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Great American Smokeout — November 17, 2016

The American Cancer Society Great American Smokeout is an annual event that encourages smokers to make a plan to quit or to plan in advance and quit smoking on that day (*1*). The 41st annual Great American Smokeout will be held on November 17, 2016.

In the more than 50 years since the Surgeon General's first report on smoking and health, cigarette smoking among U.S. adults has been reduced by approximately half. However, since 1964, an estimated 20 million persons have died because of smoking, which remains the leading preventable cause of disease, disability, and death in the United States (*2*).

About two out of three adult smokers want to quit smoking cigarettes, and approximately half of smokers made a quit attempt in the preceding year (*2*). However, in 2015, an estimated 15.1% of U.S. adults (approximately 36.5 million persons) were current cigarette smokers (*3*). Getting effective help through counseling and medications can increase the chances of quitting by as much as threefold (*4*).

Additional information and support for quitting smoking is available by telephone at 800-QUIT-NOW (800-784-8669). CDC's Tips From Former Smokers campaign offers additional quit resources at http://www.cdc.gov/tips.

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Current Cigarette Smoking Among Adults — United States, 2005–2015

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Tobacco use is the leading cause of preventable disease and death in the United States, and cigarettes are the most commonly used tobacco product among U.S. adults (*1*,*2*). To assess progress toward achieving the *Healthy People 2020* target of reducing the proportion of U.S. adults who smoke cigarettes to ≤12.0% (objective TU1.1),* CDC assessed the most recent national estimates of cigarette smoking prevalence among

* https://www.healthypeople.gov/2020/topics-objectives/topic/tobacco-use/objectives.

INSIDE

Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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adults aged ≥18 years using data from the 2015 National Health Interview Survey (NHIS). The proportion of U.S. adults who smoke cigarettes declined from 20.9% in 2005 to 15.1% in 2015, and the proportion of daily smokers declined from 16.9% to 11.4%. However, disparities in cigarette smoking persist. In 2015, prevalence of cigarette smoking was higher among adults who were male; were aged 25–44 years; were American Indian/Alaska Native; had a General Education Development certificate (GED); lived below the federal poverty level; lived in the Midwest; were insured through Medicaid or were uninsured; had a disability/limitation; were lesbian, gay, or bisexual; or who had serious psychological distress. Proven population-based interventions, including tobacco price increases, comprehensive smoke-free laws, anti-tobacco mass media campaigns, and barrier-free access to tobacco cessation counseling and medications, are critical to reducing cigarette smoking and smoking-related disease and death among U.S. adults, particularly among subpopulations with the highest smoking prevalences (*3*).

NHIS is an annual, nationally representative, in-person survey of the noninstitutionalized U.S. civilian population. The NHIS sample adult core questionnaire is administered to a randomly selected (sample) adult in the household, and, in 2015, included 33,672 adults aged ≥18 years; the response rate was 55.2%. Current cigarette smokers were adults who smoked ≥100 cigarettes during their lifetime and, at the time of interview, reported smoking every day or on some days.

Data were weighted to adjust for differences in the probabilities of selection and nonresponse, and to provide nationally representative estimates. Current smoking was assessed overall and by sex, age, race/ethnicity, education, poverty status,[†] U.S. region,[§] health insurance coverage at the time of survey,[¶]

[†] Based on reported family income: 2005 estimates are based on reported family income and 2004 poverty thresholds published by the U.S. Census Bureau, and 2015 estimates are based on reported family income and 2014 poverty thresholds published by the U.S. Census Bureau.

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

[¶] *Private coverage*: includes adults who had any comprehensive private insurance plan (including health maintenance organizations and preferred provider organizations). *Medicaid:* for adults aged <65 years, includes adults who do not have private coverage, but who have Medicaid or other state-sponsored health plans including Children's Health Insurance Program (CHIP); for adults aged ≥65 years, includes adults aged ≥65 years who do not have any private coverage but have Medicare and Medicaid or other state-sponsored health plans including CHIP; *Medicare only:* includes adults aged ≥65 years who only have Medicare coverage; *Other coverage*: includes adults who do not have private insurance, Medicaid, or other public coverage, but who have any type of military coverage, coverage from other government programs, or Medicare. *Uninsured*: includes adults who have not indicated that they are covered at the time of the interview under private health insurance, Medicare, Medicaid, CHIP, a state-sponsored health plan, other government programs, or military coverage.

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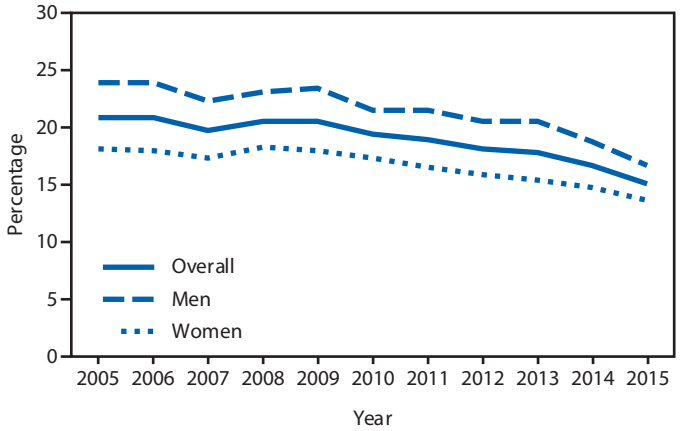
disability/limitation status,** sexual orientation,†† and serious psychological distress status§§. Two different measures for psychological distress were assessed (e.g., a dichotomous (yes/no) measure for serious psychological distress, and a four-category (no, low, moderate, or high) measure for the degree of psychological distress.¶¶ The mean number of cigarettes smoked per day was calculated among daily smokers. Differences between groups were assessed using a Wald test, with statistical significance defined as p<0.05. Logistic regression was used to assess linear trends using annual NHIS data from 2005–2015. Relative percentage changes in prevalence rates during 2005–2015 were calculated.***

Current cigarette smoking among U.S. adults declined from 20.9% (an estimated 45.1 million adults) in 2005 to 15.1% (36.5 million) in 2015, a 27.7% decline (p for trend <0.05) (Figure 1). During 2005–2015, significant declines in smoking prevalence were observed among all subgroups by sex, poverty status, and U.S. region (p<0.05) (Table).

Current cigarette smoking was significantly lower in 2015 (15.1%) than in 2014 (16.8%) (p<0.05); however, there were differences in smoking prevalence by sex, age group, race/ethnicity, educational attainment, economic status, U.S. region, insurance and disability status, sexual orientation, and serious psychological distress status. In 2015, current cigarette smoking prevalence was higher among males (16.7%) than females (13.6%) and among adults aged 25–44 years (17.7%) than those aged ≥65 years (8.4%). Prevalence was highest among American Indian/Alaska Natives (21.9%) and was more than three times the prevalence among non-Hispanic Asians, who had the lowest prevalence (7.0%). Among adults aged ≥25 years, prevalences ranged from a high of 34.1% among persons with a GED to a low of 3.6% among persons with a graduate degree. Prevalence among persons living below the poverty level (26.1%) was nearly twice that of persons at or above this level (13.9%). By region, the highest prevalence was in the Midwest (18.7%) and lowest was in the West (12.4%). Smoking prevalence was higher among Medicaid enrollees (27.8%) and uninsured persons (27.4%) than among persons covered by private health insurance (11.1%) or by Medicare only (8.9%), and higher among adults with a disability/limitation (21.5%) than among adults reporting no disability/limitation (13.8%). In addition, reported smoking prevalence was higher among adults who were lesbian, gay, or bisexual (20.6%) than heterosexual adults (14.9%). In 2015, persons with serious psychological distress reported a higher smoking prevalence (40.6%) than did persons without serious psychological distress (14.0%) (Table). Among adults with high psychological distress, prevalence was highest among persons aged 25–44 years (44.3%) and lowest among persons aged ≥65 years (18.9%) (Figure 2).

Among current smokers during 2005–2015, the number of daily smokers decreased from 36.5 million (80.8%) to 27.6 million (75.7%), while the number who smoked on

FIGURE 1. Percentage of adults who were current cigarette smokers,* overall and by sex — National Health Interview Survey, United States, 2005–2015



* Persons who reported smoking ≥100 cigarettes during their lifetime and who, at the time of interview, reported smoking every day or some days.

** Disability/limitation was defined based on self-reported presence of selected impairments including vision, hearing, cognition, and movement. Limitations in performing activities of daily living was defined based on response to the question, "Does [person] have difficulty dressing or bathing?" Limitations in performing instrumental activities of daily living defined based on response to the question, "Because of a physical, mental, or emotional condition, does [person] have difficulty doing errands alone such as visiting a doctor's office or shopping?" Any disability/limitation was defined as a "yes" response pertaining to at least one of the disabilities/limitations listed (e.g., vision, hearing, cognition, movement, activities of daily living, or instrumental activities of daily living). A random sample of half the respondents from the 2015 Person File were asked about disability/limitation.

†† Starting in 2013, sexual orientation questions were added to NHIS for the first time. To determine sexual orientation, adult respondents were asked, "Which of the following best represents how you think of yourself?" with a response options of: "gay" ("lesbian or gay" for female respondents), "heterosexual," that is, "not gay" ("not lesbian or gay" for female respondents), "bisexual," "something else," and "I don't know the answer."

§§ The six-question Kessler (K6) scale was developed to identify persons with a high likelihood of having a diagnosable mental illness and associated functional limitations. The K6 scale asked how often during the past 30 days the respondents felt a) "so sad that nothing could cheer them up"; b) "nervous"; c) "restless or fidgety"; d) "hopeless"; e) "that everything was an effort"; or f) "worthless." Responses were on a five-point Likert scale ranging from none of the time to all of the time. For each question, a value of zero, one, two, three, or four was assigned to the response: "none of the time," "a little of the time," "some of the time," "most of the time," or "all of the time," respectively. Responses to the six items were summed to yield a K6 score of 0–24, with higher scores indicating greater psychological distress. Additional information available at https://www.cdc.gov/nchs/data/databriefs/db203.pdf.

¶¶ Based on K6 scale, the degree of psychological distress is presented as a four-category measure with no psychological distress (score = 0), low psychological distress (score = 1–5), moderate psychological distress (score = 6–10), and high psychological distress (score = 11–24) (http://www.samhsa.gov/data/sites/default/files/CBHSQ-DR-C11-MI-Mortality-2014/CBHSQ-DR-C11-MI-Mortality-2014.pdf).

*** [(2005 estimate - 2015 estimate)/2005 estimate] x 100.

TABLE. Percentage of adults who were current cigarette smokers,* by selected characteristics — National Health Interview Survey, United States, 2005 and 2015

Characteristic	Male			Female			Total		
	2005 (n = 13,762) Weighted % (95% CI)	2015 (n = 15,071) Weighted % (95% CI)	% Decline from 2005 to 2015	2005 (n = 17,666) Weighted % (95% CI)	2015 (n = 18,601) Weighted % (95% CI)	% Decline from 2005 to 2015	2005 (N = 31,428) Weighted % (95% CI)	2015 (N = 33,672) Weighted % (95% CI)	% Decline from 2005 to 2015
Overall	**23.9 (22.9–24.8)**	**16.7† (15.9–17.6)**	**29.9**	**18.1 (17.4–18.9)**	**13.6† (12.9–14.2)**	**25.2**	**20.9 (20.3–21.5)**	**15.1† (14.6–15.7)**	**27.7**
Age group (yrs)									
18–24	28.0 (25.0–31.1)	15.0† (12.6–17.5)	46.5	20.7 (18.3–23.1)	11.0† (8.8–13.2)	47.0	24.4 (22.4–26.4)	13.0† (11.3–14.7)	46.6
25–44	26.8 (25.4–28.2)	19.8† (18.3–21.3)	26.0	21.4 (20.2–22.6)	15.8† (14.5–17.0)	26.4	24.1 (23.1–25.1)	17.7† (16.8–18.7)	26.2
45–64	25.2 (23.7–26.7)	17.9† (16.4–19.4)	28.9	18.8 (17.7–20.0)	16.1† (14.9–17.3)	14.6	21.9 (21.0–22.9)	17.0† (16.0–18.0)	22.6
≥65	8.9 (7.6–10.2)	9.7 (8.4–11.0)	-8.7	8.3 (7.3–9.3)	7.3 (6.5–8.2)	11.6	8.6 (7.8–9.3)	8.4 (7.6–9.2)	2.1
Race/Ethnicity§									
Non-Hispanic white	24.0 (22.8–25.2)	17.2† (16.1–18.4)	28.3	20.0 (19.1–20.9)	16.0† (15.0–16.9)	20.1	21.9 (21.1–22.7)	16.6† (15.8–17.3)	24.3
Non-Hispanic black	26.7 (23.9–29.4)	20.9† (18.5–23.4)	21.5	17.3 (15.5–19.0)	13.3† (11.5–15.0)	23.3	21.5 (19.8–23.1)	16.7† (15.2–18.2)	22.2
Hispanic	21.1 (19.3–23.0)	13.1† (11.3–14.8)	38.3	11.1 (9.8–12.4)	7.1† (6.1–8.1)	36.0	16.2 (15.1–17.4)	10.1† (9.1–11.0)	38.1
Non-Hispanic AI/AN	37.5 (20.7–54.3)	19.0 (9.4–28.7)	49.3	26.8 (15.6–38.1)	24.0 (17.2–30.8)	10.6	32.0 (22.2–41.7)	21.9† (16.6–27.1)	31.6
Non-Hispanic Asian¶	20.6 (15.7–25.5)	12.0† (9.1–14.9)	41.7	6.1 (3.7–8.5)	2.6 (1.5–3.7)	56.9	13.3 (10.4–16.3)	7.0† (5.6–8.5)	47.4
Non-Hispanic multirace	26.1 (16.3–36.0)	23.0 (16.6–29.4)	11.9	23.5 (14.8–32.2)	17.7 (12.2–23.2)	24.7	24.8 (17.7–31.8)	20.2 (16.0–24.5)	18.3
Education level**									
0–12 yrs (no diploma)	29.5 (27.2–31.8)	27.9 (25.0–30.8)	5.6	21.9 (20.0–23.7)	20.8 (18.7–22.9)	5.1	25.5 (24.0–27.1)	24.2 (22.4–26.0)	5.0
≤8th grade	21.0 (17.7–24.3)	19.1 (15.1–23.1)	9.2	13.4 (11.1–15.6)	10.2 (7.8–12.5)	23.8	17.1 (15.1–19.0)	14.4 (12.1–16.6)	15.8
9th–11th grade	36.8 (33.3–40.2)	34.9 (30.4–39.4)	5.1	29.0 (26.1–31.8)	28.5 (24.9–32.1)	1.5	32.6 (30.4–34.9)	31.6 (28.7–34.6)	3.1
12th grade (no diploma)	30.2 (23.5–36.9)	27.5 (20.5–34.5)	8.9	22.2 (16.9–27.5)	25.0 (17.5–32.5)	-12.8	26.0 (21.8–30.2)	26.3 (21.1–31.5)	-1.3
GED	47.5 (41.5–53.6)	38.3 (32.2–44.5)	19.4	38.8 (33.6–44.0)	29.4 (23.6–35.1)	24.3	43.2 (39.1–47.4)	34.1 (29.9–38.3)	21.2
High school graduate	28.8 (27.0–30.7)	21.8† (19.7–23.8)	24.5	20.7 (19.3–22.2)	17.9 (16.1–19.8)	13.6	24.6 (23.4–25.7)	19.8† (18.4–21.2)	19.3
Some college (no degree)	26.2 (24.0–28.4)	19.8† (17.8–21.8)	24.5	21.1 (19.2–22.9)	17.3 (15.6–19.0)	17.8	23.5 (22.1–24.9)	18.5† (17.2–19.7)	21.5
Associate degree	26.1 (23.2–28.9)	17.2† (14.6–19.8)	33.9	17.1 (15.0–19.3)	16.1 (14.0–18.2)	6.2	20.9 (19.2–22.6)	16.6† (15.0–18.2)	20.6
Undergraduate degree	11.9 (10.5–13.3)	8.2† (6.9–9.5)	31.1	9.6 (8.3–10.8)	6.6† (5.4–7.8)	31.1	10.7 (9.8–11.6)	7.4† (6.5–8.3)	31.3
Graduate degree	6.9 (5.3–8.5)	3.9† (2.7–5.0)	44.2	7.4 (5.9–8.8)	3.4† (2.5–4.4)	53.3	7.1 (6.0–8.3)	3.6† (2.9–4.4)	49.0
Poverty status††									
At or above poverty level	23.7 (22.6–24.7)	15.5† (14.6–16.4)	34.4	17.6 (16.8–18.5)	12.3† (11.5–13.0)	30.5	20.6 (19.9–21.3)	13.9† (13.3–14.5)	32.8
Below poverty level	34.3 (31.0–37.5)	29.5 (26.6–32.5)	13.8	26.9 (24.5–29.3)	23.7† (21.6–25.9)	11.7	29.9 (27.9–31.9)	26.1† (24.3–27.9)	12.7
Unspecified	21.2 (19.2–23.2)	12.6† (9.4–15.7)	40.7	16.1 (14.8–17.5)	8.8 (6.4–11.2)	45.2	18.4 (17.2–19.6)	10.5† (8.6–12.3)	43.2
U.S. Census region§§									
Northeast	20.7 (18.6–22.9)	14.8† (12.5–17.1)	28.5	17.9 (16.4–19.5)	12.4† (11.1–13.6)	31.0	19.2 (17.8–20.6)	13.5† (12.2–14.8)	29.7
Midwest	27.3 (25.3–29.3)	19.7† (17.8–21.6)	27.9	21.3 (19.8–22.8)	17.7† (16.0–19.4)	16.7	24.2 (23.0–25.3)	18.7† (17.4–20.0)	22.7
South	25.3 (23.6–27.0)	17.1† (15.8–18.4)	32.3	18.5 (17.3–19.7)	13.8† (12.7–14.8)	25.6	21.8 (20.6–23.0)	15.3† (14.5–16.2)	29.5
West	20.1 (18.3–21.9)	14.7† (13.0–16.4)	26.9	13.9 (12.6–15.2)	10.2† (9.0–11.4)	26.8	17.0 (16.0–18.0)	12.4† (11.4–13.5)	26.7
Health insurance coverage¶¶									
Private insurance	19.7 (18.7–20.8)	12.2† (11.2–13.2)	38.2	15.1 (14.4–15.9)	10.2† (9.4–10.9)	32.8	17.3 (16.7–18.0)	11.1† (10.5–11.8)	35.7
Medicaid	34.0 (30.1–38.0)	32.5 (29.3–35.7)	4.5	29.9 (27.3–32.5)	24.8† (22.5–27.1)	17.0	31.3 (29.1–33.6)	27.8† (26.0–29.6)	11.3
Medicare only (aged ≥65 yrs)	10.0 (7.2–12.8)	9.9 (7.8–12.1)	0.4	7.9 (5.9–9.9)	8.2 (6.5–9.9)	-2.9	8.7 (7.1–10.4)	8.9 (7.5–10.4)	-2.4
Other public insurance	27.7 (23.4–31.9)	21.9 (18.5–25.4)	20.7	22.2 (18.7–25.8)	15.4† (12.5–18.3)	30.6	25.1 (22.1–28.1)	19.0† (16.7–21.3)	24.3
Uninsured	38.0 (35.5–40.5)	29.5† (26.8–32.2)	22.4	27.6 (25.4–29.7)	24.8 (22.1–27.5)	10.0	33.3 (31.5 – 35.0)	27.4† (25.5–29.3)	17.6

See table footnotes on next page.

some days increased from 8.7 million (19.2%) to 8.9 million (24.3%) (p for trend <0.05). Among daily smokers, the mean number of cigarettes smoked per day declined from 16.7 in 2005 to 14.2 in 2015 (p for trend <0.05), but did not change significantly between 2014 (13.8 per day) and 2015 (14.2 per day). Moreover, despite an increase in the proportion of daily smokers who smoked 1–9 cigarettes per day since 2012, this proportion did not change significantly between 2014 (26.9%) and 2015 (25.1%). Similarly, during 2014–2015, no significant change occurred in the proportion of daily smokers who smoked 20–29 cigarettes per day (27.4% to 29.3%) or ≥30 cigarettes per day (6.9% to 6.8%) (Figure 3).

Discussion

During 2005–2015, the prevalence of cigarette smoking among U.S. adults declined from 20.9% to 15.1%, including a 1.7 percentage point reduction during 2014–2015 alone, indicating progress toward achieving the *Healthy People 2020* goal of reducing cigarette smoking prevalence to ≤12.0%. However, 36.5 million U.S. adults currently smoke cigarettes, and disparities in smoking prevalence persist. Cigarette smoking prevalence was higher among adults who are male; younger; American Indian/Alaska Native; have less education; live below the federal poverty level; live in the Midwest or

TABLE. (*Continued*) Percentage of adults who were current cigarette smokers,* by selected characteristics — National Health Interview Survey, United States, 2005 and 2015

Characteristic	Male			Female			Total		
	2005 (n = 13,762) Weighted % (95% CI)	2015 (n = 15,071) Weighted % (95% CI)	% Decline from 2005 to 2015	2005 (n = 17,666) Weighted % (95% CI)	2015 (n = 18,601) Weighted % (95% CI)	% Decline from 2005 to 2015	2005 (N = 31,428) Weighted % (95% CI)	2015 (N = 33,672) Weighted % (95% CI)	% Decline from 2005 to 2015
Disability/Limitation* **									
Yes	—†††	23.7 (20.5–27.0)	—†††	—†††	19.5 (16.8–22.3)	—†††	—†††	21.5 (19.5–23.6)	—†††
No	—†††	14.7 (13.5–16.0)	—†††	—†††	12.9 (11.9–13.9)	—†††	—†††	13.8 (13.0–14.7)	—†††
Sexual orientation									
Heterosexual§§§	—†††	16.6 (15.7–17.4)	—†††	—†††	13.4 (12.7–14.1)	—†††	—†††	14.9 (14.4–15.5)	—†††
Lesbian/Gay/Bisexual	—†††	21.5 (16.0–27.0)	—†††	—†††	19.8 (15.2–24.4)	—†††	—†††	20.6 (16.9–24.3)	—†††
Serious psychological distress (Kessler Scale¶¶¶)									
Yes	46.8 (40.6–53.1)	51.8 (45.5–58.2)	-10.7	39.1 (35.0–43.1)	33.5† (29.0–37.9)	14.4	41.9 (38.5–45.3)	40.6 (36.9–44.2)	3.2
No	23.4 (22.5–24.4)	15.5† (14.7–16.4)	33.7	17.4 (16.7–18.1)	12.6† (12.0–13.2)	27.6	20.3 (19.7–20.9)	14.0† (13.5–14.6)	31.0

Abbreviations: AI/AN = America Indian/Alaska Native; CI = confidence interval; GED = General Education Development certificate.

* Persons who reported smoking ≥100 cigarettes during their lifetime and who, at the time of interview, reported smoking every day or some days. Excludes 296 (2005) and 231 (2015) respondents whose smoking status was unknown.

† Denotes significant linear trend during 2005–2015 (p<0.05), adjusted for sex, age, and race/ethnicity as applicable. Although the table only presents data from the surveys in 2005 and 2015, data from all the surveys for 2005 through 2015 were used in the trend analysis.

§ Excludes 30 (2005) and 63 (2015) respondents of non-Hispanic unknown race. Unless indicated otherwise, all racial/ethnic groups are non-Hispanic; Hispanics can be of any race.

¶ Does not include Native Hawaiians or Other Pacific Islanders.

** Among persons aged ≥25 years. Excludes 339 (2005) and 144 (2015) persons whose educational level was unknown.

†† Family income is reported by the family respondent who might or might not be the same as the sample adult respondent from whom smoking information is collected. 2005 estimates are based on reported family income and 2004 poverty thresholds published by the U.S. Census Bureau, and 2015 estimates are based on reported family income and 2014 poverty thresholds published by the U.S. Census Bureau.

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

¶¶ *Private coverage*: includes adults who had any comprehensive private insurance plan (including health maintenance organizations and preferred provider organizations). *Medicaid*: For adults aged <65 years, includes adults who do not have private coverage, but who have Medicaid or other state-sponsored health plans including Children's Health Insurance Program (CHIP); for adults aged ≥65 years, includes adults aged ≥65 years who do not have any private coverage but have Medicare and Medicaid or other state-sponsored health plans including CHIP. *Medicare only*: includes adults aged ≥65 years who only have Medicare coverage. *Other coverage*: includes adults who do not have private insurance, Medicaid, or other public coverage, but who have any type of military coverage, coverage from other government programs, or Medicare. *Uninsured*: includes adults who have not indicated that they are covered at the time of the interview under private health insurance, Medicare, Medicaid, CHIP, a state-sponsored health plan, other government programs, or military coverage.

*** Disability/limitation was defined based on self-reported presence of selected impairments including vision, hearing, cognition, and movement. Limitations in performing activities of daily living were defined based on response to the question, "Does [person] have difficulty dressing or bathing?" Limitations in performing instrumental activities of daily living were defined based on response to the question, "Because of a physical, mental, or emotional condition, does [person] have difficulty doing errands alone such as visiting a doctor's office or shopping?" Any disability/limitation was defined as a "yes" response pertaining to at least one of the disabilities/limitations listed (i.e., vision, hearing, cognition, movement, activities of daily living, or instrumental activities of daily living). A random sample of half of the respondents from the 2015 Person File were asked about disability/limitation.

††† Questions pertaining to disabilities/limitations and sexual orientation were not included in the 2005 National Health Interview Survey.

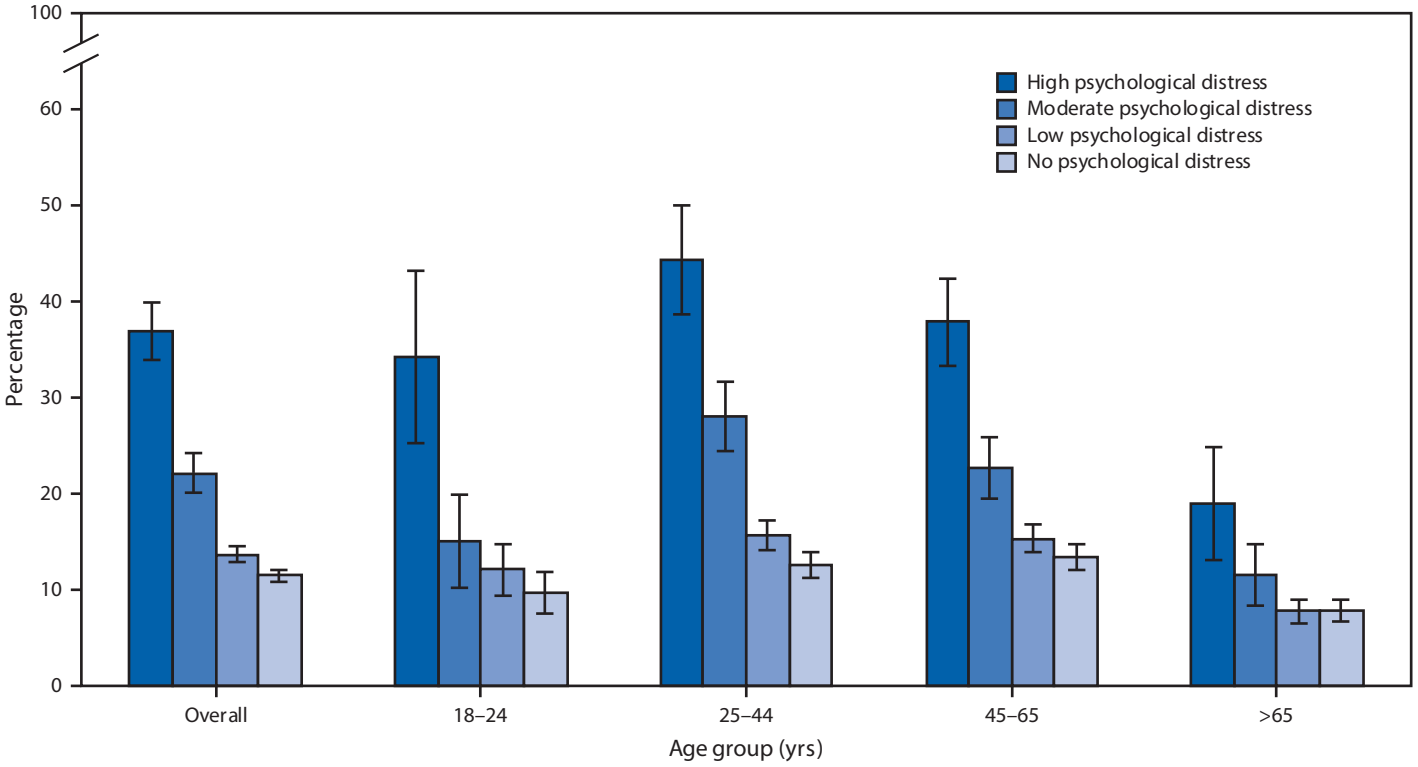
§§§ Response options provided on the National Health Interview Survey were "straight, that is, not gay" for men, and "straight, that is, not gay or lesbian" for women.

¶¶¶ The Kessler psychological distress scale is a series of six questions that ask about feelings of sadness, nervousness, restlessness, worthlessness, and feeling like everything is an effort in the past 30 days. Participants were asked to respond on a Likert Scale ranging between "None of the time" (score = 0) and "All of the time" (score = 4). Responses were summed over the six questions; any person with a score of ≥13 were coded as having serious psychological distress, and respondents with a score <13 were coded as not having serious psychological distress.

South; are insured through Medicaid or are uninsured; have a disability/limitation; are lesbian, gay, or bisexual; or have serious psychological distress. Moreover, after declines during previous years, the mean number of cigarettes smoked per day among daily smokers did not change significantly from 2014 to 2015. The Surgeon General has concluded that the burden of death and disease from tobacco use in the United States is overwhelmingly caused by cigarettes and other combusted tobacco products (*1*). Accordingly, enhanced and sustained implementation of proven population-level interventions, including tobacco price increases, anti-tobacco mass media campaigns, comprehensive smoke-free laws, and enhanced access to help in quitting tobacco use, are critical to reducing smoking-related disease and death in the United States (*3*).

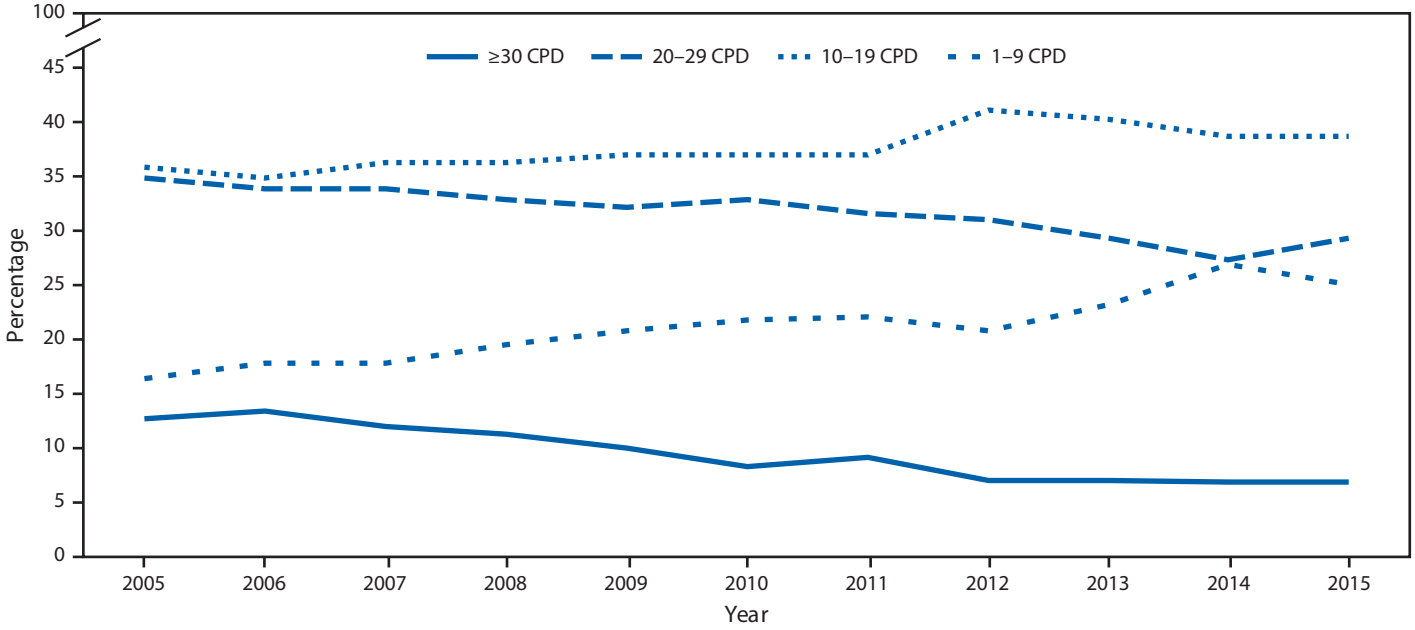
Efforts to address the disparities noted in this report are crucial to further reducing smoking prevalence in the United States (*1*). Differences in smoking by race/ethnicity might be partly explained by sociocultural influences, and disparities by education might be partly attributable to variations in the understanding of the range of health hazards caused by smoking (*4*,*5*). Differences by health insurance coverage might be partly attributable to variations in tobacco cessation coverage and access to evidence-based cessation treatments across insurance types (*6*). Consistent with previous research, smoking prevalence was higher among persons with high or serious psychological distress (*7*,*8*), which could be partly explained by higher levels of addiction and dependence, lack of financial resources, less access to cessation treatments, and stressful living conditions among these persons (*7*,*8*). Many smokers with behavioral health problems would like to quit and are able to quit with assistance (*8*,*9*). Assessing the smoking status of all patients served in psychiatric inpatient and outpatient settings, and integrating evidence-based cessation interventions such as

FIGURE 2. Current cigarette smoking* among adults, by degree of psychological distress† and age group§ — National Health Interview Survey, United States, 2015



* Persons who reported smoking ≥100 cigarettes during their lifetime and who, at the time of interview, reported smoking every day or some days.
† Degree of psychological distress is based on Kessler psychological distress scale (K6), the four-category measure: no psychological distress (score = 0), low psychological distress (score = 1–5), moderate psychological distress (score = 6–10), and high psychological distress (score = 11–24). Error bars represent the 95% confidence interval for each estimate.
§ A significant trend across Kessler scale psychological distress groups ($p<0.05$) was found overall and for all age groups.

FIGURE 3. Percentage of daily smokers* aged ≥18 years, by number of cigarettes smoked per day (CPD) — National Health Interview Survey, United States, 2005–2015



* Persons who reported smoking ≥100 cigarettes during their lifetime and who, at the time of interview, reported smoking every day or some days.

Summary

What is already known about this topic?

Tobacco use is the leading cause of preventable disease and death in the United States, and cigarettes are the most commonly used tobacco product among U.S. adults.

What is added by this report?

The proportion of U.S. adults who smoke cigarettes declined from 20.9% in 2005 (45.1 million smokers) to 15.1% in 2015 (36.5 million smokers), and the proportion of daily smokers declined from 16.9% to 11.4%. However, disparities in cigarette smoking persist; for example, in 2015, cigarette smoking prevalence was higher among persons who have serious psychological distress (40.6%) than among persons without serious psychological distress (14.0%).

What are the implications for public health practice?

Proven population-based interventions, including tobacco price increases, comprehensive smoke-free laws, anti-tobacco mass media campaigns, and barrier-free access to tobacco cessation counseling and medications, are critical to reducing cigarette smoking and smoking-related disease and death among U.S. adults, particularly among subpopulations with the highest smoking prevalence.

counseling and medications into mental health treatment plans could help reduce smoking prevalence in this population (*7*,*8*).

The findings in this report are subject to at least four limitations. First, smoking status was self-reported and was not validated by biochemical testing; however, self-reported smoking status correlates highly with serum cotinine levels (*10*). Second, because NHIS does not include institutionalized populations and persons in the military, results are not generalizable to these groups. Third, the NHIS response rate of 55.2% might have resulted in nonresponse bias. Finally, these estimates might differ from those in other surveys. These differences can be partially explained by varying survey methodologies, types of surveys administered, and definitions of current smoking; however, trends in prevalence are comparable across surveys (*1*).

Sustained comprehensive state tobacco control programs funded at CDC-recommended levels could accelerate progress in reducing adult smoking prevalence and smoking-related disease, death, and economic costs (*3*). However, during 2016, despite combined revenues of $25.8 billion from settlement payments and tobacco taxes in all states, state spending on tobacco control programs is projected to be $468 million (1.8% of revenues),[†††] representing <15% of the CDC-recommended level of funding for all states combined (*3*). Implementation of comprehensive tobacco control interventions can result in substantial reductions in tobacco-related disease and death and billions of dollars in savings from averted medical costs (*1*). In particular, the health care system offers important opportunities to reduce smoking, especially for vulnerable populations, by implementing system changes to make tobacco dependence treatment a standard of care and by working with health insurers to cover evidence-based cessation treatments with minimal barriers and to promote their use (*3*,*6*).

[†††] http://www.tobaccofreekids.org/microsites/statereport2016/.

[1]Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, CDC.

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Vital Signs: Disparities in Tobacco-Related Cancer Incidence and Mortality — United States, 2004–2013

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Abstract

Background: Tobacco use causes at least 12 types of cancer and is the leading preventable cause of cancer.

Methods: Data from the United States Cancer Statistics dataset for 2004–2013 were used to assess incidence and death rates and trends for cancers that can be caused by tobacco use (tobacco-related cancers: oral cavity and pharynx; esophagus; stomach; colon and rectum; liver; pancreas; larynx; lung, bronchus, and trachea; kidney and renal pelvis; urinary bladder; cervix; and acute myeloid leukemia) by sex, age, race, ethnicity, state, county-level poverty and educational attainment, and cancer site.

Results: Each year during 2009–2013, on average, 660,000 persons in the United States received a diagnosis of a tobacco-related cancer, and 343,000 persons died from these cancers. Tobacco-related cancer incidence and death rates were higher among men than women; highest among black men and women; higher in counties with low proportion of college graduates or high level of poverty; lowest in the West; and differed two-fold among states. During 2004–2013, incidence of tobacco-related cancer decreased 1.3% per year and mortality decreased 1.6% per year, with decreases observed across most groups, but not at the same rate.

Conclusions: Tobacco-related cancer declined during 2004–2013. However, the burden remains high, and disparities persist among certain groups with higher rates or slower declines in rates.

Implications for Public Health Practice: The burden of tobacco-related cancers can be reduced through efforts to prevent and control tobacco use and other comprehensive cancer control efforts focused on reducing cancer risk, detecting cancer early, improving cancer treatments, helping more persons survive cancer, and improving cancer survivors' quality of life, and better assisting communities disproportionately impacted by cancer.

Introduction

Tobacco use remains the leading preventable cause of disease and death in the United States, resulting in 480,000 deaths and more than $300 billion in direct health care expenditures and productivity losses each year (*1*). More than 70 carcinogens have been identified in tobacco smoke and 28 in smokeless tobacco products (*2*). Cigarette smoking causes cancers throughout the body, including cancers of the oral cavity and pharynx; esophagus; stomach; colon and rectum; liver; pancreas; larynx; lung, bronchus, and trachea; kidney and renal pelvis; urinary bladder; and cervix, as well as acute myeloid leukemia (*1,2*). Additionally, the use of smokeless tobacco (snuff and chewing tobacco) causes cancers of the oral cavity, pancreas and esophagus (*2,3*), cigar use causes cancers of the oral cavity, pharynx, esophagus, larynx, and lung (*4*), and secondhand smoke exposure causes lung cancer (*2,5*).

Data compiled for the United States Cancer Statistics (USCS) dataset were used to summarize disparities in incidence and death rates and trends during 2004–2013 for cancers that can be caused by tobacco use (tobacco-related cancers). In this report, tobacco-related cancers were defined as those classified by the U.S. Surgeon General as causally related to cigarette smoking (*1*); those classified also encompass cancers related to other tobacco products (*2–4*). Trends in all-cancer, lung cancer, and tobacco-related cancer death rates were also examined for 1970–2014.

Methods

The USCS dataset is a compilation of data from multiple sources and is used to report the official federal cancer statistics through the USCS web-based report (*6*). The USCS dataset includes cancer incidence data from the CDC's National Program of Cancer Registries (NPCR) and the National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) program and cancer mortality data from the National Vital Statistics System (NVSS) (*6*). Data on new cases of cancer diagnosed during 2004–2013 were obtained from population-based cancer registries affiliated with NPCR

Key Points

- Tobacco use causes at least 12 types of cancer.
- Thirty percent of cancer deaths are caused by cigarette smoking.
- Tobacco-related cancer incidence rates decreased significantly in 44 states.
- Disparities in tobacco-related cancer persist among certain groups with higher rates or slower declines in rates.
- Additional information is available at http://www.cdc.gov/vitalsigns.

and SEER programs in each state, the District of Columbia (DC), and Puerto Rico. Data from Puerto Rico met USCS publication criteria for 2009–2013, and data from DC and all states except Nevada met USCS publication criteria for 2004–2013; consequently, incidence data in this report cover 99% of the U.S. population.* Cancer site for cases was classified by anatomic site and histology.† Only cases of invasive cancer were included, except for urinary bladder cancer, which also included *in situ* tumors.

Data on cancer deaths during 1970–2014 were based on death certificate information reported to state vital statistics offices and compiled into a national file through NVSS. The underlying cause of death was selected according to the version of the *International Classification of Diseases (ICD)* codes and selection rules in use at the time of death (*ICD-6* to *ICD-10*) and categorized according to SEER site groups to maximize comparability with ICD for Oncology (*ICD-O*) classifications.§

Population estimates for rate denominators were annual race-, ethnicity-, and sex-specific county population estimates from the U.S. Census, as modified by NCI and aggregated to the state and national level.¶ Average annual incidence and death rates for 2004–2008 and 2009–2013 per 100,000 persons were age-adjusted to the 2000 U.S. standard population; in this analysis, death rates were limited to data through 2013, the most recent year for which incidence data were available. Annual percentage change (APC) was used to quantify changes in rates from 2004–2013 and was calculated using least squares regression. Rates and trends were estimated by sex, age, race, ethnicity, U.S. Census region, quartiles of county-level educational attainment (percentage of persons aged ≥25 years with at least a bachelor's degree), quartiles of county-level poverty (percentage of persons living below poverty threshold), and county-level rural/urban continuum.** State-specific age-adjusted tobacco-related cancer incidence rates and APCs were mapped using quartiles as cut points. Cancer deaths attributable to cigarette smoking among adults aged ≥35 years were based on recent estimates of smoking-attributable fractions (*7*). Annual age-adjusted rates for all-cancer, lung cancer, and tobacco-related cancer deaths were examined for 1970–2014. The number of tobacco-related cancer deaths averted was estimated by subtracting the actual number of deaths each year through 2014 from the number expected if tobacco-related cancer death rates had remained at the peak levels (during 1990, among men, and 1995, among women).

Results

During 2009–2013 approximately 660,000 persons received a diagnosis of a tobacco-related cancer each year in the United States, and 343,000 persons died from these cancers (Table 1). Tobacco-related invasive cancer incidence declined 1.3% per year, from 206 cases per 100,000 during 2004–2008 to 193 per 100,000 during 2009–2013. Tobacco-related cancer mortality declined 1.6% per year from 108 deaths per 100,000 during 2004–2008 to 100 per 100,000 during 2009–2013.

The tobacco-related cancer incidence rate was 1.7 times higher among males (250 per 100,000) than among females (148 per 100,000), as was the death rate (131 per 100,000 males vs. 76 per 100,000 females). Both incidence and death rates of tobacco-related cancer decreased faster during 2004–2013 among males (-1.5% and -1.8%) than among females (-1.2% and -1.4%).

Tobacco-related cancer incidence and death rates increased with age, and one third of cases and two fifths of deaths occurred among persons aged ≥75 years (Table 1). Tobacco-related cancer incidence and death rates were highest, but decreased fastest, among blacks compared with other racial/ethnic groups. Tobacco-related cancer incidence and death rates were highest, and incidence decreased slowest, in counties with lowest educational attainment or highest poverty, and were lowest, and decreased fastest, in metropolitan areas with ≥1 million population.

* Cancer registries demonstrated that cancer incidence data were of high quality by meeting the six USCS publication criteria: 1) case ascertainment ≥90% complete; 2) ≤5% of cases ascertained solely on the basis of death certificate; 3) ≤3% of cases missing information on sex; 4) ≤3% of cases missing information on age; 5) ≤5% of cases missing information on race; and 6) ≥97% of registry's records passed a set of single-field and inter-field computerized edits that test the validity and logic of data components. http://www.cdc.gov/cancer/npcr/uscs/index.htm.

† Cases were first classified by anatomic site using the International Classification of Diseases (ICD) for Oncology (ICD-O), Third Edition (http://codes.iarc.fr/) then cases with hematopoietic histologies were classified using the World Health Organization Classification of Tumours of Haematopoietic and Lymphoid Tissues, Fourth Edition (http://www.bloodjournal.org/content/117/19/5019?sso-checked=true#T1).

§ http://seer.cancer.gov/codrecode.

¶ Population estimates incorporate bridged single-race estimates derived from the original multiple race categories in the 2010 U.S. Census. http://seer.cancer.gov/popdata/index.html.

** The county attribute variables were calculated using the Census American Community Survey 5-year (2009–2013) files. http://seer.cancer.gov/seerstat/variables/countyattribs/#09-13.

TABLE 1. Average annual number of tobacco-related invasive cancer cases and deaths,* annual age-adjusted rate,† and annual percentage change (APC) between rates,§ by selected characteristics — United States,¶ 2004–2008 and 2009–2013

	Cases					Deaths				
	2004–2008		2009–2013			2004–2008		2009–2013		
Characteristic	Rate	No.	Rate	No.	APC	Rate	No.	Rate	No.	APC
Total	**206.4**	**633,278**	**193.1**	**658,581**	**-1.3§**	**108.2**	**333,567**	**100.0**	**343,347**	**-1.6§**
Sex										
Male	269.6	364,639	249.7	383,201	-1.5§	142.9	189,596	130.5	196,784	-1.8§
Female	158.0	268,640	148.4	275,380	-1.2§	82.3	143,971	76.4	146,563	-1.4§
Age group (yrs)										
<35	6.2	8,654	6.4	9,348	0.7§	1.3	1,789	1.2	1,820	-0.6§
35–44	51.5	22,162	50.4	20,531	-0.4§	14.9	6,501	13.0	5,355	-2.6§
45–54	175.3	75,551	170.7	77,150	-0.6§	67.8	29,488	62.8	28,738	-1.6§
55–64	433.8	136,361	404.2	151,794	-1.3§	199.7	63,293	183.8	69,727	-1.6§
65–74	901.9	171,985	824.9	184,891	-1.7§	466.3	89,453	417.7	94,015	-2.1§
≥75	1,225.6	218,565	1,144.6	214,867	-1.3§	792.3	143,043	748.3	143,692	-1.1§
Race**										
White	205.9	543,141	193.0	557,346	-1.2§	107.3	286,575	99.7	292,714	-1.4§
Black	221.7	66,733	205.2	72,218	-1.6§	130.4	37,838	116.5	39,509	-2.2§
American Indian/Alaska Native	150.6	3,212	139.8	3,890	-1.4§	80.0	1,581	71.6	1,841	-1.9§
Asian/Pacific Islander	145.0	16,156	134.2	19,477	-1.5§	71.6	7,573	66.8	9,283	-1.4§
Ethnicity										
Hispanic	163.3	36,747	150.3	43,730	-1.6§	71.5	14,972	66.8	18,204	-1.4§
Non-Hispanic	210.3	581,545	197.7	599,163	-1.2§	110.9	318,088	102.7	324,470	-1.5§
County-level educational attainment (percentage of persons aged ≥25 years with at least a bachelor's degree)††										
34.69%–74.39%	198.2	140,291	181.7	145,209	-1.7§	99.3	58,519	89.7	74,021	—§§
28.75%–34.68%	198.8	140,424	185.1	145,638	-1.4§	101.8	58,323	94.1	74,606	—
20.83%–28.74%	212.6	157,270	199.4	164,076	-1.2§	110.5	70,125	103.2	90,486	—
3.23%–20.82%	216.1	179,282	205.7	186,600	-0.9§	117.0	80,768	111.2	104,235	—
County-level poverty (percentage of persons who live in poverty)										
9.2%–11.54%	202.1	146,185	186.7	153,065	-1.5§	100.8	60,973	92.2	78,357	—
11.55%–15.34%	205.4	153,910	192.0	159,632	-1.3§	105.2	68,389	98.0	87,889	—
15.35%–18.32%	206.6	156,529	192.8	162,009	-1.3§	108.7	67,698	101.2	86,622	—
18.33%–53.16%	213.0	160,642	201.9	166,818	-1.0§	115.9	70,675	109.0	90,480	—
County-level rural/urban continuum										
Metropolitan, population ≥1 million	204.4	311,592	189.4	323,403	-1.5§	104.7	131,873	96.1	168,357	—
Metropolitan, population <1 million	207.1	194,452	194.3	203,475	-1.2§	108.2	84,269	100.9	108,876	—
Urban	214.4	98,761	205.0	101,885	-0.8§	115.5	45,667	110.1	58,404	—
Rural	209.3	12,463	201.8	12,760	-0.7§	112.4	5,926	110.7	7,710	—
U.S. Census region¶¶										
Northeast	215.7	131,576	201.5	131,725	-1.3§	106.3	65,395	97.6	64,511	-1.7§
Midwest	212.6	149,132	200.8	152,986	-1.1§	112.3	79,019	105.0	80,416	-1.3§
South	210.8	237,525	197.2	251,349	-1.3§	113.8	127,087	105.0	133,044	-1.6§
West	182.6	115,045	170.3	122,521	-1.4§	96.1	62,067	88.3	65,376	-1.7§

* Tobacco-related cancers include cancers of the oral cavity and pharynx; esophagus; stomach; colon and rectum; liver; pancreas; larynx; lung, bronchus, and trachea; cervix; kidney and renal pelvis; urinary bladder; and acute myeloid leukemia.

† Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.

§ Trends were measured with annual percentage change (APC) in rates and were considered to increase or decrease if $p<0.05$; otherwise trends were considered stable. Trends marked with § were significant at $p<0.05$.

¶ Cancer cases were compiled from cancer registries that meet the data quality criteria for all invasive cancer sites combined (covering approximately 99% of the U.S. population). Cancer deaths are from the National Vital Statistics System; mortality data are available through 2014 but are shown through 2013 for comparability with incidence data for which the most recently available data are from 2013.

** Racial categories are not mutually exclusive from Hispanic ethnicity. Rates are not presented for patients with unknown or other race or unknown ethnicity. Incidence rates by ethnicity exclude data from Virginia because a large percentage of these cases were missing information on ethnicity.

†† Death rates for county-level characteristics are for the period 2005–2008 rather than 2004–2008.

§§ The APC for death rates could not be calculated for county-level characteristics.

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

By region, tobacco-related cancer incidence and death rates were lowest in the West and decreased most slowly in the Midwest (Table 1). Incidence rates of tobacco-related cancer ranged two-fold among states with available data, from 248 per 100,000 persons in Kentucky to 130 per 100,000 (Utah) and 126 per 100,000 (Puerto Rico) (Figure 1). The incidence of tobacco-related cancer decreased significantly in 44 states with available data (-0.4% to -2.4%), and did not change significantly in five states and DC (Figure 1).

By cancer site, incidence and death rates were highest for lung cancer, which accounted for about one third of tobacco-related cancer cases and almost one half of tobacco-related cancer deaths (Table 2). For each cancer site (except cervix), incidence and death rates were higher among males than females. In 2009–2013, approximately 101,300 men and 65,700 women died of cigarette smoking-attributable cancers each year. Lung cancer caused most of these deaths and had the highest cigarette smoking-attributable fraction (80%).

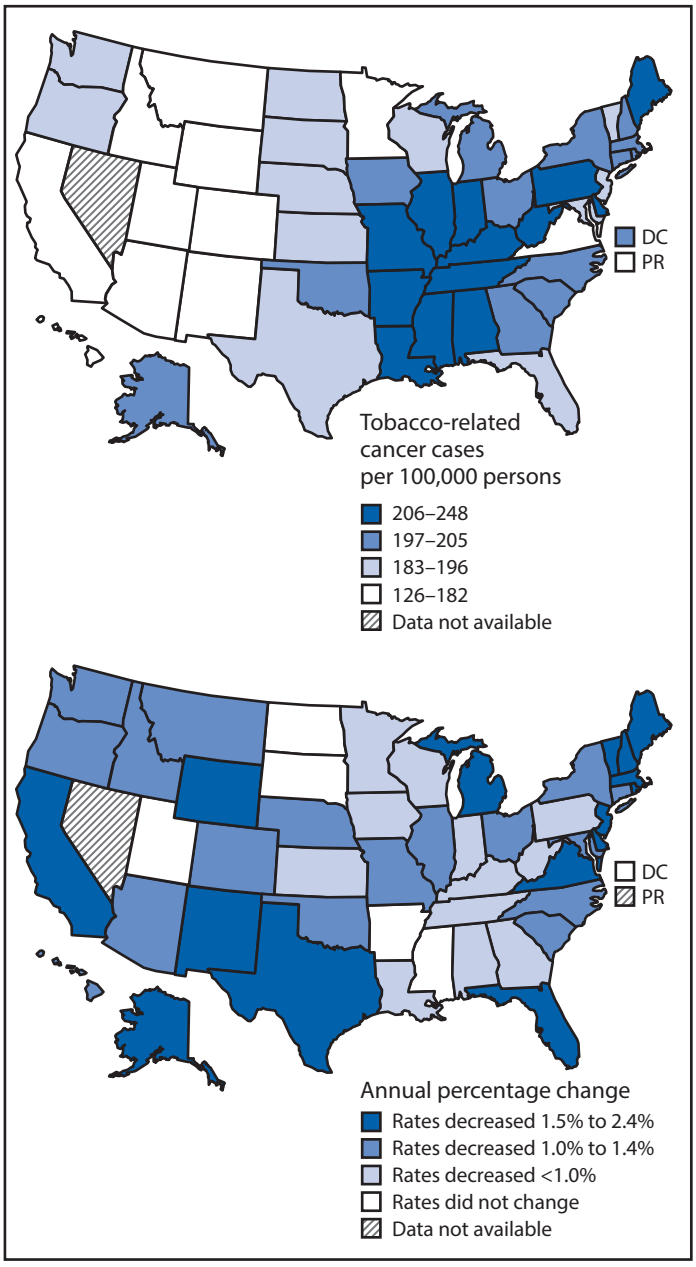
All cancer death rates peaked in 1990 among males and in 1991 among females (Figure 2). About 60% of the decrease in all cancer death rates among males was due to decreases in tobacco-related cancers, which also peaked in 1990. Among females, tobacco-related cancer death rates began to decline in 1995 and accounted for 40% of the decrease in all cancer death rates. Due to reductions in tobacco-related cancers, approximately 1,025,000 tobacco-related cancer deaths were averted among men since 1990, and 242,000 among women since 1995.

Conclusions and Comments

Tobacco-related cancer death rates in the United States have been declining since 1990 among men and since 1995 among women and continued to decline through 2014. These declines reflect the implementation of evidence-based tobacco prevention and control interventions, along with improvements in cancer prevention, detection, and treatment (*8*). Since tobacco-related cancer death rates began to decline, approximately 1.3 million tobacco-related cancer deaths have been averted. However, too many preventable tobacco-related cancer cases and deaths still are occurring. This analysis found that during 2009–2013, cigarette smoking caused 167,000 cancer deaths each year, about 30% of the 577,000 cancer deaths each year (*6*). Most of these deaths were from lung cancer, the leading cause of cancer deaths for both men and women (*6*). Furthermore, exposure to secondhand smoke could account for an additional 7,300 lung cancer deaths among nonsmokers (*1*).

At least half of persons who continue to smoke are expected to die from a tobacco-related disease, although tobacco cessation significantly decreases this risk (*9*). Therefore, among the 36.5 million people in the United States who currently smoke cigarettes (*10*), about 18.25 million might die prematurely from a tobacco-related disease, including 6 million from cancer, unless stategies are implemented to help them quit. Many tobacco-related cancers could be prevented by reducing tobacco use through sustained, comprehensive, evidence-based tobacco

FIGURE 1. Annual age-adjusted rate* of tobacco-related cancer† cases (2009–2013) and trends§ in rates (2004–2013), by state — National Program of Cancer Registries, and Surveillance, Epidemiology, and End Results Program, United States



* Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.
† Tobacco-related cancers include oral cavity and pharynx; esophagus; stomach; colon and rectum; liver; pancreas; larynx; lung, bronchus, and trachea; cervix; kidney and renal pelvis; urinary bladder; and acute myeloid leukemia.
§ Trends were measured with annual percentage change in rates and were considered to increase or decrease if $p<0.05$; otherwise, trends were considered stable.

TABLE 2. Average annual number of tobacco-related invasive cancer cases and deaths, annual age-adjusted rate,* and number and smoking-attributable fraction (SAF) of deaths among adults aged ≥35 years,† by cancer site — United States, 2009–2013§

	Cases					Deaths					Estimated cancer deaths attributable to cigarette smoking among adults aged ≥35 yrs					
	Males		Females		Total	Males		Females		Total	Males		Females		Total	
Cancer site	Rate	No.	Rate	No.	%	Rate	No.	Rate	No.	%	SAF	No.	SAF	No.	SAF	No.
Oral cavity and pharynx	17.1	27,944	6.3	11,636	6	3.8	5,980	1.3	2,585	2	49	2,900	43	1,100	47	4,000
Esophagus	8.1	12,747	1.8	3,432	2	7.4	11,477	1.5	2,959	4	52	6,000	44	1,300	51	7,300
Stomach	9.2	13,957	4.6	8,573	3	4.5	6,663	2.4	4,549	3	26	1,700	11	500	20	2,200
Colon and rectum	46.8	71,485	35.5	66,486	21	18.1	26,956	12.7	24,845	15	11	3,000	8	2,000	10	5,000
Liver	10.8	17,983	3.2	6,082	4	7.4	12,104	2.3	4,524	5	28	3,400	14	600	24	4,000
Pancreas	14.1	21,516	10.9	20,769	6	12.5	19,004	9.5	18,526	11	10	1,900	14	2,600	12	4,500
Larynx	6.2	9,923	1.4	2,575	2	1.9	2,937	0.4	752	1	72	2,100	93	700	77	2,800
Lung, bronchus, and trachea	74.7	113,223	53.4	99,895	32	57.9	87,032	37.1	70,566	46	83	72,300	76	53,800	80	126,100
Cervix uteri	NA	NA	7.6	12,299	2	NA	NA	2.3	4,046	1	NA	0	22	900	22	900
Kidney and renal pelvis	21.7	34,147	11.3	20,569	8	5.7	8,626	2.5	4,814	4	22	1,900	7	300	17	2,200
Urinary bladder	36.1	52,876	8.9	16,959	11	7.7	10,649	2.2	4,341	4	47	4,900	41	1,800	45	6,700
Acute myeloid leukemia	5.0	7,400	3.4	6,105	2	3.7	5,355	2.2	4,057	3	23	1,200	3	100	15	1,300
All tobacco-related cancers	**249.7**	**383,201**	**148.4**	**275,380**	**100**	**130.5**	**196,784**	**76.4**	**146,563**	**100**	**52**	**101,300**	**45**	**65,700**	**49**	**167,000**

Abbreviations: NA = not applicable.

* Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.

† Estimates for SAF were based on Siegel RL, Jacobs EJ, Newton CC, et al. Deaths due to cigarette smoking for 12 smoking-related cancers in the United States. JAMA Int Med 2015;175:1574–6.

§ Cancer cases were compiled from cancer registries that meet the data quality criteria for all invasive cancer sites combined (covering approximately 99% of the U.S. population). Cancer deaths are from the National Vital Statistics System; mortality data are available through 2014 but are shown through 2013 for comparability with incidence data for which the most recently available data are from 2013.

prevention and control interventions (*8*). These interventions include increased tobacco product prices, implementation and enforcement of comprehensive smoke-free laws, aggressive mass media campaigns, and promotion of smoking cessation resources proven to help users quit tobacco use (*11*). States that have invested more fully in tobacco prevention and control programs generally have experienced larger declines in youth and adult smoking prevalence, decreases in lung cancer, and reduced tobacco-related health care costs (*11*). A recent report found that smoking-attributable cancer mortality varied by state from 17% to 34% and suggested that disparities in cancer deaths among states can be explained in part by differences in smoking prevalence (*12*). In this report, tobacco-related cancers declined across most demographic groups, but not at the same pace, and not in all states. Funding state tobacco control programs at CDC-recommended levels can accelerate progress toward reducing tobacco-related cancers (*11*).

Although many factors might contribute to tobacco-related cancer disparities, they generally align with disparities in cigarette smoking prevalence by sex, geography, and socioeconomic status (*10*). Identifying and eliminating tobacco-related disparities is a goal of CDC's National Tobacco Control Program, which provides funding and technical support to state and territorial health departments.†† CDC also funds the Consortium of National Networks to Impact Populations Experiencing Tobacco-Related and Cancer Health Disparities, which seeks to advance tobacco use prevention and cancer prevention among persons at highest risk for tobacco use.§§

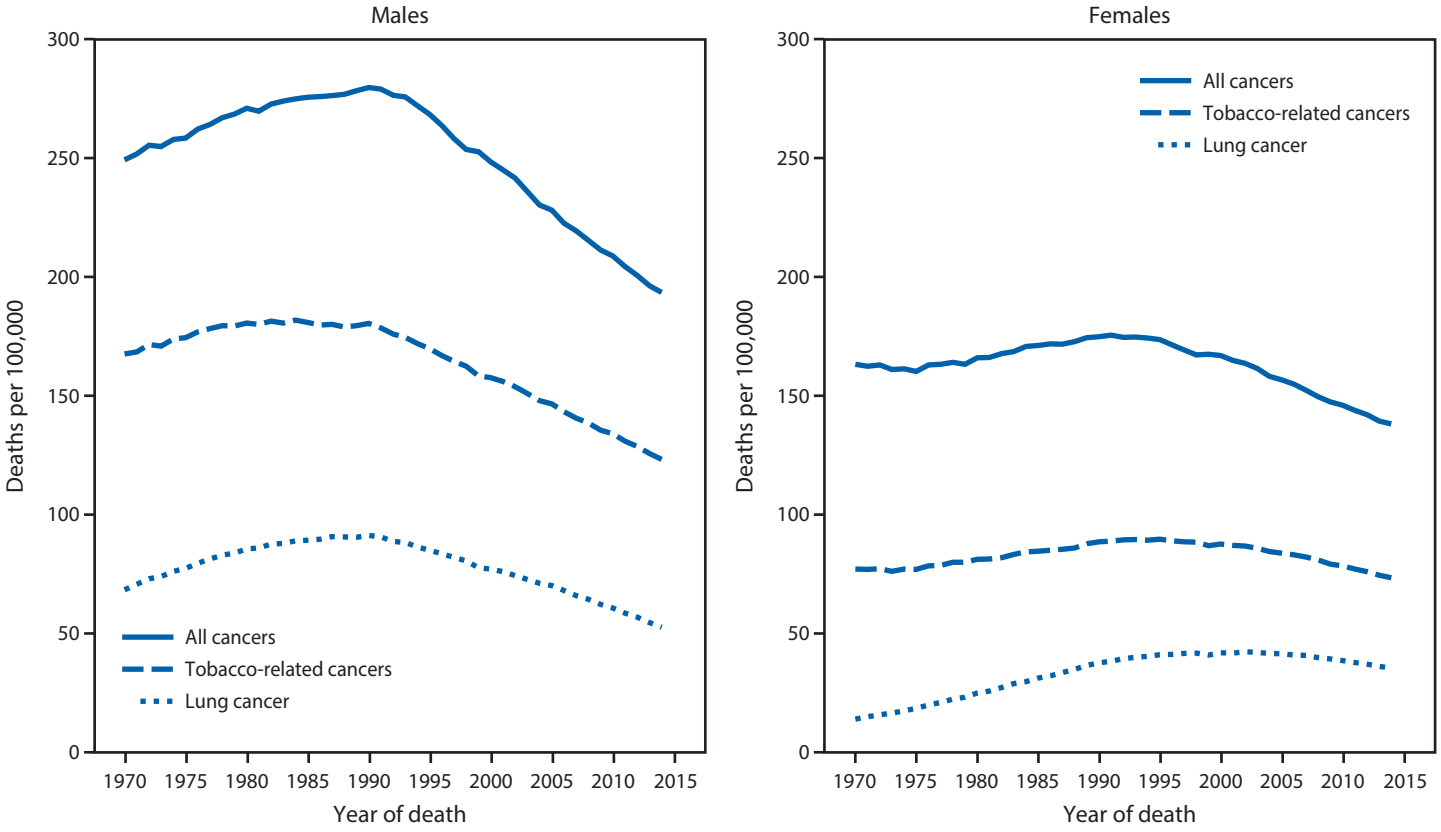
Preventive services recommended by the U.S. Preventive Services Task Force relevant to tobacco-related cancers include tobacco cessation counseling and treatment as well as screening for cervical, colorectal, and lung cancers to help detect these diseases at an early, and often treatable, stage.¶¶ Screening also can detect precancerous cervical lesions and precancerous colorectal polyps which can be treated to prevent progression to cancer. Vaccination against hepatitis B virus and human papillomavirus, as recommended by the Advisory Committee for Immunization Practices, could prevent some cancers (liver and cervix) to which both tobacco and infectious agents can

†† http://www.cdc.gov/tobacco/stateandcommunity/tobacco_control_programs/ntcp/index.htm.

§§ http://www.cdc.gov/cancer/ncccp/dp13-1314.htm.

¶¶ https://www.uspreventiveservicestaskforce.org/Page/Name/recommendations.

FIGURE 2. Trends in age-adjusted death rates* from all cancers combined, all tobacco-related cancers,† and lung cancer, by sex — National Vital Statistics System, United States, 1970–2014



* Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.
† Tobacco-related cancers include oral cavity and pharynx; esophagus; stomach; colon and rectum; liver; pancreas; larynx; lung, bronchus, and trachea; cervix; kidney and renal pelvis; urinary bladder; and acute myeloid leukemia.

contribute.*** The Affordable Care Act increased access to recommended preventive services through expanded insurance coverage and eliminating cost-sharing; however, coverage and barriers to treatment vary by type of insurance and state (*13*,*14*). CDC's National Comprehensive Cancer Control Program funds states, DC, tribes and territories to work through state and local level cancer coalitions to ensure access to these early detection and treatment services, implement evidence-based programs to prevent cancer, and support cancer survivorship activities.†††

Federal initiatives can help reduce tobacco use and tobacco-related cancers. For example, a 1997 Executive Order established a smoke-free environment for federal employees and members of the public visiting or using federal facilities by prohibiting smoking of tobacco products in all interior space owned, rented, or leased by the executive branch of the Federal Government.§§§ A key priority of the Cancer Moonshot, a recently launched large-scale federal initiative, is to accelerate understanding of cancer and promote its prevention.¶¶¶ To help inform the Moonshot initiative, the Blue Ribbon Panel, a working group of the National Cancer Advisory Board, recommended implementation research to achieve wider adoption of existing evidence-based tobacco control, cancer prevention, and screening programs, especially to reach groups with the largest cancer disparities.****

The findings in this report are subject to at least five limitations. First, rates among some racial and ethnic groups might be underestimated because race and ethnicity data are ascertained from medical records and death certificates and might be subject to misclassification (*15*). Second, while the most recent Surgeon General's Report was used to define tobacco-related cancers, this might underestimate the true burden because evidence is still accumulating that tobacco use might cause additional cancers (*1*). The burden also might be underestimated because this report did not include the contribution of

*** http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hpv.html and http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hepb.html.
††† http://www.cdc.gov/cancer/ncccp/index.htm.
§§§ https://www.archives.gov/federal-register/executive-orders/1997.html.
¶¶¶ https://www.whitehouse.gov/CancerMoonshot.
**** https://www.cancer.gov/research/key-initiatives/moonshot-cancer-initiative.

tobacco use to adverse health outcomes among cancer patients such as poorer response to cancer treatment, higher treatment-related toxicity, higher risks of developing subsequent cancers, and higher risk of dying (*1*). Third, the smoking-attributable fraction for cancer deaths was based only on cigarette smoking and did not include harms related to other forms of tobacco use or secondhand smoke (*3*–*5*). Fourth, because information about tobacco use is not routinely collected by cancer registries or on death certificates, cancer cases and deaths included in this analysis might or might not be in persons who used tobacco. Fifth, cancers can be caused by many different factors, including tobacco use; therefore, the number of cases and trends in tobacco-related cancers might also be affected by changes in other risk factors, screening, or treatment.

Incidence and mortality from tobacco-related cancer declined during 2004–2013, continuing a longer-term trend. Comprehensive cancer control efforts, including evidence-based tobacco control interventions, can reduce tobacco use and the burden of cancer in the United States.

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Morbidity and Mortality Weekly Report

Incidence of Zika Virus Disease by Age and Sex — Puerto Rico, November 1, 2015–October 20, 2016

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Zika virus is a flavivirus transmitted primarily by *Aedes* species mosquitoes; symptoms of infection include rash, arthralgia, fever, and conjunctivitis.[*,†] Zika virus infection during pregnancy can cause microcephaly and other serious brain anomalies (*1*), and in rare cases, Zika virus infection has been associated with Guillain-Barré syndrome (*2*) and severe thrombocytopenia (*3*). This report describes the incidence of reported symptomatic Zika virus disease in the U.S. territory of Puerto Rico by age and sex. During November 1, 2015–October 20, 2016, 62,500 suspected Zika virus disease cases were reported to the Puerto Rico Department of Health (PRDH); 29,345 (47%) were confirmed by reverse transcription–polymerase chain reaction (RT-PCR) testing, or were presumptively diagnosed based on serological testing. The highest incidence among confirmed or presumptive cases occurred among persons aged 20–29 years (1,150 cases per 100,000 residents). Among 28,219 (96.2%) nonpregnant patients with confirmed or presumptive Zika virus disease, incidence was higher among women (936 per 100,000 population) than men (576 per 100,000) for all age groups ≥20 years, and the majority (61%) of reported Zika virus disease cases occurred in females. Among suspected Zika virus disease cases in nonpregnant adults aged ≥40 years, the percentage that tested positive among females (52%) was higher than that among males (47%) ($p<0.01$). Reasons for the higher incidence of Zika virus disease among women aged ≥20 years are not known; serosurveys of persons living near confirmed Zika virus disease cases might help to elucidate these findings. Residents of and travelers to Puerto Rico should remove or cover standing water, practice mosquito abatement, employ mosquito bite avoidance behaviors, take precautions to reduce the risk for sexual transmission, and seek medical care for any acute illness with rash or fever.

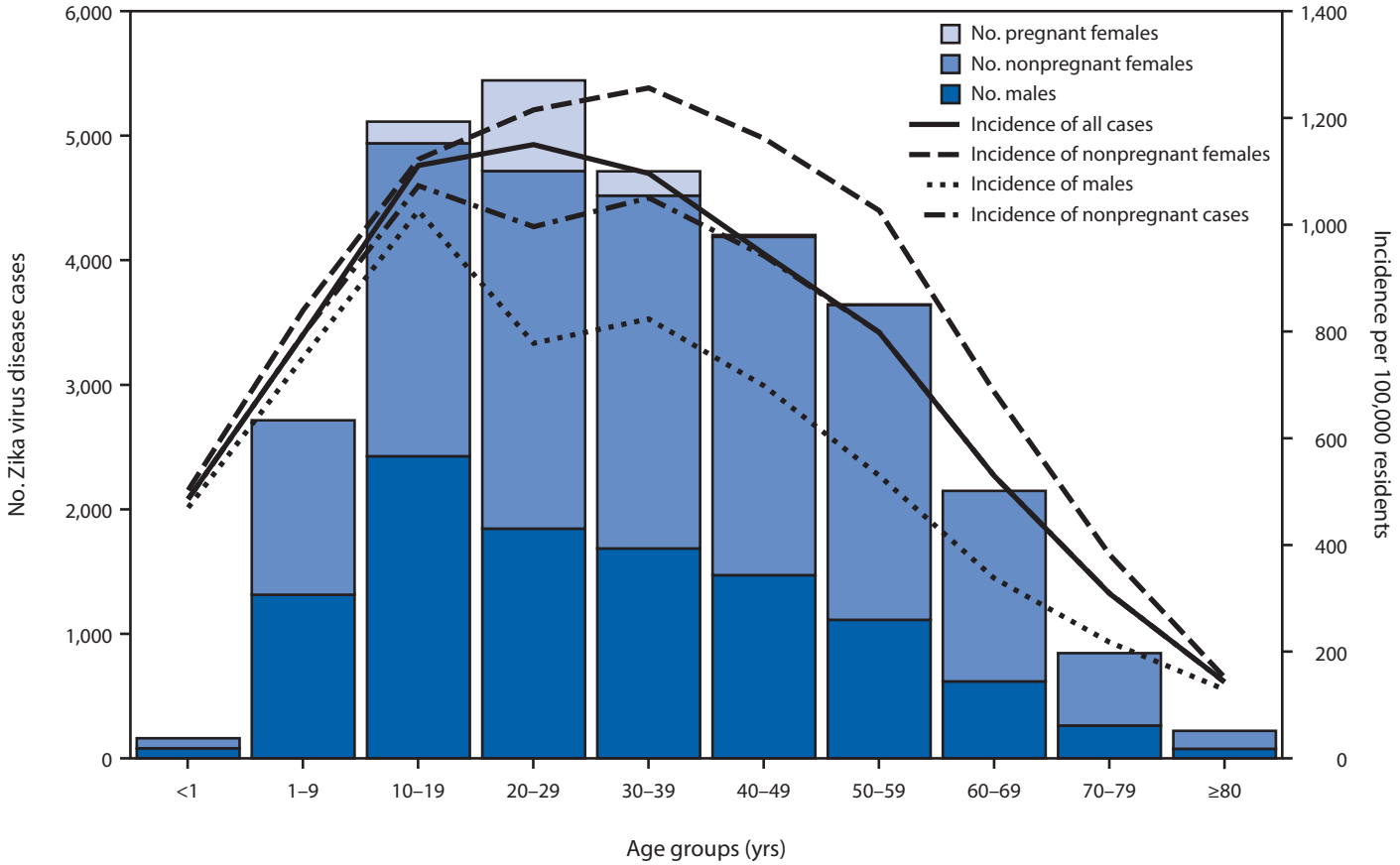
Epidemiologic surveillance for Zika virus disease in Puerto Rico includes completion of the arboviral case investigation form that records demographic data and symptoms,[§] and submission of clinical specimens for diagnostic testing of all persons with one or more signs or symptoms compatible with Zika virus disease for evidence of Zika, dengue, and chikungunya virus infection, using the Trioplex RT-PCR[¶] or immunoglobulin M (IgM) capture enzyme-linked immunosorbent assay (MAC-ELISA)[**] tests (*4*). A suspected case of Zika virus disease is defined as a symptomatic illness with at least one arboviral disease-like symptom (e.g., rash, arthralgia, or fever) in a patient seen at a health care facility, from whom a clinical specimen was collected, and which was reported to PRDH. A presumptive case is defined as a positive Zika virus result by MAC-ELISA and a negative dengue virus IgM ELISA. A confirmed case of Zika virus disease is defined as a positive RT-PCR result for Zika virus from a suspected case. Puerto Rico population estimates from 2015 were used to calculate incidence of Zika virus disease.[††]

During November 1, 2015–October 20, 2016, specimens from 62,500 patients with suspected Zika virus disease were evaluated by RT-PCR and/or MAC-ELISA; 28,341 (45%) were confirmed and 1,004 (2%) presumptive cases were identified. Among confirmed and presumptive Zika virus disease cases, 1,117 (4%) were in pregnant women. Among all confirmed and presumptive Zika virus disease cases, the median age was 32 years (range = 16 days–100 years) and 18,384 (63%) were female.

The overall estimated incidence of confirmed and presumptive Zika virus disease was 844 cases per 100,000 residents. The highest incidences were in persons aged 20–29 years (1,150 cases per 100,000 residents), and 10–19 years (1,111 per 100,000) (Figure 1) when pregnant women were included. When Zika virus-infected pregnant women, who might be more likely to seek health care and be tested for suspected Zika virus disease than women in the general population, were excluded, incidence of Zika virus disease among all persons was 812 per 100,000; 17,267 (61%) of persons with confirmed or presumptive Zika virus disease were female. Incidence among males and nonpregnant females aged 1–9 years was 795 per 100,000, and increased with age, peaking at 1,073 per 100,000 among persons aged 10–19 years. Among males, the

[*] http://www.cdc.gov/zika.
[†] http://www.salud.gov.pr/Sobre-tu-Salud/Pages/Condiciones/Zika.aspx.
[§] http://www.salud.gov.pr/Estadisticas-Registros-y-Publicaciones.
[¶] http://www.fda.gov/downloads/MedicalDevices/Safety/EmergencySituations/UCM491592.pdf.
[**] http://www.fda.gov/downloads/MedicalDevices/Safety/EmergencySituations/UCM488044.pdf.
[††] http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF.

FIGURE 1. Age group, sex, and incidence of laboratory-positive Zika virus disease cases (n = 29,345)* — Puerto Rico, November 1, 2015–October 20, 2016



* Sex was not reported for 9 cases; age or date of birth was not reported for 125 cases.

highest incidence was in persons aged 10–19 years (1,026 per 100,000) and declined as age increased. Although incidence in nonpregnant females aged 10–19 (1,123 per 100,000) was similar to that in males of the same age, incidence in females continued to increase with age and peaked among women aged 30–39 years (1,256 per 100,000). Incidence decreased among women in older age groups, but remained well above the incidence for males (Figure 1).

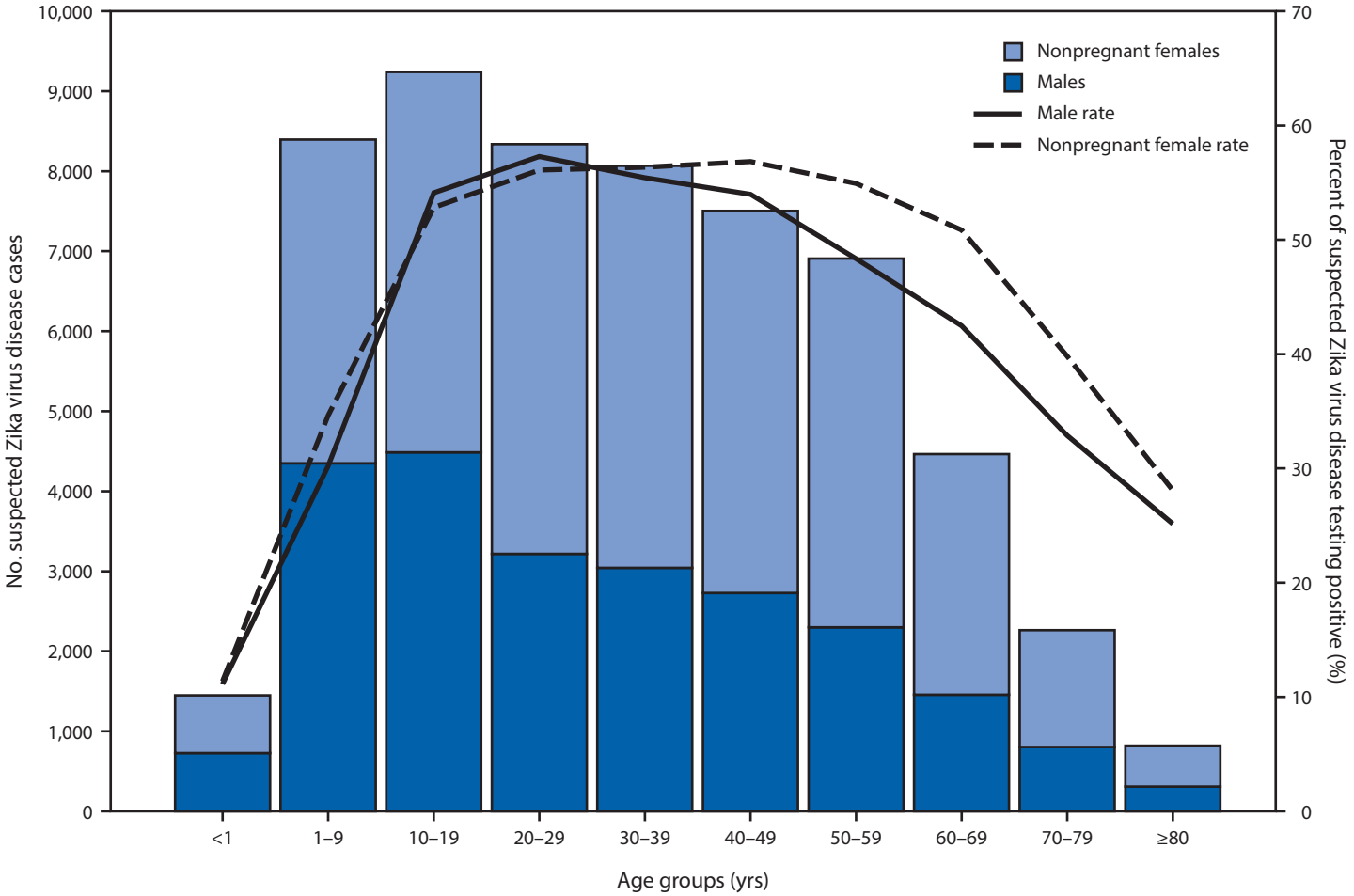
Among all cases of Zika virus disease in nonpregnant persons, 61% were in females; in all age groups females accounted for the majority of cases. The proportion of female Zika virus disease cases was significantly higher than the proportion of females in the general population in Puerto Rico for all age groups except infants and persons aged ≥80 years.

To account for potential differences in who sought medical care and reporting of a suspected case, the percentage of suspected Zika virus disease cases among nonpregnant persons that tested positive for Zika virus infection was compared by sex and age group. Among suspected cases reported to PRDH, the proportion of cases in males and females who tested positive was not significantly different among infants and persons aged 10–39 years (Figure 2). However, the proportion of suspected cases in persons who tested positive was significantly higher among females than males aged 1–9 years and ≥40 years. Among suspected cases in persons aged ≥40 years, the largest difference in the proportion of persons testing positive for Zika virus disease between females and males was among persons aged 60–69 years; in this age group, among suspected cases, 51% of females and 42% of males tested positive ($p<0.001$).

Discussion

Puerto Rico's database of Zika virus disease cases includes the largest number of laboratory-confirmed cases in the world. The findings of the age and sex distribution of Zika virus disease cases in Puerto Rico reported in this analysis are consistent with patterns observed among suspected cases in other countries, and notably, differs from the patterns observed during previous outbreaks of other arbovirus diseases in Puerto Rico. Whereas cases of dengue in 2010 (*5*) and chikungunya in 2014 (*6*) were approximately equally distributed among men and women in Puerto Rico, more than 60% of nonpregnant Zika virus disease cases occurred in women. This disparity was most

FIGURE 2. Number of reported suspected Zika virus disease cases among males and nonpregnant females, and percent that tested positive for Zika virus by age group and sex (n=57,727)* — Puerto Rico, November 1, 2015–October 20, 2016



* Sex was not reported for 33 cases; age or date of birth was not reported for 251 cases.

prominent among women aged ≥20 years. In addition, among suspected cases, a higher proportion of females aged ≥40 years tested positive for Zika virus infection than did males of the same age. It is not known why Zika virus disease incidence is higher among women aged ≥20 years.

Similar observations have been made in Bahia state (Brazil) and El Salvador, where, overall, the reported incidence of clinically suspected Zika virus disease cases was 75% higher in females than in males (*7*). In addition, rates of probable Zika virus disease cases in Bahia state and El Salvador were highest in women aged 20–49 years (*7*), the same age group most highly affected in Puerto Rico. During the 2007 Zika virus disease outbreak in Yap State, Micronesia, the attack rate among confirmed cases was highest among persons aged 30–39 years, and the overall attack rate for persons seeking care was higher among women than among men (*8*). Similar to Puerto Rico, 61% of confirmed or probable Zika virus infections in Yap occurred among females (*8*). The skewing of the distribution of Zika virus disease cases toward women in Brazil was postulated to be because of more exposure to *Aedes* mosquitoes in the home, more severe symptoms among women in certain age groups, differences in health care–seeking behavior, reporting biases by health care workers, and sexual transmission (*7,9*). Although male-to-female and female-to-male (*10*) sexual transmission has been documented, data from Rio de Janeiro suggest that differences in infection rates between men and women might be explained by male-to-female sexual transmission (*9*). The same explanations might be responsible for the observed trends in Puerto Rico. The relative contribution of sexual transmission of Zika virus to rates of Zika virus disease is only beginning to be explored, including relative risk of developing disease in men and women, and through sexual transmission versus mosquito-borne transmission.

Potential explanations for the higher reported incidence of Zika virus disease in nonpregnant women than men aged ≥20 years include possible differences in the rates of infection,

Summary

What is already known about this topic?

Zika virus has been circulating in Puerto Rico since November 2015. Previous reports from Brazil and El Salvador have demonstrated higher rates of infection in females, and suggested that Zika virus disease incidence is higher among persons aged 20–49 years.

What is added by this report?

Among 28,219 nonpregnant persons with laboratory evidence of Zika virus disease identified in Puerto Rico during November 1, 2015–October 20, 2016, incidence was highest among women aged 20–49 years. Women aged 40–79 years with suspected cases were more likely to test positive for Zika virus infection than those in males in the same age group.

What are the implications for public health practice?

Serosurveys are needed to identify the rates of Zika virus infection among males and females of all ages in Puerto Rico to determine whether observed differential disease rates reflects differential rates of infection, development of disease, or seeking medical care. Accurate information on disease burden will enable identification of populations most affected to target health messaging and interventions. Residents of and travelers to Puerto Rico should remove or cover standing water, employ mosquito bite avoidance behaviors, take precautions to reduce the risk for sexual transmission, and seek medical care for any acute illness with rash or fever.

differences in who sought care following symptomatic infection, and susceptibility to development of disease after infection. These differences might be explained by conducting serosurveys to estimate the rate of Zika virus infection among all age groups, and associating the relative frequencies by which infected persons report symptoms, seek medical care, and are reported as suspected cases. CDC and PRDH are currently conducting serosurveys among persons living near confirmed Zika virus disease cases to help answer these questions.

The findings of this report are subject to at least three limitations. First, incidence rates could be skewed by health care–seeking bias, because women are more likely to seek medical care.[§§] Second, women of childbearing age might have been more likely to seek care because a Zika virus infection during pregnancy can cause microcephaly and other serious brain anomalies. In an effort to remove these biases, the percentage of suspected Zika virus disease cases among nonpregnant persons that tested positive for Zika virus infection were calculated and found to be higher among women than among men. Finally, underreporting of suspected Zika virus disease cases to PRDH could result in these data not accurately reflecting the actual distribution of Zika virus disease in Puerto Rico.

This investigation revealed that Zika virus infections occur in males and females in all age groups in Puerto Rico. To reduce the risk for infection, all residents of and travelers to Puerto Rico should remove or cover standing water and employ mosquito bite avoidance behaviors, including using mosquito repellents, wearing long-sleeved shirts and pants, and ensure that homes are properly enclosed (e.g., screening windows and doors, closing windows, and using air conditioning). To reduce the risk for sexual transmission, especially to pregnant women, sexual partners who reside in or traveled to Puerto Rico should abstain from sex, or use condoms consistently and correctly each time they have sex.[¶¶] Women and their partners who want to delay or avoid pregnancy in the context of the Zika outbreak should work with a health care provider to find a birth control method that is safe and effective.[***] Such measures can also help avoid unintended pregnancies and reduce the risk for congenitally acquired Zika virus infection. Clinicians who suspect Zika virus disease in patients who reside in or have recently returned from areas with ongoing Zika virus transmission should work with their state and local health authorities to test patients for Zika virus infection. Additional information is available at http://www.cdc.gov/zika/index.html.

[§§] http://jid.oxfordjournals.org/content/210/4/535.full.pdf+html.

[¶¶] http://www.cdc.gov/zika/prevention/protect-yourself-during-sex.html.
[***] http://www.cdc.gov/zika/pregnancy/women-and-their-partners.html.

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Epilepsy Among Iraq and Afghanistan War Veterans — United States, 2002–2015

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The age-adjusted prevalence of seizure disorder in United States veterans deployed in Iraq and Afghanistan conflicts (IAV) is 6.1 per 1,000 persons (*1*), compared with 7.1 to 10 per 1,000 persons in the general population (*2*,*3*). Persons with epilepsy are at risk of excess mortality in part because of comorbidity (*4*). Although patterns of comorbidity have been associated with mortality in IAV (*5*), the unique contribution of epilepsy to excess mortality in IAV is unknown. A cohort study was developed using inpatient, outpatient, and pharmacy data from the U.S. Department of Veterans Affairs, Veterans Health Administration (VA) to identify epilepsy, demographic characteristics, and baseline comorbidity for IAV who received VA care in 2010 and 2011. The VA's vital status records were used to identify 5-year mortality (2011–2015). The unadjusted Kaplan-Meier estimator and adjusted proportional hazards regression models tested the hypothesis that excess mortality is associated with epilepsy. IAV with epilepsy were more likely than those without epilepsy to have mental and physical comorbidity, and significantly higher mortality, even after controlling for demographic characteristics and other comorbid conditions (adjusted hazard ratio = 2.6; 95% confidence interval [CI] 2.1–3.2). IAV with epilepsy could benefit from evidence-based chronic disease self–management programs to reduce physical and psychiatric comorbidity, and linkages to VA clinical and other community health and social service providers.

The cohort study included IAV who received VA care in both 2010 and 2011. Each IAV included in the cohort had one or more inpatient or outpatient visits in both years to ensure that they were active VA users, and that adequate data would be available to identify epilepsy and assess comorbidity. VA national health system data from inpatient, outpatient, and pharmacy records (2002–2011) identified IAV with and without epilepsy, and provided demographic characteristics and comorbidity data. Data from VA vital status records from 2011–2015 were used to identify persons who died and date of death.

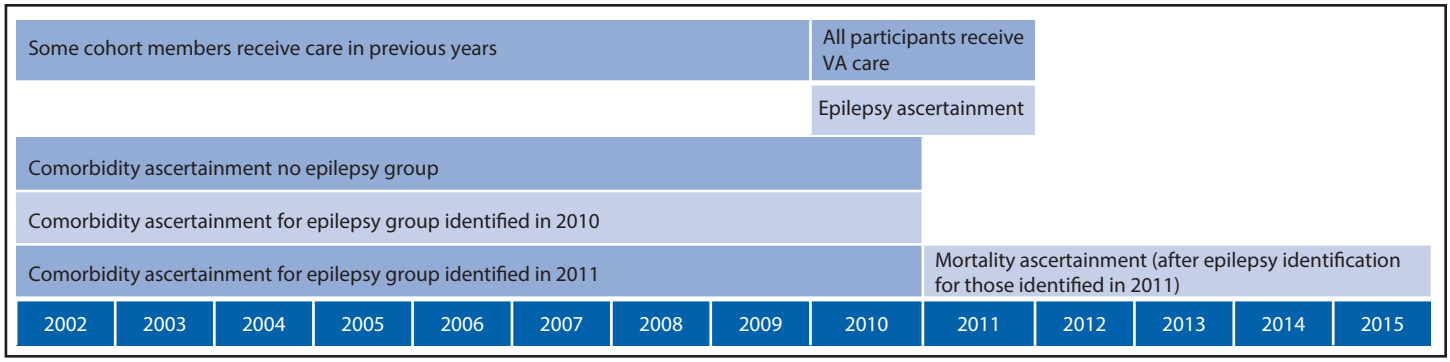
IAV with epilepsy were defined as having a diagnosis indicative of epilepsy during 2010–2011 using diagnosis codes (International Classification of Diseases, 9th Revision, Clinical Modification [ICD-9-CM]) and records of prescriptions for seizure medications (*1*). IAV with one or more diagnoses of epilepsy (ICD-9-CM 345), or two or more diagnoses of seizure not otherwise specified (ICD-9-CM 780.39), and a concomitant prescription for antiseizure medications* in 2011, met the epilepsy criteria for this study. IAV who met epilepsy criteria in 2010, but who did not receive antiseizure medications in 2011 were excluded from the study. The positive predictive value using this algorithm among IAV with epilepsy was 95% in a recent unpublished medical chart abstraction. IAV who did not meet the epilepsy study criteria formed the no epilepsy group.

Baseline demographic data (i.e., age, sex, race/ethnicity, poverty) and comorbidities were compiled from all available data for IAV with epilepsy before meeting epilepsy criteria, and for IAV without epilepsy through 2010. Sixteen comorbid conditions of interest included either those associated with epilepsy in the literature, or those that might have a strong association with mortality. Algorithms to ascertain comorbid conditions in administrative data required one inpatient diagnosis, or two outpatient diagnoses at least 7 days apart (*6*), except in cases of acute conditions such as traumatic brain injury, suicidality, and overdose in which a single diagnosis sufficed. VA vital status files provided information on the primary study outcome, the occurrence of death, and the date of death. The follow-up period to the study was January 2011–December 2015 (or the date of meeting epilepsy criteria for those who first met epilepsy criteria in 2011), or until the date of death. Complete outcome data were available for this cohort because information for veterans who have received VA care or benefits is documented in the vital status data set regardless of whether they remain in VA care. (Figure 1)

Chi-square statistics were used to compare IAV with epilepsy to IAV without epilepsy on baseline demographic characteristics, comorbid conditions, and mortality. First, analyses determined that there was no evidence of non-proportional hazards. Cumulative mortality curves were then calculated to determine if 5-year mortality in the epilepsy group differed from that in the no epilepsy group. The unadjusted Kaplan-Meier estimator and proportional hazards regression models adjusted for demographic characteristics and comorbid conditions were used to calculate hazard ratios. Statistically significant differences between groups were identified using a two-tailed significance level ($p<0.01$).

* Based on results of iterative medical chart abstraction, individuals whose only seizure medication was either gabapentin or pregabalin were included only if they also had an ICD-9-CM 345 diagnosis; this selective inclusion was used in order to minimize false-positive cases because gabapentin and pregabalin are sometimes used for pain management, or for other indications.

FIGURE 1. Cohort ascertainment timeline for Iraq and Afghanistan war veterans, by epilepsy status* — Veterans Health Administration (VA), United States, 2002–2015



* Comorbidity is noted until the date of epilepsy identification.

TABLE. Baseline demographic characteristics and comorbidity for Iraq and Afghanistan war veterans by epilepsy status — Veterans Health Administration, 2002–2011

	Cohort (N=320,583)	
	Epilepsy (n = 2,187)	No epilepsy (n = 318,396)
Characteristic	(%)	(%)
Age group (yrs)*		
18–29	(36)	(35)
30–39	(40)	(32)
40–49	(18)	(22)
50–59	(6)	(9)
>60+	(1)	(2)
Sex		
Male	(89)	(87)
Female	(11)	(13)
Race/Ethnicity*		
White	(72)	(66)
African American	(14)	(18)
Hispanic	(10)	(12)
Asian	(2)	(3)
Native American/Pacific Islander	(2)	(1)
Unknown	(1)	(1)
Poverty*†		
Yes	(97)	(84)
No	(3)	(15)
Unclassified	(0)	(1)
Baseline comorbidity*		
Post-traumatic stress disorder	(66)	(37)
Depression	(58)	(30)
Traumatic brain injury	(48)	(13)
Substance use disorder	(33)	(15)
Hypertension	(25)	(18)
Obesity	(20)	(16)
Bipolar disorder	(17)	(5)
Suicidality	(12)	(3)
Cerebrovascular disease	(9)	(1)
Cardiac disease	(6)	(2)
Diabetes	(4)	(3)
Cancer (non-skin cancer)	(4)	(1)
Overdose	(3)	(<1)
Liver disease	(2)	(1)
Schizophrenia	(2)	(1)
Kidney disease	(1)	(<1)
5-year mortality*	**(5)**	**(1)**

* Comparisons were based on chi-square statistics comparing epilepsy and no epilepsy groups with statistically significant differences (p<0.01).
† Poverty is defined using the Means Test variable, a proxy that identifies persons with documented income levels below a poverty threshold based on income, family composition, and geographic location. Individuals below this threshold are not required to pay copayments for care.

Summary

What is already known about this topic?

Although seizure disorders are associated with traumatic brain injury, little information exists regarding comorbidities and mortality in veterans with epilepsy who were deployed in the Iraq and Afghanistan conflicts.

What is added by this report?

U.S. veterans with epilepsy who were deployed in the Iraq and Afghanistan conflicts were more likely than those without epilepsy to have mental and physical comorbidity, and were 2.6 times more likely to die during 2011–2015, even after controlling for demographic characteristics and other conditions associated with death.

What are the implications for public health practice?

Veterans with epilepsy who were deployed in the Iraq and Afghanistan conflicts could benefit from evidence-based chronic disease self-management programs to reduce physical and psychiatric comorbidity, and linkages to U.S. Department of Veteran Affairs clinical health care providers and other community health and social service providers.

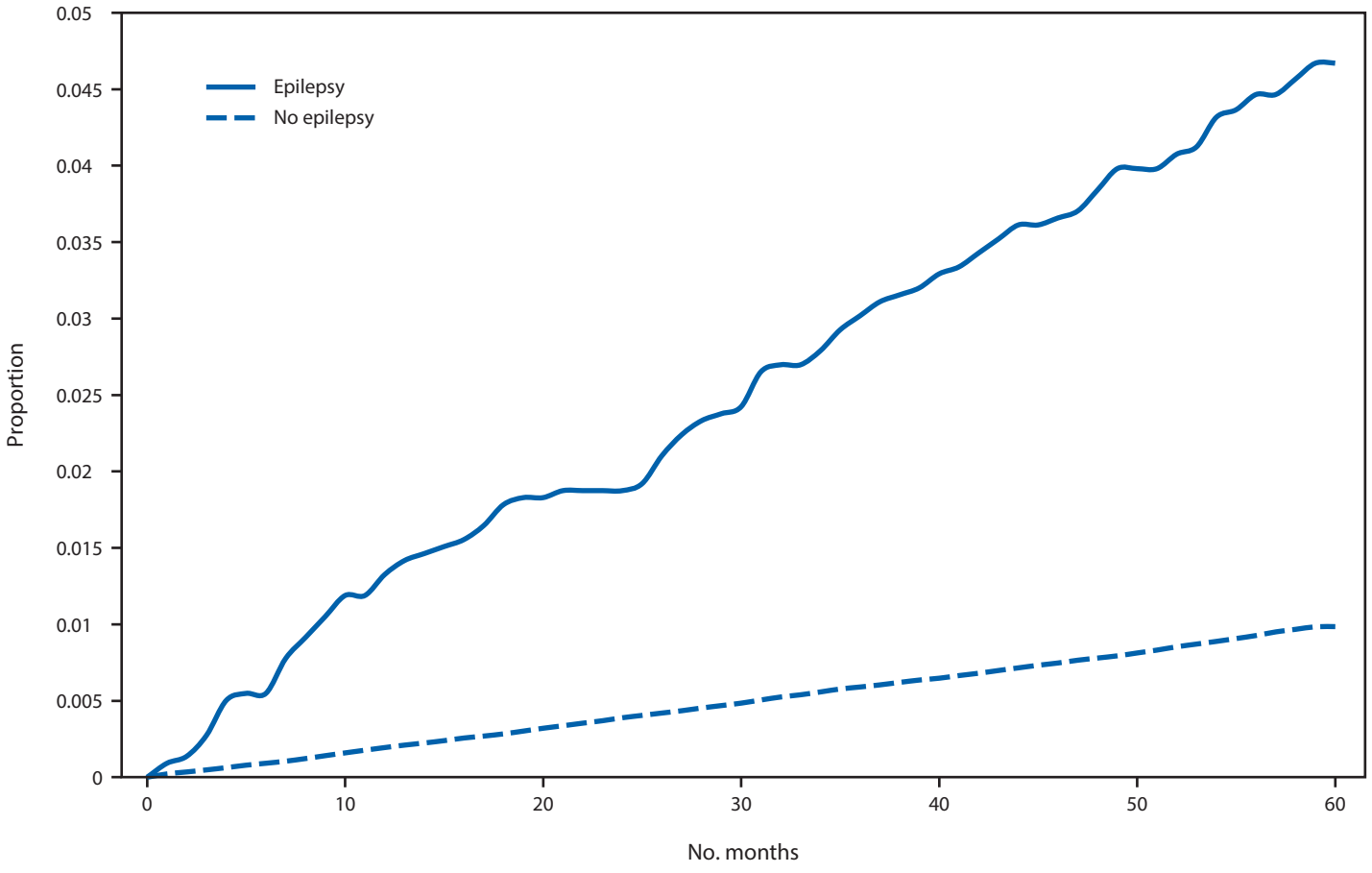
Among 320,583 IAV who received VA care in 2010 and 2011, 2,187 (0.7%) met the epilepsy criteria. IAV with epilepsy were more likely to be white and aged <40 years (Table). IAV with epilepsy were more likely than those without epilepsy to have each of the examined 16 comorbid conditions (Table). Approximately five times more IAV with epilepsy (4.6% [n = 101]) had died by the end of follow-up than those without epilepsy (1.0% [n = 3,136]) (Figure 2); unadjusted hazard ratio = 4.8; CI = 3.9–5.9. After controlling for demographic characteristics and comorbid conditions mortality was more likely among IAV with epilepsy than those without (adjusted hazard ratio = 2.6; CI = 2.1–3.2) (Table).

Discussion

This is the first study examining mortality in veterans with epilepsy who were deployed in the Iraq and Afghanistan wars. Because epilepsy typically results in persons being excluded from military service,[†] epilepsy usually develops in veterans during or after military

[†] U.S. Department of Defense physical standards preclude enlistment of those under treatment for seizure disorders and require a 5-year period without any seizures or treatment for seizures prior to enlistment per Department of Defense Instruction 6130.4.

FIGURE 2. Unadjusted cumulative mortality estimates of Iraq and Afghanistan war veterans during the 60-month follow-up period after initial provider visit, by epilepsy status — Veterans Health Administration, United States, 2011–2015



service, accounting for the lower age-adjusted prevalence of epilepsy in IAV (*2*,*3*). However, as with civilians with epilepsy (*4*,*7*), IAV with epilepsy had significantly higher mortality, even after controlling for demographic characteristics and comorbidity.

In the general population, mortality in those with epilepsy is higher among persons with psychiatric and physical comorbidity (*8*), and the most common causes of death include cancer, cardiovascular disease, cerebrovascular disease, and pneumonia (*9*). Moreover, patients with persistent seizures and diagnoses of symptomatic or cryptogenic epilepsies[§] have the largest excess mortality (*4*). The study data did not include information on the cause of death, the persistence of seizures, or the diagnostic type of seizures; however, cancer, cardiovascular disease, and cerebrovascular disease were more prevalent in IAV with epilepsy, putting them at higher risk for mortality. Even after controlling for these comorbidities, epilepsy was significantly associated with mortality. Consistent with other studies, excess mortality in veterans with epilepsy might be associated with both epilepsy (e.g., poorly controlled seizures, sudden unexpected death in epilepsy) and other individual or environmental factors (e.g., depression, high risk behaviors, and social isolation).

The findings in this report are subject to several limitations. First, veterans who were not treated in VA facilities during the study period were excluded, limiting generalizability to all veterans. Among the nearly 1.9 million IAV, approximately 61% are enrolled in VA health care.[¶] Second, the data did not account for epilepsy care received outside the VA, which might underestimate epilepsy-associated burden in the study sample. Third, comparison of epilepsy prevalence between veterans with epilepsy and the general U.S. population should be interpreted with caution because these groups differ demographically, and epilepsy ascertainment criteria differ. Finally, some IAV with psychogenic nonepileptic seizures and diagnosed with epilepsy, or misclassified as having epilepsy, could have been included in the analysis; however, identifying these persons based on administrative data is not possible (*1*).

Health care providers should strive to ensure that veterans with epilepsy receive appropriate treatment to maximize seizure control. The VA implemented the Epilepsy Centers of Excellence, a hub-and-spoke model of care, to increase access to comprehensive, multidisciplinary epilepsy specialty care in response to the risk for epilepsy in the IAV population with traumatic brain injury. However, a significantly higher prevalence of comorbidities in this population suggests that closer integration of primary care, epilepsy specialty care, and mental health care might be needed to reduce excess mortality. For veterans with epilepsy, public health agencies, including the VA, can implement evidence-based chronic disease self-management programs and supports that target physical and psychiatric comorbidity (*10*), study long-term outcomes, including cause of death, and ensure linkages to appropriate VA clinical and community health care and social service providers.

[§] Epilepsy is considered symptomatic if there is a known cause such as stroke, brain tumor, or head injury, and cryptogenic if the cause of epilepsy is unknown despite conducting tests to identify the cause.

[¶] Analysis of VA Health Care Utilization among Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn Veterans, from 1st quarter of Fiscal Year 2002 through the 2nd quarter of Fiscal Year 2015. http://www.publichealth.va.gov/docs/epidemiology/healthcare-utilization-report-fy2015-qtr2.pdf.

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Progress Toward Regional Measles Elimination — Worldwide, 2000–2015

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Adopted in 2000, United Nations Millennium Development Goal 4 set a target to reduce child mortality by two thirds by 2015, with measles vaccination coverage as one of the progress indicators. In 2010, the World Health Assembly (WHA) set three milestones for measles control by 2015: 1) increase routine coverage with the first dose of measles-containing vaccine (MCV1) for children aged 1 year to ≥90% nationally and ≥80% in every district; 2) reduce global annual measles incidence to <5 cases per 1 million population; and 3) reduce global measles mortality by 95% from the 2000 estimate (*1*,*2*).* In 2012, WHA endorsed the Global Vaccine Action Plan† with the objective to eliminate measles in four World Health Organization (WHO) regions by 2015. Countries in all six WHO regions have adopted measles elimination goals. Measles elimination is the absence of endemic measles transmission in a region or other defined geographical area for ≥12 months in the presence of a well performing surveillance system. This report updates a previous report (*3*) and describes progress toward global measles control milestones and regional measles elimination goals during 2000–2015. During this period, annual reported measles incidence decreased 75%, from 146 to 36 cases per 1 million persons, and annual estimated measles deaths decreased 79%, from 651,600 to 134,200. However, none of the 2015 milestones or elimination goals were met. Countries and their partners need to act urgently to secure political commitment, raise the visibility of measles, increase vaccination coverage, strengthen surveillance, and mitigate the threat of decreasing resources for immunization once polio eradication is achieved.

Immunization Activities

To estimate coverage with MCV1 and the second dose of measles-containing vaccine (MCV2) through routine immunization services,§ WHO and the United Nations Children's Fund (UNICEF) use data from administrative records and surveys reported annually by 194 countries. During 2000–2015, estimated MCV1 coverage increased globally from 72% to 85%, although coverage has not increased since 2009. The number of countries with ≥90% MCV1 coverage increased from 84 (44%) in 2000 to 129 (66%) in 2012, but then declined to 119 (61%) in 2015. Since 2003, countries also have reported the number of districts with ≥80% MCV1 coverage. Among countries with ≥90% MCV1 coverage nationally, the percentage with ≥80% MCV1 coverage reported in all districts increased from 2% of countries (one of 43) in 2003 to 44% (57 of 129) in 2012 and then declined to 39% (47 of 119) in 2015. Among the estimated 20.8 million infants who did not receive MCV1 through routine immunization services in 2015, approximately 11 million (53%) were in six countries: India (3.2 million), Nigeria (3 million), Pakistan (2 million), Indonesia (1.5 million), Ethiopia (0.7 million), and the Democratic Republic of the Congo (0.6 million).

During 2000–2015, the number of countries providing MCV2 nationally through routine immunization services increased from 97 (51%) to 160 (82%), with six countries (Angola, Malawi, Mozambique, Nepal, Sierra Leone, and Zimbabwe) introducing MCV2 in 2015. Estimated global MCV2 coverage increased from 15% in 2000 to 61% in 2015. During 2015, approximately 184 million persons received MCV during mass immunization campaigns known as supplementary immunization activities (SIAs)¶ implemented in 41 countries, with 32 (78%) providing one or more additional child health interventions during the SIA (Table 1). Based on doses administered, SIA coverage was ≥95% in 21 (51%) countries; however, among the four countries conducting post-SIA coverage surveys, only one estimated coverage at ≥95%.

* The coverage milestone is to be met by every country, whereas the incidence and mortality reduction milestones are to be met globally.

† The Global Vaccine Action Plan is the implementation plan of the Decade of Vaccines, a collaboration between WHO, UNICEF, the Bill and Melinda Gates Foundation, the National Institute of Allergy and Infectious Diseases, the African Leaders Malaria Alliance, Gavi, the Vaccine Alliance, and others to extend the full benefit of immunization to all persons by 2020 and beyond. In addition to 2015 targets, it also set a target for measles and rubella elimination in five of the six WHO regions by 2020. http://www.who.int/immunization/global_vaccine_action_plan/en and http://apps.who.int/gb/ebwha/pdf_files/wha65/a65_22-en.pdf.

§ For MCV1, among children aged 1 year or, if MCV1 is given at age ≥1 year, among children aged 24 months. For MCV2, among children at the recommended age of administration of MCV2, per the national immunization schedule. WHO/UNICEF estimates of national immunization coverage are available at http://www.who.int/immunization/monitoring_surveillance/data/en.

¶ Supplemental immunization activities (SIAs) generally are carried out using two target age ranges. An initial, nationwide catch-up SIA focuses on all children aged 9 months–14 years, with the goal of eliminating susceptibility to measles in the general population. Periodic follow-up SIAs then focus on all children born since the last SIA. Follow-up SIAs generally are conducted nationwide every 2–4 years and focus on children aged 9–59 months; their goal is to eliminate any measles susceptibility that has developed in recent birth cohorts and to protect children who did not respond to MCV1.

Disease Incidence

Countries report the number of measles cases[**,††] from either case-based[§§] or aggregate surveillance systems to WHO and UNICEF annually. In 2015, 189 (97%)[¶¶] countries conducted case-based surveillance in at least part of the country, and 191 (98%)[***] had access to standardized quality-controlled testing through the WHO Global Measles and Rubella Laboratory Network. However, surveillance is weak in many countries, and 43% did not achieve the sensitivity indicator of reporting ≥2 discarded measles[†††] cases per 100,000 population

During 2000–2015, the number of measles cases reported annually worldwide decreased 70%, from 853,479 to 254,928, and measles incidence decreased 75%, from 146 to 36 cases per 1 million population (Table 2). During 2013–2015, incidence declined from 40 to 36 per 1 million, although fewer countries reported case data in 2015 (169) than did in 2013 (176).[§§§] The percentage of reporting countries with an incidence of <5 cases per 1 million increased from 38% (64 of 169) in 2000

** http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tsincidencemeasles.html.

†† Measles cases are defined differently in different countries. Some countries define measles cases as those that are laboratory-confirmed or epidemiologically confirmed; others define measles cases as those that are laboratory-confirmed, epidemiologically confirmed, or clinically compatible. Laboratory-confirmed cases are suspected measles cases with specimens with detectable measles virus-specific immunoglobulin class M (IgM) antibodies, or specimens from which measles virus can be isolated or measles virus genome can be detected in appropriate clinical specimens by a proficient laboratory. Epidemiologically linked confirmed measles cases are suspected measles cases that have not been confirmed by a laboratory but are geographically and temporally related to a laboratory-confirmed case or, in the event of a chain of transmission, to another epidemiologically confirmed measles case, with dates of rash onset between cases occurring 7–21 days apart. Clinically compatible measles cases are suspected measles cases with fever and maculopapular rash and cough, coryza, or conjunctivitis, for which no adequate clinical specimen was collected and which have not been linked epidemiologically to a laboratory-confirmed case of measles or to a laboratory-confirmed case of another communicable disease.

§§ A case-based surveillance system is defined as one that collects information about each case at the individual level; in the case of measles, effective case-based surveillance includes confirmatory laboratory testing.

¶¶ Countries without case-based measles surveillance in 2015 were Mauritius, Sao Tome and Principe, Seychelles, and Somalia.

*** Countries without access to standardized quality-controlled testing by the WHO Measles and Rubella Laboratory Network in 2015 were Cape Verde, Sao Tome and Principe, and Seychelles.

††† A discarded case is defined as a suspected case that has been investigated and discarded as nonmeasles using 1) laboratory testing in a proficient laboratory or 2) epidemiological linkage to a laboratory-confirmed outbreak of a communicable disease that is not measles. The discarded case rate is used to measure the sensitivity of measles surveillance.

§§§ Countries not reporting in 2013 were Cuba (AMR); Bahrain, Libya, and the United Arab Emirates (EMR); Austria, Bosnia and Herzegovina, Italy, Malta, Monaco, San Marino, and Ukraine (EUR); and Brunei Darussalam, Cook Islands, Fiji, the Marshall Islands, Nauru, Samoa, and Tuvalu (WPR). In 2015, member states not reporting were Mauritius (AFR); El Salvador and the United States of America (AMR); Libya (EMR); Albania, Andorra, Finland, Greece, Monaco, Montenegro, Netherlands, Poland, Portugal, and San Marino (EUR); Indonesia (SEAR); and Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Singapore, Tonga, and Tuvalu (WPR). Delays in reporting could affect 2015 data.

TABLE 1. Measles supplementary immunization activities (SIAs)* and the delivery of other child health interventions, by World Health Organization (WHO) region and country — worldwide, 2015

WHO region/ Country	Age group targeted	Extent of SIA	Children reached in targeted age group		Coverage survey results (%)	Other interventions delivered
			No.	(%)†		
African						
Benin	9 m–9 y	N	408,511	102		
Burundi	18–23 m	N	22,650	8		Vitamin A, deworming, micronutrient supplementation
Cameroon	9 m–14 y	N	9,229,739	98		Rubella vaccine
Eritrea	9–59 m	N	350,765	80		
Guinea-Bissau	9–59 m	N	223,673	86		Vitamin A, deworming
Liberia	9–59 m	N	596,545	99		OPV, deworming
Malawi	9–59 m	SN	453,202	104		Vitamin A, deworming
Mali	9 m–14 y	N	9,327,708	112		
Niger	9–59 m	N	3,299,923	96		
Nigeria (2015–2016)§	6 m–10 y	SN	24,069,024	100	84	
Sierra Leone	9–59 m	N	1,205,865	97	69	OPV
South Sudan	6 m–15 y	SN	690,951	51		Vitamin A
South Sudan	6–59 m	SN	12,169	119		Vitamin A
Togo	9 m–9 y	SN	820,335	99		
Uganda	6–59 m	N	6,349,182	95		OPV
Zimbabwe	9 m–14 y	N	5,337,029	103		Rubella vaccine, Vitamin A
Americas						
Chile	1–5 y	N	1,023,997	83		Rubella vaccine
Dominican Republic	1–4 y	N	742,792	95		Rubella vaccine
Eastern Mediterranean						
Afghanistan	9–59 m	N	6,191,955	113	92	OPV
Djibouti	9 m–25 y	N	446,612	85		OPV
Egypt	9 m–10 y	N	23,356,156	102		Rubella vaccine
Iran	9 m–15 y	SN	1,804,000	99		Rubella vaccine
Iraq	9 m–5 y	N	4,461,653	94		Rubella vaccine
Pakistan	6 m–10 y	SN	36,511,184	103		
Saudi Arabia	6–18 y	N	Unknown	Unknown		Mumps and Rubella vaccine
Somalia	9 m–9 y	SN	3,518,358	91		Vitamin A
Syria	6–59 m	N	1,619,630	61		Mumps and Rubella vaccine, Vitamin A, Other routine vaccines if missing
United Arab Emirates	1–18 y	N	915,480	69		Mumps and Rubella vaccine
Yemen	6 m–15 y	SN	1,590,462	85		Rubella vaccine, OPV
European						
Azerbaijan	Adults	N	10,642	Unknown		Rubella vaccine
Georgia	2–30 y	N	23,417	13		Mumps and Rubella vaccine
Kazakhstan	15–19 y	N	851,484	97		
South-East Asia						
India	9 m–15 y	SN	890,070	Unknown		
Myanmar	9 m–14 y	N	13,160,764	94		Rubella vaccine
Nepal	6 m–5 y	SN	453,665	91		Rubella vaccine, OPV
Thailand	30 m–7 y	N	2,244,906	88		Rubella vaccine
Timor-Leste	6 m–15 y	N	484,850	97	95	Rubella vaccine, OPV

See table footnotes on next page.

TABLE 1. (*Continued*) Measles supplementary immunization activities (SIAs)* and the delivery of other child health interventions, by World Health Organization (WHO) region and country — worldwide, 2015

WHO region/ Country	Age group targeted	Extent of SIA	Children reached in targeted age group		Coverage survey results (%)	Other interventions delivered
			No.	(%)†		
Western Pacific						
Malaysia	6 m–16 y	SN	21,518	90		Mumps and Rubella vaccine
Mongolia	6 m–6 y	N	347,685	94		Vitamin A
Papua New Guinea	9 m–14 y	SN	801,436	62		Rubella vaccine, OPV, IPV, Vitamin A, deworming
Vanuatu	1–15 y	N	103,676	103		Rubella vaccine, OPV, Vitamin A, deworming
Vietnam (2014–2015)§	1–14 y	N	19,740,181	98		Rubella vaccine
Total			**183,713,844**			

Abbreviations: IPV = inactivated poliovirus vaccine; m = months; N = national; OPV = oral poliovirus vaccine; SIA = supplementary immunization activity; SN = subnational; y = years.

* SIAs generally are carried out using two approaches: 1) An initial, nationwide catch-up SIA targets all children aged 9 months to 14 years; it has the goal of eliminating susceptibility to measles in the general population. Periodic follow-up SIAs then target all children born since the last SIA. 2) Follow-up SIAs are generally conducted nationwide every 2–4 years and generally target children aged 9–59 months; their goal is to eliminate any measles susceptibility that has developed in recent birth cohorts and to protect children who did not respond to the first measles vaccination. The exact age range for follow-up SIAs depends on the age-specific incidence of measles, coverage with 1 dose of measles-containing vaccine, and the time since the last SIA.

† Values >100% indicate that the intervention reached more persons than the estimated target population.

§ Rollover national campaigns started the previous year or will continue into the next year.

to 58% (98 of 168) in 2014, and to 65% (109 of 169) in 2015. During 2000–2015, the Region of the Americas (AMR) maintained measles incidence of <5 cases per 1 million.

From 2014 to 2015, the number of reported measles cases increased 33% in the African Region (AFR), 18% in the Eastern Mediterranean Region (EMR), and 83% in the European Region (EUR), primarily because of outbreaks in several countries. There was minimal change in reported cases in the South-East Asia Region (SEAR), and reported cases decreased 78% in AMR, with interruption of outbreaks in Brazil, Canada, and the United States. In the Western Pacific Region (WPR), reported measles cases declined 50%, with decreases in the three most populous countries in the region: China, the Philippines, and Vietnam (Table 2).

Genotypes of viruses isolated from measles cases were reported by 80 (51%) of the 157 countries that reported measles cases in 2015. Among the 24 recognized measles virus genotypes, 11 were detected during 2005–2008, eight during 2009–2014, and six during 2015, excluding those from vaccine reactions and cases of subacute sclerosing panencephalitis, a fatal progressive neurologic disorder caused by persistent measles infection¶¶¶ (*4*). In 2015, among 8,076 reported measles virus sequences,**** 847 (from 48 countries) were genotype B3; 70 (10 countries) were D4; 1,801 (52 countries) were D8; 76 (10 countries) were D9; one was G3; and 5,281 (20 countries) were H1 (Table 1).

Disease and Mortality Estimates

A previously described model for estimating measles disease and mortality was updated with new measles vaccination coverage data, case data, and United Nations population estimates for all countries during 2000–2015, enabling a new series of disease and mortality estimates (*5*,*6*). According to the updated data, the estimated number of measles cases declined from 32,768,300 (95% confidence interval [CI] = 23,393,300–63,222,700) in 2000 to 9,719,600 (CI = 5,731,800–35,451,000) in 2015. During this period, the number of estimated annual measles deaths decreased 79%, from 651,600 to 134,200 (Table 2). Compared with no measles vaccination, measles vaccination prevented an estimated 20.3 million deaths during 2000–2015 (Figure).

Regional Verification of Measles Elimination

In September 2016, the AMR regional verification commission declared the region free of endemic measles (*7*). The WPR regional verification commission reclassified Mongolia as having reestablished endemic measles virus transmission because of an outbreak that lasted for >1 year; thus, five WPR member states have been verified as having eliminated endemic measles (*8*). In 2015, the EUR regional verification commission verified measles elimination in 21 countries (*9*).

Discussion

During 2000–2015, increased coverage worldwide with routine doses of MCV, combined with SIAs, contributed to a 75% decrease in reported measles incidence and a 79% reduction in estimated measles mortality. During this period, measles vaccination prevented an estimated 20.3 million deaths. Moreover, the number of countries with measles incidence <5 per million has increased, although there is a large amount of underreporting. The decreasing number of circulating measles virus genotypes suggests interruption of some chains of transmission. However, despite progress since 2000, the 2015 global control milestones and regional measles elimination goals were not achieved and much effort is needed if elimination in five of six regions is to be achieved by 2020. Countries and immunization partners need to substantially

¶¶¶ Griffin DE. Measles virus and the nervous system. Handb Clin Neurol 2014;123:577–90. http://dx.doi.org/10.1016/B978-0-444-53488-0.00027-4.

**** Sequences were for the 450 nucleotide carboxy-terminal of the nucleocapsid gene in the measles virus genome. Data (as of September 6, 2016) are available from the Measles Nucleotide Surveillance (MeaNS) database, http://www.who-measles.org/Public/Web_Front/main.php.

TABLE 2. Estimates of coverage with the first and second doses of measles-containing vaccine administered through routine immunization services, reported measles cases and incidence, estimated measles deaths,* and reported measles genotypes, by World Health Organization (WHO) region — worldwide, 2000 and 2015

WHO region	Coverage with first dose (%)†	Countries with ≥90% coverage (%)	Coverage with second dose (%)†	Reported cases (No.)§	Incidence§,¶	% of countries with incidence <5 per 1 million	Reported measles genotypes (2015)**	Estimated no. of deaths (95% CI)	Estimated % mortality reduction from 2000 to 2015
African									
2000	53	9	5	520,102	837	5		414,500 (287,600–650,600)	
2015	74	26	18	98,621	100	52	B3	61,600 (27,600–163,600)	85
Americas									
2000	93	63	44	1,754	2.1	89		NA	
2015	94	83	53	423	0.6	97	B3, D4, D8, D9, H1	NA	
Eastern Mediterranean									
2000	72	57	29	38,592	91	17		67,000 (39,300–114,300)	
2015	76	57	68	21,335	33	40	B3, D8, D9	15,900 (8,400–57,500)	76
European									
2000	91	58	48	37,421	50	45		400 (100–1,900)	
2015	94	81	89	25,947	31	70	B3, D4, D8, D9, H1	80 (4–1,500)	79
South-East Asia									
2000	63	27	3	78,558	51	0		159,200 (117,700–212,700)	
2015	85	46	71	29,109	17	45	B3, D4, D8, D9, G3, H1	54,500 (37,500–85,000)	66
South-East Asia (excluding India)									
2000	78	30	9	39,723	80	0		59,200 (36,200–91,900)	
2015	80	50	78	3,621	10	56	B3, D4, D8, D9, G3, H1	5,300 (2,100–19,600)	91
India									
2000	56	NA	0	38,835	36	0		100,000 (81,500–120,800)	
2015	87	NA	69	25,488	19	0	D4, D8	49,200 (35,400–65,500)	51
Western Pacific									
2000	85	44	2	177,052	105	30		10,600 (5,200–55,000)	
2015	96	67	93	65,176	35	59	B3, D4, D8, D9, H1	2,100 (800–46,000)	80
Total									
2000	72	43	15	853,479	146	38		651,600 (449,900–1,034,500)	
2015	85	61	61	245,928	36	65		134,200 (74,400–353,600)	79

Abbreviations: CI = confidence interval; NA = not applicable; WHO=World Health Organization.

* Mortality estimates for 2000 might be different from previous reports. When the model used to generate estimated measles deaths is rerun each year using the new WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) data, as well as updated surveillance data, adjusted results for each year, including the baseline year, are also produced and updated.

† Coverage data: WUENIC. Geneva, World Health Organization, 2015 (as of July 15, 2016). http://www.who.int/immunization/monitoring_surveillance/data/en.

§ Reported case data: measles cases (2015) from World Health Organization, 2015 (as of July 15, 2016); http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tsincidencemeasles.html. Reported cases are a sizeable underestimate of the actual number of cases, accounting for the inconsistency between reported cases and estimated deaths.

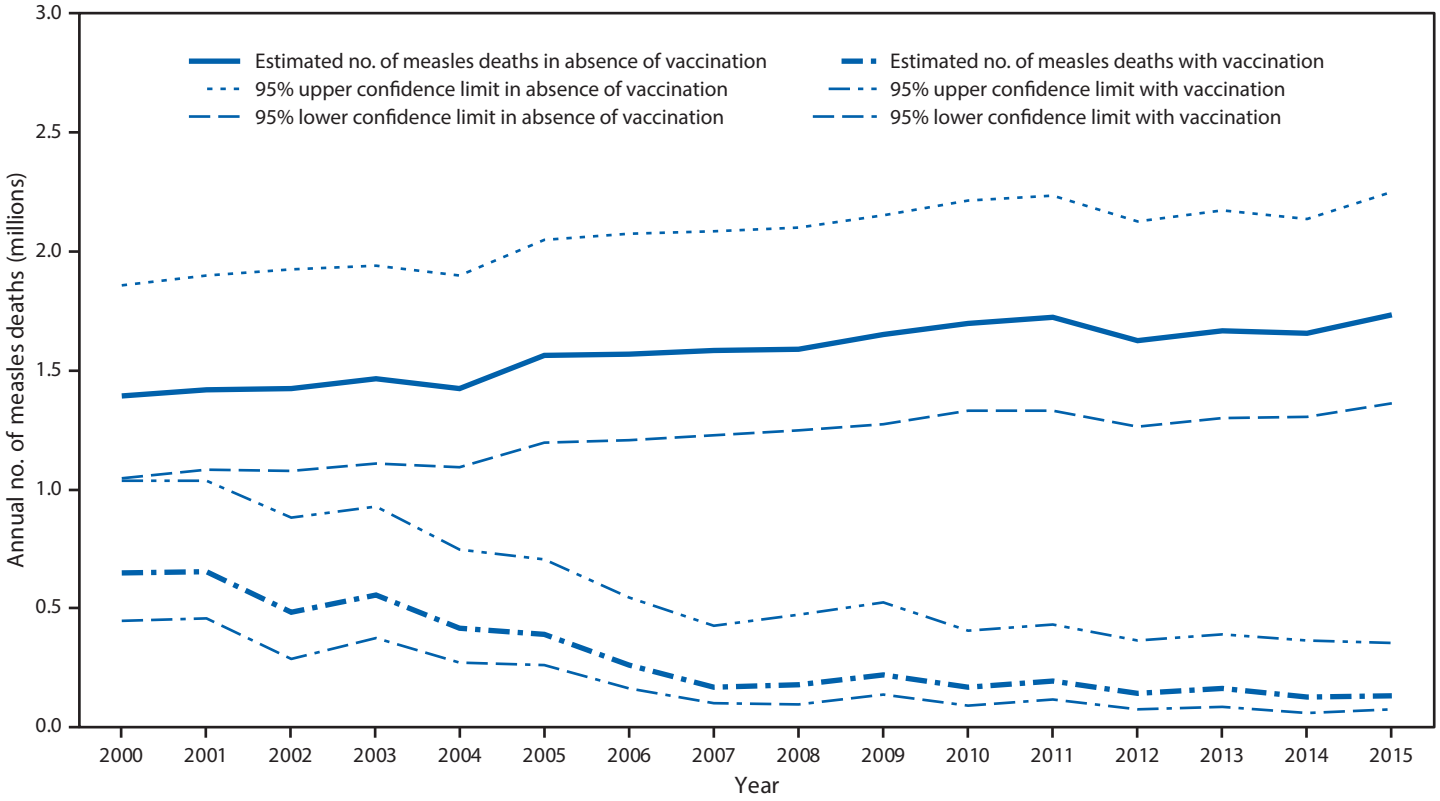
¶ Cases per 1 million population; population data from United Nations, Department of Economic and Social Affairs, Population Division (2015). Any country not reporting data on measles cases for that year was removed from both the numerator and denominator.

** Data for calendar year 2015, as reported to the Measles Nucleotide Surveillance (MeaNS) database; http://www.who-measles.org/Public/Web_Front/main.php.

increase their commitment for additional financial and human resources to 1) enable public education on the importance of vaccination; 2) strengthen health systems with staff, outreach services, and access to reliable vaccine supply to deliver 2 doses of measles vaccine; 3) improve surveillance; and 4) invest in research and innovations to overcome hurdles to achieving high vaccination coverage.

The 2015 global control milestones and regional measles elimination goals were not met because vaccination coverage gaps persist. Globally, MCV1 coverage has stagnated at 84%–85% since 2009 and MCV2 coverage only reached 61% in 2015. SIA quality was inadequate to achieve ≥95% coverage in the majority of countries. Furthermore, the discrepancy between high SIA coverage reported by administrative methods and lower coverage found by a limited number of post-SIA coverage surveys indicates that SIA quality might also be inadequate in countries with high reported administrative coverage. Countries need to allocate more time for early planning and preparation for high-quality immunization campaigns, with careful assessment of pre-SIA readiness, well-conducted intra-campaign and postcampaign monitoring, and proper implementation of appropriately budgeted activities to vaccinate persons missed during the SIA.

FIGURE. Estimated annual number of measles deaths with vaccination and had there been no vaccination — worldwide, 2000–2015*



* Compared with no measles vaccination, measles vaccination prevented an estimated cumulative total of 20.3 million deaths during 2000–2015.

The findings in this report are subject to at least three limitations. First, SIA coverage data might be biased by inaccurate reports of the number of doses delivered, doses administered to children outside the target age group, and inaccurate estimates of the target population size. Second, there are large differences between the estimated and reported incidence, indicating variable surveillance sensitivity, making comparisons difficult; in addition, not all ill persons seek care. Finally, misclassification might occur for reported cases that are not laboratory-confirmed or in countries that report aggregate numbers of unconfirmed cases rather than case-based data for confirmed cases.

The decrease in measles mortality is one of four main contributors (the others are decrease in mortality from diarrhea, malaria, and pneumonia) to the decline in overall child mortality worldwide and progress toward Millennium Development Goal 4, but continued work is needed to help achieve regional elimination (*10*). Of serious concern is the possibility that the gains made so far and future progress in measles control and elimination could be threatened if polio-funded resources that support routine immunization services, measles SIAs, and measles surveillance activities diminish or disappear following polio eradication. Those countries with the highest measles

Summary

What is already known about this topic?

During 2000–2010, global vaccination coverage with the first dose of measles-containing vaccine (MCV1) increased from 72% to 85%, and annual measles incidence decreased from 146 reported cases per 1 million population to 50 cases per 1 million.

What is added by this report?

During 2000–2015, an estimated 20.3 million deaths were prevented by measles vaccination, and measles incidence decreased 75%, from 146 to 36 cases per 1 million population. The number of countries providing the second dose of measles-containing vaccine (MCV2) nationally through routine immunization services increased to 160 (82%) in 2015, and global MCV2 coverage was 61%. In 2015, a total of 184 million persons were vaccinated against measles during supplementary immunization activities. Although measles vaccination has saved millions of lives since 2000, data indicate that the progress toward elimination goals has slowed since 2010.

What are the implications for public health practice?

Reaching measles control and elimination goals will require addressing policy and practice gaps that prevent reaching larger numbers of children with measles vaccination, increasing visibility of measles elimination efforts, assuring funding as polio funding decreases, and ensuring adequate resources for strengthening health systems.

mortality rely most heavily on polio-funded resources and are at highest risk if these resources are not transitioned to adequately support other parts of the immunization program after polio eradication is achieved. Countries and partners need to act urgently to secure political commitment, raise the visibility of measles, increase vaccination coverage, strengthen surveillance, and mitigate the threat of resources for immunization programs decreasing once polio eradication is achieved.

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Investigation of the First Seven Reported Cases of *Candida auris*, a Globally Emerging Invasive, Multidrug-Resistant Fungus — United States, May 2013–August 2016

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Candida auris, an emerging fungus that can cause invasive infections, is associated with high mortality and is often resistant to multiple antifungal drugs. *C. auris* was first described in 2009 after being isolated from external ear canal discharge of a patient in Japan (*1*). Since then, reports of *C. auris* infections, including bloodstream infections, have been published from several countries, including Colombia, India, Israel, Kenya, Kuwait, Pakistan, South Africa, South Korea, Venezuela, and the United Kingdom (*2*–*7*). To determine whether *C. auris* is present in the United States and to prepare for the possibility of transmission, CDC issued a clinical alert in June 2016 informing clinicians, laboratorians, infection control practitioners, and public health authorities about *C. auris* and requesting that *C. auris* cases be reported to state and local health departments and CDC (*8*). This report describes the first seven U.S. cases of *C. auris* infection reported to CDC as of August 31, 2016. Data from these cases suggest that transmission of *C. auris* might have occurred in U.S. health care facilities and demonstrate the need for attention to infection control measures to control the spread of this pathogen.

The emergence of *C. auris* raises several serious concerns for public health. First, many isolates are multidrug-resistant, with some strains having elevated minimum inhibitory concentrations to drugs in all three major classes of antifungal medications (*9*), a feature not found in other clinically relevant *Candida* species. Second, *C. auris* is challenging to identify, requiring specialized methods such as matrix-assisted laser desorption/ionization time-of-flight or molecular identification based on sequencing the D1-D2 region of the 28s ribosomal DNA. When using common biochemical methods such as analytical profile index strips or the VITEK 2, *C. auris* is often misidentified as other yeasts (most commonly *Candida haemulonii*, but also *Candida famata, Saccharomyces cerevisiae*, and *Rhodotorula glutinis*). Finally, *C. auris* has caused outbreaks in health care settings (*10*). Multidrug resistance and health care–associated transmission are often found with resistant bacteria, such as carbapenem-resistant Enterobacteriaceae, but have been uncommon among *Candida* spp.

To determine whether *C. auris* cases were occurring in the United States, CDC issued a clinical alert (*8*) in June 2016, requesting that laboratories report *C. auris* isolates to state and local health departments and CDC. Given the challenges of *C. auris* identification, clinical laboratories were encouraged to forward *C. haemulonii* isolates and isolates not identified beyond *Candida* spp. by conventional methods to state public health laboratories and CDC for further characterization. A case was defined as confirmed isolation of *C. auris* in a specimen from a patient at a U.S. health care facility. For all reported cases, patient information and available clinical isolates were obtained for resistance testing and whole-genome sequencing. Among cases in patients who were not deceased, cultures from various patient body sites were obtained to seek evidence of persistent colonization. One patient was hospitalized at the time of the report, allowing for collection of environmental cultures from the hospital room.

Seven *C. auris* cases occurring during May 2013–August 2016 (Table) were reported to CDC (one in 2013, one in 2015, and five in 2016). Six of seven cases were identified through retrospective review of microbiology records from reporting hospitals and reference laboratories. Cases were reported from four states: Illinois (n = 2, single hospital), Maryland (n = 1), New Jersey (n = 1), and New York (n = 3, three different hospitals). Recent travel outside the United Stated was documented for only one patient: the 2013 New York patient had been transferred less than 1 week earlier from a hospital in the Middle East. Five patients had *C. auris* initially isolated from blood, one from urine, and one from the external ear canal.

All patients had serious underlying medical conditions, including hematologic malignancies (n = 2), bone marrow transplantation (n = 1), short gut syndrome requiring total parenteral nutrition and corticosteroid use (n = 1), paraplegia with a chronic urinary catheter (n = 1), idiopathic acute respiratory failure requiring high-dose corticosteriods (n = 1), severe peripheral vascular disease and skull base osteomyelitis (n = 1), and brain tumor and recent villous adenoma

TABLE. Characteristics of the first seven cases of *Candida auris* identified in the United States—May 2013–August 2016

Patient	Isolation month/ year	State	Site of *C. auris* isolation	Underlying medical condition(s)	Outcome*
1	May 2013	New York	Blood	Respiratory failure requiring high-dose corticosteroids	Died
2	July 2015	New Jersey	Blood	Brain tumor and recent villous adenoma resection	Died
3	April 2016	Maryland	Blood	Hematologic malignancy and bone marrow transplant	Died
4	April 2016	New York	Blood	Hematologic malignancy	Died
5	May 2016	Illinois	Blood	Short gut syndrome requiring total parenteral nutrition and high-dose corticosteroid use	Survived
6	July 2016	Illinois	Urine	Paraplegia with long-term, indwelling Foley catheter	Survived
7	August 2016	New York	Ear	Severe peripheral vascular disease and skull base osteomyelitis	Survived

* Mortality was not necessarily attributable to *C. auris* infection.

resection (n = 1). Median time from admission to isolation of *C. auris* was 18 days (range = 0–231). All five patients with *C. auris* bloodstream infections had central venous catheters at the time *C. auris* was identified, and all were treated with echinocandins, a type of antifungal medication; one patient also received liposomal amphotericin B. All patients with bloodstream infections eventually had documented clearance of *C. auris* from the bloodstream, although one patient had persistently positive *C. auris* cultures for 10 days, despite having an isolate that was susceptible to the treatment administered. Two patients had recurrent *C. auris* candidemia episodes 3 and 4 months after the initial episode. *C. auris* was repeatedly isolated from the urine of a patient with a urinary catheter, even after treatment with fluconazole, to which the isolate was susceptible. The patient with the external ear canal isolate was not treated with an antifungal medication. As of August 31, 2016, four of the seven patients, all of whom had bloodstream infections, died during the weeks to months after the identification of *C. auris*.

In two separate circumstances, two patients were hospitalized in the same hospital. The first instance included the two patients from Illinois who were admitted to the same hospital on three separate occasions but were on different floors or wings of the hospital. These two patients were subsequently also admitted to a long-term acute care hospital within days of one another, although their admission dates did not overlap. The second instance involved the patients identified in Maryland and New Jersey. The patient identified in Maryland was a resident of New Jersey and had been hospitalized at the same time as the New Jersey patient, in the same New Jersey hospital, but on a different ward. This overlapping admission occurred approximately 6 months before *C. auris* was identified in the Maryland hospital.

Specimens for surveillance cultures to evaluate patients for colonization were taken from the three living patients (one with *C. auris* in the blood, one in urine and one in the external ear canal). In all three cases, cultures yielded *C. auris* from at least one body site, including groin, axilla, nares, and rectum, 1–3 months after initial detection of *C. auris*. Environmental cultures of the hospital room were collected during a subsequent hospitalization of one of the Illinois patients who had a *C. auris* bloodstream infection 3 months earlier, and who remained persistently colonized in multiple body sites; samples taken from the mattress, bedside table, bed rail, chair, and windowsill all yielded *C. auris*. *C. auris* was not detected in this patient's hospital room after terminal cleaning with sodium hypochlorite solution and ultraviolet light.

Five of seven reported isolates were either misidentified initially as *C. haemulonii* or not identified beyond *Candida* spp. at the institution's microbiology laboratory and were later identified as *C. auris* at a reference laboratory. Five of seven isolates were resistant to fluconazole; one of these isolates was resistant to amphotericin B, and another isolate was resistant to echinocandins. No isolate was resistant to all three classes of antifungal medications.

Whole-genome sequencing was performed on isolates from six patients. Isolates identified in Maryland, New Jersey, and New York were closely related to one another (differing by approximately 70 single nucleotide polymorphisms [SNPs]); the isolates from Maryland and New Jersey (the patients admitted to the same New Jersey hospital) differed by <10 SNPs, which was on same order of magnitude as the 6-SNP differences identified among multiple isolates from specimens obtained over a 10-day period from the Maryland patient. These U.S. isolates were related to isolates from South Asia (<60 SNPs apart). Isolates from the two Illinois patients were nearly identical (<10 SNPs apart) and were most closely related to isolates from South America (<150 SNPs apart). Furthermore, differences of ≤5 SNPs were identified between the environmental and patient isolates in Illinois. As a point of reference, isolates from different continents are tens of thousands of SNPs apart (*9*). None of the patients from which isolates were sequenced, including the patient from the 2013 case in the Middle East, had known travel or other direct links to South Asia or South America.

Discussion

C. auris is an emerging cause of *Candida* infections in the United States. Although the cases of *C. auris* described in this report appear related to isolates from South Asia and South

Summary

What is already known about this topic?

Candida auris is an emerging pathogenic fungus that has been reported from at least a dozen countries on four continents during 2009–2015. The organism is difficult to identify using traditional biochemical methods, some isolates have been found to be resistant to all three major classes of antifungal medications, and *C. auris* has caused health care–associated outbreaks.

What is added by this report?

This is the first description of *C. auris* cases in the United States. *C. auris* appears to have emerged in the United States only in the last few years, and U.S. isolates are related to isolates from South America and South Asia. Evidence from U.S. case investigations suggests likely transmission of the organism occurred in health care settings.

What are the implications for public health practice?

It is important that U.S. laboratories accurately identify *C. auris* and for health care facilities to implement recommended infection control practices to prevent the spread of *C. auris*. Local and state health departments and CDC should be notified of possible cases of *C. auris* and of isolates of *C. haemulonii* and *Candida* spp. that cannot be identified after routine testing.

America, available epidemiologic information suggests that most were acquired in the United States. Although transmission to patients in U.S. health care settings has not been definitively documented, several findings suggest that transmission occurred. First, whole-genome sequencing results demonstrate that isolates from patients admitted to the same hospital in New Jersey were nearly identical, as were isolates from patients admitted to the same Illinois hospital. The number of SNPs differentiating isolates from the same hospital is comparable to that detected among the multiple isolates from same patient or patient and the environment. Second, patients were colonized with *C. auris* on their skin and other body sites weeks to months after their initial infection, which could present opportunities for contamination of the health care environment. Third, *C. auris* was isolated from samples taken from multiple surfaces in one patient's health care environment, which further suggests that spread within health care settings is possible. To decrease the risk for transmission, health care personnel in acute care settings should use Standard and Contact Precautions (http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf) for patients colonized or infected with *C. auris*. In nursing homes, providers should consider the level of patient care being provided and the presence of transmission risk factors when deciding on the level of precautions. If such patients are transferred to other health care facilities, receiving facilities should be notified of the presence of this multidrug-resistant organism to ensure appropriate precautions are continued. Facilities should ensure thorough daily and terminal cleaning of rooms of patients with *C. auris* infections, including use of an EPA-registered disinfectant with a fungal claim. Facilities and laboratories are requested to continue to report cases and forward isolates of *C. haemulonii* and *Candida* spp. that are not identified further after using common laboratory identification methods to state or local health authorities and CDC, who can provide consultation about the need for additional interventions to prevent transmission.*

CDC continues to work with domestic and international partners to conduct epidemiologic studies on the emergence of this organism, risk factors for infection, and transmission mechanisms, and to evaluate the effectiveness of current infection control guidance to make additional recommendations.

* https://www.cdc.gov/fungal/diseases/candidiasis/recommendations.html.

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Notes from the Field

Photokeratoconjunctivitis Outbreak Associated with Damaged Metal Halide Lamps — Maharashtra State, Western India, June 2016

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On June 13, 2016, the Pimpriraja Primary Health Center in Aurangabad district, Maharashtra State, in western India reported learning of approximately 90 persons with red eyes and blurred vision. One day earlier, the patients had attended a gathering in Zalta village to acknowledge the contributions of a local political leader. An investigation by the Field Epidemiology Training Program (FETP) and officials from the Integrated Disease Surveillance Program (IDSP) in Aurangabad district was initiated to estimate the magnitude of the outbreak and identify reasons for its occurrence. The investigators determined that 92 (12%) of the 750 attendees had symptoms of keratoconjunctivitis, and four of six metal halide lamps used for illumination were damaged.

The team consisting of officials from IDSP and FETP trainees arrived in Zalta village on June 14. A case of keratoconjunctivitis was defined as the occurrence of any of the following eye-related symptoms in an event attendee since June 13: redness, tearing, eyelid swelling, photophobia, or foreign body sensation. Using a list obtained from the event organizers, all 750 attendees were interviewed in their homes to collect information on age, sex, and seating location during the event and to evaluate them for eye-related signs or symptoms and time of symptom onset. For persons who could not be contacted, the details about seating location and presence of eye symptoms were collected from other members of their households, villagers, or event organizers. An ophthalmologist examined all identified patients.

The event occurred on June 12 from 7:30 p.m. to 9:45 p.m. inside a temporary covered area. Six metal halide lamps affixed to high poles (about 3 meters [about 10 feet] from the ground) were used for illumination. Two lamps were on the speakers' platform, facing the speakers, and four were in front of the speakers' platform, facing the audience (Figure). A total of 750 persons, including 16 delegates (who were seated on the speakers' platform), attended the event. No food or drink was served during the program.

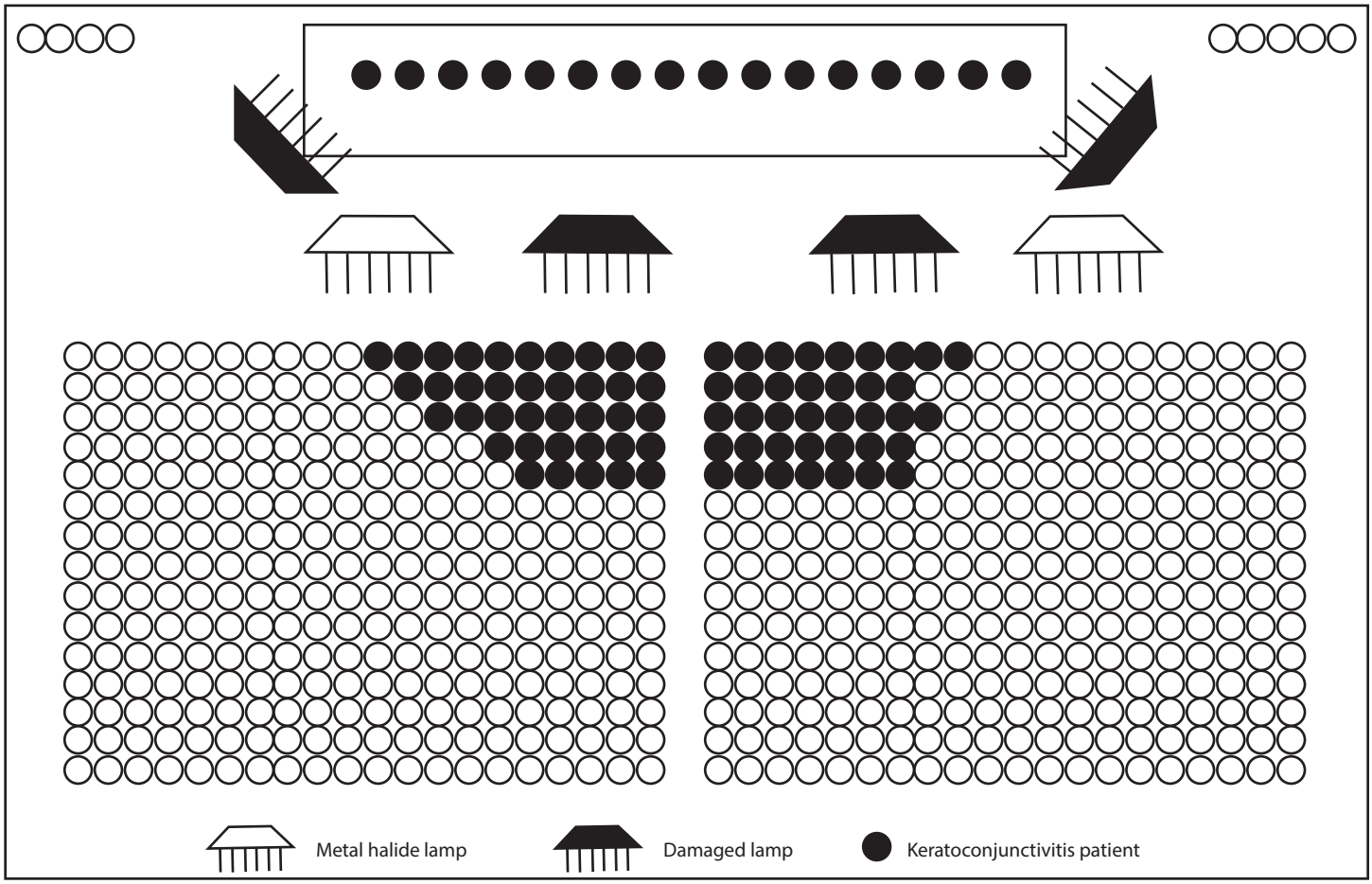
Among the 750 attendees, 92 (12%) met the case definition for keratoconjunctivitis, including all 16 delegates on the speakers' platform and 76 of 180 (42%) persons sitting in the first five rows (approximately 4–8 meters [approximately 13–26 feet] from the lights); none of the 554 persons sitting in the middle or back rows (>10 meters [>33 feet] from the lights), or standing on either side of the speakers' platform developed symptoms (Figure). Attack rates among various groups were compared using a chi-square test, with the results expressed as p values.

Attack rates did not differ by sex (females: 16% [13 of 80], males: 12% [79 of 670]; p = 0.25). The attack rate was 14% (30 of 215) among persons aged <30 years, 12% (55 of 455) among persons aged 30–59 years, and 9% (7of 80) among persons aged ≥60 years (p = 0.47). All patients reported redness, photophobia, swelling of eyelids, watering of eyes, and blurred vision. Other symptoms included eye pain (62 [67%]) and temporary loss of vision (65 [71%]). Twenty-one (23%) patients had evidence of corneal edema on ophthalmologic examination. Among the 92 patients, 34 (37%) had onset of symptoms during the event, 11 (12%) developed symptoms within 1 hour of the event, and 47 (51%) developed symptoms 1–3 hours after the event. Attack rates were significantly higher among persons sitting in closer proximity to metal halide lights (92 of 196 [47%] compared with persons on either side of the platform or in middle or back rows 0 of 554 [0%], p<0.00). The patients received supportive treatment.

In the course of the investigation, the team learned that the metal halide lamps, which had been purchased for lighting a cricket stadium and were not meant to be used indoors, were mistakenly used for the political event. In addition, four of the six metal halide lamps were found to be damaged (Figure). Metal halide lamps produce an electric arc that travels through a mixture of mercury and metal halide gases, generating an intense white light. These lamps have a coated outer glass envelope surrounding the arc tube, which serves to filter out ultraviolet light (*1*). The four damaged lamps had broken outer envelopes. Metal halide lamps with a broken outer envelope emit ultraviolet radiation and pose a risk for keratoconjunctivitis (*2*,*3*). Previous outbreaks after exposure to broken metal halide lamps have been reported (*2*,*3*).

This is the first reported outbreak from India of keratoconjunctivitis associated with the use of broken metal halide lights indoors. In India, metal halide lamps are used for sports facilities, stadiums, large auditoriums, and convention halls. Although these lamps are not routinely used during temporary mass gatherings, accidental use of damaged lamps can cause such outbreaks. Persons handling these lamps should be made aware of the health hazards of damaged lamps and instructed not to use lamps with a broken outer envelope.

FIGURE. Keratoconjunctivitis attack rates* among attendees at a political event, by seating location — Zalta village, Aurangabad, India, June 2016



* Attack rates: speakers' platform = 100% (16 of 16); either side of platform = 0% (0 of 9); front rows = 42% (76 of 180); middle and back rows = 0% (0 of 545).

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Announcements

National Epilepsy Awareness Month and Veterans Day, November 11, 2016

November is National Epilepsy Awareness Month, and November 11 is Veterans Day. Epilepsy is a brain disorder that causes recurrent seizures, which are characterized by sudden, abnormal electrical activity in the brain that briefly changes the way a person behaves, thinks, or feels. Epilepsy affects 7–10 per 1,000 persons, or approximately 2.9 million persons in the United States (*1*,*2*). Although the prevalence of epilepsy in veterans is unknown, the Veterans Health Administration (VHA) estimates that during 2012–2014, the prevalence of epilepsy among veterans under treatment at VHA facilities was 13.9 per 1,000 persons (*3*). Approximately 13% of veterans with seizures were aged <45 years, 39% were aged 45–65 years, and 7% were female (*3*).

Veterans are at higher risk for developing epilepsy than nonveterans because of an increased likelihood of traumatic brain injuries and post-traumatic stress disorder (*4*); these conditions are also associated with psychogenic nonepileptic seizures (events caused by psychological distress that resemble seizures, but are not associated with abnormal electrical activity in the brain). In a study published in this issue, veterans with epilepsy who were deployed in the Iraq and Afghanistan conflicts were found to have a higher prevalence of mental and physical comorbidity and substantially higher mortality than were veterans without epilepsy. The VHA Epilepsy Centers of Excellence (ECoE), a network of 16 sites that was created in 2008, provides comprehensive treatment and support to veterans with epilepsy (i.e., seizure disorders, including psychogenic nonepileptic seizures) (*3*). The ECoE's video series, Veterans and Epilepsy: Basic Training, helps educate veterans, their caregivers, and the general public about living with epilepsy, and helps reduce epilepsy-associated stigma (*5*).

CDC supports community-based resources and services for all adults with epilepsy and evaluates epilepsy self-management programs for veterans with epilepsy. Information about these services and programs is available at http://www.cdc.gov/epilepsy.

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Get Smart About Antibiotics Week — November 14–20, 2016

Get Smart About Antibiotics Week is November 14–20, 2016. This annual observance is intended to engage health care providers, professional societies, advocacy groups, for-profit companies, state and local health departments, the general public, the media, and others in an effort to improve antibiotic stewardship in outpatient, inpatient, nursing home, and animal health settings. During this week, participants will raise awareness of the threat of antibiotic resistance and emphasize the importance of appropriate antibiotic use across all health care settings. Get Smart About Antibiotics Week coincides with the World Health Organization's World Antibiotic Awareness Week and European Antibiotic Awareness Day (November 18). In addition to the United States and European Union, other participating countries and international organizations include Australia, Canada, and the Pan American Health Organization.

Antibiotic use is the single most important contributing factor to antibiotic resistance in patients. An estimated one third to one half of antibiotic use in humans is either unnecessary or inappropriate in selection, dosing, or duration of treatment. Each year in the United States, 47 million unnecessary antibiotic prescriptions are written in doctors' offices, emergency rooms, and hospital-based clinics, which makes improving antibiotic prescribing and use a national priority. To prevent further emergence of antibiotic resistance while providing safe, high-quality patient care, antibiotics must be used appropriately. This means prescribing antibiotics only when needed and, if they are needed, using them judiciously and correctly.

Preventing the emergence and spread of antibiotic-resistant infections and protecting the nation's health is a CDC priority. CDC has identified four Core Elements of Outpatient Antibiotic Stewardship and will release a document on this topic during Get Smart About Antibiotics Week**.** A webinar will be offered on November 15 at 1 pm EDT; information is available at https://cc.readytalk.com/r/bzt89rm0ewrr&eom.

Announcements

World Pneumonia Day — November 12, 2016

November 12th marks the eighth annual World Pneumonia Day, observed to raise awareness of pneumonia as a global public health concern for persons of all ages and a leading infectious cause of death of children aged <5 years, causing approximately 900,000 child deaths annually (*1*). In the United States, the majority of the 53,000 annual pneumonia deaths occur in persons aged ≥65 years. Respiratory viruses, such as respiratory syncytial virus (RSV) and influenza, and *Streptococcus pneumoniae* bacteria are among the leading causes of pneumonia; RSV annually causes an average of 177,000 hospitalizations and 14,000 deaths in adults aged ≥65 years in the United States (*1*,*2*). In addition, approximately 5,000 cases of Legionnaires' disease occur each year in the United States, a 286% increase from 2000–2014; the case fatality rate is about 10% (*1*).

Approximately two thirds of the world's countries routinely use pneumococcal conjugate vaccine in their childhood immunization programs, and nearly every country in the world includes a *Haemophilus influenzae* type b-containing vaccine in their program (*3*,*4*). If these two vaccines were routinely used in the world's 73 poorest countries, 2.9 million lives would be saved and 52 million cases of illness would be prevented by 2020 (*5*). New vaccines also show promise for lowering the burden of pneumonia. Currently, more than 50 vaccine products to prevent RSV are in development (http://sites.path.org/vaccinedevelopment/files/2016/09/RSV-snapshot-September2016.png).

Appropriate treatment is also instrumental in preventing pneumonia deaths. New treatment guidelines for hospital-acquired pneumonia and ventilator-associated pneumonia recommend shorter courses of antibiotics than are usually prescribed, which ensures safe and effective treatment while limiting development of antibiotic resistance (*6*).

Information about World Pneumonia Day is available at http://stoppneumonia.org/, including the 2016 Pneumonia and Diarrhea Progress Report.

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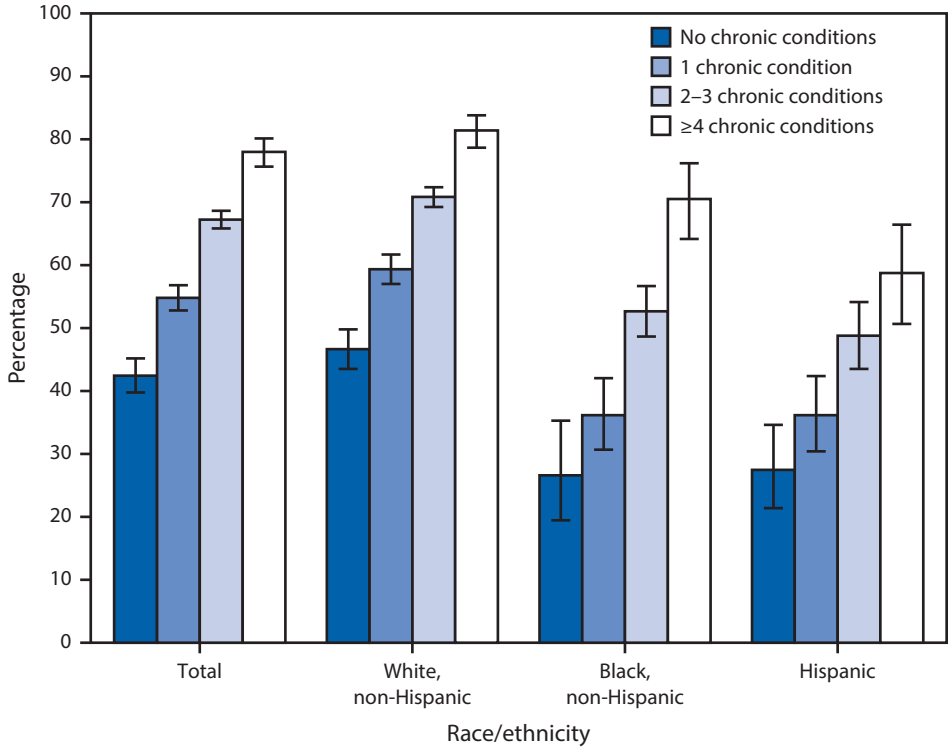
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥65 Years Who Reported Ever Receiving a Pneumococcal Vaccination,† by Race/Ethnicity§ and Number of 10 Diagnosed Chronic Conditions¶ — National Health Interview Survey, United States, 2014–2015



* Including 95% confidence interval.
† Based on the survey question, "Have you ever had a pneumonia shot? This shot is usually given only once or twice in a person's lifetime and is different from the flu shot. It is also called the pneumococcal vaccine." Unknowns were not included in the denominators when calculating percentages.
§ Persons of Hispanic ethnicity can be of any race or combination of races.
¶ The 10 selected chronic conditions are hypertension, coronary heart disease, stroke, diabetes, cancer, arthritis, hepatitis, chronic obstructive pulmonary disease (COPD), weak or failing kidneys during the past 12 months, and currently having asthma. COPD was defined as having emphysema or chronic bronchitis, or both, during the past 12 months. Unless a time frame was noted, chronic conditions were based on the respondents reporting ever being told by a doctor or other health professional that they had the condition.

During 2014–2015, the percentage of adults aged ≥65 years who reported ever receiving a pneumococcal vaccination ranged from 42.6% for adults who had none of the 10 selected diagnosed chronic conditions to 78.3% for adults with ≥4 diagnosed chronic conditions. For all racial/ethnic populations the percentage of adults who had ever received a pneumococcal vaccination increased as the number of reported chronic conditions increased. Regardless of the number of selected chronic conditions, non-Hispanic white adults were more likely than Hispanic and non-Hispanic black adults to have received the vaccination.

Source: National Health Interview Survey. http://www.cdc.gov/nchs/nhis.htm.

Reported by: Mary Ann Bush, MS, mbush@cdc.gov, 301-458-4130.

For more information on this topic, CDC recommends the following link: http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/pneumo.html.

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