-reported immunization records. This report provides vaccination coverage estimates on 18,788 adolescents aged 13–17 years.[§§] The overall Council of American

[§] Adolescents were classified as being below the federal poverty level if their total family income was less than the federal poverty level specified for the applicable family size and number of children aged <18 years. All others were classified as at or above the poverty level (https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html). Poverty status was unknown for 657 adolescents.

[¶] Metropolitan statistical area (MSA) status was determined from household reported city and county of residence and was grouped into three categories: MSA principal city, MSA nonprincipal city, and non-MSA. MSA and MSA principal city were as defined by the U.S. Census Bureau (https://www.census.gov/programs-surveys/metro-micro.html). Non-MSA areas include urban populations not located within an MSA and completely rural areas.

[**] All identified cellular-telephone households were eligible for interview. Sampling weights were adjusted for single frame (cellular telephone), nonresponse, noncoverage, and overlapping samples of mixed telephone users. A description of NIS-Teen single-frame survey methodology and its effect on reported vaccination estimates is available at https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/pubs-presentations/dual-to-single-frame-teen.html.

[††] Local areas that received federal immunization funds under Section 317 of the Public Health Service Act were sampled separately. Those included Chicago, Illinois; New York, New York; Philadelphia County, Pennsylvania; Bexar County, Texas; and Houston, Texas. Two local areas were oversampled in 2019: Dallas County, Texas, and El Paso County, Texas. Three territories were sampled separately in 2019: Guam, Puerto Rico, and the U.S. Virgin Islands.

[§§] Adolescents from Guam (n = 278), Puerto Rico (n = 216), and U.S. Virgin Island (n = 218) were excluded from the national estimates.

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Survey Research Organizations (CASRO)[¶] response rate was 19.7%, and 44.0% of adolescents for whom household interviews were completed had adequate provider data.

Data were weighted and analyzed to account for the complex sampling design.[***] T-tests were used to assess vaccination coverage differences between sociodemographic subgroups. P-values <0.05 were considered statistically significant. All analyses were conducted using SAS-callable SUDAAN (version 11; RTI International).

National Vaccination Coverage

In 2019, 71.5% of adolescents aged 13–17 years had received ≥1 dose of HPV vaccine, and 54.2% had completed the HPV vaccination series and were considered HPV UTD (Table 1, Figure). Increases from 2018 in ≥1 dose HPV vaccine coverage and HPV UTD status were observed for females and for males. Coverage with ≥1 dose of MenACWY increased by 2.3 percentage points to 88.9%. Coverage with ≥2 MenACWY doses among adolescents aged 17 years was 53.7%, similar to that in 2018 (50.8%). Coverage with ≥1 dose of MenB among adolescents aged 17 years increased from 17.2% in 2018 to 21.8% in 2019. Coverage with ≥1 dose of Tdap remained stable and high (90.2%). Coverage exceeded 90% for ≥2 doses measles, mumps, and rubella vaccine (MMR), ≥3 doses of hepatitis B vaccine, and ≥1 and ≥2 doses of varicella vaccine among adolescents without a history of varicella disease.[†††]

Vaccination Coverage by Selected Characteristics

In 2019, compared with adolescents living in MSA principal cities, coverage with ≥1 dose of HPV vaccine among those living in non-MSA areas was 9.6 percentage points lower, the percentage who were HPV UTD was 9.8 percentage points lower, and coverage with ≥1 dose of MenACWY was 5.1 percentage points lower. These disparities were only observed among adolescents living at or above the poverty level (Table 2). Coverage with all vaccine doses recommended for adolescents varied by jurisdiction, with differences ranging from 15 percentage points for ≥1 Tdap dose to 48.4 percentage points for being HPV UTD (Supplementary Table, https://stacks.cdc.gov/view/cdc/91797). Differences were observed in vaccination coverage by race and ethnicity[§§§] and by health insurance status.[¶¶¶]

Trends in HPV Vaccination by Birth Cohort

HPV vaccination initiation by age 13 years increased an average of 5.3 percentage points for each consecutive birth year, from 19.9% among adolescents born in 1998 to 62.6% among those born in 2006 (Supplementary Figure 2, https://stacks.cdc.gov/view/cdc/91796). Being HPV UTD by age 13 years increased an average of 3.4 percentage points for each consecutive birth year, from 8.0% among adolescents born in 1998 to 35.5% among those born in 2006.

Discussion

In 2019, coverage with HPV vaccine and with MenACWY improved compared with coverage in 2018. Improvements in ≥1 dose HPV and HPV UTD vaccination coverage were observed among females and males. In addition, more teens began HPV vaccination on time (by age 13 years) in 2019, suggesting that more parents are making the decision to protect their teens against HPV-associated cancers. Efforts from federal, state, and other stakeholders to prioritize HPV vaccination among adolescents, and reducing the number of recommended HPV vaccine doses from a 3-dose to a 2-dose series, (*2*) likely contributed to these improvements. Coverage with ≥1 dose of MenACWY increased to 88.9%; coverage with ≥2 doses remained low at 53.7%, indicating that continued efforts are needed to improve receipt of the booster dose.

Despite progress in adolescent HPV vaccination and MenACWY coverage, disparities remain; all adolescents are not equally protected against vaccine-preventable diseases. As in previous years, compared with adolescents living in MSA principal cities, HPV UTD status and coverage with ≥1 dose each of HPV vaccine and MenACWY continue to be lower among adolescents in non-MSA areas (*3*). However, these geographic disparities were present only for adolescents at or above the poverty level in 2019. This finding is consistent with another study that found socioeconomic status to be a moderating factor in the association between HPV vaccination and MSA (*4*). The lack of an MSA disparity among adolescents below the poverty level might reflect the access that low-income

[¶] The CASRO response rate is the product of three other rates: 1) the resolution rate (the proportion of telephone numbers that can be identified as either for business or residence), 2) the screening rate (the proportion of qualified households that complete the screening process), and 3) the cooperation rate (the proportion of contacted eligible households for which a completed interview is obtained).

[***] The NIS-Teen methodology for weighting and synthesizing provider-reported vaccination histories has been previously described. https://www.cdc.gov/vaccines/imz-managers/nis/downloads/NIS-Teen-PUF18-DUG.pdf.

[†††] Hepatitis A, hepatitis B, varicella, and measles, mumps, and rubella vaccines are considered childhood vaccinations and are recommended for adolescents who are not up to date with these vaccinations. Estimates in this report include those who might have received vaccinations on-time or as catch-up.

[§§§] https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/pubs-presentations/NIS-teen-vac-coverage-estimates-2019-tables.html#table-01.

[¶¶¶] https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/pubs-presentations/NIS-teen-vac-coverage-estimates-2019-tables.html#table-02.

TABLE 1. Estimated vaccination coverage with selected vaccines and doses among adolescents aged 13–17* years, by age at interview — National Immunization Survey–Teen (NIS-Teen), United States, 2019

Vaccine	Age at interview, yrs % (95% CI)†					Total % (95% CI)†	
	13 (n = 3,927)	14 (n = 4,007)	15 (n = 3,753)	16 (n = 3,753)	17 (n = 3,348)	2019 (n = 18,788)	2018 (n = 18,700)
Tdap§ ≥1 dose	89.0 (87.2–90.6)	91.8 (89.6–93.5)¶	91.4 (89.6–92.9)	89.5 (87.4–91.3)	88.9 (85.3–91.7)	90.2 (89.2–91.1)	88.9 (88.0–89.7)
MenACWY**							
≥1 dose	87.7 (86.0–89.3)	91.2 (89.6–92.5)¶	88.3 (86.2–90.1)	88.3 (85.8–90.4)	88.9 (85.9–91.4)	88.9 (88.0–89.8)††	86.6 (85.6–87.5)
≥2 doses§§	NA	NA	NA	NA	53.7 (49.9–57.4)	53.7 (49.9–57.4)	50.8 (47.7–53.8)
HPV¶¶ vaccine							
All adolescents							
≥1 dose	66.9 (64.1–69.6)	73.6 (70.8–76.3)¶	72.1 (69.1–75.0)¶	71.2 (68.1–74.0)¶	73.1 (69.7–76.3)¶	71.5 (70.1–72.8)††	68.1 (66.8–69.3)
HPV UTD***	45.3 (42.1–48.5)	52.2 (48.6–55.8)¶	58.6 (55.3–61.8)¶	57.6 (54.4–60.8)¶	57.1 (53.2–60.8)¶	54.2 (52.7–55.8)††	51.1 (49.8–52.5)
Females							
≥1 dose	68.4 (64.0–72.5)	75.1 (71.4–78.5)¶	75.6 (71.6–79.2)¶	71.9 (67.1–76.3)	74.9 (70.0–79.2)¶	73.2 (71.3–75.0)††	69.9 (68.1–71.6)
HPV UTD	48.9 (43.9–53.9)	53.0 (48.0–57.9)	61.6 (57.0–66.0)¶	61.5 (56.8–66.0)¶	59.2 (53.6–64.5)¶	56.8 (54.6–59.0)††	53.7 (51.8–55.6)
Males							
≥1 dose	65.4 (61.8–68.8)	72.2 (67.8–76.1)¶	68.9 (64.3–73.1)	70.4 (66.4–74.1)	71.6 (66.6–76.1)¶	69.8 (67.9–71.7)††	66.3 (64.6–68.0)
HPV UTD	41.5 (37.9–45.3)	51.5 (46.2–56.7)¶	55.7 (51.1–60.2)¶	53.9 (49.5–58.2)¶	55.2 (49.9–60.4)¶	51.8 (49.7–53.9)††	48.7 (46.8–50.6)
MenB ≥1 dose†††	NA	NA	NA	NA	21.8 (18.9–24.9)	21.8 (18.9–24.9)††	17.2 (14.9–19.9)
MMR ≥2 doses	93.0 (91.1–94.4)	91.2 (88.1–93.5)	93.3 (91.7–94.6)	91.2 (89.0–92.9)	90.7 (87.5–93.2)	91.9 (90.8–92.8)	91.9 (91.2–92.6)
Hepatitis A vaccine ≥2 doses§§§	84.1 (81.6–86.2)	79.8 (76.7–82.6)¶	78.1 (75.3–80.6)¶	71.8 (68.9–74.5)¶	71.9 (68.1–75.4)¶	77.1 (75.8–78.4)††	73.6 (72.4–74.7)
Hepatitis B vaccine ≥3 doses	92.1 (90.1–93.7)	91.6 (88.6–93.8)	92.8 (91.1–94.2)	90.7 (88.5–92.5)	90.8 (87.4–93.4)	91.6 (90.6–92.6)	92.1 (91.3–92.8)
Varicella							
History of varicella¶¶¶	6.8 (5.4–8.5)	8.4 (7.0–10.0)	9.6 (8.0–11.4)¶	10.4 (8.7–12.3)¶	10.4 (8.8–12.4)¶	9.1 (8.4–9.9)††	11.9 (11.0–12.7)
No history of varicella disease							
≥1 dose vaccine	96.0 (94.9–96.8)	94.7 (92.1–96.5)	95.8 (94.6–96.7)	94.4 (92.3–95.9)	95.0 (92.2–96.9)	95.2 (94.3–95.9)	94.9 (94.3–95.4)
≥2 doses vaccine	91.6 (89.6–93.2)	91.0 (87.7–93.5)	92.5 (90.9–93.8)	90.1 (87.7–92.0)	87.8 (84.1–90.7)	90.6 (89.5–91.7)	89.6 (88.7–90.4)
Varicella disease or received ≥2 varicella vaccine doses	92.2 (90.3–93.7)	91.8 (88.7–94.0)	93.2 (91.8–94.4)	91.1 (88.9–92.9)	89.1 (85.7–91.7)	91.5 (90.4–92.4)	90.8 (90.0–91.6)

Abbreviations: CI = confidence interval; HPV = human papillomavirus; MenACWY = quadrivalent meningococcal conjugate vaccine; MenB = serogroup B meningococcal vaccine; MMR = measles, mumps, and rubella vaccine; NA = not applicable; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine; UTD = up-to-date.

* Adolescents (N = 18,788) in the 2019 NIS-Teen were born during January 2001–February 2007.

† Estimates with 95% CIs >20 might not be reliable.

§ Includes percentages receiving Tdap at age ≥10 years.

¶ Statistically significant difference (p<0.05) in estimated vaccination coverage by age; reference group was adolescents aged 13 years.

** Includes percentages receiving MenACWY or meningococcal-unknown type vaccine.

†† Statistically significant difference (p<0.05) compared with 2018 NIS-Teen estimates.

§§ ≥2 doses of MenACWY or meningococcal-unknown type vaccine. Calculated only among adolescents aged 17 years at interview. Does not include adolescents who received 1 dose of MenACWY at age ≥16 years.

¶¶ HPV vaccine, nine-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV). For ≥1 dose and HPV UTD measures, percentages are reported among females and males combined (N = 18,788) and for females only (N = 8,916) and males only (N = 9,872).

*** HPV UTD includes those with ≥3 doses, and those with 2 doses when the first HPV vaccine dose was initiated before age 15 years and there was at least 5 months minus 4 days between the first and second dose. This update to the HPV recommendation occurred in December of 2016.

††† ≥1 dose of MenB, administered, based on individual clinical decision; calculated only among adolescents aged 17 years at interview.

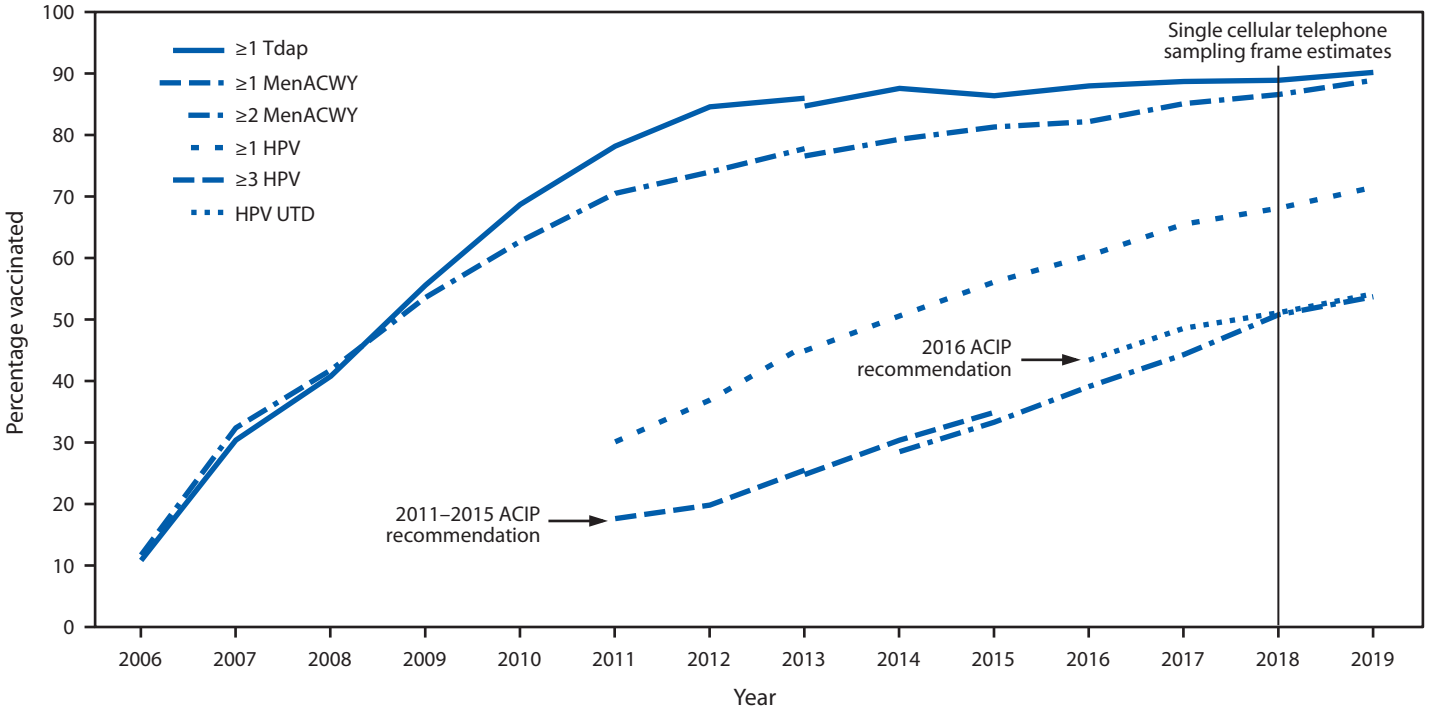
§§§ In July 2020, ACIP revised recommendations for hepatitis A vaccination to include catch-up vaccination for children and adolescents aged 2–18 years who have not previously received hepatitis A vaccine at any age (http://dx.doi.org/10.15585/mmwr.rr6905a1).

¶¶¶ By parent/guardian report or provider records.

adolescents have to the VFC program****; previous studies have reported higher HPV vaccination coverage rates among adolescents living below the poverty level (*5*,*6*). Reasons for the MSA disparity among higher socioeconomic status adolescents are less clear but might be an indicator of lower vaccine confidence. More work is needed to understand the relationship

**** Children aged ≤18 years who are Medicaid-eligible, uninsured, or American Indian/Alaska Native (as defined by the Indian Health Care Improvement Act) are eligible to receive vaccines from providers through the Vaccines for Children (VFC) program. Children categorized as "underinsured" (because their health plans do not include coverage for recommended vaccinations) are eligible to receive VFC vaccines if they are served by a rural health clinic or federally qualified health center or under an approved deputization agreement. https://www.cdc.gov/vaccines/programs/vfc/providers/eligibility.html.

FIGURE. Estimated vaccination coverage with selected vaccines and doses* among adolescents aged 13–17 years, by survey year and Advisory Committee on Immunization Practices (ACIP) recommendations† — National Immunization Survey-Teen (NIS-Teen)§,¶ — United States, 2006–2019



Abbreviations: HPV = human papillomavirus; MenACWY = quadrivalent meningococcal conjugate vaccine; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine; UTD = up-to-date.

* ≥1 dose Tdap at or after age 10 years; ≥1 dose MenACWY or meningococcal-unknown type vaccine; ≥2 doses MenACWY or meningococcal-unknown type vaccine, calculated only among adolescents aged 17 years at time of interview. Does not include adolescents who received their first and only dose of MenACWY at or after age 16 years; HPV vaccine, nine-valent (9vHPV), quadrivalent (4vHPV) or bivalent (2vHPV). The routine ACIP recommendation for HPV vaccination was made for females in 2006 and for males in 2011. Because HPV vaccination was recommended for boys in 2011, coverage for all adolescents was not measured before that year. HPV UTD includes those with ≥3 doses, and those with 2 doses when the first HPV vaccine dose was initiated before age 15 years and at least 5 months minus 4 days elapsed between the first and second dose.

† ACIP revised the recommended HPV vaccination schedule in late 2016. The recommendation changed from a 3-dose to 2-dose series with appropriate spacing between receipt of the first and second dose for immunocompetent adolescents initiating the series before the 15th birthday. Three doses are still recommended for adolescents initiating the series between the ages of 15 and 26 years. Because of the change in recommendation, the graph includes estimates for ≥3 doses HPV from 2011 to 2015 and the HPV UTD estimate from 2016–2019. The routine ACIP recommendation for HPV vaccination was made for females in 2006 and for males in 2011. Because HPV vaccination was not recommended for males until 2011, coverage for all adolescents was not measured before that year.

§ NIS-Teen implemented a revised adequate provider definition (APD) in 2014 and retrospectively applied that definition to 2013 data. Estimates using different APD definitions might not be directly comparable.

¶ NIS-Teen moved from a dual landline and cellular telephone sampling frame to a single cellular telephone sampling frame in 2018.

between socioeconomic status and geographic disparities and the barriers that might be contributing to such differences.

The findings in this report are subject to at least two limitations. First, the CASRO response rate to NIS-Teen was 19.7%, and only 44.0% of households with completed interviews had adequate provider data. A portion of the questionnaires sent to vaccination provider(s) to request the adolescent's vaccination history were mailed in early 2020. A lower response rate was observed for those requests, likely because of the effect of the COVID-19 pandemic on health care provider operations.†††† Second, even with adjustments for household and provider

†††† The Provider Record Check (PRC) phase of the NIS, which is conducted in Chicago, was disrupted on March 21, 2020, by a COVID-19–related stay-at-home order issued by the State of Illinois. This disruption meant that some 2019 NIS-Teen data received from responding providers could not be processed and resulted in a lower rate of adolescents with adequate provider data in Quarter 4 among those with consent to contact vaccination providers. NORC at the University of Chicago (https://www.norc.org), the NIS contractor, assessed the effect of the early close of the PRC operation. They found the adequate provider data rate was lower in Quarter 4 than in previous quarters, but that did not affect the demographics of children with adequate provider data or vaccination coverage estimates for MenACWY or HPV vaccines. Logistic regression models indicate that, after controlling for demographic covariates, the odds of being vaccinated with tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) were lower in Quarter 4 compared with previous quarters, but the effect on the vaccination coverage rate estimate itself was minor.

TABLE 2. Estimated vaccination coverage with selected vaccines and doses among adolescents aged 13–17* years, by metropolitan statistical area (MSA)† and by poverty level — National Immunization Survey–Teen (NIS-Teen), United States, 2019

Vaccine	MSA % (95% CI)§			Below poverty level % (95% CI)§			At or above poverty level % (95% CI)§		
	Non-MSA (n = 3,689)	MSA nonprincipal city (n = 7,745)	MSA principal city (n = 7,354)	Non-MSA (n = 607)	MSA nonprincipal city (n = 820)	MSA principal city (n = 1,376)	Non-MSA (n = 2,962)	MSA nonprincipal city (n = 6,676)	MSA principal city (n = 5,687)
Tdap¶ ≥1 dose	88.7 (86.7–90.5)	90.5 (89.0–91.8)	90.2 (88.5–91.7)	92.2 (88.7–94.6)	87.6 (80.3–92.4)	88.9 (86.0–91.3)	88.0 (85.6–90.1)	90.9 (89.5–92.1)	90.6 (88.4–92.4)
MenACWY**									
≥1 dose	83.5 (80.9–85.8)††	90.3 (89.1–91.4)	88.6 (86.8–90.2)	90.4 (87.0–93.0)	92.4 (88.5–95.1)	88.3 (84.6–91.1)	82.2 (79.0–85.0)††	89.7 (88.4–90.9)	88.8 (86.5–90.7)
≥2 doses§§	46.6 (39.2–54.2)	55.5 (49.9–61.0)	53.3 (46.9–59.5)	36.5 (23.5–51.8)††	51.5 (33.4–69.3)	59.5 (47.9–70.2)	48.8 (40.1–57.5)	57.1 (51.6–62.4)	50.8 (43.3–58.3)
HPV¶¶ vaccine									
All adolescents									
≥1 dose	64.2 (61.2–67.2)††	71.2 (69.2–73.1)	73.8 (71.5–75.9)	72.6 (66.8–77.7)	75.2 (67.9–81.3)	76.5 (71.4–81.0)	62.6 (59.0–66.1)††	70.3 (68.3–72.2)	72.4 (69.8–74.9)
HPV UTD***	47.3 (44.2–50.4)††	53.4 (51.2–55.7)††	57.1 (54.6–59.5)	54.6 (48.4–60.7)	58.8 (51.2–66.0)	58.8 (53.5–63.9)	45.4 (41.8–49.1)††	52.7 (50.3–55.0)††	56.5 (53.6–59.4)
Females									
≥1 dose	66.3 (61.7–70.7)††	72.3 (69.5–75.0)	75.9 (72.9–78.7)	76.2 (67.3–83.3)	73.0 (61.2–82.2)	78.4 (72.4–83.4)	64.0 (58.5–69.2)††	72.2 (69.6–74.7)	75.0 (71.3–78.4)
HPV UTD	49.0 (44.6–53.5)††	56.1 (53.0–59.2)	59.4 (55.7–63.1)	60.1 (51.0–68.4)	58.3 (47.3–68.4)	60.2 (53.3–66.7)	45.6 (40.6–50.7)††	55.3 (52.1–58.4)	58.7 (54.2–63.1)
Males									
≥1 dose	62.4 (58.2–66.4)††	70.2 (67.4–72.9)	71.4 (68.2–74.5)	69.4 (61.5–76.4)	77.5 (68.6–84.4)	74.8 (66.5–81.6)	61.3 (56.4–66.1)††	68.6 (65.6–71.5)	69.6 (65.9–73.1)
HPV UTD	45.7 (41.3–50.1)††	51.0 (47.7–54.3)	54.6 (51.4–57.8)	49.8 (41.4–58.3)	59.4 (48.7–69.3)	57.5 (49.6–65.1)	45.2 (40.0–50.5)††	50.5 (47.0–53.9)	54.1 (50.5–57.7)
MMR ≥2 doses	91.7 (90.0–93.1)	92.3 (91.0–93.3)	91.4 (89.3–93.2)	91.6 (87.6–94.4)	93.7 (90.3–95.9)	93.6 (91.6–95.1)	91.9 (90.0–93.5)	92.2 (90.8–93.4)	91.0 (88.0–93.2)
Hepatitis A vaccine ≥2 doses†††	67.4 (64.5–70.2)††	77.1 (75.1–78.9)	79.8 (77.6–81.9)	65.5 (59.0–71.4)††	82.2 (77.0–86.5)	81.1 (77.1–84.5)	68.1 (64.8–71.3)††	76.9 (74.9–78.9)	79.6 (76.9–82.1)
Hepatitis B vaccine ≥3 doses	92.5 (90.9–93.9)	92.0 (90.6–93.2)	90.9 (88.9–92.6)	92.8 (89.4–95.1)	92.6 (89.2–95.0)	91.0 (88.1–93.2)	92.7 (90.8–94.2)	92.9 (91.6–93.9)	91.4 (88.7–93.5)
Varicella									
History of varicella§§§	12.4 (10.3–15.0)††	8.3 (7.3– 9.3)	9.3 (8.1–10.6)	9.8 (7.1–13.4)	8.2 (5.9–11.2)††	12.3 (9.5–15.6)	13.0 (10.3–16.3)††	7.8 (6.8–8.9)	8.2 (7.0–9.6)
No history of varicella disease									
≥1 dose vaccine	95.0 (93.4–96.2)	95.6 (94.6–96.4)	94.7 (92.9–96.1)	95.7 (92.4–97.6)	95.0 (91.9–97.0)	95.2 (93.2–96.6)	95.2 (93.4–96.5)	95.6 (94.5–96.4)	94.8 (92.3–96.6)
≥2 doses vaccine	90.9 (89.1–92.4)	91.4 (90.2–92.6)	89.6 (87.1–91.6)	90.7 (86.2–93.9)	93.0 (89.6–95.4)	92.9 (90.7–94.6)	91.3 (89.2–93.0)	91.0 (89.6–92.3)	89.1 (85.8–91.6)
Varicella disease or received ≥2 varicella vaccine doses	92.0 (90.4–93.4)	92.1 (91.0–93.2)	90.5 (88.3–92.4)	91.6 (87.6–94.5)	93.6 (90.4–95.7)	93.7 (91.8–95.2)	92.4 (90.6–93.9)	91.7 (90.4–92.9)	90.0 (86.9–92.3)

Abbreviations: CI = confidence interval; HPV = human papillomavirus; MenACWY = quadrivalent meningococcal conjugate vaccine; MMR = measles, mumps, and rubella vaccine; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine; UTD = up-to-date.

* Adolescents (N = 18,788) in the 2019 NIS-Teen were born January 2001 through February 2007.

† MSA status was determined by household-reported county of residence and was grouped into three categories: MSA principal city, MSA nonprincipal city, and non-MSA. MSA and principal city were as defined by the U.S. Census Bureau (https://www.census.gov/programs-surveys/metro-micro/about.html). Non-MSA areas include urban populations not located within an MSA and completely rural areas.

§ Estimates with 95% CIs >20 might not be reliable.

¶ Includes percentages receiving Tdap at age ≥10 years.

** Includes percentages receiving MenACWY and meningococcal-unknown type vaccine.

†† Statistically significant difference (p<0.05) in estimated vaccination coverage by MSA; referent group was adolescents living in MSA principal city areas.

§§ ≥2 doses of MenACWY or meningococcal-unknown type vaccine. Calculated only among adolescents aged 17 years at interview. Does not include adolescents who received 1 dose of MenACWY at age ≥16 years.

¶¶ HPV vaccine, nine-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV) in females and males combined.

*** HPV UTD includes those with ≥3 doses and those with 2 doses when the first HPV vaccine dose was initiated before age 15 years and there was at least 5 months minus 4 days between the first and second dose. This update to the HPV recommendation occurred in December of 2016.

††† In July 2020, ACIP revised recommendations for hepatitis A vaccination to include catch-up vaccination for children and adolescents aged 2–18 years who have not previously received hepatitis A vaccine at any age (http://dx.doi.org/10.15585/mmwr.rr6905a1).

§§§ By parent/guardian report or provider records.

nonresponse, landline-only households, and phoneless households, a bias in the estimates might remain.[§§§§]

The COVID-19 pandemic has the potential to offset historically high vaccination coverage with Tdap and MenACWY and to reverse gains made in HPV vaccination coverage. Orders for adolescent vaccines have decreased among VFC providers during the pandemic. A recent analysis using VFC provider ordering data showed a decline in vaccine orders for several VFC-funded noninfluenza childhood vaccines since mid-March when COVID-19 was declared a national emergency (*7*). CDC, along with other national health organizations, continues to stress the importance of well-child visits and vaccinations as essential services (*8*). The majority of practices appear to be open and resuming vaccination activities for their pediatric patients (*9*,*10*). Providers can take several steps to ensure that adolescents are up to date with recommended vaccines. These include 1) promoting well-child and vaccination visits; 2) following guidance on safely providing vaccinations during the COVID-19 pandemic[¶¶¶¶]; 3) leveraging reminder and recall systems to remind parents of their teen's upcoming appointment, and recalling those who missed appointments and vaccinations; and 4) educating eligible patients and parents, especially those who might have lost employer-funded insurance benefits, about the availability of publicly funded vaccines through the VFC program. In addition, state, local, and territorial immunization programs can consider using available immunization information system data[*****] to identify local areas and sociodemographic groups at risk for undervaccination related to the pandemic, and to help prioritize resources aimed at improving adolescent vaccination coverage.

§§§§ An assessment of validity of the 2018 NIS-Teen estimates has been reported (https://www.cdc.gov/vaccines/imz-managers/nis/downloads/NIS-TEEN-PUF18-DUG.pdf, pages 62–69). NIS-Teen vaccination coverage estimates tended to be slightly low compared with true values derived after adjusting for noncoverage, nonresponse, and vaccination under-ascertainment, reaching up to 5.7 percentage points too low for Tdap. This was primarily attributed to under-ascertainment of vaccinations by the NIS provider record check. The validity of estimates did not change from 2017 to 2018.

¶¶¶¶ https://www.cdc.gov/vaccines/pandemic-guidance/index.html.

***** https://repository.immregistries.org/files/resources/5bae51a16a09c/identifying_immunization_pockets_of_need-_final3.pdf.

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Summary

What is already known about this topic?

Three vaccines are routinely recommended for adolescents to prevent diseases that include pertussis, meningococcal disease, and cancers caused by human papillomavirus (HPV).

What is added by this report?

Adolescent vaccination coverage in the United States continues to improve for HPV and for meningococcal vaccines, with some disparities. Among adolescents living at or above the poverty level, those living outside a metropolitan statistical area (MSA) had lower coverage with HPV and meningococcal vaccines than did those living in MSA principal cities.

What are the implications for public health care?

Ensuring routine immunization services for adolescents, even during the COVID-19 pandemic, is essential to continuing progress in protecting individuals and communities from vaccine-preventable diseases and outbreaks.

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Overdose Education and Naloxone Distribution Within Syringe Service Programs — United States, 2019

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Syringe service programs (SSPs), which provide access to sterile syringes and other injection equipment and their safe disposal after use,* represent a highly successful human immunodeficiency virus (HIV) prevention intervention. SSPs are associated with a 58% reduction in the incidence of HIV infection among persons who inject drugs (*1*). In addition, SSPs have led efforts to prevent opioid overdose deaths by integrating evidence-based opioid overdose education and naloxone distribution (OEND) programs (*2–4*). OEND programs train laypersons to respond during overdose events and provide access to naloxone and directions for drug delivery (*2–4*). SSPs are ideal places for OEND because they provide culturally relevant services designed to reach persons at high risk for experiencing or observing an opioid overdose. A 2013 survey found that only 55% of SSPs in the United States had implemented OEND (*5*). To characterize current implementation of OEND among SSPs, and to describe the current reach (i.e., the ratio of persons who received naloxone per opioid overdose death and the ratio of naloxone doses distributed per opioid overdose death) of SSP-based OEND programs by U.S. Census division,† a survey of known U.S. SSPs was conducted in 2019, which found that 94% of SSPs had implemented OEND. In addition, the reach of SSP-based OEND programs varied by U.S. Census division. Scaling up of SSP-based OEND delivery programs could be a critical component for areas of the country with high opioid overdose death rates and low reach.

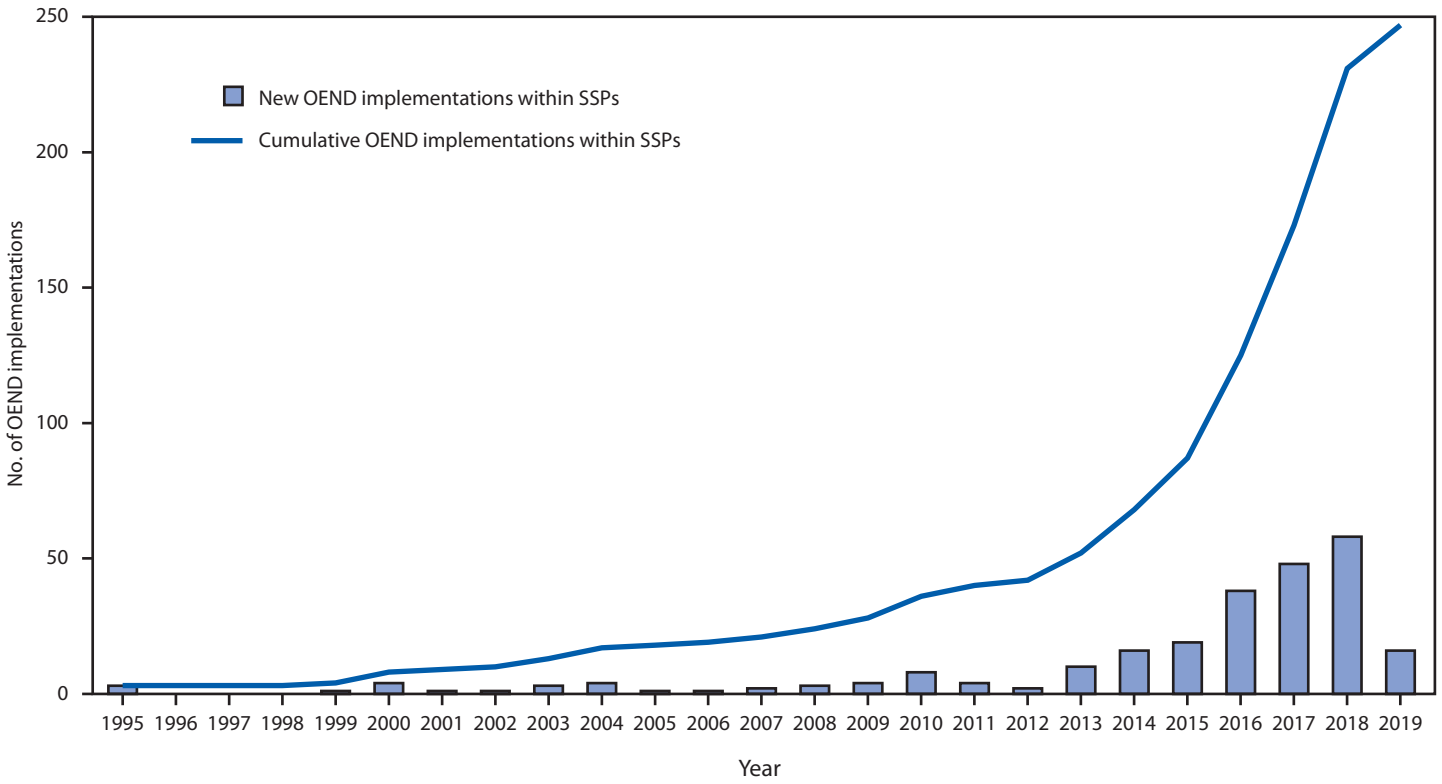
The North America Syringe Exchange Network (NASEN)§ has provided technical and resource support to SSPs for the past 3 decades and as part of this effort maintains a database of all SSPs in the United States. In February 2019, all 342 SSPs in NASEN's database were sent an e-mail asking organizational directors or their designee to participate in an online survey. If an SSP did not respond, additional e-mail or telephone follow-up was conducted to encourage participation. SSPs completing the online survey received a $50 honorarium. Opioid overdose deaths were identified using the *International Classification of Diseases, Tenth Revision* codes X40–X44 (unintentional overdose death); X60–X64 (intentional self-harm); X85 (assault [homicide]); or Y10–Y14 (undetermined intent), where the multiple cause of death codes included T40.0 (poisoning by opium), T40.1 (poisoning by heroin), T40.2 (poisoning by other opioids), T40.3 (poisoning by methadone), T40.4 (poisoning by other synthetic narcotics), or T40.6 (poisoning by other and unspecified narcotics). Opioid overdose deaths and opioid overdose death rates from 2017 were aggregated for the nine U.S. Census divisions, using publicly available data on population and opioid overdose deaths from CDC's National Center for Health Statistics (*6*). SSPs were asked how many persons received naloxone and how many naloxone doses were distributed from their program in the past 12 months. The reach of SSP-based OEND programs for the nine U.S. Census divisions was estimated using two calculations: 1) the number of persons provided naloxone in the previous 12 months divided by the number of opioid overdose deaths in 2017 and 2) the number of naloxone doses distributed during the previous 12 months divided by the number of opioid overdose deaths in 2017. For both calculations, a higher ratio indicates greater reach. These two metrics were used to approximate the extent to which SSP-based naloxone distribution met the underlying need as determined by the number of opioid overdose deaths in the preceding calendar year. Data were analyzed using Stata (version 15.1; StataCorp). All study procedures were reviewed and approved by a federally accredited Institutional Review Board at RTI International.

Among the 342 known SSPs operating at the beginning of 2019, 263 (77%) responded to the online survey; of these, 247 (94%) had an OEND program, 160 (65%) of which had been implemented since 2016 (Figure 1). With regard to phases of OEND implementation, 173 (66%) responding SSPs had been implementing OEND for 12 months or more, 74 (28%) had implemented OEND within the last 12 months, eight (3%) were actively preparing for OEND implementation, and eight (3%) were exploring OEND implementation (Table). Of the 16 SSPs not yet offering OEND, four had previously implemented naloxone distribution but stopped because of an inadequate naloxone supply or funding.

Among the 247 SSPs with an OEND program, 191 (77%) offered OEND every time syringe services were offered, and 214 (87%) provided naloxone refills as often as participants

* https://www.cdc.gov/ssp/index.html.
† https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf.
§ https://www.nasen.org/.

FIGURE 1. Number of new and cumulative overdose education and naloxone distribution (OEND) implementations within syringe service programs (SSPs),*,† by year — United States, 1995–2019



* Data displayed are derived using responses from 263 of 342 SSPs throughout the United States.
† Participating SSPs were identified by using the North America Syringe Exchange Network database.

requested them (Table). SSPs reported offering OEND for a median of 15 of the past 28 days. Only 29 (12%) SSPs entered OEND data directly into an electronic data system. During the preceding 12 months, 237 (96%) of 247 SSPs with OEND programs reported distributing 702,232 naloxone doses, including refills, to 230,506 persons (an average of 3 doses per person). Sixty-two (26%) SSPs reported distributing naloxone to >1,000 persons in the last 12 months; these programs had distributed naloxone to 186,603 laypersons, who represented 81% of all recipients in the past 12 months. Overall, 14 (6%) SSPs reported distribution of ≥10,000 naloxone doses during the last 12 months, accounting for 382,132 naloxone doses, 54% of all doses distributed by SSPs in the past 12 months. These 14 SSPs are located throughout six of the nine census divisions. Seventy-two (29%) SSPs ran out of naloxone or needed to ration their naloxone in the preceding 3 months.

The reach of SSP-based OEND programs varied by U.S. Census division. The highest ratios of persons who received naloxone per opioid overdose death (13:16) and numbers of naloxone doses distributed per opioid overdose death (22:37) were from SSP-based OEND programs in the Mountain, Pacific, and West North Central U.S. Census divisions; SSP-based OEND programs in the East South Central, Middle Atlantic, New England, and South Atlantic U.S. Census divisions had low ratios of persons provided naloxone per opioid overdose death (1:6) and of naloxone doses distributed per opioid overdose death (4:10). SSP-based OEND programs in the East North Central division achieved a high ratio of naloxone doses distributed per opioid overdose death (24), but a low ratio of persons provided naloxone (four) per opioid overdose death. The U.S. Census divisions with higher opioid overdose death rates included the East North Central, East South Central, Middle Atlantic, New England, and South Atlantic divisions (Figure 2).

Discussion

As of 2019, 247 (94%) of 263 SSPs responding to an online survey had implemented OEND, marking a substantial increase from a 2013 survey that found that 55% of SSPs had implemented OEND (*5*). However, the bulk of naloxone distribution, in terms of the number of persons provided naloxone and the number of naloxone doses dispensed, were delivered by only 14 (6%) SSPs. Although SSPs are responding to different needs in the locations where they operate, this finding suggests

TABLE. Characteristics of syringe service program (SSP) respondents (N = 263)* — United States, 2019

Characteristic	No. (%)
U.S. Census division†,§	
East North Central	40 (15)
East South Central	13 (5)
Middle Atlantic	10 (4)
Mountain	28 (11)
New England	24 (9)
Pacific	83 (32)
South Atlantic	44 (16)
West North Central	15 (6)
West South Central	6 (2)
Provide overdose prevention education†	**258 (98)**
Stage of OEND implementation†	
Exploration	8 (3)
Preparation	8 (3)
Early implementation (<12 months)	74 (28)
Sustained implementation (≥12 months)	173 (66)
Receive health department funding for OEND¶	142 (57)
Local community support for OEND¶, median (IQR)**	80 (70–90)
Naloxone offered every time syringe services offered¶	191 (77)
Number of days offering OEND in past 28 days,¶ median (IQR)	15 (6–20)
Naloxone refills provided as often as participants ask¶	214 (87)
Proactive refill system¶	199 (80)
Ran out of naloxone in past 3 months¶	45 (18)
Rationed naloxone in the past 3 months¶	61 (25)
Data system for OEND¶	
No data collected	9 (4)
Data collected via paper forms, then stored	50 (20)
Data collected via paper forms, then entered into database	149 (60)
Electronic data entry	29 (12)
No. of programs by count of persons provided naloxone in the past 12 mos††	
Small (<100)	63 (27)
Medium (100–499)	76 (32)
Large (500–999)	36 (15)
Very large (≥1000)	62 (26)
No. of programs by count of naloxone doses distributed in the past 12 mos††	
Small (<250)	76 (32)
Medium (250–999)	48 (20)
Large (1,000–9,999)	99 (42)
Very large (≥10,000)	14 (6)

Abbreviations: IQR = interquartile range; OEND = overdose education and naloxone distribution.

* Participating SSPs were identified by using the North America Syringe Exchange Network database.

† Of the 263 SSPs that responded to the survey.

§ Region classification was determined by using the U.S. Census Bureau's Census Regions and Divisions of the United States. https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf.

¶ Of the 247 SSPs that had implemented OEND.

** Respondents were asked to characterize the local community support for OEND on a scale of 1–100.

†† Of the 237 SSPs that had implemented OEND and reported naloxone distribution data.

the geographic distribution of SSP-based OEND delivery is highly concentrated in certain areas.

The existence of OEND within SSPs does not assure that the benefits of naloxone have been sufficiently and consistently extended in those areas, and there is currently no consensus regarding how many persons should receive naloxone or how many naloxone doses should be distributed, given the underlying need. A study from Massachusetts reported a 46% reduction in opioid overdose mortality when communities enrolled >100 persons at risk for experiencing or observing an overdose per 100,000 population into OEND programs (*7*). Research from Scotland demonstrated a 62% reduction in the opioid overdose mortality rate when the national program distributed 20 times the number of naloxone doses as the previous year's number of opioid overdose deaths (*8*). Optimizing SSP-based OEND programming might require maximizing the number of participants provided naloxone and the number of naloxone doses distributed to participants. The reach of U.S. SSP-based OEND (as measured by the number of persons provided naloxone and the number of naloxone doses distributed per the number of opioid overdose deaths during the preceding year), was highest in the Mountain, West, and West North Central U.S. Census divisions. However, SSPs in the eastern part of the United States had high opioid overdose death rates but low ratios of persons provided naloxone or naloxone doses relative to the previous year's opioid overdose deaths. Scaling up SSP-based OEND programming in these areas of the country is important; ensuring that SSPs have adequate resources and staffing, as well as supportive legal environments, might be a critical component to achieving these goals.

The findings in this report are subject to at least five limitations. First, other SSPs might exist that are not included in NASEN's database. Second, the survey response rate was 77%; however, previous reports have shown that SSPs that do not participate tend to be small programs (*9*); therefore, it is likely that the larger programs are represented in this analysis. Third, although the online survey might have reduced response bias, responses were self-reported and not validated with programmatic records. Fourth, some organizations provided estimates

Summary

What is already known about this topic?

In 2013, 55% of U.S. syringe service programs (SSPs) had implemented overdose education and naloxone distribution (OEND).

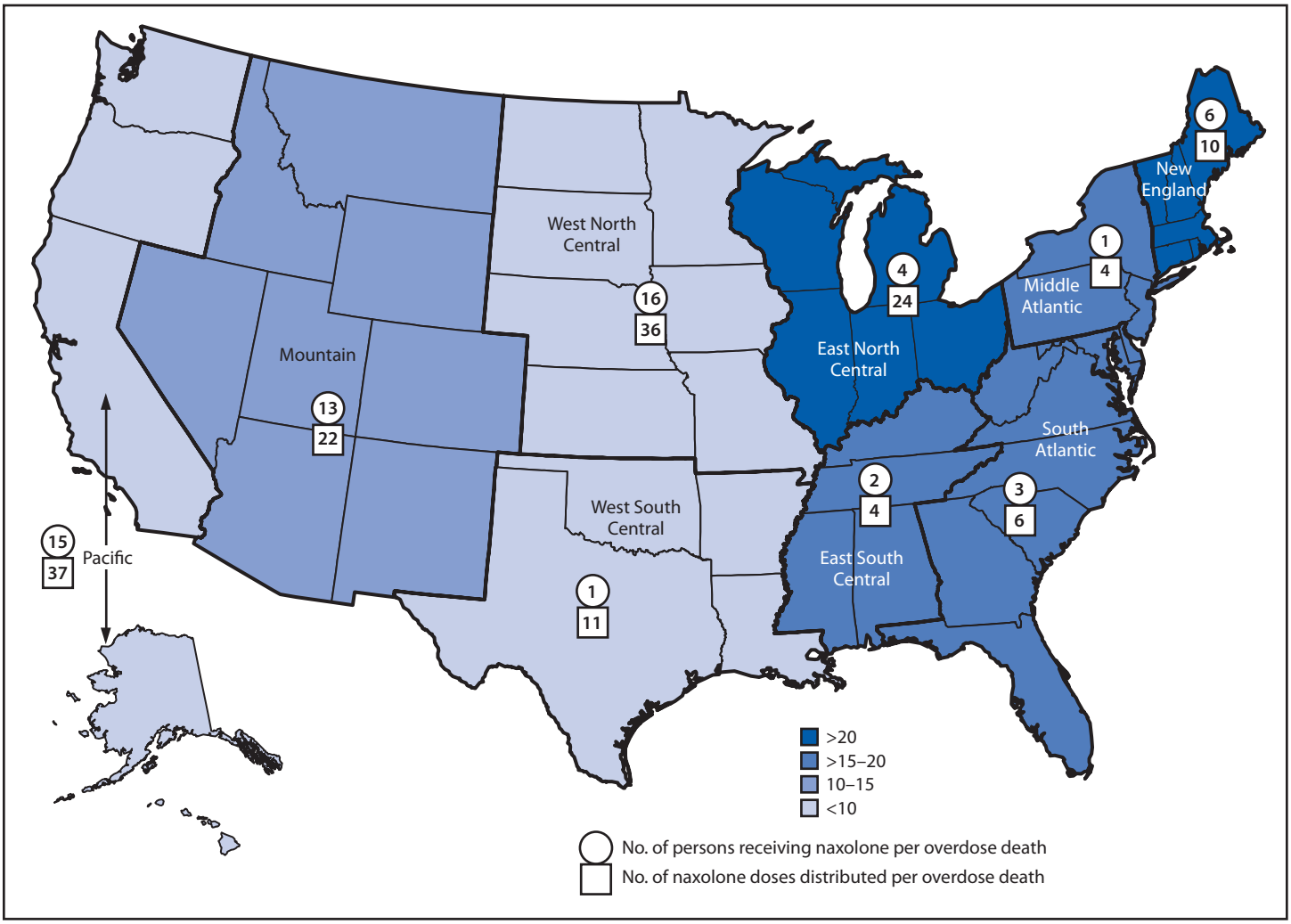
What is added by this report?

In 2019, among 263 SSPs responding to an online survey, 247 (94%) had implemented OEND. The number of persons who received naloxone per opioid overdose death and the number of naloxone doses distributed per opioid overdose death during the previous year varied by census division.

What are the implications for public health practice?

Maximizing participants engaged in OEND and naloxone doses distributed to SSP participants might help to optimize SSP-based OEND programming. Scaling up SSP-based OEND delivery could be a critical component for areas of the country with high opioid overdose death rates.

FIGURE 2. Opioid overdose deaths per 100,000 population and reach of syringe service program (SSP)–based overdose education and naloxone distribution programs,*,† by U.S. Census division (N = 247 SSPs), 2019



* SSPs were asked how many people received naloxone and how many naloxone doses were distributed in the past 12 months from their program. Opioid overdose deaths and opioid overdose death rates were from 2017 National Center for Health Statistics (https://www.cdc.gov/nchs/index.htm) data. Data were geocoded to the census division where the SSP was based, not necessarily where the naloxone was distributed nor residence of the persons proveded naloxone.
† Participating SSPs were identified by using the North America Syringe Exchange Network database.

for the number of naloxone doses distributed and the number of persons provided naloxone, which could result in under- or overreporting. Finally, SSPs operate on a smaller scale than U.S. Census divisions; therefore, the geographic distribution of naloxone distribution is not uniform within them. Further, SSP-based OEND delivery is concentrated where SSPs operate, especially those SSPs distributing ≥10,000 naloxone doses. In this analysis, the number of responding SSPs varied by U.S. Census division; however, the 14 SSPs that accounted for approximately one half of OEND distribution were located throughout six of the nine U.S. Census divisions.

This study found high levels (94%) of OEND implementation within SSPs in the United States; however, the number of persons provided naloxone and the number of naloxone doses distributed varied substantially across SSPs in U.S. Census divisions. Opportunity exists to improve the reach of SSP-based OEND programs, especially in areas of the country with high opioid overdose mortality rates. The introduction of fentanyl into the illicit drug supply has resulted in a sharp increase in the overdose rate in many regions, including those with longstanding SSP-based OEND programs (*10*). Ensuring that all SSP participants are provided access to a sufficient and consistent supply of naloxone over time can optimize efforts to reduce opioid overdose deaths. Public health initiatives might be enhanced with efforts to scale-up SSPs throughout the United States.

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Disparities in Incidence of COVID-19 Among Underrepresented Racial/Ethnic Groups in Counties Identified as Hotspots During June 5–18, 2020 — 22 States, February–June 2020

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During January 1, 2020–August 10, 2020, an estimated 5 million cases of coronavirus disease 2019 (COVID-19) were reported in the United States.* Published state and national data indicate that persons of color might be more likely to become infected with SARS-CoV-2, the virus that causes COVID-19, experience more severe COVID-19–associated illness, including that requiring hospitalization, and have higher risk for death from COVID-19 (*1*–*5*). CDC examined county-level disparities in COVID-19 cases among underrepresented racial/ethnic groups in counties identified as hotspots, which are defined using algorithmic thresholds related to the number of new cases and the changes in incidence.† Disparities were defined as difference of ≥5% between the proportion of cases and the proportion of the population or a ratio ≥1.5 for the proportion of cases to the proportion of the population for underrepresented racial/ethnic groups in each county. During June 5–18, 205 counties in 33 states were identified as hotspots; among these counties, race was reported for ≥50% of cumulative cases in 79 (38.5%) counties in 22 states; 96.2% of these counties had disparities in COVID-19 cases in one or more underrepresented racial/ethnic groups. Hispanic/Latino (Hispanic) persons were the largest group by population size (3.5 million persons) living in hotspot counties where a disproportionate number of cases among that group was identified, followed by black/African American (black) persons (2 million), American Indian/Alaska Native (AI/AN) persons (61,000), Asian persons (36,000), and Native Hawaiian/other Pacific Islander (NHPI) persons (31,000). Examining county-level data disaggregated by race/ethnicity can help identify health disparities in COVID-19 cases and inform strategies for preventing and slowing SARS-CoV-2 transmission. More complete race/ethnicity data are needed to fully inform public health decision-making. Addressing the pandemic's disproportionate incidence of COVID-19 in communities of color can reduce the community-wide impact of COVID-19 and improve health outcomes.

This analysis used cumulative county-level data during February–June 2020, reported to CDC by jurisdictions or extracted from state and county websites and disaggregated by race/ethnicity. Case counts, which included both probable and laboratory-confirmed cases, were cross-referenced with counts from the HHS Protect database (https://protect-public.hhs.gov/). Counties missing race data for more than half of reported cases (126) were excluded from the analysis.§ The proportion of the population for each county by race/ethnicity was calculated using data obtained from CDC WONDER (*6*). For each underrepresented racial/ethnic group, disparities were defined as a difference of ≥5% between the proportion of cases and the proportion of the population consisting of that group or a ratio of ≥1.5 for the proportion of cases to the proportion of the population in that racial/ethnic group. The county-level differences and ratios between proportion of cases and the proportion of population were used as a base for a simulation accounting for missing data using different assumptions of racial/ethnic distribution of cases with unknown race/ethnicity. An intercept-only logistic regression model was estimated for each race/ethnicity category and county to obtain the intercept regression coefficient and standard error. The simulation used the logistic regression-estimated coefficient and standard error to produce an estimated mean and confidence interval (CI) for the percentage difference between and ratio of proportions of cases and population. This simulation was done for each racial/ethnic group within each county. The lower bound of the CI was used to identify counties with disparities (as defined by percentage differences or ratio). The mean of the estimated differences and mean of the estimated ratios were calculated

* https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html.

† Hotspot counties are defined as those meeting all of the following baseline criteria: 1) >100 new COVID-19 cases in the most recent 7 days, 2) an increase in the most recent 7-day COVID-19 incidence over the preceding 7-day incidence, 3) a decrease of <60% or an increase in the most recent 3-day COVID-19 incidence over the preceding 3-day incidence, and 4) the ratio of 7-day incidence to 30-day incidence exceeds 0.31. In addition, hotspots must have met at least one of the following criteria: 1) >60% change in the most recent 3-day COVID-19 incidence, or 2) >60% change in the most recent 7-day incidence.

§ Data from 10 of the 126 excluded counties were excluded due to pending data questions.

for all counties with disparities. Analyses were conducted using SAS software (version 9.4; SAS Institute).

During June 5–18, a total of 205 counties in 33 states were identified as hotspots. These counties have a combined total population of 93.5 million persons, and approximately 535,000 cumulative probable and confirmed COVID-19 cases. Among the 205 identified hotspot counties, 79 (38.5%) counties in 22 states, with a combined population of 27.5 million persons and approximately 162,000 COVID-19 cases, had race data available for ≥50% of cumulative cases and were included in the analysis (range = 51.3%–97.4%). Disparities in cases were identified among underrepresented racial/ethnic groups in 76 (96.2%) analyzed counties (Table 1). Disparities among Hispanic populations were identified in approximately three quarters of hotspot counties (59 of 79, 74.7%) with approximately 3.5 million Hispanic residents (Table 2). Approximately 2.0 million black persons reside in 22 (27.8%) hotspot counties where black residents were disproportionately affected by COVID-19, approximately 61,000 AI/AN persons live in three (3.8%) hotspot counties where AI/AN residents were disproportionately affected by COVID-19, nearly 36,000 Asian persons live in four (5.1%) hotspot counties where Asian residents were disproportionately affected by COVID-19, and approximately 31,000 NHPI persons live in 19 (24.1%) hotspot counties where NHPI populations were disproportionately affected by COVID-19.

The mean of the estimated differences between the proportion of cases and proportion of the population consisting of each underrepresented racial/ethnic group in all counties with disparities ranged from 4.5% (NHPI) to 39.3% (AI/AN) (Table 3). The mean of the estimated ratio of the proportion of cases to the proportions of population were also generated for each underrepresented racial/ethnic group and ranged from 2.3 (black) to 8.5 (NHPI).

Discussion

These findings illustrate the disproportionate incidence of COVID-19 among communities of color, as has been shown by other studies, and suggest that a high percentage of cases in hotspot counties are among persons of color (*1*–*5*,*7*). Among all underrepresented racial/ethnic groups in these hotspot counties, Hispanic persons were the largest group living in hotspot counties with a disparity in cases identified within that population (3.5 million persons). This finding is consistent with other evidence highlighting the disproportionate incidence of COVID-19 among the Hispanic population (*2*,*7*). The disproportionate incidence of COVID-19 among black populations is well documented (*1*–*3*). The findings from this analysis align with other data indicating that black persons are overrepresented among COVID-19 cases, associated hospitalizations, and deaths in the United States. The analysis found few counties with disparities among AI/AN populations. This finding is likely attributable to the smaller proportions of cases and populations of AI/AN identified in hotspot counties, as well as challenges with data for this group, including a lack of surveillance data and misclassification problems in large data sets.[¶] Asian populations were disproportionately affected by COVID-19 in a small number of hotspot counties. Few studies have assessed COVID-19 disparities among Asian populations in the United States.[**] The Asian racial category is broad, and further subgroup analyses might provide additional insights regarding the incidence of COVID-19 in this population. Disparities in COVID-19 cases in NHPI populations were identified in nearly one quarter of hotspot counties. For some hotspot counties with small NHPI populations, this finding might be related, in part, to the analytic methodology used. Using a ratio of ≥1.5 in the proportion of population and proportion of cases to indicate disparities is sensitive to small differences in these groups. More complete county-level race/ethnicity data are needed to fully evaluate the disproportionate incidence of COVID-19 among communities of color.

Disparities in COVID-19–associated mortality in hotspot counties were not assessed because the available county-level mortality data disaggregated by race/ethnicity were not sufficient to generate reliable estimates. Existing national analyses highlight disparities in mortality associated with COVID-19; similar patterns are likely to exist at the county level (*5*). As more complete data are made available in the future, county-level analyses examining disparities in mortality might be possible. COVID-19 disparities among underrepresented racial/ethnic groups likely result from a multitude of conditions that lead to increased risk for exposure to SARS-CoV-2, including structural factors, such as economic and housing policies and the built environment,[††] and social factors such as essential worker employment status requiring in-person work (e.g., meatpacking, agriculture, service, and health care), residence in multigenerational and multifamily households, and overrepresentation in congregate living environments with an increased risk for transmission (*4*,*7*–*9*). Further, long-standing discrimination and social inequities might contribute to factors that increase risk for severe disease and death, such as limited access to health care, underlying medical conditions,

[¶] https://aspe.hhs.gov/execsum/gaps-and-strategies-improving-american-indianalaska-nativenative-american-data.

[**] https://www.healthaffairs.org/do/10.1377/hblog20200708.894552/full/.

[††] The built environment includes the physical makeup of where persons live, learn, work, and play, including homes, schools, businesses, streets and sidewalks, open spaces, and transportation options. The built environment can influence overall community health and individual. Behaviors, such as physical activity and healthy eating. https://www.cdc.gov/nccdphp/dnpao/state-local-programs/built-environment-assessment/.

TABLE 1. Total population and racial/ethnic disparities* in cumulative COVID-19 cases among 79 counties identified as hotspots during June 5–18, 2020, with any disparity identified — 22 states, February–June 2020

State	No. of persons living in analyzed hotspot counties*	No. of (col %) hotspot counties analyzed†	No. of counties with disparities in COVID-19 cases among each racial/ethnic group§				
			Hispanic	Black	NHPI	Asian	AI/AN
Alabama	500,000–1,000,000	1 (1.3)	—	1	—	—	—
Arizona	1,000,000–3,000,000	5 (6.3)	3	—	—	—	3
Arkansas	500,000–1,000,000	4 (5.1)	4	—	2	—	—
California	1,000,000–3,000,000	1 (1.3)	1	—	—	—	—
Colorado	100,000–500,000	1 (1.3)	1	—	1	—	—
Florida	>3,000,000	6 (7.6)	3	2	—	—	—
Georgia	100,000–500,000	1 (1.3)	1	—	—	—	—
Iowa	50,000–100,000	1 (1.3)	1	—	—	—	—
Kansas	500,000–1,000,000	2 (2.5)	2	—	2	—	—
Massachusetts	500,000–1,000,000	2 (2.5)	—	2	—	—	—
Michigan	1,000,000–3,000,000	5 (6.3)	—	5	1	—	—
Minnesota	<50,000	1 (1.3)	1	1	1	1	—
Mississippi	100,000–500,000	2 (2.5)	1	2	—	—	—
North Carolina	>3,000,000	18 (22.8)	18	—	3	1	—
Ohio	1,000,000–3,000,000	3 (3.8)	3	2	—	1	—
Oregon	1,000,000–3,000,000	6 (7.6)	6	1	4	1	—
South Carolina	1,000,000–3,000,000	9 (11.4)	6	4	2	—	—
Tennessee	500,000–1,000,000	3 (3.8)	3	—	—	—	—
Texas	500,000–1,000,000	2 (2.5)	—	1	—	—	—
Utah	1,000,000–3,000,000	4 (5.1)	4	1	3	—	—
Virginia	<50,000	1 (1.3)	—	—	—	—	—
Wisconsin	100,000–500,000	1 (1.3)	1	—	—	—	—
Total (approximate)	**27,500,000**	**79 (100)**	**59**	**22**	**19**	**4**	**3**

Abbreviations: AI/AN = American Indian/Alaska Native; COVID-19 = coronavirus disease 2019; NHPI = Native Hawaiian/other Pacific Islanders.
* Disparities were defined as percentage difference of ≥5% between the proportion of cases and the proportion of the population or a ratio ≥1.5 for the proportion of cases to the proportion of the population) for underrepresented racial/ethnic groups in each county.
† Counties with race/ethnicity data available for ≥50% of cases.
§ Racial/ethnic groups are not mutually exclusive in a given county.

and higher levels of exposure to pollution and environmental hazards[§§] (*4*). The conditions contributing to disparities likely vary widely within and among groups, depending on location and other contextual factors.

Rates of SARS-CoV-2 transmission vary by region and time, resulting in nonuniform disease outbreak patterns across the United States. Therefore, using epidemiologic indicators to identify hotspot counties currently affected by SARS-CoV-2 transmission can inform a data-driven emergency response. Tailoring strategies to control SARS-CoV-2 transmission could reduce the overall incidence of COVID-19 in communities. Using these data to identify disproportionately affected groups at the county level can guide the allocation of resources, development of culturally and linguistically tailored prevention activities, and implementation of focused testing efforts.

The findings in this report are subject to at least five limitations. First, more than half of the hotspot counties did not report sufficient race data and were therefore excluded from the analysis. In addition, many hotspot counties included in the analyses were missing data on race for a significant proportion of cases (mean = 28.3%; range = 2.6%–48.7%). These data gaps might result from jurisdictions having to reconcile data from multiple sources for a large volume of cases while data collection and management processes are rapidly evolving.[¶¶] Second, health departments differ in the way race/ethnicity are reported, making comparisons across counties and states more difficult. Third, differences in how race/ethnicity data are collected (e.g., self-report versus observation) likely varies by setting and could lead to miscategorization. Fourth, differences in access to COVID-19 testing could lead to underestimates of prevalence in some underrepresented racial/ethnic populations. Finally, the number of cases that had available race/ethnicity data for the period of study of hotspots (June 5–18) was too small to generate reliable estimates, so cumulative case counts by county during February–June 2020 were used to identify disparities. This approach describes the racial/ethnic breakdown of cumulative cases only. Therefore, these data might not provide an accurate estimate of disparities during June 5–18, which could be under- or overestimated, or change over time.

Developing culturally responsive, targeted interventions in partnership with trusted leaders and community-based organizations within communities of color might reduce disparities

[§§] https://www.medrxiv.org/content/10.1101/2020.04.05.20054502v2.

[¶¶] https://www.hhs.gov/about/news/2020/06/04/hhs-announces-new-laboratory-data-reporting-guidance-for-covid-19-testing.html.

TABLE 2. Number of persons in each racial/ethnic group living in 79 counties identified as hotspots during June 5–18, 2020 with disparities* — 22 states, February–June 2020

Racial/Ethnic group	No. (%)† of counties with disparities§ identified	Approximate no. of persons living in hotspot counties with disparities
Hispanic/Latino	59 (74.7)	3,500,000
Black/African American	22 (27.8)	2,000,000
American Indian/ Alaska Native	3 (3.8)	61,000
Asian	4 (5.1)	36,000
Native Hawaiian/ Other Pacific Islander	19 (24.1)	31,000
Total	—	**5,628,000**

Abbreviation: COVID-19 = coronavirus disease 2019.
* Disparities were defined as percentage difference of ≥5% between the proportion of cases and the proportion of the population or a ratio ≥1.5 for the proportion of cases to the proportion of the population) for underrepresented racial/ethnic groups in each county.
† Percentage of the 79 counties.
§ Disparities are in respective racial/ethnic groups and are not mutually exclusive; some counties had disparities in more than one racial/ethnic group.

TABLE 3. Proportion of cumulative COVID-19 cases compared with proportion of population in 79 counties identified as hotspots during June 5–18, 2020 with racial/ethnic disparities* — 22 states, February–June 2020

Racial/Ethnic group	Mean of estimated differences,† % (range)	Mean of estimated ratios of proportion of cases to proportion of population§ (range)
Hispanic/Latino	30.2 (8.0–68.2)	4.4 (1.2–14.6)
Black/African American	14.5 (2.3–31.7)	2.3 (1.2–7.0)
American Indian/ Alaska Native	39.3 (16.4–57.9)	4.2 (1.9–6.4)
Asian	4.7 (2.7–6.8)	2.9 (2.0–4.7)
Native Hawaiian/ Other Pacific Islander	4.5 (0.1–31.5)	8.5 (2.7–18.4)

Abbreviation: COVID-19 = coronavirus disease 2019.
* Disparities were defined as percentage difference of ≥5% between the proportion of cases and the proportion of the population or a ratio ≥1.5 for the proportion of cases to the proportion of the population) for underrepresented racial/ethnic groups in each county.
† The mean of the estimated differences between the proportion of cases in a given racial/ethnic group and the proportion of persons in that racial/ethnic group in the overall population among all counties with disparities identified by the analysis. For example, if Hispanic/Latino persons make up 20% of the population in a given county and 30% of the cases in that county, then the difference would be 10% and the county is considered to have a disparity.
§ The ratio of the estimated proportion of cases to the proportion of population for each racial/ethnic group among all counties with disparities identified by the analysis. For example, if American Indian/Alaskan Native persons made up 0.5% of the population in a given county and 1.5% of the cases in that county, then the ratio of proportions would be 3.0, and the county is considered to have a disparity.

in COVID-19 incidence. Increasing the proportion of cases for which race/ethnicity data are collected and reported can help inform efforts in the short-term to better understand patterns of incidence and mortality. Existing health inequities amplified by COVID-19 highlight the need for continued investment in communities of color to address social determinants of health*** and structural racism that affect health beyond this pandemic (*4*,*8*). Long-term efforts should focus on addressing societal factors that contribute to broader health disparities across communities of color.

*** https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health.

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Summary

What is already known about this topic?

Long-standing health and social inequities have resulted in increased risk for infection, severe illness, and death from COVID-19 among communities of color.

What is added by this report?

Among 79 counties identified as hotspots during June 5–18, 2020 that also had sufficient data on race, a disproportionate number of COVID-19 cases among underrepresented racial/ethnic groups occurred in almost all areas during February–June 2020.

What are the implications for public health practice?

Identifying health disparities in COVID-19 hotspot counties can inform testing and prevention efforts. Addressing the pandemic's disproportionate incidence among communities of color can improve community-wide health outcomes related to COVID-19.

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Trends in Number and Distribution of COVID-19 Hotspot Counties — United States, March 8–July 15, 2020

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The geographic areas in the United States most affected by the coronavirus disease 2019 (COVID-19) pandemic have changed over time. On May 7, 2020, CDC, with other federal agencies, began identifying counties with increasing COVID-19 incidence (hotspots) to better understand transmission dynamics and offer targeted support to health departments in affected communities. Data for January 22–July 15, 2020, were analyzed retrospectively (January 22–May 6) and prospectively (May 7–July 15) to detect hotspot counties. No counties met hotspot criteria during January 22–March 7, 2020. During March 8–July 15, 2020, 818 counties met hotspot criteria for ≥1 day; these counties included 80% of the U.S. population. The daily number of counties meeting hotspot criteria peaked in early April, decreased and stabilized during mid-April–early June, then increased again during late June–early July. The percentage of counties in the South and West Census regions* meeting hotspot criteria increased from 10% and 13%, respectively, during March–April to 28% and 22%, respectively, during June–July. Identification of community transmission as a contributing factor increased over time, whereas identification of outbreaks in long-term care facilities, food processing facilities, correctional facilities, or other workplaces as contributing factors decreased. Identification of hotspot counties and understanding how they change over time can help prioritize and target implementation of U.S. public health response activities.

Aggregate, cumulative counts of reported COVID-19 cases (*1*) were collected by USAFacts through automated extraction or manual entry of information from state and local health department websites.† CDC and the Applied Physics Laboratory (APL) of Johns Hopkins University cleaned the data to ensure nonnegative daily case counts and correct reporting errors (such as instances of 2 days' of data being recorded on a single day) and analyzed data by county and report date. Hotspot counties were identified among counties in U.S. states and the District of Columbia by applying standardized criteria developed through a collaborative process involving multiple federal agencies; hotspots were defined based on relative temporal increases in number of cases.§ Prospective hotspot detection began on May 7, 2020. The same methods were applied retrospectively to detect hotspot counties using data from January 22, when the first U.S. COVID-19 case was reported (*2*), until May 6, 2020; no counties met hotspot criteria during January 22–March 7, 2020. Data from prospective and retrospective hotspot detection were analyzed to characterize trends in COVID-19 hotspot counties and hotspot alerts (each time a county meets hotspot criteria for 1 day) over time. Counties meeting hotspot criteria were analyzed by U.S. Census region (*3*) and urbanicity¶ (*4*).

CDC and APL assessed factors contributing to increased COVID-19 cases in hotspot counties identified during May 11–July 13 by reviewing case and laboratory data from HHS Protect (https://protect-public.hhs.gov/), a secure data hub for sharing COVID-19 information for first responders, researchers, and policy-makers; health department websites; online news reports; CDC deployment information; and outreach to state health department leadership to validate the contributing factors. A county could have more than one contributing factor identified. Contributing factors included focal outbreaks (i.e., at long-term care facilities, food processing facilities, correctional facilities, or other workplaces), community transmission, increased testing or irregular reporting,

* U.S. Census 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.

† https://usafacts.org/articles/detailed-methodology-covid-19-data/.

§ Counties defined as hotspot counties met all four of the following criteria, relative to the date assessed: 1) >100 new COVID-19 cases in the most recent 7 days, 2) an increase in the most recent 7-day COVID-19 incidence over the preceding 7-day incidence, 3) a decrease of <60% or an increase in the most recent 3-day COVID-19 incidence over the preceding 3-day incidence, and 4) the ratio of 7-day incidence/30-day incidence exceeds 0.31. In addition, hotspots must have met at least one of the following criteria: 1) >60% change in the most recent 3-day COVID-19 incidence, or 2) >60% change in the most recent 7-day incidence.

¶ According to the CDC's National Center for Health Statistics urban-rural classification scheme for counties. *Large central metro counties*: in metropolitan statistical areas (MSAs) of ≥1 million population that contain all or part of the area's principal city. *Large fringe metro counties*: in MSAs of ≥1 million population and do not qualify as large central. *Medium metro counties*: in MSAs of 250,000–999,999 population. *Small metro counties*: in MSAs of <250,000 population. *Micropolitan counties*: in micropolitan statistical area. *Noncore counties*: not in metropolitan or micropolitan statistical areas.

or no discernible cause. Analysis identified differences in contributing factors, comparing community transmission versus focal outbreaks, for counties identified in May compared with those identified in June and July.

During March 8–July 15, 2020, among the 3,142 U.S. counties, 818 (26%) met hotspot criteria for ≥1 day for a total of 9,898 alerts (Figure 1). These 818 counties include 80% of the U.S. population. The median number of days (not necessarily consecutive) that a county met the hotspot criteria during March 8–July 15 was 10 (interquartile range = 5–18). The daily number of counties meeting hotspot criteria peaked at 175 in early April, decreased and stabilized at <75 per day during mid-April to early June, then increased again to 179 in early July (Figure 2).

By U.S. Census region, the percentage of counties meeting hotspot criteria differed over time (Table). During March–April, 40% of northeastern counties, representing 84% of the population of the Northeast region, met hotspot criteria for ≥1 day, whereas hotspot criteria were met by 8%–13% of counties in other regions. During May, 8%–11% of counties in all four U.S. Census regions met hotspot criteria. During June and July, 28% of southern counties, representing 76% of the population in the South Census region, and 22% of western counties, representing 86% of the population in the West Census region, met hotspot criteria, whereas 9%–10% of counties in the Northeast and Midwest, representing 16%–44% of the population in those regions, met hotspot criteria.

The percentage of counties meeting hotspot criteria also varied over time by counties' urbanicity. The percentage of large central metropolitan counties meeting hotspot criteria was 97% during March–April, 46% in May, and 78% during June–July; the proportions were lower for large fringe metropolitan counties (31%, 16%, and 39%, respectively). The proportion of counties in medium metropolitan areas meeting hotspot criteria during June–July was higher (46%) than the percentage during March–April (26%), as was true for counties in small metropolitan areas (32% versus 13%) and micropolitan areas (16% versus 5%). Few counties in noncore areas met hotspot criteria (1%–3%).

Factors contributing to increases in cases were identified for 116 (94%) of 124 counties with new hotspot alerts during May 11–31 (mean = 1.7 per county, total = 214), and for 389 (72%) of 539 counties with new alerts during June 1–July 13, (mean = 1.2 per county, total = 481). The proportion of factors contributing to the increases in reported COVID-19 cases that were focal outbreaks decreased from 56% during May 11–31 to 24% during June 1–July 13, whereas the proportion of identified factors that were community transmission increased from 18% to 41%, and the proportion not related to any discernible factor increased from 8% to 24%. The proportion with increased testing or reporting delay identified as contributing factors decreased from 17% to 11%.

During May 7–July 15, CDC deployed 92 teams comprising 375 persons to 37 states and the District of Columbia; the majority of these deployments were related to hotspots. For example, in response to requests for assistance with hotspot counties, CDC and the U.S. Public Health Service (USPHS; https://www.usphs.gov/) deployed multidisciplinary teams to North Carolina beginning June 13 (CDC) and June 22 (USPHS) to assist with case investigation, contact tracing, and data management; the CDC Foundation (https://www.cdcfoundation.org/) provided additional contact tracers to support local health departments in North Carolina in managing these hotspots. These public health staff members collaborated with the extensive network of local and state health officials responding to the pandemic.

Discussion

Identifying hotspot counties experiencing localized increases in COVID-19 incidence provides CDC and other federal, state, and local agencies critical information for understanding the changing epidemiology of COVID-19 and targeting the implementation of rapid public health response activities. After hotspot counties are identified, quantitative and qualitative data from multiple data sources (describing not only local epidemiology, but also demographic characteristics, prevention efforts, testing, and health care utilization) are used to inform outreach to local officials. Outreach to local officials provides an opportunity to validate findings, identify specific concerns within the community, and identify resources and opportunities for interventions adapted to the specific needs of the local area. Such intervention can include technical assistance from federal staff members upon request from state health departments, including deployments to support epidemiology and analysis, contact tracing, laboratory testing, community mitigation, worker safety, infection prevention and control, health communications, and health care. These types of partnerships, exemplified by the collaborative effort between CDC, North Carolina Department of Health and Human Services, USPHS, and the CDC Foundation, highlight the intensive local, state, and federal efforts being used across the country to focus urgent public health actions where they are needed most.

Increased community transmission during June and July demonstrated the speed with which SARS-CoV-2, the virus that causes COVID-19, can spread, even in the absence of outbreaks in high-risk congregate settings, such as long-term care facilities, food processing facilities, and correctional facilities (*5*,*6*,*7*). Increasing geographic spread across metropolitan and micropolitan counties with community transmission indicates a pressing need to strengthen community mitigation efforts, including use of face masks, physical distancing, and hand hygiene. Population characteristics as well as other cultural, language, and sociopolitical factors should be considered when

FIGURE 1. Number of COVID-19 hotspot alerts, by county and number of days* meeting hotspot criteria for (A) March 8–April 30, (B) May 1–31, (C) June 1–July 15, and (D) entire period — United States, March 8–July 15, 2020

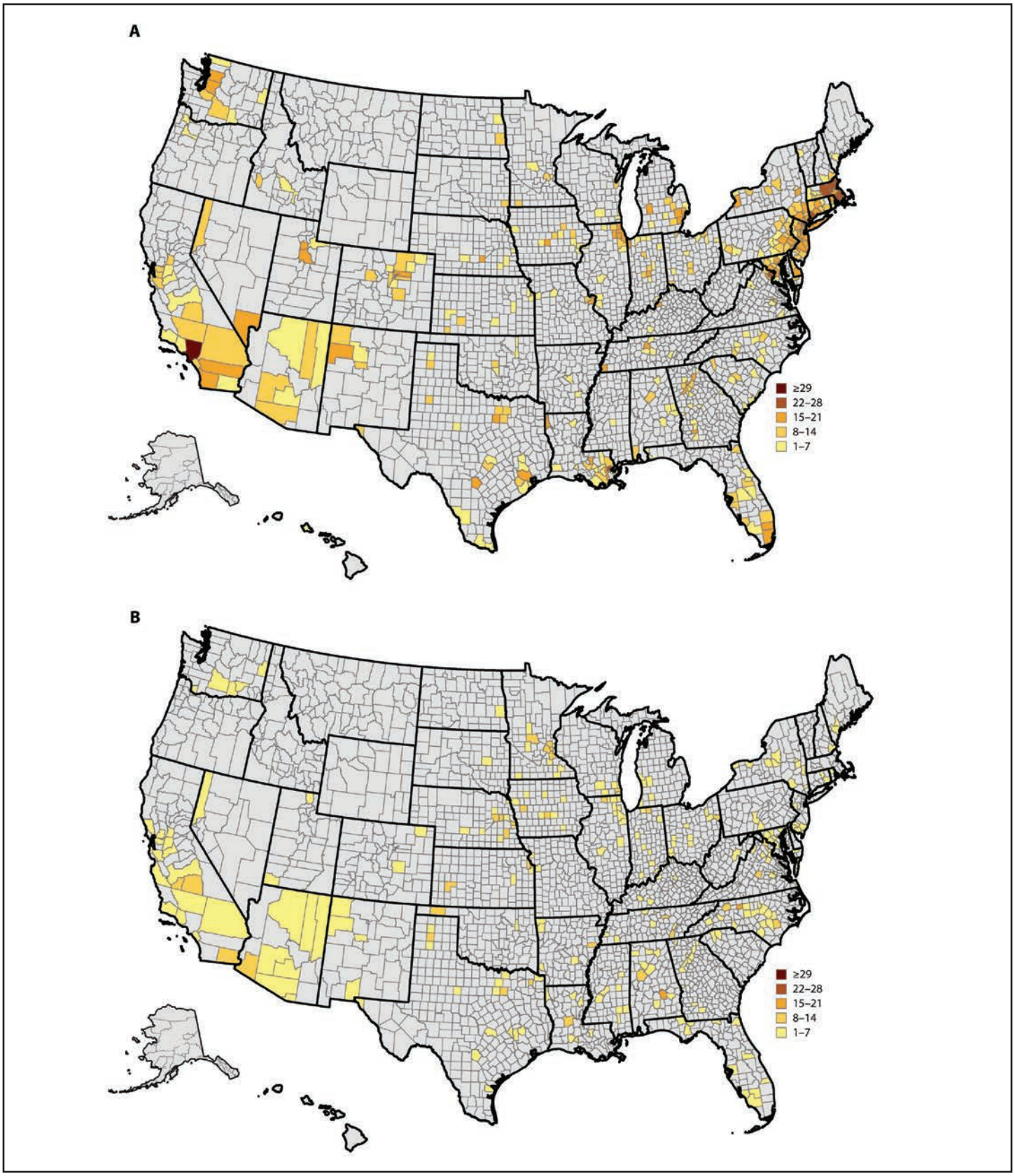
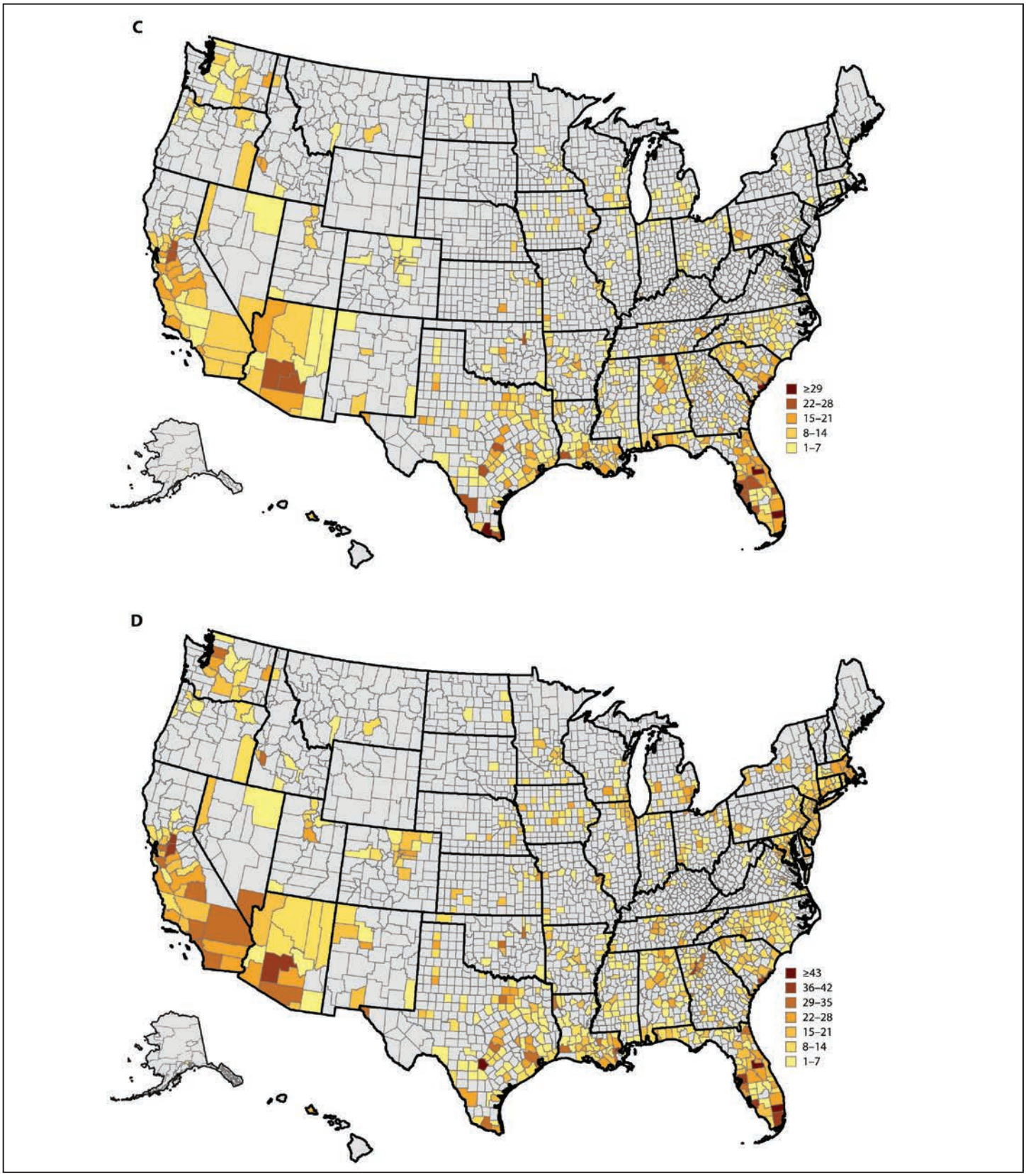
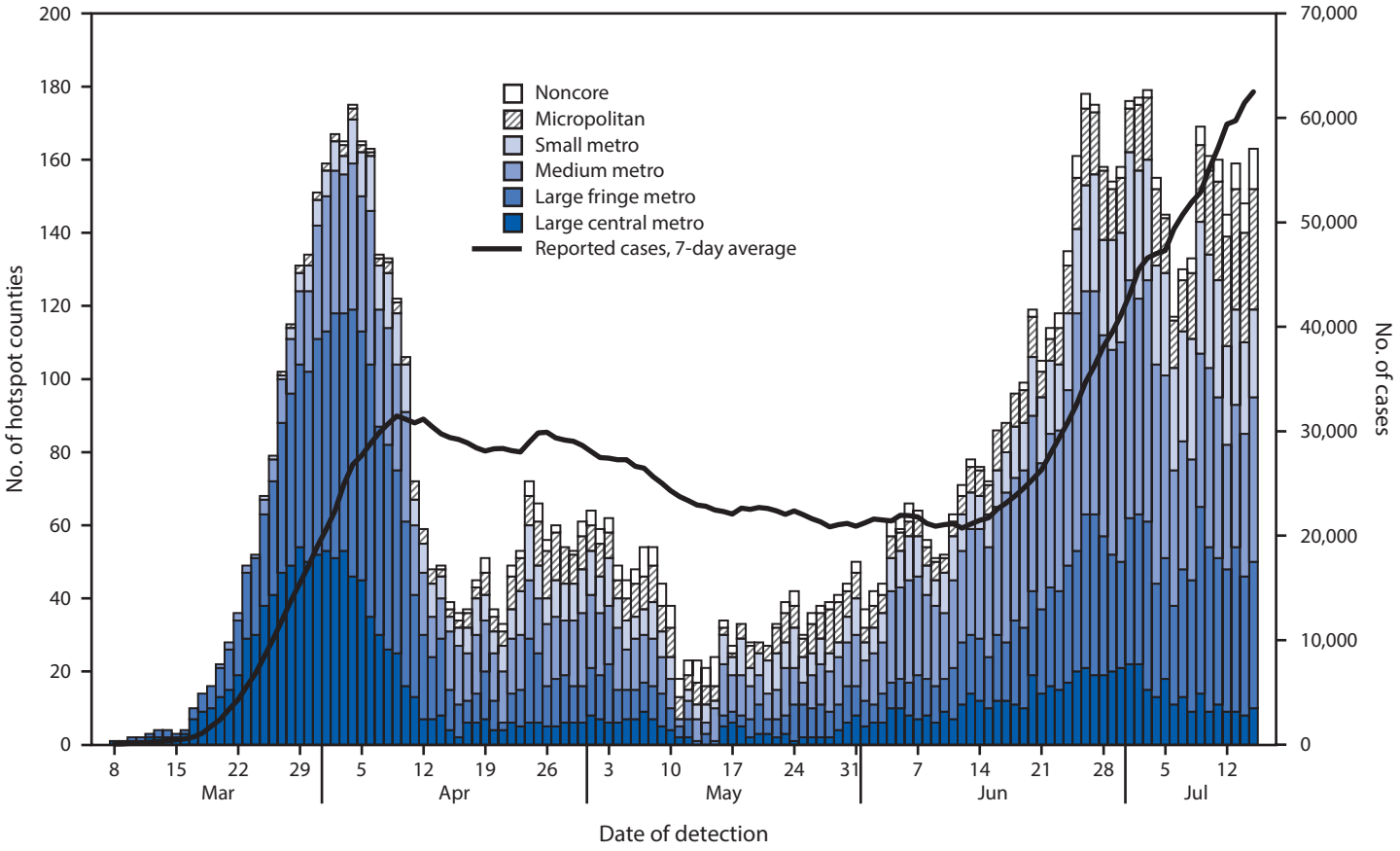


FIGURE 1. (*Continued*) Number of COVID-19 hotspot alerts, by county and number of days* meeting hotspot criteria for (A) March 8–April 30, (B) May 1–31, (C) June 1–July 15, and (D) entire period — United States, March 8–July 15, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.
* Each county is shaded according to the number of days that the county met hotspot criteria, with shading in 7-day increments.

FIGURE 2. Daily number of COVID-19 hotspot alerts, by urbanicity,* and 7-day average of new reported cases — United States, March 8–July 15, 2020†



Abbreviation: COVID-19 = coronavirus disease 2019.

* According to CDC's National Center for Health Statistics urban-rural classification scheme for counties. *Large central metro counties*: in metropolitan statistical areas (MSAs) of ≥1 million population that contain all or part of the area's principal city. *Large fringe metro counties*: in MSAs of ≥1 million population and do not qualify as large central. *Medium metro counties*: in MSAs of 250,000–999,999 population. *Small metro counties*: in MSAs of <250,000 population. *Micropolitan counties*: in micropolitan statistical area. *Noncore counties*: not in metropolitan or micropolitan statistical areas.

† No hotspots were detected during January 22–March 7, 2020.

developing and implementing locally adapted responses, ideally with engagement of local community leaders.

The findings in this report are subject to at least three limitations. First, identification of hotspot counties was based on aggregate data, and differences in testing availability, reporting delays, and changes in reporting over time might have affected the extent to which numbers of reported cases correlated with actual incidence. Second, in hotspot criteria, the absolute threshold for cases means that counties with smaller population sizes are less likely to be identified as a hotspot. Increases in cases are still monitored among smaller counties, with a focus on trends in neighboring counties. Finally, information on contributing factors was taken from data available from existing sources and might not have included all factors contributing to increased cases; availability of information might have varied for different communities.

Identification of hotspot counties permits a focused approach to assessment and response by local, state, and federal agencies. Efforts are underway to further improve methods to identify the most concerning hotspots, enabling enhanced response, and to detect communities at increased risk for becoming hotspots, facilitating earlier action. Rapid identification and characterization of hotspots will improve the timeliness and effectiveness of response efforts that can ultimately reduce the number of new COVID-19 cases.

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TABLE. Number of COVID-19 hotspot counties, by U.S. Census region* and urbanicity† — United States, March 8–July 15, 2020§

Characteristic	No. (column %)		Unique hotspot counties¶							
			Total		March–April		May		June–July	
	Total U.S. counties	Total U.S. population	No. (row %) of counties	Row % of population	No. (row %) of counties	Row % of population	No. (row %) of counties	Row % of population	No. (row %) of counties	Row % of population
Total	**3,142 (100)**	**328,239,523 (100)**	**818 (26)**	**80**	**365 (12)**	**64**	**274 (9)**	**29**	**621 (20)**	**61**
U.S. Census region*										
Northeast	217 (7)	55,982,803 (17)	94 (43)	86	86 (40)	84	24 (11)	10	20 (9)	16
South	1,422 (45)	125,580,448 (38)	456 (32)	81	137 (10)	54	127 (9)	32	399 (28)	76
Midwest	1,055 (34)	68,329,004 (21)	163 (16)	67	84 (8)	52	83 (8)	32	104 (10)	44
West	448 (14)	78,347,268 (24)	105 (23)	86	58 (13)	75	40 (9)	36	98 (22)	86
Urbanicity†										
Large central metro	68 (2)	101,005,069 (31)	68 (100)	100	66 (97)	99	31 (46)	36	53 (78)	79
Large fringe metro	368 (12)	82,475,531 (25)	207 (56)	90	115 (31)	72	59 (16)	28	144 (39)	59
Medium metro	372 (12)	68,841,839 (21)	198 (53)	86	96 (26)	59	72 (19)	39	170 (46)	73
Small metro	358 (11)	29,854,023 (9)	140 (39)	63	47 (13)	22	46 (13)	22	116 (32)	53
Micropolitan	641 (20)	27,294,422 (8)	143 (22)	28	29 (5)	6	40 (6)	7	101 (16)	22
Noncore	1,335 (42)	18,768,639 (6)	62 (5)	9	12 (0)	2	26 (2)	4	37 (3)	6

Abbreviation: COVID-19 = coronavirus disease 2019.

* *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.

† According to CDC's National Center for Health Statistics urban-rural classification scheme for counties. *Large central metro counties*: in metropolitan statistical areas (MSAs) of ≥1 million population that contain all or part of the area's principal city. Large fringe metro *counties*: in MSAs of ≥1 million population and do not qualify as large central. *Medium metro counties:* in MSAs of 250,000–999,999 population. *Small metro counties:* in MSAs of <250,000 population. *Micropolitan counties:* in micropolitan statistical area. *Noncore counties:* not in metropolitan or micropolitan statistical areas.

§ Hotspot counties ascertained retrospectively for March 8–May 6, 2020, and prospectively for May 7–July 15, 2020.

¶ Each county with at least one alert during the period is included.

Summary

What is already known about this topic?

U.S. geographic areas most affected by the COVID-19 pandemic have changed over time.

What is added by this report?

During March 8–July 15, 2020, 818 (26%) of 3,142 U.S. counties were identified as COVID-19 hotspots (counties meeting specified criteria relating to temporal increases in number of cases and incidence); these counties included 80% of the U.S. population. More hotspots were identified in the South and West during June–July.

What are the implications for public health practice?

Identification of hotspot counties allows for a focused approach for assessing localized COVID-19 outbreaks and implementing targeted public health response activities.

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Racial and Ethnic Disparities Among COVID-19 Cases in Workplace Outbreaks by Industry Sector — Utah, March 6–June 5, 2020

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On August 17, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (*https://www.cdc.gov/mmwr*).*

Improved understanding of the overall distribution of workplace coronavirus disease 2019 (COVID-19) outbreaks by industry sector could help direct targeted public health action; however, this has not been described. The Utah Department of Health (UDOH) analyzed COVID-19 surveillance data to describe workplace outbreaks by industry sectors. In this report, workplaces refer to non–health care, noncongregate–living, and noneducational settings. As of June 5, 2020, UDOH reported 277 COVID-19 outbreaks, 210 (76%) of which occurred in workplaces. Approximately 12% (1,389 of 11,448) of confirmed COVID-19 cases in Utah were associated with workplace outbreaks. The 210 workplace outbreaks occurred in 15 of 20 industry sectors;* nearly one half of all workplace outbreaks occurred in three sectors: Manufacturing (43; 20%), Construction (32; 15%) and Wholesale Trade (29; 14%); 58% (806 of 1,389) of workplace outbreak-associated cases occurred in these three sectors. Although 24% of Utah's workforce in all 15 affected sectors identified as Hispanic or Latino (Hispanic) or a race other than non-Hispanic white (nonwhite†) (*1*), 73% (970 of 1,335) of workplace outbreak-associated COVID-19 cases were in persons who identified as Hispanic or nonwhite. Systemic social inequities have resulted in the overrepresentation of Hispanic and nonwhite workers in frontline occupations where exposure to SARS-CoV-2, the virus that causes COVID-19, might be higher (*2*); extra vigilance in these sectors is needed to ensure prevention and mitigation strategies are applied equitably and effectively to workers of racial and ethnic groups disproportionately affected by COVID-19. Health departments can adapt workplace guidance to each industry sector affected by COVID-19 to account for different production processes and working conditions.

Data on workplace COVID-19 outbreaks occurring during March 6–June 5, 2020, were collected from UDOH's COVID-19 case surveillance system. UDOH defined workplace outbreaks as the occurrence of two or more laboratory-confirmed COVID-19 cases occurring within the same 14-day period among coworkers in a common workplace (i.e., same facility). UDOH classifies outbreaks in congregate living facilities, educational institutions, and health care facilities as distinct outbreak types that are managed differently from general workplace outbreaks because of the special populations they serve and the setting-specific guidance they require. Thus, cases from these settings were not included in this analysis of workplace outbreaks. Case investigators collected facility addresses, business names, or both for all workplace outbreaks. Workplaces were classified according to the North American Industry Classification System (NAICS; https://www.census.gov/eos/www/naics/) into one of 20 industry sectors. NAICS codes for workplaces were obtained from Utah's Division of Corporations and Commercial Code directory of registered businesses (https://secure.utah.gov/bes/). Because of small case numbers and similarities in sector processes and settings, the sectors for Professional, Scientific, and Technical services and Information were combined into a single category, as were the Finance and Insurance, Real Estate and Rental and Leasing, and Public Administration sectors.

The distribution of workplace outbreaks and associated cases across sectors was described. Outbreak incidence (cases per 100,000 workers) was calculated using Utah sector workforce estimates reported in the 2019 Census Quarterly Workforce Indicators (*1*) for sector denominators; workforce estimates were not adjusted to remove workers affected by outbreaks in excluded settings (e.g., educational workers and health care workers). Descriptive statistics and chi-squared tests were used to summarize and compare demographics and outcomes (e.g., hospitalization) of persons with workplace outbreak-associated COVID-19 with persons of working age (≥15 years) with nonoutbreak–associated COVID-19 (i.e., cases not associated with an outbreak). To identify sectors in which COVID-19

* The 20 industry sectors include Agriculture, Forestry, Fishing and Hunting; Mining, Quarrying, and Oil and Gas Extraction; Utilities; Construction; Manufacturing; Wholesale Trade; Retail Trade; Transportation and Warehousing; Information; Finance and Insurance; Real Estate and Rental and Leasing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; Administrative and Support and Waste Management and Remediation Services; Educational Services; Health Care and Social Assistance; Arts, Entertainment, and Recreation; Accommodation and Food Services; Other Services (except Public Administration); and Public Administration (https://www.census.gov/eos/www/naics/). No workplace outbreaks were reported in the following sectors: Agriculture, Forestry, Fishing and Hunting; Mining, Quarrying, and Oil and Gas Extraction; Utilities; Management of Companies and Enterprises; and Educational Services.

† Nonwhite includes the following (all non-Hispanic): black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, two or more races, or other race groups.

racial and ethnic disparities might be unrecognized, the racial and ethnic composition of workplace outbreak-associated cases were compared with the overall racial and ethnic composition in each sector in Utah. All statistical analyses were done in R (version 3.6.1; The R Foundation); p-values <0.05 were considered statistically significant.

During March 6–June 5, 2020, UDOH reported 11,448 confirmed COVID-19 cases throughout Utah, including 1,389 (12%) associated with workplace outbreaks, 1,081 (9%) associated with outbreaks in other settings (i.e., congregate living, educational, health care), and 8,978 (78%) that were not associated with an outbreak. UDOH reported 210 workplace COVID-19 outbreaks (median cases per workplace outbreak = 4; range = 2–79) involving 15 industry sectors, most frequently in Manufacturing (43; 20%), Construction (32; 15%), and Wholesale Trade (29; 14%); these three sectors accounted for 58% (806 of 1,389) of workplace outbreak-associated cases (Table 1). The incidence among workplace outbreak-associated cases was highest in the Wholesale Trade (377 per 100,000 workers) and Manufacturing (339 per 100,000 workers) sectors.

Compared with persons aged ≥15 years with nonoutbreak–associated COVID-19 (median age = 38 years), persons with workplace outbreak-associated COVID-19 were older (median age = 41 years) (Mann-Whitney test, p = 0.01), more likely to identify as Hispanic (56.4% versus 39.8%; p <0.001), and more likely to be male (61.4% versus 50.6%; p <0.001) (Table 2). The proportion of patients hospitalized was significantly lower among persons with workplace outbreak-associated COVID-19 (6.1%) than among those with nonoutbreak–associated COVID-19 (7.6%) (p = 0.01).

Among persons with workplace outbreak-associated COVID-19, information on race and ethnicity was available for 1,335 (96%); 783 (59%) workers with workplace outbreak-associated COVID-19 identified as Hispanic, 365 (27%) as non-Hispanic white, and 187 (19%) as nonwhite. In total, 970 (73%) of persons with workplace outbreak-associated COVID-19 identified as Hispanic or nonwhite, although these ethnic/racial groups represent <24% of Utah's workforce in the 15 affected industry sectors (*1*). This disparity was observed across all 15 industry sectors with the largest in Wholesale Trade (percentage point difference between percentage of Hispanic or nonwhite workers among workplace outbreak-associated COVID-19 cases and the overall workforce = 58) and Manufacturing (percentage point difference = 53) sectors (Figure).

Discussion

During March 6–June 5, COVID-19 outbreaks were identified in nearly all assessed industry sectors in Utah, with approximately one half of workplace outbreak-associated cases occurring in three sectors: Manufacturing, Construction, and Wholesale Trade. Persons with workplace outbreak-associated COVID-19 were disproportionately Hispanic or nonwhite compared with overall racial/ethnic distributions in these industry sectors. Sector-specific COVID-19 guidance, which CDC has generated for many industries,[§,¶,**] should be followed to account for different production processes, business operations, and working conditions faced by workers in these sectors. When available, efforts should be made to help employers operationalize sector-specific guidance; CDC and UDOH plain-language business guides can help employers manage and prevent workplace outbreaks and exposures.[††] Avoiding introduction of SARS-CoV-2 into workplaces is critical to preventing outbreaks, making both community- and workplace-specific interventions important if SARS-CoV-2 transmission in workplace settings is to be prevented. Health departments and employers need to ensure mitigation strategies are provided using culturally and linguistically responsive materials and messages, which reach workers of racial and ethnic minority groups, especially those disproportionately affected by workplace COVID-19 outbreaks.

The racial and ethnic disparities in workplace outbreak-associated COVID-19 cases found in Utah and identified in meat processing facility outbreaks in other states (*3*) demonstrate a disproportionate risk for COVID-19. These disparities might be driven, in part, by longstanding health and social inequities (*2*), resulting in the overrepresentation of Hispanic and nonwhite workers in frontline occupations (i.e., essential and direct-service) where risk for SARS-CoV-2 exposure might be higher than that associated with remote or nondirect–service work (*4*). In addition, Hispanic and nonwhite workers have less flexible work schedules and fewer telework options compared with white and non-Hispanic workers (*5*). Lack of job flexibility (i.e., ability to vary when to start and end work), lack of telework options, and unpaid or punitive sick leave policies might prevent workers from staying home and seeking care when ill, resulting in more workplace exposures, delayed treatment, and more severe COVID-19 outcomes (*6,7*). Whenever employers can provide flexible work schedules, nonpunitive paid sick leave, and telework options, they should offer this equitably to Hispanic and nonwhite workers.

The findings in this report are subject to at least six limitations. First, this analysis is not representative of all workplace outbreaks in Utah. Outbreaks might not be detected or

§ https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/businesses-employers.html; https://www.cdc.gov/niosh/emres/2019_ncov.html.
¶ https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/construction-workers.html.
** https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-manufacturing-workers-employers.html.
†† https://coronavirus.utah.gov/business/; https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html.

TABLE 1. Distribution of workplace outbreaks and workplace-associated COVID-19 cases, by North American Industry Classification System (NAICS) industry sector, and demographic characteristics of persons with workplace-associated COVID-19 and their outcomes — Utah, March 6–June 5, 2020

		Workers, outbreaks, and cases no. (%)				Characteristic no. (%)		
NAICS industry sector code	Industry sector	Workforce*	Workplace outbreaks	Workplace outbreak-associated cases	Workplace outbreak-associated incidence†	Hispanic or nonwhite§	Admitted to hospital¶	Severe outcomes¶
Overall total	—	**1,305,130 (100)**	**210 (100)**	**1,389 (100)**	**106.4**	**970/1,335 (73)**	**85/1,382 (6)**	**40/1,155 (3)**
31–33	Manufacturing	137,579 (11)	43 (20)	467 (34)	339.4	365/444 (82)	25/464 (5)	12/464 (3)
42	Wholesale Trade	53,045 (4)	29 (14)	200 (14)	377.0	145/190 (76)	8/197 (4)	3/197 (2)
23	Construction	113,610 (9)	32 (15)	139 (10)	122.3	97/135 (72)	11/139 (8)	7/139 (5)
44, 45	Retail Trade	169,559 (13)	28 (13)	116 (8)	68.4	78/113 (69)	5/116 (4)	1/116 (1)
56	Administrative, Support, and Waste Management	95,878 (7)	9 (4)	114 (8)	118.9	68/109 (62)	8/114 (7)	2/114 (2)
72	Accommodation and Food Services	128,983 (10)	25 (12)	100 (7)	77.5	78/97 (80)	7/100 (7)	7/100 (7)
48, 49	Transportation and Warehousing	64,360 (5)	10 (5)	97 (7)	150.7	71/94 (76)	9/97 (9)	6/97 (6)
71	Arts, Entertainment, and Recreation	34,862 (3)	6 (3)	40 (3)	114.7	14/39 (36)	2/40 (5)	0/40 (0)
51, 54	Professional, Scientific, Technical, and Information**	151,275 (12)	9 (4)	47 (3)	31.1	20/46 (43)	5/47 (11)	2/47 (4)
52, 53, 92	Finance, Real Estate, and Public Administration**	147,220 (11)	6 (3)	24 (2)	16.3	10/24 (42)	1/23 (4)	0/23 (0)
81	Other Services (except Public Administration)	38,651 (3)	8 (4)	24 (2)	62.1	13/23 (57)	3/24 (13)	1/24 (4)
62	Health Care and Social Assistance††	170,108 (13)	5 (2)	21 (2)	12.3	11/21 (52)	1/21 (5)	0/21 (0)

Abbreviation: COVID 19 = coronavirus disease 2019.

* Based on U.S. Census Quarterly Workforce Indicators, Utah 2019 (third quarter). https://qwiexplorer.ces.census.gov/static/explore.html#x=0&g=0.

† Cases per 100,000 workers. Estimated as workplace outbreak-associated COVID-19 cases per 100,000 workers in industry sector; does not include cases among workers not part of a workplace outbreak.

§ Among cases with known race and ethnicity (n = 1,335); Hispanic includes Hispanic or Latino; nonwhite includes the following (all non-Hispanic): black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, two or more races, or other race groups.

¶ Among cases with known hospitalization (n = 1,382) or severity status (n = 1,155); severe outcome defined as intensive care unit admission, mechanical ventilation, or death.

** Because of small case numbers, Information (NAICS code 51) and Professional, Scientific, and Technical services (NAICS code 54) sectors were combined into a single category; Finance and Insurance (NAICS code 52), Real Estate and Rental and Leasing (NAICS code 53), and Public Administration (NAICS code 92) sectors were also combined into a single category.

†† The full name of this NAICS sector includes "Health Care"; however, because health care settings were not included in this analysis, they represent only social assistance businesses.

reported in smaller workplaces, and workers with self-limiting symptoms might not be tested. Outbreaks in nursing homes, detention centers, and education settings were not included in this analysis, and thus, the relative impact of COVID-19 in industry sectors represented by those workers were not assessed. Second, worker-to-worker transmission could not be confirmed; some workplace outbreak-associated cases will represent community and household transmission, or transmission between coworkers outside of work (e.g., commuting to work or social gatherings). Third, individual occupation data were unavailable, so assumptions about the types of affected workers (e.g., frontline workers) cannot be confirmed. Gathering detailed individual occupation data during case investigations might help inform more targeted risk-mitigation interventions within sectors by identifying types of work and workers at highest risk for SARS-CoV-2 infection. Fourth, the stay-at-home directives in effect in Utah during the study period likely differentially affected workplace attendance in different sectors (e.g., more telework in information than in construction sectors); therefore, these findings might not be generalizable to states with different restriction levels and sector workforce distributions. Fifth, it is not known to what extent workers in these sectors were familiar with, able, and willing to follow guidance to prevent and reduce the spread of SARS-CoV-2. Finally, workforce estimates used to calculate the outbreak incidence rates by sector could not be adjusted to account for workers in health care, educational, and congregate-living settings that were excluded from this analysis, resulting in underestimated rates; outbreak incidence rates for the Educational Services sector (NAICS code 61) and Health Care and Social Services sector (NAICS code 62) were likely most affected by this limitation.

Understanding the distribution of workplace outbreaks across industry sectors can help health departments identify and target industries where additional guidance and intervention to mitigate SARS-CoV-2 transmission might be needed.

TABLE 2. Characteristics of nonoutbreak–associated cases and workplace outbreak-associated cases of COVID-19 among persons aged ≥15 years — Utah, March 6–June 5, 2020.

Characteristic	Case status no. (%)		P-value*
	Not outbreak–associated (n = 8,297)	Workplace outbreak–associated (n = 1,389)	
Age group, yrs			<0.001
15–24	1,718 (20.7)	192 (13.8)	
25–44	3,489 (42.1)	658 (47.4)	
45–64	2,360 (28.4)	493 (35.5)	
≥65	730 (8.8)	46 (3.3)	
Race/Ethnicity			<0.001
Hispanic or Latino	3,303 (39.8)	783 (56.4)	
White, non-Hispanic	2,972 (35.8)	365 (26.3)	
Native Hawaiian or Pacific Islander, non-Hispanic	317 (3.8)	61 (4.4)	
Asian, non-Hispanic	194 (2.3)	42 (3.0)	
Black or African American, non-Hispanic	247 (3.0)	38 (2.7)	
American Indian or Alaska Native, non-Hispanic	309 (3.7)	13 (0.9)	
Other, non-Hispanic	237 (2.9)	33 (2.4)	
Missing	718 (8.7)	54 (3.9)	
Ethnicity			<0.001
Non-Hispanic	4,279 (51.6)	552 (39.7)	
Hispanic	3,303 (39.8)	783 (56.4)	
Missing	715 (8.6)	54 (3.9)	
Sex			<0.001
Female	4,088 (49.3)	536 (38.6)	
Male	4,199 (50.6)	853 (61.4)	
Missing	10 (0.1)	0 (0)	
Any chronic condition			0.24
Yes	2013 (24.3)	318 (22.9)	
No	1698 (20.5)	298 (21.5)	
Missing	4586 (55.3)	773 (55.7)	
Hospitalized			0.01
Yes	630 (7.6)	85 (6.1)	
No	7,136 (86.0)	1,297 (93.4)	
Missing	531(6.4)	7 (0.5)	
Severe outcome†			0.74
Yes	217 (2.6)	40 (2.9)	
No	5,618 (67.7)	1,115 (80.3)	
Missing	2,462 (29.7)	234 (16.8)	
ICU admission			0.94
Yes	195 (2.4)	36 (2.6)	
No	7,497 (90.4)	1,341 (96.5)	
Missing	605 (7.3)	12 (0.9)	
Mechanical ventilation			0.78
Yes	84 (1.0)	14 (1.0)	
No	7,111 (85.7)	1,339 (96.4)	
Missing	1,102 (13.3)	36 (2.6)	
Died			0.61
Yes	59 (0.7)	9 (0.6)	
No	5,947 (71.7)	1,153 (83.0)	
Missing	2,291 (27.6)	227 (16.3)	

Abbreviations: COVID-19 = coronavirus disease 2019; ICU = intensive care unit.

* P-values based on chi-squared tests and excludes missing categories; level of significance = p<0.05.

† Persons with COVID-19 were classified as having a severe outcome if they were admitted to an ICU, required mechanical ventilation, or died; they were classified as not having a severe outcome if they were not admitted to an ICU, did not require mechanical ventilation, and did not die.

Summary

What is already known about this topic?

COVID-19 outbreaks occur within various workplaces.

What is added by this report?

During March 6–June 5, 2020, workplace outbreaks occurred in 15 Utah industry sectors; 58% of workplace outbreak-associated COVID-19 cases were in three sectors: Manufacturing, Wholesale Trade, and Construction. Despite representing 24% of Utah workers in all affected sectors, Hispanic and nonwhite workers accounted for 73% of workplace outbreak-associated COVID-19 cases.

What are the implications for public health practice?

Sector-specific COVID-19 guidance should be followed. Mitigation strategies should be culturally and linguistically responsive to racial/ethnic minority workers disproportionately affected by COVID-19. Collection of detailed case occupation data is needed to understand types of work where exposure risk is highest.

Further, health departments should consider obtaining case occupation data to better understand workplace outbreaks to inform more targeted interventions. The overrepresentation of Hispanic and nonwhite workers in frontline occupations has resulted in disproportionate disease incidence among racial/ethnic minority groups. Care must be taken to ensure that prevention and mitigation strategies are applied equitably and effectively using culturally and linguistically responsive materials, media, and messages to workers of racial and ethnic minority groups disproportionately affected by COVID-19.

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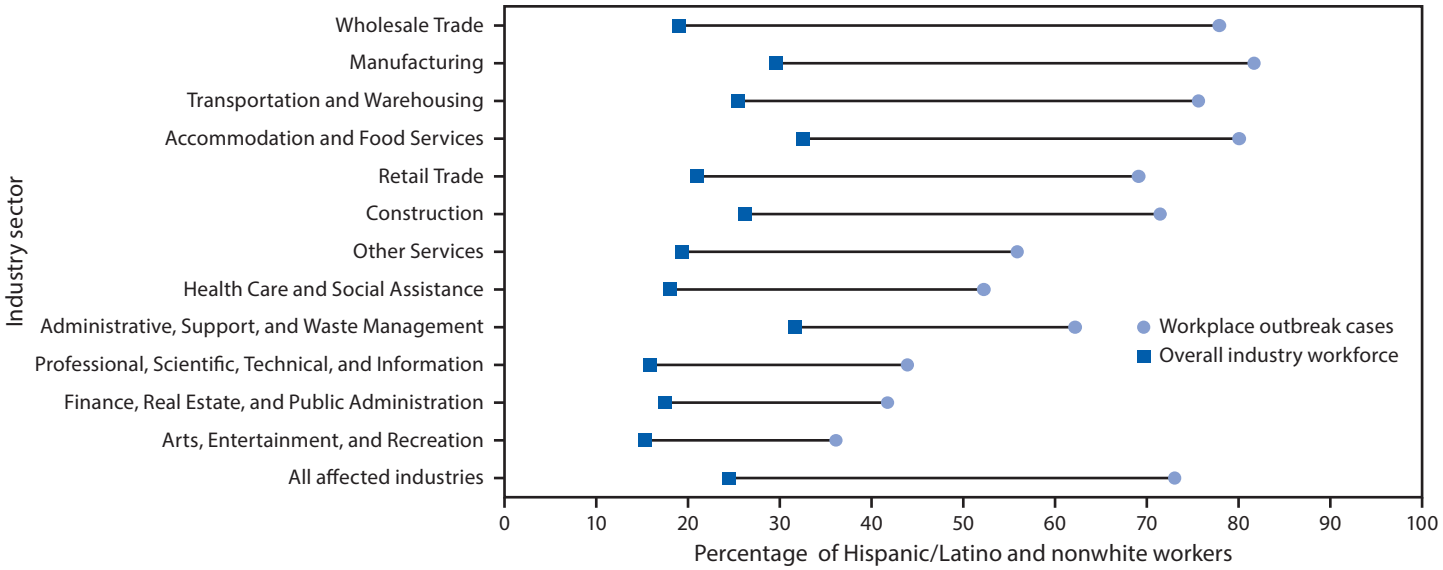
FIGURE. Percentage point difference* between the percentage of workers with workplace outbreak-associated COVID-19 who are Hispanic/Latino and nonwhite† and the percentage of Hispanic/Latino and nonwhite workers within the entire industry workforce,§ by industry sector¶ — Utah, March 6–June 5, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* Sectors are sorted on absolute disparity between the percentage of Hispanic/Latino and nonwhite workers among workplace outbreak cases and the percentage of Hispanic/Latino and nonwhite workers in the overall industry workforce, in descending order.

† Nonwhite includes the following (all non-Hispanic): black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, two or more races, or other race groups.

§ Sector workforce demographics from U.S. Census Quarterly Workforce Indicators, Utah 2019 (third quarter); https://qwiexplorer.ces.census.gov/static/explore.html.

¶ Industry sectors are based on the North American Industry Classification System (https://www.census.gov/eos/www/naics/). Because of small case numbers and similarities in sector processes and settings, Professional, Scientific, and Technical Services and Information sectors were combined into a single category, as were Finance and Insurance, Real Estate, Rental and Leasing, and Public Administration.

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Mass Testing for SARS-CoV-2 in 16 Prisons and Jails — Six Jurisdictions, United States, April–May 2020

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Preventing coronavirus disease 2019 (COVID-19) in correctional and detention facilities* can be challenging because of population-dense housing, varied access to hygiene facilities and supplies, and limited space for isolation and quarantine (*1*). Incarcerated and detained populations have a high prevalence of chronic diseases, increasing their risk for severe COVID-19–associated illness and making early detection critical (*2*,*3*). Correctional and detention facilities are not closed systems; SARS-CoV-2, the virus that causes COVID-19, can be transmitted to and from the surrounding community through staff member and visitor movements as well as entry, transfer, and release of incarcerated and detained persons (*1*). To better understand SARS-CoV-2 prevalence in these settings, CDC requested data from 15 jurisdictions describing results of mass testing events among incarcerated and detained persons and cases identified through earlier symptom-based testing. Six jurisdictions reported SARS-CoV-2 prevalence of 0%–86.8% (median = 29.3%) from mass testing events in 16 adult facilities. Before mass testing, 15 of the 16 facilities had identified at least one COVID-19 case among incarcerated or detained persons using symptom-based testing, and mass testing increased the total number of known cases from 642 to 8,239. Case surveillance from symptom-based testing has likely underestimated SARS-CoV-2 prevalence in correctional and detention facilities. Broad-based testing can provide a more accurate assessment of prevalence and generate data to help control transmission (*4*).

In May 2020, CDC requested data from 15 jurisdictions (the Federal Bureau of Prisons [BOP], 10 state prison systems, and four city or county jails), describing SARS-CoV-2 mass testing events† and cases identified before mass testing. Jurisdictions were selected based on previous discussions with investigators about mass testing events that had already occurred. Six jurisdictions provided data from 16 adult facilities, including the number of COVID-19 cases identified among incarcerated or detained persons and staff members before mass testing and findings from subsequent mass testing events§ among incarcerated or detained persons. Data describing mass testing of staff members were not available. One jurisdiction also provided results of retesting among quarantined close contacts of persons with COVID-19, 7 days after their initial negative test result from mass testing. All jurisdictions provided qualitative information describing testing practices before mass testing, actions taken based on mass testing results, and barriers to future broad-based testing. SARS-CoV-2 prevalence was calculated within each facility and by housing type. The numbers of known cases before and after mass testing were compared. Qualitative data were summarized. All analyses were descriptive; significance testing was not performed. This investigation was reviewed by CDC for human subjects protection and determined to be nonresearch.¶

Six of the 15 queried jurisdictions (BOP, three state prison systems, and two county jails) provided aggregate, facility-level data representing 16 adult facilities (11 state prisons, three federal prisons, and two county jails). From the beginning of the COVID-19 pandemic until the date of their respective mass testing events, four facilities limited testing among incarcerated or detained persons to those with symptoms, and 12 also tested close contacts; six facilities tested small numbers of symptomatic staff members, and 10 advised staff members to seek testing from their own health care providers or health department.

All 16 facilities had identified at least one case through symptom-based testing before mass testing was conducted; the first case was identified among staff members in nine facilities, among incarcerated or detained persons in six, and in both groups the same day in one. One facility identified

* Correctional facilities refer to state and federal prisons that incarcerate persons who have been tried for a crime, convicted, and sentenced for a duration of ≥1 year. Those convicted of federal crimes are incarcerated in federal prisons; those convicted of state crimes are incarcerated in state prisons. Detention facilities refer to jails or detention centers (including immigration detention centers) that temporarily detain persons awaiting trial, sentencing, or deportation, or those with a sentence of <1 year.

† Mass testing consisted of offering reverse transcription–polymerase chain reaction (RT-PCR) testing to all persons incarcerated or detained in at least one housing unit of a correctional or detention facility at a single point in time, irrespective of presence or history of symptoms.

§ Data elements collected included mass testing dates, facility census during testing, number of persons tested, number who declined, housing arrangements of persons tested, and test results.

¶ U.S. Department of Health and Human Services, Title 45 Code of Federal Regulations 46, Protection of Human Subjects.

a case only among incarcerated or detained persons (no staff member cases), and one facility identified a case only among staff members. The number of cases identified using symptom-based testing ranged from 0 to 181 (median = 19) among incarcerated or detained persons and 0 to 257 (median = 10) among staff members.

Mass testing in the 16 facilities was conducted during April 11–May 20. The interval between identification of the first symptomatic case and the start of mass testing ranged from 2 to 41 days (median = 25 days). Across facilities, 16,392 incarcerated or detained persons were offered testing, representing 2.3%–99.6% (median = 54.9%) of facilities' total populations; 7,597 previously unrecognized infections were identified (Table). All 15 facilities that had identified at least one case among incarcerated or detained persons through earlier symptom-based testing identified additional cases through mass testing (range = 8–2,179; median = 374). Mass testing increased total known cases from 642 (range = 2–181, median = 19) before mass testing to 8,239 (range = 10–2,193, median = 403) after mass testing (Figure), representing a 1.5–157-fold increase (median 12.3-fold) in each facility. The single facility that had identified no cases among incarcerated or detained persons before mass testing also found no cases during mass testing; with this facility included, the median fold-increase in total known cases after mass testing decreased slightly to 12.1-fold. In the 16 facilities, SARS-CoV-2 prevalence found during mass testing among incarcerated or detained persons ranged from 0% to 86.8% (median = 29.3%). Testing refusal rates ranged from 0.0% to 17.3% (median = 0.0%) (Table).

In addition to aggregate facility-level data, four of six jurisdictions provided mass testing data from 85 housing units within 12 of the 16 facilities. Forty-eight housing units were dormitory-based (open, communal spaces housing 63 to 216 persons in one room), and 37 were cell-based (with locked cells housing one to eight persons each). SARS-CoV-2 prevalence ranged from 1.8% to 45.0% (median = 14.6%) in cell-based units and 0% to 77.2% (median = 42.6%) in dormitory-based units.

In two federal prisons, all persons who had tested negative during mass testing events and had subsequently been quarantined as close contacts of persons testing positive were retested after 7 days. At retesting, 90 of 438 (20.5%) persons in BOP prison 2 and 84 of 314 (26.8%) in BOP prison 3 had positive test results.

Jurisdictions reported that mass testing results helped them construct medical isolation cohorts for persons testing positive and quarantine cohorts for their close contacts to prevent continued transmission. In some jurisdictions, results informed targeted testing strategies among asymptomatic persons in facilities where mass testing had not yet occurred (e.g., routine testing at intake, release, and before community-based appointments, and periodic testing of those assigned to work details requiring movement between different facility areas, such as food or laundry service). Jurisdictions reported that mass testing required large investments of staff member time and operational resources, and that the ability to rearrange housing based on test results was sometimes limited by space constraints. Jurisdictions stated that evidence-based recommendations about a potential role for less time- and resource-intensive testing (e.g., point-of-care antigen or antibody testing) and swabbing methods could help them expand testing in the future.

Discussion

High SARS-CoV-2 prevalence detected during mass testing events in a convenience sample of correctional and detention facilities suggests that symptom-based testing underestimates the number of COVID-19 cases in these settings. Mass testing resulted in a median 12.1-fold increase in the number of known infections among incarcerated or detained persons in these facilities, which had previously used symptom-based testing strategies only.

Symptom-based testing cannot identify asymptomatic and presymptomatic persons,** who represent an estimated 40%–45% of infected persons across settings (*5*). Symptom-based testing might also be limited by hesitancy to report symptoms within correctional and detention environments because of fear of medical isolation and stigma (*6*). In the facilities included in this analysis, mass testing allowed administrators to medically isolate infected persons irrespective of symptoms and to quarantine their close contacts to reduce ongoing transmission. Testing refusal rates in these facilities of up to 17.3% highlight the need to communicate the importance of testing and address fear and stigma, with care to tailor messages to cultural and linguistic needs, and to develop strategies to reduce transmission risk from persons who decline testing.

High SARS-CoV-2 prevalence among persons quarantined and retested 7 days after an initial negative result indicates that curbing transmission in correctional and detention environments might require multiple testing rounds, coupled with other recommended prevention and control measures (*7*). Test-based release from quarantine could also be warranted. Serial testing among quarantined contacts of infected persons in a Louisiana correctional and detention facility found a 36% positivity rate 3 days after an initial negative result, indicating that a short retest interval could improve case identification (*8*).

** Presymptomatic persons are those who are infected with SARS-CoV-2 and do not have symptoms at the time of testing, but who develop symptoms later. Asymptomatic persons are those who are infected with SARS-CoV-2 but never develop symptoms. Both presymptomatic and asymptomatic persons can transmit the virus to others.

TABLE. Results of SARS-CoV-2 mass testing events* among incarcerated or detained persons in 16 prisons and jails — six jurisdictions, United States, April–May 2020

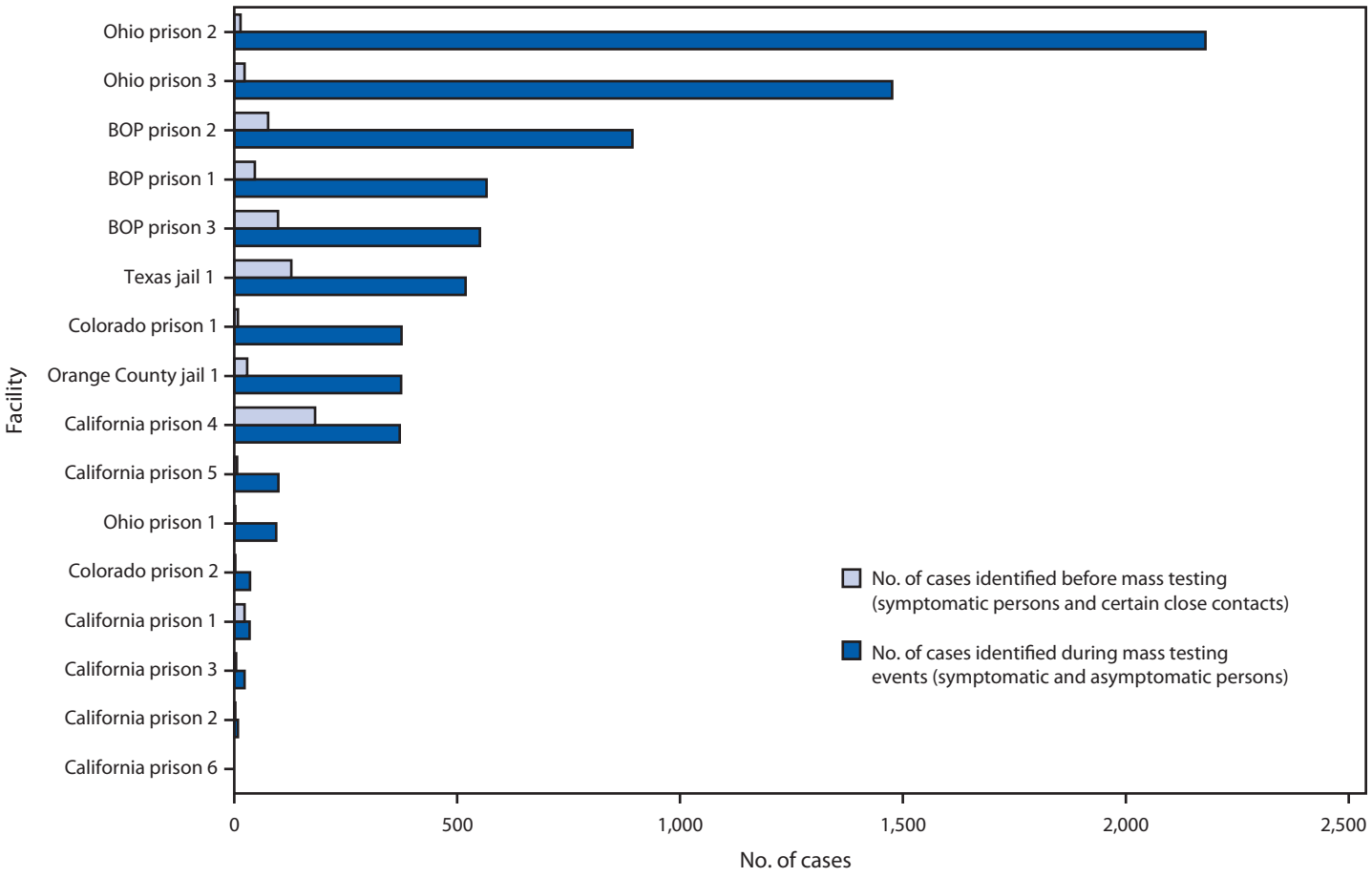
Jurisdiction/Facility	No. of days between identification of first case and start of mass testing†	Total persons incarcerated or detained in the facility during mass testing§	No. (%) offered testing¶	No. (%) who declined testing	No. (%) tested	No. with interpretable results	No. (%) testing positive	Type of housing in tested units (open dorm, cells, or both)**
Federal Bureau of Prisons††								
Prison 1	25	1,534	957 (62.4)	166 (17.3)	791 (82.7)	786	566 (72.0)	Open dorm
Prison 2	39	1,247	1,236 (99.1)	0 (0.0)	1,236 (100)	1,157	893 (77.2)	Open dorm
Prison 3	21	1,070	997 (93.2)	0 (0.0)	997 (100)	992	551 (55.5)	Both
California								
Prison 1	27	3,175	257 (8.1)	39 (15.2)	218 (84.8)	217	34 (15.7)	Cells
Prison 2	18	3,739	441 (12.0)	6 (1.4)	435 (98.6)	433	8 (1.8)	Cells
Prison 3	2	2,325	54 (2.3)	0 (0.0)	54 (100)	54	23 (42.6)	Open dorm
Prison 4	41	3,419	2,153 (63.0)	15 (0.7)	2,138 (99.3)	2,128	371 (17.4)	Both
Prison 5	34	1,565	740 (47.3)	4 (0.5)	736 (99.5)	736	99 (13.5)	Cells
Prison 6	NA	3,327	92 (2.8)	0 (0.0)	92 (100)	92	0 (0.0)	Open dorm
Colorado								
Prison 1	28	2,340	2,296 (98.1)	1 (<0.01)	2,295 (99.9)	2,262	375 (16.6)	Cells
Prison 2	5	1,704	299 (17.5)	0 (0.0)	299 (100)	297	35 (11.8)	Cells
Ohio								
Prison 1	7	497	442 (88.9)	0 (0.0)	442 (100)	442	94 (21.3)	Both
Prison 2	12	2,521	2,510 (99.6)	0 (0.0)	2,510 (100)	2,510	2,179 (86.8)	Both
Prison 3	7	2,024	Unknown	Unknown	1,846	1,846	1,476 (80.0)	Both
Orange County, California								
Jail 1	34	3,167	1,002 (31.6)	0 (0.0)	1,002 (100)	1,002	374 (37.3)	Both
Texas								
Jail 1	27	7,800	1,070 (13.7)	0 (0.0)	1,070 (100)	1,070	519 (48.5)	Both
Total	—	**41,454**	**16,392 (39.5)**	**231 (1.6)**	**16,161 (98.6)**	**16,024**	**7,597 (47.4)**	—

* Mass testing was defined as offering SARS-CoV-2 testing by reverse transcription–polymerase chain reaction (RT-PCR) to all incarcerated or detained persons in at least one housing unit of a jail or prison, irrespective of presence or history of symptoms.
† The first COVID-19 case in each facility was identified using a symptom-based approach.
§ The highest number of incarcerated or detained persons in the facility on a single day during the mass testing event.
¶ Some facilities offered SARS-CoV-2 testing to incarcerated or detained persons in all housing units. Others offered testing in selected housing units based on criteria including whether units had already identified cases, housed a large number of persons with underlying health conditions, or housed persons who were assigned to work details that required movements across the facility (e.g., food or laundry service).
** Open dorm units in these facilities housed from 63 to 216 persons in one space where they could interact freely. Cell-based units were comprised of locked cells housing from one to eight persons each.
†† The Federal Bureau of Prisons (BOP) has jurisdiction over federal prisons across the United States. The three BOP facilities with data presented here are located in three different states.

This analysis can inform testing practices in correctional and detention facilities in at least three areas. First, testing staff members at regular intervals, regardless of symptoms, could become an important part of facilities' COVID-19 prevention and mitigation plans, in collaboration with relevant stakeholders, including labor unions. In this study, more than half of the facilities identified their first case among staff members, consistent with previous CDC findings that staff members can introduce the virus into correctional and detention environments (*9*). Second, in descriptive analyses, the median prevalence of SARS-CoV-2 was nearly three times higher in dormitory-based housing units (42.6%) than in cell-based units (14.6%), suggesting that housing configuration might contribute to transmission. Further study is warranted to determine whether more frequent testing could reduce transmission in dormitory-based housing. Third, these mass testing events occurred 2–41 days after identification of the facilities' first cases. Additional studies should examine whether timing of mass testing influences its effectiveness in facilitating outbreak containment. In a study involving five health department jurisdictions that conducted facility-wide testing in 88 nursing homes that had already identified at least one case, an estimated 1.3 additional cases were identified for each additional day between identification of the first case and completion of facility-wide testing, indicating that facility-wide testing early in an outbreak can be an effective mitigation strategy (*10*).

The findings in this report are subject to at least six limitations. First, these facilities represent a convenience sample and are not representative of all U.S. correctional and detention facilities. Second, because facilities' decisions to conduct mass testing might be based on differing population characteristics, epidemiologic factors, and policy considerations, statistical

FIGURE. COVID-19 cases identified among incarcerated or detained persons during mass testing events (April–May) and through symptom-based testing (January–April) in 16 prisons and jails — six U.S. jurisdictions, 2020



Abbreviations: BOP = Federal Bureau of Prisons; COVID-19 = coronavirus disease 2019.

significance testing was not performed. Third, the number of cases identified through mass testing might be higher in facilities where mass testing occurred closer to the peak of an outbreak (a factor that could not be determined with available data), or in facilities that tested a higher proportion of their population. Fourth, data regarding symptoms reported during mass testing were unavailable, preventing calculation of the percentage of persons with positive test results who were symptomatic. Fifth, cases among staff members identified before mass testing are likely underestimated because most facilities relied largely on self-reporting. Finally, it is uncertain whether the housing unit where a person with COVID-19 was tested was the location where exposure occurred.

Challenges in practicing physical distancing and other prevention strategies within correctional and detention facilities place persons in these settings, many of whom have chronic diseases, at high risk for SARS-CoV-2 exposure. This analysis demonstrates that mass testing irrespective of symptoms, combined with periodic retesting, can identify infections and support prevention of widespread transmission in correctional and detention environments. Further research is warranted to refine strategic testing approaches that individual facilities can implement, based on local needs and resources, to contribute to COVID-19 mitigation.

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Summary

What is already known about this topic?

SARS-CoV-2 outbreaks in correctional and detention facilities are difficult to contain because of population-dense housing and limited space for medical isolation and quarantine. Testing in these settings has often been limited to symptomatic persons.

What is added by this report?

Mass testing in 16 U.S. prisons and jails found SARS-CoV-2 prevalence ranging from 0%–86.8%, a median 12.1-fold increase over the number of cases identified by earlier symptom-based testing alone. Median prevalence was three times higher in dormitory-based than in cell-based housing.

What are the implications for public health practice?

In correctional and detention facilities, broad-based SARS-CoV-2 testing provides a more accurate assessment of disease prevalence than does symptom-based testing and generates data that can potentially help control transmission.

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Notes from the Field

COVID-19 Prevention Practices in State Prisons — Puerto Rico, 2020

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As of August 17, 2020, the Puerto Rico Department of Health had reported 11,723 confirmed cases of coronavirus disease 2019 (COVID-19), 15,037 probable cases, and 335 deaths. Among persons incarcerated in state prisons, a high-risk congregate setting, only two COVID-19 cases and no associated deaths had been reported* (*1*). These results followed implementation in mid-March of a protocol (*2*) for the diagnosis, management, and prevention of COVID-19 in all Puerto Rico Department of Correction and Rehabilitation prisons based on CDC's interim guidance on management of COVID-19 in correctional and detention facilities (*3*). The protocol featured wide-ranging measures, from visitor restrictions to enhanced cleaning; this report focuses specifically on COVID-19 mitigation measures directed toward incarcerated persons.

To minimize SARS-CoV-2 transmission from newly incarcerated persons, all state prison intakes in Puerto Rico now occur at a single location, in the municipality of Bayamon. All new intake procedures include SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) testing regardless of symptoms. Asymptomatic persons awaiting test results are cohorted in groups of no more than 20 in the intake area. If everyone in the group tests negative for SARS-CoV-2, and all remain asymptomatic during 14 days of quarantine, they are released into the general prison population. Those who test positive and those with any medical concerns are immediately isolated and referred to the onsite medical facility. If any cohort member tests positive for SARS-CoV-2, either from the intake assessment or after becoming symptomatic in quarantine, the entire cohort must restart the intake process.

Incarcerated persons who leave the prison grounds for any reason (e.g., medical appointments or court appearances) must restart the intake process upon their return. During March 16–July 31, 2020, 1,340 persons entered Puerto Rico Department of Correction and Rehabilitation prisons, and two (0.1%) had positive SARS-CoV-2 RT-PCR test results. Both patients were asymptomatic, and no persons in their cohorts developed COVID-19.

*Four additional COVID-19 cases were identified in persons awaiting trial.

The general prison population is separated into groups of 40–75 persons; these groups do not share common areas with other persons in the facility. If any group member exhibits COVID-19 symptoms, which are defined according to CDC guidelines (*4*), the symptomatic person is isolated in the prison's medical facility, and the entire group is quarantined until the symptomatic person receives a negative SARS-CoV-2 RT-PCR result. There have been no suspected COVID-19 cases among the general prison population.

In May 2020, SARS-CoV-2 serologic testing was offered to all incarcerated adults using a point-of-care antibody test. This was done to evaluate the prevalence of SARS-CoV-2 antibody positivity in the prison population, particularly given the low percentage of positive SARS-CoV-2 RT-PCR test results among new arrivals. Among 8,619 adults tested, 31 (0.3%) had immunoglobulin G antibodies, suggesting past infection, and none had immunoglobulin M antibodies, indicating active or recent infection.

Efforts to mitigate SARS-CoV-2 transmission, including rigorous intake screening and cohorting, likely have helped prevent an outbreak in the state prison population. Puerto Rico's measures to protect incarcerated persons from COVID-19 can serve as a case study in the successful implementation of CDC's guidelines for correctional facilities, particularly the prevention practices for incarcerated or detained persons (*3*).

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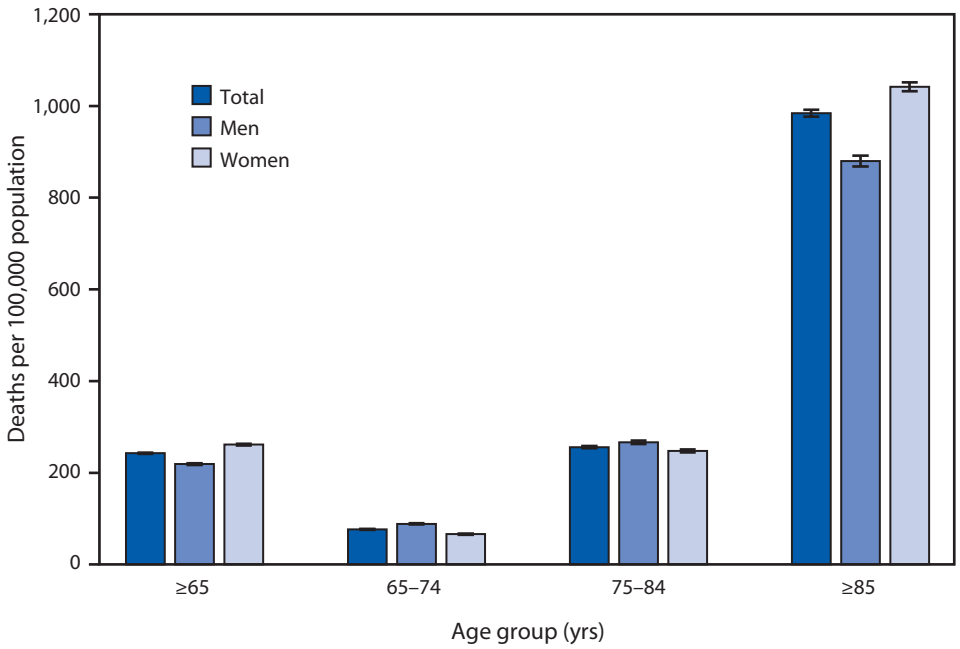
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Death Rates* from Stroke† Among Persons Aged ≥65 Years, by Sex and Age Group — National Vital Statistics System, United States, 2018



* With 95% confidence intervals shown with error bars. Rates are per 100,000 population in each age group.
† Deaths attributed to stroke (cerebrovascular diseases) were identified using the *International Classification of Diseases, Tenth Revision* underlying cause of death codes I60–I69.

In 2018, the death rate from stroke was 242.7 per 100,000 persons aged ≥65 years. Persons aged ≥85 years had the highest death rate from stroke (984.3), followed by those aged 75–84 years (256.0) and those aged 65–74 years (76.8). For both men and women, the death rates increased with age. The death rate for women (261.6) was higher than that for men (219.0) for persons aged ≥65 years, but men had higher stroke death rates for the 65–74 and 75–84 age groups. Women aged ≥85 years had higher death rates than did men in this age group.

Source: National Vital Statistics System mortality data. https://www.cdc.gov/nchs/nvss/deaths.htm.

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