Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Weekly / Vol. 69 / No. 41 October 16, 2020

Prostate Cancer Incidence and Survival, by Stage and Race/Ethnicity — United States, 2001–2017

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Among U.S. men, prostate cancer is the second leading cause of cancer-related death (*1*). Past studies documented decreasing incidence of prostate cancer overall since 2000 but increasing incidence of distant stage prostate cancer (i.e., signifying spread to parts of the body remote from the primary tumor) starting in 2010 (*2*,*3*). Past studies described disparities in prostate cancer survival by stage, age, and race/ethnicity using data covering ≤80% of the U.S. population (*4*,*5*). To provide recent data on incidence and survival of prostate cancer in the United States, CDC analyzed data from population-based cancer registries that contribute to U.S. Cancer Statistics (USCS).* Among 3.1 million new cases of prostate cancer recorded during 2003–2017, localized, regional, distant, and unknown stage prostate cancer accounted for 77%, 11%, 5%, and 7% of cases, respectively, but the incidence of distant stage prostate cancer significantly increased during 2010–2017. During 2001–2016, 10-year relative survival for localized stage prostate cancer was 100%. Overall, 5-year survival for distant stage prostate cancer improved from 28.7% during 2001–2005 to 32.3% during 2011–2016; for the period 2001–2016, 5-year survival was highest among Asian/Pacific Islanders (API) (42.0%), followed by Hispanics (37.2%), American Indian/Alaska Natives (AI/AN) (32.2%), Black men (31.6%), and White men (29.1%). Understanding incidence and survival differences by stage, race/ethnicity, and age can guide public health planning related to screening, treatment, and survivor care. Future research into differences by stage, race/ethnicity, and age could inform interventions aimed at improving disparities in outcomes.

Cases included males with malignant† prostate cancer§ and excluded cases diagnosed by autopsy and death certificate only. Incidence data were from USCS during the period 2003–2017 and covered 100% of the U.S. population. Age-adjusted rates were expressed per 100,000 men.¶ Trends in incidence were described using annual percent change (APC) and average annual percent change (AAPC) calculated by joinpoint regression. Statistically significant APC and AAPC were different from zero ($p<0.05$).** Survival data were from CDC's National Program of Cancer Registries (NPCR)–funded

* https://www.cdc.gov/cancer/uscs.

† https://www.cdc.gov/cancer/uscs/public-use/dictionary/behavior-code-ICD-O-3.htm.

§ https://seer.cancer.gov/siterecode/icdo3_dwhoheme/index.html.

¶ Rates were adjusted to the 2000 U.S. standard population.

** A maximum of two joinpoints were used to determine a change in direction of trend.

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registries that conducted active case follow-up or linkage with CDC's National Death Index, and covered 94% of the U.S. population.[††] Survival analysis included cases diagnosed during 2001–2016 with follow-up through December 31, 2016. Relative survival (cancer survival in the absence of other causes of death) was calculated[§§] for 1, 5, and 10 years after diagnosis, using expected life tables stratified by age, sex, race/ethnicity, socioeconomic status, geographic location, and calendar year of diagnosis.[¶¶] Differences between relative survival estimates were determined by comparing 95% confidence intervals (CIs), which allowed for an informal, conservative comparison of estimates. Differences in relative survival were noted when CIs did not overlap.

Incidence and survival were stratified by stage, age, year of diagnosis, and race/ethnicity. There were four categories for race (Black, White, AI/AN, and API) and one for ethnicity (Hispanic). Men categorized by race were all non-Hispanic. Men categorized as Hispanic might be of any race. Stage was defined using Summary Stage, the staging system used by the cancer surveillance community and defined with the following categories: localized (tumor is confined to the organ of origin without extension beyond the primary organ), regional (direct extension of the tumor to adjacent organs or structures or spread to regional lymph nodes), distant (cancer has spread to parts of the body remote from the primary tumor), and unknown.[***]

During 2003–2017, a total of 3,087,800 new cases of prostate cancer were diagnosed in the United States (Table 1). Over this 15-year period, age-adjusted incidence decreased from 155 per 100,000 in 2003 to 105 in 2017 (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/94592). During 2003–2017, incidence was highest for men aged 70–74 years (764) and Black men (202). Localized, regional, distant, and unknown stage prostate cancer accounted for 77%, 11%, 5%, and 7% of total cases, respectively. The percentage of localized cases decreased from 78% in 2003 to 70% in 2017, and distant cases increased from 4% in 2003 to 8% in 2017. White men had lower percentages of distant (5%) and unknown stage (6%) prostate cancer than did any other race/ethnicity. The overall incidence of prostate cancer decreased during 2003–2017 (AAPC = -2.5%) but increased for cases diagnosed at distant stage (AAPC = 2.2%). More specifically, the increase was observed during 2010–2017 (APC = 5.1%) and began in 2011 or earlier, regardless of race/ethnicity.

†† Registries met USCS publication criteria and included all U.S. states and the District of Columbia except for Connecticut, Hawaii, Indiana, Iowa, Kansas, and New Mexico.

§§ The cohort method was used to estimate survival when all patients had a full 1, 5, and 10 years of follow-up. The complete method was used when not all patients had the full 5 or 10 years of follow-up for 5-year and 10-year survival time estimates. https://surveillance.cancer.gov/survival/cohort.html.

¶¶ https://www.seer.cancer.gov.

*** Defined by merged Summary Stage. https://www.cdc.gov/cancer/uscs/public-use/dictionary/merged-summary-stage.htm and https://training.seer.cancer.gov/collaborative/intro/systems_review.html.

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR Morb Mortal Wkly Rep 2020;69:[inclusive page numbers].

TABLE 1. Age-adjusted incidence[*] of prostate cancer[†] and annual percent change (APC) and average APC (AAPC) in rates per 100,000 men, by selected characteristics — U.S. Cancer Statistics, United States, 2003–2017

	No., % of total, and rate		AAPC 2003–2017[§]	APC[§]					
Characteristic	**No. (%)[¶]**	**Rate (95%CI)**	**AAPC (95% CI)**	**Yrs**	**APC1 (95% CI)**	**Yrs**	**APC2 (95% CI)**	**Yrs**	**APC3 (95% CI)**
Overall	**3,087,800 (100)**	**128.4 (128.2 to 128.5)**	**−2.5 (−4.1 to −0.9)****	**2003–2007**	**2.0 (−1.6 to 5.7)**	**2007–2014**	**-6.6 (−8.8 to −4.4)****	**2014–2017**	**1.6 (−4.0 to 7.6)**
Age group (yrs)									
≤49	81,420 (3)	5.2 (5.1 to 5.2)	−2.9 (−4.0 to −1.7)**	2003–2009	4.4 (2.2 to 6.6)**	2009–2017	−8.0 (−9.5 to −6.4)**	—[††]	—
50–54	212,288 (7)	134.5 (133.9 to 135.0)	−1.6 (−3.7 to 0.6)	2003–2009	2.7 (0.2 to 5.2)**	2009–2014	−7.4 (−11.7 to −2.8)**	2014–2017	−0.1 (−7.8 to 8.3)
55–59	410,683 (13)	288.0 (287.1 to 288.9)	−1.8 (−3.6 to 0.0)	2003–2008	2.3 (−0.7 to 5.4)	2008–2014	−6.4 (−9.2 to −3.6)**	2014–2017	1.1 (−5.7 to 8.3)
60–64	569,259 (18)	484.7 (483.4 to 485.9)	−1.9 (−3.7 to −0.1)**	2003–2008	1.9 (−1.1 to 5.0)	2008–2014	−6.9 (−9.6 to −4.1)**	2014–2017	2.2 (−4.4 to 9.2)
65–69	658,449 (21)	720.0 (718.3 to 721.8)	−2.0 (−3.8 to −0.1)**	2003–2008	1.4 (−1.8 to 4.8)	2008–2014	−6.8 (−9.8 to −3.8)**	2014–2017	2.5 (−4.3 to 9.8)
70–74	516,620 (17)	764.0 (762.0 to 766.1)	−2.5 (−4.4 to −0.6)**	2003–2007	2.0 (−2.4 to 6.5)	2007–2014	−7.0 (−9.2 to −4.6)**	2014–2017	2.3 (−4.8 to 9.9)
75–79	346,422 (11)	693.6 (691.3 to 695.9)	−3.1 (−4.9 to −1.3)**	2003–2007	0.6 (−3.1 to 4.5)	2007–2014	−8.0 (−10.2 to −5.9)**	2014–2017	4.1 (−3.1 to 11.7)
≥80	292,659(9)	473.1 (471.4 to 474.8)	−4.6 (−5.9 to −3.2)**	2003–2007	−2.7 (−5.7 to 0.4)	2007–2013	−9.5 (−11.7 to −7.2)**	2013–2017	1.4 (−2.4 to 5.2)
Race/Ethnicity[§§]									
White	2,296,805 (74)	122.2 (122.0 to 122.3)	−2.7 (−4.7 to −0.5)**	2003–2007	2.1 (−2.5 to 7.0)	2007–2014	−7.0 (−9.4 to −4.6)**	2014–2017	1.6 (−6.7 to 10.7)
Black	451,822 (15)	202.3 (201.7 to 203.0)	−2.6 (−3.9 to −1.2)**	2003–2009	−0.5 (−2.2 to 1.1)	2009–2014	−6.6 (−9.5 to −3.7)**	2014–2017	0.4 (−4.3 to 5.3)
AI/AN	12,232 (0)	87.9 (86.2 to 89.6)	−3.4 (−5.3 to −1.4)**	2003–2009	−0.6 (−3.1 to 1.8)	2009–2014	−7.9 (−11.8 to −3.8)**	2014–2017	−1.1 (−7.7 to 6.0)
API	62,184 (2)	67.2 (66.6 to 67.7)	−3.6 (−6.5 to −0.6)**	2003–2011	−3.3 (−4.8 to −1.7)**	2011–2014	−11.1 (−23.5 to 3.3)	2014–2017	3.6 (−3.1 to 10.8)
Hispanic	196,506 (6)	106.0 (105.5 to 106.5)	−3.8 (−4.9 to −2.6)**	2003–2008	−0.5 (−2.5 to 1.5)	2008–2014	−7.4 (−9.1 to −5.7)**	2014–2017	−1.5 (−5.7 to 2.9)
Stage[¶¶]									
Localized	2,373,517 (77)	98.1 (98.0 to 98.3)	−3.3 (−5.1 to −1.4)**	2003–2007	3.1 (−1.2 to 7.5)	2007–2014	−8.0 (−10.1 to −5.9)**	2014–2017	−0.1 (−7.2 to 7.5)
Regional	344,750 (11)	13.5 (13.4 to 13.5)	0.2 (−1.5 to 2.1)	2003–2007	3.3 (−0.9 to 7.7)	2007–2013	−3.2 (−6.1 to −0.2)**	2013–2017	2.5 (−1.9 to 7.2)
Distant	157,175 (5)	7.2 (7.1 to 7.2)	2.2 (1.7 to 2.7)**	2003–2010	−0.7 (−1.5 to 0.2)	2010–2017	5.1 (4.3 to 5.8)**	—	—
Unknown	212,358 (7)	9.6 (9.6 to 9.7)	−2.8 (−5.3 to −0.2)**	2003–2005	−16.5 (−26.3 to −5.4)**	2005–2015	−3.8 (−5.4 to −2.1)**	2015–2017	19.1 (1.2 to 40.1)**
Stage by race/ethnicity									
Localized									
White	1,782,452 (78)	94.5 (94.3 to 94.6)	−3.4 (−5.3 to −1.4)**	2003–2007	3.1 (−1.3 to 7.8)	2007–2014	−8.4 (−10.7 to −6.1)**	2014–2017	0.5 (−7.1 to 8.7)
Black	349,321 (77)	153.8 (153.3 to 154.3)	−2.9 (−4.4 to −1.5)**	2003–2008	1.5 (−1.0 to 4.0)	2008–2014	−7.0 (−9.2 to −4.8)**	2014–2017	−1.7 (−7.0 to 3.9)
AI/AN	8,818 (72)	61.8 (60.4 to 63.2)	−3.9 (−6.2– to −1.6)**	2003–2008	1.1 (−3.0 to 5.3)	2008–2014	−9.0 (−12.5 to −5.3)**	2014–2017	−1.6 (−9.8 to 7.4)
API	45,682 (73)	48.9 (48.5 to 49.4)	−4.7 (−7.5 to −1.9)**	2003–2007	−0.4 (−7.4 to 7.1)	2007–2014	−8.9 (−12.2 to −5.5)**	2014–2017	−0.2 (−10.2 to 10.9)
Hispanic	143,627 (73)	76.3 (75.8 to 76.7)	−4.7 (−5.9 to −3.6)**	2003–2008	0.0 (−2.0 to 2.1)	2008–2014	−8.8 (−10.6 to −7.1)**	2014–2017	−4.1 (−8.4 to 0.4)
Regional									
White	267,155 (12)	13.5 (13.5 to 13.6)	0.5 (−1.5 to 2.5)	2003–2007	4.1 (−0.6 to 9.0)	2007–2013	−3.3 (−6.5 to −0.1)**	2013–2017	2.8 (−2.1 to 7.9)
Black	43,672 (10)	17.5 (17.3 to 17.6)	−0.1 (−2.1 to 2.0)	2003–2010	0.1 (−1.6 to 1.8)	2010–2013	−4.7 (−14.0 to 5.5)	2013–2017	3.3 (0.0 to 6.6)**
AI/AN	1,412 (12)	8.7 (8.2 to 9.2)	−0.7 (−2.1 to 0.7)						
API	8,014 (13)	7.8 (7.6 to 8.0)	0.9 (−2.2 to 4.0)	2003–2011	1.1 (−1.0 to 3.1)	2011–2014	−8.1 (−20.8 to 6.7)	2014–2017	10.1 (2.8 to 17.9)**
Hispanic	21,853 (11)	10.3 (10.2 to 10.5)	−1.4 (−2.0 to −0.9)**	2003–2017	−1.4 (−2.0 to −0.9)**	—		—	

See table footnotes on the next page.

TABLE 1: (*Continued*) Age-adjusted incidence* of prostate cancer† and annual percent change (APC) and average APC (AAPC) in rates per 100,000 men, by selected characteristics — U.S. Cancer Statistics, United States, 2003–2017

	No., % of total, and rate		AAPC 2003–2017§	APC§					
Characteristic	No. (%)¶	Rate (95%CI)	AAPC (95% CI)	Yrs	APC1 (95% CI)	Yrs	APC2 (95% CI)	Yrs	APC3 (95% CI)
Distant									
White	110,453 (5)	6.4 (6.3 to 6.4)	2.7 (2.1 to 3.2)**	2003–2010	−0.2 (−1.1 to 0.8)	2010–2017	5.6 (4.8 to 6.4)**	—	—
Black	28,946 (6)	15.1 (14.9 to 15.2)	0.1 (−0.6 to 0.8)	2003–2011	−2.4 (−3.4 to −1.3)**	2011–2017	3.5 (2.2 to 4.8)**	—	—
AI/AN	911 (7)	7.7 (7.1 to 8.2)	2.2 (0.8 to 3.6)**						—
API	3,867 (6)	4.7 (4.6 to 4.9)	1.7 (−0.5 to 4.0)	2003–2006	3.7 (−4.4 to 12.5)	2006–2010	−5.0 (−10.8 to 1.1)	2010–2017	4.9 (3.3 to 6.6)**
Hispanic	12,275 (6)	7.5 (7.4 to 7.6)	0.5 (−0.3 to 1.3)	2003–2011	−1.6 (−2.9 to −0.4)**	2011–2017	3.4 (2.0 to 4.8)**	—	
Unknown									
White	136,745 (6)	7.8 (7.8 to 7.9)	−6.1 (−9.0 to −3.1)**	2003–2005	−19.2 (−35.1 to 0.7)	2005–2017	−3.8 (−5.7 to −1.8)**	—	—
Black	29,883 (7)	16.0 (15.8 to 16.2)	−4.2 (−5.7 to −2.7)**	—	—	—	—	—	—
AI/AN	1,091 (9)	9.8 (9.2 to 10.4)	−6.0 (−8.4 to −3.5)**	—	—	—	—	—	—
API	4,621 (7)	5.7 (5.5 to 5.8)	−2.0 (−3.7 to −0.2)**	—	—	—	—	—	—
Hispanic	18,751 (10)	11.9 (11.7 to 12.1)	−4.2 (−6.1 to −2.2)**	—	—	—	—	—	—

Abbreviations: AI/AN = American Indian/Alaska Native; API = Asian/Pacific Islander; CI = confidence interval.

* Incidence data are compiled from cancer registries that meet the U.S. Cancer Statistics publication criteria for the period 2003–2017 (covering 100% of the U.S. population). Characteristic values with other, missing, or blank results are not included. Rates are age-adjusted to the 2000 U.S. Standard population.

† Cases included *International Classification of Diseases for Oncology, Third Edition* malignant cancers only.

§ Trends were considered to increase or decrease if p<0.05; otherwise trends were considered stable.

¶ Denominator for this column is 3,087,800, except for stage by race/ethnicity, where the denominator is the total number of cases for the respective race/ethnicity grouping.

** p<0.05.

†† Trend described for the period 2003–2017 by previous APC columns.

§§ White, Black, AI/AN, and API men are non-Hispanic. Hispanic men might be of any race. Counts exclude unspecified or unknown race/ethnicity. Excludes 67,696 cases with non-Hispanic unknown race.

¶¶ Defined by merged Summary Stage. https://www.cdc.gov/cancer/uscs/public-use/dictionary/merged-summary-stage.htm.

During 2001–2016, among 3,104,380 men with survival data, 5-year and 10-year relative survival was 97.6% and 97.2%, respectively (Table 2). Men aged ≤49 years and ≥80 years had the lowest 10-year relative survival (95.6% and 82.7%, respectively). For localized prostate cancer, 10-year relative survival was 100%. Ten-year relative survival for regional, distant, and unknown stage was 96.1%, 18.5%, and 78.1%, respectively. For distant stage prostate cancer, 10-year relative survival was highest for ages 60–64 years (21.8%) and was <20% for ages <55 and ≥70 years.

Comparing 2001–2005 with 2011–2016, 5-year relative survival improved from 97.5% to 99.3% for regional stage and from 28.7% to 32.3% for distant stage prostate cancer (Table 3). During 2001–2016, 5-year survival for distant stage prostate cancer was highest among API (42.0%), followed by Hispanics (37.2%), AI/AN (32.2%), Black men (31.6%), and White men (29.1%). Survival by race/ethnicity showed differences by age (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/94593). For unknown stage prostate cancer, 5-year survival was higher for Hispanic (84.4%) and White men (82.8%) than Black men (79.1%).

Discussion

Although approximately three fourths of U.S. men with prostate cancer have localized stage at diagnosis, an increasing number and percentage of men have received diagnoses of distant stage prostate cancer. Survival with distant stage prostate cancer has improved, but fewer than one third of men survive 5 years after diagnosis. Survival disparities by age and race/ethnicity were noted for distant stage prostate cancer during all three periods (i.e., 2001–2005, 2006–2010, and 2011–2016) studied.

The U.S. Preventive Services Task Force (USPSTF) has issued several recommendations that discuss the possible benefits and harms of screening for prostate cancer using prostate-specific antigen (PSA).††† In 2012, USPSTF concluded that the benefits of PSA-based screening do not outweigh the harms and

††† Information about the benefits and harms of prostate cancer screening can be found at the CDC website. Digital rectal examination to screen for prostate cancer is not recommended by USPSTF because of lack of evidence of the benefits. https://www.cdc.gov/cancer/prostate/basic_info/benefits-harms.htm, https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/prostate-cancer-screening-2012, https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/prostate-cancer-screening.

TABLE 2. Relative survival of men with prostate cancer, 1, 5, and 10 years after diagnosis — United States, 2001–2016*

Characteristic	No.	1-year relative survival % (95% CI)	5-year relative survival % (95% CI)	10-year relative survival % (95% CI)
Overall	**3,104,380**	**99.0 (98.9–99.0)**	**97.6 (97.5–97.6)**	**97.2 (97.2–97.3)**
Age group (yrs)				
≤49	83,692	99.3 (99.2–99.3)	96.7 (96.6–96.7)	95.6 (95.6–95.9)
50–54	214,757	99.6 (99.5–99.6)	97.8 (97.6–97.8)	96.9 (96.9–97.1)
55–59	407,302	99.7 (99.6–99.7)	98.4 (98.3–98.4)	98.0 (98.0–98.1)
60–64	559,872	99.7 (99.7–99.7)	98.8 (98.8–98.8)	98.7 (98.7–98.9)
65–69	650,004	99.9 (99.9–99.9)	99.6 (99.5–99.6)	99.5 (99.5–99.7)
70–74	525,876	99.8 (99.8–99.8)	99.5 (99.4–99.5)	99.4 (99.4–99.6)
75–79	361,735	99.1 (99.0–99.1)	98.4 (98.2–98.4)	97.9 (97.9–98.3)
≥80	301,315	92.1 (92.0–92.1)	84.6 (84.2–84.6)	82.7 (82.7–83.5)
Race/Ethnicity†				
White	2,323,828	99.1 (99.0–99.1)	97.9 (97.9–97.9)	97.8 (97.8–97.9)
Black	459,665	98.4 (98.4–98.4)	95.6 (95.4–95.6)	93.5 (93.5–93.8)
AI/AN	11,983	98.2 (97.7–98.2)	95.7 (94.7–95.7)	93.4 (93.4–95.0)
API	55,310	98.7 (98.6–98.7)	95.1 (94.8–95.1)	92.0 (92.0–92.6)
Hispanic	193,770	98.4 (98.3–98.4)	95.3 (95.1–95.3)	93.1 (93.1–93.4)
Stage§				
Localized	2,393,365	100.0¶	100.0	100.0
Regional	328,421	100.0 (100.0–100.0)	98.6 (98.5–98.6)	96.1 (96.1–96.4)
Distant	145,923	75.6 (75.3–75.6)	30.7 (30.4–30.7)	18.5 (18.5–18.9)
Unknown	236,919	93.2 (93.1–93.2)	84.3 (84.0–84.3)	78.1 (78.1–78.5)
Stage by age group (yrs)				
Localized				
≤49	65,134	100.0 (99.8–100.0)	99.9 (99.7–99.9)	99.8 (99.8–99.9)
50–54	167,635	100.0	100.0	100.0
55–59	318,323	100.0	100.0	100.0
60–64	437,309	100.0	100.0	100.0
65–69	512,706	100.0	100.0	100.0
70–74	421,401	100.0	100.0	100.0
75–79	283,797	100.0	100.0	100.0
≥80	187,081	100.0 (99.9–100.0)	100.0 (99.9–100.0)	100.0 (100.0–100.0)
Regional				
≤49	12,140	99.8 (99.6–99.8)	97.0 (96.5–97.0)	92.6 (92.6–93.4)
50–54	32,016	100.0	97.9 (97.6–97.9)	94.1 (94.1–94.6)
55–59	58,398	100.0	99.0 (98.7–99.0)	95.9 (95.9–96.4)
60–64	76,162	100.0	100.0 (91.2–100.0)	97.8 (97.8–98.2)
65–69	77,433	100.0	100.0	99.9 (99.9–100.0)
70–74	42,562	100.0	100.0	99.6 (99.6–100.0)
75–79	17,034	99.3 (98.8–99.3)	94.2 (93.1–94.2)	90.4 (90.4–92.3)
≥80	12,678	90.7 (89.9–90.7)	70.8 (69.0–70.8)	64.4 (64.4–67.3)

See table footnotes on the next page.

recommended against PSA-based screening for prostate cancer for men of all ages. This recommendation likely contributed to a decrease in overall reported prostate cancer incidence and might have contributed to an increase in the percentage and incidence of distant stage prostate cancer (*2*,*3*). Despite decreasing incidence of localized stage prostate cancer, 130,658 to 190,570 new cases were diagnosed each year in the United States during 2003–2017. Even though 10-year survival for localized stage prostate cancer is 100%, many of these patients need treatment, including surgery or radiation, often face long-term effects of their treatment (e.g., urinary incontinence and erectile dysfunction), and ≤6% progress to metastatic prostate cancer (*6*). Improvements in survival for distant stage prostate cancer might reflect changes in clinical management, which includes increased use of new agents and treatment innovations, such as new hormone and antibody therapies (*6*). Despite these improvements in survival, increases in distant stage prostate cancer incidence might have contributed to the plateauing of previously declining prostate cancer mortality during 2013–2017 (*1*,*2*).

Five-year survival for all stages combined was higher for White men than Black or Hispanic men. However, survival for distant stage prostate cancer was higher for Black than White men, which is different from a past study reporting higher survival for White men than Black men during 2001–2009, but with overlapping 95% CIs (*4*). In addition, unknown stage prostate cancer represented a higher percentage of total cases (7%) than distant stage prostate cancer (5%), and survival for unknown stage prostate cancer was higher for Hispanic and White men than Black men. Men in the unknown stage category, who had a 5-year relative survival of 84.3%, might include a mixture of situations, such as

TABLE 2. (*Continued*) Relative survival rate of men with prostate cancer, 1, 5, and 10 years after diagnosis — United States, 2001–2016*

Characteristic	No.	1-year relative survival % (95% CI)	5-year relative survival % (95% CI)	10-year relative survival % (95% CI)
Distant				
≤49	3,083	84.9 (83.6–84.9)	31.1 (29.2–31.1)	19.0 (19.0–20.9)
50–54	6,488	85.4 (84.5–85.4)	32.7 (31.3–32.7)	19.1 (19.1–20.5)
55–59	12,607	84.3 (83.6–84.3)	35.5 (34.5–35.5)	20.8 (20.8–21.9)
60–64	18,268	83.2 (82.6–83.2)	35.1 (34.2–35.1)	21.8 (21.8–22.8)
65–69	21,311	82.4 (81.8–82.4)	36.2 (35.3–36.2)	21.2 (21.2–22.1)
70–74	21,066	77.9 (77.3–77.9)	33.3 (32.5–33.3)	19.8 (19.8–20.9)
75–79	21,299	73.4 (72.8–73.4)	29.9 (29.0–29.9)	18.5 (18.5–19.6)
≥80	41,810	63.3 (62.8–63.3)	22.5 (21.8–22.5)	14.6 (14.6–15.8)
Unknown				
≤49	3,340	97.8 (97.2–97.8)	91.7 (90.5–91.7)	88.3 (88.3–89.8)
50–54	8,625	98.3 (98.0–98.3)	93.0 (92.2–93.0)	88.7 (88.7–89.8)
55–59	17,984	98.2 (97.9–98.2)	93.0 (92.4–93.0)	88.7 (88.7–89.5)
60–64	28,148	97.8 (97.5–97.8)	92.1 (91.6–92.1)	87.5 (87.5–88.3)
65–69	38,573	97.5 (97.3–97.5)	91.3 (90.8–91.3)	85.4 (85.4–86.2)
70–74	40,864	96.6 (96.3–96.6)	89.2 (88.6–89.2)	82.8 (82.8–83.8)
75–79	39,622	94.2 (93.9–94.2)	85.6 (84.9–85.6)	77.7 (77.7–79.0)
≥80	59,766	82.7 (82.3–82.7)	65.7 (64.9–65.7)	57.2 (57.2–58.7)

Source: CDC's National Program of Cancer Registries, https://www.cdc.gov/cancer/npcr.

Abbreviations: AI/AN = American Indian/Alaska Native; API = Asian/Pacific Islander; CI = confidence interval.

* Data were compiled from 45 population-based registries that cover approximately 94% of the US population. Counts for age and stage do not sum to the total because of multiple primaries methodology. When the relative survival is calculated stratified by a tumor or demographic characteristic, each cancer was included for patients diagnosed with multiple primary prostate cancers at the different category-levels.

† White, Black, AI/AN, and API men are non-Hispanic. Hispanic men might be of any race. Counts exclude unspecified or unknown race/ethnicity. Excludes 59,824 cases of non-Hispanic unknown race.

§ Percentage of total for localized, regional, distant, and unknown is 77%, 11%, 5%, and 8%, respectively.

¶ CI could not be calculated.

men not healthy enough for a staging workup, situations where staging is not needed to guide treatment decisions, lack of access to care, or incomplete recording in the medical record (*7*). Past data suggest that social inequities by race contribute to worse outcomes for Black men than White men with prostate cancer (*8*). Survival based on distant stage and race/ethnicity might need to be interpreted in the context of the incidence and survival for other prostate cancer stages, as well as diagnostic procedures and social determinants of health such as access to care (*7*,*8*).

Although survival by age varied by stage, survival was lowest for ages >75 years for regional, distant, and unknown stage prostate cancer. Lower survival for distant stage at age >75 years compared with younger ages might be secondary to more rapid development of resistant prostate cancer, reduced ability to receive available therapies, and impact of comorbidities (*5*). Ten-year survival was lower for men aged ≤49 years compared with all ages except ≥80 years. Prostate cancer incidence in men ≤49 years has risen over the past 3 decades, and lower survival for this age group has been reported (*9*). Prostate cancer behavior, genetics, family history, and treatment patterns might affect prostate cancer incidence and survival patterns for men aged ≤49 years (*9*).

The findings in this report are subject to least three limitations. First, prostate cancer cases missing from the dataset could result in an undercount of prostate cancer incidence,[§§§] and delays in reporting could undercount incidence over the most recent years of the study (*10*). Second, Collaborative Cancer Staging coding, which was used from 2003 to 2015 to code stage data, might explain the lower numbers of unknown stage cases during those years.[¶¶¶] Finally, confidence intervals could not be generated for all survival results that are rounded to 100.0%, and values listed as 100.0% only mean that no excess deaths were observed.

In 2018, USPSTF issued a new recommendation stating that prostate cancer screening for men aged 55–69 years should be an individualized decision based on personal preferences when weighing the benefits and harms of screening,[****] and several professional organizations have similarly recommended shared decision-making for men deciding about prostate cancer screening.[††††] Understanding incidence and long-term survival by stage, race/ethnicity, and age could inform messaging related to the possible benefits and harms of prostate cancer screening and could guide public health planning related to treatment and survivor care. Further research is needed to examine how social determinants of health affect prostate

§§§ https://link.springer.com/article/10.1023/A:1023002322935.

¶¶¶ https://seer.cancer.gov/tools/collabstaging/.

**** https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/prostate-cancer-screening.

†††† https://www.auanet.org/guidelines/prostate-cancer-early-detection-guideline; https://www.cancer.org/cancer/prostate-cancer/detection-diagnosis-staging/acs-recommendations.html; https://www.acpjournals.org/doi/10.7326/0003-4819-158-10-201305210-00633; and https://www.aafp.org/afp/2018/1015/od1.html.

TABLE 3. Five-year relative survival for men with prostate cancer, by period and selected characteristics — United States, 2001–2016*

	2001–2016		2001–2005		2006–2010		2011–2016	
Characteristic	**No.**	**Relative survival % (95% CI)**	**No.**	**Relative survival % (95% CI)**	**No.**	**Relative survival % (95% CI)**	**No.**	**Relative survival % (95% CI)**
Overall	**3,104,380**	**97.6 (97.5–97.6)**	**965,748**	**97.3 (97.2–97.4)**	**1,052,255**	**98.2 (98.1–98.3)**	**1,086,532**	**97.2 (97.1–97.3)**
Age group (yrs)								
≤49	83,692	96.7 (96.6–96.9)	25,688	96.3 (96.0–96.6)	31,384	97.1 (96.8–97.3)	26,621	96.9 (96.5–97.2)
50–54	214,757	97.8 (97.6–97.9)	63,318	97.8 (97.6–98.0)	76,549	97.9 (97.7–98.1)	74,893	97.4 (97.2–97.7)
55–59	407,302	98.4 (98.3–98.5)	117,213	98.6 (98.4–98.7)	143,170	98.6 (98.5–98.7)	146,920	97.7 (97.5–97.9)
60–64	559,872	98.8 (98.8–98.9)	154,088	98.7 (98.6–98.9)	195,058	99.2 (99.1–99.4)	210,727	98.4 (98.2–98.6)
65–69	650,004	99.6 (99.5–99.7)	185,518	99.1 (98.9–99.3)	213,975	99.9 (99.7–100.0)	250,514	99.5 (99.3–99.6)
70–74	525,876	99.5 (99.4–99.6)	175,220	99.1 (98.8–99.3)	171,457	99.9 (99.9–100.0)	179,201	99.3 (99.0–99.4)
75–79	361,735	98.4 (98.2–98.6)	134,039	98.0 (97.6–98.3)	120,166	99.0 (98.7–99.2)	107,532	97.7 (97.4–98.0)
≥80	301,315	84.6 (84.2–84.9)	110,671	85.7 (85.2–86.3)	100,506	86.9 (86.3–87.4)	90,144	79.7 (78.9–80.6)
Race/Ethnicity[†]								
White	2,323,828	97.9 (97.9–98.0)	752,786	97.8 (97.7–97.9)	792,482	98.6 (98.5–98.6)	778,682	97.3 (97.2–97.5)
Black	459,665	95.6 (95.4–95.7)	130,818	94.8 (94.6–95.1)	152,416	96.1 (95.9–96.3)	176,445	95.7 (95.3–95.9)
AI/AN	11,983	95.7 (94.7–96.6)	3,361	94.6 (92.7–96.1)	3,991	96.4 (94.8–97.5)	4,632	95.5 (93.2–97.1)
API	55,310	95.1 (94.8–95.5)	14,865	95.4 (94.7–96.0)	18,207	95.5 (94.9–96.0)	22,241	94.7 (93.9–95.3)
Hispanic	193,770	95.3 (95.1–95.5)	52,951	94.9 (94.5–95.2)	64,680	96.0 (95.7–96.3)	76,154	95.2 (94.8–95.6)
Stage*								
Localized	2,393,365	100.0[§]	753,909	100.0[§]	836,008	100.0[§]	803,466	100.0[§]
Regional	328,421	98.6 (98.5–98.7)	87,320	97.5 (97.3–97.8)	106,635	99.0 (98.8–99.2)	134,467	99.3 (98.9–99.5)[¶]
Distant	145,923	30.7 (30.4–31.0)	37,195	28.7 (28.1–29.2)	40,895	30.2 (29.7–30.8)	67,835	32.3 (31.6–33.0)[¶]
Unknown	236,919	84.3 (84.0–84.5)	87,357	83.0 (82.6–83.4)	68,748	84.2 (83.7–84.6)	80,818	86.7 (86.1–87.2)[¶]
Stage by race/ethnicity								
Localized								
White	1,807,824	100.0[§]	592,631	100.0[§]	634,465	100.0[§]	580,741	100.0[§]
Black	354,643	100.0[§]	99,964	100.0[§]	121,260	100.0[§]	133,420	100.0[§]
AI/AN	8,626	100.0[§]	2,477	99.9 (97.3–100.0)	2,960	100.0[§]	3,189	100.0[§]
API	41,192	99.6 (99.1–99.8)	11,622	99.6 (98.1–99.9)	13,940	99.6 (98.6–99.9)	15,631	99.8 (97.4–100.0)
Hispanic	142,007	100.0[§]	39,557	100.0[§]	48,798	100.0[§]	53,655	100.0[§]
Regional								
White	254,394	98.6 (98.5–98.8)	68,723	97.5 (97.2–97.7)	83,382	99.0 (98.7–99.2)	102,290	99.4 (99.0–99.7)[¶]
Black	42,843	98.8 (98.3–99.1)	11,027	97.9 (96.9–98.5)	13,494	99.3 (98.3–99.7)	18,322	98.9 (97.7–99.5)
AI/AN	1,366	98.2 (93.2–99.5)	354	97.3 (87.8–99.4)	431	98.5 (82.2–99.9)	581	97.5 (79.3–99.7)
API	6,671	97.4 (96.5–98.1)	1,491	97.1 (95.0–98.4)	2,091	97.9 (96.3–98.9)	3,089	96.9 (94.7–98.2)
Hispanic	20,794	97.5 (97.0–98.0)	5,145	96.8 (95.7–97.7)	6,424	97.9 (96.9–98.5)	9,225	98.0 (96.7–98.8)
Distant								
White	101,621	29.1 (28.7–29.5)	25,864	27.2 (26.6–27.9)	28,392	28.5 (27.9–29.1)	47,367	30.8 (29.9–31.6)[¶]
Black	28,330	31.6 (30.9–32.3)	7,718	29.9 (28.6–31.1)	8,047	31.0 (29.9–32.2)	12,565	33.3 (31.8–34.9)[¶]
AI/AN	796	32.2 (27.8–36.8)	180	29.0 (21.6–36.8)	219	27.9 (21.3–34.8)	397	39.0 (30.4–47.4)
API	3,153	42.0 (39.6–44.3)	650	38.1 (33.9–42.3)	853	43.3 (39.5–47.0)	1,650	41.5 (36.8–46.1)
Hispanic	11,418	37.2 (36.1–38.4)	2,655	35.3 (33.3–37.4)	3,213	37.4 (35.5–39.3)	5,550	37.5 (35.2–39.9)
Unknown								
White	160,180	82.8 (82.5–83.2)	65,593	83.3 (82.8–83.8)	46,266	82.0 (81.4–82.5)	48,322	83.0 (82.2–83.8)
Black	33,879	79.1 (78.3–79.8)	12,113	78.3 (77.1–79.5)	9,619	78.8 (77.5–80.0)	12,148	80.9 (79.3–82.4)
AI/AN	1,196	82.2 (78.1–85.7)	350	76.9 (69.4–82.8)	381	84.6 (77.6–89.6)	465	84.1 (74.8–90.3)
API	4,298	82.7 (80.9–84.4)	1,102	82.0 (78.5–84.9)	1,323	81.1 (78.0–83.7)	1,873	85.4 (81.5–88.5)
Hispanic	19,572	84.4 (83.5–85.2)	5,598	80.6 (79.0–82.1)	6,249	86.5 (85.1–87.7)	7,727	85.8 (83.9–87.6)[¶]

Source: CDC's National Program of Cancer Registries. https://www.cdc.gov/cancer/npcr.

Abbreviations: AI/AN = American Indian/Alaska Native; API = Asian/Pacific Islander; CI = confidence interval.

* Data were compiled from 45 population-based registries that cover approximately 94% of the U.S. population. Counts for age and stage do not sum to the total because of multiple primaries methodology. When the relative survival is calculated stratified by a tumor or demographic characteristic, each cancer was included for patients diagnosed with multiple primary prostate cancers at the different category levels.

† White, Black, AI/AN, and API men are non-Hispanic. Hispanic men might be of any race. Counts exclude unspecified or unknown race/ethnicity. Excludes 59,824 cases of non-Hispanic unknown race.

§ CI could not be calculated.

¶ Indicates nonoverlapping 95% CIs when comparing 2001–2005 with 2011–2016.

Summary

What is already known about this topic?

Among U.S. men, prostate cancer is the second leading cause of cancer-related death. The incidence of distant stage prostate cancer (signifying spread to parts of the body remote from the primary tumor) has increased since 2010.

What is added by this report?

Additional years of data show continued increases in the incidence of distant stage prostate cancer in the United States. The percentage of distant stage prostate cancer increased from 4% in 2003 to 8% in 2017. Five-year survival for distant stage prostate cancer improved from 28.7% during 2001–2005 to 32.3% during 2011–2016; for the period 2001–2016, 5-year survival was highest among Asian/Pacific Islanders (42.0%), followed by Hispanics (37.2%), American Indian/Alaska Natives (32.2%), Black men (31.6%), and White men (29.1%).

What are the implications for public health?

Understanding the disease trends of distant stage prostate cancer and disparities in prostate cancer survival by stage, race/ethnicity, and age can guide public health planning related to screening, treatment, and survivor care.

cancer diagnosis and treatment; findings should inform interventions to decrease disparities in outcomes.

Acknowledgments

Reda J. Wilson, Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, CDC; state and regional cancer registry and health department personnel.

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

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Breast Cancer Survival Among Males by Race, Ethnicity, Age, Geographic Region, and Stage — United States, 2007–2016

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Breast cancer among males in the United States is rare; approximately 2,300 new cases and 500 associated deaths were reported in 2017, accounting for approximately 1% of all breast cancers.* Risk for male breast cancer increases with increasing age (*1*), and compared with women, men receive diagnoses later in life and often at a later stage of disease (*1*). Gradual improvement in breast cancer survival from 1976–1985 to 1996–2005 has been more evident for women than for men (*1*). Studies examining survival differences among female breast cancer patients observed that non-Hispanic White (White) females had a higher survival than non-Hispanic Black (Black) females (*2*), but because of the rarity of breast cancer among males, few studies have examined survival differences by race or other factors such as age, stage, and geographic region. CDC's National Program of Cancer Registries (NPCR)† data were used to examine relative survival of males with breast cancer diagnosed during 2007–2016 by race/ethnicity, age group, stage at diagnosis, and U.S. Census region. Among males who received a diagnosis of breast cancer during 2007–2016, 1-year relative survival was 96.1%, and 5-year relative survival was 84.7%. Among characteristics examined, relative survival varied most by stage at diagnosis: the 5-year relative survival for males was higher for cancers diagnosed at localized stage (98.7%) than for those diagnosed at distant stage (25.9%). Evaluation of 1-year and 5-year relative survival among males with breast cancer might help guide health care decisions regarding early detection of male breast cancer and establishing programs to support men at high risk for breast cancer and male breast cancer survivors.

Data on survival patterns of breast cancer (*International Classification of Diseases for Oncology, Third Edition,* C50.0–C50.9)§ reported during 2007–2016, the most recently available data, were obtained from NPCR and restricted to those occurring in males. The data set, which covers 94% of the U.S. population, includes 45 population-based cancer registries that met U.S. Cancer Statistics (USCS) publication criteria and conducted active follow-up or linkage with CDC's National Center for Health Statistics National Death Index (*3*). Cases with histology codes 9050–9055 (mesothelial neoplasms), 9140 (Kaposi sarcoma), and 9590–9992 (lymphomas and hematopoietic neoplasms) were excluded from analysis. The 1-year and 5-year relative survival were defined as the percentages of persons who did not die from breast cancer ≥1 year and ≥5 years after cancer diagnosis. The 1-year and 5-year relative survival for males with breast cancer diagnosed during 2007–2016 with follow-up through 2016 were calculated using the Ederer II actuarial method with the complete analysis approach to account for shorter follow-up time of cancers diagnosed in more recent diagnosis years (*4*). Using the Surveillance, Epidemiology, and End Results (SEER) statistical program (version 8.3.6; National Cancer Institute), relative survival was calculated for males with diagnosed breast cancer by race/ethnicity (four mutually exclusive groups including White, Black, Hispanic, and other [non-Hispanic Asian/Pacific Islander and non-Hispanic American/Indian Alaskan Native]), age group (<50, 50–59, 60–69, 70–79, and ≥80 years), U.S. Census region, and stage at diagnosis (SEER Summary Stage 2000¶ was used to characterize cancers as localized, regional, distant, or unknown stage using clinical and pathologic tumor characteristics). To allow for informal comparisons, without specifying a referent group, 95% confidence intervals for survival estimates are presented.

Among males with breast cancer diagnosed during 2007–2016, the 1-year and 5-year relative survival was 96.1% and 84.7%, respectively (Table). One-year relative survival was 97.0% among Hispanics, 96.4% among Whites, 95.3% among other racial/ethnic groups, and 93.7% among Blacks (Figure 1). Relative survival from 1 to 5 years decreased 15.4 percentage points among Blacks (93.7% to 77.6%), 14.5 among Hispanics (97.0% to 82.5%), 10.4 among Whites (96.4% to 86.0%), and 9.1 among other racial/ethnic groups (95.3% to 86.2%).

Approximately one third of cases were diagnosed in males aged <60 years, one third in men aged 60–69 years, and one third in men aged ≥70 years. The 1-year survival was similar for all age groups, and 5-year survival was similar for all age groups, but 1-year and 5-year differed. Survival estimates by U.S. Census region were similar; 1-year survival was 97.4% in the West, 96.0% in the South, 95.8% in the Northeast, and 95.6% in the Midwest, whereas 5-year survival was 87.0% in the West, 85.9% in the Northeast, 83.9% in the South, and 82.7% in the Midwest.

A large proportion of cases in males were diagnosed at localized (45.8%) and regional (41.9%) stages, but approximately 8.7% were diagnosed at a distant stage and 3.6% at an unknown stage. The 1-year survival was similar among males with cancer diagnosed at localized (approximately 99.7%)

* https://www.cdc.gov/cancer/dataviz.

† https://www.cdc.gov/cancer/npcr/index.htm.

§ http://www.iacr.com.fr/index.php?option=com_content&view=category&layout=blog&id=100&Itemid=577.

¶ https://seer.cancer.gov/tools/ssm/.

TABLE. Relative survival 1 and 5 years after breast cancer diagnosis among males, by selected characteristics — United States, 2007–2016*

Characteristic	No.	Relative survival (95% CI) 1-year	5-year
Overall	**14,805**	**96.1 (95.6–96.5)**	**84.7 (83.7–85.7)**
Race/Ethnicity†			
White, non-Hispanic	11,306	96.4 (95.9–96.9)	86.0 (84.8–87.1)
Black, non-Hispanic	2,095	93.7 (92.3–94.9)	77.6 (74.6–80.3)
Hispanic	889	97.0 (95.1–98.2)	82.5 (78.0–86.1)
Other	392	95.3 (92.0–97.2)	86.2 (79.6–90.7)
Age group (yrs)			
<50	1,626	96.9 (95.8–97.6)	83.6 (81.2–85.7)
50–59	2,990	96.5 (95.6–97.1)	83.9 (82.0–85.6)
60–69	4,583	96.1 (95.3–96.7)	85.1 (83.4–86.6)
70–79	3,471	96.3 (95.2–97.1)	85.9 (83.3–88.1)
≥80	2,135	94.8 (92.7–96.3)	84.5 (78.8–88.7)
Census region§			
Northeast	3,087	95.8 (94.7–96.7)	85.9 (83.5–88.0)
Midwest	2,844	95.6 (94.4–96.5)	82.7 (80.1–85.0)
South	5,842	96.0 (95.2–96.6)	83.9 (82.2–85.5)
West	2,833	97.4 (96.3–98.1)	87.0 (84.4–89.1)
Stage at diagnosis¶			
Localized	6,779	99.7 (98.9–99.9)	98.7 (96.5–99.5)
Regional	6,205	98.7 (98.1–99.2)	83.7 (82.0–85.2)
Distant	1,290	70.5 (67.8–73.1)	25.9 (22.7–29.3)
Unknown	531	80.5 (76.4–84.0)	62.1 (55.7–67.8)

* Data were compiled from 45 population-based cancer registries that participate in the National Program of Cancer registries, meet the data-quality standards for inclusion in U.S. Cancer Statistics, and meet the criteria for inclusion in the survival data set, which covers approximately 94% of the U.S. population.
† Racial and ethnic groups are mutually exclusive. Hispanic persons can be any race. The "other" race group contains non-Hispanic Asian/Pacific Islander and non-Hispanic American Indian/Alaska Native cases.
§ *Northeast*: Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Midwest*: Illinois, 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, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.
¶ Surveillance, Epidemiology, and End Results Summary Stage 2000 was used to characterize cancers as localized, regional, distant, or unknown stage using clinical and pathologic tumor characteristics.

and regional stages (98.7%), but 5-year survival was lower among those whose cancers were diagnosed at a regional stage (83.7%) than among those diagnosed at a localized stage (98.7%). Relative survival was lowest among males with cancer diagnosed at a distant stage (1-year = 70.5%; 5-year = 25.9%) (Figure 2). Among males with breast cancer diagnosed at an unknown stage 1-year relative survival was 80.5% and 5-year was 62.1%. Although survival estimates were similar by race/ethnicity, a larger proportion of cases in Black males was diagnosed at distant stage (12.2%) than were those in males in other racial/ethnic groups (7.1% of Hispanic males, 8.1% of White males, and 10.2% of other race/ethnicity groups).

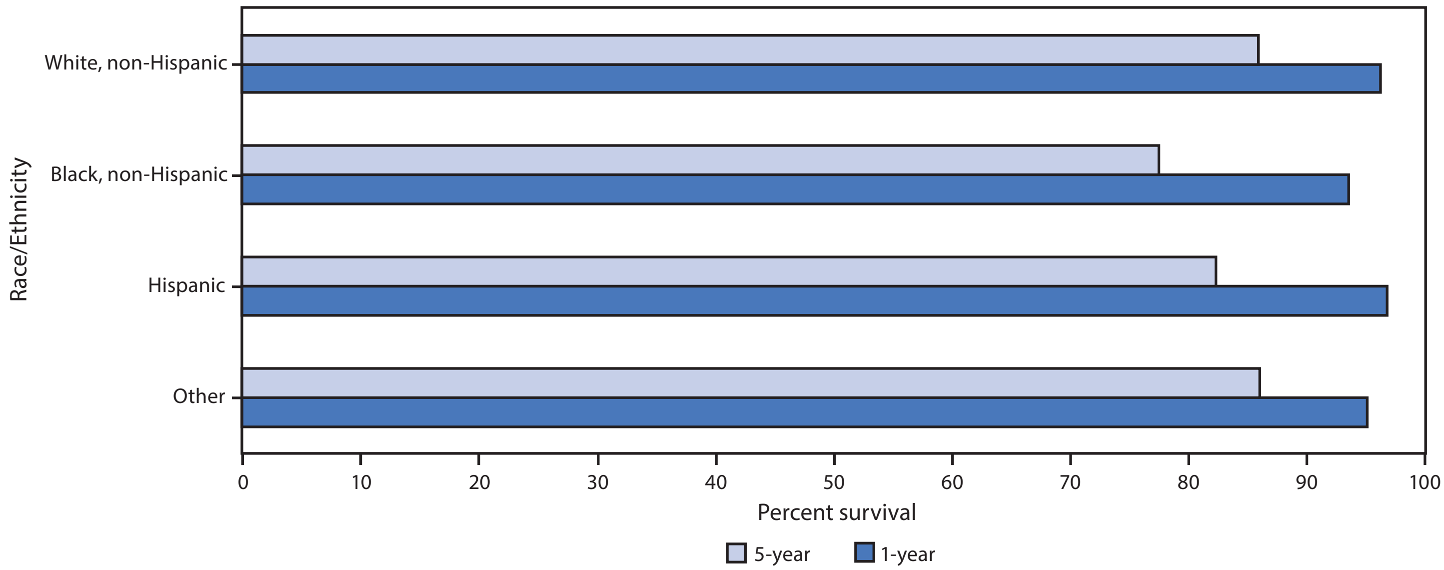
Discussion

During 2007–2016, differences were observed in 1-year and 5-year relative survival among males with diagnosed breast cancer. This report found that males with breast cancer diagnosed at localized and regional stages had higher relative survival than did those whose cancers were diagnosed at a distant or unknown stage.

Results from this study show that relative survival 1 year after breast cancer diagnosis was lower among Black males than it was among White and Hispanic males. Previous studies found no significant difference between racial groups regarding receipt of primary cancer-directed treatment when stratified by stage of disease (*5*). However, differences in survival have been observed by type of treatment. The 5-year overall survival among males with breast cancer was worse for those who did not receive any treatment or who received primary radiation therapy than it was for those who received any type of mastectomy (*5*). Assuring access to optimal treatment might reduce the observed differences in relative survival by race/ethnicity.

Approximately one half of males with breast cancer received a diagnosis after it had already spread (i.e., regional or distant stage), when 5-year relative survival was lower than when diagnosed at a localized stage. It is critical that men notice any breast masses and related symptoms and seek immediate medical attention. Breast cancer symptoms among males are similar to those among females and include a painless lump or thickening in breast tissue; skin dimpling, puckering, thickening, redness, or scaling; and nipple discharge, ulceration, or retraction (*6*). Transgender females have a higher risk for breast cancer than do cisgender males, but transgender males have a lower risk

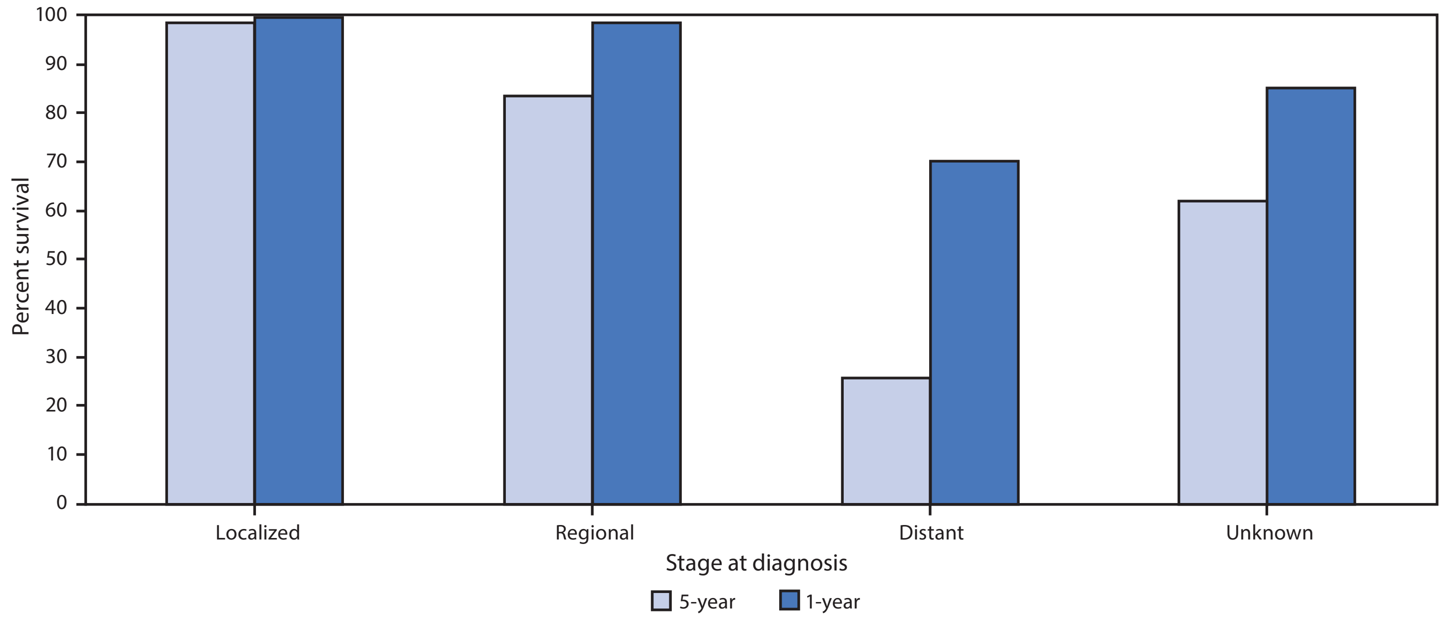
FIGURE 1. Relative 1-year and 5-year survival of male breast cancer patients, by race/ethnicity*— United States, 2007–2016†



* Racial and ethnic groups are mutually exclusive. Hispanic persons can be any race. The "other" race group contains non-Hispanic Asian/Pacific Islander and non-Hispanic American Indian/Alaska Native patients.

† Data were compiled from 45 population-based cancer registries that participate in the National Program of Cancer registries, meet the data quality standards for inclusion in U.S. Cancer Statistics, and meet the criteria for inclusion in the survival data set, which covers approximately 94% of the U.S. population.

FIGURE 2. Male breast cancer relative 1-year and 5-year survival, by stage at diagnosis*— United States, 2007–2016†



* Surveillance, Epidemiology, and End Results Summary Stage 2000 (https://seer.cancer.gov/tools/ssm/) was used to characterize cancers as localized, regional, distant, or unknown stage using clinical and pathologic tumor characteristics.

† Data were compiled from 45 population-based cancer registries that participate in the National Program of Cancer registries, meet the data quality standards for inclusion in U.S. Cancer Statistics, and meet the criteria for inclusion in the survival data set, which covers approximately 94% of the U.S. population.

than cisgender females (*7*); being aware of transgender status might help health care providers assess breast cancer risk and refer to appropriate risk-adapted early detection protocols.

Routinely discussing family health history with patients might help health care providers identify men who could be at increased risk and should undergo counseling and testing for genetic mutations.** The U.S. Surgeon General's "My Family Health Portrait" tool can be used to collect family health history

** https://www.cdc.gov/cancer/family-health-history/index.htm.

Summary

What is already known about this topic?

Breast cancer can occur in males; approximately 2,300 new male breast cancer diagnoses and 500 associated deaths occurred in the United States in 2017.

What is added by this report?

During 2007–2016, relative 1- and 5-year survival for males with diagnosed breast cancer were 96.1% and 84.7%, respectively. Five-year survival was lowest among cancers diagnosed at a distant stage (25.9%) and highest among those diagnosed at a localized stage (98.7%).

What are the implications for public health practice?

Using high-quality cancer surveillance data to evaluate 1-year and 5-year relative survival among males with breast cancer might help guide health care decisions regarding breast cancer testing and treatment among males and establishing programs to support survivors and men at high risk for developing breast cancer.

of breast, ovarian, and other cancers.[††] Men with BRCA1 and BRCA2 mutations are more likely than are those who do not have these mutations to develop breast cancer.[§§] If a man has a BRCA1 or BRCA2 mutation, breast self-exam training and education and yearly clinical breast exams starting at age 35 years might be recommended. Men with BRCA mutations are also at increased risk for prostate and pancreatic cancers.[¶¶]

For males who have had a breast cancer diagnosis, the risk for recurrence continues through 15 years after primary treatment and beyond (*8*). The American Society of Clinical Oncology (ASCO) recommends that male patients with breast cancer be offered genetic counseling and genetic testing for germline mutations (*8*). Continuity of care for all patients with breast cancer is recommended by ASCO and should be performed by a physician experienced in the care of patients with cancer and in breast examination, including the examination of irradiated breasts (*9*). CDC supports the National Comprehensive Cancer Control Program, which assists community programs to address the needs of cancer survivors and their caregivers.[***]

The findings in this report are subject to at least two limitations. First, analyses of relative survival should be carefully interpreted. Higher relative survival among racial/ethnic groups and stage at diagnosis presented in this study might not equate to a lower mortality rate (*10*). Second, analyses based on race and ethnicity might be biased if race and ethnicity were systematically misclassified; ongoing efforts are made to ensure that this information is as accurate as possible.[†††]

[††] https://phgkb.cdc.gov/FHH/html/index.html.
[§§] https://www.cdc.gov/genomics/disease/breast_ovarian_cancer/medical_options.htm.
[¶¶] https://www.cdc.gov/cancer/breast/men/index.htm.
[***] https://www.cdc.gov/cancer/ncccp/priorities/cancer-survivor-caregiver.htm.
[†††] https://www.cdc.gov/cancer/uscs/technical_notes/interpreting/race.htm.

CDC's NPCR collects information about cancers diagnosed in 46 states, the District of Columbia, Puerto Rico, the U.S. affiliated Pacific Island Jurisdictions, and the U.S. Virgin Islands, and is an important data source for rare cancers. Using high quality cancer surveillance to evaluate relative survival among males with breast cancer might help guide health care decisions regarding breast cancer testing and treatment among males and establishing programs to support men at high risk for breast cancer and male breast cancer survivors.

Acknowledgments

State and regional cancer registry staff members.

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

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Demographic Characteristics, Experiences, and Beliefs Associated with Hand Hygiene Among Adults During the COVID-19 Pandemic — United States, June 24–30, 2020

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Frequent hand hygiene, including handwashing with soap and water or using a hand sanitizer containing ≥60% alcohol when soap and water are not readily available, is one of several critical prevention measures recommended to reduce the spread of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19).* Previous studies identified demographic factors associated with handwashing among U.S. adults during the COVID-19 pandemic (*1*,*2*); however, demographic factors associated with hand sanitizing and experiences and beliefs associated with hand hygiene have not been well characterized. To evaluate these factors, an Internet-based survey was conducted among U.S. adults aged ≥18 years during June 24–30, 2020. Overall, 85.2% of respondents reported always or often engaging in hand hygiene following contact with high-touch public surfaces such as shopping carts, gas pumps, and automatic teller machines (ATMs).† Respondents who were male (versus female) and of younger age reported lower handwashing and hand sanitizing rates, as did respondents who reported lower concern about their own infection with SARS-CoV-2§ and respondents without personal experience with COVID-19. Focused health promotion efforts to increase hand hygiene adherence should include increasing visibility and accessibility of handwashing and hand sanitizing materials in public settings, along with targeted communication to males and younger adults with focused messages that address COVID-19 risk perception.

During June 24–30, among 9,896 eligible U.S. adults,¶ 5,412 (54.7%) completed Internet-based surveys administered by Qualtrics, LLC, as part of The COVID-19 Outbreak Public Evaluation (COPE) Initiative.** The Monash University Human Research Ethics Committee of Monash University (Melbourne, Australia) reviewed and approved the study protocol on human subjects research. This activity was also reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.†† Respondents were informed of study purposes and provided electronic consent before commencement, and investigators received anonymized responses. The 5,412 participants who completed surveys

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

† Respondents were provided with the following examples as high-touch public surfaces: shopping carts, gas pumps, and ATMs.

§ For this question, respondents were asked to rate on a scale from "Not at all" to "Extremely" the extent to which they were concerned about the following statement regarding COVID-19 and infection control measures: "My own risk of infection with COVID-19."

¶ Eligibility to complete a survey during June 24–30, 2020, was determined following electronic contact of potential participants with criteria of age ≥18 years and residence within the United States. Age and residence were assessed using screening questions without indication of eligibility criteria before commencement of the earliest survey (recontacted respondents: April 2–8, 2020; first-time respondents: June 24–30, 2020). Residence was reassessed among recontacted respondents during June 24–30, and one respondent whose primary residence had changed to outside of the United States was excluded from the analysis. Country-specific geolocation verification via IP address mapping was used to ensure respondents were from the United States. Informed consent was obtained electronically during June 24–30, 2020, before enrollment into the study as a participant. All surveys underwent Qualtrics, LLC data quality screening procedures including algorithmic and keystroke analysis for attention patterns, click-through behavior, duplicate responses, machine responses, and inattentiveness. Respondents who failed an attention or speed check, along with any responses identified that failed data quality screening procedures, were excluded from the analysis (6.6%).

** The COVID-19 Outbreak Public Evaluation (COPE) Initiative (http://www.thecopeinitiative.org/) is designed to assess public attitudes, behaviors, and beliefs related to COVID-19 pandemic and to evaluate the mental and physical health consequences of the pandemic. The COPE Initiative surveys included in this analysis were administered by Qualtrics, LLC (https://www.qualtrics.com), a commercial survey company with a network of participant pools comprising hundreds of suppliers and with varying recruitment methodologies that include digital advertisements and promotions, word-of-mouth and membership referrals, social networks, television and radio advertisements, and offline mail-based approaches. This analysis focused on questions about hand hygiene behavior during the COVID-19 pandemic.

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

during June included 3,683 (68.1%) first-time respondents and 1,729 (31.9%) respondents who were recontacted after having been recruited to participate in The COPE Initiative during April 2–8, 2020.[§§] Complete data for explanatory variables included in the analysis were obtained from 5,000 (92.4%) respondents. Among these respondents, 4,817 (96.3%) reported having been in public during the previous week and were included in this analysis (3,243 [67.3%] first-time respondents and 1,574 [32.7%] recontacted respondents). Quota sampling and survey weighting were employed to improve sample representativeness of the adult U.S. population by gender, age, and race/ethnicity. Hand hygiene frequency was assessed on a five-item Likert scale from "Never" to "Always" using the following questions: "In the last week, how frequently did you use hand sanitizer after touching high-touch surfaces in public?" and "In the last week, how frequently did you wash your hands with soap and water after touching high-touch surfaces in public?" Bivariate chi-squared analyses identified covariates associated with frequency of hand hygiene.

With handwashing and hand sanitizing frequency as dependent variables for separate models, adjusted odds ratios (aORs) and 95% confidence intervals (CIs) for hand hygiene frequency were estimated using weighted ordered logistic regressions with the following explanatory variables: gender, age, race/ethnicity, 2019 household income, U.S. Census region,[¶¶] rural/urban residence,[***] whether respondents knew someone who had positive test results for SARS-CoV-2 or who was hospitalized for or died from COVID-19, and concern for personal risk for infection with SARS-CoV-2 (from "Not at all" to "Extremely"). Statistical analyses were conducted in R (version 4.0.2; The R Foundation) with the R survey package (version 3.29).

Among 4,817 U.S. adults, 85.2% reported frequent (always or often) use of at least one form of hand hygiene after contact with high-touch public surfaces, including handwashing (78.5%) and hand sanitizing (70.7%) (Table). Frequent handwashing and hand sanitizing were least prevalent among adults aged 18–24 years (64.6% and 59.8%, respectively, with 72.4% reporting at least one form of hand hygiene); frequency increased with age and was highest among persons aged ≥65 years (83.3% and 73.3%, respectively, with 89.4% reporting at least one form of hand hygiene). Frequent hand sanitizing was more prevalent among respondents with a 2019 household income ≥$100,000 (72.6%) compared with those with a household income <$25,000 (62.5%). Regarding concern for personal risk for SARS-CoV-2 infection, frequent handwashing and hand sanitizing were least prevalent among those not at all concerned (68.0% and 54.0%, respectively, with 72.1% reporting at least one form of hand hygiene); prevalence increased with level of concern and was most prevalent among those extremely concerned (89.5% and 83.1%, respectively, with 93.7% reporting at least one form of hand hygiene).

The aORs and 95% CIs reflect significant differences in odds of more frequent handwashing associated with gender, age, race/ethnicity, whether the respondent knew someone who had received a positive SARS-CoV-2 test result, and concern for personal risk for SARS-CoV-2 infection (Figure 1). Odds of more frequent handwashing were lower for males than for females (aOR = 0.65; 95% CI = 0.57–0.74) and higher among older than among younger respondents (e.g., aOR = 2.36; 95% CI = 1.85–3.01 for persons aged 45–64 years compared with those aged 18–24 years). Odds of more frequent handwashing were 66% higher among non-Hispanic Asian respondents than among non-Hispanic White (White) respondents (aOR = 1.66; 95% CI = 1.34–2.06) and were 30% higher among those who knew someone who received a positive SARS-CoV-2 test result than among those who did not (aOR = 1.30; 95% CI = 1.10–1.53). Compared with those who were not at all concerned about SARS-CoV-2 infection, those who were moderately, very, and extremely concerned had 35% (aOR = 1.35; 95% CI = 1.07–1.72), 77% (aOR = 1.77; 95% CI = 1.36–2.31), and 209% higher odds (aOR = 3.09; 95% CI = 2.38–4.01), respectively, of more frequent handwashing.

Adjusted odds of more frequent hand sanitizing were similar to those observed for more frequent handwashing (Figure 2), with the following exceptions: those with higher 2019 household income ($25,000–$49,999) had 30% higher odds of more frequent hand sanitizing (aOR = 1.30, 95% CI = 1.04–1.64) than did those with household income <$25,000, and those who knew someone hospitalized for or who died from COVID-19 had 28% higher odds of more frequent hand sanitizing (aOR = 1.28; 95% CI = 1.04–1.59) than did those who did not know someone who had been hospitalized or died from COVID-19.

Discussion

Approximately 85% of 4,817 U.S. adults frequently engaged in either handwashing or using hand sanitizer after contact with high-touch public surfaces, including only 72.4% of those aged 18–24 years. These findings highlight the need for continued health communication and outreach promoting hand hygiene. Respondents who were male and of younger age reported less frequent handwashing and hand sanitizing. These findings are consistent with those from previous pandemics (*3*) and earlier in the COVID-19 pandemic (*1*), when males and younger adults engaged in less frequent handwashing than did females

[§§] https://www.medrxiv.org/content/10.1101/2020.04.22.20076141v1.
[¶¶] https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf.
[***] https://www.hrsa.gov/rural-health/about-us/definition/datafiles.html.

TABLE. Prevalence of frequent hand hygiene* after contact with high-touch public surfaces among adults, by select respondent characteristics — United States, June 24–30, 2020

Characteristic	All respondents	Often or always wash hands		Often or always use hand sanitizer	
	Weighted no. (%)†	Weighted no. (%)†	P-value§	Weighted no. (%)†	P-value§
Overall	**4,817 (100)**	**3,781 (78.5)**	—	**3,407 (70.7)**	—
Demographic characteristic					
Sex					
Female	2,448 (50.8)	1,971 (80.5)	<0.001	1,800 (73.5)	<0.001
Male	2,369 (49.2)	1,810 (76.4)		1,608 (67.9)	
Age group, yrs					
18–24	629 (13.1)	406 (64.6)	<0.001	376 (59.8)	<0.001
25–44	1,685 (35.0)	1,295 (76.8)		1,210 (71.8)	
45–64	1,672 (34.7)	1,388 (83.0)		1,212 (72.5)	
≥65	830 (17.2)	692 (83.3)		609 (73.3)	
Race/Ethnicity					
White, non-Hispanic	3,068 (63.7)	2,461 (80.2)	<0.001	2,208 (72.0)	<0.001
Black, non-Hispanic	587 (12.2)	427 (72.7)		385 (65.6)	
Asian, non-Hispanic	230 (4.8)	198 (86.2)		182 (79.0)	
Other or multiple race or races, non-Hispanic¶	145 (3.0)	104 (71.9)		95 (65.9)	
Hispanic, any race or races	787 (16.3)	590 (75.0)		537 (68.2)	
2019 household income, USD					
<$25,000	639 (13.3)	471 (73.6)	<0.001	400 (62.5)	<0.001
$25,000–$49,999	992 (20.6)	765 (77.1)		707 (71.3)	
$50,000–$99,999	1,670 (34.7)	1,343 (80.4)		1,200 (71.9)	
≥$100,000	1,515 (31.5)	1,202 (79.4)		1,100 (72.6)	
U.S. Census region**					
Northeast	1,073 (22.3)	862 (80.3)	0.941	747 (69.6)	0.044
Midwest	913 (19.0)	710 (77.7)		646 (70.7)	
South	1,674 (34.7)	1,300 (77.7)		1,217 (72.7)	
West	1,157 (24.0)	909 (78.6)		797 (68.9)	
Rural/Urban residence††					
Rural	544 (11.3)	423 (77.8)	0.003	396 (72.7)	0.211
Urban	4,273 (88.7)	3,358 (78.6)		3,012 (70.5)	
COVID-19 experiences and beliefs					
Knew someone who had test results positive for SARS-CoV-2					
Yes	970 (20.1)	837 (86.4)	<0.001	771 (79.5)	<0.001
No	3,847 (79.9)	2,944 (76.5)		2,636 (68.5)	
Knew someone who was hospitalized for severe illness or died from COVID-19					
Yes	624 (12.9)	518 (83.0)	0.002	495 (79.4)	<0.001
No	4,193 (87.1)	3,263 (77.8)		2,912 (69.4)	
Level of concern of own risk of SARS-CoV-2 infection§§					
Not at all	576 (12.0)	392 (68.0)	<0.001	311 (54.0)	<0.001
Slightly	1,093 (22.7)	810 (74.1)		727 (66.5)	
Moderately	1,411 (29.3)	1,086 (77.0)		966 (68.5)	
Very	783 (16.2)	639 (81.6)		610 (77.9)	
Extremely	954 (19.8)	854 (89.5)		793 (83.1)	

Abbreviations: COVID-19 = coronavirus disease 2019; USD = U.S. dollars.

* Frequency of hand hygiene was assessed on a 5-point Likert scale from "Never" to "Always" using the following questions: "In the last week, how frequently did you use hand sanitizer after touching high-touch surfaces in public" and "In the last week, how frequently did you wash hands with soap and water after touching high-touch surfaces in public." For this table, answers of "Often" or "Always" were considered frequent.

† Quota sampling and survey weighting were employed to improve representativeness of the cross-sectional June cohort of the United States population by gender, age, and race/ethnicity according to the 2010 U.S. Census.

§ Bivariate chi-squared test was used to test for differences in observed and expected frequencies among groups by characteristic for each type of hand hygiene on the full 5-item Likert scale from "Never" to "Always." Statistical significance for bivariate analyses was evaluated as $p<0.05$.

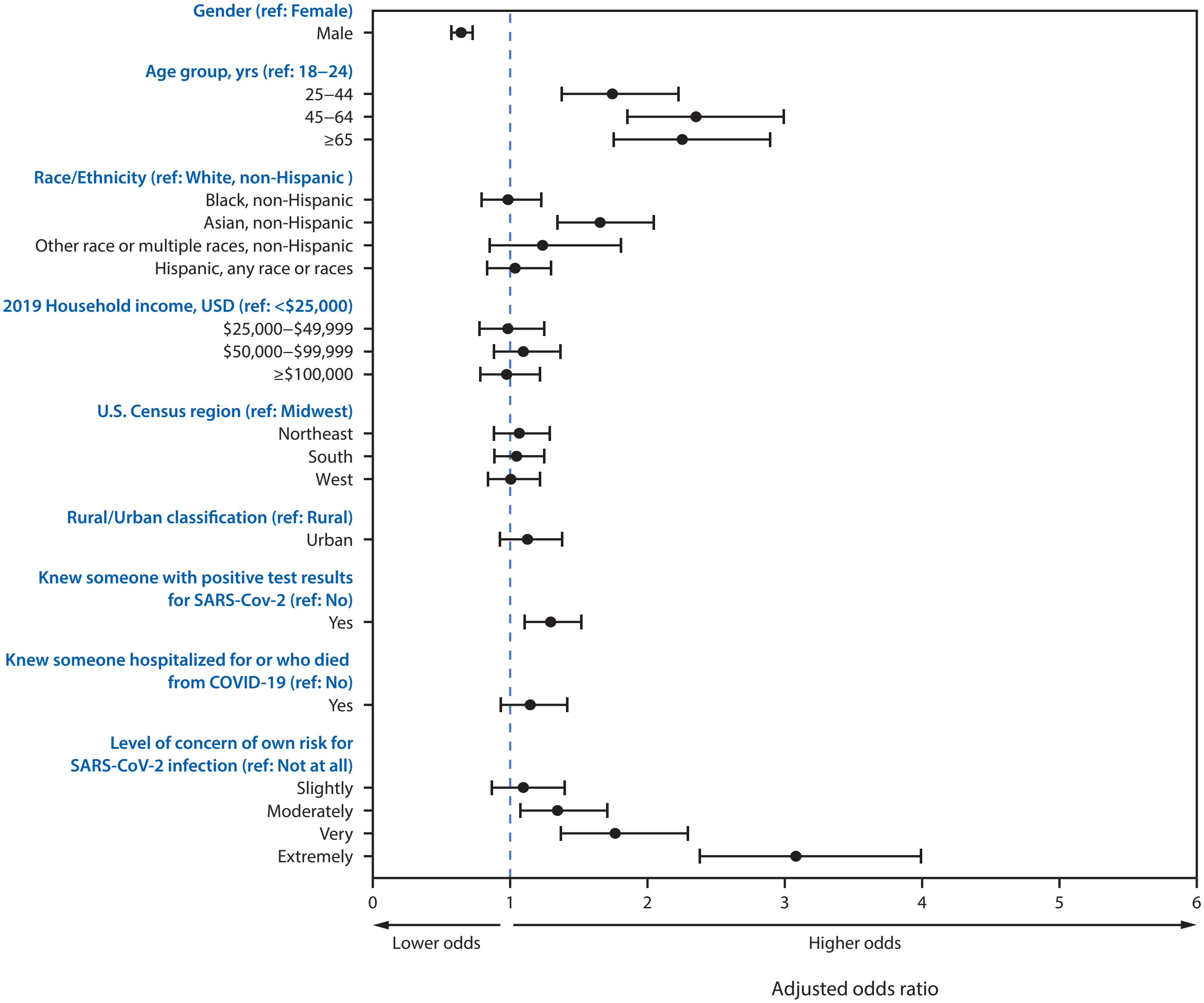
¶ The non-Hispanic, other race or multiple races category includes respondents who identified as not Hispanic and as more than one race or as American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or Other.

** Region classification was determined 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.

†† Rural/urban residence was classified as urban or rural based on self-reported ZIP codes according to the Federal Office of Rural Health Policy definition of rurality. https://www.hrsa.gov/rural-health/about-us/definition/datafiles.html.

§§ For this question, respondents were asked to rate on a scale from "Not at all" to "Extremely" the extent to which they were concerned about the following statement regarding COVID-19 and infection control measures: "My own risk of infection with COVID-19."

FIGURE 1. Adjusted odds ratios*,† for washing hands after contact with high-touch public surfaces,§ by select respondent characteristics¶,,††,§§ — United States, June 24–30, 2020**



Abbreviations: COVID-19 = coronavirus disease 2019; ref = referent; USD = U.S. dollars.

* Adjusted odds ratios were estimated using an ordered logit model of handwashing on the variables listed in the column with a proportional odds assumption.

† 95% confidence intervals indicated with error bars.

§ Frequency of handwashing was assessed on a 5-point Likert scale from "Never" to "Always" using the following question: "In the last week, how frequently did you wash your hands with soap and water after touching high-touch surfaces in public."

¶ The non-Hispanic, other race, or multiple races category includes respondents who identified as not Hispanic and as more than one race or as American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or Other.

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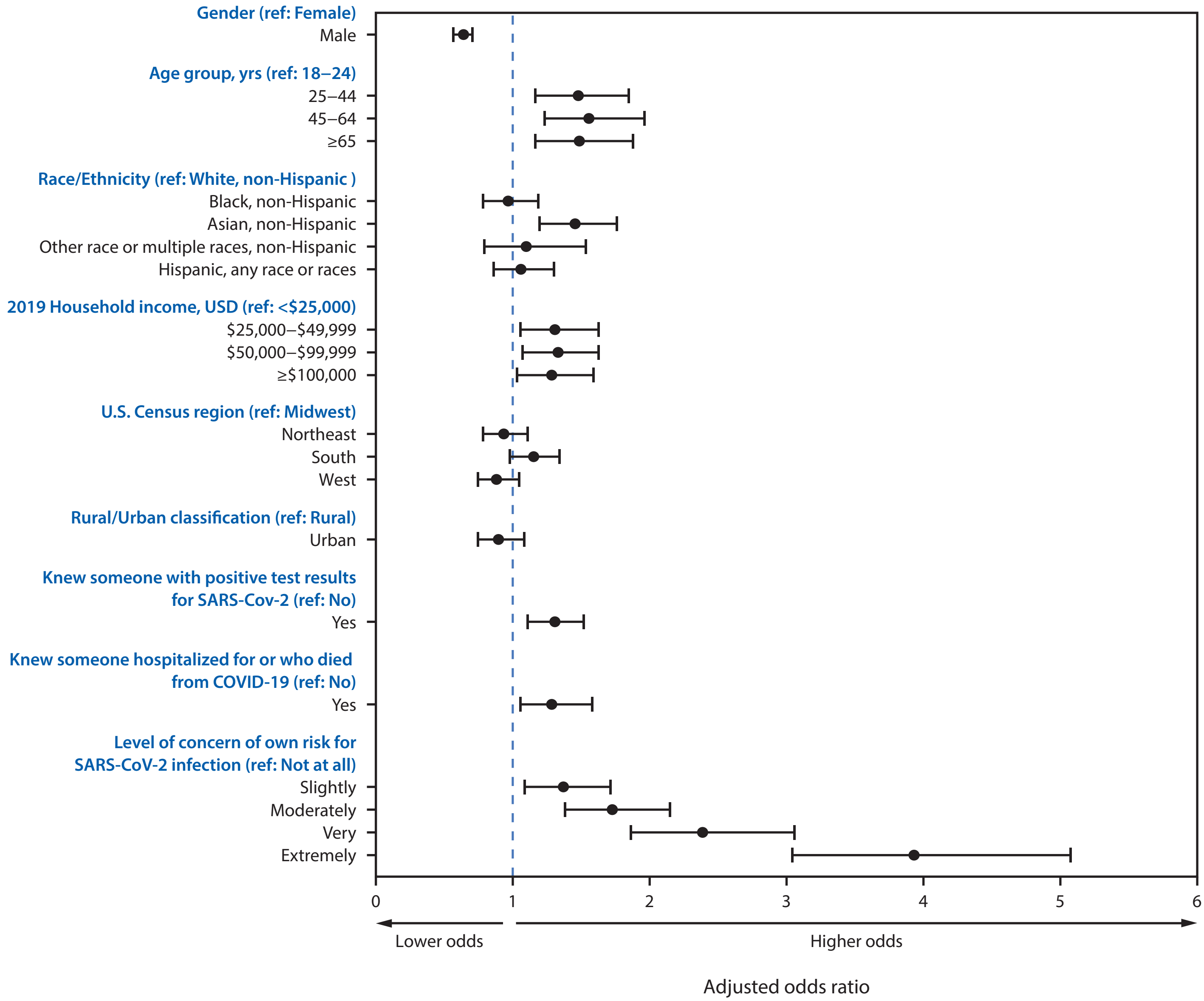
†† Rural/urban residence was classified as urban or rural based on self-reported ZIP codes according to the Federal Office of Rural Health Policy definition of rurality. https://www.hrsa.gov/rural-health/about-us/definition/datafiles.html.

§§ For this question, respondents were asked to rate on a scale from "Not at all" to "Extremely" the extent to which they were concerned about the following statement regarding COVID-19 and infection control measures: "My own risk of infection with COVID-19."

FIGURE 2. Adjusted odds ratios*,† for use of hand sanitizer after contact with high-touch public surfaces,§ by select respondent characteristics¶,,††,§§ — United States, June 24–30, 2020**



Abbreviations: COVID-19 = coronavirus disease 2019; ref = referent; USD = U.S. dollars.

* Adjusted odds ratios were estimated using an ordered logit model of using hand sanitizer on the variables listed in the column with a proportional odds assumption.

† 95% confidence intervals indicated with error bars.

§ Frequency of hand sanitizing was assessed on a 5-point Likert scale from "Never" to "Always" using the following question: "In the last week, how frequently did you use hand sanitizer after touching high-touch surfaces in public after touching high-touch surfaces in public."

¶ The non-Hispanic, other race, or multiple races category includes respondents who identified as not Hispanic and as more than one race or as American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or Other.

** Region classification was determined 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.

†† Rural/urban residence was classified as urban or rural based on self-reported ZIP codes according to the Federal Office of Rural Health Policy definition of rurality. https://www.hrsa.gov/rural-health/about-us/definition/datafiles.html.

§§ For this question, respondents were asked to rate on a scale from "Not at all" to "Extremely" the extent to which they were concerned about the following statement regarding COVID-19 and infection control measures: "My own risk of infection with COVID-19."

and older adults (*2*,*3*). During the COVID-19 pandemic, one study found that Hispanic adults reported more frequent handwashing than did White adults (*1*); however, the current study did not find a difference in handwashing between Hispanic and White adults after adjusting for concern for SARS-CoV-2 infection.

Respondents with lower income reported less frequent hand sanitizing. This could reflect lack of access to hand sanitizer; higher income and access to handwashing infrastructure have been previously found to be associated with adherence to hand hygiene (*4*). Difficulty obtaining hand sanitizer has been documented during the COVID-19 pandemic (*5*), and purchasing hand sanitizer might be prohibitive for persons with low income, particularly given recent reported increases in cost.[†††] Strategies to increase hand sanitizing among lower-income populations could apply innovative approaches with regard to the location of signage and contactless dispensers (e.g., the center of a lobby or market or next to or built into gas filling stations) to make hand sanitizer and handwashing materials visible and readily available in public settings and address disparities in access.

Increased concern for personal risk for SARS-CoV-2 infection and personal experience with COVID-19 were both positively associated with handwashing and hand sanitizing. During previous respiratory pandemics, general concern, perceived susceptibility, and perceived severity of illness were found to be positively associated with engagement in hygiene-related prevention behaviors (*3*). During this pandemic, higher perceived risk has been associated with increased handwashing (*6*). In addition to hand hygiene, risk perceptions have been associated with engaging in other protective behaviors such as physical distancing,[§§§] avoiding handshakes and crowds (*7*), and wearing cloth face masks (*8*). Perceived risk for COVID-19 in the United States, when assessed during March–April 2020, was moderately high (*6*); however, some evidence indicates U.S. adults underestimate their risk of becoming ill with COVID-19 (*7*). Differences in risk perceptions might partially explain why men and younger adults reported less frequent practicing of hand hygiene compared with women and older adults. Although differences in risk perceptions by gender and age were not assessed in this study, research conducted during the COVID-19 pandemic has found that younger persons (*7*,*9*) and men (*6*) had lower COVID-19 risk perceptions compared with older adults and women. For both populations, efforts are needed to further characterize COVID-19 risk perceptions and their relationships to hand hygiene, and to identify how health communication efforts can address risk perceptions in promotion of preventive behaviors. This is particularly important given that only 72.1% of those who were not at all concerned about their risk for SARS-CoV-2 infection frequently engaged in either handwashing or using hand sanitizer after contact with high-touch public surfaces, compared with 93.7% of those who were extremely concerned.

The findings in this report are subject to at least five limitations. First, self-reported data are subject to recall, response, and social desirability biases, and self-reported hand hygiene behavior might be overreported. Survey weighting might not have eliminated nonresponse bias. Second, estimation assumed proportional odds (i.e., that odds are constant across response levels), an assumption that is often violated (*10*); weighted ordered logistic regressions were used for ease of interpretation given that the estimates did not differ substantially from models that did not assume proportional odds. Third, although quota sampling methods and survey weighting were employed to improve sample representativeness of 2010 U.S. Census adult population estimates for age, gender, and race/ethnicity, the Internet-based survey sample might not be fully representative of the 2020 U.S. population for income, educational attainment, and access to technology. Fourth, hand hygiene was self-reported by respondents after contact with high-touch public surfaces; future studies could evaluate hand hygiene within households, workplaces, and other environments. Similarly, although respondents included in this analysis had been in public during the preceding week, adherence to hand hygiene did not account for the number of times respondents contacted high-touch public surfaces, or the number of hand hygiene methods used following contact with such surfaces. Finally, respondents were not asked whether they had access to soap and water or hand sanitizer, which could influence hand hygiene behaviors.

Hand hygiene is part of a multicomponent public health approach, which also includes wearing face masks and maintaining a physical distance of ≥6 feet from others, among additional prevention measures, to prevent and control COVID-19 in community settings. Public health promotional outreach about hand hygiene is needed, given that these findings indicate that hand hygiene adherence could be improved, especially among certain groups. Hand-hygiene–related health promotion strategies should be tailored toward men and young adults. To motivate hand hygiene behavior, health promotion messaging could focus on addressing risk perceptions of COVID-19, which might have shared benefits to promote engagement in additional COVID-19 prevention measures. Finally, increasing visibility and accessibility of handwashing and hand sanitizing signage and materials in public settings could encourage and facilitate hand hygiene to prevent the spread of COVID-19.

[†††] https://www.npr.org/sections/coronavirus-live-updates/2020/03/25/821513190/stop-price-gouging-33-attorneys-general-tell-amazon-walmart-others.
[§§§] https://psyarxiv.com/dz428/.

Summary

What is already known about this topic?

Hand hygiene, including handwashing with soap and water and using hand sanitizer containing ≥60% alcohol, is one measure recommended to prevent COVID-19 and other infectious diseases.

What is added by this report?

In an Internet-based survey, approximately 85% of 4,817 U.S. adults reported frequent hand hygiene after contact with public surfaces. Males, young adults, respondents with lower concern about risk for SARS-CoV-2 infection, and respondents without personal COVID-19 experience reported less frequent hand hygiene.

What are the implications for public health practice?

COVID-19 messages should continue promoting hand hygiene, particularly among men and young adults. Messages addressing COVID-19 risk perceptions and making handwashing accessible and hand sanitizer available by facilities in public settings should be considered to encourage and facilitate hand hygiene.

Acknowledgments

Survey respondents; Mallory Colys, Sneha Baste, Daniel Chong, Rebecca Toll, Qualtrics, LLC; The Kinghorn Foundation; Emily Capodilupo, Whoop, Inc.; Alexandra Drane, Sarah Stephens Winnay, Archangels; Australian-American Fulbright Commission.

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All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Mark É. Czeisler reports a grant from the Australian-American Fulbright Commission and personal fees from Vanda Pharmaceuticals. Rebecca Robbins reports personal fees from Denihan Hospitality, Rituals Cosmetics, SleepCycle, Dagmejan, and byNacht. Elise R. Facer-Childs reports a grant from the Science and Industry Endowment Fund Ross Metcalf STEM+ Business Fellowship administered by the Commonwealth Scientific and Industrial Research Organisation, Canberra, Australia. Laura K. Barger reports a grant from the National Institute for Occupational Safety and Health and personal fees from the University of Pittsburgh, CurAegis, Casis, Puget Sound Pilots, Boston Children's Hospital, and Charles A. Czeisler. Charles A. Czeisler reports an endowed professorship provided to Harvard Medical School by Cephalon, Inc.; educational and research support to Harvard Medical School and Brigham and Women's Hospital from Philips Respironics, Inc. (supported in part the survey administration and analysis) and from a gift to Brigham and Women's Hospital by Alexandra Drane, the CEO of Archangels (support for The COPE Initiative); grants from the National Institute of Occupational Safety and Health, Teva Pharmaceuticals Industries, Ltd; consulting fees and equity interest from Vanda Pharmaceuticals; lecture fees from Teva Pharma Australia; and royalties from Philips Respironics for the Actiwatch-2 and Actiwatch-Spectrum devices. Shantha M.W. Rajartnam reports grants from the Turner Institute for Brain and Mental Health, Monash University, and Teva Pharmaceuticals; a grant and personal fees from the Cooperative Research Centre for Alertness, Safety and Productivity; and consultancy fees paid to Monash University from Vanda Pharmaceuticals, BHP Billiton, and Herbert Smith Freehills. Mark E. Howard reports a grant from the Institute for Breathing and Sleep, Austin Health, Melbourne, Australia. Shantha M.W. Rajartnam, Mark E. Howard, Charles A. Czeisler, Laura K. Barger, Elise R. Facer-Childs, and Mark É. Czeisler report a contract from Whoop Inc. to Monash University, which provided partial funding for administration of the June Survey. No other potential conflicts of interest were disclosed.

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An Outbreak of COVID-19 Associated with a Recreational Hockey Game — Florida, June 2020

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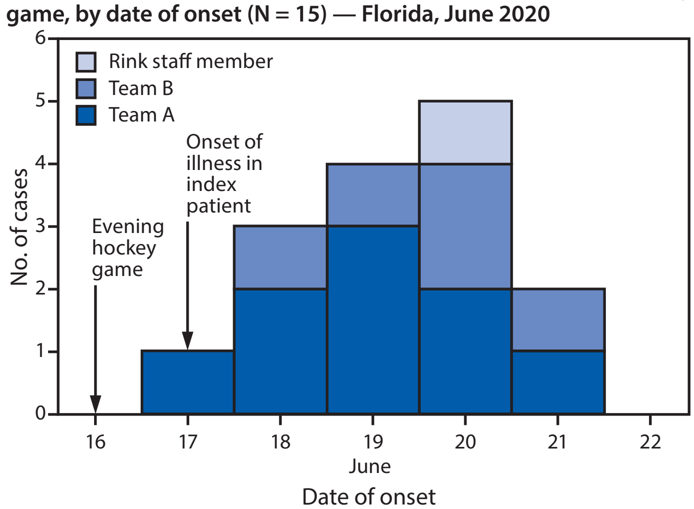
On June 16, 2020, a recreational ice hockey game was played at an ice rink in the Tampa Bay, Florida, metropolitan area. Teams A and B, each consisting of 11 players (typically six on the ice and five on the bench at any given time), included men aged 19–53 years. During the 5 days after the game, 15 persons (14 of the 22 players and a rink staff member) experienced signs and symptoms compatible with coronavirus disease 2019 (COVID-19)*; 13 of the 15 ill persons had positive laboratory test results indicating infection with SARS-CoV-2, the virus that causes COVID-19. Widespread transmission of SARS-CoV-2 has been documented at a choir practice (*1*) and at meat processing plants (*2*,*3*); however, apart from an outbreak involving 57 infected dancers that has been linked to high-intensity fitness dance classes in South Korea (*4*) and a cluster of five infected persons at a squash facility in Slovenia (5), few published reports are available regarding transmission associated with specific sports games or practices. In addition, outbreaks of COVID-19 infections among amateur hockey players in the United States have recently been reported in the news.†

On June 19, 2020, the Florida Department of Health was notified of a team A player (the index patient) who experienced fever, cough, sore throat, and a headache beginning on June 17, the day after he had participated in an evening game; 2 days later, a nasal specimen was obtained, which tested positive for SARS-CoV-2 by Sofia SARS Antigen Fluorescent Immunoassay (https://www.quidel.com/immunoassays/coronavirus). An investigation by the Florida Department of Health revealed that eight of 10 team A players (excluding the index patient), five of 11 players from team B, and one rink staff member experienced COVID-19 signs and symptoms during June 18–21 (Figure), 2–5 days after the game. Excluding the index patient, 13 of the 21 (62%) players experienced illness. Among the 15 total cases in this outbreak, 11 patients had positive SARS-CoV-2 reverse transcription–polymerase chain reaction results, two had positive antigen tests,§ and two were not tested.¶ Asymptomatic players did not seek testing. Neither of the two on-ice referees experienced symptoms. Because the investigation was deemed public health practice, approval by the Florida Department of Health Institutional Review Board was not required.

FIGURE. COVID-19 cases associated with a recreational ice hockey game, by date of onset (N = 15) — Florida, June 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

Ice hockey involves vigorous physical exertion accompanied by deep, heavy respiration, and during the game, players frequently move from the ice surface to the bench while still breathing heavily. In this game, hockey-specific face protection varied and included metal cages or plastic half-shields (covering the eyes and the upper part of the nose); some players do not wear face protection. Cloth face masks for disease control were not used in the locker rooms or during the game. A standard ice rink in the United States measures 200 feet (61 meters) by 85 feet (26 meters). Boards and plexiglass, extending upward to approximately 10 feet (3 meters), surround the ice surface creating a physically segregated playing area. In addition to the 60-minute game time on the ice, during which players frequently came within 6 feet of one another, each team used a separate locker room, typically for 20 minutes before and after the game. Players from the teams did not have other common exposures in the week before the game. The median incubation period for SARS-CoV-2 is 4–5 days from exposure to symptom onset and ranges from 2–14 days.** Although more than one player might have been infectious during the game, it is hypothesized that the index patient was the source of SARS-CoV-2 transmission for the other players while he was presymptomatic.

* Signs and symptoms included fever, myalgia, cough, sore throat, headache, and loss of sense of taste or smell.

† https://patch.com/new-jersey/middletown-nj/cluster-covid-cases-teams-practiced-middletown-rink. https://www.ajc.com/news/junior-hockey-league-held-likely-covid-19-spreader-event-in-cobb/EID5ZRFLMRGGFCZ7NBK7BV4S5A/.

§ Information on the type of antigen test used for the second patient was not available.

¶ Whether patients were tested and what type of testing was performed was determined by the health care providers who evaluated the players.

** https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html.

The ice rink provides a venue that is likely well suited to COVID-19 transmission as an indoor environment where deep breathing occurs, and persons are in close proximity to one another. An Italian study estimating the rate of SARS-CoV-2 emission by infectious persons based on viral load in the mouth showed that during heavy exercise, a high viral emission rate can be reached during oral breathing (*6*). The higher proportion of infected players on the index patient's team might result from additional exposures to the index patient in the locker room and on the player bench, where players sit close to one another.

A limitation of this investigation was that not all players from the game sought testing, and asymptomatic infections were possibly not identified. The indoor space and close contact between players during a hockey game increase infection risk for players and create potential for a superspreader event, especially with ongoing community COVID-19 transmission. Superspreader events, in which one infectious person infects many others, can lead to explosive growth at the beginning of an outbreak and facilitate sustained transmission later in an outbreak (*7*). This game involved a relatively limited number of players and only one spectator, who remained symptom-free and was not tested (the limited number of spectators was not related to rink policy); however, hockey games can include up to 20 players on each of the two teams and many spectators in the arena.

The high proportion of infections that occurred in this outbreak provides evidence for SARS-CoV-2 transmission during an indoor sporting activity where intense physical activity is occurring. In response, Florida Department of Health staff members provided isolation and quarantine recommendations to the persons in the rink during the game and advised ice rink management on COVID-19 risk and disease control.

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All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. David Atrubin reports that he plays hockey in the Tampa Bay metropolitan area. No other potential conflicts of interest were disclosed.

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Transmission Dynamics by Age Group in COVID-19 Hotspot Counties — United States, April–September 2020

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On October 9, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

CDC works with other federal agencies to identify counties with increasing coronavirus disease 2019 (COVID-19) incidence (hotspots) and offers support to state, tribal, local, and territorial health departments to limit the spread of SARS-CoV-2, the virus that causes COVID-19 (*1*). Understanding whether increasing incidence in hotspot counties is predominantly occurring in specific age groups is important for identifying opportunities to prevent or reduce transmission. The percentage of positive SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) test results (percent positivity) is an important indicator of community transmission.* CDC analyzed temporal trends in percent positivity by age group in COVID-19 hotspot counties before and after their identification as hotspots. Among 767 hotspot counties identified during June and July 2020, early increases in the percent positivity among persons aged ≤24 years were followed by several weeks of increasing percent positivity in persons aged ≥25 years. Addressing transmission among young adults is an urgent public health priority.

Hotspot counties were identified by applying previously described standardized criteria to detect counties that had >100 cases during the past 7 days and experienced increases in cases in the preceding 3–7 days (*1*). Counties identified as hotspots during June 1–July 31, 2020, that had not met hotspot criteria in the previous 21 days were included. SARS-CoV-2 RT-PCR test results were obtained from data submitted by state health departments and laboratories.† Percent positivity was calculated by dividing the number of positive test results by the sum of positive and negative test results for each age group (0–17, 18–24, 25–44, 45–64, and ≥65 years) for the 45 days before and 45 days after hotspot detection (spanning April–September 2020) based on specimen collection or test order date. Data were presented using a 7-day moving average. Results were aggregated across all hotspot counties and stratified by age group. Analyses were conducted using R software (version 3.6.0; The R Foundation).

The 767 hotspot counties detected during June 1–July 31 represented 24% of all U.S. counties and 63% of the U.S. population. Percent positivity among persons aged 0–17 and 18–24 years began increasing 31 days before hotspot identification. Increases in percent positivity among older age groups began after the increases in younger age groups: among adults aged 25–44 years, 45–64 years, and ≥65 years, increases began 28 days, 23 days, and 20 days, respectively, before hotspot identification (Figure 1). At the time of hotspot detection, the highest percent positivity was among persons aged 18–24 years (14%), followed by those aged 0–17 years (11%), 25–44 years (10%), 45–64 years (8%), and ≥65 years (6%). Percent positivity among persons aged 18–24 years was near its peak of 15% by the date of hotspot detection; however, among other age groups, percent positivity continued to increase for 21–33 days after hotspot detection, peaking at 10%–14%, and the decline for other age groups was slower than that for persons aged 18–24 years.

Important differences were identified when analyzing percent positivity by U.S. Census region§ (Figure 2). Trends by age for hotspot counties in the South (488 counties) and West (98 counties) aligned with national trends, although percent positivity was higher in the South than in the West for all age groups. In hotspot counties in the Midwest (134 counties), percent positivity among persons aged 18–24 years peaked before hotspot detection, and percent positivity increased minimally in other age groups. In hotspot counties in the Northeast (47 counties), there was a small increase in percent positivity among persons aged 18–24 years but minimal or no increases in other age groups.

In hotspot counties, particularly those in the South and West, percent positivity increased earliest in younger persons, followed by several weeks of increasing percent positivity among older age groups. An increase in the percentage of positive test results in older age groups is likely to result in more hospitalizations, severe illnesses, and deaths.¶ These findings corroborate regional patterns in the southern United States, where increased percent positivity among adults aged 20–39 years preceded increases among those aged ≥60 years (*2*); provide evidence that among young adults, those aged 18–24 years demonstrate the earliest increases in percent positivity; and underscore the importance of reducing transmission from younger populations

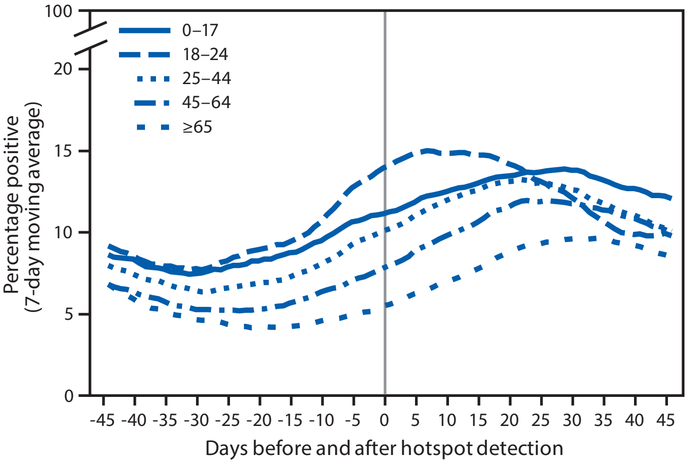
* https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/calculating-percent-positivity.html; https://www.whitehouse.gov/openingamerica/.

† SARS-CoV-2 RT-PCR testing data were obtained from COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and from data submitted directly by a subset of public health, commercial, and reference laboratories (representing approximately 50% of all tests) for 13 states and the District of Columbia. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority, but not all, SARS-CoV-2 RT-PCR tests in the United States. The data represent laboratory test totals (not individual persons) and exclude antibody and antigen tests.

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

¶ https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html.

FIGURE 1. Percentage of positive SARS-CoV-2 reverse transcription–polymerase chain reaction test results (7-day moving average)* in COVID-19 hotspot counties before and after date of hotspot detection, by age group — United States, June 1–July 31, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* From COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and from data submitted directly by public health, commercial, and reference laboratories for 13 states and the District of Columbia, using specimen collection or test order date.

to those at highest risk for severe illness or death. There is an urgent need to address transmission among young adult populations, especially given recent increases in COVID-19 incidence among young adults (*3*). These data also demonstrate the urgency of health care preparedness in hotspot counties,** which are likely to experience increases in COVID-19 cases and hospitalizations among older populations in the weeks after meeting hotspot criteria.

** CDC and other federal agencies that monitor trends in COVID-19 are collaborating to refine approaches to define and track hotspots. As a result, terminology or definitions used in future reports might differ from the terminology used in this report.

Acknowledgment

Virginia Bowen, State, Tribal, Local, and Territorial Support Task Force.

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

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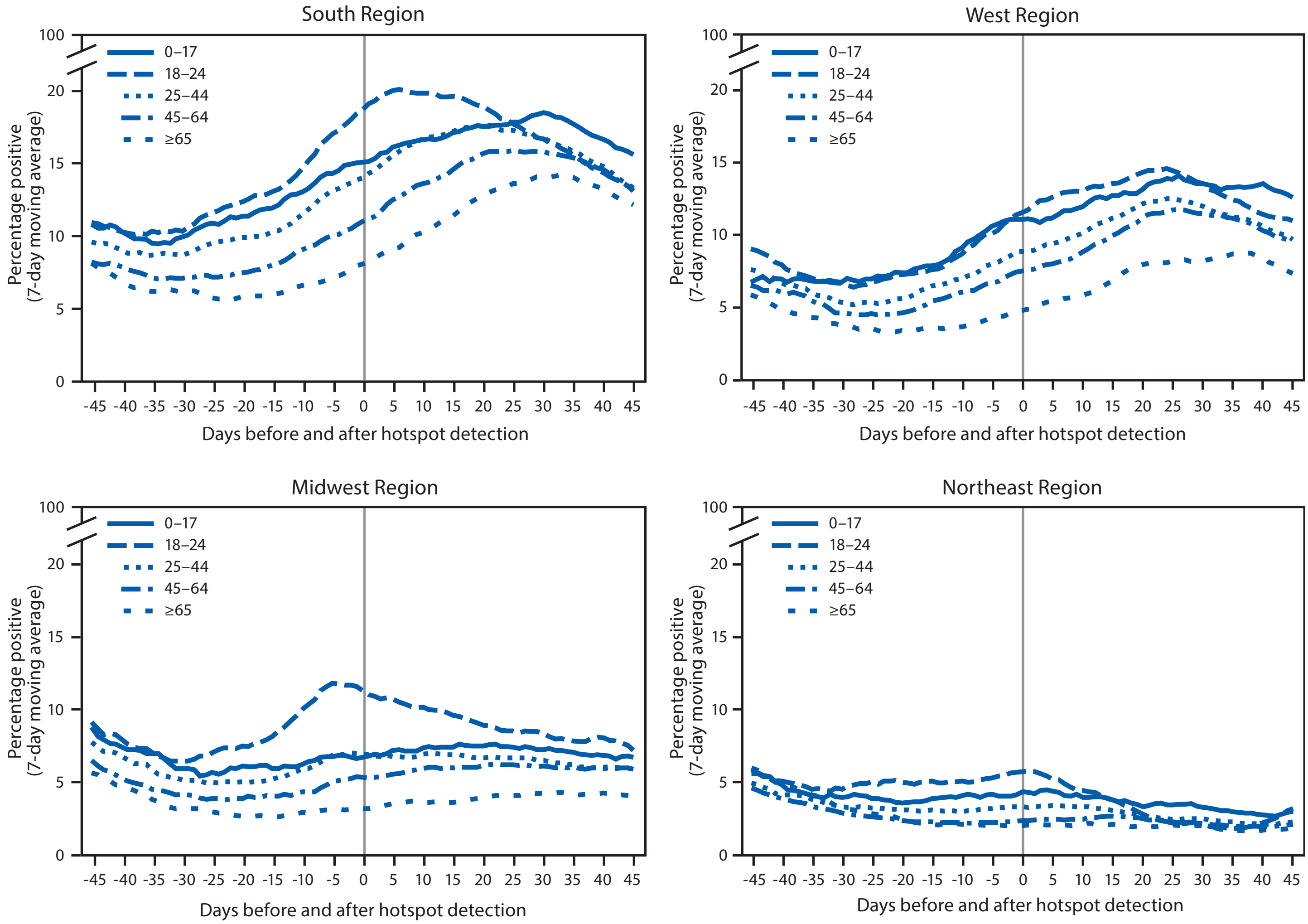
FIGURE 2. Percentage of positive SARS-CoV-2 reverse transcription–polymerase chain reaction test results (7-day moving average)* in COVID-19 hotspot counties before and after date of hotspot detection, by age group and U.S. Census region† — United States, June 1–July 31, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* From COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and from data submitted directly by public health, commercial, and reference laboratories for 13 states and the District of Columbia, using specimen collection or test order date.

† *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. *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

Factors Influencing Risk for COVID-19 Exposure Among Young Adults Aged 18–23 Years — Winnebago County, Wisconsin, March–July 2020

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On October 9, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

On May 13, 2020, the Wisconsin Supreme Court declared the state's Safer at Home Emergency Order (https://evers.wi.gov/Documents/COVID19/EMO28-SaferAtHome.pdf) "unlawful, invalid, and unenforceable,"* thereby increasing opportunities for social and business interactions. By mid-June, Winnebago County,† Wisconsin experienced an increase in the number of infections with SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), with the largest increase among persons aged 18–23 years (young adults) (*1*). This age group§ accounts for 12.5% of the population in the county. To identify factors that influence exposure to COVID-19 among young adults in Winnebago County, characteristics of COVID-19 cases and drivers of behaviors in this age group were examined. During March 1–July 18, 2020, 240 young adults received positive SARS-CoV-2 test results, accounting for 32% of all Winnebago County cases. In 30 key informant interviews, most interviewees reported exposure to misinformation, conflicting messages, or opposing views about the need for and effectiveness of masks. Thirteen young adults described social or peer pressure to not wear a mask and perceived severity of disease outcome for themselves as low but high for loved ones at risk. Having low perceived severity of disease outcome might partly explain why, when not in physical contact with loved ones at risk, young adults might attend social gatherings or not wear a mask (*2*). Exposure to misinformation and unclear messages has been identified as a driver of behavior during an outbreak (*3*,*4*), underscoring the importance of providing clear and consistent messages about the need for and effectiveness of masks. In addition, framing communication messages that amplify young adults' responsibility to protect others and target perceived social or peer pressure to not adhere to public health guidance might persuade young adults to adhere to public health guidelines that prevent the spread of COVID-19.

SARS-CoV-2 spreads easily through person-to-person contact; certain behavioral factors (e.g., wearing masks, social distancing, and avoiding large gatherings) are effective in preventing COVID-19.¶ Young adults represent an increasingly large proportion of U.S. COVID-19 cases (*5*). A recent survey found that persons aged 18–24 years reported lower agreement with and adherence to public health guidance (e.g., wearing masks) compared with those aged ≥25 years (*2*). Identifying factors (e.g., perceived severity of disease outcome) that influence risk for exposure to COVID-19 and framing communication messages to target those factors might persuade young adults to engage in behaviors that are effective in preventing the spread of COVID-19 (*6*,*7*).

This study used a quantitative and qualitative approach to identify drivers of behavior that influence risk for exposure to COVID-19 among young adults. Characteristics (e.g., social gathering attendance, occupation, and age) of young adults with COVID-19 during March 1–July 18, 2020, and within Winnebago County, were obtained from Wisconsin's Electronic Disease Surveillance System.** In addition, key informant interviews were conducted during July 9–22 with 30 persons, including 13 young adults, nine owners of business establishments employing and frequented by young adults (e.g., restaurants and bars), and eight community leaders†† (persons

* https://www.wicourts.gov/sc/opinion/DisplayDocument.pdf?content=pdf&seqNo=260868.

† The COVID-19 data provided in this report are specific to the Winnebago County Health Department (WCHD) jurisdiction. Data for the portions of the City of Menasha or City of Appleton that fall within Winnebago County are not included. Data provided on the Wisconsin Department of Health Services website might be different than the information provided by WCHD because the state reports data for the entire county, which includes those portions of Menasha and Appleton.

§ Percentage of population includes persons aged 18–24 years in Winnebago County, Wisconsin, and were obtained using the U.S. Census 2018 American Community Survey data. Population data for young adults aged 18–23 years were not available for this report. https://data.census.gov/cedsci/table?g%20=%200500000US55139.060000&y%20=%202018&d%20=%20ACS%205-Year%20Estimates%20Detailed%20Tables&tid%20=%20ACSDT5Y2018.B01001.

¶ https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html.

** In Wisconsin's Electronic Disease Surveillance System, information for occupation and social gathering is systematically collected in various formats (e.g., text field and drop-down menu options); thus, abstraction of free text fields was completed to enhance data completeness and accuracy of these variables.

†† Community leaders were interviewed to gain an understanding of broader concerns related to COVID-19 and its impact within the community, but because of their diverse roles within the community, results from those interviews were not analyzed for themes but presented as salient concerns raised by community leaders. Thus, NVivo software was not used to analyze interviews for community leaders. Broader concerns expressed by community leaders that paralleled those of business owners and young adults were presented along with themes that emerged from interviews with business owners and or young adults.

in various leadership roles) within Winnebago County using semistructured interview guides. Interviews did not knowingly include anyone who had received positive SARS-CoV-2 test results before the interview. Interview guides included questions to assess various factors (e.g., attitudes and perceptions).[§§] Participants were recruited using snowball sampling, a method whereby enrolled participants refer other potential participants (*8*). Local health officials provided initial participant referrals. In-person interviews, lasting 30–75 minutes, were digitally recorded, transcribed, and analyzed using NVivo software (version 12; QSR International).[¶¶] Analysis involved summarizing patterns of information shared by participants regarding their subjective experiences of the pandemic. All participants consented to being interviewed and received a gift card for participating.[***] Interviews were conducted until thematic saturation was achieved and no new themes emerged.[†††]

By mid-June, after the Safer at Home Emergency Order was invalidated, Winnebago County experienced an increase in COVID-19 cases, with the largest increase among young adults (Figure). During March 1–July 18, 2020, young adults accounted for 240 (32%) of 757 cumulative COVID-19 cases in Winnebago County (Table 1). The majority of young adults were non-Hispanic White (72%); followed by other/unknown race/ethnicity (14%); Hispanic (7%); and non-Hispanic Black (4%). Over half were female (54%), and 72% reported being employed. Among those employed, 83% reported working outside of the home during their exposure period[§§§]; over half (58%) reported working outside of the home 2 days before symptom onset or positive specimen collection (i.e., during their contagious period[¶¶¶]). In addition, 38% reported attending a social gathering[****] during their exposure period, and 84% reported clinical symptoms consistent with COVID-19.

Among the 13 young adults interviewed, nine were women, all were employed, and all were either enrolled in college or had graduated from college within the last year. Common themes that emerged during interviews as drivers of behavior were social or peer pressure, social interactions, attitudes regarding public health guidance, perceived severity of disease outcome, perceived responsibility to others, workplace COVID-19 mitigation measures, absence of countywide measures, identifying a trusted source for COVID-19 information, and exposure to misinformation, conflicting messages, or opposing views regarding masks (Table 2). In the analysis of interviews, young adults described feeling social or peer pressure to not wear a mask, reportedly receiving "negative reactions" or "odd looks" from others when wearing a mask, or feeling "weird" about wearing a mask. Young adults reported limiting social interactions; however, many reported engaging in social activities (e.g., attending a bonfire or bar) that exposed them to multiple persons. Young adults reported wearing masks when shopping, most held favorable views of public health guidance (e.g., wearing masks), and a few had negative or questioning views of masks and social distancing. Most young adults indicated they would likely be asymptomatic or have mild or flu-like symptoms if they were to receive a positive test result or "had peers who had tested positive and those peers hardly even had symptoms." Young adults reported having loved ones at risk for severe COVID-19–associated outcomes and expressed a sense of responsibility to those loved ones and the broader community. Moreover, most young adults voiced concerns about exposure to SARS-CoV-2 within their workplaces and reported exposure to misinformation, conflicting messages, or opposing views regarding the need for or effectiveness of masks.

Among interviewed business owners (nine) and community leaders (eight), all business owners identified local health officials as trusted sources for COVID-19 information, yet a few community leaders did not. Further, many business owners

[§§] The interview guide for young adults included a range of questions and were abbreviated for this report to include questions regarding social interactions with peers, adherence to and attitudes about public health guidance, perceived severity of disease outcome, perceived responsibility to others, and social or peer pressure. The interview guide for business owners included a range of questions and were abbreviated for this report to include questions regarding trusted sources of COVID-19 information, main concerns regarding the pandemic, and barriers to implementing public health guidance within their establishments. The interview guide for community leaders included questions regarding participants' appraisal of the pandemic, main concerns regarding the pandemic, and trusted sources of COVID-19 information.

[¶¶] https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home.

[***] Providing incentives to participants have been found to increase participation in studies (https://link.springer.com/article/10.1023/A:1025023600517). Thus, in this study, a gift card in the sum of $25 was provided to participants, and the amount was based on the need to balance motivating interviewees to participate without offering a coercive sum (i.e., a sum that a low-income individual would find difficult to refuse). Two interviewees declined the offer of a gift card.

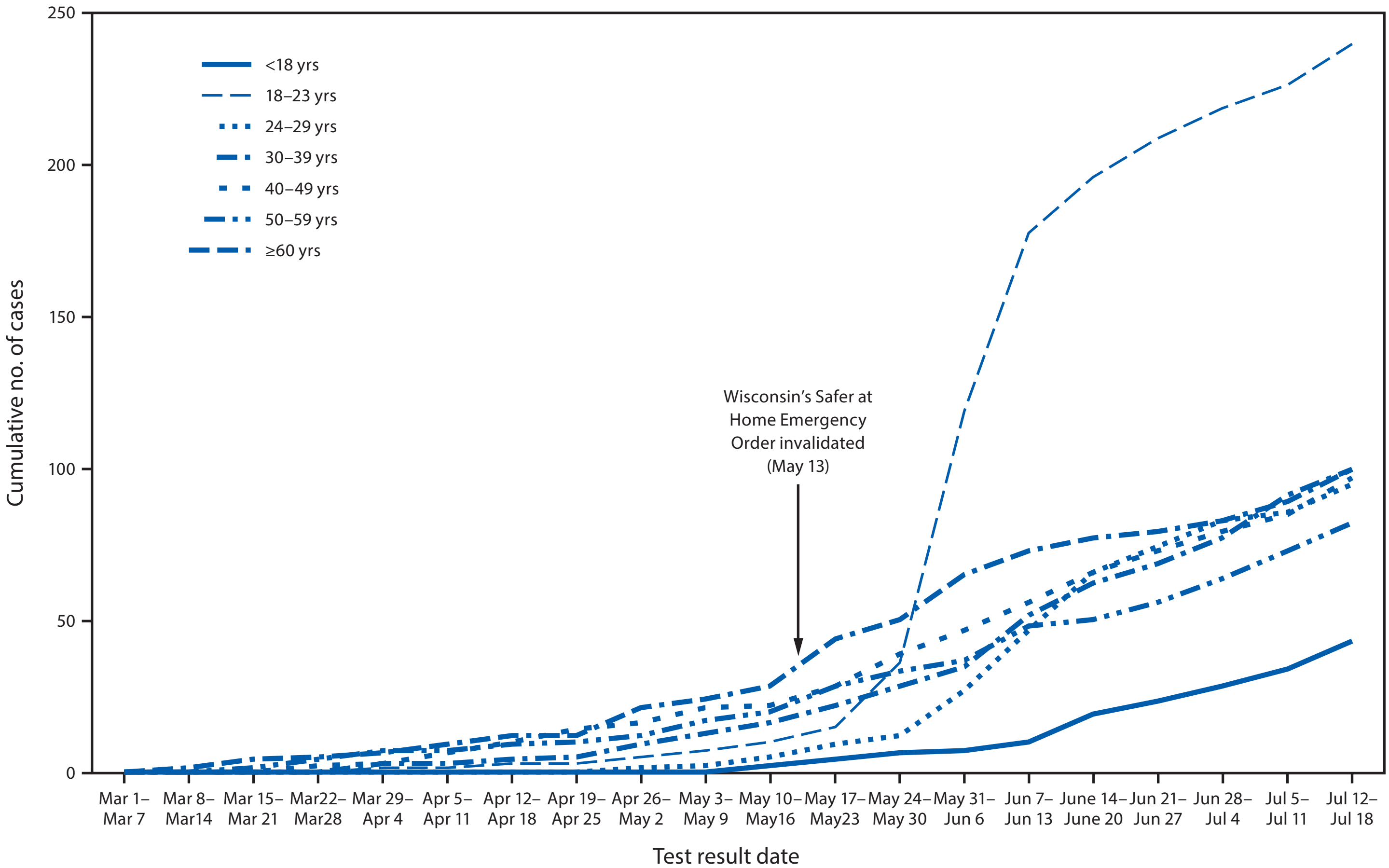
[†††] Thematic saturation, which is often used to determine sample size in qualitative data collection (e.g., key informant interviews), is achieved when no new information or salient themes arise from data collection. Probing, in-depth responses provided by interviewees, and the number of salient issues being discussed are some factors that influence when thematic saturation is reached. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6010234/.

[§§§] Exposure period is defined as the 14 days preceding symptom onset or receiving positive test results.

[¶¶¶] Contagious period is defined as working outside of the home the 2 days before symptom onset or positive specimen collection. Information for worked during contagious period was determined by examining information contained in the Facility Intervention section and the date of onset of symptoms, which are both systematically collected in Wisconsin's Electronic Disease Surveillance System. Abstraction of free text fields was completed to enhance data completeness and accuracy of data collected on patients reporting working outside of the home in the 2 days before symptom onset or positive specimen collection contagious period.

[****] Social gathering refers to the COVID-19 patient reporting attending a gathering, party, or meeting with people from outside of their household in the 14 days before symptom onset or receiving positive test results. Wisconsin's Electronic Disease Surveillance System does not provide a minimum number of participants to qualify as a social gathering.

FIGURE. Cumulative number of confirmed COVID-19 cases, by age group (N = 757) — Winnebago County, Wisconsin, March 1–July 18, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

and community leaders reported exposure to misinformation, conflicting messages, or opposing views regarding the need for or effectiveness of masks. Business owners indicated they had implemented some control measures (e.g., hand-hygiene stations and mask-wearing); however, many reported discontinuing mask-wearing requirements for reasons such as not wanting to offend customers or perceived competition with similar establishments. Business owners perceived the absence of a countywide mask ordinance as a barrier to reimplementing mask-wearing requirements within their establishments and some spontaneously indicated that if a mask ordinance was implemented, they would comply.

Discussion

Wisconsin's Electronic Disease Surveillance System data indicated social interactions and workplace and community transmission likely contributed to the spread of COVID-19 among young adults in Winnebago County. Nearly three quarters (72%) of young adults with COVID-19 were employed, and over one half (58%) worked outside of the home while contagious, increasing the risk for transmitting SARS-CoV-2 to the broader community. Among young adult interviewees with jobs that entailed interaction with the public, many voiced concerns about workplace exposure, underscoring the importance of businesses implementing control measures (e.g., requiring masks) consistent with published guidance,[††††] especially when physical distancing is difficult. These concerns, coupled with the fact that most business owners identified the absence of a countywide mask ordinance as a barrier to reimplementing mask-wearing requirements within their establishments, highlight the benefits that might come from implementing a countywide mask ordinance (*9*). Given that business owners and most community leaders trusted local health officials for COVID-19 information, businesses could collaborate with local health officials in implementing control measures tailored to their needs. Among the few community leaders who distrusted COVID-19 information shared by local health officials, that distrust appeared to stem from exposure to misinformation

†††† https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/business-employers/bars-restaurants.html#anchor_1589927161215.

TABLE 1. Characteristics of confirmed cumulative COVID-19 cases among persons aged 18–23 years (N = 240), Wisconsin's Electronic Disease Surveillance System — Winnebago County, Wisconsin,* March 1–July 18, 2020

Characteristic	No. (%†)
Age, yrs	
18	8 (3.3)
19	22 (9.2)
20	28 (11.7)
21	63 (26.3)
22	67 (27.9)
23	52 (21.7)
Sex	
Men	111 (46.3)
Women	129 (53.8)
Race/Ethnicity	
White, non-Hispanic	173 (72.1)
Hispanic	17 (7.1)
Black, non-Hispanic	10 (4.2)
Asian	3 (1.3)
American Indian	3 (1.3)
Other/Unknown	34 (14.2)
Employment status/Occupation§	
Employed	173 (72.1)
Restaurant/Bar	47 (19.6)
Health care	35 (14.6)
Other	91 (37.9)
Unemployed	41 (17.1)
Unknown	26 (10.8)
Among employed (n = 173), worked 14 days before symptom onset or receiving positive test results (exposure period)	
Yes	143 (82.7)
No	15 (8.7)
Unknown	15 (8.7)
Among employed (n = 173), worked in the 2 days before symptom onset or positive specimen collection (contagious period)	
Yes	101 (58.4)
No	37 (21.4)
Unknown	35 (20.2)
Attended social gathering in the 14 days before symptom onset receiving positive test results¶	
Yes	91 (37.9)
No	109 (45.4)
Unknown	40 (16.7)
Among those who reported attending a social gathering (n = 91), locations reported**	
House party	32 (35.2)
Domestic travel††	31 (34.1)
Restaurant or bar	30 (33.0)
Unknown location§§	14 (15.4)
Symptoms	
Symptomatic	202 (84.2)
Asymptomatic	38 (15.8)
Symptoms reported by respondents (n = 202)**	
Headache	117 (48.8)
Cough	106 (44.2)
Loss of taste or loss of smell	96 (40.0)
Fevers, chills, or night sweats	87 (36.3)
Sore throat or hoarseness	76 (31.7)
Runny nose, congestion, allergy, or sinus symptoms	73 (30.4)
Muscle aches	63 (26.3)
Fatigue, weakness, or dizziness	61 (25.4)
Nausea, vomiting, diarrhea, or abdominal pain	42 (17.5)
Shortness of breath, chest tightness, or chest pain	37 (15.4)

TABLE 1. (*Continued*) Characteristics of confirmed cumulative COVID-19 cases among persons aged 18–23 years (N = 240), Wisconsin's Electronic Disease Surveillance System — Winnebago County, Wisconsin,* March 1–July 18, 2020

Abbreviation: COVID-19 = coronavirus disease 2019.

* COVID-19 cases in this report are specific to the Winnebago County Health Department jurisdiction and do not include COVID-19 cases that fall within the City of Menasha Health Department jurisdiction and the City of Appleton Health Department jurisdictions.

† Percentages might not sum to 100% because of rounding.

§ Five young adults reported employment at more than one employer but were counted only once under restaurant/bar (two) or health care (three). Young adults who reported their employment status as employed and student are counted under employed. Young adults who reported their occupation as student and did not include any additional information about occupation type are counted under unemployed.

¶ Social gathering refers to the COVID-19 patient reporting attending a gathering, party, or meeting with people from outside of their household in the 14 days before symptom onset or receiving positive test results. Wisconsin's Electronic Disease Surveillance System does not provide a minimum number of participants to qualify as a social gathering.

** Characteristic is not mutually exclusive.

†† Domestic travel is categorized as a social gathering if the COVID-19 patient reported making a journey, out of town, to attend a gathering, party, or meeting with people from outside of their household in the 14 days before symptom onset or receiving positive test results.

§§ Unknown location reflects COVID-19 positive patients who reported attending a social gathering in the 14 days before symptom onset or receiving positive test results but did not report the location of the social gathering.

and conflicting messages regarding the severity of the pandemic, which in turn seemed to influence their views about the extremeness of broader community mitigation measures (e.g., the Safer at Home Order). Lack of trust can influence adherence to public health guidance.§§§§

Some young adults admitted to not wearing a mask when socializing with friends, which might indicate a sense of security when interacting with friends. Moreover, the expectation that they would likely be fine if they contracted COVID-19, coupled with social or peer pressure, might help explain transmission patterns among young adults. Although young adults perceived a low severity of disease outcome for themselves, many expressed concerns about transmitting SARS-CoV-2 to loved ones at risk and to the broader community. Having a sense of responsibility to others might explain why young adults reported wearing masks when shopping and why most held positive views of masks. However, when not in physical contact with loved ones at risk, young adults might choose to not wear a mask or to attend larger gatherings with peers who might also perceive a low severity of disease outcome for themselves. Exposure to misinformation and conflicting messages regarding masks might make it difficult to know what information to trust, underscoring the importance of providing clear and consistent messages during an outbreak (*3*,*4*). Among the few young adults who expressed negative attitudes about masks and social distancing or who had questions about the effectiveness

§§§§ https://www.cdc.gov/eis/field-epi-manual/chapters/Communicating-Investigation.html.

TABLE 2. Themes from key informant interviews with young adults aged 18–23 years (n = 13), business owners* (n = 9), and community leaders† (n = 8) — Winnebago County, Wisconsin, July 9–22, 2020

Theme	Example quotes
Young adults	
Social or peer pressure	"I felt like everybody else in here is not going to wear a mask, I might as well just go in there and not wear a mask as well. I don't want to be seen as different." "When you're at your friend's, you don't want to be 'that' person that wears the mask, because then you look like a weirdo, you know." "So, like for me seeing everyone not wearing masks and me being the only one, I'm like yeah, I feel pressured to take it off, and I don't want that, so I'll leave."
Social interactions	"I've chosen to eat outside. I've chosen to do the things that I think are good that I also like to do. I felt like that was a risk versus a reward type of thing." "[My friends and I] don't wear masks together, but whenever I go out with them, we always just go to an outdoors place because we're not in a bar or restaurant or anything like that. If you limit the amount of people you see and your friends also do the same, I feel comfortable."
Attitudes regarding public health guidelines (e.g., wearing masks and social distancing)	"I personally feel like masks are a very effective way to stop the virus spread or at least control it." "The isolation and the masks and everything, I just don't know that that's really necessary……Like I said, I'm not a scientist. I don't know. I'm questioning it. It's a little scary to me. Because if this is something that they're mandating, like what else is going to come next?" "But I just–like, that gets into personal beliefs."
Perceived severity of disease outcome	"I know like five people that have had COVID, and they're all fine. I don't know anybody that's died and some of them have hardly even had symptoms." "I hear most of it, you're probably like asymptomatic. I don't want to speak on it and jinx myself. So, I probably wouldn't show many signs [if I tested positive for COVID-19]."
Perceived responsibility to others	"For me it's more of who am I affecting the most. When it comes to, like, my grandparents or people at the grocery store, I don't want–even if do have it, and if I don't have any symptoms, why spread it to other people?" "I'm most worried about giving it to my dad. He's not in great health."
Workplace COVID-19 mitigation measures	"I feel like if I went to my manager and asked him if we could do more, he would not take anything well, or he wouldn't implement anything. So, that's frustrating." "We are actually not [required to wear masks at work], which is weird, in my personal opinion, but we are being very safe about it."
Exposure to misinformation, conflicting messages, or opposing views regarding public health guidance§	"I think it's just hard, because nobody has the same message, and I feel like since it's a pandemic, and since it's a health issue, it shouldn't be about confusing messages. I think because it's confusing, that's makes me not really want to listen to anything." "Some people are saying we need to wear masks for public health. Some people are saying they don't work… So, it's super hard to trust…" "I think definitely looking at [local and national leaders] and just seeing them not wear a mask. I think that has a really big effect on people and their own perception of the virus."
Business owners*	
Lack of countywide measures	"They should mandate masks right this second. They should have done it two weeks ago, and the pushback was terrible." "I would say the main thing is, that without a [county-wide] mandate for [masks] and knowing that many of my competitors are just not going to [require masks], that is my biggest barrier to [requiring masks]." "If I said, 'you guys have to wear a mask,' they'd walk down to the next bar that's not requiring a mask. I can guarantee that. It's competition, and it's a competition."
Trusted source for COVID-19 information	"My main thing is I get that email every day from the [local health department], and that's where I go [for information on COVID-19]." "Within the county health department, their dashboards are great on a daily basis…..to understand daily where we are as a snapshot."
Exposure to misinformation, conflicting messages, or opposing views regarding public health guidance§	"There are people who don't think [COVID-19] is real and that it doesn't exist, and there are people who think that wearing a mask impedes in their freedom and telling people where to sit [6 ft apart] impedes on their freedom as well, and they will not follow it regardless." "We don't have any leadership from the top. You get these mixed signals. Who do I trust?"
Community leaders†	
Exposure to misinformation, conflicting messages, or opposing views regarding public health guidance§	"And it's, it's just been a disaster from a PR perspective for getting good information, accurate information out……. In the meantime, we're all bad people you know because we're not adhering to whatever they want us to adhere to." "When you have [professionals] that don't think it's a good idea to self-quarantine, an ordinary person is going to sit there and say "well, [they] must know better."
Perceived severity of the pandemic	"They [federal, state, and local public health agencies] have all done a crappy job of selling why this is bad, and that's why nobody believes it." "I might not call it a pandemic, but until the numbers get higher than the regular flu, in my mind it's still a nasty flu."
Trusted source for COVID-19 information	"[The local county health department] has done a good job with visibility, I believe." "[We're] being asked to wear a mask and do all sorts of things, you know. And I'm saying it's being based on wrong information, [bad data]."

Abbreviation: COVID-19 = coronavirus disease 2019.

* Business owners are owners of establishments employing and frequented by young adults (e.g., restaurants and bars).

† Community leaders were interviewed to gain an understanding of broader concerns related to COVID-19 and its impact within the community, but because of their diverse roles within the community, results from those interviews were not analyzed for themes but presented as salient concerns raised by community leaders.

§ Exposure to misinformation, conflicting messages, or opposing views regarding public health guidance was reported within all interviewee groups. To facilitate interpretation and analysis of this theme, these three salient issues were reported under one theme because of their similarities.

of masks, those views appeared to be based on the expressed need to make their own choices (i.e., personal agency).

The findings in this report are subject to at least four limitations. First, interviews were conducted in Winnebago County; therefore, findings are not widely generalizable. Second, self-reported information collected in Wisconsin's Electronic Disease Surveillance System and from interviews is subject to social desirability bias and might have led to underestimations of some characteristics and factors. Third, interviewees identified through snowball sampling might have similar characteristics; thus, this report might not capture representativeness of diverse responses. Finally, missing information in text fields could have led to underestimations of some characteristics.

Despite limitations, this report provides a framework for tailoring communication messages that are empathetic, that amplify personal responsibility and responsibility to protect others, and that focus on perceived pressure to not wear a mask, all of which might persuade young adults to adhere to public health guidelines (e.g., wearing masks) that prevent the spread of COVID-19. Masks are an effective tool to prevent the spread of COVID-19 (*9*), and current CDC guidance recommends universal masking to prevent SARS-CoV-2 transmission.¶¶¶¶ This report further underscores the importance of providing clear and consistent messages regarding need for and effectiveness of masks, because consistent messages could help increase widespread adoption of evidence-based guidance (*3*).

¶¶¶¶ https://www.cdc.gov/media/releases/2020/p0714-americans-to-wear-masks.html.

Summary

What is already known about this topic?

Young adults represent an increasingly large proportion of U.S. COVID-19 cases.

What is added by this report?

In Winnebago County, Wisconsin, perceived low severity of disease outcome; perceived responsibility to others; peer pressure; and exposure to misinformation, conflicting messages, or opposing views regarding masks were identified as drivers of behaviors that might influence risk for COVID-19 exposure among young adults.

What are the implications for public health practice?

Identifying factors that influence risk for COVID-19 exposure and framing messaging to target those factors could help persuade young adults to adhere to public health guidelines that prevent the spread of COVID-19. Providing clear and consistent messages regarding the need for and effectiveness of masks could help increase widespread adoption of evidence-based guidance.

Acknowledgments

All interviewees; Winnebago County Public Health Department staff members; Wisconsin Department of Health Services.

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

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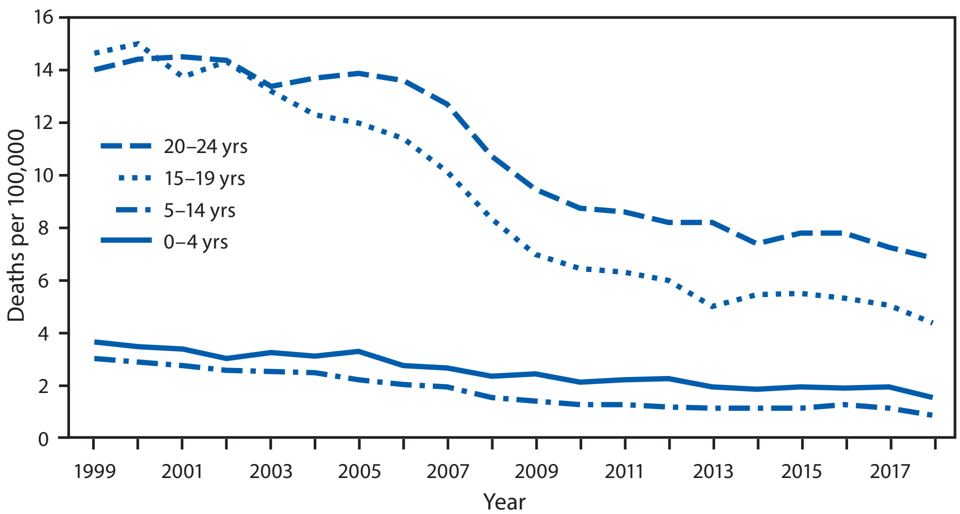
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Rate* of Unintentional Traumatic Brain Injury (TBI)–Related Deaths† Among Persons Aged ≤24 Years, by Age Group — National Vital Statistics System, United States, 1999–2018



* Age-specific deaths per 100,000 population.

† Based on *International Classification of Diseases, Tenth Revision* codes S01.0–S01.9 (open wound of the head); S02.0, S02.1, S02.3, and S02.7–S02.9 (fracture of the skull and facial bones); S04.0 (injury to optic nerve and pathways); S06.0–S06.9 (intracranial injury); S07.0, S07.1, S07.8, and S07.9 (crushing injury of head); S09.7–S09.9 (other unspecified injuries of head); T01.0 (open wounds involving head with neck); T02.0 (fractures involving head with neck); T04.0 (crushing injuries involving head with neck); T06.0 (injuries of brain and cranial nerves with injuries of nerves and spinal cord at neck level); and T90.1, T90.2, T90.4, T90.5, T90.8, and T90.9 (sequelae of injuries of head).

From 1999 to 2018, death rates for unintentional TBI among persons aged ≤24 years declined across all age groups. During the 20-year period, TBI-related death rates declined from 3.7 per 100,000 to 1.5 among children aged 0–4 years, from 3.0 to 0.9 for children and adolescents aged 5–14 years, from 14.7 to 4.4 for adolescents and young adults aged 15–19 years, and from 14.1 to 6.9 for young adults aged 20–24 years. For most of the period, rates were highest for persons aged 20–24 years followed by those aged 15–19, 0–4, and 5–14 years.

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

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ISSN: 0149-2195 (Print)