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Smokeless Tobacco Use Among Working Adults — United States, 2005 and 2010

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Smokeless tobacco causes cancers of the oral cavity, esophagus, and pancreas (*1*). CDC analyzed National Health Interview Survey (NHIS) data to estimate the proportion of U.S. working adults who used smokeless tobacco in 2005 and 2010, by industry and occupation. This report describes the results of that analysis, which showed no statistically significant change in the prevalence of smokeless tobacco use among workers from 2005 (2.7%) to 2010 (3.0%). In 2010, smokeless tobacco use was highest among adults aged 25–44 years (3.9%), males (5.6%), non-Hispanic whites (4.0%), those with no more than a high school education (3.9%), and those living in the South (3.9%). By industry, the prevalence of smokeless tobacco use ranged from 1.5% in education services to 18.8% in mining industries, and by occupation from 1.3% in office and administrative support to 10.8% in construction and extraction. These findings highlight opportunities for reducing the health and economic burdens of tobacco use among U.S. workers, especially those in certain industries (e.g., mining) and occupations (e.g., construction and extraction) where use of smokeless tobacco is especially common. CDC recommends best practices for comprehensive tobacco control programs, including effective employer interventions, such as providing employee health insurance coverage for proven cessation treatments, offering easily accessible help for those who want to quit, and establishing and enforcing tobacco-free workplace policies (*2*).

NHIS is an annual, nationally representative, in-person survey of the noninstitutionalized U.S. civilian population. Questions about cigarette smoking are directed to one randomly selected adult in each surveyed family. In 2005 and 2010, data on cigarette smoking were collected from 31,428 and 27,157 persons, respectively. The same participants responded to a supplemental questionnaire that contained questions regarding the use of smokeless tobacco (i.e., chewing tobacco and snuff).* The survey response rates for the adult core and supplemental questionnaire combined were 69.0% in 2005 and 60.8% in 2010.

Survey participants were considered currently working if, when asked about their employment status during the week before their interview, they responded, "working at a job or business," "with a job or business but not at work," or "working, but not for pay, at a family-owned job or business."† Information on participants' current industry and occupation was coded by trained coders and grouped into 21 industry groups and 23 occupation groups.§ Current cigarette smokers

* Additional information available at http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm.

† A total of 19,445 and 15,649 survey respondents were classified as currently working in 2005 and 2010, respectively.

§ Additional information available at ftp://ftp.cdc.gov/pub/health_statistics/nchs/dataset_documentation/nhis/2005/samadult_layout.pdf, http://www.census.gov/cps/files/occupation%20codes.pdf, and ftp://ftp.cdc.gov/pub/health_statistics/nchs/dataset_documentation/nhis/2008/naics_sectors_and_subsectors08.pdf.

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What is already known on this topic?

Smokeless tobacco use causes cancers of the oral cavity, esophagus, and pancreas. Smokeless tobacco use varies by age, sex, and education. Targeted workplace interventions are effective in reducing tobacco use.

What is added by this report?

Although current cigarette smoking among working adults was significantly lower in 2010 (19.1%) than in 2005 (22.2%), the prevalence of smokeless tobacco use among adult workers in 2010 (3.0%) did not significantly differ from 2005 (2.7%). The 3% prevalence in 2010 is 10 times the *Healthy People 2020* target of ≤0.3% for smokeless tobacco use among all U.S. adults. Smokeless tobacco use varied widely by industry and occupation, reaching 10.8% among construction and extraction workers. Among working adults who currently smoked cigarettes, the proportion who also used smokeless tobacco was 4.1% in 2005 and 4.2% in 2010.

What are the implications for public health practice?

These findings highlight opportunities for reducing the adverse health effects and economic impact of tobacco use among U.S. workers, especially those in certain industries (e.g., mining) and occupations (e.g., construction and extraction) where use of smokeless tobacco is especially common. CDC recommends best practices for comprehensive tobacco control, including effective employer interventions, such as providing employee health insurance coverage for proven cessation treatments, offering easily accessible help for those who want to quit, and establishing and enforcing tobacco-free workplace policies. Additionally, health-care providers can advise all their tobacco-using patients to quit.

were defined as respondents who reported having smoked ≥100 cigarettes during their lifetime and who reported currently smoking every day or some days. Current smokeless tobacco users were defined as respondents who reported having used chewing tobacco or snuff ≥20 times in their lifetime and who reported currently using chewing tobacco or snuff every day or some days. Dual users were defined as persons who were both current cigarette smokers and smokeless tobacco users. Sample weights were used to account for the complex sample design. Estimates with a relative standard error of ≥30% are not reported. Two-tailed t-tests were used to determine statistically significant differences between point estimates.¶

The estimated number of adults aged ≥18 years who were working during the week before the interview was 141 million in 2005 and 139 million in 2010. Current smokeless tobacco use prevalence among working adults did not significantly differ from 2005 (2.7%) to 2010 (3.0%)** ($p=0.87$). The prevalence of smokeless tobacco use among working adults was highest among those aged 18–24 years (3.6%) in 2005 and those aged 25–44 years (3.9%) in 2010, and among males (4.9% and 5.6%, in 2005 and 2010, respectively), non-Hispanic whites (3.5% and

¶ Additional information available at http://www.cdc.gov/nchs/data/series/sr_10/sr10_256.pdf.

** The age-adjusted smokeless tobacco use in 2010 was 2.9%. The estimate was age-adjusted to the 2000 U.S. standard population using the age groups 18–24, 25–34, 35–44, 45–64, and ≥65 years following the *Healthy People 2010* methodology (ftp://ftp.cdc.gov/pub/health_statistics/nchs/datasets/data2010/focusarea27/o2701b.pdf).

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4.0%), those with no more than a high school education (3.6% and 3.9%), and those living in the Midwest (3.8% and 3.3%) or South (3.1% and 3.9%) (Table 1).

Current cigarette smoking prevalence among working adults aged ≥18 years was 22.2% in 2005 and 19.1% in 2010 (p<0.05).[††] Among working adults who currently smoke cigarettes, the proportion who currently used smokeless tobacco (i.e., dual users) was 4.1% in 2005 and 4.2% in 2010 (p=0.55). In 2010, dual use was greatest among the following subgroups of working adult smokers: those aged 18–24 years (6.3%), males (7.3%), non-Hispanic whites (3.9%), those with no more than a high school education (4.5%), those with annual household income ≥$75,000 (4.8%), and those living in the Midwest (5.3%). Among adult workers, the average number of cigarettes smoked per day was significantly higher among dual users (15.5) compared with those who used cigarettes only (12.1) (p<0.05).

Reliable 2010 estimates of smokeless tobacco use were available for workers in 10 industry groups (Table 2). Prevalence of smokeless tobacco use in 2010 was highest among workers in mining (18.8%), wholesale trade (8.9%), and construction (7.9%) industries. Reliable estimates of dual use among smoking workers were available only for construction (10.2%) and manufacturing (7.1%) industries.

[††] Additional information available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6038a2.htm?s_cid=mm6038a2_w.

TABLE 1. Current smokeless tobacco use,* cigarette smoking,[†] and proportion of cigarette smokers who use smokeless tobacco among working adults[§] aged ≥18 years, by selected characteristics — National Health Interview Survey, United States, 2005 and 2010

	2005 (N = 19,445)							2010 (N = 15,649)						
				Current cigarette smoking							Current cigarette smoking			
						Proportion currently using smokeless tobacco							Proportion currently using smokeless tobacco	
	Estimated[¶] working population	Current smokeless tobacco use						Estimated[¶] working population	Current smokeless tobacco use					
Characteristic	(1,000s)	%[¶]	(95% CI)	%[¶]	(95% CI)	%[¶]	(95% CI)	(1,000s)	%[¶]	(95% CI)	%[¶]	(95% CI)	%[¶]	(95% CI)
Overall	**140,701**	**2.7**	**(2.3–3.1)**	**22.2**	**(21.4–22.9)**	**4.1**	**(2.9–5.2)**	**138,951**	**3.0**	**(2.7–3.5)**	**19.1**	**(18.3–19.8)**	**4.2**	**(3.3–5.0)**
Age group (yrs)														
18–24	18,355	3.6	(1.9–5.4)	26.4	(24.0–28.8)	—**	—	17,605	3.8	(2.6–5.3)	20.2	(17.8–22.5)	6.3	(3.0–9.6)
25–44	65,680	3.4	(2.9–3.9)	23.2	(22.2–24.3)	4.5	(3.3–5.6)	61,315	3.9	(3.3–4.7)	20.4	(19.2–21.7)	5.3	(3.9–6.8)
45–64	51,706	1.5	(1.2–1.9)	20.6	(19.5–21.7)	1.5	(0.8–2.3)	53,936	1.8	(1.4–2.3)	18.5	(17.2–19.7)	2.1	(1.1–3.0)
≥65	4,960	—	—	8.3	(6.3–10.3)	—	—	6,094	—	—	9.4	(7.1–11.7)	—	—
Sex														
Men	75,888	4.9	(4.3–5.6)	24.6	(23.5–25.7)	6.8	(4.9–8.7)	73,406	5.6	(4.9–6.3)	20.7	(19.6–21.8)	7.3	(5.8–8.8)
Women	64,813	—	—	19.3	(18.3–20.2)	—	—	65,544	—	—	17.4	(16.3–18.5)	—	—
Race/Ethnicity														
Hispanic	18,796	—	—	17.8	(16.4–19.3)	—	—	73,406	—	—	12.6	(11.2–14.1)	—	—
White, non-Hispanic	100,385	3.5	(3.0–4.0)	23.5	(22.6–24.4)	4.8	(3.3–6.3)	65,544	4.0	(3.5–4.6)	21.2	(20.2–22.2)	3.9	(3.4–4.5)
Black, non-Hispanic	15,146	—	—	19.7	(17.8–21.6)	—	—	73,406	0.9	(0.6–1.6)	18.1	(16.1–20.1)	0.9	(0.4–1.3)
Other	6,374	—	—	18.9	(15.6–22.2)	—	—	65,544	—	—	12.6	(10.2–15.0)	—	—
Education														
≤High school	54,652	3.6	(2.9–4.3)	30.8	(29.5–32.2)	4.7	(2.8–6.6)	47,605	3.9	(3.1–4.6)	28.3	(26.7–29.8)	4.5	(3.2–5.8)
>High school	84,901	2.1	(1.8–2.5)	16.6	(15.8–17.3)	3.3	(2.4–4.3)	90,927	2.6	(2.1–3.0)	14.4	(13.5–15.3)	3.8	(2.6–5.0)
Unknown	1,148	—	—	23.4	(16.0–30.8)	—	—	419	—	—	—	—	—	—
Annual household income														
$0—$34,999	23,127	2.6	(2.0—3.1)	30.6	(29.1–32.0)	3.9	(2.9–5.0)	31,905	2.7	(2.0–3.4)	28.6	(26.8–30.4)	3.8	(2.5–5.1)
$35,000—$74,999	43,279	3.4	(2.7—4.0)	23.7	(22.3–25.1)	4.2	(2.8–5.7)	45,281	3.0	(2.4–3.7)	21.3	(20.0–22.6)	4.2	(2.7–5.7)
≥$75,000	48,932	2.2	(1.7—2.8)	15.2	(14.0–16.5)	2.8	(1.3–4.4)	54,750	3.2	(2.5–3.8)	12.1	(11.1–13.2)	4.8	(2.6–7.0)
Unknown	25,363	2.5	(1.3—3.7)	19.7	(17.9–21.5)	—	—	7,015	—	—	16.9	(13.7–20.1)	—	—
Health insurance														
Not insured	24,662	2.8	(1.6–4.0)	32.9	(30.9–34.9)	—	—	24,151	3.0	(2.2–3.7)	31.4	(29.2–33.6)	4.1	(2.4–5.8)
Insured	115,545	2.7	(2.3–3.0)	19.9	(19.1–20.6)	3.9	(2.9–4.8)	114,221	3.0	(2.6–3.5)	16.6	(15.8–17.3)	4.2	(3.2–5.2)
Unknown	494	—	—	18.3	(6.6–30.0)	—	—	579	—	—	19.2	(3.2–35.2)	—	—
Census region														
Northeast	25,145	1.3	(0.7–2.0)	19.8	(18.0–21.5)	—	—	24,580	1.6	(0.9–2.3)	16.9	(15.0–18.8)	—	—
Midwest	36,465	3.8	(3.1–4.6)	26.0	(24.7–27.4)	4.6	(2.9–6.2)	33,168	3.3	(2.5–4.1)	21.6	(19.9–22.3)	5.3	(3.5–7.1)
South	49,831	3.1	(2.4–3.8)	23.1	(21.7–24.6)	4.7	(2.2–7.3)	48,802	3.9	(3.2–4.7)	21.0	(19.6–22.4)	4.2	(2.9–5.5)
West	29,260	1.7	(1.2–2.2)	17.7	(16.5–18.8)	3.1	(1.7–4.6)	32,401	2.4	(1.6–3.2)	15.6	(14.2–17.1)	3.7	(1.5–5.8)

Abbreviation: CI = confidence interval.
* Reported using chewing tobacco or snuff ≥20 times in their lifetime and currently using chewing tobacco or snuff every day or some days.
[†] Reported having smoked ≥100 cigarettes during their lifetime and currently smoking every day or some days.
[§] Estimated number of adults who were employed during the week before interview.
[¶] Weighted to provide national estimates using the survey sample weights for each participant.
** Estimates with a relative standard error ≥30% are suppressed.

TABLE 2. Current smokeless tobacco use* and current cigarette smoking† among working adults§ aged ≥18 years, by industry — National Health Interview Survey, United States, 2005 and 2010

	2005 (N = 19,445)					2010 (N = 15,649)				
	Estimated¶ working population	Current smokeless tobacco use		Current cigarette smoking		Estimated¶ working population	Current smokeless tobacco use		Current cigarette smoking	
Industry	(1,000s)	%¶	(95% CI)	%¶	(95% CI)	(1,000s)	%¶	(95% CI)	%¶	(95% CI)
Agriculture, forestry, fishing, and hunting	2,187	8.8	(4.6–13.1)	16.6	(11.6–21.7)	2,019	—**	—	18.1	(12.5–23.7)
Mining	432	—	—	33.4	(18.0–48.8)	668	18.8	(7.9–29.7)	27.0	(15.9–38.2)
Utilities	1,298	—	—	20.7	(13.6–27.9)	1,353	—	—	18.2	(11.2–25.2)
Construction	11,245	6.4	(4.0–8.9)	33.4	(30.0–36.8)	9,253	7.9	(6.0–9.9)	29.5	(26.1–32.8)
Manufacturing	15,658	4.8	(3.5–6.0)	24.9	(22.7–27.1)	13,037	4.0	(2.9–5.2)	21.6	(19.2–24.0)
Wholesale trade	4,396	3.4	(1.7–5.1)	24.2	(20.1–28.2)	3,523	8.9	(5.0–12.9)	23.4	(18.3–28.5)
Retail trade	14,495	2.5	(1.6–3.5)	24.6	(22.2–27.1)	15,056	3.4	(1.9–4.9)	22.5	(19.9–25.1)
Transportation and warehousing	5,790	3.5	(1.9–5.1)	27.5	(23.6–31.4)	5,641	3.4	(1.5–5.2)	21.0	(17.4–24.5)
Information	3,199	1.8	(0.3–3.3)	20.8	(16.5–25.1)	3,433	—	—	15.6	(11.6–19.6)
Finance and insurance	6,726	—	—	16.5	(13.7–19.3)	5,970	—	—	14.5	(11.5–17.6)
Real estate and rental and leasing	2,876	—	—	25.8	(19.6–32.0)	2,643	—	—	23.6	(17.8–29.4)
Professional, scientific, and technical services	9,101	1.9	(0.9–2.8)	16.0	(13.8–18.3)	9,447	2.4	(1.2–3.6)	13.0	(10.8–15.2)
Management of companies and enterprises	27	—	—	—	—	84	—	—	—	—
Administrative and support and waste management and remediation services	5,319	3.6	(1.8–5.3)	28.6	(24.6–32.5)	6,037	4.1	(2.0–6.2)	25.1	(21.3–29.0)
Education services	12,880	0.8	(0.4–1.3)	10.6	(9.0–12.2)	13,835	1.5	(0.6–2.3)	8.5	(6.9–10.0)
Health care and social assistance	16,472	—	—	18.6	(16.6–20.6)	18,543	—	—	15.8	(13.9–17.8)
Arts, entertainment, and recreation	2,584	—	—	21.9	(17.0–26.8)	2,872	—	—	20.8	(14.9–26.7)
Accommodation and food services	7,644	—	—	34.0	(30.5–37.6)	9,090	—	—	31.1	(27.6–34.6)
Other services (except public administration)	6,504	—	—	20.3	(17.3–23.3)	7,112	—	—	17.1	(13.9–20.4)
Public administration	6,741	3.0	(1.5–4.6)	18.7	(16.1–21.4)	7,343	3.5	(2.0–5.0)	14.6	(12.1–17.2)
Armed forces††	64	—	—	19.6	—	127	—	—	14.0	(0.0–36.4)
Unknown	5,061	—	—	16.2	(12.9–19.4)	1,864	—	—	13.6	(8.2–18.9)

Abbreviation: CI = confidence interval.
* Reported using chewing tobacco or snuff ≥20 times in their lifetime and currently using chewing tobacco or snuff every day or some days.
† Reported having smoked ≥100 cigarettes during their lifetime and currently smoking every day or some days.
§ Estimated number of adults who were employed during the week before interview.
¶ Weighted to provide national estimates using the survey sample weights for each participant.
** Estimates with a relative standard error ≥30% are suppressed.
†† Includes only civilian employees; active military personnel excluded.

Reliable 2010 estimates of smokeless tobacco use were available for workers in eight occupation groups (Table 3). Prevalence of smokeless tobacco use in 2010 was highest among workers in construction and extraction (10.8%) and installation, maintenance, and repair (9.0%) occupations. No respondents in health-care support occupations reported smokeless tobacco use. Reliable estimates of dual use among smoking workers were available only for construction and extraction (14.5%) and production (5.7%) occupations.

Discussion

In 2010, the prevalence of smokeless tobacco use among working adults (3.0%) exceeded the *Healthy People 2020* target of ≤0.3% for all U.S. adults, as did nearly all demographic and industry and occupation subgroups for which results are presented in this report. Although current cigarette smoking prevalence among working adults was significantly lower in 2010 (19.1%) than in 2005 (22.2%), the prevalence of smokeless tobacco use did not significantly differ from 2005 (2.7%) to 2010 (3.0%). The lack of reduction in smokeless tobacco use might be attributable to the introduction of novel smokeless

TABLE 3. Current smokeless tobacco use* and current cigarette smoking† among working adults§ aged ≥18 years, by occupation — National Health Interview Survey, United States, 2005 and 2010

Occupation	2005 (N = 19,445)					2010 (N = 15,649)				
	Estimated¶ working population (1,000s)	Current smokeless tobacco use		Current cigarette smoking		Estimated¶ working population (1,000s)	Current smokeless tobacco use		Current cigarette smoking	
		%¶	(95% CI)	%¶	(95% CI)		%¶	(95% CI)	%¶	(95% CI)
Management	13,082	2.2	(1.4–3.1)	17.3	(15.3–19.3)	13,434	3.3	(2.2–4.4)	12.7	(10.8–14.6)
Business and financial operations	5,880	—**	—	16.7	(14.1–19.4)	6,375	—	—	13.9	(10.9–16.9)
Computer and mathematical	3,029	—	—	12.8	(9.3–16.3)	4,028	—	—	12.2	(8.7–15.7)
Architecture and engineering	2,527	—	—	14.4	(9.7–19.0)	2,750	—	—	13.1	(8.8–17.5)
Life, physical, and social science	1,570	—	—	10.2	(5.0–15.4)	1,602	—	—	—	—
Community and social services	2,177	—	—	13.1	(8.5–17.6)	2,571	—	—	9.4	(6.0–12.9)
Legal	1,605	—	—	10.6	(6.0–15.3)	1,734	—	—	12.0	(7.0–17.1)
Education, training, and library	8,408	—	—	9.2	(7.5–10.9)	9,287	—	—	8.1	(6.1–10.2)
Arts, design, entertainment, sports, and media	2,546	—	—	17.9	(13.5–22.4)	2,847	—	—	13.3	(9.4–17.3)
Health-care practitioners and technical	6,908	—	—	13.6	(11.4–15.8)	6,876	—	—	10.3	(8.0–12.5)
Health-care support	2,954	—	—	23.5	(19.0–28.0)	3,436	—	—	28.5	(22.7–34.3)
Protective service	2,611	3.9	(1.7–6.1)	19.3	(14.8–23.9)	2,767	4.8	(2.2–7.5)	17.3	(12.5–22.0)
Food preparation and serving related	6,484	—	—	33.1	(29.2–36.9)	7,446	—	—	32.0	(28.0–36.0)
Building and grounds cleaning and maintenance	5,404	3.5	(1.9–5.0)	26.1	(22.2–30.0)	5,365	—	—	22.0	(18.2–25.9)
Personal care and service	3,916	—	—	23.8	(19.9–27.7)	5,001	—	—	16.4	(13.1–19.7)
Sales and related	14,507	1.9	(1.3–2.6)	24.0	(21.6–26.4)	14,277	3.6	(2.1–5.2)	22.0	(19.5–24.5)
Office and administrative support	18,988	1.1	(0.6–1.6)	20.8	(18.9–22.6)	18,102	1.3	(0.6–1.9)	18.4	(16.3–20.4)
Farming, fishing, and forestry	1,077	12.5	(5.3–19.8)	16.0	(9.4–22.7)	867	—	—	17.0	(7.6–26.5)
Construction and extraction	9,158	7.7	(4.6–10.8)	36.3	(32.6–40.0)	7,396	10.8	(8.2–13.4)	29.5	(25.6–33.3)
Installation, maintenance, and repair	4,832	5.1	(3.0–7.2)	29.5	(25.3–33.6)	4,904	9.0	(6.2–11.7)	28.9	(24.1–33.7)
Production	9,547	5.2	(3.2–7.1)	29.9	(27.0–32.7)	8,012	4.6	(2.8–6.4)	27.1	(24.0–30.2)
Transportation and material moving	8,305	4.6	(3.0–6.2)	31.9	(28.4–35.3)	7,789	4.5	(2.8–6.3)	28.7	(25.0–32.5)
Military††	79	—	—	—	—	133	—	—	—	—
Unknown	5,105	—	—	16.6	(13.4–19.8)	1,953	—	—	15.8	(9.9–21.7)

Abbreviation: CI = confidence interval.
* Reported using chewing tobacco or snuff ≥20 times in their lifetime and currently using chewing tobacco or snuff every day or some days.
† Reported having smoked ≥100 cigarettes during their lifetime and currently smoking every day or some days.
§ Estimated number of adults who were employed during the week before interview.
¶ Weighted to provide national estimates using the survey sample weights for each participant.
** Estimates with a relative standard error ≥30% are suppressed. Health-care support occupations was the only category for which no respondents using smokeless tobacco were identified.
†† Includes only civilian employees; active military personnel excluded.

tobacco products into the U.S. marketplace (e.g., snus and dissolvable tobacco), as well as increased expenditures§§ on smokeless tobacco marketing in recent years (*3,4*).

Tobacco industry advertising encourages cigarette smokers to use smokeless tobacco as an alternative in locations where smoking is not permitted (*5,6*). Additionally, research indicates that cigarette smokers might switch to smokeless tobacco for the purposes of harm reduction or smoking cessation (*7*). However, smokeless tobacco is not a safe alternative to combustible tobacco, and no conclusive scientific evidence currently exists showing that switching to smokeless tobacco promotes long-term cigarette smoking cessation (*8*). Because persons who concurrently use smokeless tobacco and cigarettes are less likely to report planning to quit than adults who smoke cigarettes exclusively (*9*), evidence-based interventions to reduce all forms of tobacco use are warranted. High-impact antitobacco media messages, comprehensive smoke-free policies, increased

§§ Additional information available at http://www.ftc.gov/sites/default/files/documents/reports/federal-trade-commission-smokeless-tobacco-report-2011/130521smokelesstobaccoreport.pdf.

tobacco prices, and other interventions that prevent initiation and encourage cessation of tobacco products, in concert with sustained, comprehensive state tobacco control programs funded at CDC-recommended levels, are critical to decreasing tobacco use and reducing the health burden and economic impact of tobacco-related diseases in the United States (*2*).

The findings in this report are subject to at least four limitations. First, because tobacco use information was self-reported and was not validated by biochemical tests, the extent of underreporting or overreporting of tobacco use could not be determined. Self-reported current cigarette smoking status has been shown to have a high validity (*10*), but the validity of self-reported smokeless tobacco use has not been established. Second, limited sample size prevented the presentation of reliable estimates for some subpopulations. Third, the NHIS response rates of 69.0% and 60.8% might have resulted in nonresponse bias. Finally, the prevalence of smokeless tobacco use might be underestimated because certain smokeless tobacco products (e.g., snus) were not included in the NHIS questionnaire.

Health professionals can play an important role[¶¶] in assessing smokeless tobacco use and advising users to quit. Results from this report identify industry and occupation groups with high prevalence of smokeless tobacco use where evidence-based cessation interventions could be effective in reducing tobacco use. Employers can help reduce tobacco use among employees by making their workplaces tobacco-free,[***] providing employees with information on the health risks of tobacco use and the benefits of quitting, and sponsoring workplace-based tobacco cessation services, including employer-sponsored health insurance that covers proven treatments for tobacco use and dependence (*2*).[†††] Such efforts can help to achieve the *Healthy People 2020* objective to reduce smokeless tobacco use by adults to ≤0.3% by 2020.[§§§]

¶¶ Additional information available at http://bphc.hrsa.gov/buckets/treatingtobacco.pdf.

*** Tobacco-free workplaces allow no use of any tobacco products (including cigarettes, cigars, pipes, smokeless tobacco products, or of electronic cigarettes) by anyone at any time.

††† Additional information available at http://blogs.cdc.gov/niosh-science-blog/2010/12/10/smoking.

§§§ Additional information available at http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=41.

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Influenza Activity — United States, 2013–14 Season and Composition of the 2014–15 Influenza Vaccines

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During the 2013–14 influenza season in the United States, influenza activity* increased through November and December before peaking in late December. Influenza A (H1N1)pdm09 (pH1N1) viruses predominated overall, but influenza B viruses and, to a lesser extent, influenza A (H3N2) viruses also were reported in the United States. This influenza season was the first since the 2009 pH1N1 pandemic in which pH1N1 viruses predominated and was characterized overall by lower levels of outpatient illness and mortality than influenza A (H3N2)–predominant seasons, but higher rates of hospitalization among adults aged 50–64 years compared with recent years. This report summarizes influenza activity in the United States for the 2013–14 influenza season (September 29, 2013–May 17, 2014†) and reports recommendations for the components of the 2014–15 Northern Hemisphere influenza vaccines.

Viral Surveillance

During September 29, 2013–May 17, 2014, World Health Organization and National Respiratory and Enteric Virus Surveillance System collaborating laboratories in the United States tested 308,741 specimens for influenza viruses; 53,470 (17.3%) were positive (Figure 1). Of the positive specimens, 46,727 (87.4%) were influenza A viruses, and 6,743 (12.6%) were influenza B viruses. Among the seasonal influenza A viruses, 31,353 (67.1%) were subtyped; 28,323 (90.3%) were pH1N1 viruses, and 3,030 (9.7%) were influenza A (H3) viruses. In addition, one variant influenza A (H3N2)§ virus (H3N2v) was identified.

During the 2013–14 season, pH1N1 viruses were the predominant viruses in circulation nationally, with fewer influenza B viruses and influenza A (H3) viruses also identified. Using the percentage of specimens testing positive for influenza to determine the peak of influenza activity, the peak occurred during surveillance week 52 (the week ending December 28, 2013) nationally; however, differences among the 10 U.S. Department of Health and Human Services regions¶ in the timing of influenza activity were observed. Activity in Region 4 in the southern United States peaked earliest, during the week ending December 7, 2013 (surveillance week 49), and activity in Regions 2 and 3 in the eastern United States peaked latest, during the week ending January 25, 2014 (week 4).

Whereas pH1N1 activity peaked between late December and late January, influenza B activity occurred later in the influenza season. Influenza A viruses predominated until late March, and influenza B viruses became the most commonly identified virus nationally during the week ending March 29, 2014 (week 13). The intensity and timing of influenza B activity varied geographically. One region (Region 4) never reported a single week during which influenza B viruses predominated, whereas influenza B viruses were predominant in Region 6 from week 9 (the week ending March 1, 2014) through week 20 (the week ending May 17, 2014). During the late season increase in influenza B activity, the overall number of influenza A viruses decreased; however, the proportion of influenza A viruses subtyped as (H3) increased. In week 13 (the week ending March 29, 2014) influenza A (H3) viruses became the predominant influenza A virus nationally. Region 2 was most heavily impacted with late season influenza B activity, whereas Region 1 in the northeastern United States reported

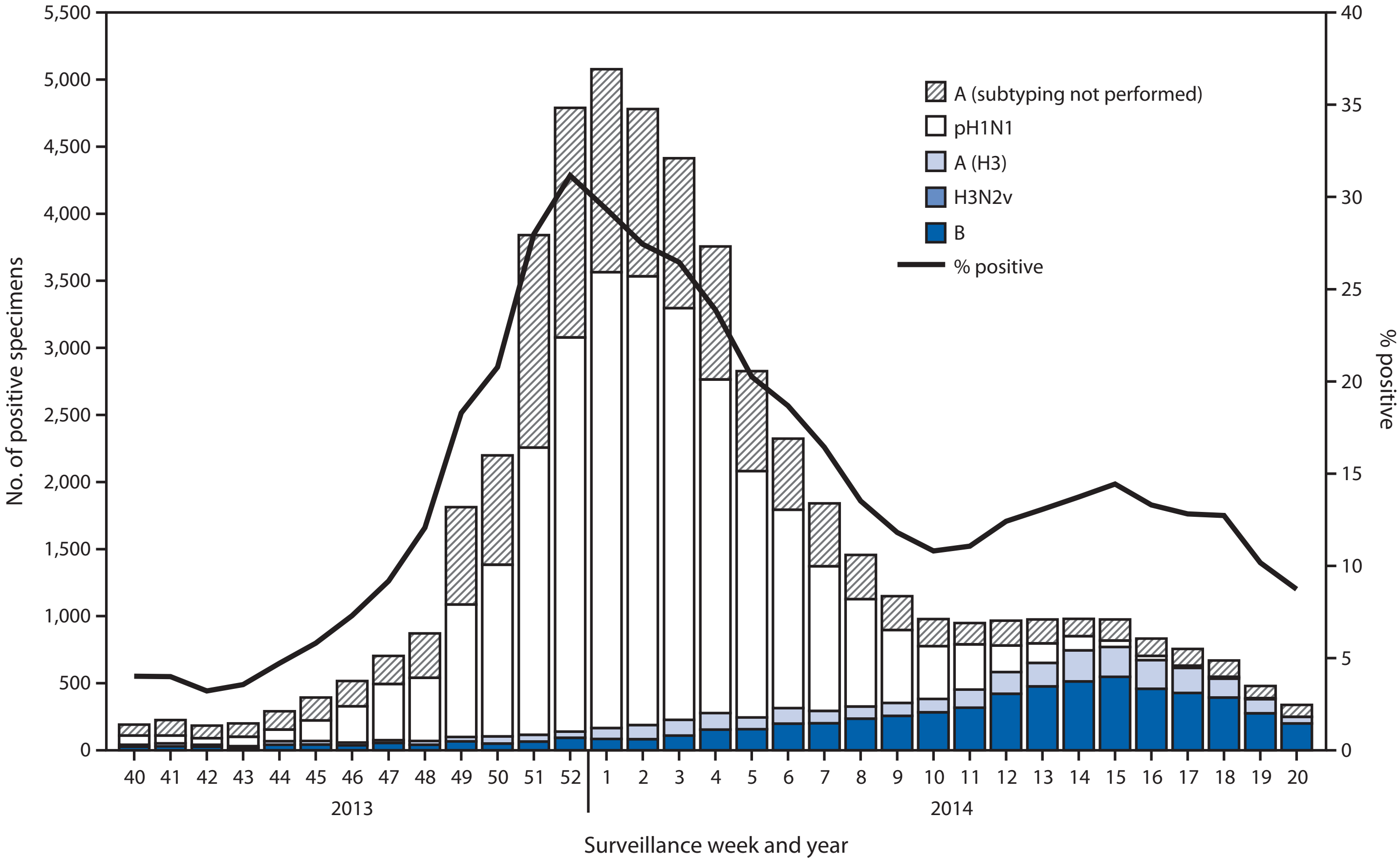
* The CDC influenza surveillance system collects information in five categories from eight data sources: 1) viral surveillance (World Health Organization collaborating laboratories, the National Respiratory and Enteric Virus Surveillance System, and novel influenza A virus case reporting); 2) outpatient illness surveillance (U.S. Outpatient Influenza-like Illness Surveillance Network); 3) mortality (122 Cities Mortality Reporting System and influenza-associated pediatric mortality reports); 4) hospitalizations (Influenza Hospitalization Surveillance Network [FluSurv-NET], which includes the Emerging Infections Program and Influenza Hospitalization Surveillance Project); and 5) summary of the geographic spread of influenza (state and territorial epidemiologist reports).

† Data as of May 30, 2014.

§ Influenza viruses that normally circulate in pigs are called "variant" viruses when they are found in humans. Influenza A (H3N2) variant viruses (H3N2v) with the matrix (M) gene from the pH1N1 pandemic virus were first detected in humans in July 2011. Cases of H3N2v infection have been confirmed in humans, mostly associated with prolonged exposure to pigs at agricultural fairs.

¶ *Region 1:* Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. *Region 2:* New Jersey, New York, Puerto Rico, and the U.S. Virgin Islands. *Region 3:* Delaware, the District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia. *Region 4:* Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee. *Region 5:* Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. *Region 6:* Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. *Region 7:* Iowa, Kansas, Missouri, and Nebraska. *Region 8:* Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming. *Region 9:* Arizona, California, Hawaii, Nevada, American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Marshall Islands, and Republic of Palau. *Region 10:* Alaska, Idaho, Oregon, and Washington.

FIGURE 1. Number* and percentage of respiratory specimens testing positive for influenza, by type, subtype, surveillance week, and year — World Health Organization and National Respiratory and Enteric Virus Surveillance System collaborating laboratories, United States, 2013–14 influenza season†



* N = 53,470.
† Data reported as of May 30, 2014.

most late season influenza A (H3) activity. Region 2 identified 21.4% of all influenza B viruses nationally; Region 1 identified 21.4% of all influenza A viruses subtyped as (H3) nationally.

Novel Influenza A Viruses

During the 2013–14 influenza season, one case of human infection with an H3N2v virus occurred during week 40 (the week ending October 5, 2013) in a child from Iowa with known direct exposure to swine. The child fully recovered, and no additional cases were identified in family members or other close contacts.

Antigenic Characterization of Influenza Viruses

CDC antigenically characterized 2,905 influenza viruses collected and submitted by U.S. laboratories since October 1, 2013, including 2,036 pH1N1 viruses, 426 influenza A (H3N2) viruses, and 443 influenza B viruses. Of the 2,036 pH1N1 viruses tested, 2,033 (99.9%) were antigenically similar to A/California/7/2009, the influenza A (H1N1) component of the 2013–14 Northern Hemisphere influenza vaccines. Three viruses (0.1%) of the 2,036 tested showed reduced titers with ferret antiserum raised against A/California/7/2009. Of the 426 influenza A (H3N2) viruses tested, 406 (95.3%) were antigenically similar to A/Texas/50/2012, the influenza A (H3N2) component of the 2013–14 Northern Hemisphere vaccines. Twenty (4.7%) of the 426 tested showed reduced titers with antiserum produced against A/Texas/50/2012.

Of the 443 influenza B viruses tested, 323 (72.9%) belonged to the B/Yamagata lineage, and 322 (99.7%) were antigenically similar to B/Massachusetts/2/2012, the influenza B component of the 2013–14 Northern Hemisphere trivalent and quadrivalent influenza vaccines. One (0.3%) virus showed reduced titers with antiserum produced against B/Massachusetts/2/2012. The remaining 120 (27.1%) influenza B viruses belonged to the B/Victoria lineage and were antigenically similar to B/Brisbane/60/2008, the influenza B component of the 2013–14 Northern Hemisphere quadrivalent influenza vaccine.

Resistance to Influenza Antiviral Medications

Since October 1, 2013, a total of 6,294 influenza virus specimens have been tested for resistance to influenza antiviral medications. All 508 influenza B viruses and 683 influenza A (H3N2) viruses tested were sensitive to both oseltamivir and zanamivir. Among the 5,103 pH1N1 viruses tested for resistance to oseltamivir, 59 (1.2%) were resistant, and all of the 1,890 viruses tested for resistance to zanamivir, including the 59 oseltamivir-resistant viruses, were sensitive. Resistance to the adamantanes (amantadine and rimantadine) persisted among influenza A viruses currently circulating globally (the adamantanes are not effective against influenza B viruses).

Composition of the 2014–15 Influenza Vaccines

The Food and Drug Administration's Vaccines and Related Biological Products Advisory Committee has determined that the 2014–15 influenza vaccines used in the United States have the same antigenic composition as those used in 2013–14. The trivalent vaccines should contain an A/California/7/2009-like (2009 H1N1) virus, an A/Texas/50/2012-like (H3N2) virus, and a B/Massachusetts/2/2012-like (B/Yamagata lineage) virus. The committee also recommended that quadrivalent vaccines contain a B/Brisbane/60/2008-like (B/Victoria lineage) virus (*1*). These recommendations were based on global influenza virus surveillance data related to epidemiology, antigenic and genetic characteristics, serologic responses to 2013–14 seasonal vaccines, and the availability of candidate vaccine viruses and reagents.

Outpatient Illness Surveillance

Nationally, the weekly percentage of outpatient visits for ILI** to health-care providers participating in the U.S. Outpatient Influenza-Like Illness Surveillance Network (ILINet) was at or above the national baseline level†† of 2.0% for 15 consecutive weeks during the 2013–14 influenza season (Figure 2). The peak percentage of outpatient visits for ILI was 4.6%, and occurred in the week ending December 28, 2013 (week 52). During the 2012–13 influenza season, when influenza A (H3N2) virus was the predominant circulating virus, the peak percentage of outpatient visits for ILI was 6.1% and also occurred in late December. During the 2013–14 season, on a regional level, the percentage of visits for ILI exceeded region-specific baselines in all 10 regions for 8 consecutive weeks (Regions 7 and 10) and 22 consecutive weeks (Region 1).

ILINet data are used to produce a weekly jurisdiction-level measure of ILI activity,§§ ranging from minimal to high. The number of jurisdictions experiencing elevated ILI activity peaked during the week ending December 28, 2013 (week 52), when 22 jurisdictions experienced high ILI activity. During recent previous seasons, the peak number of jurisdictions experiencing high ILI activity has ranged from eight (2008–09 season) to 44 (2009–10 season) in a given week.

What is already known on this topic?

CDC collects, compiles, and analyzes data on influenza activity year-round in the United States. Substantial influenza activity generally begins in the fall and continues through the winter and spring months; however, the timing and severity of influenza activity varies by geographic location and season.

What is added by this report?

The 2013–14 influenza season was the first influenza A (H1N1) pdm09–predominant season since the emergence of the virus in 2009, and also had later-season influenza B activity. The highest hospitalization rates were among adults aged ≥65 years, which is consistent with previous influenza seasons; hospitalization rates among those aged 50 to 64 years were significantly higher than in all years since the 2009 pandemic. Nearly all of the influenza virus specimens sent to CDC for antigenic characterization were similar to the components of the 2013–14 Northern Hemisphere influenza vaccine. The Food and Drug Administration has recommended that the 2014–15 influenza vaccines used in the United States have the same antigenic composition as those used in 2013–14.

What are the implications for public health practice?

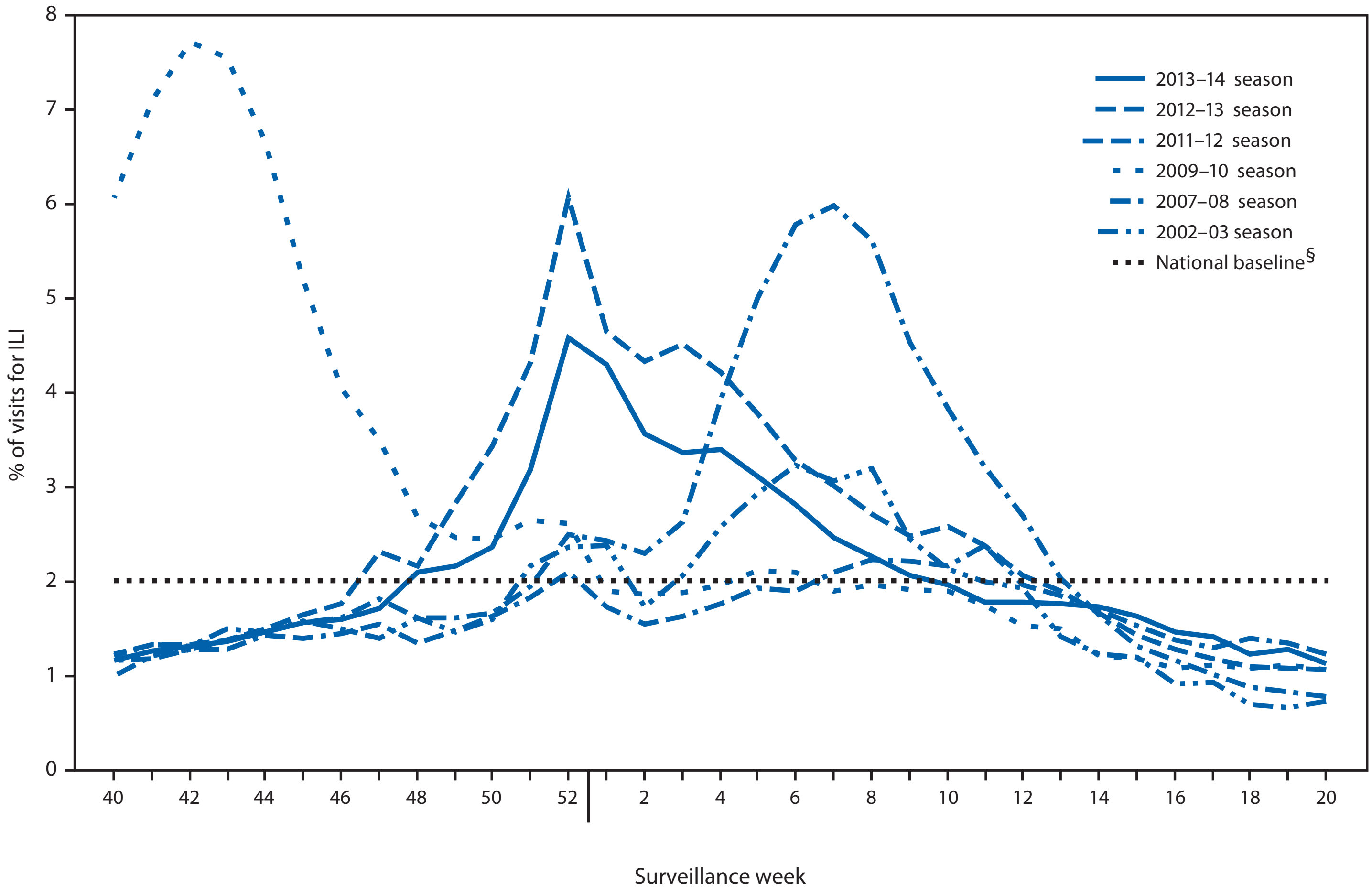
Influenza surveillance, including for novel influenza viruses, should continue throughout the summer months, and health-care providers should consider influenza as a cause of respiratory illness even outside the typical season. Although influenza viruses typically circulate at low levels during the summer months, timely empiric antiviral treatment is recommended for patients with severe, complicated, or progressive influenza illness and those at higher risk for influenza complications; treatment can be considered for others if it can be started within 48 hours of illness onset.

** Defined as a temperature of ≥100.0°F (≥37.8°C), oral or equivalent, and cough or sore throat, in the absence of a known cause other than influenza.

†† The national and regional baselines are the mean percentage of visits for ILI during weeks with little or no influenza virus circulation (noninfluenza periods) for the previous three seasons plus two standard deviations. A noninfluenza period is defined as ≥2 consecutive weeks in which each week accounted for <2% of the season's total number of specimens that tested positive for influenza. National and regional percentages of patient visits for ILI are weighted on the basis of state population. Use of the national baseline for regional data is not appropriate.

§§ Activity levels are based on the percentage of outpatient visits in a jurisdiction attributed to ILI and are compared with the average percentage of ILI visits that occur during weeks with little or no influenza virus circulation. Activity levels range from minimal, which would correspond to ILI activity from outpatient clinics below or only slightly above the average, to high, which would correspond to ILI activity from outpatient clinics that are much higher than the average. Because the clinical definition of ILI is nonspecific, not all ILI is caused by influenza; however, when combined with laboratory data, the information on ILI activity provides a clearer picture of influenza activity in the United States.

FIGURE 2. Percentage of visits for influenza-like illness (ILI)* reported to CDC, by surveillance week — Outpatient Influenza-Like Illness Surveillance Network, United States, 2013–14 influenza season and selected previous seasons†



* Defined as a fever of ≥100.0°F (≥37.8°C), oral or equivalent, and cough or sore throat, in the absence of a known cause other than influenza.
† Data as of May 30, 2014.
§ The national baseline is the mean percentage of visits for ILI during weeks with little or no influenza virus circulation (noninfluenza periods) for the previous three seasons plus two standard deviations. A noninfluenza period is defined as ≥2 consecutive weeks in which each week accounted for <2% of the season's total number of specimens that tested positive for influenza. Use of the national baseline for regional data is not appropriate.

Geographic Spread of Influenza Activity

State and territorial epidemiologists determine the geographic distribution of influenza in their jurisdictions using all available data sources through a weekly influenza activity code.¶¶ The geographic distribution of influenza activity was most extensive during the week ending January 18, 2014 (week 3), when 41 states reported widespread influenza activity and nine states reported regional influenza activity. The number of jurisdictions reporting widespread or regional activity during the peak week of activity has ranged from 40 to 51 jurisdictions during the previous four influenza seasons.

¶¶ Levels of activity are 1) *no activity;* 2) *sporadic:* isolated laboratory-confirmed influenza case(s) or a laboratory-confirmed outbreak in one institution, with no increase in activity; 3) *local:* increased ILI, or at least two institutional outbreaks (ILI or laboratory-confirmed influenza) in one region of the state, with recent laboratory evidence of influenza in that region and virus activity no greater than sporadic in other regions; 4) *regional:* increased ILI activity or institutional outbreaks (ILI or laboratory-confirmed influenza) in at least two but less than half of the regions in the state with recent laboratory evidence of influenza in those regions; and 5) *widespread:* increased ILI activity or institutional outbreaks (ILI or laboratory-confirmed influenza) in at least half the regions in the state, with recent laboratory evidence of influenza in the state.

Influenza-Associated Hospitalizations

CDC monitors hospitalizations associated with laboratory-confirmed influenza virus infections using the Influenza

Hospitalization Surveillance Network (FluSurv-NET).*** Cumulative hospitalization rates (per 100,000 population)††† were calculated by age group based on 9,635 reported influenza hospitalizations during October 1, 2013–April 30, 2014. Among 9,586 cases with influenza type specified, 8,497 (88.2%) were associated with influenza A virus infection, 1,046 (10.9%) with influenza B virus infection, and 43 (0.4%) were associated with mixed influenza A and influenza B virus infections. Persons aged 18-64 years accounted for 57.4% of reported hospitalizations. The cumulative incidence for all age groups for the period October 1, 2013–April 30, 2014, was 35.6 per 100,000 (Figure 3). The cumulative hospitalization rate (per 100,000 population) by age group for this period was 46.9 (for 0–4 years), 9.5 (5–17 years), 22.0 (18–49 years), 54.3 (50–64 years), and 88.1 (≥65 years). During the past four influenza seasons, age-specific hospitalization rates have ranged from 15.9 to 77.4 (0–4 years), 4.0 to 27.2 (5–17 years), 4.2 to 23.4 (18–49 years), 8.1 to 40.6 (50–64 years), and 25.7 to 183.1 (≥65 years).

As of May 30, 2014, among the FluSurv-NET adult patients for whom medical chart data were available, 89.0% had at least one underlying medical condition. The most frequent underlying medical conditions identified were obesity (42.9%), metabolic disorders (36.0%), and cardiovascular disease (34.6%). Among children hospitalized with laboratory-confirmed influenza and for whom medical chart data were available, 57.0% had at least one underlying medical condition. The most commonly identified conditions were asthma (25.4%) and neurologic disorders (14.1%). Among the 882 hospitalized women of childbearing age (15–44 years), 197 (22.3%) were pregnant.

Pneumonia and Influenza-Associated Mortality

During the 2013–14 influenza season, the percentage of deaths attributed to pneumonia and influenza (P&I) exceeded the epidemic threshold§§§ for 8 consecutive weeks, from January 11, 2014 to March 1, 2014 (weeks 2–9). The percentage of deaths attributed to P&I peaked at 8.7% during the week ending January 25, 2014 (week 4) (Figure 4). From the 2008–09 influenza season through the 2012–13 season, the peak percentage of P&I deaths has ranged from 7.9% to 9.9%, and the total number of consecutive weeks at or above the epidemic threshold has ranged from 1 to 13.

Influenza-Associated Pediatric Mortality

For the 2013–14 influenza season, 96 laboratory-confirmed, influenza-associated pediatric deaths were reported from 30 states, New York City, and Chicago. The deaths included 18 children aged <6 months, 24 aged 6–23 months, eight aged 2–4 years, 27 aged 5–11 years, and 19 aged 12–17 years; mean and median ages were 6.0 years and 4.6 years, respectively. Among the 96 deaths, 79 deaths were associated with influenza A virus infections (43 with pH1N1 viruses, two with an A [H3] virus, and 34 with influenza A viruses for which subtyping was not performed), 13 deaths were associated with influenza B viruses, two deaths were associated with an influenza virus for which the type was not determined, and two deaths were associated with an influenza A and influenza B virus coinfection. Of 90 children with known medical history, 49 (54.4%) had at least one high-risk medical condition. Neurologic disorders (29 [32.2%]) and pulmonary disease (17 [18.9%]) were the most commonly identified conditions.

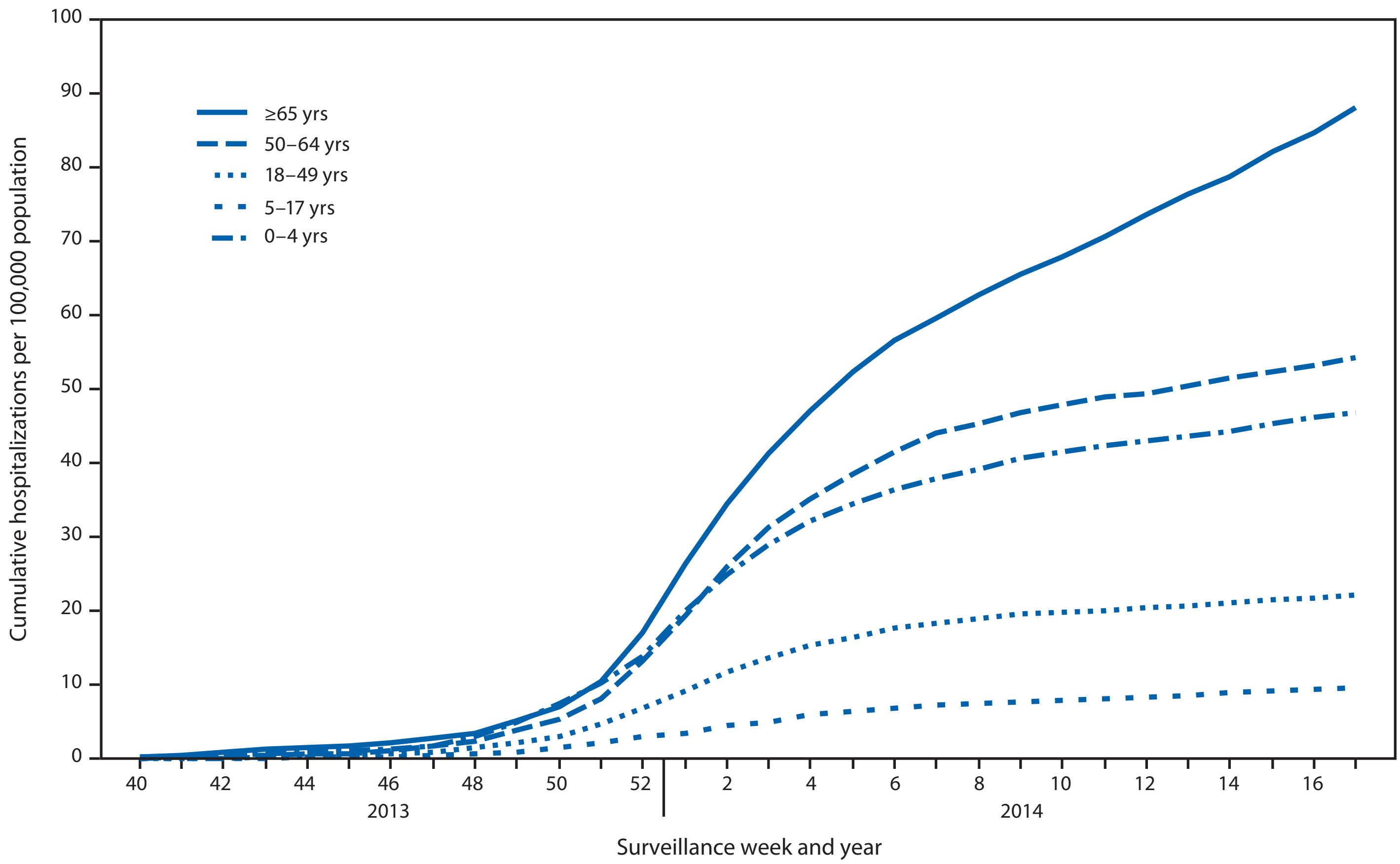
Since influenza-associated pediatric mortality became a nationally notifiable condition in 2004, the total number of influenza-associated pediatric deaths has ranged from 35

*** FluSurv-NET conducts population-based surveillance for laboratory-confirmed influenza-associated hospitalizations among children aged <18 years (since the 2003–04 influenza season) and adults aged ≥18 years (since the 2005–06 influenza season). FluSurv-NET covers approximately 70 counties in the 10 Emerging Infections Program states (California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee) and additional Influenza Hospitalization Surveillance Project (IHSP) states. IHSP began during the 2009–10 season to enhance surveillance during the 2009 H1N1 pandemic. IHSP sites included Iowa, Idaho, Michigan, Oklahoma, and South Dakota during the 2009–10 season; Idaho, Michigan, Ohio, Oklahoma, Rhode Island, and Utah during the 2010–11 season; Michigan, Ohio, Rhode Island, and Utah during the 2011–12 season; Iowa, Michigan, Ohio, Rhode Island, and Utah during the 2012–13 season; and Michigan, Ohio, and Utah during the 2013–14 season.

††† Incidence rates are calculated using CDC's National Center for Health Statistics population estimates for the counties included in the surveillance catchment area. Laboratory confirmation is dependent on clinician-ordered influenza testing, and testing for influenza often is underused because of the poor reliability of rapid influenza diagnostic test results and greater reliance on clinical diagnosis for influenza. As a consequence, the number of cases identified as part of influenza hospitalization surveillance likely is an underestimation of the actual number of persons hospitalized with influenza.

§§§ The seasonal baseline proportion of P&I deaths is projected using a robust regression procedure, in which a periodic regression model is applied to the observed percentage of deaths from P&I that were reported by the 122 Cities Mortality Reporting System during the preceding 5 years. The epidemic threshold is set at 1.645 standard deviations above the seasonal baseline.

FIGURE 3. Cumulative rates of hospitalization for laboratory-confirmed influenza, by age group and surveillance week and year — FluSurv-NET* surveillance system, United States, 2013–14 influenza season†



* FluSurv-NET conducts population-based surveillance for laboratory-confirmed influenza-associated hospitalizations in children aged <18 years (since the 2003–04 influenza season) and adults aged ≥18 years (since the 2005–06 influenza season). FluSurv-NET covers approximately 70 counties in the 10 Emerging Infections Program states (California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee) and additional Influenza Hospitalization Surveillance Project states (Michigan, Ohio, and Utah).

† Data as of May 30, 2014.

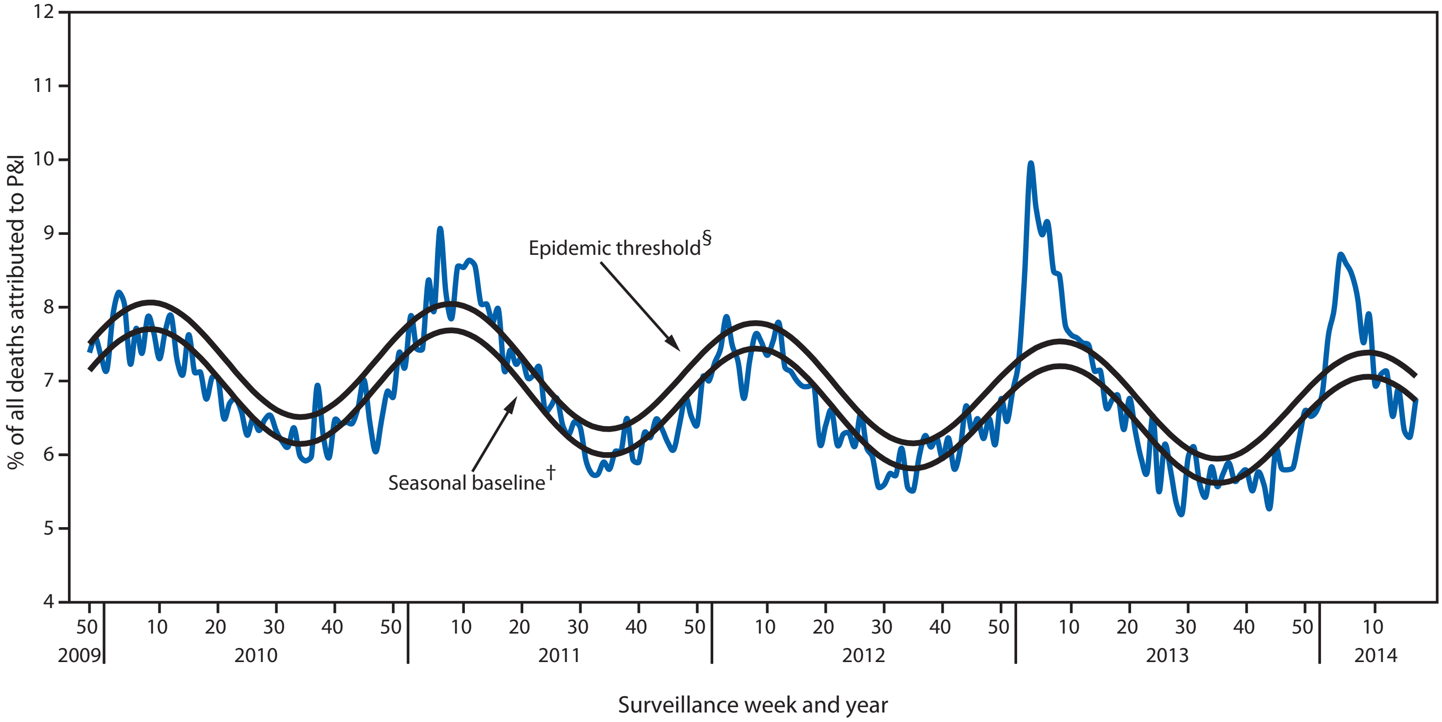
to 171 per season; this excludes the 2009 pandemic, when 348 pediatric deaths were reported to CDC during April 15, 2009–October 2, 2010.

Discussion

The 2013–14 influenza season peaked in late December with pH1N1 viruses predominating nationally and in all 10 regions. Activity decreased through January and February, but a late season increase in influenza B activity occurred in March, and influenza B viruses became the predominant virus nationally in week 13 (the week ending March 29, 2014). Nearly all of the influenza virus specimens sent to CDC for further antigenic characterization were similar to the components of the 2013–14 Northern Hemisphere vaccines.

After several recent influenza A (H3N2)–predominant seasons, 2013-14 was the first pH1N1–predominant season since the 2009 pH1N1 pandemic. During the 2009 pandemic, adults aged 50–64 years had the highest mortality rate and second highest influenza-associated hospitalization rate, and during the 2013–14 season, adults again were at high risk of severe influenza illness. The cumulative incidence of hospitalization among adults aged 50–64 years during the 2013–14 season was well above the range of rates seen in seasons following the pandemic, whereas hospitalization rates in all other age groups were within the range seen in recent years. This age distribution of hospitalizations is likely attributable to several factors, including lack of cross-protective immunity to pH1N1

FIGURE 4. Percentage of all deaths attributable to pneumonia and influenza (P&I), by surveillance week and year — 122 Cities Mortality Reporting System, United States, 2009–2014*



* Data as of May 30, 2014.

† The seasonal baseline proportion of P&I deaths is projected using a robust regression procedure, in which a periodic regression model is applied to the observed percentage of deaths from P&I reported by the 122 Cities Mortality Reporting System during the preceding 5 years.

§ The epidemic threshold is set at 1.645 standard deviations above the seasonal baseline.

and lower influenza vaccination coverage among persons in this age group (*2*).

Testing for seasonal influenza viruses and monitoring for novel influenza A virus infections should continue year-round, as should specimen submission to CDC for further antigenic and genetic analysis and antiviral resistance monitoring. Human infections with novel influenza A viruses were identified in greater numbers during the summer months of 2012 and 2013 (*3,4*) and might also occur during the summer months of 2014. An H3N2v virus that had acquired the matrix (M) gene from pH1N1 was first identified in pigs in 2010, and after being identified in 12 human patients in 2011 became the most commonly identified novel influenza A virus in the United States. Cases were most often associated with prolonged direct contact with swine in agricultural fair settings (*3*). Limited human-to-human spread of this virus has been detected, but no sustained community spread of H3N2v has been identified. The larger H3N2v outbreaks in 2012 and 2013 in the United States and continued identification of influenza A (H7N9) viruses (*5*) and other avian influenza viruses in humans outside the United States highlight the importance of ongoing monitoring for novel influenza A viruses throughout the year.

Although influenza activity in summer in the United States typically is low, cases of influenza, and even influenza outbreaks, are detected in the United States throughout the summer. Health-care providers should remain vigilant and consider influenza as a potential cause of summer respiratory illnesses, and also consider treatment with influenza antiviral medications for those at high risk for influenza-associated complications, as recommended by the Advisory Committee on Immunization Practices (*6*). Health-care providers also should consider novel influenza virus infections in persons with ILI and swine exposure, and those with severe acute respiratory infection after travel to areas where those viruses have been identified previously. Public health laboratories should immediately send to CDC any specimens that cannot be typed or subtyped using standard methods and submit all specimens that are otherwise unusual, including all summer specimens, as soon as possible after identification.

Influenza surveillance reports for the United States are posted online at CDC weekly and are available at http://www.cdc.gov/flu/weekly. Additional information regarding influenza viruses, influenza surveillance, influenza vaccine, influenza antiviral medications, and novel influenza A virus infections in humans is available at http://www.cdc.gov/flu.

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Vital Signs: Foodborne Norovirus Outbreaks — United States, 2009–2012

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Abstract

Introduction: Norovirus is the leading cause of acute gastroenteritis and foodborne disease in the United States, causing an estimated one in 15 U.S. residents to become ill each year as well as 56,000–71,000 hospitalizations and 570–800 deaths, predominantly among young children and the elderly. Whereas noroviruses often spread through person-to-person contact, foodborne transmission can cause widespread exposures and presents important prevention opportunities.

Methods: CDC analyzed 2009–2012 data on suspected and confirmed norovirus outbreaks reported by state, local, and territorial health departments through the National Outbreak Reporting System (NORS) to characterize the epidemiology of foodborne norovirus outbreaks.

Results: During 2009–2012, a total of 1,008 foodborne norovirus outbreaks were reported to NORS, constituting 48% of all foodborne outbreaks with a single known cause. Outbreaks were reported by 43 states and occurred year round. Restaurants were the most common setting (64%) of food preparation reported in outbreaks. Of 520 outbreaks with factors contributing to contamination reported, food workers were implicated as the source in 70%. Of 324 outbreaks with an implicated food, most resulted from food contaminated during preparation (92%) and food consumed raw (75%). Specific food categories were implicated in only 67 outbreaks; the most frequently named were vegetable row crops (e.g., leafy vegetables) (30%), fruits (21%), and mollusks (19%).

Conclusions: Noroviruses are the leading cause of reported foodborne disease outbreaks and most often associated with contamination of food in restaurants during preparation by infected food workers.

Implications for Public Health Practice: Improved adherence to appropriate hand hygiene, excluding ill staff members from working until ≥48 hours after symptom resolution, and supervision by certified kitchen managers are all recommended to reduce the incidence of foodborne norovirus disease.

Introduction

Noroviruses are the leading cause of both sporadic cases and reported outbreaks of acute gastroenteritis (diarrhea or vomiting) in the United States (*1,2*). Each year, there are an estimated 19–21 million cases of norovirus disease, including 1.7–1.9 million outpatient visits, 400,000 emergency department visits, 56,000–71,000 hospitalizations, and 570–800 deaths, which result in approximately $777 million in health-care costs (*2*). Rates of severe outcomes, such as hospitalization and death, are greatest in children aged <5 years and older adults aged ≥65 years (*2*). Symptoms include vomiting, diarrhea, and sometimes fever, although norovirus infections also can be asymptomatic (*3*). This genetically-diverse group of viruses comprises six genogroups (GI–GVI), three of which (GI, GII, and GIV) cause human disease (*4*). Genogroups are further subdivided into at least 38 known norovirus genotypes; GII.4 strains cause most outbreaks worldwide (*5*).

Transmission of norovirus occurs primarily via the fecal-oral route, including direct person-to-person contact, consumption of contaminated food or water, or contact with contaminated environmental surfaces (*3*). Noroviruses also might be spread through incidental ingestion of vomitus droplets, which can disperse via aerosolization. The varied means through which noroviruses spread coupled with their environmental stability (remain infectious at freezing temperatures or until heated above 140°F [60°C], and for 2 weeks on surfaces), resistance to common disinfectants, low infectious dose (18–2,800 viral particles), and copious shedding (up to 10^{12} viral particles per gram of feces) among persons with asymptomatic infections as well as before, during, and after the manifestation of symptomatic infections make these viruses challenging to control (*3,6,7*).

Norovirus diagnostics generally rely on molecular methods and are not in widespread clinical use for sporadic cases; however, data collected through outbreak investigations provide insights that can help guide prevention efforts. Noroviruses often are associated with person-to-person spread in health-care settings, for which specific prevention and control guidelines are available* (*8*); however, noroviruses also are the leading cause of sporadic cases and outbreaks of foodborne disease in the United States (*9,10*), and thus require specific attention to improve food safety. This report provides an updated description of the epidemiology of U.S. norovirus outbreaks, focusing on those resulting primarily from foodborne transmission, to help target interventions.

Methods

Since 2009, state, local, and territorial health departments have electronically reported data to CDC on outbreaks of acute gastroenteritis transmitted through food, water, person-to-person contact, animal contact, contaminated environments, and unknown transmission routes through the National Outbreak Reporting System† (NORS) (*1*). An outbreak was defined as two or more cases of a similar illness epidemiologically linked to a common exposure (e.g., a setting or a food). Primary transmission route is determined by each reporting site, based on the local public health investigation and CDC guidance documents.§ Outbreaks with a first illness onset date of January 2009–December 2012 that indicated norovirus as the only suspected or confirmed cause were included in this analysis.

Frequencies of norovirus outbreaks, outbreak-related illnesses, and their associated outcomes (i.e., outpatient visits, emergency department visits, hospitalizations, and deaths) were calculated. Demographic data were not always reported; therefore, the relative proportions of illnesses by age group and sex among those reports that included such data (47% and 65%, respectively) were extrapolated to the total number of reported outbreak-associated illnesses. Monthly counts of outbreaks stratified by primary transmission route were calculated to assess differences in seasonality. Rates of reported outbreaks were calculated by dividing the average annual number by the average U.S. intercensal population estimates from 2009–2012.¶ Proportions among categorical variables were compared using chi-square tests, and median illnesses per outbreak were compared by Wilcoxon rank-sum tests.

Level of food preparation (i.e., raw with minimal or no processing, raw with some processing, or cooked) and specific factors contributing to food contamination were analyzed using standardized categorization schemes.** Foods implicated in norovirus outbreaks were classified using a categorization scheme recently developed by the Interagency Food Safety Analytics Collaboration.††

Results

During 2009–2012, a total of 4,318 norovirus outbreaks were reported to NORS, resulting in 161,253 illnesses, 2,512 hospitalizations, and 304 deaths. Foodborne transmission was the primary mode reported in 1,008 (23%) norovirus outbreaks, representing 48% of the 2,098 foodborne outbreaks reported with a single suspected or confirmed cause during the 4-year study period. Other primary transmission modes reported among the 4,318 norovirus outbreaks included person-to-person (2,976 [69%]), environmental (15 [0.35%]), waterborne (11 [0.26%]), and unknown transmission mode (308 [7%]). In 158 (16%) of foodborne norovirus outbreaks, secondary transmission through one of these other modes was reported. Norovirus outbreaks were most common in winter, with 2,394 (55%) occurring during December–February (Figure 1). Among foodborne norovirus outbreaks, 398 (39%) occurred during December–February, compared with 1,996 (60%) of nonfoodborne norovirus outbreaks.

Of the 4,318 reported norovirus outbreaks, 2,961 (69%) were laboratory-confirmed, and 1,357 (31%) were suspected to be caused by norovirus based on clinical or epidemiologic findings. Of confirmed norovirus outbreaks, a genogroup was identified in 2,729 (92%), including 2,341 (86%) GII, 374 (14%) GI, 13 (0.5%) mixed GI/GII, and one (0.04%) GIV. A specific norovirus genotype was reported in 707 (24%) of the laboratory-confirmed outbreaks, among which GII.4 (465 [66%]) was predominant, followed by GII.1 (58 [8%]) and GI.6 (56 [8%]). Foodborne outbreaks were more often caused by non-GII.4 genotypes (48%) than were nonfoodborne outbreaks (31%, $p<0.001$).

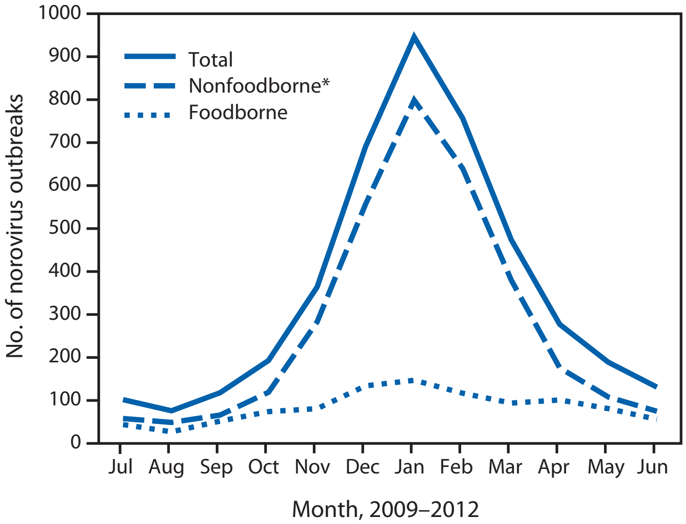
Foodborne norovirus outbreaks were reported by 43 states (Figure 2), with the number per state ranging from one to 117 (median = nine). The median number of outbreaks per 1,000,000 person-years reported among the states was 0.6 (range = 0.05–5.5). Of 1,008 foodborne norovirus outbreaks, a setting of food preparation was reported for 904 (90%), among which restaurants (574 [64%]) and catering or banquet facilities (151 [17%]) were most common (Table 1). In contrast, most (80%) nonfoodborne outbreaks occurred in long-term care facilities such as nursing homes.

Demographic characteristics and outcomes of outbreak-associated illnesses reflected the settings in which outbreaks

* Additional information available at http://www.cdc.gov/norovirus/php/responding.html.
† Additional information available at http://www.cdc.gov/nors.
§ Available at http://www.cdc.gov/nors/pdf/nors_guidance_20130219_508c.pdf.
¶ Additional information available at http://www.cdc.gov/nchs/nvss/bridged_race.htm.

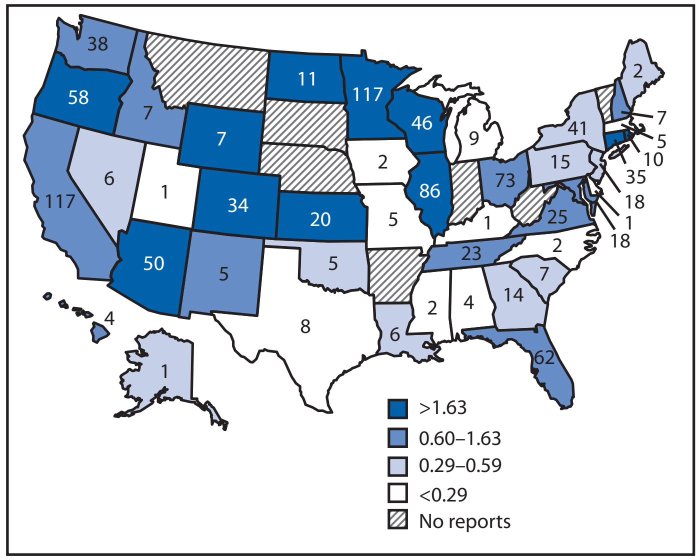
** Available at http://www.cdc.gov/nors/pdf/nors_appendix_v3.pdf.
†† Additional information available at http://www.cdc.gov/foodborneburden/pdfs/ifsac-webinar-06-18-2013-slides-508c.pdf.

FIGURE 1. Number of reported norovirus outbreaks, by primary transmission mode and month of onset — National Outbreak Reporting System, United States, 2009–2012



* Includes person-to-person, waterborne, environmental contamination, and other or unknown transmission modes.

FIGURE 2. Number and rate of reported foodborne norovirus outbreaks (per 1 million person-years*), by state — National Outbreak Reporting System, United States, 2009–2012



* Legend indicates rate ranges divided by quartile.

occurred (Table 2). Foodborne outbreaks more often affected men (44%) and persons aged <75 years (95%), compared with nonfoodborne outbreaks (30% men and 50% aged <75 years, both p<0.001). Likewise, the reported case-hospitalization and case-fatality ratios in foodborne outbreaks (1% and 0.01%, respectively) were lower than those in nonfoodborne outbreaks (2% and 0.3%, respectively, both p<0.001), However, a greater proportion of cases among foodborne outbreaks resulted in emergency department visits than among nonfoodborne outbreaks (4% versus 2%, p<0.001). Foodborne outbreaks also had significantly fewer reported cases (median: 12 per outbreak) compared with nonfoodborne outbreaks (median: 30 per outbreak, p<0.001).

Factors contributing to food contamination were reported in 520 (52%) of 1,008 foodborne norovirus outbreaks, among which infectious food workers were implicated as the source of contamination in 364 (70%). Bare-hand contact with ready-to-eat foods was explicitly identified in 196 (54%) of these outbreaks.

At least one specific food item was implicated in 324 (32%) of 1,008 foodborne norovirus outbreaks; among those outbreaks with data, 92% of implicated foods were contaminated during preparation, and 75% were foods eaten raw (i.e., not cooked). Of 324 outbreaks with an implicated food, only 67 (21%) could be attributed to a single food category; those attributed most often were vegetable row crops (e.g., lettuce and other leafy vegetables) (20 [30%]), fruits (15 [21%]), and mollusks (13 [19%]).

TABLE 1. Number and percentage of reported foodborne and nonfoodborne norovirus outbreaks, by setting* — National Outbreak Reporting System, United States, 2009–2012

	Foodborne		Nonfoodborne†	
Setting	No.	(%)	No.	(%)
Restaurant	574	(64)	38	(1)
Catering or banquet facility	151	(17)	8	(0.3)
Private residence	37	(4)	32	(0.1)
School	13	(1)	148	(6)
Long-term care facility	12	(1)	2,060	(80)
Hospital	2	(0.2)	115	(4)
Day care	1	(0.1)	52	(2)
Other/Multiple settings	114	(13)	137	(5)
All settings	904	(100)	2,590	(100)

* A setting was reported in 904 (90%) of 1,008 foodborne outbreaks and in 2,590 (78%) of 3,310 nonfoodborne outbreaks.
† Includes person-to-person, waterborne, environmental contamination, and other or unknown transmission modes.

Conclusions and Comment

This report highlights the predominant role of noroviruses among foodborne disease outbreaks and specific actions that might reduce their impact on public health. While there is the potential for norovirus contamination during production or harvesting of foods commonly eaten raw, particularly molluscan shellfish and fresh produce (*10*), most norovirus contamination occurs during food preparation. As shown in a previous analysis of foodborne norovirus outbreaks occurring during 2001–2008 (*10*), food workers continue to be the primary source of contamination and have the potential to significantly amplify community transmission of noroviruses through widespread exposure. The majority

TABLE 2. Number and percentage of persons with illness associated with reported foodborne and nonfoodborne norovirus outbreaks, by selected characteristics and outcomes — National Outbreak Reporting System, United States, 2009–2012

	Foodborne		Nonfoodborne*	
Characteristic/Outcome	**No.**	**(%)**	**No.**	**(%)**
Sex†				
Male	9,285	(44)	42,112	(30)
Female	11,780	(56)	98,076	(70)
Age group (yrs)†				
0–4	481	(2)	2,178	(2)
5–19	2,959	(14)	18,621	(13)
20–49	9,558	(45)	24,619	(18)
50–74	7,002	(33)	24,910	(18)
≥75	1,064	(5)	69,860	(50)
Outcomes§				
Outpatient visit	1,102	(7)	3,848	(7)
Emergency department visit	520	(4)	1,109	(2)
Hospitalization	203	(1)	2,309	(2)
Death	2	(0.01)	302	(0.3)
Total illnesses	**21,065**	**(100)**	**140,188**	**(100)**

* Includes person-to-person, waterborne, environmental contamination, and other or unknown transmission modes.

† Proportions of illness by age and sex among persons for whom such data were reported were extrapolated to include all patients from reported norovirus outbreaks, including those without such data.

§ Proportions based on specific known outcomes where such data were reported; thus, each proportion was calculated using a different denominator.

of reported foodborne norovirus outbreaks result from foods prepared in restaurants and other food service settings, where bare-hand contact by infectious workers with ready-to-eat foods frequently is identified. Thus, interventions targeting food workers have substantial potential for prevention of norovirus transmission.

Steps to curtail contamination of ready-to-eat foods by food workers include 1) adherence to appropriate recommendations for hand washing and avoiding bare-hand contact with ready-to-eat foods (e.g., through use of gloves or utensils), 2) compliance with policies to prevent ill staff members from working until ≥48 hours after symptom resolution, 3) and supervision by a certified kitchen manager, as recommended by the Food and Drug Administration Food Code (*11*). However, an observational study of food workers in restaurants found proper hand washing in only 27% of activities for which it is recommended and even less frequently (16%) when gloves were used (*12*). Additionally, one in five food workers in restaurants report having worked while ill with vomiting or diarrhea for at least one shift in the previous year (*13*). Fear of job loss and concerns about leaving coworkers short-staffed were identified as significant factors in their decision to work while ill and thus are important barriers to be addressed (*13*). One specific intervention with demonstrated success is the training and certification of kitchen managers in appropriate food safety practices; supervision by such certified kitchen managers is associated with fewer norovirus outbreaks and absence of bare-hand contact with ready-to-eat foods as a contributing factor when outbreaks do occur (*14*).

The findings in this report are subject to at least three limitations. First, the 100-fold difference in outbreak reporting rates between the highest and lowest reporting states and the fact that some states did not report any outbreaks likely reflect differing sensitivities of surveillance for ascertaining outbreaks, rather than variation in disease incidence alone. The actual incidence likely is much higher, indicating a continued need for capacity of state and local health departments to investigate and report outbreaks. Second, missing data in key NORS report fields, such as "contributing factors" and "implicated foods," indicate the need for investigative resources to understand the causes of an outbreak (*15*). CDC efforts to address these issues include improved integration of NORS with other surveillance systems, such as the National Voluntary Environmental Assessment Information System[§§] and CaliciNet[¶¶] (*4*), the CDC-coordinated laboratory network for norovirus outbreaks. Data from these systems in conjunction with NORS data might help improve attribution of norovirus disease to specific strains and environmental contributing factors. Additionally, the Norovirus Sentinel Testing and Tracking[***] network can help improve data completeness and provide a real-time assessment of norovirus activity in the context of new strain emergence (*16*). Finally, NORS does not capture outbreaks occurring on cruise ships with international and U.S. ports; those are reported through an active surveillance collaboration between the cruise industry and the CDC Vessel Sanitation Program.[†††] Although the 44 norovirus outbreaks meeting Vessel Sanitation Program posting criteria during 2009–2012 would represent only 1% of those reported through NORS, these high-profile outbreaks often result in large numbers of cases.

The public health burden exacted by noroviruses is substantial. Although candidate norovirus vaccines are in development and show promise (*17*), behavioral interventions focused on food workers continue to be primary means to prevent foodborne norovirus disease. Provisions in the Food and Drug Administration Food Code (*11*) outline how foodborne spread of noroviruses can be curtailed and food safety improved.

§§ Additional information available at http://www.cdc.gov/nceh/ehs/nveais/index.htm.

¶¶ Additional information available at http://www.cdc.gov/norovirus/reporting/calicinet.

*** Additional information available at http://www.cdc.gov/norovirus/reporting/norostat.

††† Additional information available at http://www.cdc.gov/nceh/vsp/surv/gilist.htm.

Key Points

- Norovirus is highly contagious and can cause severe disease. About 1 in 15 U.S. residents become ill with it each year and up to 800 die.
- Person-to-person contact and foodborne transmission are the main ways that norovirus outbreaks occur.
- Of those foodborne outbreaks in which a single cause was identified, 48% were caused by norovirus, making it the leading cause of foodborne outbreaks in the U.S.
- Restaurants are the most common setting for foodborne norovirus outbreaks. Food handlers infected with norovirus are the largest source of food contamination.
- CDC recommends improved adherence to hand hygiene, having ill workers stay home until ≥48 hrs after their symptoms resolve, and having kitchen managers become formally certified in food safety.
- Additional information is available at http://www.cdc.gov/vitalsigns.

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Measles — United States, January 1–May 23, 2014

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Measles is a highly contagious, acute viral illness that can lead to serious complications and death. Although measles elimination (i.e., interruption of year-round endemic transmission) was declared in the United States in 2000 (*1*), importations of measles cases from endemic areas of the world continue to occur, leading to secondary measles cases and outbreaks in the United States, primarily among unvaccinated persons (*2*). To update national measles data in the United States, CDC evaluated cases reported by states from January 1 through May 23, 2014. A total of 288 confirmed measles cases have been reported to CDC, surpassing the highest reported yearly total of measles cases since elimination (220 cases reported in 2011) (*3*). Fifteen outbreaks accounted for 79% of cases reported, including the largest outbreak reported in the United States since elimination (138 cases and ongoing). The large number of cases this year emphasizes the need for health-care providers to have a heightened awareness of the potential for measles in their communities and the importance of vaccination to prevent measles.

Confirmed measles cases in the United States are reported by state and local health departments to CDC using a standard case definition.* A measles case is considered confirmed if it is laboratory-confirmed or meets the clinical case definition (an illness characterized by a generalized rash lasting ≥3 days, a temperature of ≥101°F [≥38.3°C], and cough, coryza, and/or conjunctivitis) and is linked epidemiologically to a confirmed case. Measles cases are laboratory confirmed if there is detection in serum of measles-specific immunoglobulin M, isolation of measles virus, or detection of measles virus nucleic acid from a clinical specimen. Cases are considered imported if at least some of the exposure period (7–21 days before rash onset) occurred outside the United States and rash occurred within 21 days of entry into the United States, with no known exposure to measles in the United States during that time. An outbreak of measles is defined as a chain of transmission of three or more confirmed cases.

Patients with reported measles cases this year have ranged in age from 2 weeks to 65 years; 18 (6%) were aged <12 months, 48 (17%) were aged 1–4 years, 71 (25%) were aged 5–19 years, and 151 (52%) were aged ≥20 years. Forty-three (15%) were hospitalized, and complications have included pneumonia (five patients), hepatitis (one), pancytopenia (one), and thrombocytopenia (one). No cases of encephalitis and no deaths have been reported.

Measles cases have been reported from 18 states and New York City. Most cases were reported from Ohio (138), California (60), and New York City (26). Fifteen outbreaks have accounted for 227 (79%) of the 288 cases. The median outbreak size has been five cases (range: 3–138 cases). There is an ongoing outbreak involving 138 cases, occurring primarily among unvaccinated Amish communities in Ohio.

Of the 288 cases, 280 (97%) were associated with importations from at least 18 countries. The source of measles acquisition could not be identified for eight (3%) cases. Forty-five direct importations (40 U.S. residents returning from abroad and five foreign visitors) have been reported. Almost half (22 [49%]) of these importations were travelers returning from the Philippines, where a large outbreak has been occurring since October 2013. Imported cases were also associated with travel from other countries in the World Health Organization (WHO) Western Pacific Region (seven cases), as well as countries in the WHO South-East Asia (eight), European (four), Americas (three), and Eastern Mediterranean (one) regions. Measles genotype information was obtained from 103 (36%) of the 288 measles cases. Four measles virus genotypes were identified: B3 (67 cases), D9 (23), D8 (12), and H1 (one) (Table).

Most of the 288 measles cases reported this year have been in persons who were unvaccinated (200 [69%]) or who had an unknown vaccination status (58 [20%]); 30 (10%) were in persons who were vaccinated. Among the 195 U.S. residents who had measles and were unvaccinated, 165 (85%) declined vaccination because of religious, philosophical, or personal objections, 11 (6%) were missed opportunities for vaccination, and10 (5%) were too young to receive vaccination (Figure).

Discussion

Measles elimination has been maintained in the United States since elimination was declared almost 15 years ago. However, approximately 20 million cases of measles occur each year globally, and importations into the United States continue to pose a risk for measles cases and outbreaks among unvaccinated persons. The 288 measles cases reported during January 1–May 23, 2014, including an ongoing outbreak involving 138 persons in Ohio, represent the highest number of measles cases reported

* Available at http://www.cdc.gov/vaccines/pubs/surv-manual/chpt07-measles.pdf.

TABLE. Countries associated with imported measles cases, by World Health Organization (WHO) region, number of cases (N = 45), and genotype — United States, January 1–May 23, 2014

WHO region	No. of cases	Country	No. of cases	Genotype*
African	0	—	—	
Eastern Mediterranean	1	Pakistan	1	B3
European	4	Dubai/Germany/England	1†	B3
		France/Belgium	1†	D8
		Netherlands	1	
		Republic of Georgia	1	B3
Americas	3	Brazil	1	B3
		Chile	1	D8
		Canada	1	D8
South-East Asia	8	India	6	D8
		Indonesia	1	
		Thailand/South Korea	1†	
Western Pacific	29	China	2	H1
		Micronesia	1	B3
		Philippines	22	B3, D9
		Saipan	1	B3
		Singapore	1	D8
		South-East Asia/Philippines	1†	
		Vietnam	1	D8

* Genotype was determined based on methodology described in the WHO measles virus nomenclature 2012 update: Wkly Epidemiol Rec 2012;87:73–80. Genotypes listed are those identified in a sample from the imported case or from a case that is epidemiologically linked to that importation.
† Patient had visited more than one country where measles is endemic during the incubation period, and exposure could have occurred in any of the countries and regions listed.

for that period since 1994. The increase in measles this year serves as a reminder for health-care providers to be cognizant of the possibility of measles cases occurring in their communities.

Health-care providers should maintain a high suspicion for measles among febrile patients with rash. Patients with clinical symptoms compatible with measles (febrile rash plus cough, coryza, and/or conjunctivitis), should be asked about recent travel abroad and contact with returning travelers, and their vaccination status should be verified. Measles cases have been initially misdiagnosed as Kawasaki disease, dengue, and scarlet fever, among other diseases, underscoring the importance of considering measles in the differential diagnosis of clinically compatible cases. It is important to obtain viral specimens for confirmation and genotyping on any patient when measles is suspected, in addition to serology. Genetic characterization of measles virus can suggest the likely source of an imported virus. Because patients with measles often seek medical care, early recognition of suspected measles cases and implementation of appropriate infection control measures are vital to reduce transmission in health-care settings. Where possible, because of the high transmissibility of measles, patients with suspected measles should be promptly screened before entering waiting rooms and appropriately isolated (i.e., in an airborne isolation room or, if not available, in a separate room with the door closed), or have their office appointments scheduled at the end of the day to prevent exposure of other patients (*4*). To assist state and local public health departments with rapid investigation and control efforts to limit the spread of disease, suspected measles cases should be reported to local health departments immediately. State health departments should notify CDC about cases of measles within 24 hours of detection (*5*).

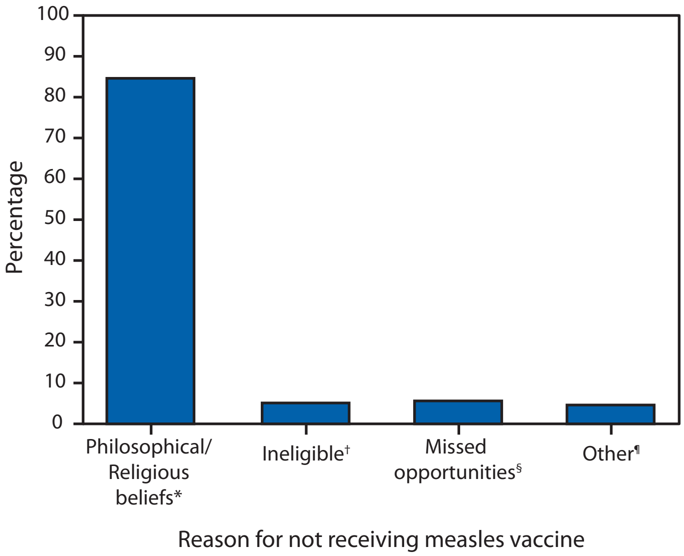
To date in 2014, a total of 40 importations have been reported among unvaccinated returning U.S. travelers. Among these, 22 acquired measles in the Philippines, where 32,030 measles cases (26,014 suspected cases and 6,016 confirmed cases) and 41 measles deaths have been reported from January 1 through April 20†. The large number of importations from the Philippines highlights how importations are related to increases in measles incidence in countries that are common destinations for U.S. travelers. Because measles remains endemic in countries in five out of the six WHO regions of the world, including India, from where six importations have occurred this year, the source of imported cases could be any country where measles continues to circulate. This underscores the importance of ensuring age-appropriate vaccination for all persons before international travel to any region of the world.

Health-care providers should remind persons who plan to travel internationally, including travel to large international events and gatherings (e.g., the 2014 FIFA World Cup in Brazil), of the increased risk for measles, § and encourage timely vaccination of all persons aged ≥6 months without evidence of measles immunity.¶ One dose of measles-mumps-rubella (MMR) vaccine is recommended for infants aged 6–11 months before travel, and 2 doses for persons aged ≥12 months, with a minimum interval between doses of 28 days (*6*).

In the three largest outbreaks of 2014, which account for over a half of all cases this year, transmission occurred after introduction of measles into communities with pockets of persons who were unvaccinated because of philosophical or religious beliefs. Although high population immunity throughout the United States (through maintaining ≥90% MMR vaccine coverage among children aged 19–35 months and adolescents) prevents spread from most importations (*7,8*), coverage varies

† Additional information available at http://www.wpro.who.int/immunization/documents/MRBulletinVol8Issue04.pdf?ua=1.
§ Additional information available at http://wwwnc.cdc.gov/travel/notices.
¶ Presumptive evidence of measles immunity: 1) documentation of age-appropriate vaccination with a live measles virus–containing vaccine (preschool-aged children: 1 dose; school-aged children [grades K–12]: 2 doses; adults not at high risk: 1 dose); or 2) laboratory evidence of immunity; or 3) laboratory confirmation of disease; or 4) born before 1957.

FIGURE. Percentage of U.S. residents with measles who were unvaccinated (N = 195), by reason for not receiving measles vaccine — United States, January 1–May 23, 2014



* Includes persons who were unvaccinated because of their own or their parents' beliefs.
† Includes person ineligible for measles vaccination, generally those aged <12 months.
§ Includes children aged 16 months–4 years who had not been vaccinated and international travelers aged ≥6 months who were unvaccinated but had no exemption.
¶ Includes persons who were known to be unvaccinated and the reason was unknown, and those who were born before 1957 and presumed to be immune.

at the local level, and unvaccinated children tend to cluster geographically, increasing the risk for outbreaks (*9*). Thus, maintaining high measles vaccination coverage is critical to prevent large measles outbreaks in the United States, and to protect and limit spread to infants too young to be vaccinated and to persons who cannot be vaccinated because of medical contraindications.

In the United States, routine MMR vaccination is recommended for all children, with the first dose given at age 12–15 months, and a second dose at age 4–6 years. Catch-up vaccination is recommended for children and adolescents who have not received 2 appropriately spaced doses. Unless they have other evidence of immunity, adults should receive at least 1 dose of MMR vaccine, and 2 appropriately spaced doses of MMR vaccine are recommended for health-care personnel, college students, and international travelers (*6*).

The findings in this report are subject to at least two limitations. First, underreporting might have occurred. Second, for a few cases complete data could not be ascertained (e.g., the source of infection). However, national surveillance is considered adequate to detect measles circulation in the United States in the postelimination era (*10*). These numbers are considered preliminary and are subject to change should additional details become available.

Despite maintenance of measles elimination in the United States, importations from endemic countries continue to occur and have caused an unusually high number of measles cases in 2014. The most frequent sources of importations were unvaccinated U.S. travelers returning from abroad, with subsequent transmission among clusters of unvaccinated persons. Encouraging timely delivery of measles vaccination for persons traveling internationally and sustaining high vaccination coverage in the United States in accordance with the Advisory Committee on Immunization Practices (ACIP) routine immunization schedule are essential to limit measles importations and the spread of disease. To help expedite public health containment strategies, health-care providers should maintain a high awareness of measles, implement appropriate infection control measures when measles is suspected, and promptly report suspected cases to their local health departments.

What is already known on this topic?

Measles elimination (i.e., interruption of year-round endemic transmission) has been maintained in the United States since 2000. Despite progress in global measles control, measles remains common in many countries of the world, and measles is imported regularly into the United States.

What is added by this report?

Both the highest number of measles cases and the largest outbreak since elimination have been reported to CDC this year. As of May 23, 2014, a total of 288 cases were reported, of which 258 (90%) were in persons who were unvaccinated or had unknown vaccination status. Forty (89%) of the 45 importations were associated with U.S. travelers returning from abroad.

What are the implications for public health practice?

Importations of measles into communities with unvaccinated persons can lead to measles cases and outbreaks in the United States. Maintenance of high vaccination coverage, ensuring timely vaccination before travel, and early detection and isolation of cases, are key factors to limit importations and the spread of disease.

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Notes from the Field

Chikungunya Virus Spreads in the Americas — Caribbean and South America, 2013–2014

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(Author affiliations at end of text)

In December 2013, the World Health Organization reported the first local transmission of chikungunya virus in the Western Hemisphere, with autochthonous cases identified in Saint Martin (*1*). Since then, local transmission has been identified in 17 countries or territories in the Caribbean or South America (Anguilla, Antigua and Barbuda, British Virgin Islands, Dominica, Dominican Republic, French Guiana, Guadeloupe, Guyana, Haiti, Martinique, Puerto Rico, Saint Barthelemy, Saint Kitts and Nevis, Saint Lucia, Saint Martin, Saint Vincent and the Grenadines, and Sint Maarten). As of May 30, 2014, a total of 103,018 suspected and 4,406 laboratory-confirmed chikungunya cases had been reported from these areas.* The number of reported cases nearly doubled during the previous 2 weeks. More than 95% of the cases have been reported from five jurisdictions: Dominican Republic (38,656 cases), Martinique (30,715), Guadeloupe (24,428), Haiti (6,318), and Saint Martin (4,113). The highest incidences have been reported from Saint Martin (115 cases per 1,000 population), Martinique (76 per 1,000), Saint Barthelemy (74 per 1,000), and Guadeloupe (52 per 1,000). Further expansion of these outbreaks and spread to other countries in the region is likely.

Chikungunya virus is a mosquito-borne alphavirus transmitted primarily by *Aedes aegypti* and *Aedes albopictus* mosquitoes (*1–3*). These vectors also transmit dengue virus and are found throughout much of the Americas, including parts of the United States. Humans are the primary amplifying host for chikungunya virus, and most infected persons develop symptomatic disease (*2*). The most common clinical findings are acute onset of fever and polyarthralgia. Joint pains are usually bilateral and symmetric; they can be severe and debilitating. Mortality is rare and occurs mostly in older adults.

Chikungunya outbreaks previously have been documented in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans. Before the cases on Saint Martin, the only chikungunya cases identified in the Americas were in travelers to or from known endemic areas. None of these cases resulted in local transmission or outbreaks.

Chikungunya is not a nationally notifiable disease in the United States. However, chikungunya cases can be reported to ArboNET, a national passive surveillance system for arthropod-borne diseases. During 2006–2013, studies identified an average of 28 persons per year (range: 5–65) with positive tests for recent chikungunya virus infection from one of the four U.S. laboratories that perform testing. All were travelers visiting or returning to the United States from affected areas, mostly in Asia (*1,4*). Only 23% of the cases were reported to ArboNET. Beginning in 2014, cases have been identified in travelers returning from the Caribbean. As of June 2, a total of 28 chikungunya cases had been reported to ArboNET from U.S. states and territories. On May 30, the Puerto Rico Department of Health reported their first locally transmitted case; local transmission has not been identified in other U.S. states or territories. The remaining U.S. cases have occurred in travelers returning from affected areas, including 26 travelers returning from the Caribbean (Dominica, Dominican Republic, Haiti, Martinique, Saint Martin, and Sint Maarten) and one traveler returning from Asia (Indonesia). With the recent outbreaks in the Caribbean and the Pacific, the number of chikungunya cases among travelers visiting or returning to the United States from affected areas will likely increase. These imported cases could result in local spread of the virus in other parts of the United States.

Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia, especially travelers who recently returned from areas with known virus transmission. Chikungunya virus diagnostic testing currently is performed at CDC, three state health departments (California, Florida, and New York), and one commercial laboratory (Focus Diagnostics).

No specific treatment, vaccine, or preventive drug is available for chikungunya virus infection. Treatment is palliative and can include rest, fluids, and use of analgesics and antipyretics (*1,3*). Most patients' symptoms improve within 1 week. In some persons, joint pain can persist for months (*2,3*). The best way to prevent chikungunya virus infection is to avoid mosquito bites: use air conditioning or screens when indoors, use insect repellents, and wear long sleeves and pants when outdoors. Persons infected with chikungunya virus should be protected from mosquito exposure during the first week of illness to prevent further spread of the virus.

* *Suspected case:* patient with acute onset of fever >101°F (>38°C) and severe arthralgia or arthritis not explained by other medical conditions, and who resides or has visited epidemic or endemic areas within 2 weeks before the onset of symptoms. *Confirmed case:* a suspected case with laboratory evidence of recent chikungunya virus infection (i.e., viral isolation, reverse transcription–polymerase chain reaction, immunoglobulin M antibodies, or a fourfold or greater increase in virus-specific neutralizing antibody titers) (*3*).

Health-care providers are encouraged to report suspected chikungunya cases to their state or local health department to facilitate diagnostic testing and mitigate the risk for local transmission. CDC and the Council of State and Territorial Epidemiologists urge health departments to perform surveillance for chikungunya cases in returning travelers and be aware of the risk for possible local transmission in areas where *Aedes* species mosquitoes are currently active. State health departments are encouraged to report confirmed chikungunya virus infections to CDC through ArboNET (*1*).

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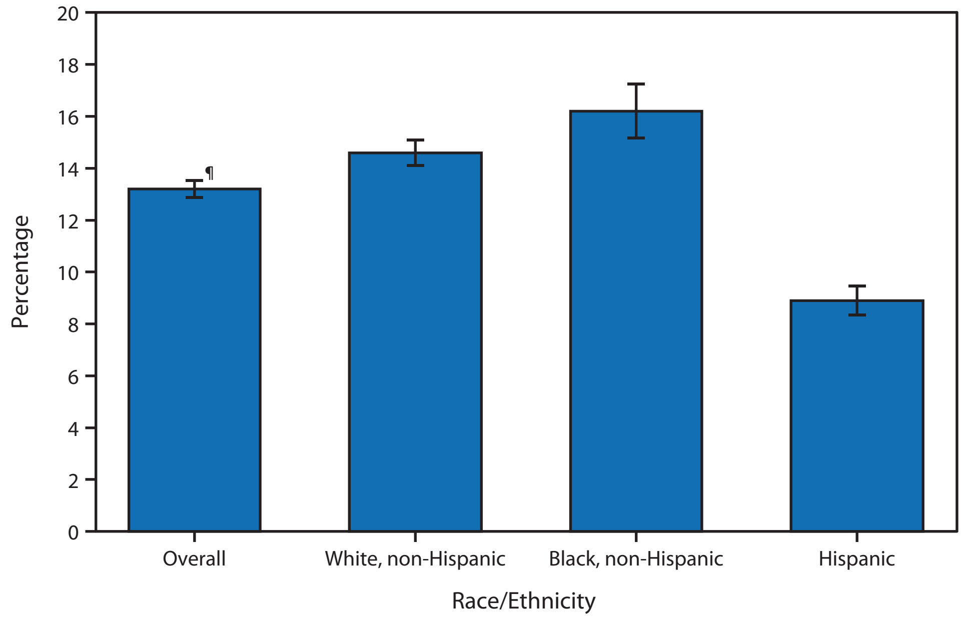
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Children Aged <18 Years with a Health Problem for Which They Have Taken Prescription Medication Regularly for ≥3 Months,* by Race/Ethnicity† — National Health Interview Survey, United States, 2012§



* Based on a survey question that asked respondents, "Does [your child] now have a problem for which [he/she] has regularly taken prescription medication for at least 3 months?" Unknowns were not included in the denominators when calculating percentages.
† Children of Hispanic ethnicity might be of any race or combination of races. Non-Hispanic children are not of Hispanic ethnicity, regardless of race.
§ Estimates are age-adjusted using the projected 2000 U.S. population as the standard population and using age groups 0–4 years, 5–11 years, and 12–17 years.
¶ 95% confidence interval.

In 2012, overall, 13% of children aged <18 years had a health problem for which prescription medication had been taken regularly for ≥3 months. Non-Hispanic white children (15%) and non-Hispanic black children (16%) were more likely to have taken a regular medication for a health problem for ≥3 months than Hispanic children (9%).

Source: Bloom B, Jones LI, Freeman G. Summary health statistics for U.S. children: National Health Interview Survey, 2012. Vital Health Stat 2013;10(258).

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