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National Black HIV/AIDS Awareness Day — February 7, 2019

National Black HIV/AIDS Awareness Day is observed each year on February 7 to highlight the continuing disproportionate impact of human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) on the U.S. black/African American (black) population.

In 2017, blacks represented 13% of the U.S. population (*1*), but accounted for 44% of all new HIV diagnoses (*2*). Among racial/ethnic groups, the highest rate of new HIV diagnoses occurred among blacks (41.1 per 100,000 population). Blacks also had the highest rate of new diagnoses of HIV infection in each of the four census regions of the United States; the highest overall rate was among blacks in the South (44.8 per 100,000 population).

Partner services is an effective, high-yield strategy for identifying undiagnosed HIV infections and thereby linking persons with newly diagnosed HIV infection into HIV care. A study reported in this issue of *MMWR* presents the first national level analysis of HIV partner services offered to blacks through CDC-funded health departments (*3*). CDC supports a range of efforts to reduce the risk for acquiring or transmitting HIV infection among blacks (https://www.cdc.gov/features/BlackHIVAIDSAwareness).

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HIV Partner Service Delivery Among Blacks or African Americans — United States, 2016

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Identifying persons with human immunodeficiency virus (HIV) infection who are unaware of their infection status, linking them to HIV care, and reducing racial/ethnic disparities are important national HIV prevention goals (*1*). Blacks/African Americans (blacks)* are disproportionately affected by HIV infection in the United States. Although blacks represent 13% of the U.S. population (*2*), in 2017, 44% of diagnoses of HIV infection were in blacks, and the rate of new diagnoses in blacks (41.1 per 100,000 persons) was approximately eight times that of non-Hispanic whites (5.1) (*3*). HIV partner services are offered by health officials to persons with diagnosed HIV infection (index patients) and their sex- or needle-sharing partners, who are notified of their potential HIV exposure and offered HIV testing and related services (*4*). CDC analyzed 2016

* Persons categorized as blacks/African Americans were not Hispanic or Latino.

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data from the National HIV Prevention Program Monitoring and Evaluation system submitted by 59 health departments.[†] Among 49,266 index patients identified as potential candidates for partner services, 21,191 (43%) were black. The percentage of black index patients interviewed for partner services (76%) was higher than that for all index patients combined (73%). Among the 11,088 black partners named by index patients, 78% were notified of their potential HIV exposure. Fewer than half (47%) of those notified were tested for HIV infection. Among those tested, one in six (17%) received a new HIV diagnosis. The prevalence of newly diagnosed HIV infection was particularly high among black partners who were gay, bisexual, and other men who have sex with men (MSM) (37%) and transgender persons (38%). Effective implementation of partner services is important to identify HIV infection, link patients to care or reengage them in care, and provide prevention services to reduce HIV transmission.

In 2016, CDC funded 61 state and local health departments to implement comprehensive HIV prevention programs, including partner services. CDC analyzed HIV partner services client-level data in the National HIV Prevention Program Monitoring and Evaluation system submitted by 59 health departments. Data were stratified by age group, gender, U.S. Census region,[§] HIV prevalence,[¶] and priority population (i.e., MSM, transgender persons, persons who inject drugs, heterosexual males, and heterosexual females).[**] An index patient is eligible for partner services if he or she is living within the jurisdiction at the time of report. Named partners are eligible for partner services if there is enough information to potentially locate and notify them of their exposure to HIV. Partners with newly diagnosed HIV infection are defined as

[†] Fifty states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and eight metropolitan statistical areas (MSAs) or specified metropolitan divisions (Baltimore, Chicago, Fulton County (Atlanta), Houston, Los Angeles County, New York City, Philadelphia, and San Francisco). In 2016, two health departments did not submit partner services data and were excluded from the analysis.

[§] U.S. Census regions (includes MSAs): *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, New York City (New York), Pennsylvania, Philadelphia (Pennsylvania), and Rhode Island. *Midwest:* Chicago (Illinois), Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South:* Alabama, Arkansas, Atlanta (Georgia), Baltimore (Maryland), Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, District of Columbia, and West Virginia. *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Los Angeles (California), Montana, Nevada, New Mexico, Oregon, San Francisco, Utah, Washington, and Wyoming; *U.S. dependent areas:* Puerto Rico and U.S. Virgin Islands.

[¶] HIV prevalence is defined based on the number of persons with diagnosed HIV infection in 2010. The jurisdictions are classified based on HIV prevalence as high: ≥20,000; medium: 4,000–19,999; medium–low: 1000–3,999; low: <1,000. https://www.cdc.gov/hiv/pdf/policies/progressreports/cdc-hiv-stateprogressreport.pdf.

[**] MSM includes males who reported male-to-male sexual contact and those who reported both male-to-male sexual contact and injection drug use in the past 12 months. Persons who inject drugs include persons who reported injection drug use in the past 12 months. Heterosexual males include males who only reported heterosexual contact with a female in the past 12 months. Heterosexual female includes females who only reported heterosexual contact with a male in the past 12 months.

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TABLE 1. Number and percentage of all index patients and black index patients offered services through human immunodeficiency virus (HIV) partner services, by demographic characteristics and priority populations — United States,* 2016

Characteristic	All index patients		Black index patients	
	No. (% of total)	No. (%) interviewed	No. (% of total index patients)	No. (%) interviewed
Total	**49,266 (100.0)**	**36,037 (73.1)**	**21,191 (43.0)**	**16,153 (76.2)**
Age group (yrs)†				
13–19	1,002 (2.0)	800 (79.8)	654 (65.3)	527 (80.6)
20–29	15,577 (31.6)	12,086 (77.6)	8,167 (52.4)	6,460 (79.1)
30–39	12,941 (26.3)	9,462 (73.1)	5,223 (40.4)	3,962 (75.9)
40–49	8,569 (17.4)	5,956 (69.5)	2,853 (33.3)	2,075 (72.7)
≥50	10,635 (21.6)	7,545 (70.9)	4,163 (39.1)	3,112 (74.8)
Gender§				
Male	40,148 (81.5)	29,167 (72.6)	15,853 (39.5)	12,007 (75.7)
Female	7,076 (14.4)	5,308 (75.0)	4,352 (61.5)	3,323 (76.4)
U.S. Census region¶				
Northeast	5,884 (11.9)	4,696 (79.8)	2,760 (46.9)	2,222 (80.5)
Midwest	4,263 (8.7)	2,586 (60.7)	2,026 (47.5)	1,279 (63.1)
South	28,002 (56.8)	22,387 (79.9)	14,516 (51.8)	11,538 (79.5)
West	10,772 (21.9)	6,031 (56.0)	1,882 (17.5)	1,108 (58.9)
U.S. dependent areas	345 (0.7)	337 (97.7)	7 (2.0)	6 (85.7)
HIV prevalence**				
High	32,920 (66.8)	24,486 (74.4)	1,4084 (42.8)	11,207 (79.6)
Medium	14,876 (30.2)	10,466 (70.4)	6,763 (45.5)	4,685 (69.3)
Medium–low	1,128 (2.3)	812 (72.0)	274 (24.3)	199 (72.6)
Low	342 (0.7)	273 (79.8)	70 (20.5)	62 (88.6)
Priority population††				
MSM	22,780 (46.2)	19,200 (84.3)	8,155 (35.8)	7,362 (90.3)
Transgender persons	507 (1.0)	374 (73.8)	284 (56.0)	226 (79.6)
Persons who inject drugs	768 (1.6)	640 (83.3)	192 (25.0)	166 (86.5)
Heterosexual men	4,125 (8.4)	3,705 (89.8)	2,395 (58.1)	2,192 (91.5)
Heterosexual women	3,914 (7.9)	3,568 (91.2)	2,523 (64.5)	2,340 (92.7)

Abbreviation: MSM = gay, bisexual, and other men who have sex with men.

* Includes U.S. dependent areas of Puerto Rico and the U.S. Virgin Islands.

† Because of missing/invalid data, records were excluded in the column "All index patients" for number of index patients (542; 1.1%) and number interviewed (188; 0.5%) and in the column "Black index patients" for number of black index patients (131; 0.6%) and number interviewed (17; 0.1%).

§ Records for transgender persons and other missing/invalid genders were excluded in the column "All index patients" for number of index patients (2,042; 4.1%) and number interviewed (1,562; 4.3%) and in the column "Black Index Patients" for number of black index patients (986; 4.7%) and number interviewed patients (823; 5.1%).

¶ *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Midwest:* Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South:* Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; *U.S. dependent areas:* Puerto Rico and U.S. Virgin Islands. Two states did not submit data.

** Jurisdictions are grouped according to HIV prevalence and based on the number of persons with diagnosed HIV infection in 2010 (high: ≥20,000; medium: 4,000–19,999; medium–low: 1,000–3,999; and low: <1,000).

†† Because of missing risk information, records were excluded in the column "All index patients" for number of index patients (17,172; 34.9%) and number interviewed (8,550; 20.7%) and in the column "Black index patients" for number of black index patients (7,642; 36.1%) and number interviewed (3,867; 23.9%). MSM include males who reported male-to-male sexual contact as well as males who reported both male-to-male sexual contact and injection drug use in the past 12 months. Persons who inject drugs include persons who reported injection drug use in the past 12 months. Heterosexual males include males who only reported heterosexual contact with a female in the past 12 months. Heterosexual females include females who only reported heterosexual contact with a male in the past 12 months. Data on behavioral risk factors used to define the priority population were required for HIV–positive persons and optional for HIV-negative persons.

those who test positive for HIV through partner services–initiated HIV testing and have no evidence of a previous HIV diagnosis reported to the health department surveillance system; recorded in a laboratory report, medical record, or other available data source (e.g., partner services database or records of previous treatment for HIV infection); or recorded in a patient self-report. Partners with a previous diagnosis of HIV infection are those who test positive and have evidence of a previous HIV diagnosis. Data on index patients and partners were extracted from two databases that did not link the race/ethnicity of index patients and partners. Thus, black partners included in this analysis could have been named by index patients of any race/ethnicity. Data on behavioral risk factors used to define the priority population were required for HIV-positive persons and optional for HIV-negative persons. The key outcomes for this analysis include the percentage of black index patients who were interviewed for partner services,

TABLE 2. Number and percentage of black partners named, notified, and tested, and new and previous diagnoses of human immunodeficiency virus (HIV) infection through HIV partner services programs, by characteristic — United States,* 2016

Characteristic	Named partners, no. (% by group)	Named partners notified, no. (%)	Notified partners tested, no. (%)	Tested partners with newly diagnosed HIV infection, no. (%)	Tested partners with previously diagnosed HIV infection, no. (%)
Total	**11,088 (100.0)**	**8,616 (77.7)**	**4,080 (47.4)**	**690 (16.9)**	**361 (8.8)**
Age groups (yrs)†					
13–19	248 (2.2)	194 (78.2)	126 (64.9)	15 (11.9)	7 (5.6)
20–29	4,136 (37.3)	3,260 (78.8)	1,837 (56.3)	275 (15.0)	183 (10.0)
30–39	2,484 (22.4)	1,909 (76.9)	1,032 (54.1)	173 (16.8)	89 (8.6)
40–49	1,170 (10.6)	914 (78.1)	504 (55.1)	78 (15.5)	36 (7.1)
≥50	2,113 (19.1)	1,792 (84.8)	483 (27.0)	140 (29.0)	44 (9.1)
Gender§					
Male	8,563 (77.2)	6,555 (76.6)	3,168 (48.3)	540 (17.0)	285 (9.0)
Female	1,736 (15.7)	1,389 (80.0)	839 (60.4)	98 (11.7)	74 (8.8)
U.S. Census region¶					
Northeast	1,406 (12.7)	704 (50.1)	355 (50.4)	72 (20.3)	8 (2.3)
Midwest	1,130 (10.2)	650 (57.5)	273 (42.0)	64 (23.4)	7 (2.6)
South	7,848 (70.8)	6,872 (87.6)	3,268 (47.6)	539 (16.5)	335 (10.3)
West	700 (6.3)	388 (55.4)	183 (47.2)	14 (7.7)	11 (6.0)
U.S. dependent areas	4 (0.0)	2 (50.0)	1 (50.0)	1 (100.0)	0 (–)
HIV prevalence**					
High	7,407 (66.8)	6,353 (85.8)	2,964 (46.7)	376 (12.7)	270 (9.1)
Medium	3,388 (30.6)	2,078 (61.3)	1,030 (49.6)	292 (28.3)	85 (8.3)
Medium–low	265 (2.4)	163 (61.5)	70 (42.9)	20 (28.6)	3 (4.3)
Low	28 (0.3)	22 (78.6)	16 (72.7)	2 (12.5)	3 (18.8)
Priority population††					
MSM	1,731 (15.6)	1,392 (80.4)	839 (60.3)	309 (36.8)	170 (20.3)
Transgender persons	58 (0.5)	40 (69.0)	16 (40.0)	6 (37.5)	1 (6.3)
Persons who inject drugs	17 (0.2)	15 (88.2)	8 (53.3)	2 (25.0)	1 (12.5)
Heterosexual men	542 (4.9)	452 (83.4)	309 (68.4)	69 (22.3)	66 (21.4)
Heterosexual women	467 (4.2)	398 (85.2)	270 (67.8)	65 (24.1)	55 (20.4)

Abbreviation: MSM = gay, bisexual, and other men who have sex with men.

* Includes U.S. dependent areas of Puerto Rico and the U.S. Virgin Islands.

† Because of missing/invalid data, records were excluded in the columns for named partners (937; 8.5%); notified partners (547; 6.3%); tested partners (98; 2.4%); newly diagnosed HIV–positive partners (9; 1.3%); and previously diagnosed HIV–positive partners (2; 0.2%).

§ Because of missing/invalid data, records for transgender persons and other missing/invalid genders were excluded in the columns for named partners (789; 7.1%); notified partners (672; 7.8%); tested partners (73; 1.8%); newly diagnosed HIV–positive partners (52; 7.5%); and previously diagnosed HIV–positive partners (2; 0.6%).

¶ *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Midwest:* Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South:* Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; *U.S. dependent areas:* Puerto Rico and U.S. Virgin Islands. Two states did not submit data.

** Jurisdictions are grouped according to HIV prevalence and based on the number of persons with diagnosed HIV infection in 2010 (high: ≥20,000; medium: 4,000–19,999; medium–low: 1,000–3,999; and low: <1,000).

†† Because of missing risk information, records were excluded in the columns for named partners (8,273; 74.6%); notified partners (6,319; 73.3%); tested partners (2,638; 64.7%); newly diagnosed HIV–positive partners (239; 34.6%); and previously diagnosed HIV–positive partners (68; 18.8%). MSM include males who reported male-to-male sexual contact as well as males who reported both male-to-male sexual contact and injection drug use in the past 12 months. Persons who inject drugs include persons who reported injection drug use in the past 12 months. Heterosexual males include males who only reported heterosexual contact with a female in the past 12 months. Heterosexual females include females who only reported heterosexual contact with a male in the past 12 months. Data on behavioral risk factors used to define the priority population were required for HIV–positive persons and optional for HIV-negative persons.

HIV status, and the HIV positivity rate among black partners named during the partner services interviews.

Overall, 49,266 index patients were identified as potential candidates for partner services in 2016, including 21,191 (43.0%) who were black (Table 1). The percentage of interviews of black index patients by partner services were higher among those aged 13–19 years (80.6%); females (76.4%); persons residing in the Northeast (80.5%) (excluding U.S. dependent areas); persons residing in low HIV prevalence areas (88.6%), and heterosexual women (92.7%). Among priority populations, percentages of interviews among black index patients by partner services exceeded 90% among heterosexual women (92.7%), heterosexual men (91.5%), and MSM (90.3%); the lowest percentages of interviews among black index patients occurred among those who inject drugs (86.5%) and transgender patients (79.6%).

Among 27,779 partners named by index patients in 2016, a total of 11,088 (39.9%) were black (Table 2). Among named partners who were black, 77.7% (8,616) were notified of their potential HIV exposure. Among partners who were

notified, 4,080 (47.4%) were tested for HIV infection. The highest percentages of testing occurred among black partners aged 13–19 years (64.9%); females (60.4%); residents of the Northeast (50.4%); residents of low HIV prevalence areas (72.7%); and heterosexual men (68.4%).

Among black partners tested in 2016, 16.9% received a new diagnosis of HIV infection. Newly diagnosed HIV positivity among black partners was higher among persons aged ≥50 years (29.0%); males (17.0%); those residing in the Midwest (23.4%) (excluding U.S. dependent areas); persons residing in medium and medium–low prevalence areas (28.3% and 28.6%, respectively); transgender persons (37.5%); and MSM (36.8%). Among black partners tested, the percentage with previously diagnosed HIV infection was 8.8%. The prevalence of previously diagnosed HIV infection among black partners tested was higher among persons aged 20–29 years (10.0%); males (9.0%); persons residing in the South (10.3%); persons residing in low prevalence areas (18.8%); and heterosexual men (21.4%). Among black MSM partners, 60.3% were tested for HIV.

Summary

What is already known about this topic?

In 2017, the rate of diagnosis of new human immunodeficiency virus (HIV) infection among blacks/African Americans (blacks) was approximately eight times that of non-Hispanic whites.

What is added by this report?

In 2016, 78% of black index patients were interviewed for partner services. However, among black partners, fewer than half were tested for HIV infection, 17% received a new diagnosis of HIV infection, and 9% were previously infected. The prevalence of newly diagnosed HIV infection was particularly high among black partners who were gay, bisexual, and other men who have sex with men (MSM) (37%) and transgender persons (38%).

What are the implications for public health practice?

Focusing effective implementation of partner services for blacks, especially for MSM and transgender persons, could lead to reductions in HIV incidence and HIV-related inequities.

Discussion

Among MSM, blacks accounted for 38% of HIV diagnoses in 2017 (*3*). The present analysis found that partner services implemented by CDC-funded health departments interviewed approximately three of four black index patients. Index patients who were black MSM accounted for 45.6% (7,362 of 16,153) of partner services interviews among all black index patients, and approximately 90% of those in this group were interviewed. Fewer than half of all black partners notified of their potential HIV exposure were tested. Among those tested, one in six received a new diagnosis of HIV infection, and one in 11 had a previous diagnosis. The rate of newly diagnosed HIV infection was particularly high among black partners who were MSM (37%) and transgender persons (38%). The high HIV positivity rates among black partners and black MSM partners who were tested are consistent with previous findings that indicate partner services is an effective, high-yield strategy for identifying undiagnosed HIV infections (*5*,*6*). Prevention efforts that promote HIV testing and consistently include partner services might increase early diagnosis and improve HIV-related health outcomes among blacks, particularly among black MSM and transgender persons.

The findings in this report are subject to at least three limitations. First, although CDC provides recommendations outlining the basic elements of partner services (*4*), health department implementation varies considerably. Health departments employ different methods and models for partner services that depend on local legislation and regulations, local service delivery systems, and available resources, including trained disease intervention specialists. Second, the rate of newly diagnosed HIV infection might have been overestimated in those jurisdictions that do not routinely check their laboratory or surveillance records to identify persons with previously diagnosed HIV infection and those jurisdictions with a large proportion of missing data on behavioral risk information. Finally, even though partner services evaluation data requirements are standardized, data collection approaches and systems vary among CDC-funded recipients.

Full and effective implementation of partner services programs to reach all index patients and partners, particularly black MSM and transgender persons, as recommended by the National HIV/Acquired Immunodeficiency Syndrome (AIDS) Strategy, is important to identifying persons who are unaware of their HIV status (*1*). Further, partner services program managers need to ensure that disease intervention specialists have access to all the resources needed to identify and locate partners named by index patients during partner services interviews and to link newly diagnosed partners to HIV medical care. In addition, partner services offer the opportunity to reengage both index patients and previously diagnosed partners who are not in care (*4*). Partner services can also facilitate linkage to HIV preexposure prophylaxis and other prevention services, especially for high risk HIV-negative partners of HIV-positive persons, to reduce their risk of HIV acquisition (*7*). Barriers to effective implementation of partner services and HIV testing include client concerns about compromised confidentiality and fear of negative impacts (e.g., abuse, stigmatization, medical mistrust, and abandonment) (*8*–*10*). Therefore, HIV prevention programs, such as partner services that focus on increasing testing, enhancing linkage to HIV care, reengaging patients with previously diagnosed HIV

infection in care, providing prophylactic treatment, and increasing access to support services for blacks, would help to address barriers to service and so reduce onward HIV transmission and HIV-related health disparities.

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Use of Toothpaste and Toothbrushing Patterns Among Children and Adolescents — United States, 2013–2016

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Fluoride use is one of the main factors responsible for the decline in prevalence and severity of dental caries and cavities (tooth decay) in the United States (*1*). Brushing children's teeth is recommended when the first tooth erupts, as early as 6 months, and the first dental visit should occur no later than age 1 year (*2–4*). However, ingestion of too much fluoride while teeth are developing can result in visibly detectable changes in enamel structure such as discoloration and pitting (dental fluorosis) (*1*). Therefore, CDC recommends that children begin using fluoride toothpaste at age 2 years. Children aged <3 years should use a smear the size of a rice grain, and children aged >3 years should use no more than a pea-sized amount (0.25 g) until age 6 years, by which time the swallowing reflex has developed sufficiently to prevent inadvertent ingestion. Questions on toothbrushing practices and toothpaste use among children and adolescents were included in the questionnaire component of the National Health and Nutrition Examination Survey (NHANES) for the first time beginning in the 2013–2014 cycle. This study estimates patterns of toothbrushing and toothpaste use among children and adolescents by analyzing parents' or caregivers' responses to questions about when the child started to brush teeth, age the child started to use toothpaste, frequency of toothbrushing each day, and amount of toothpaste currently used or used at time of survey. Analysis of 2013–2016 data found that >38% of children aged 3–6 years used more toothpaste than that recommended by CDC and other professional organizations. In addition, nearly 80% of children aged 3–15 years started brushing later than recommended. Parents and caregivers can play a role in ensuring that children are brushing often enough and using the recommended amount of toothpaste.

NHANES is a multistage probability sample of the noninstitutionalized U.S. population; data are obtained from assessments made using interview questionnaires and clinical examinations (*5*). This analysis was limited to children and adolescents aged 3–15 years whose parent or caregiver completed the following open-ended questions: "At what age did study participant (SP) start brushing (his/her) teeth?" and "At what age did (SP) start using toothpaste?" The responses were coded into the following four categories: <1 year, 1 year, 2 years, and ≥3 years. Response to the question "How many times (do you/does SP) brush (his/her) teeth in one day?" was recoded into the following three categories: 1 time, 2 times, and 3–6 times. To estimate the amount of toothpaste used, parents were asked, "On average, how much toothpaste (do you/does SP) use when brushing (his/her) teeth?" Responses, based on the amount of toothpaste on the toothbrush, were categorized as smear, pea size, half load, and full load. All analyses were performed using statistical software that accounted for the complex sample design of NHANES. All estimates were obtained using the interview sample weights. Chi-squared tests were used to assess the association between toothbrushing and toothpaste use behaviors and sociodemographic characteristics, and a p-value <0.05 was considered to be statistically significant (*5*).

A total of 5,157 children and adolescents aged 3–15 years were included in this analysis (Table 1). Approximately half (51%) were non-Hispanic white (white), 14.4% were non-Hispanic black (black), and 15.9% were Mexican-American. More than half (52.8%) were from households earning ≥200% of the federal poverty level, and more than two thirds (69.1%) of heads of households had completed more than a high school education. Overall, 20.1%, 38.8%, 26.6%, and

TABLE 1. Characteristics of a sample of 5,157* children and adolescents aged 3–15 years included in analysis of toothbrushing behaviors — National Health and Nutrition Examination Survey, United States 2013–2016

Characteristic	No.	% (95% CI)
Age group (yrs)		
3–6	1,686	29.7 (28.1–31.4)
7–11	2,116	37.7 (36.3–39.2)
12–15	1,355	32.5 (30.7–34.4)
Sex		
Male	2,644	51.5 (49.4–53.5)
Female	2,513	48.5 (46.5–50.6)
Race/Ethnicity		
White, non-Hispanic	1,333	51.0 (43.2–58.8)
Black, non-Hispanic	1,286	14.4 (10.8–18.8)
Mexican-American	1,119	15.9 (11.8–21.1)
Other	1,419	18.8 (16.0–21.8)
Poverty status†		
<100% FPL	1,545	23.3 (19.4–27.7)
100%–199% FPL	1,300	23.9 (21.5–26.6)
≥200% FPL	1,882	52.8 (47.1–58.4)
Head of household education†		
<High school	1,032	15 (12.0–18.7)
High school	939	15.9 (13.5–18.7)
>High school	3,101	69.1 (63.7–73.9)

Abbreviations: CI = confidence interval; FPL = federal poverty level.
* Representing an estimated 51,554,933 U.S. children and adolescents aged 3–15 years.
† Excludes 430 children and adolescents with missing values on poverty status and 130 children with missing values for head of household/education level.

14.5% of children and adolescents were reported to have started brushing their teeth at age <1 year, 1 year, 2 years, and ≥3 years, respectively (Table 2). Approximately 60% of white and black children were reported to have started toothbrushing at age ≤1 year, including 22.9% and 18.6%, respectively, at age <1 year, and 40.8% and 40.0%, respectively, at age 1 year. Among Mexican-American children, nearly half (49.3%) were reported to have started toothbrushing at age ≤1 year, including 15.4% at age <1 year and 33.9% at age 1 year. More than one fifth (22.6%) of Mexican-American children were reported to have initiated toothbrushing at age ≥3 years, compared with 11.4% of white children and 13.9% of black children. Among children living with a head of household with less than a high school education, 44.5% were reported to start tooth-brushing at age ≤1 year compared with 63.2% of those living with a head of household with higher than a high school education. Overall, 60.5% of children aged 3–15 years were reported to brush their teeth twice a day.

Initiation of toothpaste use at age <1 year, 1 year, 2 years, and ≥3 years was reported for 9.0%, 35.2%, 32.7%, and 23.1% of children, respectively. Overall, 8.9%, 10.8%, and 7.7% of white, black, and Mexican-American children, respectively, were reported to have started to use toothpaste at age <1 year, whereas 21.4%, 17.3%, and 31.2% of white, black, and Mexican-American children, respectively, were reported to have started at age ≥3 years. Among children living with a head of household with less than a high school education, nearly 6% were reported to have commenced using toothpaste at age <1 year, compared with 10.6% whose head of household had a high school diploma and 9.3% whose head of household had more than high school education (Table 3).

Approximately 60% of children and adolescents aged 3–15 years reported using a half load (28.7%) or full load (31.4%) of toothpaste when brushing. Among children aged 3–6 years, the reported amount of toothpaste varied: 12.4% used a smear, 49.2% used a pea-sized amount, 20.6% used a half load, and 17.8% used a full load (Table 3).

Discussion

CDC recommends that all persons drink optimally fluoridated water (0.7 mg/L) and if aged ≥2 years, brush their teeth twice daily with a fluoride toothpaste to reduce the risk for dental caries (*1*). CDC also advises parents to consult with their child's dentist or physician before introducing fluoride toothpaste to children aged <2 years (*6*). The American Academy of Pediatrics (AAP), American Academy of Pediatric Dentistry (AAPD), and American Dental Association (ADA) recommend fluoride toothpaste for all children and limit the amount of toothpaste used by children aged <3 years to a "smear" the size of a grain of rice (*2–4*). In this study, >38% of children aged 3–6 years reportedly used a half or full load of toothpaste, exceeding current recommendation for no more than a pea-sized amount (0.25 g) and potentially exceeding recommended daily fluoride ingestion (*1*,*6*). In addition, some children, particularly Mexican-Americans, were reported to have started brushing their teeth and using toothpaste at age ≥3 years, which is later than is recommended. Similarly, some children living in a low-income household or one in which the head of household had less than a high school education were reported to start toothbrushing at age ≥3 years. Recommendations aim to balance the benefits of fluoride exposure for prevention of dental caries with the potential risk for fluorosis when excessive amounts of fluoride toothpaste are swallowed by young children. The findings from this study highlight the importance of recommendations that parents supervise young children during brushing and monitor fluoride ingestion (*7–10*).

Recently, CDC and AAP have begun collaborative work to develop messages targeted at pregnant women and new mothers regarding recommended toothbrushing practices. CDC, AAP, AAPD, and ADA recommend that children aged 3–6 years brush their teeth twice daily using a pea-sized amount of fluoride toothpaste. Supervision is emphasized as a critical role for the parent or caregiver as the child first begins using a toothbrush and toothpaste.

The findings in this report are subject to at least three limitations. First, the measures used are based on parents' self-report, so reporting bias is possible. Second, the question about the amount of toothpaste used focuses on the amount currently used and therefore might overestimate the amount that was used at younger ages. Finally, the type of toothpaste (fluoride versus nonfluoride) was not specified. Use of these self-report

Summary

What is already known about this topic?

Fluoride prevents dental caries; however, excessive ingestion by young children can discolor and pit the permanent teeth. Toothbrushing should commence when the first tooth erupts, and children aged <3 years and 3–6 years should use a smear the size of a rice grain and a pea-sized amount of toothpaste, respectively.

What is added by this report?

In a survey of toothbrushing practices, nearly 80% of children aged 3–15 years began toothbrushing at age ≥1 year, approximately one third brushed once daily, and nearly 40% of children aged 3–6 years used too much toothpaste.

What are the implications for public health practice?

Health care professionals can educate parents about using the recommended amount of fluoride toothpaste under parental supervision to realize maximum benefit.

TABLE 2. Age of initiation of toothbrushing and number of times teeth are brushed per day among children and adolescents aged 3–15 years — National Health and Nutrition Examination Survey, United States 2013–2016

Characteristic	% (SE) Age child initiated toothbrushing				Chi-squared test	% (SE) No. of times teeth brushed per day			Chi-squared test
	<1 yr	1 yr	2 yrs	≥3 yrs		1 time	2 times	3–6 times	
Total	**20.1 (1.1)**	**38.8 (1.2)**	**26.6 (0.8)**	**14.5 (0.9)**	—	**34.2 (1.0)**	**60.5 (1.0)**	**5.3 (0.5)**	—
Age group (yrs)									
3–6	24.7 (1.5)	40.6 (1.3)	25.3 (1.5)	9.4 (1.0)	—*	34.6 (1.7)	59.0 (1.5)	6.4 (0.8)	—*
7–11	19.6 (1.4)	36.9 (1.6)	27.7 (1.6)	15.8 (1.3)		33.7 (1.3)	62.0 (1.3)	4.3 (0.6)	
12–15	16.5 (1.4)	39.3 (2.2)	26.5 (1.8)	17.8 (1.5)		34.3 (2.0)	60.0 (2.0)	5.7 (0.8)	
Sex									
Male	19.0 (1.4)	38.9 (1.6)	25.9 (1.1)	16.2 (1.2)	—*	39.1 (1.5)	56.0 (1.4)	4.9 (0.5)	—*
Female	21.2 (1.1)	38.7 (1.4)	27.3 (1.0)	12.8 (0.9)		29.0 (1.2)	65.2 (1.2)	5.8 (0.7)	
Race/Ethnicity									
White, non-Hispanic	22.9 (2.0)	40.8 (2.1)	24.9 (1.4)	11.4 (1.3)	—*	38.3 (1.6)	58.5 (1.5)	3.2 (0.5)	—*
Black, non-Hispanic	18.6 (1.8)	40.0 (1.6)	27.4 (1.6)	13.9 (1.6)		34.3 (2.3)	60.1 (2.3)	5.6 (0.7)	
Mexican-American	15.4 (1.4)	33.9 (1.2)	28.1 (1.5)	22.6 (1.7)		26.5 (1.4)	63.8 (1.8)	9.7 (1.2)	
Other	17.5 (1.3)	36.5 (2.1)	29.2 (1.7)	16.7 (1.5)		29.4 (2.0)	63.3 (2.0)	7.3 (0.9)	
Poverty status									
<100% FPL	18.0 (1.7)	35.8 (1.6)	27.6 (1.6)	18.5 (1.6)	—*	31.2 (1.5)	60.4 (1.7)	8.4 (1.0)	—*
100%–199% FPL	18.0 (1.7)	39.4 (2.2)	28.8 (1.7)	13.8 (1.7)		34.4 (2.0)	59.9 (2.0)	5.8 (1.0)	
≥200% FPL	23.0 (1.8)	40.1 (1.8)	24.5 (1.5)	12.4 (1.2)		35.9 (1.6)	60.7 (1.6)	3.4 (0.4)	
Head of household education									
<High school	9.7 (1.4)	34.8 (2.0)	30.0 (2.1)	25.4 (1.7)	—*	29.0 (2.4)	62.8 (2.5)	8.2 (1.4)	—*
High school	19.3 (1.6)	35.3 (2.6)	28.9 (1.9)	16.5 (1.4)		37.2 (2.8)	54.6 (2.3)	8.1 (1.5)	
>High school	22.6 (1.4)	40.6 (1.6)	25.2 (1.2)	11.6 (1.0)		34.8 (1.3)	61.1 (1.2)	4.1 (0.5)	

Abbreviations: FPL = federal poverty level; SE = standard error.
* Statistically significant (p<0.05) associations between toothbrushing patterns and the individual sociodemographic factors.

TABLE 3. Age child began using toothpaste and amount of toothpaste used while brushing among children and adolescents aged 3–15 years — National Health and Nutrition Examination Survey, United States 2013–2016

Characteristic	% (SE) Age child began using toothpaste				Chi-squared test	% (SE) Amount of toothpaste used*				Chi-squared test
	<1 year	1 year	2 years	≥3 years		Smear	Pea	Half load	Full load	
Total	**9.0 (0.7)**	**35.2 (1.2)**	**32.7 (1.0)**	**23.1 (1.4)**	—	**6.5 (0.4)**	**33.4 (1.2)**	**28.7 (0.7)**	**31.4 (1.1)**	—
Age group (yrs)										
3–6	9.7 (0.9)	39.5 (1.8)	33.9 (1.6)	16.9 (1.5)	—†	12.4 (0.8)	49.2 (1.7)	20.6 (1.2)	17.8 (1.3)	—†
7–11	9.6 (0.9)	34.4 (1.6)	31.9 (1.3)	24.0 (1.8)		5.1 (0.6)	33.6 (1.6)	32.2 (1.1)	29.1 (1.4)	
12–15	7.7 (1.3)	32.1 (2.1)	32.6 (2.6)	27.6 (1.9)		2.9 (0.8)	18.7 (1.6)	32.0 (1.4)	46.4 (2.0)	
Sex										
Male	9.0 (0.9)	33.6 (1.4)	32.3 (1.2)	25.1 (1.8)	—†	6.6 (0.6)	33.0 (1.4)	29.1 (1.1)	31.3 (1.4)	NS
Female	9.0 (0.9)	36.9 (1.4)	33.2 (1.3)	20.9 (1.4)		6.4 (0.6)	33.9 (1.5)	28.2 (1.3)	31.5 (1.6)	
Race/Ethnicity										
White, non-Hispanic	8.9 (1.3)	36.8 (2.1)	32.9 (1.7)	21.4 (1.9)	—†	6.7 (0.7)	37.1 (1.7)	29.0 (1.3)	27.3 (1.4)	—†
Black, non-Hispanic	10.8 (1.2)	39.9 (1.7)	32.0 (1.5)	17.3 (1.6)		4.7 (0.5)	24.2 (2.1)	24.7 (1.5)	46.4 (1.8)	
Mexican-American	7.7 (1.0)	29.7 (1.6)	31.5 (2.1)	31.2 (2.7)		7.7 (0.8)	30.0 (1.7)	29.4 (1.5)	32.9 (1.7)	
Other	8.9 (1.1)	31.8 (1.7)	34.0 (1.5)	25.3 (1.7)		6.5 (0.8)	33.5 (1.6)	30.3 (1.5)	29.7 (1.5)	
Poverty status										
<100% FPL	10.2 (1.28)	31.7 (1.7)	30.4 (2.0)	27.8 (2.5)	—†	7.4 (0.9)	28.0 (1.6)	28.5 (1.8)	36.0 (1.3)	—†
100%–199% FPL	8.9 (1.1)	32.6 (1.5)	35.6 (1.7)	22.9 (2.0)		5.7 (0.9)	35.3 (2.2)	25.9 (1.2)	33.2 (2.0)	
≥200% FPL	9.0 (1.2)	38.4 (1.9)	31.9 (1.5)	20.7 (1.5)		6.1 (0.6)	34.9 (1.9)	29.9 (1.3)	29.1 (1.8)	
Head of household education										
<High school	5.5 (1.0)	29.4 (1.6)	31.7 (2.6)	33.4 (2.8)	NS	5.7 (0.9)	30.4 (2.3)	29.9 (2.4)	34.0 (1.9)	NS
High school	10.6 (1.4)	31.9 (2.1)	31.6 (1.6)	26.0 (2.2)		6.7 (0.9)	29.9 (2.2)	27.4 (2.3)	36.0 (2.4)	
>High school	9.3 (1.0)	37.2 (1.6)	33.2 (1.3)	20.2 (1.4)		6.5 (0.6)	34.7 (1.4)	28.8 (0.8)	30.0 (1.3)	

Abbreviations: FPL = federal poverty level; NS = not significant; SE = standard error.
* Current amount of toothpaste used was based on the amount of toothpaste on the brush reported by parent or caregiver.
† Statistically significant (p<0.05) associations between toothpaste use patterns and the individual sociodemographic factors.

questions is part of the CDC Division of Oral Health's surveillance plan to improve and monitor fluoride exposure. For future surveillance efforts, it would be ideal to know the amount of toothpaste used when the child first started to use toothpaste and to ensure that the parent or caregiver understands the distinction between the amounts of toothpaste recommended for children and adolescents by using visual aids.

The findings suggest that children and adolescents are engaging in appropriate daily preventive dental health practices; however, implementation of recommendations is not optimal. Careful supervision of fluoride intake improves the preventive benefit of fluoride, while reducing the chance that young children might ingest too much fluoride during critical times of enamel formation of the secondary teeth. Health care professionals and their organizations have an opportunity to educate parents and caregivers about recommended toothbrushing practices to ensure that children are getting the maximum preventive effect by using the recommended amount of fluoride toothpaste under parental supervision.

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Postlicensure Safety Surveillance of Recombinant Zoster Vaccine (Shingrix) — United States, October 2017–June 2018

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Recombinant zoster vaccine (RZV; Shingrix), an adjuvanted glycoprotein vaccine, was licensed by the Food and Drug Administration (FDA) and recommended by the Advisory Committee on Immunization Practices for adults aged ≥50 years in October 2017 (*1*). The previously licensed live-attenuated zoster vaccine (ZVL; Zostavax) is recommended for adults aged ≥60 years. RZV is administered intramuscularly as a 2-dose series, with an interval of 2–6 months between doses. In prelicensure clinical trials, 85% of 6,773 vaccinated study participants reported local or systemic reactions after receiving RZV, with approximately 17% experiencing a grade 3 reaction (erythema or induration >3.5 inches or systemic symptoms that interfere with normal activity). However, rates of serious adverse events (i.e., hospitalization, prolongation of existing hospitalization, life-threatening illness, permanent disability, congenital anomaly or birth defect, or death) were similar in the RZV and placebo groups (*2*). After licensure, CDC and FDA began safety monitoring of RZV in the Vaccine Adverse Event Reporting System (VAERS) (*3*). During the first 8 months of use, when approximately 3.2 million RZV doses were distributed (GlaxoSmithKline, personal communication, 2018), VAERS received a total of 4,381 reports of adverse events, 130 (3.0%) of which were classified as serious. Commonly reported signs and symptoms included pyrexia (fever) (1,034; 23.6%), injection site pain (985; 22.5%), and injection site erythema (880; 20.1%). No unexpected patterns were detected in reports of adverse events or serious adverse events. Findings from early monitoring of RZV are consistent with the safety profile observed in prelicensure clinical trials.

VAERS is a national passive surveillance system for adverse events after administration of U.S.-licensed vaccines and is coadministered by CDC and FDA (*3*). VAERS accepts reports from health care providers, vaccine manufacturers, and the public. Signs and symptoms of each adverse event are coded using Medical Dictionary for Regulatory Activities (MedDRA) terminology (*3*). A single VAERS report might be assigned more than one MedDRA Preferred Term*; these terms are not necessarily medically confirmed diagnoses. VAERS reports are classified as "serious" according to Code of Federal Regulations Title 21 Section 600.80.† Medical records are requested for reports of serious adverse events, including autopsy findings and death certificates for reported deaths.

CDC and FDA investigators conducted descriptive analyses of reports to VAERS involving RZV for the period October 20, 2017–June 30, 2018. Physicians reviewed reports (as well as medical records and other documentation when available) for 22 prespecified outcomes, which included conditions of general interest for vaccine safety and conditions identified as possible or theoretical safety concerns from prelicensure clinical trials (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/62214) (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/62215). When available, standardized definitions from the Brighton Collaboration were applied during reviews (*4*). Because dose number in a vaccination series is often missing or inconsistently reported in VAERS, this information was not analyzed. Vaccination errors were identified by applying a previously used error-search strategy (*5*) and included any reports with recipient age <50 years or subcutaneous route of administration. Empirical Bayesian data mining methods were used to identify RZV-adverse event pairings that were reported at least twice as frequently as were reported in all other U.S.-licensed vaccines in the VAERS database (*3*).

During the analytic period, VAERS received 4,381 RZV reports (Table 1), for a rate of 136 reports per 100,000 doses distributed; among these, 130 (3.0%) were classified as serious (four serious reports per 100,000 doses distributed). Women accounted for 2,870 (65.5%) reports. For 4,167 (95.1%) reports, RZV was the only vaccine that had been administered. Most reports were submitted by health care professionals (1,661; 37.9%) and the vaccine manufacturer (1,661; 37.9%). Pyrexia was reported most frequently (1,034; 23.6%) (Table 2). Other systemic symptoms, such as chills, headache, fatigue, and myalgia, were commonly reported, as were injection site reactions. Reported signs and symptoms were similar whether RZV was administered alone or in combination with other vaccines. Median interval from receipt of RZV to onset of signs or symptoms was 1 day (i.e., the day after vaccination). Persons aged 50–69 years reported a high proportion of systemic signs and symptoms, such as pyrexia (29.1%), chills (24.6%), and headache (21.3%), whereas persons aged ≥70 years reported a high frequency of local symptoms, such as injection site erythema (22.5%) and pain (21.5%).

*A distinct descriptor (e.g., for a symptom, sign, or disease diagnosis). https://www.meddra.org/how-to-use/basics/hierarchy.

†https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=600.80.

TABLE 1. Characteristics of recombinant zoster vaccine (RZV) reports submitted to VAERS — United States, October 2017–June 2018

Report characteristic	No. (%)
Total reports	**4,381 (100)**
Sex	
Women	2,870 (65.5)
Men	1,265 (28.9)
Not reported or unknown	246 (5.6)
Seriousness*	
Nonserious	4,251 (97.0)
Serious†	130 (3.0)
Type of reporter	
Health care professional	1,661 (37.9)
Manufacturer	1,661 (37.9)
Patient	801 (18.3)
Other	236 (5.4)
Parent/Guardian/Caretaker	22 (0.5)
Age group (yrs)	
<50§	27 (0.6)
50–59	956 (21.8)
60–69	1,467 (33.5)
70–79	988 (22.6)
≥80	251 (5.7)
Not reported or unknown	692 (15.8)
RZV given alone¶	**4,167 (95.1)**

Abbreviation: VAERS = Vaccine Adverse Event Reporting System.
* Includes hospitalization, prolongation of existing hospitalization, life-threatening illness, permanent disability, congenital anomaly or birth defect, and death, as defined in Code of Federal Regulations Title 21 Section 600.80.
† Includes eight reports of death, seven of which were confirmed using autopsy reports, death certificates, or medical records; one was an unconfirmed hearsay (i.e., secondhand) report.
§ RZV is not licensed for use in this age group.
¶ When RZV was given concomitantly with other vaccines, the most common vaccines included 23-valent pneumococcal polysaccharide (86); tetanus, diphtheria, acellular pertussis (Tdap), tetanus, diphtheria (Td), or tetanus toxoid (TT) (57 tetanus toxoid–containing vaccines); 13-valent pneumococcal conjugate (43); influenza (19); hepatitis A (16); and combination hepatitis A and B (seven) vaccines.

Seven confirmed deaths after receipt of RZV were reported. According to autopsy reports, death certificates, or medical records, the median decedent age was 65 years (range = 61–86 years), and the interval from vaccination to death ranged from 6 hours to 6 weeks. The cause of death in four persons was cardiovascular disease, three of whom had multiple cardiac risk factors. Two persons, both of whom were immunosuppressed, died of septic shock. One death occurred in a woman (aged 86 years) who died subsequent to a fall.

The most commonly reported prespecified outcomes (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/62215) were herpes zoster (196; 4.5%; 6.1 reports per 100,000 RZV doses distributed; 14 reports specified previous herpes zoster) and postherpetic neuralgia (49; 1.1%; 1.5 reports per 100,000 RZV doses distributed; six reports specified previous postherpetic neuralgia). The remaining prespecified outcomes each accounted for <0.5% of total reports.

Overall, 230 reports described vaccination errors; some reports described more than one error in the same report

TABLE 2. Most commonly reported symptoms* after receipt of recombinant zoster vaccine (RZV) in reports submitted to VAERS (N = 4,381)† — United States, October 2017–June 2018

Sign/Symptom	Total RZV reports, no. (%)	RZV given in combination with other vaccines, no. (%)
Pyrexia	1,034 (23.6)	57 (26.6)
Injection site pain	985 (22.5)	49 (22.9)
Injection site erythema	880 (20.1)	50 (23.4)
Pain	853 (19.5)	45 (21.0)
Chills	847 (19.3)	32 (15.0)
Headache	730 (16.7)	30 (14.0)
Fatigue	703 (16.0)	23 (10.7)
Pain in extremity	691 (15.8)	37 (17.3)
Injection site swelling	588 (13.4)	29 (13.6)
Myalgia	530 (12.1)	19 (8.9)

Abbreviation: VAERS = Vaccine Adverse Event Reporting System.
* According to Medical Dictionary for Regulatory Activities Preferred Terms, a single report may be assigned more than one Preferred Term (i.e., terms are not mutually exclusive).
† Includes reports for RZV given alone (95.1%) and concomitantly with other vaccines.

(Table 3). Most vaccination errors (143; 62.2%) were errors of administration, and among these, the most frequent error was incorrect route of administration (108; 75.5% of administration errors), with RZV given subcutaneously rather than intramuscularly. RZV is supplied with two vials that must be combined before administration. One vial contains the lyophilized antigen, and the other contains the $AS01_B$ adjuvant suspension component (liquid) that is mixed with the contents of the first vial. Among 19 reports documenting product preparation errors, eight included administration of only the $AS01_B$ adjuvant; 11 reported mixing RZV lyophilized antigen with the wrong diluent, including sterile water (six), ZVL diluent (four), and an unspecified incorrect diluent (one). Twenty-six reports described administration of RZV to patients aged <50 years; 15 of these reports were not coded as errors but were identified through the patient age field on the VAERS form, and therefore could represent clinical decisions to use the vaccine off-label rather than a practice error. Among 24 reports of administration of the "incorrect dose," 12 reported an "incomplete course of vaccination," including six cases in which health care providers advised patients who experienced common and expected adverse events (e.g., injection site reactions, arm swelling, fever, and fatigue) after the first dose of RZV to forego the second dose. Although coded as errors, these reports could represent clinical decisions by health care providers to not vaccinate, despite lack of a clear precaution or contraindication. No RZV-adverse event pairings met the statistical threshold for an empirical Bayesian data mining finding of a potential safety signal.

Discussion

Although VAERS data are subject to the limitations inherent in passive surveillance, the initial safety data from VAERS

TABLE 3. Vaccination error reports (N = 230) submitted to VAERS involving recombinant zoster vaccine (RZV) — United States, October 2017–June 2018

Vaccination error group*/ most common MedDRA Preferred Terms	No. (%) of reports
Administration errors	**143 (62.2)**
Incorrect route†	108
Incorrect site	26
Other§	9
Inappropriate schedule	**30 (13.0)**
Vaccine administered at inappropriate age¶	26
Inappropriate schedule of vaccine administration (<2 months between doses)	4
Incorrect dose	**24 (10.4)**
Incomplete course of vaccination	12
Incorrect dose administered**	12
Product quality	**23 (10.0)**
Product quality issue††	21
Product storage error	2
Prescribing and dispensing	**19 (8.3)**
Product preparation error (only adjuvant given)	8
Product preparation error (wrong diluent used)	11
Wrong vaccine	**4 (1.7)**
Equipment	**4 (1.7)**
Product labeling and packaging	**1 (0.4)**
Total errors§§	**248**

Abbreviations: MedDRA = Medical Dictionary for Regulatory Activities; VAERS = Vaccine Adverse Event Reporting System.

* Vaccination error groups contain multiple MedDRA Preferred Terms. Some reports include errors belonging to multiple error groups.

† Thirty-eight of 108 reports were not coded with a MedDRA Preferred Term for an incorrect route error, but subcutaneous route was selected on the VAERS form field for route of administration.

§ Includes wrong technique (five) and accidental exposure to product involving vaccine splashing on the health care provider or patient skin or eyes during product preparation (four).

¶ Fifteen of 26 reports of RZV given to patients aged <50 years were not coded with a MedDRA Preferred Term for an inappropriate age error, but age at vaccination of <50 years was documented on the VAERS form; these 15 reports could therefore represent clinical decisions to use the vaccine off-label rather than a practice error.

** Includes incorrect dose administered (eight), overdose (too much volume) (two), accidental overdose (one), underdose (too little volume caused by patient pulling away during administration) (one).

†† Health care provider or patient questioning of product quality was related to adverse events after administration of RZV and not based on empiric or objective evidence of actual product quality problems.

§§ A single report might describe more than one error; 230 reports described 248 errors.

monitoring during the first 8 months of RZV use are consistent with the safety profile observed in prelicensure clinical trials (*2*,*6*,*7*). No adverse events reported for RZV were disproportionate to adverse event reporting patterns observed for other vaccines in the VAERS database. Reports for prespecified outcomes are generally consistent with reporting patterns observed for other vaccines in VAERS and likely represent temporally associated events that are occurring as background incidence in the general population.

Passive surveillance data are not conducive to direct comparisons between vaccines, but observations of reporting patterns can reveal general similarities and differences. Injection site reactions were commonly reported for both RZV and ZVL vaccines. Herpes zoster and rash were commonly reported for ZVL, whereas systemic reactions including pyrexia and chills were commonly reported for RZV. Reporting rates for RZV were 136 per 100,000 doses distributed (all adverse event reports) and 4.0 per 100,000 (serious adverse event reports) versus 106 and 4.4, respectively, for ZVL (*8*). Because dose number in series (i.e., first or second) is not consistently reported in VAERS, the number of reports representing a person's first or second exposure to RZV is unknown. Of note, errors involving subcutaneous administration of RZV (the vaccine is licensed for intramuscular injection) could reflect confusion with administration procedures for ZVL, which is administered subcutaneously.

Several reports suggested that health care providers made clinical decisions to not administer the second dose of RZV after observing local or systemic reactions in patients. In clinical trials, approximately 17% of RZV recipients experienced grade 3 reactions (*2*,*6*,*7*); these episodes were self-limited and resolved in a few days. Providers should expect such reactions in many of their patients and counsel them accordingly. The effectiveness of a single dose of RZV has not been studied.

CDC and FDA will continue to closely monitor the safety of RZV. Whereas the initial safety data for RZV are reassuring, the vaccine is still in the early uptake period. Understanding of the safety of RZV will advance as use increases and additional data become available from VAERS and from near real-time sequential monitoring in CDC's Vaccine Safety Datalink (*9*).

Summary

What is already known about this topic?

Recombinant zoster vaccine (RZV), a highly efficacious shingles vaccine licensed in October 2017, is recommended for adults aged ≥50 years. In clinical trials, local and systemic vaccine reactions were common.

What is added by this report?

Early RZV safety monitoring findings are consistent with prelicensure clinical trial data. Serious adverse events were rare, and no unexpected patterns were detected.

What are the implications for public health practice?

Health care providers and patients can be reassured by RZV's initial postlicensure safety data. Counseling patients to expect self-limited adverse reactions such as pain, swelling and redness at the injection site, fever, chills, and body aches might ease concerns and encourage completion of the 2-dose RZV series.

Acknowledgment

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Notes From The Field

Mumps Outbreak in a Recently Vaccinated Population — Kosrae, Federated States of Micronesia, August–December, 2017

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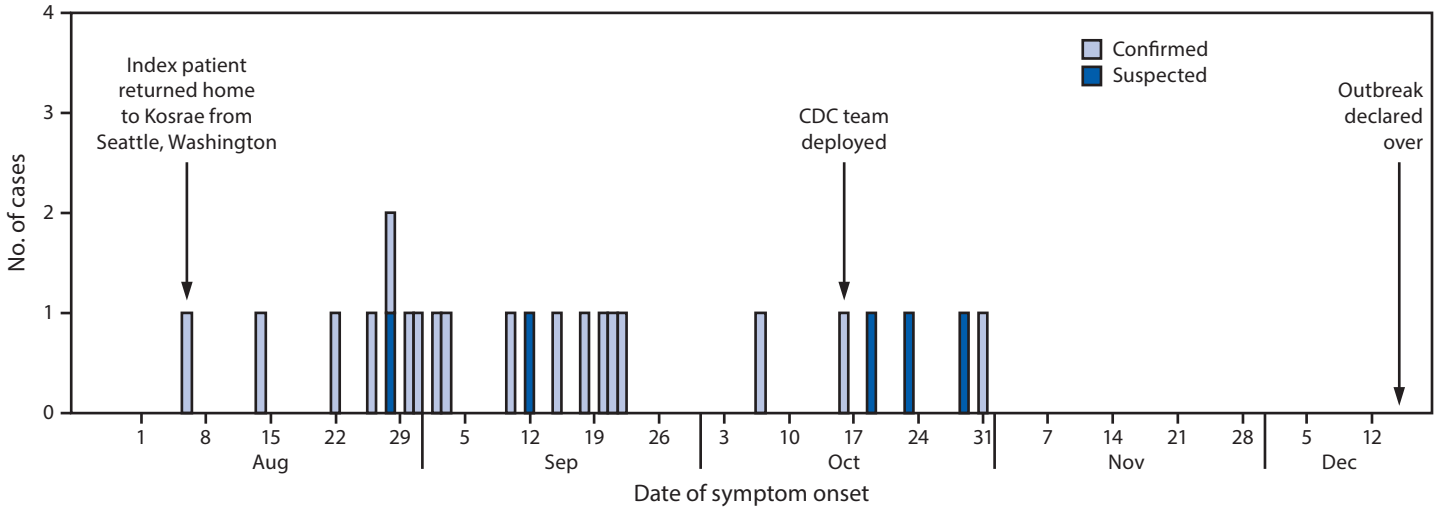
On August 6, 2017, the Kosrae Department of Health Services (KDHS) in the Federated States of Micronesia identified a confirmed case of mumps in a Kosrae resident who had 2 documented doses of measles-mumps-rubella (MMR) vaccine. The patient aged 18 years had recently traveled to Seattle, Washington, which was experiencing a mumps outbreak among members of its Pacific Islander population. Other Pacific Islands were concurrently experiencing large mumps outbreaks (*1*,*2*), in some places exceeding 500 cases, raising concern about the possibility of a similar outbreak in Kosrae. By October 6, KDHS had identified 17 cases (nine laboratory confirmed and eight suspected [clinically diagnosed as parotitis]) on the island (population 6,600) (Figure), with an attack rate of 14 cases per 1,000 residents in the primary affected municipality. At the request of KDHS, CDC deployed a team on October 17 to assist KDHS in investigation and control activities. The KDHS-CDC team conducted active surveillance to assess outbreak magnitude, interviewed mumps patients, collected specimens for laboratory testing, and reviewed patients' vaccination records. KDHS conducted islandwide awareness campaigns about the outbreak and mumps prevention measures, and highlighted the importance of vaccination.

By December 15, a total of 23 mumps cases with onset dates August 5–November 1, 2017, had been identified; 52% of patients were male, and the median age was 14 years (range = 1–26 years). Common symptoms reported were parotitis (20 patients; 95%), fever (20; 95%), and headache (18; 86%); one young patient was hospitalized. Seven patients (30%) reported contact with the index patient, and epidemiologic links established for 20 patients showed that transmission occurred primarily via the island's school system. Twenty-one (91%) patients had received the recommended ≥2 documented MMR doses, and the remaining two patients had each received 1 dose. Of the 21 patients tested for mumps, 19 tested positive by reverse transcription–polymerase chain reaction assay or had a positive immunoglobulin M result. Nineteen of the 20 specimens tested with a mumps immunoglobulin G avidity assay had high-avidity antibodies; these cases were classified as secondary vaccine failures,* and one result was indeterminate.

During a widespread 2014 measles outbreak response in Kosrae, 4,360 MMR doses were administered (90% coverage of persons aged 6 months–57 years) (*3*). KDHS initially planned a similar mass MMR campaign for mumps outbreak control. However, review of vaccination records for the 21 mumps patients with ≥2 documented doses showed that 76.2%

* Secondary vaccine failure refers to waning of vaccine-induced immunity to nonprotective levels. Although distinguishing between primary and secondary vaccine failure is difficult, detection of mumps antibody with high avidity in a person with mumps suggests secondary failure.

FIGURE. Number of suspected and confirmed mumps cases, by date of symptom onset — Kosrae, Federated States of Micronesia, August–December, 2017



(95% confidence interval = 58%–94%; p<0.001) had received their last MMR dose before the 2014 campaign. Among these patients, the median interval since the last dose was 12 years. Investigations of recent mumps outbreaks suggest that waning of vaccine-induced immunity might contribute to transmission in populations with high MMR vaccination coverage (*4*). The current findings suggested that the 2014 MMR dose might have prevented additional mumps cases and that another mass vaccination activity was not warranted. Therefore, KDHS modified its initial response plan to a catch-up vaccination campaign for persons aged 1–24 years with <2 documented MMR doses.

KDHS declared the end of the outbreak on December 15, 2017. Unlike mumps in other Pacific Island communities, this outbreak remained small. The analysis suggests that the interval since last MMR dose contributed to mumps acquisition, and the 2014 campaign dose of MMR might have prevented further spread. Active case-finding and assessment of vaccination status enabled KDHS to save an estimated 1,000 MMR doses. This investigation underscored the importance of an accurate public health assessment of persons at risk for mumps to determine the most efficient and cost-effective outbreak response.

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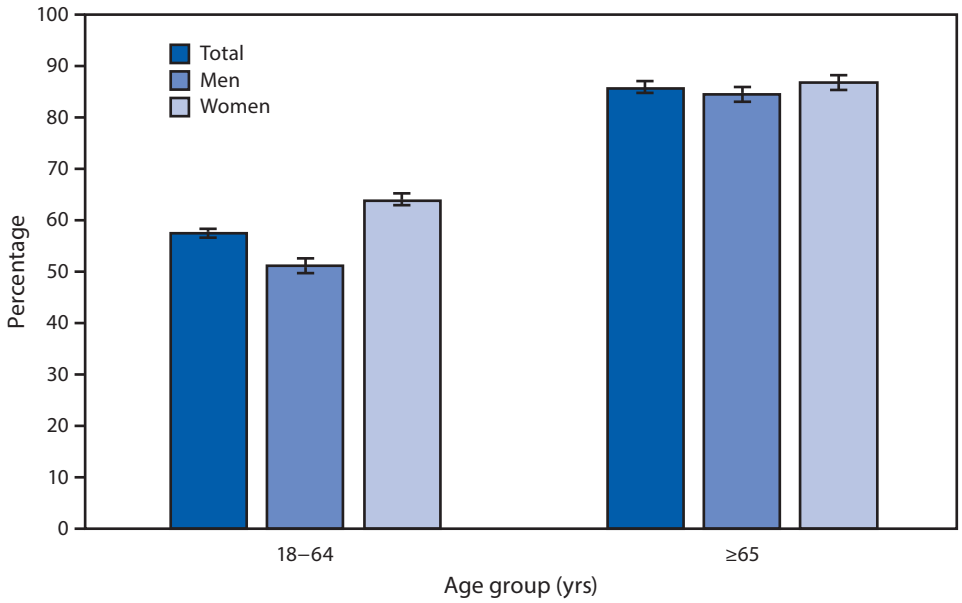
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years Who Were Prescribed Medication in the Past 12 Months,† by Sex and Age Group — National Health Interview Survey,§ 2017



* With 95% confidence intervals indicated by error bars.
† Based on a positive response to the question "During the past 12 months, were you prescribed medication by a doctor or other health professional?"
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey Sample Adult component.

In 2017, 57.9% of adults aged 18–64 years and 86.1% of adults aged ≥65 years were prescribed medication in the past 12 months. Overall and for both men and women separately, receipt of a prescription increased with age. Among both age groups, a greater percentage of women were prescribed medication than men, with 64.3% of women and 51.3% of men aged 18–64 years and 87.1% of women and 85.0% of men aged ≥65 years having been prescribed medication.

Source: National Health Interview Survey, 2017. https://www.cdc.gov/nchs/nhis/index.htm.

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