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Frequent Exertion and Frequent Standing at Work, by Industry and Occupation Group — United States, 2015

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Repeated exposure to occupational ergonomic hazards, such as frequent exertion (repetitive bending or twisting) and frequent standing, can lead to injuries, most commonly musculoskeletal disorders (*1*). Work-related musculoskeletal disorders have been estimated to cost the United States approximately $2.6 billion in annual direct and indirect costs (*2*). A recent literature review provided evidence that prolonged standing at work also leads to adverse health outcomes, such as back pain, physical fatigue, and muscle pain (*3*). To determine which industry and occupation groups currently have the highest prevalence rates of frequent exertion at work and frequent standing at work, CDC analyzed data from the 2015 National Health Interview Survey (NHIS) Occupational Health Supplement (OHS) regarding currently employed adults in the United States. By industry, the highest prevalence of both frequent exertion and frequent standing at work was among those in the agriculture, forestry, fishing, and hunting industry group (70.9%); by occupation, the highest prevalence was among those in the construction and extraction occupation group (76.9%). Large differences among industry and occupation groups were found with regard to these ergonomic hazards, suggesting a need for targeted interventions designed to reduce workplace exposure.

NHIS is an annual, in-person, household interview survey of noninstitutionalized, U.S. civilian residents that has been continuously conducted since 1957 with the main purpose of monitoring the health of the U.S. population through assessment of a range of health topics and demographic characteristics.* The NHIS questionnaire contains a set of core questions with Household, Family, Sample Adult, and Sample Child components, which have remained relatively unchanged from 1997 through 2017. In addition, NHIS has sets of questions, known as Supplements, which vary each year depending on new public health data needs. In 2015, CDC's National Institute for Occupational Safety and Health (NIOSH) sponsored an OHS to collect information on work-related health conditions as well as psychological and physical occupational exposures. The OHS questions were included in the Sample Adult questionnaire, which had a final, unconditional response rate of 55.2%.†

* https://www.cdc.gov/nchs/nhis/about_nhis.htm.

† ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2015/srvydesc.pdf.

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To determine industry and occupation, currently employed adult respondents were asked, in reference to the job they were working at during the week before the interview, "What kind of business or industry was this?" and "What kind of work were you doing?" Open-ended responses were recorded as text and subsequently coded by the U.S. Census Bureau into 4-digit codes derived from the 2012 North American Industrial Classification System (NAICS) industry groups and 2010 Standard Occupational Classification (SOC) occupation groups. To improve reliability of the statistical estimates, the detailed 4-digit industry and occupation groups were collapsed into 2-digit industry groups and occupation groups (based on the NAICS and SOC major groups[§]). As part of the OHS, currently employed adults were asked two questions related to the ergonomics of their current job: "How often does your job involve repeated lifting, pushing, pulling, or bending?" and "How often does your job involve standing or walking around?" Responses to these questions were dichotomized into Often/Always and Never/Seldom/Sometimes, to indicate frequent or infrequent exertion or standing, respectively. Responses to these two ergonomics questions were also used to create one dichotomous variable capturing respondents that reported both frequent exertion at work and frequent standing at work.

Among the 36,672 adult NHIS respondents, 19,456 were currently employed and considered for analyses. After excluding 1,615 respondents who worked <20 hours per week, 187 respondents who did not provide adequate information on their hours worked in the previous week, and 190 respondents in military-specific occupations, the final analytic sample included 17,464 respondents (89.8% of the currently employed adult respondents). Sample adults who worked more than 20 hours per week were more likely to be aged <65 years, men, and hold a college degree or higher; however, there was no difference in the distribution of frequent exertion and frequent standing by number of hours worked. Unadjusted prevalence of frequent exertion at work, frequent standing at work, and both frequent exertion and frequent standing at work were calculated by the 20 major industry groups and the 22 major occupation groups. The unadjusted prevalence estimates were obtained using statistical software. All analyses were weighted, and standard errors were adjusted to account for the survey design.

Overall, 39.5% of currently employed adults who work at least 20 hours per week reported both frequent exertion and frequent standing at work (Table 1). The prevalences of frequent exertion at work or frequent standing at work, or both frequent exertion at work and frequent standing at work were highest among men, persons aged 18–29 years, Hispanics, and adults with less than a high school diploma (Table 1).

Among the 20 major industry groups, the groups with the highest prevalence of both frequent exertion and frequent standing at work were agriculture, forestry, fishing, and hunting (70.9%); construction (67.2%); and accommodation and food

[§] https://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012 and https://www.bls.gov/soc/major_groups.htm.

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TABLE 1. Weighted prevalence of frequent exertion at work, frequent standing at work, and both frequent exertion and frequent standing at work among adult U.S. workers,* by demographic characteristics — National Health Interview Survey, 2015

Characteristic	Both frequent exertion and frequent standing at work			Frequent exertion at work			Frequent standing at work		
	No. in sample exposed	Weighted no. in population	% (95% CI)	No. in sample exposed	Weighted no. in population	% (95% CI)	No. in sample exposed	Weighted no. in population	% (95% CI)
Sex									
Men	3,985	31,887,307	44.1 (42.7–45.5)	4,235	33,946,823	47.0 (45.6–48.3)	6,149	49,783,090	68.8 (67.5–70.2)
Women	2,997	20,897,950	34.0 (32.7–35.4)	3,124	21,864,499	35.6 (34.2–37.0)	5,520	39,328,061	64.0 (62.6–65.4)
Age group (yrs)									
18–29	1,682	14,707,666	49.2 (46.7–51.6)	1,738	15,307,794	51.2 (48.7–53.7)	2,593	22,663,742	75.8 (73.7–77.8)
30–44	2,414	17,548,635	39.0 (37.4–40.7)	2,538	18,448,479	41.0 (39.4–42.7)	3,964	29,256,582	65.1 (63.4–66.7)
45–64	2,603	19,130,997	35.7 (34.1–37.4)	2,769	20,480,104	38.3 (36.6–39.9)	4,517	34,073,378	63.7 (62.1–65.2)
≥65	283	1,397,959	26.3 (22.5–30.0)	314	1,574,945	29.6 (25.8–33.4)	595	3,117,450	58.6 (54.4–62.8)
Race/Ethnicity									
White, non-Hispanic	4,256	33,402,064	38.4 (37.2–39.7)	4,466	35,094,556	40.4 (39.1–41.7)	7,078	56,412,145	64.9 (63.6–66.1)
Black, non-Hispanic	919	6,736,754	43.4 (40.6–46.2)	971	7,199,190	46.4 (43.6–49.2)	1,555	11,046,554	71.1 (68.6–73.6)
Other race, non-Hispanic	363	2,340,168	25.4 (21.8–29.0)	387	2,562,924	27.8 (24.1–31.4)	691	4,767,859	51.7 (47.7–55.7)
Hispanic	1,444	10,306,271	46.8 (44.4–49.2)	1,535	10,954,652	49.8 (47.4–52.2)	2,345	16,884,593	76.7 (74.7–78.7)
Education level†									
Less than high school diploma	910	6,425,171	59.5 (56.0–63.0)	967	6,840,231	63.4 (60.1–66.6)	1,269	9,036,138	83.7 (81.4–86.0)
High school diploma/GED	2,138	16,679,503	56.6 (54.5–58.7)	2,249	17,558,718	59.6 (57.4–61.7)	3,000	23,231,939	78.8 (77.1–80.5)
Some college	2,612	19,898,969	47.3 (45.4–49.2)	2,744	21,027,565	50.0 (48.1–51.9)	3,986	30,423,401	72.3 (70.7–73.8)
Bachelor's degree or higher	1,303	9,513,585	18.7 (17.4–19.9)	1,379	10,116,181	19.8 (18.6–21.1)	3,384	26,079,808	51.2 (49.4–52.9)
All currently employed adults	**6,982**	**52,785,257**	**39.5 (38.5–40.5)**	**7,359**	**55,811,322**	**41.7 (40.7–42.7)**	**11,669**	**89,111,151**	**66.6 (65.6–67.6)**

Abbreviations: CI = confidence interval; GED = General Educational Development.
* The survey sample consisted of 17,464 U.S. workers aged ≥18 years who worked at least 20 hours per week.
† Education level only shown for persons aged ≥25 years.

services (57.7%) (Table 2). These same three industry groups also had the highest prevalence rates of frequent exertion at work and frequent standing at work considered separately. The finance and insurance industry group had the lowest prevalence rates of all three exposures (Table 2). Among the 22 major occupation groups, the groups with the highest prevalence of both frequent exertion and frequent standing at work were construction and extraction (76.9%); farming, fishing, and forestry (75.5%); and building and grounds cleaning and maintenance (74.0%) (Table 3). These same three occupation groups also had the highest prevalence rates for frequent exertion at work. The food preparation and serving related occupation group (97.2%) had the highest prevalence of frequent standing at work. The computer and mathematical occupation group had the lowest prevalence rate of the combined exposures of frequent exertion and frequent standing at work (4.6%) (Table 3).

Discussion

This is the first CDC report to evaluate exposure to frequent exertion and frequent standing at work among U.S. employed adults in all industries and occupations. The prevalence of exposure to both of these ergonomic hazards was higher among agricultural and construction workers than among workers in all other industries. A previous study using the U.S. Department of Labor's Occupational Information Network database found that of 10 detailed occupation categories evaluated with regard to self-reported bending or twisting at work, half were construction-related, which is consistent with the findings from this study (*4*). In addition, previous research using NHIS data that evaluated musculoskeletal disorders among agricultural workers found that low back pain was the most prevalent musculoskeletal disorder. That study also found that agricultural workers had a significantly higher prevalence of upper extremity pain compared with all other industries (*5*). Research has shown that agricultural and construction work are physically demanding, as these industries often require manual material handling, repetitive exertions, awkward body postures, and use of machinery that causes whole body vibration (*4–7*).

Approximately two thirds of all workers reported frequent standing at work. The industry and occupation groups that reported high prevalence rates of frequent exertion (e.g., farming, construction, and food services) also tended to report high prevalence rates of frequent standing, possibly because bending, pushing, pulling, and lifting commonly co-occur with standing. Several industry and occupation groups, such as education

TABLE 2. Weighted prevalence of frequent exertion at work, frequent standing at work, and both frequent exertion and frequent standing at work among adult U.S. workers,* by industry group — National Health Interview Survey, 2015

Industry group†	Both frequent exertion and frequent standing at work			Frequent exertion at work			Frequent standing at work		
	No. in sample exposed	Weighted no. in population	% (95% CI)	No. in sample exposed	Weighted no. in population	% (95% CI)	No. in sample exposed	Weighted no. in population	% (95% CI)
Agriculture, Forestry, Fishing, and Hunting	199	1,168,731	70.9 (63.2–78.5)	213	1,241,068	75.2 (68.0–82.5)	238	1,428,182	86.6 (81.2–92.0)
Construction	741	5,673,721	67.2 (63.5–70.8)	782	5,959,974	70.6 (67.0–74.2)	900	7,041,656	83.4 (80.4–86.3)
Accommodation and Food Services	703	5,272,820	57.7 (53.6–61.7)	712	5,317,174	58.2 (54.1–62.2)	1,093	8,459,753	92.5 (90.6–94.4)
Retail Trade	955	7,504,966	54.6 (51.1–58.2)	977	7,682,555	55.9 (52.4–59.4)	1,403	11,235,663	81.7 (79.3–84.1)
Arts, Entertainment, and Recreation	138	1,165,969	50.1 (41.3–59.0)	143	1,214,309	52.2 (43.8–60.6)	244	1,869,437	80.4 (74.7–86.0)
Health Care and Social Assistance	1,128	8,186,368	45.9 (43.2–48.6)	1,171	8,486,195	47.6 (44.9–50.3)	1,858	13,360,776	74.9 (72.7–77.1)
Administrative and support and Waste management and remediation services	350	2,780,964	45.7 (41.2–50.1)	374	2,955,167	48.5 (43.9–53.1)	539	4,230,331	69.4 (65.6–73.3)
Manufacturing	818	6,742,939	44.7 (41.8–47.7)	872	7,299,479	48.4 (45.4–51.4)	1,198	10,054,756	66.7 (63.7–69.6)
Other service (except Public Administration)	372	2,875,412	44.1 (39.5–48.7)	389	3,003,845	46.0 (41.6–50.5)	624	4,830,228	74.0 (69.8–78.3)
Transportation and warehousing	294	2,238,125	43.7 (38.5–49.0)	352	2,781,765	54.4 (49.3–59.5)	383	2,882,926	56.4 (51.2–61.5)
Wholesale trade	181	1,563,819	40.2 (33.3–47.2)	195	1,683,560	43.3 (36.4–50.2)	274	2,349,503	60.4 (54.3–66.6)
Utilities	54	283,706	27.7 (19.3–36.1)	56	288,971	28.2 (19.8–36.6)	96	593,375	57.9 (47.4–68.5)
Mining	60	217,846	27.0 (19.3–34.6)	63	226,742	28.1 (20.2–36.0)	88	470,569	58.3 (46.0–70.5)
Real Estate and Rental and Leasing	107	745,525	26.2 (20.2–32.2)	110	794,548	27.9 (21.7–34.2)	242	1,773,803	62.4 (55.2–69.6)
Information	84	701,050	23.7 (17.7–29.6)	96	816,293	27.5 (21.2–33.9)	157	1,305,710	44.0 (37.1–51.0)
Public administration	218	1,594,215	23.0 (19.6–26.4)	234	1,706,227	24.6 (21.1–28.1)	525	3,794,816	54.8 (50.4–59.2)
Education services	390	2,698,347	22.7 (19.9–25.5)	402	2,778,152	23.4 (20.5–26.2)	1,187	8,599,529	72.3 (69.4–75.2)
Professional, scientific, and technical services	134	1,026,452	9.8 (7.6–12.0)	153	1,159,929	11.1 (8.8–13.3)	404	3,149,955	30.1 (26.5–33.6)
Finance and Insurance	55	342,473	5.0 (3.2–6.8)	64	413,560	6.0 (3.9–8.2)	209	1,651,592	24.1 (20.3–27.9)
All currently employed adults	**6,982**	**52,785,257**	**39.5 (38.5–40.5)**	**7,359**	**55,811,322**	**41.7 (40.7–42.7)**	**11,669**	**89,111,151**	**66.6 (65.6–67.6)**

Abbreviation: CI = confidence interval.

* The survey sample consisted of 17,464 U.S. workers aged ≥18 years who worked at least 20 hours per week.

† The Management of Companies and Enterprises industry group was removed from the results because the cell size was <10 and did not meet the National Center for Health Statistics' standards of reliability.

and protective services, reported a high prevalence of frequent standing at work with a low prevalence of frequent exertion at work compared with other industry and occupation groups.

Recent studies have emphasized health risks associated with excessive sitting during the workday (*8*); however, excessive standing on the job also has been linked to adverse health outcomes (*9*). A systematic review of peer-reviewed articles on musculoskeletal symptoms and occupational standing as the main exposure variable found that occupational standing is associated with low back pain; however, associations with lower and upper extremity symptoms were inconclusive (*9*). More research is needed to understand how to balance time spent sitting and standing while at work.

The findings in this report are subject to at least four limitations. First, because NHIS data are cross-sectional, it is not possible to make causal inferences. Second, because NHIS data are self-reported, they are subject to recall or social desirability bias. Third, the intermediate exposure categories (Often, Sometimes, and Seldom) rely on subjective assessment of frequency. Finally, collapsing the detailed industry and occupation groups into the major industry and occupation groups might have aggregated employees with different working conditions.

Healthy People 2020 has an objective to "reduce rate of injury and illness cases involving days away from work due to overexertion and repetitive motion," by at least 10%.¶ NIOSH has developed educational resources on a variety of ergonomic issues.** For example, NIOSH provides a

¶ https://www.healthypeople.gov/2020/topics-objectives/topic/occupational-safety-and-health/objectives.

** https://www.cdc.gov/niosh/topics/ergonomics/default.html.

TABLE 3. Weighted prevalence of frequent exertion at work, frequent standing at work, and both frequent exertion and frequent standing at work among adult U.S. workers,* by occupation group — National Health Interview Survey, 2015

Occupation group	Both frequent exertion and frequent standing at work			Frequent exertion at work			Frequent standing at work		
	No. in sample exposed	Weighted no. in population	% (95% CI)	No. in sample exposed	Weighted no. in population	% (95% CI)	No. in sample exposed	Weighted no. in population	% (95% CI)
Construction and Extraction	685	4,856,232	76.9 (73.2–80.6)	718	5,077,403	80.4 (76.8–84.1)	793	5,739,639	90.9 (88.7–93.2)
Farming, Fishing, and Forestry	129	731,178	75.5 (65.3–85.8)	133	749,387	77.4 (67.3–87.4)	147	888,366	91.7 (86.9–96.6)
Building and Grounds Cleaning and Maintenance	518	3,495,764	74.0 (69.9–78.1)	532	3,605,331	76.3 (72.3–80.3)	658	4,332,921	91.7 (88.7–94.7)
Installation, Maintenance, and Repair	436	1,290,688	73.0 (68.4–77.6)	451	3,611,498	75.5 (71.0–79.9)	516	4,238,754	88.6 (85.1–92.1)
Food Preparation and Serving Related	587	4,277,608	65.7 (61.1–70.2)	591	4,304,915	66.1 (61.5–70.7)	853	6,336,456	97.2 (96.1–98.4)
Production	704	5,615,533	65.2 (61.5–69.0)	738	5,884,574	68.3 (64.7–72.0)	940	7,310,817	84.9 (82.2–87.6)
Healthcare Support	285	1,965,904	62.2 (56.2–68.1)	291	2,010,000	63.6 (57.6–69.5)	395	2,769,227	87.6 (83.5–91.7)
Transportation and Material Moving	540	4,244,701	55.2 (51.0–59.5)	642	5,187,351	67.5 (63.4–71.6)	648	5,182,206	67.4 (63.4–71.4)
Healthcare Practitioners and Technical	527	4,272,338	53.1 (49.2–57.1)	543	4,375,067	54.4 (50.3–58.5)	874	6,955,460	86.5 (84.1–88.9)
Personal Care and Service	278	2,072,693	52.2 (46.1–58.3)	290	2,135,012	53.8 (47.7–59.8)	467	3,448,249	86.8 (83.3–90.4)
Sales and Related	657	5,313,669	39.3 (35.7–42.9)	675	5,484,798	40.6 (37.0–44.2)	1,194	10,006,503	73.9 (70.9–76.8)
Protective Service	119	907,995	35.0 (28.2–41.8)	123	925,096	35.6 (28.7–42.6)	280	2,198,270	84.7 (79.5–89.8)
Education, Training, and Library	267	2,057,303	25.2 (21.5–28.9)	274	2,104,193	25.8 (22.1–29.5)	891	6,717,390	82.2 (79.2–85.3)
Office and Administrative Support	528	3,847,255	24.3 (21.8–26.8)	567	4,166,405	26.3 (23.7–28.9)	996	7,528,768	47.5 (44.8–50.2)
Arts, Design, Entertainment, Sports and Media	74	579,465	22.8 (16.9–28.7)	80	631,237	24.8 (18.9–30.8)	171	1,145,550	45.1 (38.3–51.8)
Management	418	3,258,402	22.5 (19.9–25.1)	444	3,441,037	23.7 (21.1–26.4)	965	7,543,484	52.0 (49.0–55.0)
Community and Social Services	52	423,039	15.7 (10.0–21.5)	53	444,643	16.5 (10.7–22.4)	217	1,448,680	53.9 (47.1–60.7)
Life, Physical, and Social Science	31	176,272	12.1 (6.1–18.0)	34	220,958	15.1 (8.3–21.9)	107	734,098	50.2 (40.9–59.5)
Architecture and Engineering	35	337,561	10.2 (6.1–14.3)	39	366,910	11.1 (6.9–15.3)	144	1,318,074	39.8 (33.4–46.3)
Business and Financial Operations	76	594,080	7.9 (5.7–10.1)	89	696,504	9.2 (6.9–11.6)	242	1,967,945	26.1 (22.5–29.7)
Computer and Mathematical	29	232,386	4.6 (2.6–6.6)	41	336,596	6.7 (4.1–9.2)	116	949,751	18.8 (14.8–22.8)
Legal	7	32,566	—§	11	52,407	3.1 (0.8–5.4)†	55	350,543	20.6 (13.5–27.6)
All currently employed adults	**6,982**	**52,785,257**	**39.5 (38.5–40.5)**	**7,359**	**55,811,322**	**41.7 (40.7–42.7)**	**11,669**	**89,111,151**	**66.6 (65.6–67.6)**

Abbreviation: CI = confidence interval.

* The survey sample consisted of 17,464 U.S. workers aged ≥18 years who worked at least 20 hours per week.

† Estimate has a relative standard error >30% and <50% and should be used with caution because it does not meet the National Center for Health Statistics' standards of reliability.

§ Estimate had a cell size <10 and was removed from the results because it did not meet the National Center for Health Statistics' standards of reliability.

demonstration guide on ergonomic principles including how to maintain neutral postures when working, how to select the appropriate hand tools, and how to prevent fatigue failure of the vertebrae. In addition, NIOSH offers ergonomic guidelines for manual material handling, a primer for creating a workplace ergonomic programs, and ergonomic interventions by specific industry, including agriculture and construction.†† Because ergonomic hazards are risk factors for work-related musculoskeletal disorders, continued research is necessary to develop a better understanding of these hazards and to create interventions aimed at reducing them (*2*,*8*–*10*).

†† https://www.cdc.gov/niosh/docs/2001-111/ and https://www.cdc.gov/niosh/docs/2007-122/.

Conflict of Interest

No conflicts of interest were reported.

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Summary

What is already known about this topic?

Occupational ergonomic hazards are risk factors for negative health outcomes such as musculoskeletal disorders. Previous research has found that employees in the agricultural and construction sectors experience high rates of musculoskeletal disorders and other injuries because of the physical nature of the work and has also found that workers in the construction and agricultural sectors have high prevalence rates of exertion including bending, lifting, pushing, and pulling.

What is added by this report?

Analysis of data from the National Health Interview Survey to examine two ergonomic hazards among currently employed adults who work at least 20 hours per week in 20 major industry groups and 22 major occupation groups found a 41.7% prevalence of frequent exertion (repeated lifting, pushing, pulling, or bending) at work and a 66.6% prevalence of frequent standing at work. A wide range in prevalence for these ergonomic hazards was observed among the industry and occupation groups.

What are the implications for public health practice?

Large differences in prevalence of frequent exertion at work and frequent standing at work exist among the major industry and occupation groups. Identification of workers with the highest prevalences of exposure to these two ergonomic hazards can inform the targeting of interventions.

Tobacco Product Use Among Military Veterans — United States, 2010–2015

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In 2015, an estimated 18.8 million U.S. adults were military veterans (*1*). Although the prevalence of tobacco-attributable conditions is high among veterans (*2*), there is a paucity of data on use of tobacco products, other than cigarettes, in this population. To monitor tobacco product use among veterans, CDC analyzed self-reported current (i.e., past 30-day) use of five tobacco product types (cigarettes, cigars [big cigars, cigarillos, or little cigars], roll-your-own tobacco, pipes, and smokeless tobacco [chewing tobacco, snuff, dip, or snus]) from the National Survey on Drug Use and Health (NSDUH). Overall, 29.2% of veterans reported current use of any of the assessed tobacco products. Cigarettes were the most commonly used tobacco product (21.6%), followed by cigars (6.2%), smokeless tobacco (5.2%), roll-your-own tobacco (3.0%), and pipes (1.5%); 7.0% of veterans currently used two or more tobacco products. Within subgroups of veterans, current use of any of the assessed tobacco products was higher among persons aged 18–25 years (56.8%), Hispanics (34.0%), persons with less than a high school diploma (37.9%), those with annual family income <$20,000 (44.3%), living in poverty (53.7%), reporting serious psychological distress (48.2%), and with no health insurance (60.1%). By age and sex subgroups, use of any of the assessed tobacco products was significantly higher among all veteran groups than their nonveteran counterparts, except males aged ≥50 years. Expanding the reach of evidence-based tobacco control interventions among veterans could reduce tobacco use prevalence in this population.

NSDUH is an annual, in-person survey of the civilian, non-institutionalized U.S. population aged ≥12 years conducted at the respondent's residence (*3*). The analyses in this report were restricted to adults aged ≥18 years. Data were pooled for 2010–2015 to increase statistical precision of estimates. Pooled sample size for adults aged ≥18 years was 238,917; annual response rate averaged 65.4%.*

Military veterans were those who had "ever been in the United States Armed Forces" and were "now separated/retired from reserves/active duty" (pooled n = 13,140). Nonveterans were those who had never been in the United States Armed Forces (pooled n = 224,648).† Respondents who reported currently being in a reserve component, or did not provide an answer were excluded from the analyses. Current users of cigarettes, cigars, roll-your-own tobacco, pipes, and smokeless tobacco were persons who had used the respective products during the past 30 days. Any tobacco product use was defined as use of any of the five assessed tobacco product types. Respondents who reported use of two or more tobacco product types during the past 30 days were further classified as current users of two or more tobacco product types.§ Prevalence estimates were calculated overall and by sex, age, race/ethnicity, education, annual family income, poverty status,¶ marital status, presence of serious psychological distress,** and health insurance coverage.†† Additionally, age- and sex-specific prevalence estimates were calculated among veterans and nonveterans separately to allow direct comparisons of the two groups, given differences between veterans and nonveterans by age and sex.§§ Cigarette quit ratio was calculated as the proportion of former

* Data are collected annually through handheld computer-assisted face-to-face interviews, using a combination of interviewer-administered and respondent self-administered questions. Sample sizes and response rates for adult population were 39,069; 65.9% (2010); 38,965; 64.7% (2011); 37,657; 67.1% (2012); 37,250; 64.5% (2013); 41,520; 61.2% (2014), and 43,401; 69.2% (2015). Of the 238,917 adults in the pooled sample, 13,140 were veterans, 224,648 were nonveterans, 1,040 were currently in a reserve component, and 89 did not provide an answer.

† To determine military veteran status, respondents were asked two questions. The first question was "Have you ever been in the United States Armed Forces?" Categorical response options were "Yes" or "No." Those who answered "Yes" were then asked "Are you currently on active duty in the United States Armed Forces, are you in a Reserve component, or are you now separated or retired from the military?" Categorical response options were "On active duty in the Armed Forces," "In a reserve component" or "Now separated/retired from reserves/active duty." Persons who reported currently being on active duty were not included in the survey. Respondents who reported currently being in a reserve component (1,040; 0.4% of respondents) and those did not provide an answer (89; 0.04% of respondents) were excluded from the analysis.

§ For the use of any tobacco product types and two or more tobacco product types, respondents who had at least one missing response to any of the five tobacco product type questions were excluded from the analysis (76; 0.03% of respondents).

¶ Poverty status was assessed in National Survey on Drug Use and Health since 2003. Poverty status indicates a person's family income relative to Federal poverty thresholds. https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.

** The Kessler Serious Psychological Distress is a series of six questions that asks about feelings of sadness, nervousness, restlessness or fidgetiness, worthlessness, hopelessness, and feeling like everything is an effort during the past 30 days. Responses were scored on a Likert Scale ranging from "None of the time" (score = 0) to "All of the time" (score = 4). Responses were summed over the six questions; scores could range from 0–24. Respondents with a score ≥13 were coded as having serious psychological distress, and respondents with a score <13 were coded as not having serious psychological distress. https://jamanetwork.com/journals/jamapsychiatry/fullarticle/207204.

†† Respondents were classified as being insured if they had private insurance, Medicare, Medicaid/HIPCOV, Champus, ChampVA, VA, Military, or other health insurance. Among veterans, weighted proportions of those insured and uninsured were 94.3% and 5.7%, respectively.

§§ Veteran and nonveteran populations differed in distributions of sex (males: 93.1% versus 43.2%, veterans and nonveterans, respectively) and age (persons aged ≥50 years: 76.2% versus 40.3%, veterans and nonveterans, respectively).

cigarette smokers (persons who smoked ≥100 cigarettes during lifetime, but did not smoke in past 12 months) among ever cigarette smokers (persons who smoked ≥100 cigarettes during lifetime); quit ratios were not calculated for the other noncigarette tobacco products because of the absence of lifetime usage thresholds to distinguish actual former users from experimenters. The proportion of former cigarette smokers who still reported current (past 30-day) use of any noncigarette tobacco product (cigars, roll-your-own tobacco, pipes, and smokeless tobacco) was computed to determine complete tobacco abstinence among those who had quit cigarette smoking. Within-group differences and differences between veterans and nonveterans were assessed with Chi-squared tests, and trends in estimates were tested with logistic regression using orthogonal polynomials, with statistical significance at $p<0.05$. Estimates with relative standard errors ≥30% were suppressed.

Among veterans overall, 29.2% reported current use of any tobacco product, and 7.0% reported current use of two or more tobacco products (Table 1). By tobacco product type, current use was highest for cigarettes (21.6%), followed by cigars (6.2%), smokeless tobacco (5.2%), roll-your-own tobacco (3.0%), and pipes (1.5%). Significant differences existed within veteran subgroups in current use of any tobacco product. Prevalence was lowest among persons who were aged ≥50 years (23.8%), non-Hispanic white (28.3%), had a college degree or higher (17.2%), an annual family income of ≥$75,000 (23.9%), living at more than twice the Federal Poverty Threshold (25.2%), married (24.3%), did not report serious psychological distress (28.5%), and were insured (27.3%). Prevalence was highest among persons who were aged 18–25 years (56.8%), Hispanic (34.0%), had less than a high school diploma (37.9%), an annual family income of <$20,000 (44.3%), were living in poverty (53.7%), were never married (43.4%), who reported serious psychological distress (48.2%), and who were uninsured (60.1%).

The prevalence of current use of any tobacco product was significantly higher among veterans than nonveterans in all age and sex strata, except males aged ≥50 years (Table 2). Among both veterans and nonveterans, the prevalence of any tobacco product use was significantly higher among males than among females in each age stratum, except veterans aged ≥50 years.

Cigarette quit ratio estimates were not significantly different among veterans and nonveterans in any age/sex stratum except females aged 18–25 years (18.7%, veterans versus 10.4% nonveterans), females aged ≥50 years (50.8% versus 62.1%); and males aged ≥50 years (72.4% versus 61.1%,) ($p<0.05$) (Figure). For both veterans and nonveterans, sex-specific quit ratios increased with increasing age ($p<0.05$ for trend). Current use of noncigarette tobacco products among former cigarette smokers was not significantly different among veterans and nonveterans in any age/sex stratum except males aged 35–49 years (26.4% versus 17.9%, veterans versus nonveterans), and males aged ≥50 years (8.6% versus 11.7%) ($p<0.05$). Although sex-specific prevalence of noncigarette tobacco product use decreased with increasing age among nonveterans ($p<0.05$ for trend), trends were not significant for veterans.

Summary

What is already known about this topic?

In the United States, the prevalence of adverse health conditions caused by tobacco use is particularly high among veterans; however, data on use of tobacco products other than cigarettes in this population are limited.

What is added by this report?

Analysis of data from the 2010–2015 National Survey on Drug Use and Health indicates that 29.2% of veterans reported current tobacco product use. Cigarettes were the most commonly used tobacco product (21.6%), followed by cigars (6.2%), smokeless tobacco (5.2%), roll-your-own tobacco (3.0%), and pipes (1.5%); 7.0% of veterans currently used two or more tobacco products. Within veteran subgroups, current use of any of the assessed tobacco products was higher among persons aged 18–25 years (56.8%), Hispanics (34.0%), persons who had not completed high school (37.9%), whose annual family income was <$20,000 (44.3%), were living in poverty (53.7%), who reported serious psychological distress (48.2%), and who had no health insurance (60.1%). By age and sex subgroups, any tobacco product use was significantly higher among all veteran groups than their nonveteran counterparts, except males aged ≥50 years.

What are the implications for public health practice?

Evidence-based tobacco control interventions can be implemented to reach veterans, which could reduce tobacco use prevalence and tobacco-attributable disease and death among this population. Strategies could include promoting cessation to current military personnel and veterans, implementing tobacco-free policies at military installations and Veterans Affairs medical centers and clinics, increasing the age requirement to buy tobacco on military bases to 21 years, and eliminating tobacco product discounts through military retailers.

Discussion

During 2010–2015, close to three in 10 U.S. veterans were current users of any tobacco products, and prevalence of use of any tobacco product was higher among veterans than among nonveterans within all subgroups of age and sex, except males aged ≥50 years. Evidence-based strategies can help veterans quit tobacco use, including quitline services (e.g., 1–855-QUIT-VET and 1–800-QUIT-NOW[¶¶]); text messaging services (e.g., https://www.publichealth.va.gov/smoking/smokefreevet.asp); web resources (e.g., https://www.publichealth.va.gov/smoking/

[¶¶] https://www.publichealth.va.gov/smoking/quit/index.asp.

TABLE 1. Point prevalence estimates and 95% confidence intervals of past 30-day use of tobacco product among military veterans* aged ≥18 years, overall and by sociodemographic characteristics — National Survey on Drug Use and Health, United States, 2010–2015

Characteristic	Cigarettes % (95% CI)	Cigars (big cigars/ cigarillos/ little cigars) % (95% CI)	Roll-your-own tobacco % (95% CI)	Pipe % (95% CI)	Smokeless tobacco (chewing tobacco/snuff/ dip/snus) % (95% CI)	Any tobacco product¶ % (95% CI)	≥2 tobacco products** % (95% CI)
Overall (n = 13,140)	**21.6 (20.7–22.6)**	**6.2 (5.7–6.8)**	**3.0 (2.7–3.4)**	**1.5 (1.2–1.7)**	**5.2 (4.7–5.7)**	**29.2 (28.1–30.2)**	**7.0 (6.4–7.5)**
Sex							
Male	21.1 (20.1–22.1)†	6.5 (5.9–7.1)†	3.0 (2.6–3.4)	1.6 (1.3–1.9)†	5.6 (5.1–6.1)†	29.1 (28.0–30.2)	7.1 (6.5–7.7)†
Female	28.9 (25.3–32.5)†	2.1 (1.3–2.9)†	3.4 (1.9–5.0)	—§	—§	29.7 (26.1–33.3)	4.8 (3.1–6.5)†
Age group (yrs)							
18–25	47.3 (43.5–51.2)†	13.3 (10.7–16.0)†	5.3 (3.8–6.7)†	2.5 (1.2–3.8)	15.4 (12.7–18)†	56.8 (52.9–60.6)†	21.2 (18.1–24.3)†
26–34	43.7 (40.2–47.2)†	11.2 (9.0–13.4)†	6.0 (4.5–7.4)†	1.6 (0.7–2.4)	12 (9.8–14.2)†	52.7 (49.1–56.2)†	17.6 (15–20.2)†
35–49	31.5 (29.4–33.6)†	8.8 (7.4–10.1)†	3.8 (3.0–4.6)†	1.1 (0.6–1.5)	11.3 (9.8–12.7)†	43.2 (41.0–45.5)†	10.8 (9.4–12.3)†
≥50	17.3 (16.2–18.5)†	5.2 (4.5–5.8)†	2.6 (2.2–3.0)†	1.5 (1.2–1.9)	3.2 (2.7–3.7)†	23.8 (22.5–25.1)†	5.0 (4.4–5.7)†
Race/Ethnicity							
Non-Hispanic white	20.2 (19.2–21.2)†	5.9 (5.3–6.5)†	2.9 (2.5–3.3)	1.5 (1.2–1.9)	5.8 (5.2–6.3)†	28.3 (27.1–29.4)†	6.7 (6.0–7.3)
Non-Hispanic black	26.3 (23.2–29.4)†	9.4 (7.4–11.4)†	3.6 (2.2–4.9)	1.2 (0.5–1.9)	1.9 (1.1–2.8)†	32.1 (28.7–35.4)†	8.3 (6.4–10.1)
Hispanic	29.1 (24.1–34.1)†	6.0 (3.8–8.3)†	—§	—§	4.7 (2.8–6.6)†	34.0 (28.9–39.1)†	7.7 (5.0–10.3)
Non-Hispanic other	29.0 (22.8–35.2)†	—§	5.4 (2.9–7.9)	—§	3.2 (1.8–4.5)†	33.6 (27.1–40.0)†	8.6 (5.7–11.4)
Education							
Less than high school	30.4 (26.6–34.1)	6.6 (4.6–8.7)†	6.1 (4.2–8.0)†	2.8 (1.5–4.1)	6.3 (4.4–8.2)†	37.9 (34.0–41.9)†	10.4 (8–12.7)†
High school	26.3 (24.5–28.1)	5.9 (4.9–6.9)†	4.2 (3.4–4.9)†	1.4 (0.9–1.9)	6.3 (5.4–7.2)†	33.9 (31.9–35.8)†	8.8 (7.7–9.9)†
Some college	25.7 (23.8–27.5)	6.9 (5.9–7.9)†	3.3 (2.6–4.0)†	1.4 (0.9–1.8)	6.1 (5.2–6.9)†	33.6 (31.6–35.5)†	7.9 (6.9–9.0)†
College degree or higher	10.1 (8.7–11.5)	5.8 (4.7–6.8)†	0.7 (0.4–1.1)†	1.3 (0.8–1.8)	2.9 (2.1–3.6)†	17.2 (15.5–18.9)†	3.0 (2.2–3.8)†
Annual family income ($)							
<$20,000	37.7 (34.5–40.9)†	8.2 (6.6–9.9)†	10.3 (8.4–12.3)†	3.0 (1.9–4.0)†	5.2 (3.9–6.6)	44.3 (41.0–47.6)†	15.9 (13.6–18.1)†
$20,000–$49,999	24.8 (23.0–26.5)†	5.6 (4.7–6.5)†	3.5 (2.8–4.2)†	1.6 (1.1–2.1)†	4.9 (4.1–4.9)	31.5 (29.6–33.3)†	7.5 (6.5–7.5)†
$50,000–$74,999	18.7 (16.7–20.8)†	5.6 (4.3–6.8)†	1.5 (0.8–2.1)†	1.6 (0.9–2.3)†	4.6 (3.7–4.6)	25.8 (23.5–28.1)†	4.9 (3.8–4.9)†
>$75,000	15.0 (13.5–16.4)†	6.6 (5.6–7.6)†	1.1 (0.7–1.4)†	0.8 (0.5–1.1)†	5.8 (4.9–6.7)	23.9 (22.1–25.6)†	4.6 (3.8–5.5)†
Poverty status††							
Living in poverty	46.2 (41.9–50.5)†	9.9 (7.5–12.3)†	14.1 (11.1–17.2)†	3.2 (1.8–4.6)†	7.4 (5.2–9.6)†	53.7 (49.4–58.1)†	21.0 (17.5–24.4)†
Up to 2X Federal Poverty Threshold	32.0 (29.3–34.6)†	6.5 (5.2–7.9)†	5.6 (4.4–6.8)†	1.8 (1.0–2.6)†	5.7 (4.6–6.8)†	38.7 (35.9–41.4)†	10.6 (9.0–12.3)†
More than 2X Federal Poverty Threshold	17.5 (16.5–18.6)†	5.9 (5.2–6.5)†	1.6 (1.3–1.9)†	1.3 (1.0–1.6)†	5.0 (4.4–5.5)†	25.2 (24.1–26.4)†	5.1 (4.5–5.6)†
Marital status							
Married	16.6 (15.5–17.7)†	5.6 (4.9–6.3)†	2.1 (1.7–2.5)†	1.1 (0.8–1.3)†	5.1 (4.5–5.7)†	24.3 (23.1–25.6)†	5.2 (4.6–5.9)†
Widowed/Divorced/ Separated	30.4 (28.2–32.6)†	6.7 (5.5–7.9)†	4.9 (4.0–5.9)†	2.6 (1.8–3.4)†	4.8 (4.0–5.7)†	37.4 (35.1–39.8)†	9.6 (8.2–10.9)†
Never married	36.1 (33.0–39.3)†	9.9 (8.0–11.8)†	5.2 (4.1–6.3)†	1.5 (0.8–2.1)†	7.4 (5.8–8.9)†	43.4 (40.1–46.8)†	12.9 (11.0–14.8)†
Serious psychological distress§§							
No	21.0 (20.0–22.0)†	6.1 (5.6–6.7)†	2.8 (2.5–3.2)†	1.4 (1.1–1.7)†	5.2 (4.7–5.7)	28.5 (27.4–29.6)†	6.7 (6.1–7.2)†
Yes	40.8 (35.0–46.5)†	9.4 (6.1–12.7)†	9.2 (6.2–12.2)†	4.1 (1.9–6.3)†	6.6 (4.4–8.8)	48.2 (42.2–54.2)†	15.7 (11.9–19.5)†
Health insurance coverage¶¶							
Uninsured	51.4 (46.7–56.1)†	12.0 (9.4–14.5)†	8.8 (6.7–10.8)†	2.6 (1.3–4.0)†	10.5 (7.8–13.2)†	60.1 (55.4–64.8)†	19.4 (16.2–22.6)†
Insured	19.8 (18.9–20.8)†	5.9 (5.3–6.5)†	2.7 (2.3–3.1)†	1.4 (1.1–1.7)†	4.9 (4.4–5.4)†	27.3 (26.2–28.4)†	6.2 (5.6–6.8)†

Abbreviation: CI = confidence interval.

* Persons who reported having ever been in the U.S. Armed Forces and currently being separated or retired from reserves/active duty at the time of the survey (pooled n = 13,140).

† Estimates significantly varied within sociodemographic subgroups (p<0.05).

§ Estimates not presented because of relative standard error ≥30%.

¶ Any tobacco product–users were persons who reported past-30 day use of at least one of the five tobacco product types (cigarettes, cigars, roll-your-own tobacco, pipe, and smokeless tobacco). Respondents who had at least one missing response to any of the tobacco product use questions were excluded from the analysis (76, 0.03% of respondents).

** ≥2 tobacco product–users were persons who reported past-30 day use of ≥2 tobacco products. Respondents who had at least one missing response to any of the tobacco product use questions were excluded from the analysis (76, 0.03% of respondents).

†† Poverty status indicates a person's family income relative to Federal Poverty Threshold. https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.

§§ The Kessler Serious Psychological Distress is a series of six questions that asks about feelings of sadness, nervousness, restlessness, worthlessness, hopelessness, and feeling like everything is an effort during the past 30 days. Participants responded using a Likert Scale ranging from "None of the time" (score = 0) to "All of the time" (score = 4). Responses were summed over the six questions for a total possible score of 0–24; respondents with a score ≥13 were coded as having serious psychological distress, and respondents with a score <13 were coded as not having serious psychological distress. https://jamanetwork.com/journals/jamapsychiatry/fullarticle/207204.

¶¶ Respondents were classified as being insured if they had private insurance, Medicare, Medicaid/HIPCOV, Champus, ChampVA, VA, Military, or other health insurance. Among veterans, weighted proportions of those insured and uninsured were 94.7% and 5.7%, respectively.

TABLE 2. Comparisons of age and sex-specific point prevalence estimates of past 30-day use of tobacco product between military veterans* and nonveterans — National Survey on Drug Use and Health, United States, 2010–2015

Age group, yrs (sex)	Cigarettes % (95% CI)	Cigars (big cigars/ cigarillos/ little cigars) % (95% CI)	Roll-your-own tobacco % (95% CI)	Pipe % (95% CI)	Smokeless tobacco (chewing tobacco/snuff/ dip/snus) % (95% CI)	Any tobacco product¶ % (95% CI)	≥2 tobacco products** % (95% CI)
Veterans (n = 13,140)							
18–25 (male)	50.2 (45.8–54.5)†	14.7 (11.6–17.8)	5.6 (3.9–7.4)	3.2 (1.5–4.8)	18.9 (15.7–22.2)†	61.7 (57.4–66.0)†	23.7 (20.1–27.4)†
18–25 (female)	36.4 (28.8–44.0)†	8.0 (3.4–12.5)	—§	—§	—§	37.9 (30.2–45.5)†	11.4 (6.4–16.4)†
26–34 (male)	45.5 (41.6–49.5)†	12.7 (10–15.3)	6.2 (4.6–7.9)	1.8 (0.8–2.8)	14.0 (11.4–16.6)†	55.9 (51.9–59.8)†	19.3 (16.3–22.4)†
26–34 (female)	35.2 (28.2–42.3)†	—§	—§	—§	—§	37.4 (30.3–44.5)†	9.5 (5.3–13.7)†
35–49 (male)	31.5 (29.2–33.7)†	9.6 (8.2–11.1)†	4.0 (3.1–4.8)	1.2 (0.7–1.8)	12.9 (11.3–14.5)†	44.8 (42.3–47.2)†	11.9 (10.3–13.5)†
35–49 (female)	31.5 (26.3–36.7)†	—§	—§	—§	—	32.7 (27.5–38.0)†	3.5 (1.7–5.3)
≥50 (male)	17.0 (15.8–18.1)	5.4 (4.7–6.1)	2.6 (2.1–3.0)†	1.6 (1.2–2.0)	3.3 (2.8–3.9)	23.7 (22.5–25.0)	5.1 (4.4–5.7)
≥50 (female)	24.8 (18.8–30.8)†	—§	—§	—§	—§	24.9 (10.9–30.9)†	—§
Nonveterans (n = 224,648)							
18–25 (male)	35.3 (34.7–35.9)†	15.2 (14.7–15.6)	6.7 (6.4–7.0)	2.7 (2.5–2.9)	10.4 (10.1–10.8)†	45.3 (44.7–45.9)†	18.8 (18.3–19.3)†
18–25 (female)	26.0 (25.5–26.5)†	5.4 (5.1–5.6)	3.5 (3.3–3.7)	1.1 (1.0–1.2)	0.7 (0.6–0.7)	28.8 (28.3–29.3)†	6.5 (6.3–6.8)†
26–34 (male)	36.3 (35.3–37.3)†	11.5 (10.8–12.2)	5.9 (5.5–6.4)	1.4 (1.2–1.7)	8.4 (7.9–9.0)†	45.2 (44.2–46.3)†	14.8 (14.1–15.5)†
26–34 (female)	26.7 (25.9–27.5)†	3.1 (2.8–3.4)	3.0 (2.7–3.2)	0.4 (0.3–0.5)	0.5 (0.3–0.6)	28.3 (27.5–29.1)†	4.6 (4.3–5.0)†
35–49 (male)	26.3 (25.5–27.1)†	7.3 (6.9–7.8)†	4.5 (4.2–4.8)	0.9 (0.8–1.1)	7.8 (7.3–8.2)†	35.6 (34.7–36.4)†	9.3 (8.8–9.8)†
35–49 (female)	23.0 (22.3–23.6)†	1.8 (1.6–2.0)	2.9 (2.7–3.2)	0.2 (0.1–0.2)	0.3 (0.2–0.4)	23.8 (23.2–24.4)†	3.9 (3.6–4.2)
≥50 (male)	18.1 (17.2–18.9)	5.7 (5.2–6.2)	3.3 (2.9–3.7)	1.3 (1.1–1.6)	3.7 (3.3–4.1)	25.1 (24.2–26.1)	5.7 (5.2–6.2)
≥50 (female)	14.8 (14.2–15.3)†	0.6 (0.5–0.7)	2.0 (1.8–2.2)	0.1 (0.1–0.2)	0.4 (0.3–0.6)	15.4 (14.8–16.0)†	2.4 (2.2–2.6)

Abbreviation: CI = confidence interval.

* Veterans were persons who reported having ever been in the U.S. Armed Forces and being separated or retired from reserves/active duty at the time of the survey (pooled n = 13,140). Nonveterans were persons who reported having never been in the U.S. Armed Forces (pooled n = 224,648).

† Estimates significantly different from corresponding estimate among veteran and nonveteran populations.

§ Estimates not presented because of relative standard error ≥30%.

¶ Any tobacco product users were persons who reported past-30 day use of at least one of the five tobacco product types (cigarette, cigar, roll-your-own tobacco, pipe, and smokeless tobacco). Respondents who had at least one missing response to any of the tobacco product use question were excluded from the analysis (76, 0.03% of respondents).

** ≥2 tobacco-product–users were persons who reported past-30 day use of ≥2 tobacco products. Respondents who had at least one missing response to any of the tobacco product use questions were excluded from the analysis (76, 0.03% of respondents).

and https://smokefree.gov/veterans); group/individual counseling; and use of FDA approved cessation medications. Additionally, CDC's Tips From Former Smokers' Campaign (https://www.cdc.gov/tobacco/campaign/tips/index.html) features real stories of smokers, including military service members and veterans who live with smoking-related diseases and disabilities, to motivate smokers to quit.***

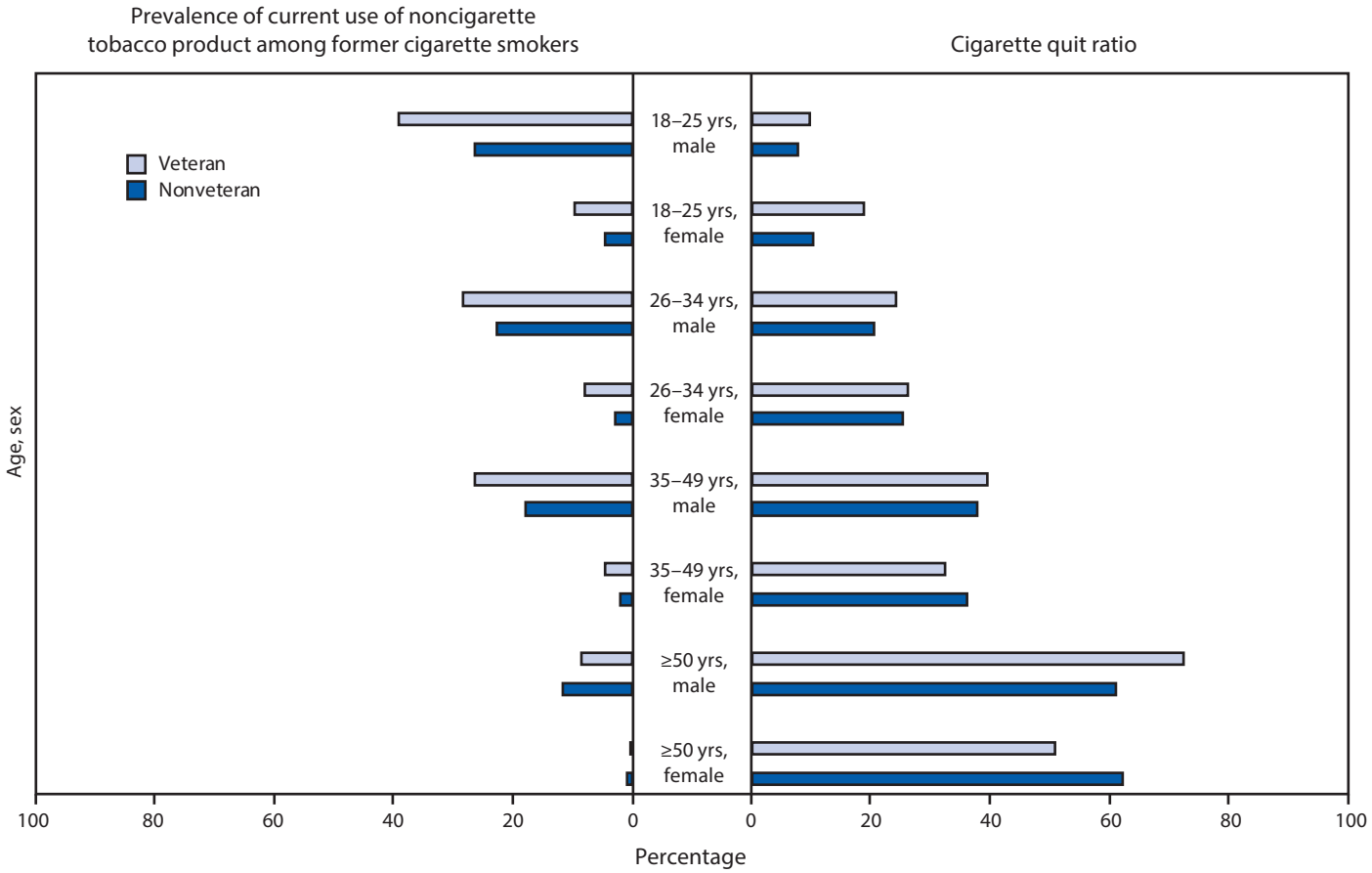
Despite similar quit ratios among veterans and nonveterans, the prevalence of current cigarette smoking was higher among veterans in most age groups. These findings are consistent with those of previous studies showing high rates of smoking initiation among military personnel (*4*,*5*). Approximately 38% of current military smokers initiate tobacco use after enlisting in military service (*6*). Factors encouraging or enabling tobacco use in the military include stress, peer influence, and easy access to cheap tobacco products (*7*,*8*).

The high prevalence of tobacco use among military personnel and veterans also has a significant financial impact. During 2010, the Veterans Health Administration (VHA) spent an estimated $2.7 billion (7.6% of the VHA expenditures on health services for which the cost of smoking could be attributed) on smoking-related ambulatory care, prescription drugs, hospitalization, and home health care for the segment of the veteran population receiving VHA services (*2*). Tobacco use among active military personnel can eventually contribute to VHA expenditures as these become veterans. Reducing tobacco use among both active duty military and veterans can therefore result in a substantial reduction in tobacco-related morbidity and mortality and billions of dollars in savings from averted medical costs.

Implementation of evidence-based tobacco control interventions among military and veteran populations can help reduce prevalence by preventing initiation and relapse, and encouraging quitting. Because more than a third of current smokers in active duty military initiate smoking after enlistment (*6*), and because veterans continue to have access to military installations after retirement from the military, interventions that impact both current and former military members are important to reduce tobacco use among veterans. Strategies could include promoting cessation to current military personnel and veterans, implementing tobacco-free policies at military installations and Veterans Affairs medical centers and clinics, increasing the age requirement to buy tobacco on military bases to 21 years, and eliminating tobacco product discounts through military retailers (*9*,*10*).

*** https://www.cdc.gov/tobacco/campaign/tips/groups/military.html.

FIGURE. Prevalence of current (past 30-day) use of noncigarette tobacco product* among former cigarette smokers and cigarette quit ratios,† among military veterans and nonveterans,§ by age and sex — National Survey on Drug Use and Health, United States, 2010–2015



* Noncigarette tobacco product includes cigars, roll-your-own tobacco, pipes, and smokeless tobacco.

† Cigarette quit ratio was calculated as the proportion of former smokers (persons who smoked ≥100 cigarettes during lifetime and did not smoke in the past 12 months) among ever smokers (persons who smoked ≥100 cigarettes during lifetime).

§ Veterans were individuals who reported having ever been in the U.S. Armed Forces and currently being separated or retired from reserves/active duty at the time of the survey (pooled n = 13,140). Nonveterans were individuals who reported having never been in the U.S. Armed Forces (pooled n = 224,648). Prevalence of current use of noncigarette tobacco product among former smokers was significantly different among veterans and nonveterans in males aged 35–49 years and males aged ≥50 years ($p<0.05$). Cigarette quit ratios were significantly different among veterans and nonveterans in females aged 18–25 years; males aged ≥50 years; and females aged ≥50 years ($p<0.05$).

The findings in this report are subject to at least five limitations. First, these cross-sectional data do not allow a comparison of prevalence estimates for the same cohort as they age. Second, the definition of veterans used in this study possibly includes persons who served in the U.S. Armed Forces but might not meet the statutory definition of "veterans" (e.g., dishonorably discharged persons). Third, data were not available for newer tobacco products such as hookah and electronic cigarettes. Fourth, these analyses used data pooled from multiple years; therefore, only time-averaged prevalence estimates could be assessed. Finally, multivariable analyses were not performed to identify independent predictors of tobacco use, especially among subgroups where multiple risk factors for tobacco use might exist simultaneously.

The health and economic costs of tobacco use among veterans are high (*2*). Opportunities exist to make tobacco products less acceptable and accessible for both active duty military personnel and veterans. For example, U.S. Department of Veterans Affairs health care facilities are required by Federal law to have designated smoking areas.††† Progress has been made in recent years in promoting tobacco cessation and denormalizing smoking among military personnel and veterans. This includes VHA's efforts to increase access to tobacco use treatment options§§§ as well as the U.S. Department of Defense's (DOD) prohibition of tobacco use on DOD medical campuses

††† https://www.gpo.gov/fdsys/pkg/STATUTE-106/pdf/STATUTE-106-Pg4943.pdf.

§§§ https://www.publichealth.va.gov/smoking/quit/index.asp.

and medical treatment facilities, with a goal to achieve tobacco-free installations by 2020.¶¶¶ Continued implementation of these and other evidence-based tobacco control interventions on military and veteran facilities can help reduce tobacco use and tobacco-attributable disease and death among veterans.

¶¶¶ http://www.med.navy.mil/sites/nmcphc/Documents/health-promotion-wellness/tobacco-free-living/INCOMING-CARTER-Tobacco-Policy-Memo.pdf.

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Conflict of Interest

No conflicts of interest were reported.

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West Nile Virus and Other Nationally Notifiable Arboviral Diseases — United States, 2016

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Arthropod-borne viruses (arboviruses) are transmitted to humans primarily through the bites of infected mosquitoes and ticks. West Nile virus (WNV) is the leading cause of domestically acquired arboviral disease in the continental United States (*1*,*2*). Other arboviruses, including La Crosse, Powassan, Jamestown Canyon, St. Louis encephalitis, and eastern equine encephalitis viruses, cause sporadic cases of disease and occasional outbreaks. This report summarizes surveillance data reported to CDC for 2016 for nationally notifiable arboviruses. It excludes dengue, chikungunya, and Zika viruses, as these are primarily nondomestic viruses typically acquired through travel. Forty-seven states and the District of Columbia (DC) reported 2,240 cases of domestic arboviral disease, including 2,150 (96%) WNV disease cases. Of the WNV disease cases, 1,310 (61%) were classified as neuroinvasive disease (e.g., meningitis, encephalitis, acute flaccid paralysis), for a national incidence of 0.41 cases per 100,000 population. After WNV, the most frequently reported arboviruses were La Crosse (35 cases), Powassan (22), and Jamestown Canyon (15) viruses. Because arboviral diseases continue to cause serious illness, maintaining surveillance is important to direct prevention activities.

Arboviruses are maintained in a transmission cycle between arthropods and vertebrate hosts, including humans and other animals. Humans primarily become infected when bitten by an infected tick or mosquito. Person-to-person transmission through blood transfusion and organ transplantation has been reported but is uncommon (*3*). Most human infections are asymptomatic; symptomatic infections commonly manifest as a systemic febrile illness and, less commonly as neuroinvasive disease.

Most endemic arboviral diseases are nationally notifiable and are reported to CDC through ArboNET, a national arboviral surveillance system managed by CDC and state health departments (*3*,*4*). Using standard definitions, human cases with laboratory evidence of recent arboviral infection are classified as having either neuroinvasive or non-neuroinvasive disease (*3*). Cases reported as encephalitis, meningitis, acute flaccid paralysis, or other neurologic manifestations were categorized as neuroinvasive disease. Reports without indication of a central neurologic process were categorized as non-neuroinvasive disease. Acute flaccid paralysis can occur with or without encephalitis or meningitis. In this report, any case reported as acute flaccid paralysis (with or without another clinical syndrome) was classified as acute flaccid paralysis and not included in the other categories. Because ArboNET is a passive surveillance system, detection and reporting of neuroinvasive disease are thought to be more consistent and more complete than non-neuroinvasive disease, which is likely considerably underreported. For this reason, incidence rates were calculated using neuroinvasive disease cases and the U.S. Census 2016 mid-year population estimates.

In 2016, 2,240 cases of domestic arboviral diseases were reported to CDC. Cases were caused by WNV (2,150 cases, 96%), La Crosse virus (35), Powassan virus (22), Jamestown Canyon virus (15), St. Louis encephalitis virus (eight), eastern equine encephalitis virus (seven), and unspecified California serogroup virus (three). Of the 3,142 U.S. counties, 656 (21%) reported one or more cases of arboviral disease. No cases of domestic arboviral disease were reported from Alaska, Hawaii, or Delaware.

Overall, 2,150 WNV disease cases were reported from 604 counties in 45 states and the District of Columbia. Of these, 1,310 (61%) cases were neuroinvasive and 1,781 (83%) patients had illness onset during July–September (Table 1). The median age of patients was 57 years (interquartile range [IQR] = 44–68 years); 1,326 (62%) were male. A total of 1,465 (68%) patients were hospitalized and 106 (5%) died. The median age of patients who were hospitalized was 61 years (IQR = 48–72 years) and 947 (65%) were male. The median age of patients who died was 75 years (IQR = 62–82 years) and 63 (59%) were male.

Among the 1,310 WNV neuroinvasive disease cases, 689 (53%) were reported as encephalitis, 468 (36%) as meningitis, 78 (6%) as acute flaccid paralysis, and 75 (6%) as other neurologic presentation. Of the 78 patients with reported acute flaccid paralysis, 44 (56%) also had reported encephalitis or meningitis. Among patients with neuroinvasive disease, 1,250 (95%) were hospitalized and 105 (8%) died. The incidence of neuroinvasive WNV disease in the United States was 0.41 per 100,000 population (Table 2). South Dakota (4.04 per 100,000), North Dakota (3.17), Nebraska (1.84), Wyoming (1.37), and Colorado (1.06) had the highest incidence rates (Table 2) (Figure).The largest number of cases were reported from California (335), Texas (252) and Illinois (98), which together accounted for just over half of neuroinvasive disease cases (52%). The incidence of WNV neuroinvasive disease increased with age, from 0.02 per 100,000 in children aged <10 years to 1.16 in adults aged ≥70 years. Incidence was higher among males (0.54 per 100,000) than among females (0.28).

TABLE 1. Number and percentage of reported cases of West Nile virus and other arboviral diseases, by virus type and selected patient characteristics — United States, 2016*

Characteristic	Virus type, no. (%)					
	West Nile (N = 2,150)	La Crosse (N = 35)	Powassan (N = 22)	Jamestown Canyon (N = 15)	Saint Louis encephalitis (N = 8)	Eastern equine encephalitis (N = 7)
Age group (yrs)						
<18	61 (3)	28 (80)	1 (5)	0 (0)	0 (0)	1 (14)
18–59	1,152 (54)	5 (14)	2 (9)	7 (47)	4 (50)	2 (29)
≥60	937 (44)	2 (6)	19 (86)	8 (53)	4 (50)	4 (57)
Sex						
Male	1,326 (62)	25 (71)	14 (64)	12 (80)	5 (63)	6 (86)
Female	824 (38)	10 (29)	8 (36)	3 (20)	3 (38)	1 (14)
Period of illness onset						
January–March	2 (<1)	0 (0)	1 (5)	0 (0)	0 (0)	0 (0)
April–June	88 (4)	4 (11)	6 (27)	1 (7)	1 (13)	0 (0)
July–September	1,781 (83)	25 (71)	3 (14)	11 (73)	7 (88)	6 (86)
October–December	279 (13)	6 (17)	12 (55)	3 (20)	0 (0)	1 (14)
Clinical syndrome						
Non-neuroinvasive	840 (39)	4 (11)	1 (5)	8 (53)	1 (13)	0 (0)
Neuroinvasive	1,310 (61)	31 (89)	21 (95)	7 (47)	7 (88)	7 (100)
Encephalitis	689 (32)	24 (69)	15 (68)	4 (27)	6 (75)	6 (86)
Meningitis	468 (22)	6 (17)	3 (14)	2 (13)	0 (0)	0 (0)
AFP†	78 (4)	0 (0)	1 (5)	0 (0)	0 (0)	0 (0)
Other	75 (3)	1 (3)	2 (9)	1 (7)	1 (13)	1 (14)
Outcome						
Hospitalization	1,465 (68)	32 (91)	20 (91)	7 (47)	8 (100)	7 (100)
Death	106 (5)	0 (0)	3 (14)	0 (0)	2 (25)	3 (43)

Abbreviation: AFP = acute flaccid paralysis.
* Three unspecified California serogroup virus cases were also reported.
† Of the 78 West Nile virus disease patients with AFP, 44 (56%) also had encephalitis or meningitis; the additional AFP patient with Powassan virus also had encephalitis.

Thirty-five La Crosse virus disease cases were reported from six states (Minnesota, North Carolina, Ohio, Tennessee, Wisconsin, and West Virginia), including 31 (89%) that were neuroinvasive (Table 1). Illness onset ranged from May through October, with 25 (71%) patients reporting onset during July–September. Twenty-five (71%) patients were male. The median age was 9 years (IQR = 5–12 years) and 28 (80%) were aged <18 years. Thirty-two (91%) patients were hospitalized; none died. Among patients hospitalized, 29 (91%) had neuroinvasive disease. Incidence of La Crosse virus neuroinvasive disease was highest in West Virginia (0.27 per 100,000) (Table 2).

Twenty-two Powassan virus disease cases were reported from nine states (Connecticut, Maine, Massachusetts, Minnesota, New Hampshire, New York, North Carolina, Rhode Island, and Wisconsin). Illness onset dates ranged from February through December. The median age of patients was 66 years (IQR = 61–72 years) and 14 (64%) were male. Twenty-one (95%) cases were neuroinvasive. Twenty (91%) patients were hospitalized and three (14%) died.

Fifteen Jamestown Canyon virus disease cases were reported from three states (Massachusetts, Minnesota, and Wisconsin). Illness onset dates ranged from June through November, with 11 (73%) of those patients reporting onset during July–September. The median age of patients was 64 years (IQR = 44–70 years) and 12 (80%) were male. Seven (47%) cases were neuroinvasive, seven (47%) patients were hospitalized, and none died.

Eight cases of St. Louis encephalitis virus disease were reported from four states (California, Illinois, Nevada, and Utah). The median age of patients was 64 years (IQR = 56–74) and five (63%) were male. Illness onset dates ranged from June through September. Seven (88%) cases were neuroinvasive (Table 1). All eight patients were hospitalized and two (25%) died.

Seven cases of eastern equine encephalitis virus disease were reported from five states (Georgia, Michigan, Montana, New Jersey, and North Carolina); all were neuroinvasive disease. The median age of patients was 63 years (IQR = 39–71 years) and six (86%) were male. Illness onset dates ranged from July through October. All patients were hospitalized and three (43%) died.

Discussion

As in previous years, in 2016, WNV remained the most common cause of neuroinvasive arboviral disease in the continental United States, accounting for 95% of reported neuroinvasive disease cases. The incidence of WNV neuroinvasive disease in

TABLE 2. Number and rate* of reported cases of arboviral neuroinvasive disease, by virus type, U.S. Census division, and state — United States, 2016

	Virus type											
	West Nile		La Crosse		Powassan		Jamestown Canyon		Saint Louis encephalitis		Eastern equine encephalitis	
U.S. Census division/State	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
United States	**1,310**	**0.41**	**31**	**0.01**	**21**	**0.01**	**7**	**<0.01**	**7**	**<0.01**	**7**	**<0.01**
New England	**15**	**0.10**	—†	**—**	**9**	**0.06**	**1**	**0.01**	**—**	**—**	**—**	**—**
Connecticut	1	0.03	—	—	1	0.03	—	—	—	—	—	—
Maine	—	—	—	—	1	0.08	—	—	—	—	—	—
Massachusetts	10	0.15	—	—	5	0.07	1	0.01	—	—	—	—
New Hampshire	—	—	—	—	1	0.07	—	—	—	—	—	—
Rhode Island	2	0.19	—	—	1	0.09	—	—	—	—	—	—
Vermont	2	0.32	—	—	—	—	—	—	—	—	—	—
Middle Atlantic	**43**	**0.10**	**—**	**—**	**1**	**<0.01**	**—**	**—**	**—**	**—**	**1**	**<0.01**
New Jersey	11	0.12	—	—	—	—	—	—	—	—	1	0.01
New York	20	0.10	—	—	1	0.01	—	—	—	—	—	—
Pennsylvania	12	0.09	—	—	—	—	—	—	—	—	—	—
East North Central	**177**	**0.38**	**12**	**0.03**	**5**	**0.01**	**5**	**0.01**	**1**	**<0.01**	**2**	**<0.01**
Illinois	98	0.77	—	—	—	—	—	—	1	0.01	—	—
Indiana	15	0.23	—	—	—	—	—	—	—	—	—	—
Michigan	42	0.42	—	—	—	—	—	—	—	—	2	0.02
Ohio	12	0.10	9	0.08	—	—	—	—	—	—	—	—
Wisconsin	10	0.17	3	0.05	5	0.09	5	0.09	—	—	—	—
West North Central	**175**	**0.81**	**3**	**0.01**	**5**	**0.02**	**1**	**<0.01**	**—**	**—**	**—**	**—**
Iowa	16	0.51	—	—	—	—	—	—	—	—	—	—
Kansas	18	0.62	—	—	—	—	—	—	—	—	—	—
Minnesota	38	0.69	3	0.05	5	0.09	1	0.02	—	—	—	—
Missouri	9	0.15	—	—	—	—	—	—	—	—	—	—
Nebraska	35	1.84	—	—	—	—	—	—	—	—	—	—
North Dakota	24	3.17	—	—	—	—	—	—	—	—	—	—
South Dakota	35	4.04	—	—	—	—	—	—	—	—	—	—
South Atlantic	**32**	**0.05**	**13**	**0.02**	**1**	**<0.01**	**—**	**—**	**—**	**—**	**3**	**<0.01**
Delaware	—	—	—	—	—	—	—	—	—	—	—	—
District of Columbia	1	0.15	—	—	—	—	—	—	—	—	—	—
Florida	6	0.03	—	—	—	—	—	—	—	—	—	—
Georgia	5	0.05	—	—	—	—	—	—	—	—	1	0.01
Maryland	6	0.10	—	—	—	—	—	—	—	—	—	—
North Carolina	2	0.02	8	0.08	1§	0.01	—	—	—	—	2	0.02
South Carolina	6	0.12	—	—	—	—	—	—	—	—	—	—
Virginia	6	0.07	—	—	—	—	—	—	—	—	—	—
West Virginia	—	—	5	0.27	—	—	—	—	—	—	—	—

See table footnotes on next page.

2016 (0.41 per 100,000) was the same as the median incidence during 2002–2015 (*2*). The case fatality rate for neuroinvasive disease cases (8%) was comparable to that reported in past years (median of 9% for 1999–2015).

La Crosse virus continued to be more frequently reported in children than in other age groups (*5*). Overall, however, fewer cases of La Crosse virus were reported in 2016 than in any year in the past decade. More cases of Powassan virus were reported in 2016 than in previous years (22 in 2016 compared with a median of seven cases each year during 2006–2015) (*6*). This increase was, in part, likely caused by increased awareness and testing for the virus. In 2016, Powassan virus disease was reported for the first time in Connecticut and Rhode Island (*6*). The patient from North Carolina had history of travel to a state with previously documented Powassan virus transmission. Three states (California, Illinois, and Utah) reported cases of St. Louis encephalitis virus disease for the first time in >10 years. However, fewer cases were reported than in 2015, a year in which an outbreak in Arizona occurred (*7*). Eastern equine encephalitis virus was again the domestic arboviral disease with the highest fatality rate, with four deaths reported among the seven patients with neuroinvasive disease. Cases were reported from states that have historically reported eastern equine encephalitis virus, with the exception of a case from Montana, where the infection was acquired in a state with previously documented transmission.

Arboviruses continue to cause substantial morbidity in the United States, although reported numbers of cases vary annually. Cases occur sporadically, and the epidemiology varies by virus and geographic area. Consistent with past years, in 2016 just over 85% of arboviral disease cases occurred during April–September. Weather, zoonotic host and vector abundance, and

TABLE 2. (*Continued*) Number and rate* of reported cases of arboviral neuroinvasive disease, by virus type, U.S. Census division, and state — United States, 2016

	Virus type											
	West Nile		La Crosse		Powassan		Jamestown Canyon		Saint Louis encephalitis		Eastern equine encephalitis	
U.S. Census Division/State	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
East South Central	**48**	**0.25**	**3**	**0.02**	—	—	—	—	—	—	—	—
Alabama	13	0.27	—	—	—	—	—	—	—	—	—	—
Kentucky	5	0.11	—	—	—	—	—	—	—	—	—	—
Mississippi	27	0.90	—	—	—	—	—	—	—	—	—	—
Tennessee	3	0.05	3	0.05	—	—	—	—	—	—	—	—
West South Central	**319**	**0.80**	—	—	—	—	—	—	—	—	—	—
Arkansas	8	0.27	—	—	—	—	—	—	—	—	—	—
Louisiana	38	0.81	—	—	—	—	—	—	—	—	—	—
Oklahoma	21	0.54	—	—	—	—	—	—	—	—	—	—
Texas	252	0.90	—	—	—	—	—	—	—	—	—	—
Mountain	**156**	**0.65**	—	—	—	—	—	—	**3**	**0.01**	**1**	**<0.01**
Arizona	57	0.82	—	—	—	—	—	—	—	—	—	—
Colorado	59	1.06	—	—	—	—	—	—	—	—	—	—
Idaho	3	0.18	—	—	—	—	—	—	—	—	—	—
Montana	3	0.29	—	—	—	—	—	—	—	—	1[§]	0.10
Nevada	13	0.44	—	—	—	—	—	—	2	0.07	—	—
New Mexico	6	0.29	—	—	—	—	—	—	—	—	—	—
Utah	7	0.23	—	—	—	—	—	—	1	0.03	—	—
Wyoming	8	1.37	—	—	—	—	—	—	—	—	—	—
Pacific	345	0.65	—	—	—	—	—	—	3	0.01	—	—
Alaska	—	—	—	—	—	—	—	—	—	—	—	—
California	335	0.85	—	—	—	—	—	—	3	0.01	—	—
Hawaii	—	—	—	—	—	—	—	—	—	—	—	—
Oregon	2	0.05	—	—	—	—	—	—	—	—	—	—
Washington	8	0.11	—	—	—	—	—	—	—	—	—	—

* Per 100,000 population, based on July 1, 2016, U.S. Census population estimates.
† Dashes indicate none reported.
§ Patient reported travel to a state with a history of the virus.

human behavior are all factors that can influence when and where outbreaks occur. These factors make it difficult to predict future locations and timing of cases and help to emphasize the importance of surveillance to identify outbreaks and inform public health prevention efforts.

The findings in this report are subject to at least two limitations. First, ArboNET is a passive surveillance system, which leads to an underestimation of the actual prevalence of disease. To be reported as a disease case, the person affected must seek care, a clinician must request appropriate diagnostic tests, and health care providers and laboratories must then report cases to public health authorities. Previous studies have estimated that between 30 and 70 non-neuroinvasive disease cases occur for every reported case of WNV neuroinvasive disease (*8*–*10*). Based on the number of neuroinvasive disease cases reported in 2016, between 39,300 and 91,700 non-neuroinvasive disease cases of WNV would have been expected to occur; however, only 840 (1%–2%) were reported. Second, because ArboNET does not require information about clinical signs and symptoms or laboratory findings, cases might be misclassified.

It is important for health care providers to consider arboviral infections in the differential diagnosis of cases of aseptic meningitis and encephalitis, obtain appropriate specimens for laboratory testing, and promptly report cases to public health authorities (*2*). Understanding the epidemiology, seasonality, and geographic distribution of these viruses will assist with clinical recognition and potential differentiation from other neuroinvasive etiologies. Because human vaccines against domestic arboviruses are not available, prevention depends on community and household efforts to reduce vector populations (e.g., applying insecticides and reducing breeding sites), personal protective measures to decrease exposure to mosquitoes and ticks (e.g., use of repellents and wearing protective clothing), and screening of blood donors.

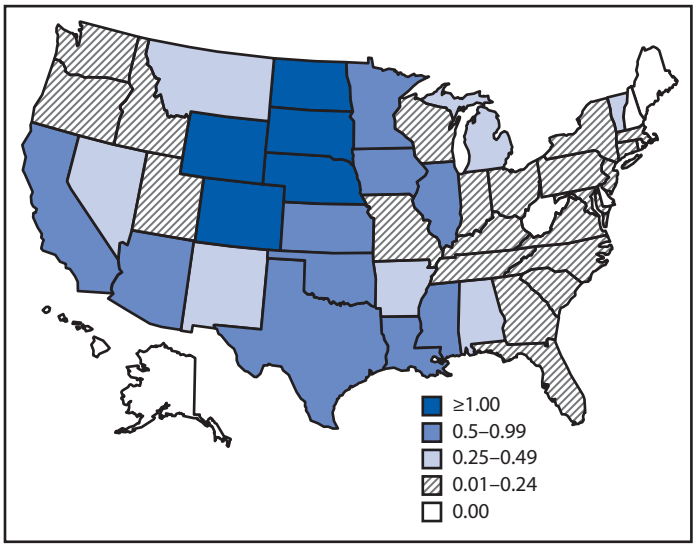
Acknowledgments

ArboNET surveillance coordinators in state and local health departments.

Conflict of Interest

No conflicts of interest were reported.

FIGURE. Rate* of reported cases of West Nile virus neuroinvasive disease — United States, 2016



* Per 100,000 population.

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Summary

What is already known about this topic?

Arboviral disease can cause considerable morbidity and mortality in the United States. West Nile virus (WNV) is consistently found to be the leading cause of domestically acquired arboviral disease, but several other arboviruses cause sporadic cases and outbreaks of neuroinvasive disease.

What is added by this report?

In 2016, WNV continued to be the most common cause of neuroinvasive arboviral disease in the United States, with a similar incidence to the median incidence during 2002–2015. An increase in reported cases of Powassan virus occurred in 2016, with two states reporting their first cases.

What are the implications for public health practice?

Arboviral diseases are a continuing source of severe illness each year. Surveillance remains important to identify outbreaks and guide prevention strategies.

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Antibiotics Dispensed to Privately Insured Pregnant Women with Urinary Tract Infections — United States, 2014

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Urinary tract infections (UTIs) occur in about 8% of pregnant women, and untreated UTIs can have serious consequences, including pyelonephritis, preterm labor, low birth weight, and sepsis (*1*). Pregnant women are typically screened for UTIs during early pregnancy, and those with bacteriuria are treated with antibiotics (*1*,*2*). Antibiotic stewardship is critical to improving patient safety and to combating antibiotic resistance. Because of the potential risk for birth defects, including anencephaly, heart defects, and orofacial clefts, associated with use of sulfonamides and nitrofurantoin during pregnancy (*3*), a 2011 committee opinion from the American College of Obstetricians and Gynecologists (ACOG) recommended that sulfonamides and nitrofurantoin may be prescribed in the first trimester of pregnancy only when other antimicrobial therapies are deemed clinically inappropriate (*4*). To assess the effects of these recommendations, CDC analyzed the Truven Health MarketScan Commercial Database* to examine antibiotic prescriptions filled by pregnant women with UTIs. Among 482,917 pregnancies in 2014, 7.2% of women had an outpatient UTI diagnosis during the 90 days before the date of last menstrual period (LMP) or during pregnancy. Among pregnant women with UTIs, the most frequently prescribed antibiotics during the first trimester were nitrofurantoin, ciprofloxacin, cephalexin, and trimethoprim-sulfamethoxazole. Given the potential risks associated with use of some of these antibiotics in early pregnancy and the potential for unrecognized pregnancy, women's health care providers should be familiar with the ACOG recommendations and consider the possibility of early pregnancy when treating women of reproductive age.

The MarketScan Commercial Database includes a convenience sample of employed persons with private employer-sponsored insurance and their dependents. An algorithm using insurance claims data has been developed to identify pregnant women and estimate critical periods during pregnancy (*5*). For the current analysis, CDC used the most recently available data (2013–2015) to identify pregnancies among women aged 15–44 years with an estimated LMP or date of delivery/end of pregnancy in 2014 (i.e., pregnancies that included at least one day of 2014) that ended in live birth or pregnancy loss. To capture all relevant UTI diagnosis codes and antibiotic prescriptions, the analysis was restricted to pregnant women who were continuously enrolled, or missing only one month of enrollment from 90 days before LMP to the end of pregnancy, on a health insurance plan with prescription drug coverage. Claims from physician office, urgent care, emergency department, and other outpatient visits of pregnant women were examined to identify those with a diagnosis of a UTI from 90 days before LMP through the end of pregnancy (hereafter referred to as 'outpatient UTIs'); diagnoses associated with laboratory claims without a clinic visit were excluded. UTIs were defined as presence of an *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9 CM) diagnosis code of UTI (599.0) or acute cystitis (595.0 or 595.9) on at least one outpatient visit claim (*6*,*7*). Inpatient hospitalizations on the day of or day after the outpatient UTI were excluded, because these women were unlikely to have an outpatient prescription. Women with evidence of recurrent UTIs (defined as three or more UTIs from 90 days before LMP to the end of pregnancy) were also excluded, as they are likely to represent a different population from women with sporadic UTIs. For pregnant women with a UTI diagnosis claim, outpatient pharmacy claims from 2013 to 2015 were searched to identify antibiotic medications dispensed on the day of and up to 7 days after the outpatient UTI claim. The first prescription filled was used to capture the initial treatment for the UTI. If more than one antibiotic prescription was filled on the same day as the first prescription, both prescriptions were included. However, any antibiotic prescriptions filled on subsequent days were excluded. The frequency of outpatient UTIs before and during pregnancy, and the frequency, type, and timing of antibiotics dispensed were calculated. Analyses were conducted using statistical software.

Among 680,988 pregnancies in 2014 identified in the 2013–2015 data, 482,917 were eligible for further analysis (Figure 1). Among these, 34,864 (7.2%) pregnant women had an initial outpatient UTI claim 90 days before or during pregnancy. UTI diagnoses were most frequent during the first trimester of pregnancy (41.0% of UTIs) and least frequent in the third (11.8%) (Table). Overall, 68.9% of women with an outpatient UTI filled a prescription for an antibiotic within 7 days of their outpatient visit during pregnancy (median = 0 days, standard deviation = 1.1 days). In contrast, a higher proportion of women with UTIs before pregnancy filled a prescription (76.1%) during the 90 days before estimated LMP

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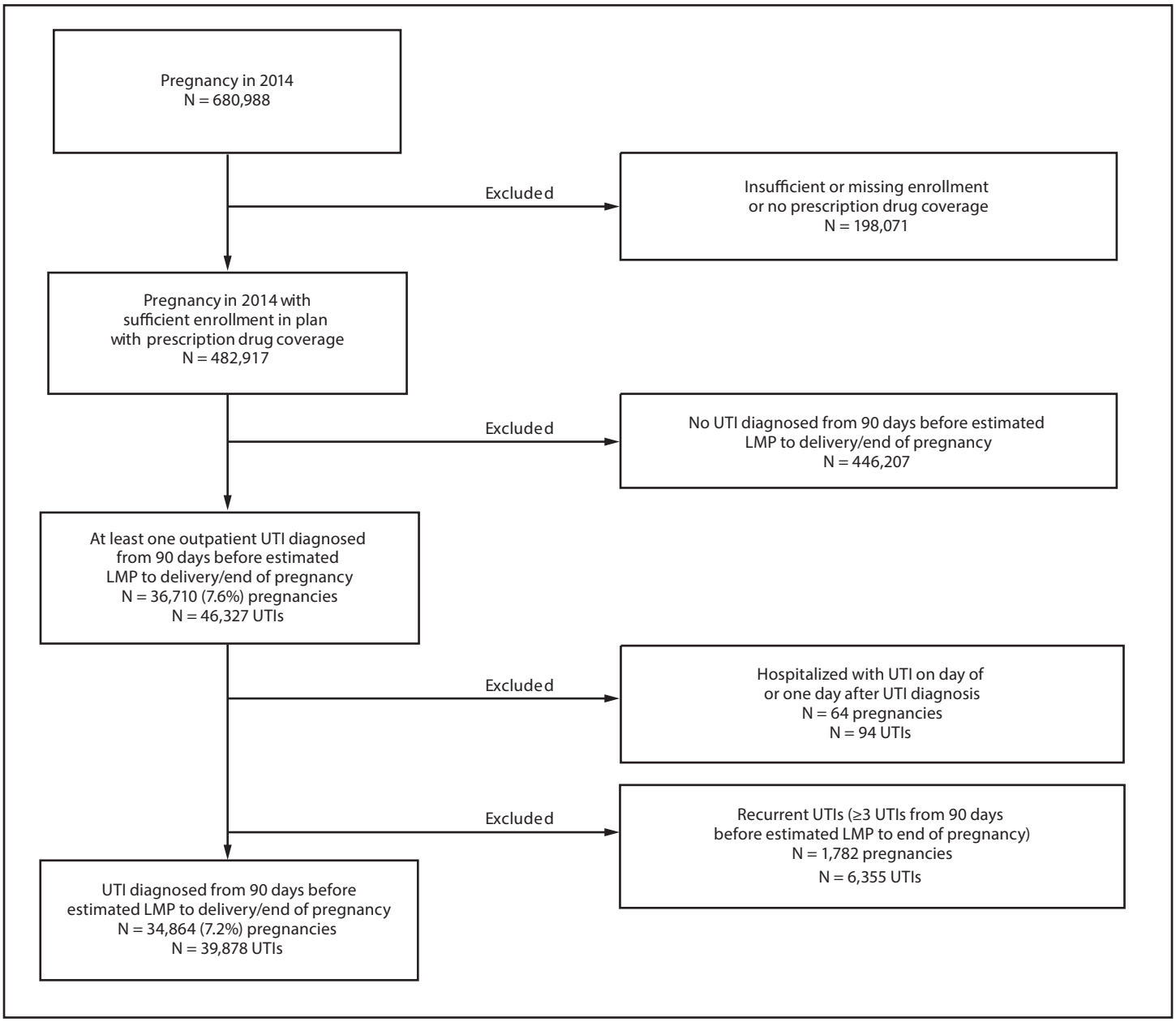
FIGURE 1. Selection of study sample of women with pregnancies in 2014 who had sufficient enrollment in a plan with prescription drug coverage* and had an outpatient claim for at least one urinary tract infection (UTI) diagnosis† — Truven Health MarketScan Commercial Database, United States, 2013–2015



Abbreviation: LMP = date of last menstrual period.

* Sufficient enrollment was defined as continuous enrollment from 3 months before date of LMP through the end of pregnancy or missing only 1 month during that period. All others were considered to have insufficient enrollment.

† UTIs were defined as presence of an *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9 CM) diagnosis code of UTI (599.0) or acute cystitis (595.0 or 595.9) on at least one outpatient claim.

(Table). Type of antibiotic dispensed differed for UTIs treated before and during pregnancy (Figure 2). Fluoroquinolones (e.g., ciprofloxacin) and sulfonamides (e.g., trimethoprim-sulfamethoxazole) were more commonly dispensed to women within 90 days before their LMP than to pregnant women during any trimester of pregnancy. In contrast, nitrofurantoin, cephalosporins (e.g., cephalexin), and penicillins (e.g., amoxicillin) were more commonly dispensed during pregnancy than during the 90 days before LMP. The most frequently dispensed antibiotics during the first trimester of pregnancy were nitrofurantoin (34.7%), ciprofloxacin (10.5%), cephalexin (10.3%), and trimethoprim-sulfamethoxazole (7.6%) (Table).

TABLE. Number and proportion* of women with pregnancies in 2014 who had an outpatient claim for at least one urinary tract infection (UTI) diagnosis† who filled at least one prescription for an antibiotic from an outpatient pharmacy within seven days of their UTI diagnosis§ before or during pregnancy — Truven Health MarketScan Commercial Database, United States, 2013–2015

Medication	Period, no. (%)					
	90 days before LMP to LMP	First trimester¶	Second trimester¶	Third trimester¶	Any time during pregnancy	90 days before LMP through the end of pregnancy
Total pregnancies with UTIs	**10,864**	**14,286**	**7,880**	**4,101**	**25,264**	**34,864**
Any antibiotic	8,264 (76.1)	9,846 (68.9)	5,365 (68.1)	2,678 (65.3)	17,399 (68.9)	24,970 (71.6)
Fluoroquinolones	2,927 (26.9)	1,577 (11.0)	138 (1.8)	28 (0.7)	1,742 (6.9)	4,630 (13.3)
Ciprofloxacin	2,768 (25.5)	1,493 (10.5)	126 (1.6)	26 (0.6)	1,644 (6.5)	4,382 (12.6)
Levofloxacin	165 (1.5)	86 (0.6)	12 (0.2)	2 (0.1)	100 (0.4)	262 (0.8)
Nitrofurantoin	2,604 (24.0)	4,954 (34.7)	3,338 (42.4)	1,639 (40.0)	9,767 (38.7)	12,283 (35.2)
Trimethoprim-Sulfamethoxazole	2,031 (18.7)	1,083 (7.6)	149 (1.9)	73 (1.8)	1,304 (5.2)	3,316 (9.5)
Cephalosporins	560 (5.2)	1,675 (11.7)	1,216 (15.4)	659 (16.1)	3,521 (13.9)	4,062 (11.7)
Cephalexin	445 (4.1)	1,469 (10.3)	1,064 (13.5)	577 (14.1)	3,088 (12.2)	3,519 (10.1)
Cefuroxime	57 (0.5)	89 (0.6)	69 (0.9)	39 (1.0)	196 (0.8)	253 (0.7)
Cefdinir	32 (0.3)	76 (0.5)	60 (0.8)	30 (0.7)	165 (0.7)	197 (0.6)
Penicillins	276 (2.5)	686 (4.8)	469 (6.0)	272 (6.6)	1,416 (5.6)	1,689 (4.8)
Amoxicillin**	248 (2.3)	618 (4.3)	412 (5.2)	231 (5.6)	1,254 (5.0)	1,499 (4.3)
Ampicillin	17 (0.2)	63 (0.4)	47 (0.6)	39 (1.0)	146 (0.6)	163 (0.5)
Other	313 (2.9)	364 (2.6)	233 (3.0)	92 (2.2)	687 (2.7)	999 (2.9)
Metronidazole††	188 (1.7)	185 (1.3)	106 (1.4)	47 (1.2)	337 (1.3)	525 (1.5)
Azithromycin††	55 (0.5)	94 (0.7)	86 (1.1)	35 (0.9)	215 (0.9)	270 (0.8)
Other	159 (1.5)	151 (1.1)	83 (1.1)	30 (0.7)	263 (1.0)	421 (1.2)

Abbreviation: LMP = date of last menstrual period.

* Number and proportion sum to greater than those of "any" antibiotic because some women filled a prescription for more than one type of antibiotic. Women could also have up to two UTIs during the 90 days before LMP through the end of pregnancy.

† UTIs were defined as presence of an *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9 CM) diagnosis code of UTI (599.0) or acute cystitis (595.0 or 595.9) on at least one outpatient claim.

§ Defined as the first antibiotic prescription(s) filled from an outpatient pharmacy within 7 days of UTI diagnosis.

¶ First trimester = 0–90 days after LMP; second trimester = 91–180 days after LMP; third trimester = 181 days after LMP until end of pregnancy.

** Includes amoxicillin/clavulanate potassium.

†† Typically used to treat genitourinary infections.

Discussion

According to 2011 guidelines from the Infectious Diseases Society of America, nonpregnant women with uncomplicated UTIs should be treated with nitrofurantoin or trimethoprim-sulfamethoxazole.† For pregnant women in their first trimester, a 2011 Committee Opinion from the American College of Obstetricians and Gynecologists recommended that sulfonamides and nitrofurantoin may be prescribed only if other antimicrobial therapies are deemed clinically inappropriate (*4*). In this analysis, 34.7% of pregnant women with UTIs in 2014 filled a prescription for nitrofurantoin and 7.6% filled a prescription for trimethoprim-sulfamethoxazole during their first trimester of pregnancy.

Few estimates of UTI treatment of pregnant women are available, though the current estimate is similar to a previous report of approximately 700 mothers of liveborn infants without major birth defects enrolled in a large, multisite, population-based case-control study of risk factors for major birth defects from 1997 to 2011 (*8*). In that study, approximately 6.7% of

† https://academic.oup.com/cid/article/52/5/e103/388285.

Summary

What is already known about this topic?

Because of the potential risk for birth defects, a 2011 committee opinion from the American College of Obstetricians and Gynecologists recommended that sulfonamide antibiotics and nitrofurantoin may be prescribed in the first trimester of pregnancy only when other antimicrobial therapies are deemed clinically inappropriate.

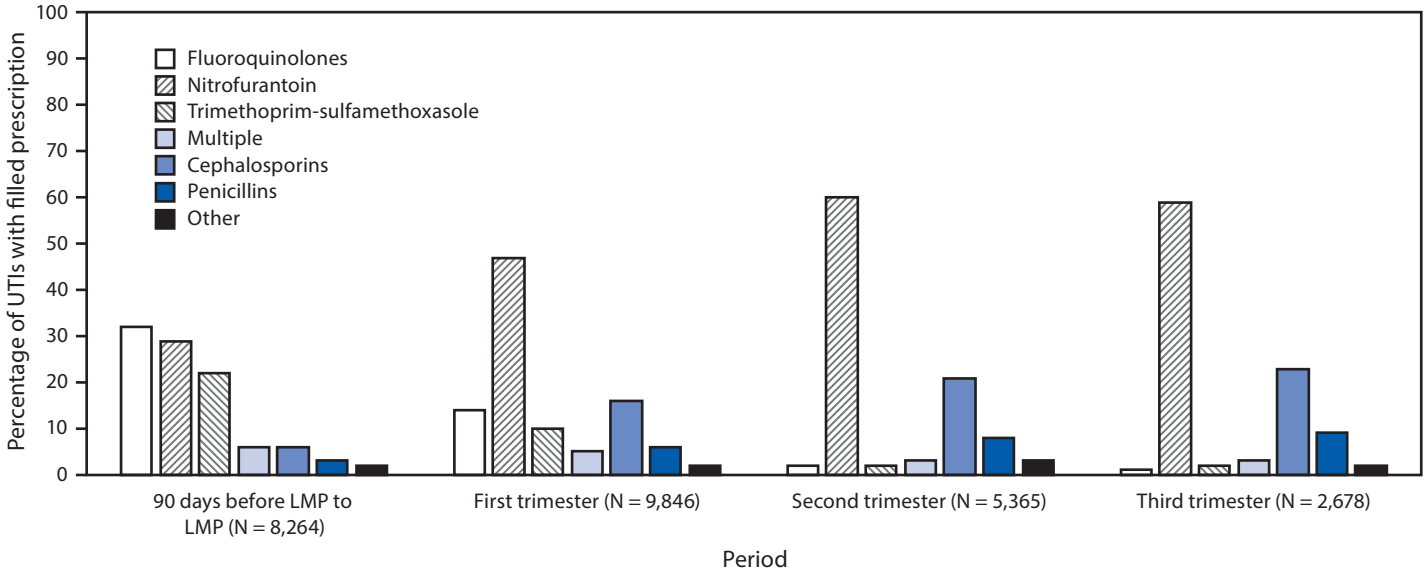
What is added by this report?

Nitrofurantoin and trimethoprim-sulfamethoxazole are commonly prescribed and dispensed to women with urinary tract infections during their first trimester of pregnancy.

What are the implications for public health practice?

Given the recommendations to avoid nitrofurantoin and trimethoprim-sulfamethoxazole in early pregnancy if possible, it is important that health care providers of various specialties be familiar with these recommendations and that they consider that they might be "treating for two" when prescribing antibiotic treatments for urinary tract infections to pregnant women and women who might become pregnant in the near future.

FIGURE 2. Antibiotic medication types filled from outpatient pharmacies* among women who were pregnant in 2014, had an outpatient claim for at least one urinary tract infection (UTI) diagnosis,† and filled a prescription for an antibiotic, by period before and during pregnancy — Truven Health MarketScan Commercial Database, United States, 2013–2015



Abbreviation: LMP = date of last menstrual period.

* Defined as the first antibiotic prescription(s) filled from an outpatient pharmacy within 7 days of UTI diagnosis. Women with a prescription filled for more than one type of antibiotic during a given period were classified as filling prescriptions for multiple antibiotic types.

† UTIs were defined as presence of an *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9 CM) diagnosis code of UTI (599.0) or acute cystitis (595.0 or 595.9) on at least one outpatient claim.

pregnant women reported at least one UTI from the month before conception through the third month of pregnancy, and two-thirds (66.6%) reported antibiotic treatment, similar to the prevalence observed in this analysis.

The current estimates of antibiotic treatment for UTIs during the 3 months before LMP are similar to estimates from previous studies of nonpregnant women. A 2003 study that examined approximately 13,000 claims among women aged 18–75 years with acute cystitis enrolled in a preferred provider care organization during 1997–1999 (*7*) found that the antibiotics most commonly dispensed within 3 days of a nonrecurrent episode of cystitis were fluoroquinolones (32%), trimethoprim-sulfamethoxazole (37%), and nitrofurantoin (16%). A recent study using the National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey to examine >7,000 outpatient visits for UTIs among women aged ≥18 years from 2002 to 2011 (*6*) found that 80% were prescribed antibiotics within 7 days of diagnosis; the most commonly prescribed medications were fluoroquinolones (39%), sulfonamides (22%), and nitrofurantoin (15%). By comparison, in the current analysis, women with UTIs during the 3 months before LMP were most often dispensed ciprofloxacin (25.5%), nitrofurantoin (24.0%), and trimethoprim-sulfamethoxazole (18.7%).

The findings in this report are subject to at least five limitations. First, pregnancies and UTI diagnoses were identified based on diagnosis and procedure codes; LMP dates, delivery dates, and UTI diagnoses were not validated (*5*). Thus, misclassification could have occurred with respect to the length of gestation, type of infection, the occurrence or timing of UTIs, and dispensing of antibiotics. Some women might have also had concomitant infections, potentially affecting the type of antibiotic prescribed. Second, pregnancies might not have been recognized by the provider or the patient at the time of UTI diagnosis and treatment. Third, these data did not allow identification of clinically appropriate nitrofurantoin or trimethoprim-sulfamethoxazole treatment that was based on urine culture or antibiotic testing. Fourth, the MarketScan Commercial Database is a convenience sample and is not generalizable to the U.S. population. Finally, antibiotic prescriptions paid for out-of-pocket were not included.

CDC's analysis of a large insurance claims database demonstrated that, in 2014, nitrofurantoin and trimethoprim-sulfamethoxazole were common treatments for women with UTIs during their first trimester of pregnancy. Improving antibiotic selection is an important aspect of antibiotic stewardship and these antibiotics have potential risks associated with early pregnancy use, particularly during organogenesis (*3*,*8*,*9*). Given the recommendations to avoid these medications in

early pregnancy if possible and the fact that nearly 50% of pregnancies in the United States are unintended (*10*), it is important that health care providers of various specialties be aware of these recommendations and that they might be "treating for two"[§] when prescribing antibiotic treatments for UTIs to pregnant women and women who might become pregnant in the near future.

[§] CDC's Treating for Two: Safer Medication Use in Pregnancy initiative aims to accelerate research on medication safety during pregnancy to provide evidence-based information for health care providers to effectively weigh the risks and benefits of treatment options for reproductive-aged women who could become pregnant. https://www.cdc.gov/pregnancy/meds/treatingfortwo/.

Conflict of Interest

No conflicts of interest were reported.

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HIV Infection and HIV-Associated Behaviors Among Persons Who Inject Drugs — 20 Cities, United States, 2015

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In the United States, 9% of human immunodeficiency virus (HIV) infections diagnosed in 2015 were attributed to injection drug use (*1*). In 2015, 79% of diagnoses of HIV infection among persons who inject drugs occurred in urban areas (*2*). To monitor the prevalence of HIV infection and associated behaviors among persons who inject drugs, CDC's National HIV Behavioral Surveillance (NHBS) conducts interviews and HIV testing in selected metropolitan statistical areas (MSAs) (*3*). The prevalence of HIV infection among persons who inject drugs in 20 MSAs in 2015 was 7%. In a behavioral analysis of HIV-negative persons who inject drugs, an estimated 27% receptively shared syringes and 67% had condomless vaginal sex in the previous 12 months. During the same period, 58% had tested for HIV infection and 52% received syringes from a syringe services program. Given the increased number of persons newly injecting drugs who are at risk for HIV infection because of the recent opioid epidemic (*2*,*4*), these findings underscore the importance of continuing and expanding health services, HIV prevention programs, and community-based strategies, such as those provided by syringe services programs, for this population.

In 2015, NHBS staff members in 20 MSAs* collected cross-sectional behavioral survey data and conducted HIV testing among persons who inject drugs; survey participants were recruited using respondent-driven sampling (RDS),† a peer-referral sampling method (*5*). Eligible participants§ completed a standardized questionnaire administered face-to-face by trained interviewers. All participants were offered anonymous HIV testing¶; a nonreactive screening test result was considered HIV-negative and a reactive screening test result was considered HIV-positive if confirmed by western blot or indirect immunofluorescence assay. Incentives were offered for completing the interview, HIV testing, and recruitment.** Participants were asked about behaviors in the previous 12 months, including high-risk injection (receptive sharing)†† or sexual behaviors,§§ testing for HIV and hepatitis C virus (HCV) infection, participation in HIV behavioral interventions,¶¶ and receiving any syringes from a syringe services program or all syringes from sterile sources.*** Because knowledge of personal HIV infection status could influence risk behaviors (*6*), behavioral analysis was limited to HIV-negative persons who inject drugs.††† Data from each MSA were analyzed using the RDS Analysis Tool that produces estimates adjusted for differences in peer recruitment patterns and the size of the network of persons who inject drugs and estimated 95% confidence intervals (CIs) (*5*). All comparisons were considered significant if there was no overlap in their adjusted 95% CIs; because of the sampling methodology, RDS analysis is limited to calculating point estimates with CIs and precludes any other statistical testing. A weighted average of MSA-level estimates was calculated using the estimated size of the population of persons who inject drugs in each MSA to describe aggregated

* The 20 metropolitan statistical areas (MSAs) were Atlanta, Georgia; Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Dallas, Texas; Denver, Colorado; Detroit, Michigan; Houston, Texas; Los Angeles, California; Miami, Florida; Nassau-Suffolk, New York; New Orleans, Louisiana; New York, New York; Newark, New Jersey; Philadelphia, Pennsylvania; San Diego, California; San Francisco, California; San Juan, Puerto Rico; Seattle, Washington; District of Columbia.

† Recruitment chains in each city began with three to 15 initial participants identified during formative assessment. Initial participants who completed the interview were asked to recruit up to five other persons who inject drugs using a coded coupon system designed to track referrals. Referred and surveyed persons who inject drugs were also asked to recruit up to five other persons who inject drugs.

§ Persons who injected drugs during the previous 12 months, resided in the MSA, were aged ≥18 years and could complete the interview in English or Spanish.

¶ All 20 MSAs conducted HIV screening with a rapid test; for supplemental testing to confirm rapid tests, four collected blood via venipuncture, 15 collected blood via dried blood spots, and one collected oral samples.

** The incentive format (cash or gift card) and amount varied by MSA based on formative assessment and local policy. A typical format included $25 for completing the interview, $25 for providing a specimen for HIV testing, and $10 for each successful recruitment (maximum of five).

†† Receptive sharing of syringes was defined as "using needles that someone else had already injected with," and receptive sharing of injection equipment was defined as using equipment such as cookers, cottons, or water used to rinse needles or prepare drugs "that someone else had already used."

§§ Condomless vaginal sex/condomless anal sex was defined as sex without a condom at least once in the past 12 months. Ascertainment of male-to-male anal sexual contact was restricted to males and includes both insertive and receptive anal sexual contact.

¶¶ Participating in an individual or group HIV behavioral intervention was defined as a one-on-one conversation with a counselor or an organized discussion regarding prevention of HIV infection, and did not include counseling received as part of an HIV test or conversations with friends.

*** Receiving a syringe from a syringe services program was defined as receiving a sterile syringe or a needle at least once from a "needle or syringe exchange program" during the previous 12 months. Receiving syringes from sterile sources only was defined as receiving all syringes from syringe services program, pharmacy, or health care provider and not any other sources during the previous 12 months.

††† Behavioral analyses from previous reports excluded participants reporting a previous HIV-positive test result. A comparison of analysis excluding those who tested HIV-positive to analysis excluding those who reported a previous HIV-positive test did not yield significantly different estimates.

prevalence of HIV and percentage of participants engaging in selected behaviors (*7*).[§§§]

In 2015, 13,633 persons were recruited to participate; 2,955 (22%) were ineligible and 330 (3%) were excluded because of incomplete data.[¶¶¶] Among the 10,348 persons who injected drugs who tested for HIV, 709 (6.9%) tested HIV-positive and 9,639 tested HIV-negative. Adjusted HIV prevalence in the 20 MSAs was estimated to be 7% (Table 1). HIV prevalence was higher[****] among blacks (11%) than whites (6%) and among persons in the South U.S. Census region (10%) than in the Midwest (3%) and Northeast (5%) regions. The prevalence of HIV infection was 24% among males who inject drugs who reported male-to-male sex in the previous 12 months.

Among the HIV-negative participants, 27% receptively shared syringes, 67% had condomless vaginal sex, 22% had condomless heterosexual anal sex, and 45% had more than one opposite sex partner (Table 2). Receptive syringe sharing was higher among whites (39%) than among Hispanics (24%) and blacks (17%); similar patterns were seen for sharing injection equipment (61%, 45%, and 41%, respectively). Condomless vaginal and anal sex was higher among whites (74% and 25%, respectively) than among blacks (62% and 17%, respectively).

In the 12 months preceding the interview, 58% of HIV-negative participants received an HIV test, 26% participated in an HIV behavioral intervention, 52% received syringes from syringe services programs and 34% received all their syringes from sterile sources (Table 3). Ever testing for HCV was reported by 82% of participants. Fewer white participants were tested for HIV in the preceding 12 months (51%) than were black (65%) and Hispanic (62%) participants. Fewer persons who inject drugs in the South obtained syringes from a syringe services program (36%) than did those in the Northeast (61%), Midwest (50%), and West (66%). Fewer persons who inject drugs from the South (26%) and West (28%) regions obtained syringes solely from sterile sources than did those the Northeast (44%) and Midwest (43%) regions.

Among persons who inject drugs, a higher percentage of those with health insurance were tested for HIV infection

TABLE 1. Estimated prevalence of human immunodeficiency virus (HIV) infection among persons who inject drugs (N = 10,348), by selected characteristics — National HIV Behavioral Surveillance, 20 cities, United States, 2015

Characteristic	Overall* % (95% CI)	HIV prevalence* % (95% CI)
Overall	**100 —**	**7(6–8)**
Sex		
Men	69(67–71)	6 (5–7)
Women	31(29–33)	9 (7–12)
Race/Ethnicity		
Black, non-Hispanic	39 (36–42)	11 (8–15)
Hispanic†	21(19–23)	7 (4–9)
White, non-Hispanic	39 (36–41)	6 (5–8)
Other§	2 (1–2)	—¶
Age group (yrs)		
18–29	14 (12–16)	2(1–3)
30–39	21(19–23)	5(3–6)
40–49	24(22–26)	11(9–13)
≥50	41(39–44)	9(7–11)
Education		
Less than HS diploma	28 (26–30)	8(4–12)
HS diploma	41(39–44)	8 (6–9)
More than HS diploma	31 (29–33)	6 (0–13)
Health insurance		
No	18 (17–20)	3(2–4)
Yes	82 (80–83)	8 (6–9)
Poverty level**		
At or below FPL	78 (76–79)	7 (6–9)
Above FPL	22(21–24)	6 (5–8)
Drug injected most frequently		
Heroin only	65(63–67)	5(2–8)
Other/Multiple††	35(33–37)	11(9–13)
Male-male sex, last 12 months (among males only)		
No	90(88–93)	5(3–6)
Yes	10(7–12)	24(15–33)
U.S. Census region§§		
Northeast	24(24–51)	5(3–7)
South	36(15–42)	10(8–13)
Midwest	11(0–22)	3(1–5)
West	24(10–37)	7(5–9)

Abbreviations: CI = confidence interval; FPL = federal poverty level; HS = high school.

* Aggregate estimates are weighted averages of MSA (metropolitan statistical areas) -level percentages. MSA-level percentages were adjusted for differences in recruitment and the size of participant peer networks of persons who inject drugs, then proportionally weighted by the size of the population of persons who inject drugs in each city.

† Persons of Hispanic ethnicity might be of any race or combination of races.

§ Includes American Indian/Alaska Natives, Asians, Native Hawaiian or other Pacific Islanders, and persons of multiple races.

¶ Insufficient data.

** Poverty level is based on household income and household size.

†† Other drugs injected alone or two or more drugs injected with the same frequency.

§§ The Northeast region includes the MSAs of Boston, Massachusetts; Nassau-Suffolk, New York; New York, New York; Newark, New Jersey; and Philadelphia, Pennsylvania. South region includes Atlanta, Georgia; Baltimore, Maryland; Dallas, Texas; Houston, Texas; Miami, Florida; New Orleans, Louisiana; and Washington, District of Columbia. Midwest region includes Chicago, Illinois and Detroit, Michigan. West region includes Denver, Colorado; Los Angeles, California; San Diego, California; San Francisco, California; and Seattle, Washington. San Juan, Puerto Rico was not included.

§§§ For city-level estimates for which confidence intervals could not be calculated, maximally wide confidence intervals (0–1) were used in aggregation. City-level estimates with insufficient data for analysis were excluded from the aggregated estimates. Estimates not including all cities represented 16% of the analysis.

¶¶¶ Data from 331 participants were excluded because of missing recruitment data, lost data during electronic upload, incomplete survey data, survey responses with questionable validity, invalid HIV test results, or the participant could not be identified as male or female. Reasons for exclusion were not mutually exclusive.

**** In comparing HIV prevalence among black persons who inject drugs to white persons who inject drugs, the confidence intervals (CIs) appear to overlap. However, this is because of rounding as the actual CIs do not overlap (black persons who inject drugs: 11.5% [95% CI = 8.4–14.6]; white persons who inject drugs: 6.4% [95% CI = 4.7–8.2]).

TABLE 2. Estimated percentage* of HIV-negative participants who inject drugs (n = 9,639) who engaged in behaviors† associated with HIV infection in the previous 12 months, by selected characteristics — National HIV Behavioral Surveillance, 20 cities, United States, 2015

Characteristics	Receptive syringe sharing,† % (95% CI)	Receptive injection equipment sharing,† % (95% CI)	Had vaginal sex, % (95% CI)	Had condomless vaginal sex, % (95% CI)	Had heterosexual anal sex, % (95% CI)	Had condomless heterosexual anal sex, % (95% CI)	Had condomless heterosexual sex or receptive syringe sharing, % (95% CI)	Had more than one opposite sex partner, % (95% CI)
Overall	**27 (25–29)**	**49 (46–51)**	**78 (76–80)**	**67 (65–70)**	**28 (26–30)**	**22 (20–24)**	**72 (70–75)**	**45 (42–47)**
Sex								
Men	27 (25–29)	48 (46–51)	77 (74–79)	65 (63–68)	27 (25–29)	20 (19–22)	73 (71–75)	44 (42–47)
Women	28 (24–31)	49 (45–54)	82 (78–86)	73 (68–77)	29 (24–34)	24 (20–29)	77 (72–81)	44 (39–48)
Race/Ethnicity§								
Black, non-Hispanic	17 (14–19)	41 (37–45)	75 (72–79)	62 (58–66)	22 (19–24)	17 (14–19)	68 (65–71)	41 (38–45)
Hispanic¶	24 (20–27)	45 (41–49)	79 (74–84)	68 (62–73)	33 (28–38)	26 (22–31)	74 (69–79)	43 (38–47)
White, non-Hispanic	39 (35–42)	61 (57–64)	82 (79–85)	74 (71–77)	31 (27–34)	25 (22–28)	81 (78–84)	48 (44–52)
Age group (yrs)								
18–29	41 (36–46)	63 (56–69)	89 (85–93)	80 (75–85)	43 (36–49)	33 (28–39)	85 (80–91)	62 (56–68)
30–39	38 (33–42)	58 (53–62)	90 (87–92)	82 (78–85)	37 (31–42)	30 (25–35)	86 (83–89)	53 (48–58)
40–49	25 (22–28)	47 (42–52)	77 (72–81)	69 (65–73)	27 (23–30)	20 (18–23)	76 (72–80)	41 (37–46)
≥50	17 (14–19)	41 (38–45)	68 (65–72)	56 (53–60)	18 (15–20)	12 (10–14)	61 (57–64)	34 (31–38)
Education								
Less than HS diploma	26 (23–29)	47 (43–51)	78 (75–82)	66 (62–70)	29 (25–32)	22 (19–25)	76 (73–79)	47 (43–52)
HS diploma	28 (25–30)	50 (46–54)	80 (77–83)	70 (67–74)	29 (26–33)	23 (20–26)	75 (72–78)	44 (41–47)
More than HS diploma	27 (24–31)	50 (45–55)	76 (72–80)	70 (66–74)	27 (23–31)	22 (18–25)	75 (71–79)	44 (40–49)
Health insurance								
No	36 (32–40)	55 (51–59)	80 (77–84)	71 (67–75)	29 (26–33)	24 (20–27)	79 (75–82)	52 (48–56)
Yes	26 (24–28)	48 (45–51)	78 (75–80)	67 (64–69)	27 (25–30)	21 (19–23)	71 (68–74)	41 (38–43)
Poverty level**								
At or below FPL	27 (25–29)	48 (45–51)	78 (75–80)	66 (64–69)	27 (25–30)	21 (19–23)	71 (69–74)	43 (41–46)
Above FPL	26 (23–29)	51 (46–55)	80 (76–84)	73 (68–77)	31 (27–35)	26 (22–29)	77 (72–81)	47 (43–52)
Drug injected most frequently								
Heroin only	27 (25–29)	49 (46–52)	77 (75–80)	66 (63–68)	25 (23–28)	20 (18–22)	71 (68–73)	39 (37–42)
Other/Multiple††	27 (23–30)	46 (41–50)	80 (77–84)	71 (67–75)	34 (30–37)	26 (23–29)	76 (72–79)	52 (49–56)
Region§§								
Northeast	25 (21–28)	43 (38–48)	82 (78–87)	69 (64–74)	31 (27–36)	23 (19–27)	72 (67–77)	53 (47–59)
South	26 (23–30)	50 (46–54)	78 (75–81)	68 (64–71)	25 (22–28)	19 (17–22)	73 (70–76)	42 (38–45)
Midwest	24 (20–28)	44 (39–49)	71 (66–77)	60 (55–65)	16 (13–20)	12 (10–15)	68 (62–73)	34 (30–39)
West	32 (29–36)	57 (53–61)	75 (71–78)	67 (64–71)	28 (25–32)	25 (22–28)	74 (70–77)	43 (40–47)

Abbreviations: CI = confidence interval; FPL = federal poverty level; HS = high school.

* Aggregate estimates are weighted averages of MSA (metropolitan statistical areas)-level percentages. MSA-level percentages were adjusted for differences in recruitment and, the size of participant persons who inject drugs peer networks, then proportionally weighted by the size of the persons who inject drugs population in each city.

† Receptive syringe sharing was defined as "using needles that someone else had already injected with," and receptive injection equipment sharing was defined as using equipment such as cookers, cottons, or water used to rinse needles or prepare drugs "that someone else had already used." Condomless vaginal or anal sex was defined as "sex without a condom."

§ Aggregate estimates for "Other" race/ethnicity excluded due to insufficient data. "Other" includes American Indian/Alaska Natives, Asians, Native Hawaiian or other Pacific Islanders, and persons of multiple races.

¶ Persons of Hispanic ethnicity might be of any race or combination of races.

** Poverty level is based on household income and household size.

†† Other drugs injected alone or two or more drugs injected with the same frequency.

§§ The Northeast region includes the MSAs of Boston, Massachusetts; Nassau-Suffolk, New York; New York, New York; Newark, New Jersey; and Philadelphia, Pennsylvania. South region includes Atlanta, Georgia; Baltimore, Maryland; Dallas, Texas; Houston, Texas; Miami, Florida; New Orleans, Louisiana; and Washington, District of Columbia. Midwest region includes Chicago, Illinois and Detroit, Michigan. West region includes Denver, Colorado; Los Angeles, California; San Diego, California; San Francisco, California; and Seattle, Washington. San Juan, Puerto Rico was not included.

in the previous 12 months (61%) than were those without health insurance (47%) (Table 3). Similarly, more persons who inject drugs with health insurance reported participating in HIV behavioral interventions (28%) or ever testing for HCV infection (85%) than did those without health insurance (15% and 70%, respectively).

Discussion

This report provides updated prevalence of HIV infection and behaviors since the last NHBS survey among persons who inject drugs in 2012 (*3*). In 2015, persons who inject drugs continued to report high levels of injection and sex risk behaviors placing them at increased risk for HIV acquisition,

TABLE 3. Estimated percentage* of HIV-negative participants who inject drugs (n = 9,639) who received testing and HIV prevention services, by selected characteristics — National HIV Behavioral Surveillance, 20 cities, United States, 2015

Characteristics	Tested for HIV infection in the previous 12 months, % (95% CI)	Participated in HIV behavioral interventions in the previous 12 months,† % (95% CI)	Ever tested for hepatitis C, % (95% CI)	Received syringes from SSP in the previous 12 months,§ % (95% CI)	Received syringes from sterile sources only in the previous 12 months,§ % (95% CI)
Overall	**58 (56–60)**	**26 (23–28)**	**82 (80–84)**	**52 (49–55)**	**34 (32–37)**
Sex					
Men	58 (55–60)	25 (22–27)	82 (80–84)	49 (45–52)	33 (30–35)
Women	62 (58–66)	28 (24–32)	83 (81–86)	57 (51–62)	38 (33–43)
Race/Ethnicity¶					
Black, non-Hispanic	65 (62–69)	29 (25–33)	82 (79–85)	51 (47–56)	36 (33–40)
Hispanic**	62 (58–67)	27 (22–32)	78 (73–83)	53 (48–58)	38 (33–43)
White, non-Hispanic	51 (47–55)	23 (20–26)	84 (82–87)	54 (49–58)	28 (25–31)
Age group (yrs)					
18–29	58 (53–64)	23 (18–28)	74 (69–78)	46 (39–54)	26 (21–31)
30–39	58 (52–63)	20 (16–24)	84 (81–87)	54 (48–61)	30 (25–35)
40–49	61 (57–64)	31 (26–35)	82 (78–86)	56 (52–61)	35 (31–39)
≥50	61 (57–64)	27 (23–31)	86 (83–88)	54 (50–57)	38 (35–42)
Education					
Less than HS diploma	58 (54–62)	24 (20–28)	81 (79–84)	53 (48–57)	34 (30–38)
HS diploma	61 (59–64)	24 (21–28)	82 (79–85)	52 (48–56)	35 (32–39)
More than HS diploma	55 (51–60)	29 (25–34)	84 (81–87)	50 (45–55)	31 (26–36)
Health insurance					
No	47 (43–51)	15 (12–18)	70 (66–74)	36 (32–40)	23 (20–27)
Yes	61 (58–63)	28 (25–31)	85 (83–87)	55 (52–59)	37 (34–40)
Poverty level††					
At or below FPL	59 (57–62)	26 (23–29)	83 (81–85)	52 (49–56)	35 (32–37)
Above FPL	55 (51–59)	25 (21–29)	81 (78–85)	50 (44–56)	33 (28–38)
Drug injected most frequently					
Heroin only	58 (55–61)	26 (23–28)	83 (81–85)	54 (50–57)	36 (33–39)
Other/Multiple§§	59 (56–62)	26 (22–29)	80 (77–83)	45 (42–49)	29 (25–33)
Region¶¶					
Northeast	63 (58–68)	33 (28–38)	87 (84–91)	61 (54–67)	44 (39–50)
South	62 (59–66)	23 (19–26)	79 (76–82)	36 (32–39)	26 (23–30)
Midwest	47 (42–52)	19 (15–22)	78 (74–82)	50 (44–55)	43 (37–48)
West	49 (46–53)	20 (17–23)	80 (76–83)	66 (62–70)	28 (24–31)

Abbreviations: CI = confidence interval; FPL = federal poverty level; HS = high school; SSP = syringe services program.

* Aggregate estimates are weighted averages of MSA (metropolitan statistical areas)-level percentages. MSA-level percentages were adjusted for differences in recruitment and the size of participant persons who inject drugs, peer networks then proportionally weighted by the size of the persons who inject drugs population in each city.

† Participating in an individual or group HIV behavioral intervention (e.g., a one-on-one conversation with a counselor or an organized discussion regarding HIV prevention) did not include counseling received as part of an HIV test or conversations with friends.

§ Receiving a syringe from a syringe services program (SSP) was defined as reporting receiving a sterile syringe or needles at least once from an SSP or syringe/needle exchange program. Receiving syringes from sterile sources only included reporting receiving syringes from at least one of the following: SSP, pharmacy, or healthcare provider and not any other sources during the previous 12 months.

¶ Aggregate estimates for "Other" race/ethnicity excluded due to insufficient data. "Other" includes American Indian/Alaska Natives, Asians, Native Hawaiian or other Pacific Islanders, and persons of multiple races.

** Persons of Hispanic ethnicity might be of any race or combination of races.

†† Poverty level is based on household income and household size.

§§ Other drugs injected alone or two or more drugs injected with the same frequency.

¶¶ The Northeast region includes the MSAs of Boston, Massachusetts; Nassau-Suffolk, New York; New York, New York; Newark, New Jersey; and Philadelphia, Pennsylvania. South region includes Atlanta, Georgia; Baltimore, Maryland; Dallas, Texas; Houston, Texas; Miami, Florida; New Orleans, Louisiana; and Washington, District of Columbia. Midwest region includes Chicago, Illinois and Detroit, Michigan. West region includes Denver, Colorado; Los Angeles, California; San Diego, California; San Francisco, California; and Seattle, Washington. San Juan, Puerto Rico was not included.

highlighting the need for effective and comprehensive prevention services, including access to sterile injection equipment.

The prevalence of HIV infection was 7% (CI = 6%–8%) in 2015, lower than in 2012 (11%; 95% CI = 9%–12%). The change might partially be explained by the differences in the sample composition from 2012 to 2015: the percentage of white persons who inject drugs increased from 30% in 2012 to 39% in 2015, and white persons who inject drugs in 2012 and 2015 had the lowest HIV prevalence (5% and 6%, respectively).

Consistent with previous reports (*3*), this analysis found a higher prevalence of HIV infection among blacks who inject drugs than among whites who inject drugs, despite fewer

Summary

What is already known about this topic?

Persons who inject drugs are at increased risk for acquiring human immunodeficiency virus (HIV) infection. In 2012, National HIV Behavioral Surveillance found an overall 11% prevalence of HIV infection of among persons who inject drugs living in 20 large cities. Among HIV-negative persons who inject drugs, 27% shared syringes and 67% had vaginal sex without a condom in the previous 12 months.

What is added by this report?

In 2015, National HIV Behavioral Surveillance found a 7% prevalence of HIV infection among persons who inject drugs which was lower than in 2012 (11%). Among HIV-negative respondents, 27% reported sharing syringes and 67% reported having vaginal sex without a condom in the previous 12 months; only 52% received syringes from a syringe services program and 34% received all syringes from sterile sources. HIV infection prevalence was higher among blacks (11%) than whites (6%) but more white persons who inject drugs shared syringes (white: 39%; black: 17%) and injection equipment (white: 61%; black: 41%) in the previous 12 months.

What are the implications for public health practice?

Persons who inject drugs are at risk for acquiring HIV infection because of their drug use practices and sexual behaviors. Approximately half of injection drug users did not receive syringes from a syringe services program in the previous 12 months. Provision of sterile syringes and other community-based strategies can decrease risk for HIV transmission. Persons who inject drugs need access to sterile injection and drug preparation equipment; HIV and viral hepatitis testing; health services that provide treatment for HIV infection, viral hepatitis, substance use disorder and mental health disorders; preexposure prophylaxis; and education on drug- and sex-related risks and risk reduction

reported risk behaviors among blacks. In 2015, when compared with white persons who inject drugs, fewer black persons who inject drugs shared syringes or injection equipment, fewer had condomless vaginal or anal sex, more tested for HIV infection, and more received syringes only from sterile sources in the previous 12 months. Taken together with data from previous reports suggesting that persons who first injected drugs during the 5 years before their interview and young persons who inject drugs are more likely to be white (*2*), these findings suggest HIV prevalence among white persons who inject drugs could be lower because they have had less time to acquire HIV infection through injection drug use.

Overall, higher percentages of 2015 participants tested for HIV infection in the previous 12 months (51% in 2012, 58% in 2015) and ever tested for HCV (78% in 2012, 82% in 2015) (*3*). Increases in HIV and HCV testing could be the result of increased access to health insurance among persons who inject drugs (69% in 2012, 82% in 2015) (*3*). In 2015, higher percentages of persons who inject drugs and who have health insurance tested for HIV infection, participated in HIV behavioral interventions, and ever tested for HCV than did those without health insurance. Although these results highlight gains in HIV and HCV testing measures, nearly half of persons who inject drugs did not test for HIV in the previous 12 months as recommended by CDC (*8*). Continued activities that expand HIV testing in settings that provide services to persons who inject drugs, such as in syringe services programs, substance use disorder treatment programs and emergency departments, are needed.

The findings in this report are subject to at least four limitations. First, because a method of obtaining standard probability samples of persons who inject drugs does not exist, the representativeness of the NHBS sample cannot be determined. Although adjusted for RDS (*5*), biases related to participants' recruitment behavior or their willingness and ability to participate in the interview might have affected the sample. Second, the numbers of participants in some cities were insufficient to include these cities in the aggregate estimates. The number of cities excluded from aggregate estimates varied based on the analysis variable. Third, persons who inject drugs were interviewed in 20 cities with high prevalences of HIV infection; findings from these cities might not be generalizable to all persons who inject drugs including those who reside in rural or nonmetropolitan areas. Finally, behavioral data are self-reported and subject to social desirability bias.

This analysis highlights the ongoing need for risk reduction and HIV prevention services among persons who inject drugs. Only half of persons who inject drugs used syringe services programs and only a third obtained their syringes exclusively from sterile sources. Access to sterile injection and drug preparation equipment is critical for the prevention of HIV infections among persons who inject drugs. Although access to syringes through syringe services programs has increased in the United States (*9*), the available supply is likely insufficient to meet the demand, and multiple areas continue to lack access to these services. The recent opioid use epidemic increases the potential for HIV outbreaks among persons who inject drugs, particularly in areas with limited prevention services for persons who inject drugs (*4*). Thus, failure to respond appropriately to this prevention gap could reverse earlier successes in reducing HIV infection among persons who inject drugs (*2*). Comprehensive syringe services programs reduce transmission of HIV and other infections (*10*) by providing access to safe syringe disposal; risk reduction education; HIV and viral hepatitis testing; referrals to health services including treatment for HIV, HCV, or substance use disorder (including medication-assisted therapy) and mental health disorders; and

preexposure prophylaxis. Recent changes in federal appropriations law[††††] permitting the use of federal funding to support syringe services programs present an opportunity to improve access to these critical prevention services to persons who inject drugs.

[††††] Consolidated Appropriations Act, 2016. Division H, Section 520. https://www.congress.gov/114/bills/hr2029/BILLS-114hr2029enr.pdf.

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Conflict of Interest

No conflicts of interest were reported.

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Status of HIV Epidemic Control Among Adolescent Girls and Young Women Aged 15–24 Years — Seven African Countries, 2015–2017

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In 2016, an estimated 1.5 million females aged 15–24 years were living with human immunodeficiency virus (HIV) infection in Eastern and Southern Africa, where the prevalence of HIV infection among adolescent girls and young women (3.4%) is more than double that for males in the same age range (1.6%) (*1*). Progress was assessed toward the Joint United Nations Programme on HIV/AIDS (UNAIDS) 2020 targets for adolescent girls and young women in sub-Saharan Africa (90% of those with HIV infection aware of their status, 90% of HIV-infected persons aware of their status on antiretroviral treatment [ART], and 90% of those on treatment virally suppressed [HIV viral load <1,000 HIV RNA copies/mL]) (*2*) using data from recent Population-based HIV Impact Assessment (PHIA) surveys in seven countries. The national prevalence of HIV infection in adolescent girls and young women aged 15–24 years, the percentage who were aware of their status, and among those persons who were aware, the percentage who had achieved viral suppression were calculated. The target for viral suppression among all persons with HIV infection is 73% (the product of 90% x 90% x 90%). Among all seven countries, the prevalence of HIV infection among adolescent girls and young women was 3.6%; among those in this group, 46.3% reported being aware of their HIV-positive status, and 45.0% were virally suppressed. Sustained efforts by national HIV and public health programs to diagnose HIV infection in adolescent girls and young women as early as possible to ensure rapid initiation of ART should help achieve epidemic control among adolescent girls and young women.

The PHIA surveys are nationally representative, household-based surveys funded by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and conducted under the leadership of the respective countries' ministries of health, CDC, and ICAP at Columbia University (http://www.icap.columbia.edu/). The objectives of the PHIA surveys are to provide national estimates of HIV incidence and subnational estimates of HIV prevalence and viral load suppression to assess the HIV epidemic and the impact of HIV prevention and ART programs in each country. During 2015–2017, PHIA surveys were conducted in Lesotho, Malawi, Swaziland, Uganda, Tanzania Zambia, and Zimbabwe. Each survey used a two-stage cluster sampling design to obtain representative samples of persons living in households within the country. Household members and persons who slept in the household the night before the survey were eligible to participate in the surveys. Persons aged 15–59 years were eligible in all households, and children aged 0–14 years were eligible in one of every two or three households, depending upon the number of participants required to estimate pediatric HIV prevalence. All surveys used comparable questionnaires that included a set of core questions as well as common specimen collection and HIV testing methods.

Data on demographic characteristics, risk behaviors, testing, and treatment history were collected through structured household and individual questionnaires. The surveys included home-based HIV counseling and testing conducted in private locations within or around the home, using each country's national HIV rapid testing algorithm, and employing CD4 testing technology, with results immediately returned to participants. Awareness of HIV status and current ART use (an indicator of ART coverage at the population level) were determined based on responses provided in the survey questionnaire. HIV viral load testing was conducted using plasma specimens or dried blood spots. Survey data were weighted based on sampling design, nonresponse, and the age and sex distribution of each country's population. Because each country's survey weights account for population size, these weights were applied to the pooled data to produce combined

estimates for the total population of females aged 15–24 years in the seven countries.

Among the seven countries, 32,273 adolescent girls and young women were eligible for participation; 29,949 (93%) participated in the interview, and 28,152 (94%) of those interviewed participated in the biomarker portion of the survey. The combined prevalence of HIV infection among adolescent girls and young women was 3.6%, ranging from 2.1% in Tanzania to 13.9% in Swaziland (Table). Among HIV-positive adolescent girls and young women, 46.3% reported being aware of their HIV-positive status (range = 40.1% [Zambia] to 70.2% [Swaziland]). Among those who were aware of their HIV-positive status, 85.5% reported current ART use (range = 77.9% [Zambia] to 89.7% [Lesotho]). Among those who reported current ART use, 81.8% were virally suppressed (range = 75.8% [Uganda] to 90.6% [Tanzania]). The overall prevalence of viral load suppression among all adolescent girls and young women with HIV infection, regardless of awareness of HIV-positive status or reported current use of ART, was 45.0%, and ranged from 33.6% in Zambia to 55.5% in Swaziland (Table).

Summary

What is already known about this topic?

In 2016, an estimated 1.5 million adolescent girls and young women were living with HIV infection in Eastern and Southern Africa, where HIV prevalence among adolescent girls and young women is more than twice that of their male peers.

What is added by this report?

Analysis of data from Population-based HIV Impact Assessment surveys conducted during 2015–2017 in seven countries in Eastern and Southern Africa found that the prevalence of HIV infection among adolescent girls and young women was 3.6%. Among those who were HIV-positive, 46.3% reported being aware of their status, and among those aware of their HIV-positive status, 85.5% reported current antiretroviral treatment (ART) use. Overall, viral load suppression among HIV-infected adolescent girls and young women, regardless of status awareness or current use of ART, was 45.0%, well below the UNAIDS target of 73%.

What are the implications for public health practice?

There is a need to design, implement, and evaluate strategies aimed at ensuring HIV-positive adolescent girls and young women know their HIV status and are on ART treatment to improve their immunity status and reduce transmission to others.

Discussion

The PHIA surveys provide the first population level estimates of viral load suppression for adolescent girls and young women in the seven countries surveyed. Although it is encouraging that among adolescent girls and young women who were aware that they were HIV-positive, 86% reported that they were receiving ART and 82% of those had achieved viral suppression, more remains to be done. Less than half (46.3%) of HIV-positive adolescent girls and young women were aware of their HIV-positive status, which is just over halfway to the 90% UNAIDS target, and based on reported current use of ART, coverage at the population level among adolescent girls and young women with diagnosed HIV infection ranged from 78% to 90%. In Lesotho, Uganda, and Tanzania, self-reported ART use among adolescent girls and young women aware of their HIV-positive status is approaching the 90% target. Although the rate of viral load suppression (45.0%) among all HIV-positive adolescent girls and young women was well below the UNAIDS 73% target, the high rate of viral load suppression among HIV-positive adolescent girls and young women who reported current ART use (82%) is particularly encouraging, suggesting that once these persons receive a diagnosis, national ART programs are successful in initiating and maintaining them on effective ART.

The population of young persons aged 15–24 years in Africa is the fastest-growing youth demographic group globally (*3*). By 2055, the current population of 226 million adolescents and young persons is expected to double (*3*). A rapid and substantial reduction in HIV incidence in this population is critical to achieve epidemic control by 2030.

PEPFAR's DREAMS (Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe) initiative is a public-private partnership aimed at reducing the impact of HIV on adolescent girls and young women by engaging them, their families, and their communities through programs aimed at addressing the economic, cultural, legal, and behavioral drivers of new HIV infections in this population (*4*). DREAMS interventions consist of programs aimed at risk reduction for HIV-negative adolescent girls and young women (*4*,*5*). Because a significant percentage of HIV-positive adolescent girls and young women do not know their status, strategies for identifying effective and innovative case finding linked to same day treatment in this population are needed and would complement the existing DREAMS strategies (*6*).

The findings in this report are subject to at least one limitation. HIV status-awareness and ART coverage are based on participants' responses to the survey questionnaire. These two indicators might be underestimated if HIV-positive participants were unwilling to report knowing their HIV status, which might be the case among adolescents in particular (*7*). Multiplying the three 90/90/90 target measures from this analysis together (46.3% aware of HIV-positive status x 85.5% self-reported ART use x 81.8% viral suppression among those

TABLE. HIV prevalence, awareness of HIV status, self-reported ART, and viral load suppression among female participants aged 15–24 years in Population-based HIV Impact Assessment (PHIA) surveys — seven Eastern and Southern African countries, 2015–2017

Country	Years survey conducted	HIV prevalence, % (95% CI)	Aware of HIV-positive status, % (95% CI)	Self-reported ART,* % (95% CI)	Viral load suppression among those self-reported on ART,† % (95% CI)	Viral load suppression among all HIV-positive,§ % (95% CI)
Zimbabwe	2015–2016	5.9 (5.0–6.7)	48.2 (41.5–55.0)	86.2 (79.4–93.0)	89.0 (83.1–94.9)	47.9 (41.0–54.7)
Malawi	2015–2016	3.4 (2.7–4.2)	55.3 (46.9–63.7)	84.8 (75.9–93.8)	79.6 (67.6–91.6)	49.7 (40.2–59.1)
Zambia	2016	5.7 (4.9–6.5)	40.1 (33.6–46.5)	77.9 (69.3–86.4)	78.1 (67.5–88.7)	33.6 (27.2–39.9)
Uganda	2016–2017	3.3 (2.8–3.82)	44.0 (35.7–52.4)	88.6 (80.9–96.2)	75.8 (64.7–86.9)	44.9 (36.5–53.3)
Swaziland	2016–2017	13.9 (12.1–15.8)	70.2 (64.4–76.1)	79.9 (73.8–85.9)	79.9 (72.7–87.2)	55.5 (49.5–61.5)
Tanzania	2016–2017	2.1 (1.7–2.6)	46.3 (42.8–49.8)	88.2 (77.5–99.0)	90.6 (79.1–100.0)	47.1 (37.3–56.9)
Lesotho	2016–2017	11.1 (9.7–12.5)	61.4 (55.2–67.7)	89.7 (84.8–94.7)	76.4 (69.1–83.7)	50.9 (44.8–57.1)
Total	**2015–2017**	**3.6 (3.3–3.9)**	**46.3 (42.8–49.8)**	**85.5 (82.2–88.8)**	**81.8 (77.7–85.9)**	**45.0 (41.6–48.5)**

Abbreviations: ART = antiretroviral treatment; CI = confidence interval; HIV = human immunodeficiency virus.
* Percentage who reported antiretroviral treatment among participants who reported being HIV-positive.
† Percentage with viral load suppression (<1,000 HIV RNA copies/mL) among participants who self-reported being HIV-positive and being on antiretroviral treatment.
§ Percentage with viral load suppression (<1,000 HIV RNA copies/mL) among participants with HIV-positive test result conducted as part of the PHIA survey, regardless of awareness of diagnosis or reported current use of ART.

on ART) produces a viral load suppression prevalence among HIV-positive adolescent girls and young women on ART of 32.4%. This is lower than the 45.0% observed via biomarker viral load suppression among all HIV-positive adolescent girls and young women, suggesting underreporting in the measurement of the first two targets. Absent underreporting, virtually all of the 46.3% of HIV-positive adolescent girls and young women reporting awareness of their HIV-positive status would need to be on ART and suppressed to achieve the 45.0% overall viral load suppression. This is unlikely given that 14.5% of those who were aware of their status did not report current ART use, and a more likely explanation is that there is some level of underreporting of both knowledge of status and ART use. All HIV-positive blood specimens collected for the PHIA surveys will be tested for the presence of selected antiretroviral medications, based on the national treatment guidelines, to provide additional measures of ART coverage. Although the results of the ART testing are pending, overall viral load suppression is based on objective measures and is, therefore, not subject to the same sources of underestimation.

There has been notable progress toward overall HIV epidemic control in countries in this region, as documented by PHIA survey results (2015–2016) from Malawi, Zambia, and Zimbabwe, which found that 62.0% of all HIV-positive adults aged 15–59 years were virally suppressed (*8*). In Swaziland, the prevalence of viral load suppression among HIV-positive adults aged 18–49 years more than doubled from 34.8% in 2011 to 71.3% in 2017, and a 44% decline in HIV incidence was observed over the same period (*9*). In contrast to these successes in the general adult population, the 45% prevalence for viral load suppression among adolescent girls and young women is well below the 73% target, suggesting the strategies that have been more broadly successful in initiating and keeping adults with HIV on ART are less successful in this population. Even as significant progress has been made toward achieving the 90/90/90 targets in these countries, additional, targeted strategies are needed to reach some groups, particularly adolescent girls and young women.

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Conflict of Interest

Bharat Parekh reports receipt of royalties from CDC from the sale of LAg-Avidity Enzyme Immunoassay during conduct of the study. No other conflicts of interest were reported.

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Recommendation of the Advisory Committee on Immunization Practices for Use of a Third Dose of Mumps Virus–Containing Vaccine in Persons at Increased Risk for Mumps During an Outbreak

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A substantial increase in the number of mumps outbreaks and outbreak-associated cases has occurred in the United States since late 2015 (*1*,*2*). To address this public health problem, the Advisory Committee on Immunization Practices (ACIP) reviewed the available evidence and determined that a third dose of measles, mumps, rubella (MMR) vaccine is safe and effective at preventing mumps. During its October 2017 meeting, ACIP recommended a third dose of a mumps virus–containing vaccine* for persons previously vaccinated with 2 doses who are identified by public health authorities as being part of a group or population at increased risk for acquiring mumps because of an outbreak. The purpose of the recommendation is to improve protection of persons in outbreak settings against mumps disease and mumps-related complications. This recommendation supplements the existing ACIP recommendations for mumps vaccination (*3*).

In 1977, ACIP recommended 1 dose of mumps vaccine for all children aged ≥12 months (*4*). In response to multiple measles outbreaks in the late 1980s, in 1989 ACIP recommended routine administration of 2 doses of MMR vaccine for children, with the first dose administered at ages 12 through 15 months and the second at ages 4 through 6 years (*5*). In addition to improved measles control, this policy led to substantial reduction in the number of mumps cases in the United States during the 1990s, which was sustained through 2005 (*3*). However, in 2006, mumps outbreaks primarily affecting populations with high coverage with 2 doses of MMR vaccine in midwestern states and colleges resulted in 6,584 reported mumps cases that year (*6*). These outbreaks prompted ACIP to formally recommend a routine 2-dose mumps vaccination policy for school-aged children (i.e., kindergarten–grade 12) and adults at high risk (i.e., students at post-high school educational institutions, health care personnel, and international travelers) in 2006 (*7*). In addition, ACIP recommended that a second dose of mumps vaccine should be considered in outbreak settings for children aged 1–4 years and adults who have received 1 dose of vaccine, depending on the epidemiology of the outbreak (e.g., the age groups affected or institutions involved).

Despite this recommendation, mumps outbreaks continued to be reported throughout the United States, particularly in settings where persons have close, prolonged contact (e.g., universities and close-knit communities). To assist state and local health departments in responding to mumps outbreaks, CDC issued guidance on use of a third dose of MMR vaccine in the 2012 *Manual for the Surveillance of Vaccine-Preventable Diseases*.† The guidance was based on limited data and provided criteria for health departments regarding when to consider use of a third dose in specifically identified target populations. Additional evidence on effectiveness and safety of the third dose of MMR vaccine recently became available and was presented to ACIP during 2017. This report summarizes the evidence considered by ACIP regarding use of a third dose of a mumps virus–containing vaccine during outbreaks and provides the recommendation for its use among persons who are at increased risk for acquiring mumps because of an outbreak.

Methods

During March–October 2017, the ACIP Mumps Work Group held biweekly conference calls to review and discuss relevant scientific evidence. Topics addressed included the epidemiology of mumps in the United States since introduction of a routine second dose of MMR vaccine; effectiveness, duration of protection, immunogenicity, and risk factors for 2-dose vaccine failure; and effectiveness, immunogenicity, and safety of a third dose of MMR vaccine. Also assessed were stakeholders' values attributed to the perceived benefits and harms of a third dose of MMR vaccine, acceptability, and implementation considerations regarding use of a third dose of MMR vaccine. Where scientific data were lacking, the summary of evidence incorporated the opinions of the Mumps Work Group member experts. Quality of evidence related to the benefits and harms of a third dose of mumps virus–containing vaccine was evaluated using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) framework (https://www.cdc.gov/vaccines/acip/recs/grade/about-grade.html). Methods and GRADE tables for the evidence for third dose of mumps virus–containing

* The third dose may be administered as measles, mumps, rubella (MMR) vaccine, (M-M-R II, Merck & Co., Inc.) or measles, mumps, rubella, and varicella (MMRV) vaccine (ProQuad, Merck & Co., Inc.).

† This publication has been archived and is no longer available online. Readers may contact ncirddvdmmrhp@cdc.gov for more information.

vaccine can be found at https://www.cdc.gov/vaccines/acip/recs/grade/mumps.html.

Summaries of the evidence reviewed were presented to ACIP at the February 2017, June 2017, and October 2017 meetings. At the October 2017 ACIP meeting, the proposed recommendation for a third dose of a mumps virus–containing vaccine (i.e., MMR or measles, mumps, rubella, and varicella [MMRV]) during mumps outbreaks was presented, and after a period for public comment, was approved unanimously by the voting ACIP members.[§]

Summary of Key Findings

Public Health Burden of Mumps. Parotitis occurs in >85% of mumps cases; however, severe manifestations with complications such as orchitis (12%–66%), aseptic meningitis (0.2%–10%), or encephalitis (0.02%–0.3%) were recognized during the prevaccine era (*3*) and also can occur in vaccinated persons (3%–11%, <1%, and <0.3%, respectively) (*6,8*). Since 2012, the number of mumps cases, incidence, number of outbreaks, proportion of outbreak-associated cases, and number of jurisdictions reporting mumps outbreaks have all increased (*8*). The number of cases reported in 2016 (6,369) and 2017 (5,629, preliminary as of December 31) are the highest reported in a decade. Furthermore, from January 1, 2016 through June 30, 2017, state health departments reported 150 mumps outbreaks (the occurrence of three or more cases linked by place and time) (*9*), accounting for 9,200 cases; 39 (76%) of 51 of state health departments reported at least one outbreak (*2,8*). Seventy-five (50%) outbreaks occurred in universities and 16 (11%) in close-knit communities (i.e., communities or groups that are strongly connected by social, cultural, or family ties; participate in communal activities; or have a common living space). A median of 10 cases occurred per outbreak (interquartile range [IQR] = 4–26); 20 (13%) outbreaks had ≥50 cases, and these accounted for 83% of all outbreak-associated cases. Most cases occurred in young adults (median age of outbreak-associated patients = 21 years [IQR = 19–22]). Among 7,187 (78%) of 9,200 patients with known vaccination status, 5,015 (70%) had received 2 doses of MMR vaccine before developing mumps. The overall proportion of outbreak-associated mumps patients with complications was <3% (270 of 9,200); orchitis accounted for 75% (203 of 270) of reported complications. Other investigations also reported significantly lower prevalences of complications among mumps patients who had received 2 vaccine doses than among unvaccinated patients (*10,11*).

[§] Indication for a third dose of mumps virus–containing vaccine was not included in the package insert for these vaccines at the time the recommendation was made.

Two-Dose Mumps Vaccine Effectiveness and Immune Response. The median effectiveness of 2 doses of MMR vaccine in preventing mumps is 88%, with estimates ranging from 31% to 95% (*3,12–16*). The studies reporting these findings were conducted during 2005–2016, and most included persons who received the second MMR dose <10 years before the study. Several studies found decreasing effectiveness with increasing time after receipt of the second dose (*12,17*) or reported increased risk for mumps with increasing time after receipt of the second dose (*12,15,18*). Limited laboratory data on immune response to mumps virus indicate both lower antibody titers and poorer antibody quality (e.g., lower avidity antibodies, failure to generate strong memory B cell responses) after either natural mumps infection or mumps vaccination compared with the responses to infection with or vaccination against measles and rubella (*19,20*). Both neutralizing and non-neutralizing mean mumps antibody titers decline over time in persons who have received 2 doses of MMR vaccine (*19,21–23*).

Since 2006, the predominant circulating mumps virus genotype in the United States has been genotype G. Mumps virus–containing vaccines available in the United States are manufactured using the genotype A Jeryl-Lynn mumps virus strain (*3*). When studied 4–6 weeks and 10 years after receipt of the second MMR dose at age 4–6 years, all recipients had neutralizing antibody against genotype G mumps strain; however, the geometric mean titers of antibodies were lower than those against the vaccine strain (*21,24*).

Third Dose of MMR Vaccine. Three epidemiologic studies provided evidence regarding use of a third dose of MMR vaccine for prevention of mumps, all conducted in outbreak settings among populations with high coverage with 2 doses of MMR vaccine (schools and a university) (*12,25,26*). All studies reported lower attack rates among persons who received the third dose during the outbreak compared with persons who had received 2 doses before the outbreak, but only one study (*12*) found a statistically significant risk ratio (6.7 versus 14.5 per 1,000 person-years; p<0.001). Incremental vaccine effectiveness of the third versus the second MMR dose in these studies ranged from 61% to 88%, with one estimate being statistically significant (78.1%, 95% confidence interval = 60.9%–87.8%) (*12*). This study also found that students who had received 2 doses of MMR vaccine ≥13 years before the outbreak had nine or more times the risk for contracting mumps than did those who had received the second dose within the 2 years preceding the outbreak.

Two studies evaluated the geometric mean titers of mumps virus–specific antibodies after the third dose of MMR vaccine and demonstrated a significant increase (p<0.0001) 1 month after vaccination; however, antibody titers declined to near baseline by 1 year after vaccination (*27,28*). In the absence of a

correlate of protection that would define the level of antibodies needed to protect a person from mumps disease, the clinical significance of these laboratory findings is unclear.

Five studies evaluated the safety of the third dose of MMR vaccine among children and young adults (aged 9–28 years) using passive and active surveillance for adverse events (J. Routh, CDC, personal communication, 2017) (*25*,*29*–*31*). No serious adverse events[¶] were reported among 14,368 persons who received a third MMR vaccine dose. Nonserious adverse events were mild and reported at low rates. Among children, 6%–7% reported at least one nonserious adverse event within 2 weeks after receiving the third dose. Among young adults who received a third dose, the prevalences of four symptoms were significantly elevated during the 4-week postvaccination period compared with the prevaccination period. These symptoms and estimated proportions of subjects with episodes attributable to receipt of the third dose were lymphadenopathy (12%), diarrhea (9%), headache (7%), and joint pain (6%) (*32*). The median duration of these episodes was short (1–3 days).

Stakeholders' Values, Acceptability, and Implementation Considerations. During July–September 2017, CDC conducted surveys of stakeholders, including students and parents, universities and colleges, and health departments to assess values, acceptability, and considerations for implementation of a third MMR vaccine dose during mumps outbreaks. Because the response rates for the student and parent surveys were very low (<0.5% in one university that agreed to participate), thereby limiting reliability of the results, the values regarding the benefits and harms of using a third dose to prevent mumps from the perspective of these stakeholders was based on expert opinion. Experts concluded that students and parents place high value on preventing mumps and its complications as well as preventing the harms associated with loss of productivity that can occur with mumps disease. Experts also concluded students and parents do not have concerns about safety of a third dose of MMR vaccine.

The survey of colleges and universities was distributed through the American College Health Association. Among 980 member university student health service administrators, 251 (26%) responded, representing colleges and universities from 47 states (*33*). Among these, 79 (31%) reported having mumps cases on campus since 2014. On a scale ranging from strongly negative (0), to neutral (5), to strongly positive (10), most university administrators felt student and parent attitudes were positive (80% and 83%, respectively, gave a score higher than 5 toward use of a third dose of MMR vaccine to protect students during a mumps outbreak (median = 7 for student attitudes, IQR = 6–9; median = 7 for parent attitudes, IQR = 6–8). With regard to disruption of activities, almost all administrator respondents indicated outbreaks resulted in some degree of disruption on campus. Using a scale from not disruptive (0), to somewhat disruptive (5), to extremely disruptive (10), 57% indicated that mumps outbreaks were more than somewhat disruptive (score >5) to student life (median = 6, IQR = 4–7), and 67% indicated outbreaks were more than somewhat disruptive to staff activities (median = 6, IQR = 5–8). Ranking of disruption to student life and staff activities did not differ significantly by the size of the outbreak experienced by the university (p = 0.20 and p = 0.57, respectively).

The survey of health departments was distributed through the Council of State and Territorial Epidemiologists to 81 health department jurisdictions, including 58 (72%) state and territorial health departments and 23 (28%) city or large urban health departments. Among the 61 (75%) responding health departments, 46 (75%) reported having one or more mumps outbreaks in their jurisdiction since January 1, 2016 (*33*). Nearly half (47%, 20 of 43) of health departments that reported outbreaks indicated recommending an outbreak dose or third dose of MMR vaccine[**] during one or more of these outbreaks. Compared with other mumps outbreak control measures, on a scale from not effective (0), to somewhat effective (5), to most effective (10), 42% (8 of 19) of health departments rated the intervention with an effectiveness score >5 (more than somewhat effective) (median = 5, IQR = 3–7). On a scale from least cost beneficial (0), to somewhat cost beneficial (5), to most cost beneficial (10), 53% (8 of 15) of health departments rated the intervention with a cost benefit score >5 (more than somewhat cost beneficial) (median = 7, IQR = 4–7).

GRADE Quality of Evidence Summary. The GRADE evidence type[††] for critical outcomes was determined to be 4 for benefits (effectiveness for prevention of mumps) and 2 for harms (serious adverse events) (https://www.cdc.gov/vaccines/acip/recs/grade/mumps.html).

Summary of Rationale for Recommendation for a Third Dose of Mumps Virus–Containing Vaccine in Persons at Increased Risk for Acquiring Mumps During an Outbreak

Mumps outbreaks have occurred primarily in populations in institutional settings with close contact or in close-knit

[¶] Serious adverse events are defined as death, life-threatening illness, hospitalization or prolongation of existing hospitalization, or permanent disability.

[**] An outbreak dose is a dose of MMR vaccine administered without checking individual records before vaccination. Third dose of MMR vaccine is an MMR dose administered after confirmation of receipt of 2 MMR vaccine doses.

[††] The evidence type (or quality of the body of evidence) is assessed for each outcome on the basis of the study design and specified downgrading or upgrading criteria. The evidence type is classified as the following: 1 = randomized controlled trials (RCTs), or overwhelming evidence from observational studies; 2 = RCTs with important limitations, or exceptionally strong evidence from observational studies; 3 = observational studies, or RCTs with notable limitations; 4 = clinical experience and observations, observational studies with important limitations, or RCTs with several major limitations.

communities. The current routine recommendation for 2 doses of MMR vaccine appears to be sufficient for mumps control in the general population, but insufficient for preventing mumps outbreaks in prolonged, close-contact settings, even where coverage with 2 doses of MMR vaccine is high. Waning of vaccine-induced immunity with time after receipt of the second vaccine dose in high intensity exposure settings typical of outbreaks contributes to this higher risk for mumps disease in these settings. Protection against severe disease, however, is maintained. Considering the evidence regarding the public health burden of disease and the known risk factors, persons who are at increased risk for acquiring mumps because of an outbreak were identified as a public health priority for receiving a third dose of mumps virus–containing vaccine.

A third dose of MMR vaccine has at least a short-term benefit for persons in outbreak settings. No serious adverse events were reported, and rates of nonserious adverse events were low. Because mumps is prevented in persons who receive a third dose, complications will also be prevented. Together, the benefit of added protection through administration of a third dose of MMR vaccine outweighs the low risk for vaccine-associated adverse events. Universities and health departments value the prevention of mumps disease and mumps complications and recognize that there is a potential loss of productivity because of mumps disease. A third dose of MMR vaccine was considered acceptable to students, parents, universities/schools, and health departments. Regarding implementation, an ACIP recommendation would allow health departments to make more rapid decisions regarding use of a third dose of MMR vaccine and increase access to vaccine for persons identified by public health authorities as being at increased risk for mumps because of an outbreak. MMRV vaccine, which is the other vaccine licensed in the United States for the prevention of mumps (*34*),[§§] may also be used when a third dose mumps vaccination is indicated among children aged ≤12 years.

Available evidence indicates that a third dose of MMR vaccine improves protection for persons at increased risk for mumps because of an outbreak. Because of the complexity of mumps outbreaks, including the setting, the group or population affected, and risk factors for transmission, public health authorities are uniquely positioned to advise parents, students, clinicians, and universities regarding when and for which groups a third dose of MMR vaccine is appropriate. At this time, evidence is limited and is not sufficient to fully characterize the effect of a third dose of MMR vaccine on reducing the size or duration of an outbreak, nor are any data available to demonstrate the duration of additional protection conferred by a third dose. In addition, limited immunologic evidence suggests antibody titers decline within 1 year after the third dose. As more data on duration of protection after receipt of the third dose become available, evidence for use of a routine third dose will be considered. No evidence is available regarding the benefit of an additional dose of a mumps virus–containing vaccine to persons with documentation of receipt of 3 previous doses; therefore, no additional dose is recommended for persons in outbreak settings who have already received ≥3 doses of a mumps virus–containing vaccine.

Recommendation

Persons previously vaccinated with 2 doses of a mumps virus–containing vaccine who are identified by public health authorities as being part of a group or population at increased risk for acquiring mumps because of an outbreak should receive a third dose of a mumps virus–containing vaccine to improve protection against mumps disease and related complications.

Implementation Considerations and Future Research

In the setting of an identified mumps outbreak, public health authorities should define target groups at increased risk for mumps during the outbreak, determine whether vaccination of at-risk persons is indicated, and provide recommendations for vaccination to health care providers. Persons at increased risk for acquiring mumps are those who are more likely to have prolonged or intense exposure to droplets or saliva from a person infected with mumps, such as through close contact or sharing of drinks or utensils. During an outbreak, persons identified as being at increased risk and who have received ≤2 doses of mumps virus–containing vaccine or have unknown vaccination status should receive 1 dose. Additional guidance can be found in the *Manual for the Surveillance of Vaccine-Preventable Diseases* (*9*).

Contraindications and precautions for administration of a third dose of a mumps virus–containing vaccine are the same as those for routine use of the vaccine (1 or 2 doses) (*3*). CDC will monitor the burden of mumps among persons who have received 2 and 3 doses of mumps virus–containing vaccine and the duration of protection conferred by the third dose, as well as adverse events after the receipt of a third dose of a mumps virus–containing vaccine. Adverse events occurring after administration of any vaccine should be reported to the Vaccine Adverse Event Reporting System (VAERS;

[§§] MMRV vaccine contains the same strain of mumps virus as MMR vaccine. MMRV vaccine was licensed on the basis of non-inferior immunogenicity compared with administration of MMR and varicella at the same time, therefore the two vaccination options are considered to provide the same protection against the respective diseases. MMRV vaccine is associated with an increased risk for fever and febrile seizures among children aged 12-23 months of age during the 5-12 days after the first dose compared with the use of MMR vaccine and varicella vaccine at the same visit. However, among children who received the second dose of MMRV vaccine at age 4-6 years data do not suggest an increased risk for febrile seizures.

https://vaers.hhs.gov/). In addition, CDC will continue to collect data to assess the impact of receipt of a third dose of mumps virus–containing vaccine on mumps outbreaks.

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Conflict of Interest

No conflicts of interest were reported.

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Vital Signs: Trends and Disparities in Infant Safe Sleep Practices — United States, 2009–2015

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Abstract

Introduction: There have been dramatic improvements in reducing infant sleep-related deaths since the 1990s, when recommendations were introduced to place infants on their backs for sleep. However, there are still approximately 3,500 sleep-related deaths among infants each year in the United States, including those from sudden infant death syndrome, accidental suffocation and strangulation in bed, and unknown causes. Unsafe sleep practices, including placing infants in a nonsupine (on side or on stomach) sleep position, bed sharing, and using soft bedding in the sleep environment (e.g., blankets, pillows, and soft objects) are modifiable risk factors for sleep-related infant deaths.

Methods: CDC analyzed 2009–2015 Pregnancy Risk Assessment Monitoring System (PRAMS) data to describe infant sleep practices. PRAMS, a state-specific and population-based surveillance system, monitors self-reported behaviors and experiences before, during, and shortly after pregnancy among women with a recent live birth. CDC examined 2015 data on nonsupine sleep positioning, bed sharing, and soft bedding use by state and selected maternal characteristics, as well as linear trends in nonsupine sleep positioning from 2009 to 2015.

Results: In 2015, 21.6% of respondents from 32 states and New York City reported placing their infant in a nonsupine sleep position; this proportion ranged from 12.2% in Wisconsin to 33.8% in Louisiana. Infant nonsupine sleep positioning was highest among respondents who were non-Hispanic blacks. Nonsupine sleep positioning prevalence was higher among respondents aged <25 years compared with ≥25 years, those who had completed ≤12 years compared with >12 years of education, and those who participated in the Special Supplemental Nutrition Program for Women, Infants, and Children during pregnancy. Based on trend data from 15 states, placement of infants in a nonsupine sleep position decreased significantly from 27.2% in 2009 to 19.4% in 2015. In 2015, over half of respondents (61.4%) from 14 states reported bed sharing with their infant, and 38.5% from 13 states and New York City reported using any soft bedding, most commonly bumper pads and thick blankets.

Conclusions and Implications for Public Health Practice: Improved implementation of the safe sleep practices recommended by the American Academy of Pediatrics could help reduce sleep-related infant mortality. Evidence-based interventions could increase use of safe sleep practices, particularly within populations whose infants might be at higher risk for sleep-related deaths.

Introduction

Approximately 3,500 sleep-related deaths among infants are reported each year in the United States, including those from sudden infant death syndrome (SIDS), accidental suffocation and strangulation in bed, and unknown causes (*1*). Significant sociodemographic and geographic disparities in sleep-related infant deaths exist (*2*,*3*). To reduce risk factors for sleep-related infant mortality, recommendations from the American Academy of Pediatrics (AAP) for safe sleep include 1) placing the infant in the supine sleep position (placing the infant on his or her back) on a firm sleep surface such as a mattress in a safety-approved crib or bassinet, 2) having infant and caregivers share a room, but not the same sleeping surface, and 3) avoiding the use of soft bedding (e.g., blankets, pillows, and soft objects) in the infant sleep environment (*4*). Additional recommendations to reduce the risk for sleep-related infant deaths include breastfeeding, providing routinely recommended immunizations, and avoiding prenatal and postnatal exposure to tobacco smoke, alcohol, and illicit drugs (*4*).

Although the individual effect of each recommendation on sleep-related infant mortality is unclear, sharp declines in SIDS and other sleep-related mortality in the 1990s have been attributed to an increase in safe sleep practices such as supine sleep. However, since the late 1990s declines in infant sleep-related deaths (*4*) and nonsupine sleep positioning (on side or stomach) (*5*) have been

less pronounced. The rate of infant sleep-related deaths declined from 154.6 deaths per 100,000 live births in 1990 to 93.9 per 100,000 live births in 1999; in 2015, the rate of infant sleep-related deaths was 92.6 deaths per 100,000 live births (*6*). Previous research indicates implementation of safe sleep recommendations by infant caregivers remains suboptimal. In the Study of Attitudes and Factors Effecting Infant Care, which interviewed mothers 2–6 months postpartum during 2011–2014, 22% said they had placed their infant in a nonsupine sleep position (*7*), and 21% shared a bed with their infant at least once during the 2 weeks before being interviewed (*8*). In addition, in the National Infant Sleep Position Study, a household telephone survey that sampled nighttime caregivers during 2007–2010, more than half (54%) placed their infant to sleep with soft bedding during the 2 weeks before the interview (*9*).

CDC used data from the Pregnancy Risk Assessment Monitoring System (PRAMS) to examine the prevalence of unsafe infant sleep practices. Ongoing surveillance efforts can identify populations at risk for unsafe sleep practices and help evaluate policies and programs to improve safe sleep practices. Health care providers and state-based and community-based programs can identify barriers to safe sleep practices and provide culturally appropriate counseling and messaging to improve infant sleep practices.

Methods

Data source. PRAMS (*10*) collects state-specific, population-based data on self-reported maternal behaviors and experiences before, during, and shortly after pregnancy. In each participating state, a stratified random sample of women with a recent live birth is selected from birth certificate files, and women are surveyed 2–6 months postpartum using a standardized protocol and questionnaire. PRAMS data for each site are weighted for sampling design, nonresponse, and noncoverage to produce a data set representative of the state's birth population. PRAMS sites were included in this report if their weighted response rate was ≥65% for years 2009–2011, ≥60% for 2012–2014, and ≥55% for 2015.

PRAMS sites included the question, "In which position do you most often lay your baby down to sleep now?" (check one answer): "on side; on back; on stomach." Respondents who selected "on side" or "on stomach" were classified as placing their infant in a nonsupine sleep position.* Analyses on nonsupine sleep positioning were conducted using 2015 data from 32 PRAMS states† and New York City. To explore trends in nonsupine sleep position, CDC analyzed PRAMS data from 2009–2015 in 15 states.§ Analyses of bed sharing used 2015 data from 14 states¶ that included the optional question on their state-specific PRAMS survey: "How often does your new baby sleep in the same bed with you or anyone else?" Respondents who indicated "always," "often," "sometimes," or "rarely" were classified as having bed shared and were compared with respondents who indicated "never." Bed sharing was also categorized as: "rarely or sometimes," and "often or always." Analyses of soft bedding used 2015 data from 13 states** and New York City that included the following optional question on their state-specific survey: "Listed below are some things that describe how your new baby usually sleeps." Respondents were asked to select "yes" or "no" for the following soft bedding items: "pillows," "thick or plush blankets," "bumper pads," "stuffed toys" and "infant positioner." Respondents who selected "yes" to one or more items were defined as using any soft bedding.

Statistical analysis. The weighted prevalence and 95% confidence intervals of unsafe sleep practices were calculated overall and by state for 2015. Chi-square tests and 95% confidence intervals†† were used to determine differences in unsafe sleep practices by maternal characteristic (i.e., race/ethnicity, age, education level, and participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) program during pregnancy), gestational age at birth (i.e., preterm, <37 weeks' gestation, compared with term, ≥37 weeks' gestation) and any breastfeeding at 8 weeks postpartum. CDC tested for linear trends in nonsupine sleep position overall and by maternal characteristics and state, from 2009 to 2015, using logistic regression. Analyses accounted for the complex survey sampling design of PRAMS.

Results

In 2015, the overall prevalence of nonsupine sleep positioning was 21.6%, ranging from 12.2% in Wisconsin to 33.8% in Louisiana (Table 1). Nonsupine sleep positioning varied by maternal characteristics, and was highest among respondents who were non-Hispanic blacks. Nonsupine sleep

* A small percentage of respondents (<4%) selected more than one sleep position. Respondents selecting multiple positions were classified as placing their infant in a nonsupine sleep position. Denominator includes supine, on stomach, on side only, and combinations of any of the three positions.

† The 32 states include Alabama, Alaska, Arkansas, Colorado, Connecticut, Delaware, Hawaii, Illinois, Iowa, Louisiana, Maryland, Massachusetts, Michigan, Missouri, Nebraska, New Hampshire, New Jersey, New Mexico, New York (excluding New York City), Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

§ The 15 states include Delaware, Hawaii, Illinois, Maryland, Massachusetts, Missouri, Nebraska, New Jersey, Oklahoma, Pennsylvania, Utah, Vermont, Washington, West Virginia, and Wyoming.

¶ The 14 states include Alaska, Connecticut, Delaware, Louisiana, Nebraska, New Jersey, Pennsylvania, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

** The 13 states include Alaska, Illinois, Iowa, Louisiana, Maryland, Michigan, Missouri, New Jersey, New York (excluding New York City), Pennsylvania, Tennessee, West Virginia, and Wyoming.

†† To provide general guidance on the statistical differences, 95% confidence intervals (CIs) for the prevalence were compared across groups, with an emphasis on identifying differences (i.e., nonoverlap of CIs) between categories within the selected variables. This typically conservative approach might fail to note differences between estimates more often than formal statistical testing. Overlap between confidence intervals does not necessarily mean there is no statistical difference between estimates.

positioning prevalence was higher among respondents aged <25 years compared with ≥25 years and those who had completed ≤12 years compared with >12 years of education, and who were WIC participants. Among the 15 states examined during 2009–2015, nonsupine sleep positioning decreased significantly from 27.2% in 2009 to 19.4% in 2015 overall (p<0.001) (Supplementary Table https://stacks.cdc.gov/view/cdc/50001) and in 13 of 15 states (except for Maryland and Washington). Nonsupine sleep positioning decreased significantly among all age, education, WIC participation and most race/ethnicity groups except among respondents who were American Indians/Alaska Natives (Figure).[§§]

[§§] Alaska Native information available for Alaska only.

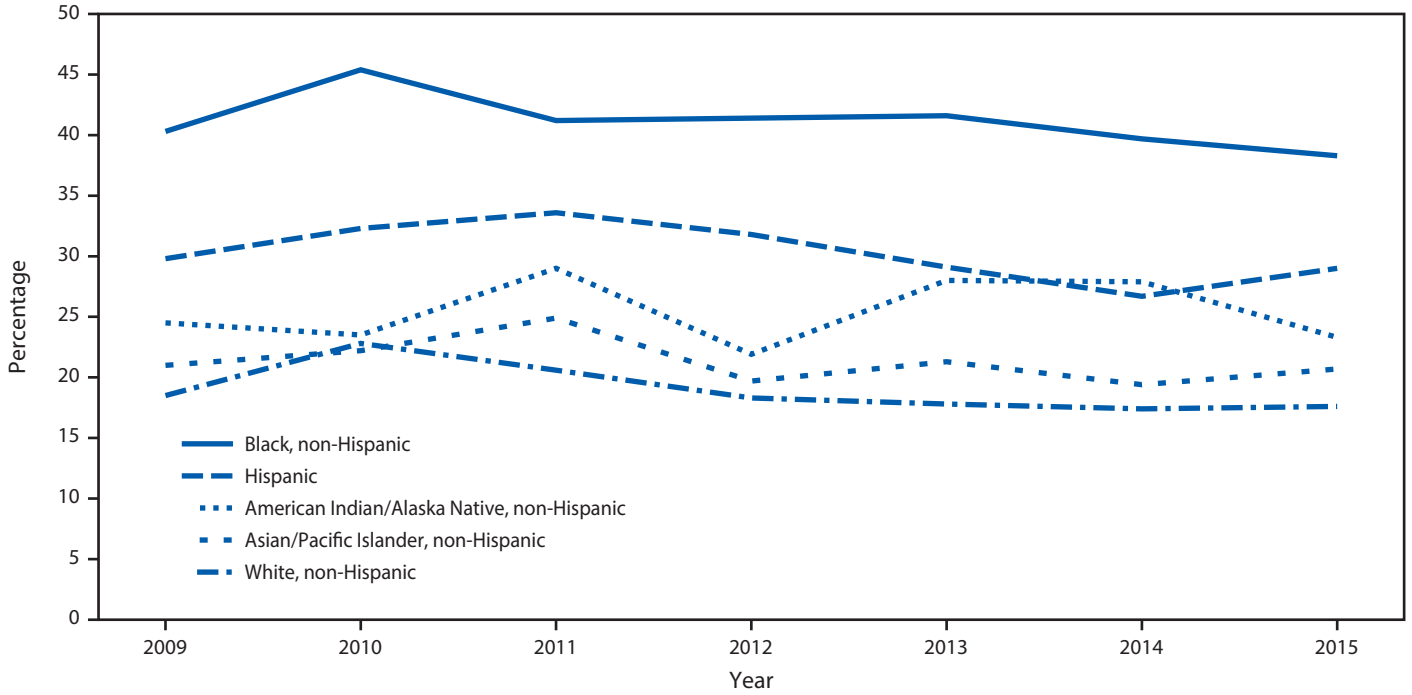
In 2015, more than half (61.4%) of respondents reported any bed sharing with their infant, with 37.0% reporting "rarely or sometimes" and 24.4% responding "often or always" bed sharing (Table 2). Self-report of any bed sharing varied by state, ranging from 49.0% in West Virginia to 78.9% in Alaska. The prevalence of bed sharing varied by maternal characteristics, gestational age at birth, and breastfeeding at 8 weeks postpartum. Bed sharing prevalence was higher among respondents who were American Indians/Alaska Natives, non-Hispanic blacks, or Asians/Pacific Islanders compared with non-Hispanic whites or Hispanics, aged <25 years compared with ≥25 years, who had completed ≤12 years compared with >12 years of education, who were WIC participants, and who reported any breastfeeding at 8 weeks postpartum (Table 2).

TABLE 1. Prevalence of nonsupine (on side or stomach) sleep positioning, by maternal characteristics, gestational age at birth, and breastfeeding at 8 weeks postpartum — Pregnancy Risk Assessment Monitoring System, 32 states and New York City, 2015

Characteristic	Nonsupine sleep positioning % (95% CI)*	Chi-square p-value
Total	**21.6 (20.9–22.4)**	—
Maternal race/ethnicity		<0.001
White, non-Hispanic	16.1 (15.3–16.9)	
Black, non-Hispanic	37.6 (35.8–39.3)	
Hispanic	26.5 (24.3–28.9)	
Asian or Pacific Islander, non-Hispanic	20.8 (18.2–23.6)	
American Indian or Alaska Native, non-Hispanic	19.8 (13.8–27.6)	
Maternal age group (yrs)		<0.001
<20	29.9 (26.4–33.5)	
20–24	27.9 (26.0–29.8)	
25–34	19.4 (18.6–20.3)	
≥35	18.5 (16.8–20.3)	
Maternal education (yrs)		<0.001
<12	27.9 (25.5–30.5)	
12	26.0 (24.3–27.7)	
>12	18.4 (17.6–19.2)	
WIC participation during pregnancy		<0.001
No	16.7 (15.9–17.6)	
Yes	28.0 (26.7–29.3)	
Infant gestation (wks)		0.240
Term (≥37)	21.5 (20.7–22.3)	
Preterm (<37)	22.9 (20.8–25.2)	
Any breastfeeding at 8 wks		<0.001
No	24.0 (22.7–25.4)	
Yes	20.4 (19.5–21.3)	
State/City		<0.001
Alabama	28.7 (25.7–32.0)	
Alaska	23.0 (20.1–26.2)	
Arkansas	29.3 (25.3–33.6)	
Colorado	12.3 (10.3–14.6)	
Connecticut	22.7 (19.7–26.1)	
Delaware	18.7 (16.1–21.5)	
Hawaii	18.5 (15.8–21.5)	
Illinois	19.1 (17.0–21.4)	
Iowa	14.2 (11.5–17.5)	
Louisiana	33.8 (30.9–36.8)	
Maryland	25.4 (22.7–28.3)	
Massachusetts	14.2 (12.1–16.5)	
Michigan	18.6 (16.3–21.1)	
Missouri	20.6 (17.9–23.5)	
Nebraska	15.9 (13.8–18.2)	
New Hampshire	13.1 (10.1–16.7)	
New Jersey	29.5 (26.8–32.3)	
New Mexico	21.7 (19.5–24.0)	
New York City	31.1 (28.6–33.8)	
New York (outside of New York City)	20.9 (17.6–24.6)	
Ohio	14.5 (12.1–17.3)	
Oklahoma	18.8 (16.0–21.9)	
Oregon	17.9 (15.1–21.2)	
Pennsylvania	16.0 (13.6–18.7)	
Tennessee	17.0 (14.1–20.4)	
Texas	28.8 (25.7–32.0)	
Utah	16.4 (14.1–18.9)	
Vermont	15.3 (13.0–18.0)	
Virginia	22.0 (18.2–26.2)	
Washington	17.5 (15.1–20.2)	
West Virginia	16.3 (13.7–19.3)	
Wisconsin	12.2 (9.8–15.1)	
Wyoming	12.5 (9.6–16.2)	

Abbreviations: CI = confidence interval; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
* Weighted percentage.

FIGURE. Trends in prevalence of nonsupine (on side or stomach) sleep positioning of infants, by mother's race/ethnicity — 15 states,* Pregnancy Risk Assessment Monitoring System, 2009–2015



* Delaware, Hawaii, Illinois, Maryland, Massachusetts, Missouri, Nebraska, New Jersey, Oklahoma, Pennsylvania, Utah, Vermont, Washington, West Virginia, and Wyoming.

Key Points

- Infant safe sleep practices recommended by the American Academy of Pediatrics (AAP), including placing infants to sleep on their backs, room sharing but not bed sharing, and keeping soft objects and loose bedding out of the infant's sleep environment, can help reduce sleep-related infant deaths; however, implementation of these recommendations remains suboptimal.
- Approximately one in five mothers reported placing their infant to sleep on their side or stomach. More than one half reported bed sharing with their infant, and more than one third reported using soft bedding in the infant's sleep environment. Unsafe sleep practices varied by state, race/ethnicity, age, education, and participation in the Special Supplemental Nutrition Program for Women, Infants, and Children.
- Health care providers and state-based and community-based programs can identify barriers to safe sleep practices and provide culturally appropriate counseling and messaging to improve infant safe sleep practices.
- Additional information is available at https://www.cdc.gov/vitalsigns/.

Use of at least one type of soft bedding was reported by 38.5% of respondents, ranging from 28.7% in Illinois to 52.6% in New York City (Table 3). The most frequently reported types of soft bedding were bumper pads (19.1%) and plush or thick blankets (17.5%), followed by pillows (7.1%), infant positioners (6.2%), and stuffed toys (3.1%). Use of at least one type of soft bedding varied by maternal characteristics and breastfeeding at 8 weeks postpartum. The prevalence of soft bedding use was higher among respondents who were Asians/Pacific Islanders or Hispanics compared with members of other race/ethnicity groups, aged <25 years compared with ≥25 years, who had completed ≤12 compared with >12 years of education, who were WIC participants, and who were not breastfeeding at 8 weeks postpartum (Table 3).

Conclusions and Comment

Among all mothers responding, 21.6% reported placing their infant to sleep in a nonsupine position, 61.4% shared their bed with their infant, and 38.5% reported using soft bedding. The noted variation observed in nonsupine sleep positioning by maternal characteristics is similar to several disparities observed in sleep-related death rates (*2,3*). Sleep-related infant deaths have been consistently highest among American Indian or Alaska Native followed by non-Hispanic black mothers (*2*) and those who are aged <20 years and have

TABLE 2. Prevalence of bed sharing, by maternal characteristics, gestational age at birth, and breastfeeding at 8 weeks postpartum — Pregnancy Risk Assessment Monitoring System, 14 states, 2015

Characteristic	Any* % (95% CI)†	Rarely or sometimes % (95% CI)†	Often or always % (95% CI)†	Never % (95% CI)†	Chi–square p–value, Never versus Any
Total	**61.4 (59.9–62.8)**	**37.0 (35.6–38.5)**	**24.4 (23.1–25.7)**	**38.6 (37.2–40.1)**	—
Maternal race/ethnicity					<0.001
White, non-Hispanic	52.7 (50.9–54.4)	35.2 (33.5–37.0)	17.5 (16.1–18.9)	47.3 (45.6–49.1)	
Black, non-Hispanic	76.5 (74.2–78.7)	41.2 (38.5–43.9)	35.3 (32.7–38.0)	23.5 (21.3–25.8)	
Hispanic	66.7 (62.9–70.3)	38.0 (34.3–41.9)	28.7 (25.2–32.4)	33.3 (29.7–37.1)	
Asian or Pacific Islander, non-Hispanic	76.8 (72.0–80.9)	39.8 (34.7–45.2)	37.0 (31.8–42.4)	23.2 (19.1–28.0)	
American Indian or Alaska Native, non-Hispanic	83.9 (75.3–89.9)	27.8 (20.1–37.0)	56.1 (44.3–67.3)	16.1 (10.1–24.7)	
Maternal age group (yrs)					<0.001
<20	76.8 (71.1–81.7)	40.5 (34.3–47.2)	36.3 (30.0–43.1)	23.2 (18.3–28.9)	
20–24	68.5 (65.2–71.7)	40.5 (37.1–44.0)	28.0 (24.9–31.3)	31.5 (28.3–34.8)	
25–34	58.1 (56.3–59.9)	36.3 (34.5–38.2)	21.8 (20.3–23.4)	41.9 (40.1–43.7)	
≥35	57.1 (53.6–60.6)	33.5 (30.3–36.9)	23.6 (20.5–27.0)	42.9 (39.4–46.4)	
Maternal education level (yrs)					0.001
<12	65.2 (60.7–69.4)	34.4 (30.2–38.9)	30.8 (26.5–35.5)	34.8 (30.6–39.3)	
12	64.6 (61.5–67.5)	39.9 (36.8–42.9)	24.7 (22.1–27.6)	35.4 (32.5–38.5)	
>12	58.8 (57.1–60.5)	36.3 (34.6–38.0)	22.5 (21.1–24.0)	41.2 (39.5–42.9)	
WIC participation during pregnancy					<0.001
No	57.5 (55.7–59.3)	35.4 (33.7–37.2)	22.1 (20.5–23.7)	42.5 (40.7–44.3)	
Yes	66.2 (63.9–68.5)	39.0 (36.6–41.4)	27.2 (25.1–29.5)	33.8 (31.5–36.1)	
Infant gestation (wks)					0.023
Term (≥37)	61.8 (60.3–63.3)	37.0 (35.5–38.5)	24.8 (23.4–26.2)	38.2 (36.7–39.7)	
Preterm (<37)	56.4 (52.1–60.7)	37.5 (33.3–41.9)	18.9 (15.9–22.3)	43.6 (39.3–47.9)	
Any breastfeeding at 8 wks					<0.001
No	56.9 (54.3–59.4)	36.6 (34.0–39.1)	20.3 (18.3–22.5)	43.1 (40.6–45.7)	
Yes	63.8 (62.1–65.5)	37.4 (35.6–39.1)	26.4 (24.8–28.1)	36.2 (34.5–37.9)	
State					<0.001
Alaska	78.9 (75.7–81.7)	33.0 (29.7–36.4)	45.9 (42.4–49.4)	21.1 (18.3–24.3)	
Connecticut	52.9 (48.9–56.9)	33.8 (30.2–37.6)	19.1 (16.3–22.3)	47.1 (43.1–51.1)	
Delaware	52.8 (49.5–56.2)	34.4 (31.3–37.7)	18.4 (15.9–21.1)	47.2 (43.8–50.5)	
Louisiana	63.6 (60.5–66.7)	35.5 (32.5–38.7)	28.1 (25.4–31.0)	36.4 (33.3–39.5)	
Nebraska	54.4 (51.2–57.6)	35.2 (32.2–38.4)	19.2 (16.9–21.7)	45.6 (42.4–48.8)	
New Jersey	57.7 (54.6–60.8)	37.9 (34.9–41.1)	19.8 (17.5–22.3)	42.3 (39.2–45.4)	
Pennsylvania	50.9 (47.4–54.3)	37.4 (34.1–40.7)	13.5 (11.3–16.1)	49.1 (45.7–52.6)	
Tennessee	58.3 (54.0–62.4)	37.2 (33.2–41.4)	21.1 (17.7–24.8)	41.7 (37.6–46.0)	
Texas	67.0 (63.6–70.1)	36.9 (33.6–40.3)	30.1 (27.0–33.3)	33.0 (29.9–36.4)	
Vermont	63.1 (59.8–66.3)	39.2 (35.9–42.5)	23.9 (21.2–26.9)	36.9 (33.7–40.2)	
Virginia	63.9 (59.2–68.3)	40.6 (35.9–45.3)	23.3 (19.5–27.6)	36.1 (31.7–40.8)	
Washington	68.1 (64.7–71.2)	35.2 (32.0–38.6)	32.9 (29.7–36.1)	31.9 (28.8–35.3)	
West Virginia	49.0 (45.2–52.8)	32.8 (29.3–36.4)	16.2 (13.6–19.3)	51.0 (47.2–54.8)	
Wisconsin	51.8 (47.6–56.0)	38.7 (34.7–42.9)	13.1 (10.6–16.0)	48.2 (44.0–52.4)	

Abbreviations: CI = confidence interval, WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
* "Any" is the sum of "Rarely or sometimes" and "Often or always."
† Weighted percentage.

less education (*3*). Unsafe sleep practices were most commonly reported by younger, less educated, and racial/ethnic minority mothers, suggesting priority groups that might need to be reached with clear, culturally appropriate messages.

While most states and subpopulations observed a significant decline over time in nonsupine sleep positioning, these findings highlight the need to implement and evaluate interventions to continue improving safe sleep practices. Evidence-based approaches to increase use of safe sleep practices include developing health messages and educational tools for caregivers and educating health and child care professionals on safe sleep practices (*11*,*12*). For example, a recent randomized controlled trial among postpartum mothers found a 60-day mobile health program significantly improved uptake of safe sleep practices. The mobile health program included sending frequent emails or text messages with short videos related to infant safe sleep practices (*13*). Other strategies include removing known barriers to safe sleep practices (e.g., providing free or reduced cost cribs for families), identifying and addressing cultural and social practices that are unsafe (e.g., by holding safe-sleep baby showers), and implementing legislative and regulatory supports

TABLE 3. Prevalence of soft bedding* use, by maternal characteristics, gestational age at birth, and breastfeeding at 8 weeks postpartum — Pregnancy Risk Assessment Monitoring System, 13 states and New York City, 2015

Characteristic	Pillows % (95% CI)†	Blankets % (95% CI)†	Bumper pads % (95% CI)†	Toys % (95% CI)†	Positioner % (95% CI)†	Any soft bedding* % (95% CI)†	Chi-square p-value
Total	**7.1 (6.6–7.6)**	**17.5 (16.8–18.3)**	**19.1 (18.3–19.9)**	**3.1 (2.8–3.5)**	**6.2 (5.7–6.7)**	**38.5 (37.5–39.5)**	—
Maternal race/ethnicity							<0.001
White, non-Hispanic	4.3 (3.8–4.9)	14.7 (13.7–15.7)	16.4 (15.4–17.5)	2.5 (2.1–3.0)	5.7 (5.1–6.4)	32.9 (31.6–34.2)	
Black, non-Hispanic	9.9 (8.6–11.5)	22.0 (20.1–24.1)	14.9 (13.2–16.7)	3.8 (2.9–4.9)	7.4 (6.2–8.7)	40.5 (38.2–42.8)	
Hispanic	9.1 (7.7–10.7)	19.3 (17.3–21.4)	35.1 (32.6–37.8)	3.0 (2.2–4.0)	6.2 (5.1–7.5)	52.9 (50.2–55.5)	
Asian or Pacific Islander, non-Hispanic	21.1 (18.0–24.7)	31.1 (27.4–35.0)	18.2 (15.2–21.6)	7.3 (5.4–9.8)	9.5 (7.2–12.4)	54.7 (50.6–58.7)	
American Indian or Alaska Native, non-Hispanic	12.4 (7.3–20.5)	15.1 (9.5–23.0)	12.8 (6.6–23.4)	2.2 (1.3–3.6)	2.8 (1.8–4.5)	35.9 (26.4–46.6)	
Maternal age group (yrs)							<0.001
<20	10.9 (8.3–14.1)	27.7 (23.6–32.2)	22.8 (19.0–27.1)	6.4 (4.4–9.2)	7.3 (5.2–10.2)	49.2 (44.6–53.9)	
20–24	9.4 (8.1–10.8)	24.1 (22.1–26.3)	22.0 (20.0–24.1)	4.4 (3.5–5.6)	6.1 (5.1–7.2)	45.9 (43.5–48.2)	
25–34	6.2 (5.6–6.9)	15.3 (14.3–16.2)	18.0 (17.0–19.0)	2.5 (2.1–3.0)	6.1 (5.5–6.8)	35.9 (34.6–37.2)	
≥35	6.1 (5.1–7.4)	14.4 (12.8–16.2)	18.3 (16.5–20.3)	2.4 (1.8–3.3)	6.6 (5.5–7.9)	35.5 (33.2–37.9)	
Maternal education level (yrs)							<0.001
<12	12.6 (10.8–14.6)	22.1 (19.7–24.6)	27.9 (25.2–30.7)	4.9 (3.8–6.4)	8.8 (7.3–10.6)	51.0 (48.0–53.9)	
12	8.6 (7.6–9.9)	23.0 (21.2–24.9)	23.3 (21.5–25.2)	3.6 (2.8–4.4)	6.9 (5.9–8.0)	46.9 (44.7–49.1)	
>12	5.4 (4.8–6.0)	14.6 (13.7–15.5)	15.7 (14.8–16.6)	2.6 (2.2–3.0)	5.5 (4.9–6.1)	32.9 (31.7–34.1)	
WIC participation during pregnancy							<0.001
No	4.8 (4.3–5.4)	13.4 (12.5–14.4)	15.6 (14.6–16.6)	2.4 (2.0–2.9)	5.6 (5.0–6.2)	31.7 (30.5–33.0)	
Yes	10.0 (9.1–10.9)	22.7 (21.4–24.0)	23.4 (22.0–24.8)	3.9 (3.3–4.6)	7.1 (6.4–8.0)	47.0 (45.5–48.6)	
Infant gestation (wks)							0.410
Term (≥37)	7.0 (6.5–7.6)	17.5 (16.7–18.4)	19.3 (18.4–20.2)	3.2 (2.8–3.6)	6.1 (5.6–6.7)	38.6 (37.6–39.7)	
Preterm (<37)	8.0 (6.6–9.7)	17.8 (15.8–20.1)	16.8 (14.8–19.0)	2.4 (1.6–3.5)	7.5 (6.2–9.1)	37.4 (34.8–40.1)	
Any breastfeeding at 8 wks							<0.001
No	7.9 (7.0–8.8)	19.8 (18.4–21.2)	22.1 (20.7–23.6)	4.0 (3.4–4.8)	7.4 (6.5–8.3)	42.7 (41.0–44.4)	
Yes	6.6 (6.0–7.3)	16.1 (15.1–17.0)	17.2 (16.3–18.2)	2.6 (2.2–3.0)	5.4 (4.9–6.0)	35.8 (34.6–37.0)	
State/City§							<0.001
Alaska	13.0 (10.8–15.6)	18.4 (15.8–21.3)	14.4 (12.0–17.2)	2.6 (1.7–3.8)	5.6 (4.1–7.6)	40.6 (37.2–44.2)	
Illinois	5.9 (4.7–7.4)	12.2 (10.4–14.1)	15.6 (13.7–17.8)	1.7 (1.1–2.6)	3.8 (2.9–5.0)	28.7 (26.2–31.3)	
Iowa	5.7 (3.9–8.2)	14.1 (11.1–17.8)	12.4 (9.7–15.7)	1.0 (0.4–2.6)	4.4 (2.9–6.5)	29.0 (25.0–33.3)	
Louisiana	11.6 (9.7–13.8)	16.7 (14.5–19.3)	18.3 (15.9–21.0)	2.9 (2.0–4.1)	11.7 (9.9–13.9)	41.3 (38.2–44.6)	
Maryland	6.1 (4.7–7.9)	19.2 (16.8–21.9)	12.1 (10.1–14.4)	3.5 (2.4–4.9)	6.4 (5.0–8.2)	35.7 (32.7–38.9)	
Michigan	5.4 (4.1–7.2)	13.2 (11.1–15.6)	12.6 (10.5–15.0)	2.0 (1.3–3.2)	4.7 (3.4–6.4)	29.5 (26.6–32.6)	
Missouri	7.3 (5.7–9.3)	19.6 (17.0–22.5)	17.1 (14.7–19.9)	3.0 (2.0–4.5)	5.7 (4.3–7.6)	37.9 (34.7–41.3)	
New Jersey	9.0 (7.4–10.8)	25.2 (22.5–28.0)	28.2 (25.5–31.1)	4.8 (3.7–6.2)	6.0 (4.7–7.6)	51.8 (48.7–54.9)	
New York (outside of New York City)	5.3 (3.7–7.6)	15.7 (12.8–19.1)	20.2 (16.9–23.9)	2.8 (1.7–4.7)	7.1 (5.2–9.6)	38.2 (34.2–42.5)	
New York City	11.4 (9.7–13.3)	24.5 (22.1–27.0)	27.8 (25.3–30.5)	5.2 (4.0–6.7)	7.0 (5.7–8.6)	52.6 (49.7–55.4)	
Pennsylvania	4.8 (3.5–6.5)	15.5 (13.2–18.2)	19.7 (17.0–22.7)	3.8 (2.6–5.4)	5.8 (4.3–7.6)	36.7 (33.4–40.1)	
Tennessee	6.5 (4.7–9.1)	19.7 (16.5–23.4)	20.2 (16.9–23.8)	2.4 (1.4–4.1)	7.9 (5.9–10.6)	41.4 (37.3–45.7)	
West Virginia	6.2 (4.6–8.4)	16.0 (13.4–19.0)	22.2 (19.2–25.6)	3.5 (2.3–5.2)	7.8 (6.0–10.1)	41.5 (37.8–45.3)	
Wyoming	6.8 (4.6–9.9)	20.6 (16.8–25.0)	20.4 (16.6–24.8)	3.4 (2.0–5.9)	8.9 (6.4–12.3)	41.1 (36.2–46.1)	

Abbreviations: CI = confidence interval, WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
* Soft bedding defined as infant being placed to sleep with any of the following items: pillow, thick or plush blanket, bumper pads, stuffed toys, or an infant positioner.
† Weighted percentage.

(e.g., requiring SIDS risk reduction training for licensed child care providers) (*11*).

States and health care providers can play an important role in promoting implementation of AAP safe sleep recommendations in a variety of settings. In the Study of Attitudes and Factors Effecting Infant Care, 55% of caregivers reported receiving appropriate advice, 25% received incorrect advice and 20% received no advice on safe sleep practices from health care providers. Caregivers who received appropriate advice were significantly less likely to place their infants to sleep in a nonsupine position than were those who received inappropriate or no advice on safe sleep practices (*7*). In recent years, state public health agencies have worked with partners to implement a variety of efforts to promote safe sleep, including communication campaigns, messaging delivered during WIC program visits and home-visiting programs, policies in facilities and clinics, and hospital-based quality improvement initiatives and collaboratives.¶¶ States aiming to improve safe sleep practices can examine successful interventions that have been

¶¶ https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pqc.htm.

implemented in other states. For example, the Massachusetts Perinatal-Neonatal Quality Improvement Network implemented a safe sleep initiative in neonatal intensive care units that improved safe sleep practices by modeling safe practices for parents of medically stable premature infants in advance of infant discharge (*14*).*** The Tennessee Department of Health demonstrated that having a hospital policy to correctly model safe sleep practices reduced the percentage of infants placed to sleep in an unsafe environment (e.g., not on their back) while in the hospital by nearly half (*15*). Finally, state participation in national initiatives, such as the National Action Partnership to Promote Safe Sleep Improvement and Innovation Network††† and Collaborative Improvement and Innovation Network to reduce infant mortality,§§§ can help facilitate and monitor the use of evidence-based strategies related to safe sleep according to standardized metrics of success.

Continued surveillance of infant sleep practices in the United States is necessary to monitor whether the prevalence of safe sleep practices is improving, especially among populations where sleep-related infant mortality is disproportionately high. The state-specific estimates derived from PRAMS can complement other data sources used to assess initiatives to reduce sleep-related infant deaths. Of note, CDC also supports 16 states and two jurisdictions through its Sudden Unexpected Infant Death (SUID)¶¶¶ Case Registry to monitor sleep-related deaths and related circumstances, including the sleep environment. This surveillance effort, which captures 30% of all SUID cases in the United States, focuses on improving data quality and completeness of SUID investigations to inform strategies to reduce sleep-related deaths (*16*).****

The findings in this report are subject to at least three limitations. First, results are limited to states that implemented PRAMS, met the required response rate threshold for inclusion in data analysis, and included questions regarding safe sleep practices on their state-specific PRAMS survey. Second, AAP recommends placing the infant to sleep in the supine position every time; however, the PRAMS survey only asked respondents the sleep position their infant was placed most often. Also, prior to 2016, PRAMS collected data on the unsafe practice of bed sharing, but not on the AAP-recommended practice of room sharing. Finally, PRAMS data are self-reported and might be subject to both recall and social desirability biases.

Despite recommendations from AAP regarding safe sleep practices for infants, this report demonstrates that placement of infants in a nonsupine sleep position, bed sharing with infants, and use of soft bedding are commonly reported by mothers. Evidence-based interventions that encourage infant safe sleep practices by caregivers, particularly within populations where unsafe infant sleep practices are higher, could help reduce sleep-related infant mortality.

*** http://www.mapnqin.org/neonatal-projects/.

††† http://www.nichq.org/project/national-action-partnership-promote-safe-sleep-improvement-and-innovation-network-nappss.

§§§ https://mchb.hrsa.gov/maternal-child-health-initiatives/collaborative-improvement-innovation-networks-coiins.

¶¶¶ Sudden unexpected infant death (SUID) is the death of an infant aged <1 year that occurs suddenly and unexpectedly, and whose cause of death is not immediately obvious before investigation.

**** https://www.cdc.gov/sids/CaseRegistry.htm.

[1]Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [2]Oak Ridge Institute for Science and Education Fellowship.

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Conflict of Interest

No conflicts of interest were reported.

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Notice to Readers

New Web Location for Weekly and Annual NNDSS Data

To improve the usability, availability, quality, and timeliness of surveillance data as part of the CDC Surveillance Strategy (*1*), CDC now provides users a convenient way to access notifiable infectious and noninfectious disease data through the National Notifiable Diseases Surveillance System (NNDSS) website.

CDC has redesigned the data and statistics section of the NNDSS website to be a one-stop shop where users can find both detailed information about the notifiable disease data and links to the weekly and annual data. Although these data are no longer published in *MMWR*, users can easily access the information on the NNDSS website. To ease the transition, *MMWR* also links users from its website to the new location on the NNDSS website.

Weekly Reporting

Starting this week, CDC transitions the reporting of NNDSS weekly data to the redesigned NNDSS Data and Statistics webpage https://wwwn.cdc.gov/nndss/data-and-statistics.html. This site contains links to infectious disease data tables that are available in HTML, text, and PDF formats and hosted on the CDC WONDER platform. Figure 1, which was previously published in the *MMWR* weekly report, is also available. In addition, the webpage provides NNDSS documentation, including how the data are collected and reported, publication criteria, notes about interpreting data, and the list of notifiable conditions by year.

Annual Reporting

CDC transitioned the reporting of NNDSS annual data on November 3, 2017. This information is available on the NNDSS Data and Statistics webpage at https://wwwn.cdc.gov/nndss/data-and-statistics.html and includes links to infectious disease data tables that are available in HTML, text, and PDF formats and hosted on the CDC WONDER platform. The webpage also provides links to noninfectious conditions and disease outbreak surveillance reports published by CDC programs and hosted on the CDC WONDER platform. In addition, the webpage provides the following resources: documentation for NNDSS infectious diseases and noninfectious conditions and disease outbreaks, including how the data are collected, reported, and finalized; publication criteria; notes about interpreting data; and the list of notifiable conditions by year.

Consolidating the notifiable disease data on the NNDSS website is part of the NNDSS Modernization Initiative (NMI) strategy to streamline NNDSS and access to data for users; NMI is a component of the CDC Surveillance Strategy. This consolidation of information reflects the recommendations of a CDC-wide workgroup, consisting of representatives from the CDC Excellence in Science Committee, the Surveillance Science Advisory Group, and *MMWR*, to make more data available online and to allow *MMWR* to focus on publishing scientific and actionable surveillance reports.

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Notice to Readers

Online Manuscript Submission System Now Available for *MMWR* Serial Publications

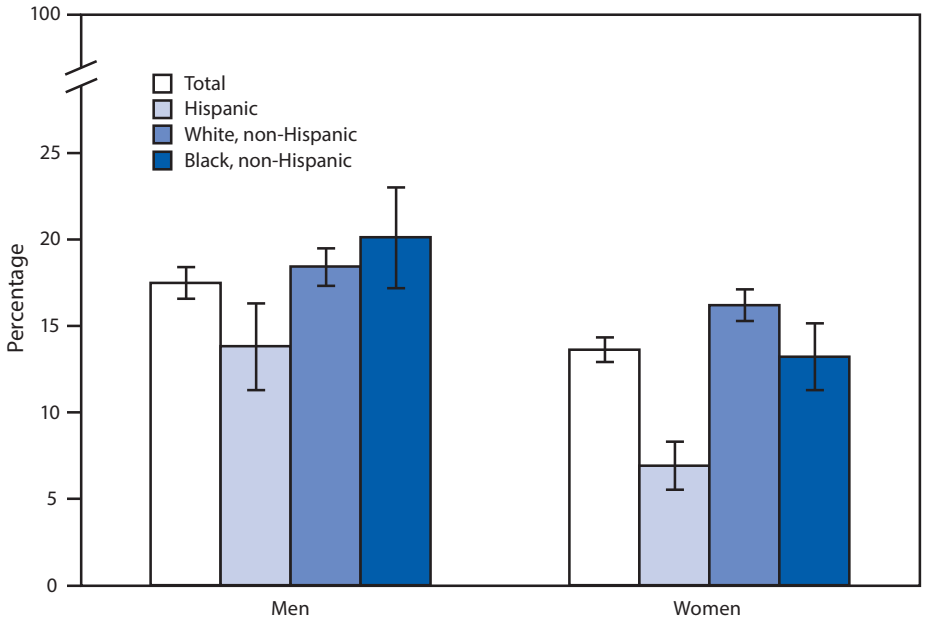
The *MMWR* Serial Publications are now using ScholarOne Manuscripts, an online system for manuscript submissions. This system provides comprehensive workflow management and streamlines the submission process for *Recommendations and Reports*, *Surveillance Summaries*, and *Supplements*.

ScholarOne Manuscripts allows manuscripts to be transmitted electronically and makes manuscript files accessible to editors through the submission site. All manuscripts for the Serial Publications must be submitted through ScholarOne Manuscripts at https://mc.manuscriptcentral.com/mmwr-sp. Additional information on how to submit through ScholarOne Manuscripts is available at https://www.cdc.gov/mmwr/serial_submissions.html.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Percentages* of Current Smokers† Among Adults Aged ≥18 Years, by Sex, Race, and Hispanic Origin§ — National Health Interview Survey, 2016¶



* With 95% confidence intervals indicated with error bars.
† Based on two survey questions: All respondents were first asked, "Have you smoked at least 100 cigarettes in your entire life?" Respondents answering "yes" were then asked, "Do you now smoke cigarettes every day, some days, or not at all?" Current smokers have smoked at least 100 cigarettes in their lifetime and still currently smoke either every day or on some days.
§ Categories shown are for Hispanic adults, who may be of any race or combination of races, and non-Hispanic adults who selected one racial group. Not all race groups are shown. Total bars are based on all adults aged ≥18 years.
¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population, are shown for sample adults aged ≥18 years, and are age-adjusted using the projected 2000 U.S. population as the standard population and using four age groups: 18–44, 45–64, 65–74, and ≥75 years.

In 2016, men aged ≥18 years were more likely to be current smokers than women (17.5% compared with 13.6%). Non-Hispanic black men (20.1%) and non-Hispanic white men (18.4%) were more likely to be current smokers than Hispanic men (13.8%). Non-Hispanic white women (16.2%) were more likely to be current smokers than non-Hispanic black women (13.2%) and Hispanic women (6.9%).

Source: National Health Interview Survey, 2016. https://www.cdc.gov/nchs/nhis/index.htm.

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