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World AIDS Day — December 1, 2017

World AIDS Day, observed each year on December 1, draws attention to the status of the human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) epidemic worldwide. The first cases of AIDS were reported in the June 5, 1981, issue of *MMWR* (*1*). Today, approximately 36.7 million persons worldwide are living with HIV infection, including approximately 1.8 million persons who were newly infected during 2016 (*2*). Although the number of annual AIDS-related deaths has declined 48% since 2005, an estimated 1 million persons worldwide died from AIDS in 2016 (*2*).

In the United States, approximately 39,800 persons received a diagnosis of HIV infection in 2016 (*3*). In 2014, an estimated 1.1 million persons in the United States were living with HIV infection, and 85% were aware of their infection (*4*).

Global efforts, including the U.S. President's Emergency Plan for AIDS Relief, for which CDC is an important implementing agency, resulted in 19.5 million persons worldwide receiving antiretroviral therapy for HIV infection in 2016, an increase from 17.1 million in 2015 (*5*).

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Scale-Up of Voluntary Medical Male Circumcision Services for HIV Prevention — 12 Countries in Southern and Eastern Africa, 2013–2016

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Countries in Southern and Eastern Africa have the highest prevalence of human immunodeficiency virus (HIV) infection in the world; in 2015, 52% (approximately 19 million) of all

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persons living with HIV infection resided in these two regions.* Voluntary medical male circumcision (VMMC) reduces the risk for heterosexually acquired HIV infection among males by approximately 60% (*1*). As such, it is an essential component of the Joint United Nations Programme on HIV/AIDS (UNAIDS) strategy for ending acquired immunodeficiency syndrome (AIDS) by 2030 (*2*). Substantial progress toward achieving VMMC targets has been made in the 10 years since the World Health Organization (WHO) and UNAIDS recommended scale-up of VMMC for HIV prevention in 14 Southern and Eastern African countries with generalized HIV epidemics and low male circumcision prevalence (*3*).† This has been enabled in part by nearly $2 billion in cumulative funding through the President's Emergency Plan for AIDS Relief (PEPFAR), administered through multiple U.S. governmental agencies, including CDC, which has supported nearly half of all PEPFAR-supported VMMCs to date. Approximately 14.5 million VMMCs were performed globally during 2008–2016, which represented 70% of the original target of 20.8 million VMMCs in males aged 15–49 years through 2016 (*4*). Despite falling short of the target, these VMMCs are projected to avert 500,000 HIV infections by the end of 2030 (*4*). However, UNAIDS has estimated an additional 27 million VMMCs need to be performed by 2021 to meet the Fast Track targets (*2*). This report updates a previous report covering the period 2010–2012, when VMMC implementing partners supported by CDC performed approximately 1 million VMMCs in nine countries (*5*). During 2013–2016, these implementing partners performed nearly 5 million VMMCs in 12 countries. Meeting the global target will require redoubling current efforts and introducing novel strategies that increase demand among subgroups of males who have historically been reluctant to undergo VMMC.

CDC supports national ministries of health to provide VMMC services for HIV prevention in 12 priority countries: Botswana, Ethiopia, Kenya, Malawi, Mozambique, Namibia, Rwanda, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.§ The VMMC service package includes male circumcision, offer of HIV testing services and linkage to care and treatment for men testing HIV positive, HIV risk reduction education, condom provision, and screening and treatment or referral for sexually transmitted infections (*3*). Circumcisions are performed under local anesthesia by trained clinicians (clinical officers and nurses in most countries). All VMMC clients provide informed consent; consenting for minors adheres to national standards.

* http://aidsinfo.unaids.org/.

† In 2015, the prevalence of HIV infection among all persons (male and female) aged 15–49 years in the 14 priority VMMC countries was as follows: Botswana (22.2%), Ethiopia (not available), Kenya (5.9%), Lesotho (22.7%), Malawi (9.1%), Mozambique (10.5%), Namibia (13.3%), Rwanda (2.9%), South Africa (19.2%), Swaziland (28.8%), Tanzania (4.7%), Uganda (7.1%), Zambia (12.9%), and Zimbabwe (14.7%).

§ CDC support includes hiring of clinical staff members to provide VMMCs, conducting training and quality assurance assessments, providing technical assistance, and procurement of VMMC supplies, medications, and instruments.

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CDC-supported VMMC programs reported program data on key indicators. Data were reported in accordance with the fiscal year October 1–September 30. Data were drawn from site-level VMMC client registers, collected by VMMC implementing partners, and reported to PEPFAR and CDC. The primary indicator was the total number of VMMCs performed; disaggregated indicators included VMMC method (conventional surgical circumcision or device-based circumcision), client age group, HIV test results among VMMC clients tested at VMMC sites, and attendance at postoperative follow-up visits within 14 days.

During 2013–2014, client age was reported as <15 or ≥15 years; during 2015–2016, age was categorized as <15 years, 15–29 years, and ≥30 years. HIV prevalence was calculated by dividing the number of males that tested positive for HIV infection by the number undergoing HIV testing services at VMMC sites. In this report, disaggregated indicators were excluded from multi-country analyses if the sum of values in the disaggregated indicator was <85% or >100% of the total number of VMMCs reported for a given year.

During 2013–2016, CDC supported 4,859,948 VMMCs in 12 Southern and Eastern African countries (Table 1). The annual number of VMMCs increased during 2013–2015. In 2016, 181,737 (13.4%) fewer VMMCs were performed than in 2015. In multi-country analyses, the proportion of VMMC clients aged <15 years increased each year during 2013–2016, from 31.7% in 2013 to 47.6% in 2016 (Table 2). Conversely, the proportion of VMMC clients aged 15–29 years declined from 48.4% in 2015 to 45.6% in 2016. During 2013–2016, circumcision devices were used in 42,520 (1.1%) of the VMMCs.

Data from multi-country analyses indicated that, during 2013–2016, 89.3% of VMMC clients participated in HIV testing services, and among those tested, the percentage of clients who tested positive ranged from 0.8% to 1.3% (at the country level, the percentage testing positive ranged from <0.1% to 4.4%) (Table 2). All VMMC clients were advised to return for a postoperative assessment; overall, 71.9% returned to the circumcising site within 14 days of surgery.

TABLE 1. VMMCs provided in CDC-supported VMMC programs — 12 Southern and Eastern African countries, 2013–2016

Country	Fiscal year*				Total
	2013	2014	2015	2016	
Botswana	11,855	12,745	7,320	23,977	**55,897**
Ethiopia	14,037	10,439	9,861	10,655	**44,992**
Kenya	144,943	154,776	147,998	176,056	**623,773**
Malawi	18,398	18,889	18,910	19,180	**75,377**
Mozambique	121,369	141,113	159,299	184,488	**606,269**
Namibia	0	685	7,132	10,194	**18,011**
Rwanda	0	21,475	25,000	8,809	**55,284**
South Africa	139,174	185,193	193,311	149,081	**666,759**
Tanzania	159,230	278,948	341,544	181,199	**960,921**
Uganda	272,182	329,059	251,815	225,597	**1,078,653**
Zambia	96,183	154,941	147,962	126,765	**525,851**
Zimbabwe	6,171	39,840	44,868	57,282	**148,161**
Yearly total	**983,542**	**1,348,103**	**1,355,020**	**1,173,283**	**4,859,948**
Cumulative total	**983,542**	**2,331,645**	**3,686,665**	**4,859,948**	—

Abbreviation: VMMC = voluntary medical male circumcision.
* October 1–September 30.

Discussion

During 2013–2016, nearly 5 million adolescent and adult males were medically circumcised by CDC-supported VMMC programs in 12 countries in Southern and Eastern Africa. Considering that a decade ago, male circumcision was not a social norm in many of these countries, and the human and structural resources for this surgical intervention were minimal before scale-up, this represents a substantial accomplishment. In addition, many of the men who sought VMMC would not have otherwise had contact with the medical system in the absence of significant injury or illness.

However, the number of VMMCs declined in 2016, and several large-volume programs also performed fewer VMMCs in 2015. Multiple factors likely contributed to this decline, including 1) slowing of service delivery in several countries following recognition of tetanus as a rare but severe complication of VMMC, because many males in Southern and Eastern Africa were never fully immunized (*6*)[¶]; 2) retraining providers in dorsal slit circumcision technique in some countries upon identification that the forceps-guided technique posed elevated risk for injury to the immature penis (*7*); 3) prioritization of VMMC service delivery to geographic regions with the highest HIV prevalence for greater impact; and 4) possibly declining demand because many early adopters had already been circumcised.

Multiple countries increased the proportion of males aged 15–29 years who were provided VMMC in 2016, when PEPFAR began emphasizing prioritizing VMMC in this age group to most immediately achieve the HIV preventive benefit of VMMC (*8*); however, the overall percentage of males aged 15–29 years who were circumcised declined in 2016. CDC continues to work with partners to identify and implement innovative approaches to increase VMMC demand among these men (*9*). The large proportion of VMMC clients aged <15 years also likely accounts for the lower HIV prevalence observed among VMMC clients compared with national

[¶] http://apps.who.int/iris/bitstream/10665/250146/1/WHO-HIV-2016.19-eng.pdf.

TABLE 2. Disaggregated indicators for CDC-supported VMMC programs — 12 Southern and Eastern African countries, 2013–2016

Country	Fiscal year*	No. of CDC-supported VMMCs performed	No. of clients aged <15 yrs (%)	No. of clients aged 15–29 yrs (%)	No. of clients aged ≥30 yrs (%)	No. of VMMCs performed using devices (%)†	No. of VMMC clients receiving HIV testing services (%)§	No. of clients testing HIV positive (%)¶	No. of clients with postoperative follow-up within 14 days of VMMC (%)
Botswana	2013	11,855	4,432 (37.4)	NR (—)**	NR (—)**	807 (6.8)	11,855 (100.0)	23 (0.2)	9,880 (83.3)
	2014	12,745	8,765 (68.8)	NR (—)**	NR (—)**	64 (0.5)	12,711 (99.7)	136 (1.1)	4,572 (35.9)**
	2015	7,320	4,759 (65.0)	2,040 (27.9)	521 (7.1)	1,896 (25.9)	5,368 (73.3)	134 (2.5)	4,619 (63.1)
	2016	23,977	4,249 (17.7)**	3,660 (15.3)**	1,414 (5.9)**	2,715 (11.3)**	6,216 (25.9)**	271 (4.4)**	5,562 (23.2)**
	Total	55,897	22,205 (39.7)	5,700 (10.2)	1,935 (3.5)	5,482 (9.8)	36,150 (64.7)	564 (1.6)	24,633 (44.1)
Ethiopia	2013	14,037	56 (0.4)	11,572 (82.4)	2,409 (17.2)	0 (0.0)	13,268 (94.5)	37 (0.3)	13,905 (99.1)
	2014	10,439	1,671 (16.0)	6,880 (65.9)	1,888 (18.1)	0 (0.0)	5,802 (55.6)	4 (0.1)	10,402 (99.6)
	2015	9,861	608 (6.2)	7,339 (74.4)	1,914 (19.4)	0 (0.0)	8,081 (81.9)	9 (0.1)	9,861 (100.0)
	2016	10,655	3,194 (30.0)	6,143 (57.7)	1,318 (12.4)	0 (0.0)	4,664 (43.8)	5 (0.1)	10,597 (99.5)
	Total	44,992	5,529 (12.3)	31,934 (71.0)	7,529 (16.7)	0 (0.0)	31,815 (70.7)	55 (0.2)	44,765 (99.5)
Kenya	2013	144,943	52,643 (36.3)	NR (—)**	NR (—)**	512 (0.4)	112,657 (77.7)	1,360 (1.2)	45,300 (31.3)**
	2014	154,776	87,066 (56.3)	NR (—)**	NR (—)**	302 (0.2)	129,530 (83.7)	1,380 (1.1)	66,634 (43.1)
	2015	147,998	94,634 (63.9)	48,735 (32.9)	4,544 (3.1)	448 (0.3)	133,584 (90.3)	1,797 (1.3)	89,724 (60.6)
	2016	176,056	123,006 (69.9)	49,075 (27.9)	3,976 (2.3)	2,201 (1.3)	145,931 (82.9)	575 (0.4)	116,933 (66.4)
	Total	623,773	357,349 (57.3)	97,810 (15.7)	8,520 (1.4)	3,463 (0.6)	521,702 (83.6)	5,112 (1.0)	318,591 (51.1)
Malawi	2013	18,398	4,749 (25.8)	NR (—)**	NR (—)**	0 (0.0)	18,354 (99.8)	262 (1.4)	13,287 (72.2)
	2014	18,889	8,594 (45.5)	NR (—)**	NR (—)**	299 (1.6)	18,867 (99.9)	132 (0.7)	15,099 (79.9)
	2015	18,910	6,928 (36.6)	10,033 (53.1)	1,949 (10.3)	2,949 (15.6)	18,871 (99.8)	427 (2.3)	11,309 (59.8)
	2016	19,180	9,127 (47.6)	9,022 (47.0)	1,031 (5.4)	0 (0.0)	19,022 (99.2)	125 (0.7)	14,956 (78.0)
	Total	75,377	29,398 (39.0)	19,055 (25.3)	2,980 (4.0)	3,248 (4.3)	75,114 (99.7)	946 (1.3)	54,651 (72.5)
Mozambique	2013	121,369	62,136 (51.2)	NR (—)**	NR (—)**	0 (0.0)	123,909 (102.1)**	2,944 (2.4)**	NR (—)**
	2014	141,113	75,469 (53.5)	NR (—)**	NR (—)**	0 (0.0)	143,055 (101.4)**	1,475 (1.0)**	98,458 (69.8)
	2015	159,299	78,863 (49.5)	72,405 (45.5)	8,031 (5.0)	0 (0.0)	156,308 (98.1)	1,844 (1.2)	110,111 (69.1)
	2016	184,488	78,117 (42.3)	95,033 (51.5)	11,338 (6.1)	0 (0.0)	172,814 (93.7)	2,473 (1.4)	133,781 (72.5)**
	Total	606,269	294,585 (48.6)	167,438 (27.6)	19,369 (3.2)	0 (0.0)	596,086 (98.3)	8,736 (1.5)	342,350 (70.6)
Namibia	2013	0	NA	NA	NA	NA	NA	NA	NA
	2014	685	72 (10.5)	597 (87.2)	16 (2.3)	0 (0.0)	685 (100.0)	6 (0.9)	562 (82.0)
	2015	7,132	15 (0.2)	5,706 (80.0)	1,411 (19.8)	0 (0.0)	6,283 (88.1)	211 (3.4)	7,132 (100.0)
	2016	10,194	1 (0.0)	8,319 (81.6)	1,874 (18.4)	0 (0.0)	8,686 (85.2)	183 (2.1)	10,157 (99.6)
	Total	18,011	88 (0.5)	14,622 (81.2)	3,301 (18.3)	0 (0.0)	15,654 (86.9)	400 (2.6)	17,851 (99.1)
Rwanda	2013	0	NA	NA	NA	NA	NA	NA	NA
	2014	21,475	NR (—)**	NR (—)**	NR (—)**	0 (0.0)	17,777 (82.8)	10 (0.1)	NR (—)**
	2015	25,000	4,693 (18.8)	17,050 (68.2)	3,227 (12.9)	194 (0.8)	24,970 (99.9)	15 (0.1)	16,647 (66.6)**
	2016	8,809	593 (6.7)	7,255 (82.4)	961 (10.9)	1,336 (15.2)	8,809 (100.0)	9 (0.1)	7,454 (84.6)**
	Total	55,284	5,286 (9.6)	24,305 (44.0)	4,188 (7.6)	1,530 (3.7)	51,556 (93.3)	34 (0.1)	24,101 (71.3)

See table footnotes on next page.

estimates,** because many of those aged <15 years likely had not yet had sexual intercourse, the primary mode of HIV transmission in this setting.

The findings in this report are subject to at least four limitations. First, the findings reflect results from CDC-supported VMMC programs rather than national, PEPFAR, or global totals. Data entry errors and reporting variations are possible, and data were incomplete for some countries in some years. Second, during 2013–2014, the disaggregated age group indicator definition prevented reporting on males aged 15–29 years. Third, use of HIV testing services did not include clients with indeterminate results or those who might have been tested elsewhere recently, possibly affecting the HIV prevalence estimate among VMMC clients. Finally, follow-up within 14 days was likely underestimated because reported data might not include males who sought care at another health care site different from the one where they underwent circumcision.

VMMC is an evidence-based, one-time intervention that confers lifelong partial protection against HIV infection for males. In addition, its benefits carry over to females by lowering the prevalence of HIV (and several other sexually transmitted infections) among potential sex partners (*10*). To date, significant progress has been made by countries with VMMC programs. However, many more VMMCs need to be performed to reach the ambitious UNAIDS target by 2021. Enhancing VMMC service delivery will involve simultaneous focusing on supply-side and demand-side factors. On the supply side, VMMC programs are 1) offering service delivery on days and

** In 2015, the prevalence of HIV infection among males aged 15–24 years in the 14 priority VMMC countries was as follows: Botswana (3.9%), Ethiopia (not available), Kenya (2.3%), Lesotho (5.1%), Malawi (1.8%), Mozambique (2.3%), Namibia (2.4%), Rwanda (0.8%), South Africa (4.0%), Swaziland (7.3%), Tanzania (1.0%), Uganda (1.9%), Zambia (3.1%), and Zimbabwe (3.8%). The prevalence among males aged 15–49 years was as follows: Botswana (17.8%), Ethiopia (not available), Kenya (4.8%), Lesotho (18.9%), Malawi (7.1%), Mozambique (8.7%), Namibia (10.7%), Rwanda (2.3%), South Africa (14.9%), Swaziland (23.2%), Tanzania (3.7%), Uganda (5.9%), Zambia (10.9%), and Zimbabwe (12.1%).

TABLE 2. (*Continued*) Disaggregated indicators for CDC-supported VMMC programs — 12 Southern and Eastern African countries, 2013–2016

Country	Fiscal year*	No. of CDC-supported VMMCs performed	No. of clients aged <15 yrs (%)	No. of clients aged 15–29 yrs (%)	No. of clients aged ≥30 yrs (%)	No. of VMMCs performed using devices (%)†	No. of VMMC clients receiving HIV testing services (%)§	No. of clients testing HIV positive (%)¶	No. of clients with postoperative follow-up within 14 days of VMMC (%)
South Africa	2013	139,174	29,889 (21.5)	NR (—)**	NR (—)**	0 (0.0)	142,390 (102.3)**	4,048 (2.8)**	66,667 (47.9)
	2014	185,193	68,231 (36.8)	NR (—)**	NR (—)**	56 (0.0)	194,746 (105.2)**	4,724 (2.4)**	93,939 (50.7)
	2015	193,311	84,239 (43.6)	NR (—)**	NR (—)**	976 (0.5)	187,859 (97.2)	5,702 (3.0)	93,047 (48.1)
	2016	149,081	69,266 (46.5)	NR (—)**	NR (—)**	3,903 (2.6)	150,211 (100.8)**	6,072 (4.0)**	102,021 (68.4)
	Total	666,759	251,625 (37.7)	NR (—)	NR (—)	4,935 (0.7)	675,206 (101.3)	20,546 (3.0)	355,674 (53.3)
Tanzania	2013	159,230	64,173 (40.3)	NR (—)**	NR (—)**	0 (0.0)	NR (—)**	NR (—)**	NR (—)**
	2014	278,948	113,731 (40.8)	NR (—)**	NR (—)**	0 (0.0)	213,239 (76.4)	1,029 (0.5)	NR (—)**
	2015	341,544	142,740 (41.8)	172,594 (50.5)	26,210 (7.7)	0 (0.0)	335,105 (98.1)	926 (0.3)	312,691 (91.6)
	2016	181,199	88,607 (48.9)	79,239 (43.7)	13,353 (7.4)	0 (0.0)	180,845 (99.8)	458 (0.3)	150,605 (83.1)
	Total	960,921	409,251 (42.6)	251,833 (26.2)	39,563 (4.1)	0 (0.0)	729,189 (75.9)	2,413 (0.3)	463,296 (88.6)
Uganda	2013	272,182	54,608 (20.1)	NR (—)**	NR (—)**	NR (—)**	237,830 (87.4)	NR (—)**	NR (—)**
	2014	329,059	112,555 (34.2)	NR (—)**	NR (—)**	NR (—)**	298,060 (90.6)	NR (—)**	NR (—)**
	2015	251,815	0 (0.0)**	0 (0.0)**	466 (0.2)**	990 (0.4)**	112,465 (44.7)**	920 (0.8)**	76,432 (30.4)**
	2016	225,597	29,841 (13.2)**	35,560 (15.8)**	10,004 (4.4)**	4,168 (1.8)	215,240 (95.4)	1,144 (0.5)	173,829 (77.1)**
	Total	1,078,653	197,004 (18.3)	35,560 (3.3)	10,470 (1.0)	5,158 (0.5)	863,595 (80.1)	2,064 (0.2)	250,261 (23.2)
Zambia	2013	96,183	37,310 (38.8)	NR (—)**	NR (—)**	NR (—)**	71,407 (74.2)	491 (0.7)	77,350 (80.4)
	2014	154,941	65,481 (42.3)	NR (—)**	NR (—)**	0 (0.0)	116,881 (75.4)	1,742 (1.5)	130,360 (84.1)**
	2015	147,962	52,716 (35.6)	82,197 (55.6)	12,701 (8.6)	4,533 (3.1)	125,137 (84.6)	2,429 (1.9)	134,762 (91.1)
	2016	126,765	42,780 (33.7)	72,290 (57.0)	11,611 (9.2)	691 (0.5)	110,823 (87.4)	1,334 (1.2)	118,628 (93.6)
	Total	525,851	198,287 (37.7)	154,487 (29.4)	24,312 (4.6)	5,224 (1.0)	424,248 (80.7)	5,996 (1.4)	461,100 (87.7)
Zimbabwe	2013	6,171	2,019 (32.7)	NR (—)**	NR (—)**	0 (0.0)	6,174 (100.0)	1 (<0.1)	NR (—)**
	2014	39,840	14,827 (37.2)	NR (—)**	NR (—)**	1,085 (2.7)	39,837 (100.0)	135 (0.3)	36,566 (91.8)
	2015	44,868	19,619 (43.7)	22,453 (50.0)	2,796 (6.2)	3,452 (7.7)	44,714 (99.7)	230 (0.5)	43,180 (96.2)
	2016	57,282	24,784 (43.3)	27,065 (47.2)	5,433 (9.5)	12,648 (22.1)	57,136 (99.7)	726 (1.3)	54,772 (95.6)
	Total	148,161	61,249 (41.3)	49,518 (33.4)	8,229 (5.6)	17,185 (11.6)	147,861 (99.8)	1,092 (0.7)	134,518 (94.7)
All countries	2013	983,542	312,015 (31.7)	NA	NA	1,319 (0.1)	737,844 (75.0)	9,166 (1.2)	226,389 (23.0)
	2014	1,348,103	556,462 (41.3)	NA	NA	1,806 (0.1)	1,191,190 (88.4)	10,773 (0.9)	456,592 (33.9)
	2015	1,355,020	489,814 (44.4)	537,722 (48.7)	63,770 (5.8)	15,438 (1.1)	1,158,745 (85.5)	14,644 (1.3)	909,515 (67.1)
	2016	1,173,283	473,565 (47.0)	461,923 (45.8)	62,313 (6.2)	27,662 (2.4)	1,080,397 (92.1)	13,375 (1.2)	899,295 (76.6)
	Total	4,859,948	1,831,856 (41.2)	999,645 (47.3)	126,083 (6.0)	46,225 (1.0)	4,168,176 (85.8)	47,958 (1.2)	2,491,791 (51.3)
Multi-country analyses**	**2013**	**983,542**	**312,015 (31.7)**	**NA**	**NA**	**1,319 (0.2)**	**471,545 (83.6)**	**2,174 (0.9)**	**181,089 (64.8)**
	2014	**1,348,103**	**556,462 (41.9)**	**NA**	**NA**	**1,806 (0.2)**	**853,389 (83.5)**	**4,574 (0.8)**	**321,660 (58.4)**
	2015	**1,355,020**	**489,814 (44.4)**	**440,552 (48.4)**	**63,304 (7.0)**	**14,448 (1.3)**	**1,046,280 (94.8)**	**13,724 (1.3)**	**816,436 (75.7)**
	2016	**1,173,283**	**439,475 (47.6)**	**353,441 (45.6)**	**50,895 (6.6)**	**24,947 (2.6)**	**923,970 (92.4)**	**7,032 (0.8)**	**578,669 (79.2)**
	Total	**4,859,948**	**1,797,766 (41.5)**	**793,993 (47.1)**	**114,199 (6.8)**	**42,520 (1.1)**	**3,295,184 (89.3)**	**27,504 (1.0)**	**1,897,854 (71.9)**

Abbreviations: NA = not applicable; NR = not reported; VMMC = voluntary medical male circumcision.

* October 1–September 30.

† Circumcision devices prequalified by the World Health Organization include the PrePex and ShangRing. However, PrePex was the predominant device in use in these 12 countries during 2013–2016.

§ HIV testing services exceeded 100% for certain countries that reported persons tested for HIV at VMMC clinics who did not undergo male circumcision.

¶ HIV prevalence was calculated by dividing the number of males that tested HIV positive by the number undergoing HIV testing services at VMMC sites.

** Excluded from multi-country analyses because the sum of values in the disaggregated indicator was <85% or >100% of the total number of VMMCs reported for the given year.

times that best match clients' needs, including evening and weekend hours; 2) using mobile outreach service delivery to overcome geographic barriers; 3) ensuring safe service delivery through quality improvement and assurance activities and rigorous adverse event monitoring (*6*); 4) where possible, layering VMMC service delivery with other health care services such as preexposure prophylaxis, HIV care and treatment, and general medical care; and 5) incorporating medical innovations (e.g., new circumcision devices) that might enhance acceptability of VMMC for some males.

To increase demand for VMMC, programs are 1) evolving messaging from generating general awareness to addressing specific concerns of persons who have been hesitant to undergo VMMC; 2) linking VMMC with prevention activities for women (e.g., perinatal HIV testing services and HIV prevention programs that target adolescent girls and young women [i.e., the DREAMS program††]); 3) engaging community stakeholders, such as traditional and religious leaders, celebrities, and satisfied VMMC clients, to become VMMC champions; 4) compensating clients for the opportunity cost of undergoing VMMC; and 5) ensuring VMMC services are available to men regardless of

†† https://www.pepfar.gov/partnerships/ppp/dreams/.

HIV status, through voluntarism of HIV testing services. Going forward, country programs at or nearing targets should begin planning for VMMC program sustainability, including VMMC training and program staffing operated by ministries of health, regional or national government contributions to VMMC financing, and establishing a framework to maintain high male circumcision coverage by continuing a VMMC program for adolescents males aged 10–14 years and/or introducing routine early infant male circumcision. Reaching and maintaining high male circumcision coverage in countries with high prevalence of HIV infection remains a critical component of achieving an AIDS-free generation.

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Conflict of Interest

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Summary

What is already known about this topic?

Voluntary medical male circumcision (VMMC) has been recognized by the World Health Organization and Joint United Nations Programme on HIV/AIDS as an effective human immunodeficiency virus (HIV) infection prevention intervention in settings with a generalized HIV epidemic and low male circumcision prevalence. During 2010–2012, CDC (through the U.S. President's Emergency Plan for AIDS Relief) supported 1,020,424 VMMCs in nine countries in Southern and Eastern Africa.

What is added by this report?

During 2013–2016, CDC-supported implementation partners performed 4,859,948 VMMCs in 12 countries in Southern and Eastern Africa, a substantial increase from 2010–2012.

What are the implications for public health practice?

Although millions of males have been medically circumcised in CDC-supported programs, many more VMMCs need to be performed to reach global targets. This will require redoubling current efforts and introducing novel strategies that increase demand among subgroups of males who have historically been reluctant to undergo VMMC.

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Morbidity and Mortality Weekly Report

Synthetic Cannabinoid and Mitragynine Exposure of Law Enforcement Agents During the Raid of an Illegal Laboratory — Nevada, 2014

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Synthetic cannabinoids (SCs), commonly known by the street name "Spice," are designer drugs of abuse that mimic the psychoactive effects of marijuana. Intentional SC use has resulted in multiple toxicities (*1*,*2*), but little is known about occupational SC exposure. After a federal agency's law enforcement personnel in Nevada reported irritability and feeling "high" after raiding illegal SC laboratories and processing seized SCs, a request for a health hazard evaluation was made by the agency to CDC's National Institute for Occupational Safety and Health (NIOSH) in 2014 to evaluate agents' occupational SC exposures. After making the request for a health hazard evaluation, federal agents conducted a raid of an illegal SC laboratory, with assistance from local law enforcement and Drug Enforcement Administration (DEA) personnel and with NIOSH investigators observing from a distance. After the raid, agents collected and processed material evidence. NIOSH investigators tested agents' urine for SC levels before and after the raid and measured SCs in the air and on surfaces after the raid. DEA determined that AB-PINACA (an SC compound) and mitragynine (a plant material with opium-like effects, also known as "kratom") were present in the illegal laboratory. AB-PINACA, its metabolites, and mitragynine were not detected in agents' urine before the raid; however, one or more of these substances was found in the urine of six of nine agents after the raid and processing of the SC evidence. AB-PINACA was detected in one surface wipe sample from the SC laboratory; none was detected in the air in the laboratory or in the offices of the law enforcement agency where the materials were processed after the raid. No policies were in place regarding work practices and use of personal protective equipment (PPE) during raids and evidence processing. To protect agents from SC exposures, NIOSH recommended that the agency require agents to wear a minimum level of PPE (e.g., protective gloves and disposable clothing) and undergo training in PPE and in handling and storing of contaminated evidence from SC laboratory raids. Showers and locker rooms also need to be provided so that agents can reduce contamination and prevent take-home exposure.

Shortly after NIOSH received the request for a health hazard evaluation, an opportunity arose for federal agents to plan a raid of an illegal SC laboratory with a 1-week lead time. A health hazard evaluation site visit was immediately planned in response to the agency's concerns. Four NIOSH investigators arrived at the agency's office 1 day before the raid and participated in a briefing to discuss roles and responsibilities. Agents' activities, work and hygiene practices, and PPE use were observed, and sampling was conducted before and after the raid. Eighteen personal breathing zone air samples and seven area air samples (from the SC laboratory and the agents' office) were collected over 2 days. Seventeen surface wipe samples were collected from the SC laboratory and the agents' office. Air and surface wipe samples were analyzed for AB-PINACA and mitragynine using gas chromatography–mass spectrometry at Bureau Veritas North America, Novi, Michigan. No validated method exists for quantitative air sampling of SC, so a modified DEA method using gas chromatography–mass spectrometry and methanol extraction was used. The results obtained should be considered semiquantitative and the reported minimum detectable and minimum quantifiable concentrations should be considered estimates. The ventilation system of the office was evaluated by measuring airflow using a ventilation flow hood.

Nine agents completed a questionnaire and, after providing informed consent, submitted urine samples for SC analyses. The questionnaire asked about demographics and work, medical, and smoking history; alcohol use; and pertinent health symptoms ever experienced when handling SC evidence. Each agent provided five urine specimens over 3 consecutive days. The first specimen (baseline) was collected on designated day 1 (the day before the raid); the second was collected at the end of the shift on day 2 (after the raid and evidence collection). The third was collected at bedtime on day 2; the fourth was collected before beginning the shift on day 3, and the fifth was collected at the end of the shift on day 3 (after sorting evidence in the office) (Table). Liquid chromatography–tandem mass spectrometry testing was performed at the Clinical Toxicology and Environmental Biomonitoring Laboratory, University of California, San Francisco, to measure the amount of AB-PINACA, two AB-PINACA metabolites (AB-PINACA-[4-hydroxypentyl] metabolite and AB-PINACA N-pentanoic acid), and mitragynine in all urine specimens.

NIOSH investigators observed agents' practices during the raid and evidence collection and processing. During the raid (day 2), the agents collected suspect plant material, sealed packets containing SC and mitragynine, baking sheets, and paper records. The evidence was placed in plastic or paper bags and stored in a locked evidence room located in the agency offices. The next day (day 3), the agents took evidence bags from the evidence room to

TABLE. Presence* of cannabinoid metabolites and mitragynine in the urine of nine law enforcement agents, detected by liquid chromatography–tandem mass spectrometry before and after a raid on an illegal synthetic cannabinoid laboratory — Nevada, 2014

Agent	Day 1 (pre-raid) baseline	Day 2 (raid) post-shift	Day 2 (raid) at bedtime	Day 3 (post-raid) morning	Day 3 (post-raid) post-shift
1	None	None	None	Mitragynine	Mitragynine
2	None	AB-PINACA, AB-PINACA OH, AB-PINACA pent, mitragynine	AB-PINACA, AB-PINACA OH, AB-PINACA pent, mitragynine	AB-PINACA pent, mitragynine	AB-PINACA pent, mitragynine
3	None	None	AB-PINACA pent, mitragynine	None	None
4	None	None	None	None	None
5	None	None	None	None	None
6	None	AB-PINACA, AB-PINACA pent, mitragynine	AB-PINACA pent, mitragynine	AB-PINACA pent, mitragynine	AB-PINACA pent, mitragynine
7	None	Mitragynine	Mitragynine	Mitragynine	Mitragynine
8	None	None	None	None	None
9	None	AB-PINACA, mitragynine	Mitragynine	Mitragynine	Mitragynine

Abbreviations: AB-PINACA OH = AB-PINACA N-(4-hydroxypentyl) metabolite; AB-PINACA pent = AB-PINACA N-pentanoic acid metabolite.

a carpeted conference room, an adjacent equipment room with tiled flooring, and individual offices for sorting and cataloging.

During the raid, some agents voluntarily wore disposable protective clothing, and one wore a filtering face-piece respirator during part of the raid. No agents wore disposable shoe coverings. The use of latex or nitrile gloves during the raid and evidence processing was inconsistent. Some agents entered the office after the raid without changing out of the clothing (either personal or disposable) worn during the raid. Agents were not provided with a designated locker room or showers. Agents were observed to be eating and drinking while handling and cataloging the evidence. The evidence storage and processing rooms were connected to the ventilation system that also supplied the other office areas. The ventilation system, the layout of the offices, and the agents' work practices were not designed to contain or control forensic hazards.

All nine participating agents were men, and their average age was 45 years (range = 35–60 years). The average time in their current job was 9 years (range = 4–19 years). Some agents reported tobacco or alcohol use, exposure to solvents outside of work, chronic medical conditions, and prescription medication use. All reported previously handling SC material evidence from previous drug raids. Approximately half of the nine agents reported ever having cough, eye irritation, throat irritation, and dizziness or lightheadedness (based on recall) from previous activities handling SC (Figure). Four agents reported feeling "high" when handling SC and three of these four also reported irritability, difficulty remembering things, and difficulty concentrating, which are frequently experienced by persons with intentional SC exposure.

All nine agents reported handling or being in the same room with the SC compound during the NIOSH evaluation. Two agents reported that they always wore gloves, five said they sometimes or usually wore gloves, and two said they did not wear gloves when handling SC during this evaluation. Six agents reported that they sometimes wore respirators during their job, including dust masks, filtering face-piece respirators, or half-mask elastomeric respirators (air-purifying respirators with replaceable filters, cartridges, or canisters).

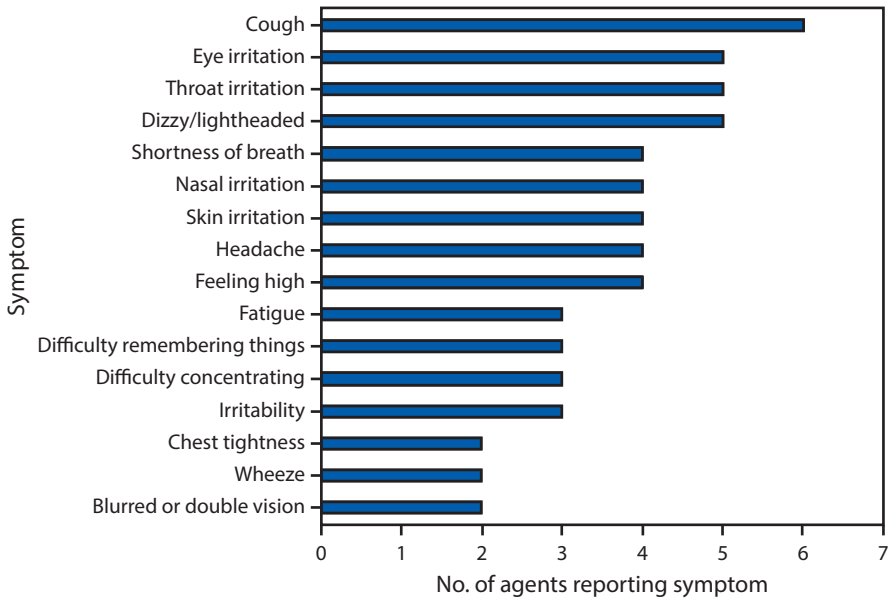
No AB-PINACA or mitragynine was found in any of the personal air or area air samples. The estimated minimum detectable concentrations for AB-PINACA and mitragynine were based on laboratory measurements and ranged from 0.03 to 0.1 mg/m^3 and from 0.02 to 0.1 mg/m^3, respectively. Only one wipe sample, taken from a baking sheet in the SC laboratory where treated plant material was dried, had a detectable level of AB-PINACA. No wipe samples had detectable levels of mitragynine.

Liquid chromatography–tandem mass spectrometry testing did not detect AB-PINACA, its metabolites, or mitragynine in any agent's baseline urine specimen (Table). After the raid, however, four agents had detectable AB-PINACA or its metabolites in their urine, and six agents had mitragynine in their urine. The agent with the highest concentrations of SC metabolites was observed handling most of the evidence; this agent reported not wearing gloves. Five agents with positive urine results handled evidence during the raid and reported variable glove use, ranging from none to always; one of the five was a smoker who reported usually wearing gloves and could have had hand-to-mouth exposure. Among the three agents with negative urine testing results, two did not handle evidence during or after the raid; the third agent participated in both activities and reported some glove use.

Discussion

Acute SC poisonings in the United States appear to be increasing, and several recent outbreaks among users have been reported (*1*,*3*). DEA has banned several SCs, but SC manufacturers continually modify these compounds to avoid illegal status, packaging them as "herbal incense" and labeling them "not for human consumption" (*4*). SCs have effects that are

FIGURE. Symptoms reported by nine law enforcement agents involved in the raid of an illegal synthetic cannabinoid lab while ever handling* synthetic cannabinoids — Nevada, 2014



Source: Adapted from Ramsey JG, Tapp L, Burr G. Evaluation of law enforcement agents' potential exposures during a raid of a clandestine "spice" lab. HHE report no. 2014-0039-3246. US Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health; 2014. https://www.cdc.gov/niosh/hhe/reports/pdfs/2014-0039-3246.pdf.

* Refers to previous raids of illegal "spice" laboratories and evidence handling, not to the raid and evidence handling during this investigation.

similar to, but often much more potent than, those of delta-9-tetrahydrocannabinol, the psychoactive compound found in marijuana (*1*,*4*,*5*). Symptoms of SC toxicity vary by exposure route, type of SC, and dose (*5*). Reported signs and symptoms of abuse include anxiety, agitation, acute psychosis, hallucinations, seizures, tachycardia, hypertension, hypokalemia, nausea, and vomiting (*1*,*2*,*4*,*5*). More severe health effects of SC abuse include respiratory depression requiring endotracheal intubation and mechanical ventilation, acute kidney injury, hyperthermia and rhabdomyolysis, and acute myocardial infarction (*2*,*4*,*5*). Few SCs are identified by routine drug screening tests (*4*).

Mitragynine is derived from the *Mitragyna speciosa* plant. It has been used for its stimulant effects (to enhance physical effort and endurance), opium-like effects (pain relief and sedation), and modulation of opiate withdrawal, but it appears to have addictive properties (*6*). Mitragynine preparations are accessible in some "smoke shops" and via the Internet (*7*).

Law enforcement agents are involved in raiding SC manufacturing laboratories and processing seized SC evidence, but little is known about their occupational exposure to SCs. A recent case series reported occupational skin exposure to SC oil resulted in transdermal SC poisoning in three customs inspectors (*8*). A previous study found that law enforcement agents participating in methamphetamine laboratory investigations had an increased number of respiratory symptoms, even with the use of respiratory protection (*9*). The levels of AB-PINACA and its metabolites found in agents' urine were much lower than the levels reported in patients evaluated in emergency departments after intentional use (*10*); however, the levels at which health effects might occur is unknown, and no biologic exposure limits or reference ranges exist for these compounds in the occupational setting.

AB-PINACA and mitragynine were detected in urine, but not in air, suggesting that dermal absorption or ingestion from dermal contamination might be important routes of exposure. However, these compounds might also be present in air and levels might vary substantially among manufacturing laboratories.

The findings in this report are subject to at least three limitations. First, methods have not been validated for air and surface SC sampling and analyses and, therefore, levels of contamination might have been underestimated. Second, agents' reported symptoms could not be compared with urine levels of cannabinoid metabolites and mitragynine because the symptom survey asked about historical symptoms when handling SC, not symptoms experienced during the evaluation. Finally, some agents reported tobacco or alcohol use, exposure to solvents outside of work, chronic medical conditions, and prescription medication use that might have contributed to their reported symptoms.

Law enforcement agents are at risk for dermal and ingestion exposures to SCs and other contaminants when collecting evidence in the field and processing evidence in the office; the risk for inhalation exposure is not well understood. A final report issued to the agency included the following recommendations to reduce personal exposures to potential contaminants during raids and while handling evidence: 1) properly design the forensic facility, 2) train agents on good hygiene practices, including prohibiting eating, drinking, and smoking while processing evidence, and 3) require a minimum level of PPE (e.g., disposable clothing and protective gloves) to avoid skin contact or inadvertent ingestion. Other occupations, such as housekeeping staff members in the offices, also might be at risk for exposure. Additional research exploring air exposures from SCs, take-home exposures, laboratory methods, and preventive measures is needed. The related health hazard evaluation was published online by NIOSH in March 2016 (https://www.cdc.gov/niosh/hhe/reports/pdfs/2014-0039-3246.pdf).

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Conflict of Interest

No conflicts of interest were reported.

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Summary

What is already known about this topic?

Some persons who have inhaled or ingested synthetic cannabinoids (SCs) have had severe health effects. New SCs continue to be manufactured despite Drug Enforcement Administration efforts. Law enforcement personnel have experienced symptoms during methamphetamine laboratory investigations, but little is known about their symptoms during SC enforcement activities.

What is added by this report?

This is the first reported investigation of occupational SC exposure. SCs or their urinary metabolites or mitragynine were detected in the urine of six of nine law enforcement agents after they were involved in raiding an illegal SC manufacturing facility and collecting, processing, and cataloging SC evidence. No policies were in place regarding the appropriate handling of evidence, such as requirements for gloves and protective clothing, or on prohibiting food and drink in evidence processing areas. Shower and locker areas were not provided for agents to reduce contamination and prevent take-home exposure. The layout and ventilation of the agency's office did not contain or control potential hazards from the receiving, processing, and storing of evidence.

What are the implications for public health practice?

Law enforcement agents are exposed to material containing SCs during raids of illegal SC laboratories, and when collecting, processing, and cataloging SC evidence. A properly designed forensic facility and good hygiene practices can reduce personal exposures to potential contaminants during law enforcement raids and while handling evidence. A minimum level of personal protective equipment is needed, in addition to prohibiting eating, drinking, and smoking while processing SC evidence.

Fractional-Dose Inactivated Poliovirus Vaccine Campaign — Sindh Province, Pakistan, 2016

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Following the declaration of eradication of wild poliovirus (WPV) type 2 in September 2015, trivalent oral poliovirus vaccine (tOPV) was withdrawn globally to reduce the risk for type 2 vaccine-derived poliovirus (VDPV2) transmission; all countries implemented a synchronized switch to bivalent OPV (type 1 and 3) in April 2016 (*1*,*2*). Any isolation of VDPV2 after the switch is to be treated as a potential public health emergency and might indicate the need for supplementary immunization activities (*3*,*4*). On August 9, 2016, VDPV2 was isolated from a sewage sample taken from an environmental surveillance site in Hyderabad, Sindh province, Pakistan. Possible vaccination activities in response to VDPV2 isolation include the use of injectable inactivated polio vaccine (IPV), which poses no risk for vaccine-derived poliovirus transmission. Fractional-dose, intradermal IPV (fIPV), one fifth of the standard intramuscular dose, has been developed to more efficiently manage limited IPV supplies. fIPV has been shown in some studies to be noninferior to full-dose IPV (*5*,*6*) and was used successfully in response to a similar detection of a single VDPV2 isolate from sewage in India (*7*). Injectable fIPV was used for response activities in Hyderabad and three neighboring districts. This report describes the findings of an assessment of preparatory activities and subsequent implementation of the fIPV campaign. Despite achieving high coverage (>80%), several operational challenges were noted. The lessons learned from this campaign could help to guide the planning and implementation of future fIPV vaccination activities.

Campaign Preparations and Implementation

The fIPV campaign was conducted in 120 subdistricts, known as union councils, in Hyderabad and three neighboring districts (Jamshoro, Matyari, and Tando Allahyar) of Sindh province during October 24–November 1, 2016 (Figure 1). Areas with sewage drainage to the Tulsidas Pumping Station, from which the VDPV isolate was identified, and those within the potential zone of poliovirus circulation were chosen for campaign implementation. The target population for the campaign comprised 258,492 children aged 4–23 months (Table). In contrast to OPV campaigns, in which house-to-house visits constitute the primary strategy for vaccination activities, the fIPV campaign was conducted at fixed sites, such as hospitals and dispensaries, and through deployment of outreach teams to designated vaccination stations. This was to ensure cold chain maintenance and safe injection practices.

Vaccinators for the fIPV campaign were recruited mostly from among Pakistan's Lady Health Worker Programme* and staff members of the national Expanded Programme on Immunization (EPI). A small proportion of vaccinators were recruited from among other community health workers, including dispensary staff members, clinical ward attendants, and, in one district, gardeners who had previous experience working in EPI. In addition to vaccinators, team assistants and social mobilizers were also recruited. A total of 995 vaccinators, 995 team assistants, and 1990 social mobilizers were recruited to support the campaign.

Vaccinators received a 2-day training and worked with teams of supervisors to develop microplans ahead of the campaigns. These microplans included details of the specific number of children within the target age group for each location as well as management of vaccine and cold chain supplies. Social mobilizers were recruited to promote awareness of the campaigns in the union councils where they were scheduled to take place. In addition, awareness of the campaign was promoted using posters and banners, radio and television, public announcements, and through engagement of religious and community leaders.

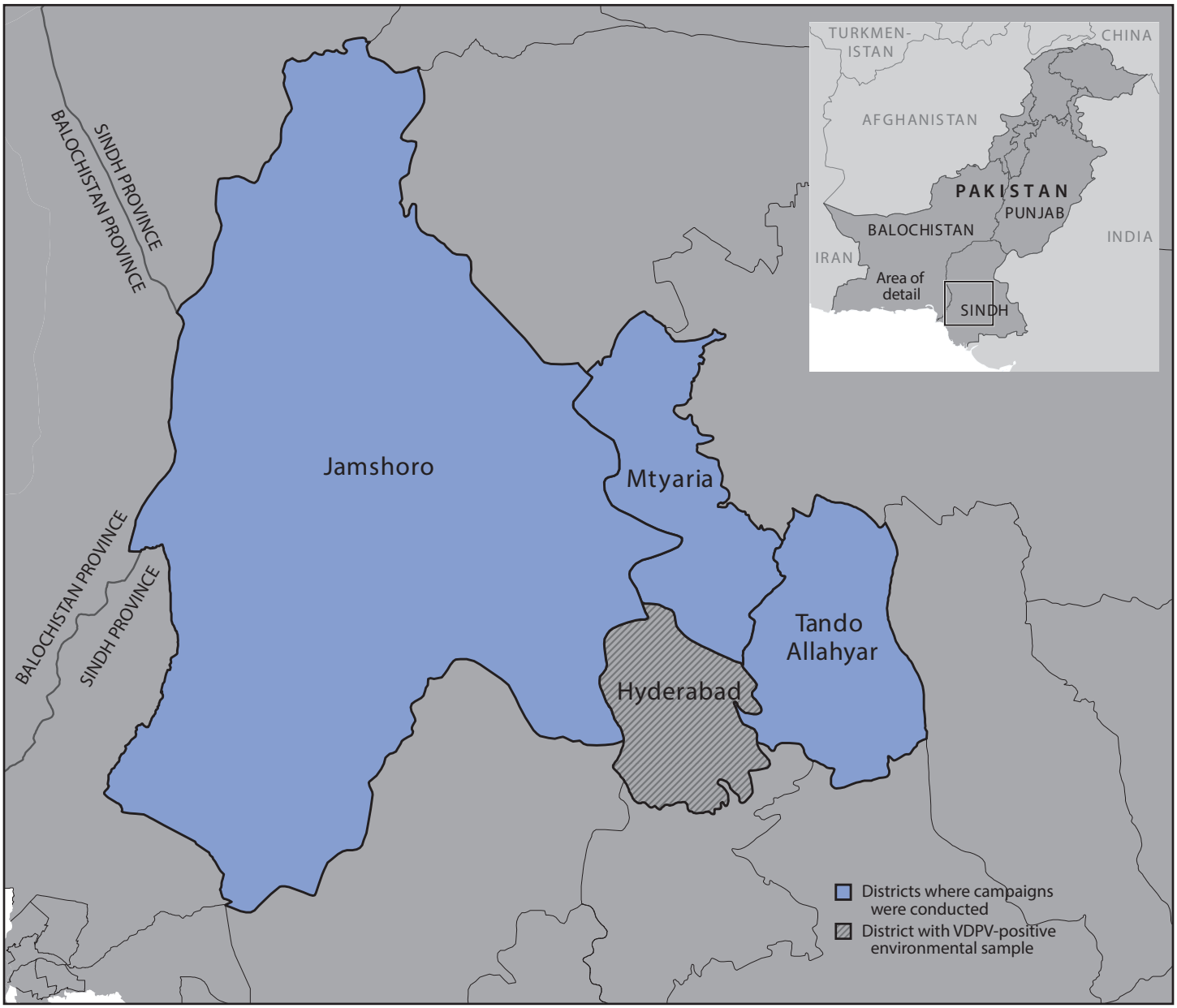
Over 9 days of the campaign, vaccination activities took place at designated locations during 8 a.m.–4 p.m. A team comprising at least one vaccinator, an assistant, and two social mobilizers staffed each vaccination site. Vaccinators administered a 0.1-mL dose of fIPV (one fifth of a full intramuscular dose of IPV, drawn from a vial containing 10 full intramuscular doses) intradermally in the upper left arm of each child, and assistants marked the left fifth finger of each vaccinated child with an indelible marker and entered records in a tally sheet.

Intracampaign Monitoring and Field Assessment

A team of 20 campaign assessors drawn from the Pakistan Field Epidemiology and Laboratory Training Program monitored the campaign in 21 union councils. The 21 union councils were randomly selected from the pool of 120 union councils that took part in the campaign, with probability of

*http://www.who.int/workforcealliance/knowledge/case_studies/CS_Pakistan_web_en.pdf?ua=1.

FIGURE 1. Location of fractional inactivated poliovirus vaccine campaign — Sindh Province, Pakistan, October–November 2016



Abbreviation: VDPV = vaccine-derived poliovirus.

selection proportional to estimated size. Campaign assessors visited selected vaccination sites, fixed and outreach, where they assessed staffing patterns and vaccine delivery procedures, including the quality of intradermal injections, vaccine supply and cold chain management, and compliance with the open-vial policy† (*8*).

†The World Health Organization's open vial policy allows for the use of inactivated poliovirus vaccine (IPV) for up to 28 days after opening so long as the vaccine vial monitor is valid and the manufacturer's instructions stipulate that it can be used as such. The vaccine vial must be within its expiry date, there should be no evidence of leakage or contamination, and it must be stored under proper conditions between vaccination sessions.

TABLE. Distribution of union councils, target populations, and vaccination sites during a fractional inactivated poliovirus vaccine campaign, by district — Sindh Province, Pakistan, October–November 2016

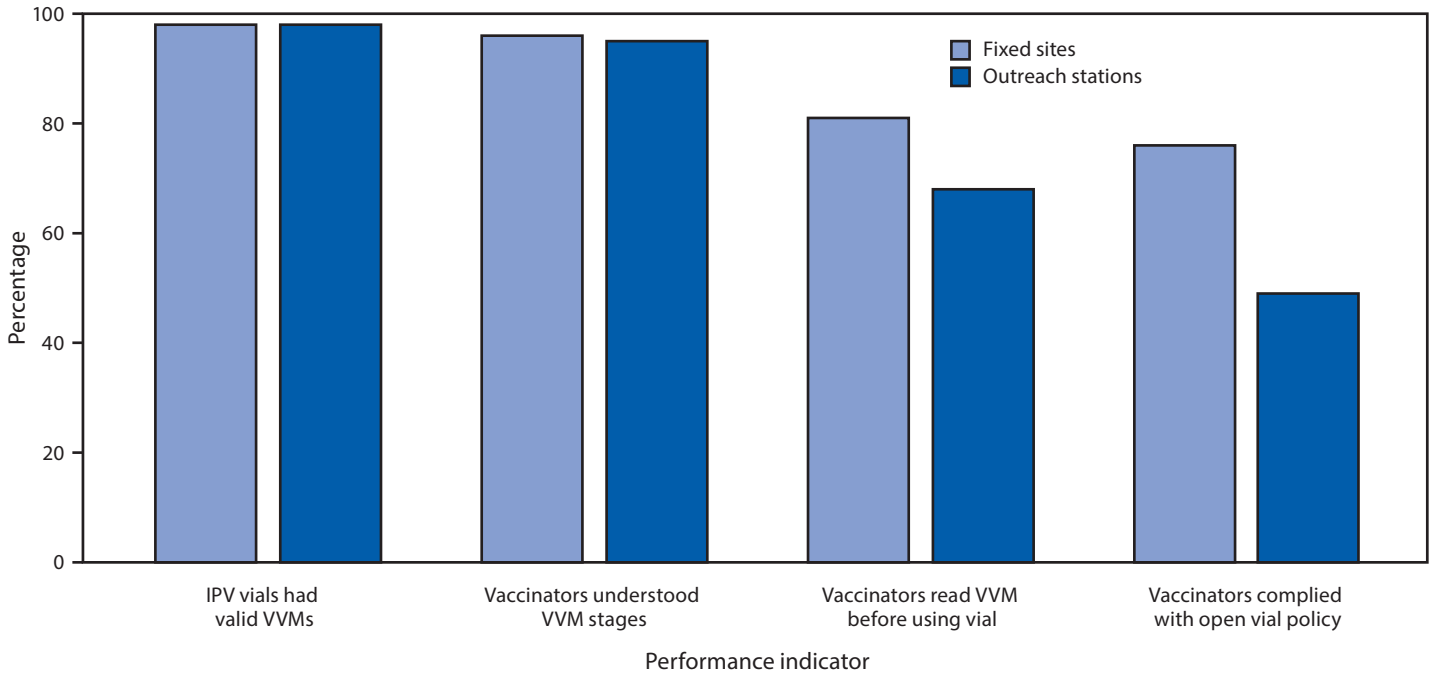
District	No. of union councils	Target population	Sites visited by campaign assessors	
			No. of fixed sites	No. of outreach stations
Hyderabad	54	99,392	54	211
Jamshoro	28	62,376	33	143
Matyari	18	48,524	22	120
Tando Allah Yar	20	48,200	27	116
Total	**120**	**258,492**	**136**	**590**

Among 726 (590 outreach and 136 fixed) vaccination sites visited (Table), 74 (10%) were either nonfunctional or experienced delays in commencing their activities. Of the 566 functional outreach vaccination sites, 32% were not at the locations indicated in the campaign microplan. Furthermore, vaccinators at 67 (12%) outreach stations were different from those listed in the microplan. All but one (134 of 135) of the vaccinators at fixed sites reported having previous experience with intradermal injections, compared with 90% of vaccinators at outreach stations. Nine percent of vaccinators stated that the training they received did not adequately prepare them for administering intradermal fIPV injections during the campaign.

All IPV vials were within their expiration dates, and 98% had valid vaccine vial monitors (VVMs), thermochromic labels that change color when the vaccine has not been maintained at the appropriate temperature. Although 95% of vaccinators were knowledgeable about the different stages of VVMs and their significance related to vaccine viability, 32% of vaccinators at outreach stations and 19% at fixed sites were observed to not review VVMs before administering the vaccine (Figure 2). Each campaign assessor observed an average of three intradermal fIPV injections per vaccination station visited. Among 1,960 injections observed, 96% were administered at the appropriate site; bleb formation, indicative of intradermal delivery of fIPV, was observed in 82% of injections. Blebs were more commonly observed among children vaccinated at fixed sites (92%) than at outreach stations (80%). There were no adverse event reporting forms at 119 (17%) of the stations visited, and 15% of vaccinators at outreach stations were not aware of procedures for reporting adverse events. There was also considerable confusion about the open-vial policy: 51% of outreach stations and 24% of fixed sites were not reusing open IPV vials the next day, even if the VVM was valid, there was no leakage from the vial septum, and the vaccine was within its expiration date (Figure 2).

To assess the level of campaign awareness, campaign assessors interviewed 1,968 caregivers at vaccination sites. Seventy percent of caregivers were from rural union councils and 30% from urban union councils. Awareness of the campaign before its commencement was lower among caregivers from rural union councils (57%) than among those from urban union councils (83%). Of the 1,273 (65%) caregivers who were aware of the campaign, three-quarters gained their awareness through a single information source. Among this group, the principal sources of information about the campaign were social mobilizers (75%) and vaccinators/health workers (15%). Mass media, such as radio and TV, accounted for <5% of caregiver campaign awareness. Despite the pivotal role of

FIGURE 2. Knowledge of vaccine vial monitors and compliance with open vial policy among vaccinators during a fractional inactivated poliovirus vaccine campaign — Sindh Province, Pakistan, October–November 2016



Abbreviations: IPV = inactivated polio vaccine; VVM = vaccine vial monitor.

social mobilizers in creating awareness in the community, deficiencies were noted in their performance. Among 517 social mobilizers, 63% did not have a social mobilization plan with a route map and 17% did not have a checklist to mark off houses they had visited.

Postcampaign Coverage Assessment

A multistage cluster survey was used to assess the quality of the fIPV campaign. Thirty-five union councils were selected as primary sampling units from among 120 union councils that took part in the campaign, with probability of selection proportional to estimated size. Within each council, six neighborhood clusters were selected, from among which 10 households were randomly chosen. One eligible child in each of these households was checked for finger-marking as evidence of vaccination. Data on vaccination status based on parental recall was also collected. The postcampaign assessment took place during November 3–6, 2016 and was undertaken by staff members of the Pakistan Polio Eradication Initiative.

Overall, 2,100 children were assessed for vaccination during the campaign. Estimated coverage, accounting for the first stage clusters, was 82% (Wilson confidence interval = 78%–85%) based on finger-marking and 90% (Wilson confidence interval = 88%–92%) based on parental recall. Nearly half (49%) of 377 children reported as unvaccinated were classified as such based on the absence of finger-marking, despite claims by their parents that they were vaccinated. Among the remaining 191 children, refusals (27%), lack of awareness (24%), and absence of the child during the campaign (16%) were the main reasons for children not being vaccinated. Refusals were driven mostly by fear or illness of the child at the time of the campaign, but they only constituted approximately 2% of the 2,100 children assessed during the survey.

Discussion

Although relatively high vaccination coverage (82%) was achieved during the fIPV campaign in response to the VDPV2 isolate in Hyderabad, the campaign highlighted several operational challenges associated with the use of an intradermally injected vaccine during a polio campaign. Many of these challenges are related to the fact that campaigns using injectable vaccines are better suited to fixed-site implementation, as opposed to the house-to-house strategy used for most polio campaigns, because of the operational complexities of safely administering injections and disposing of needles and syringes.

Many of the difficulties encountered in the fIPV campaign occurred more commonly at outreach stations. Compared with those at fixed sites, vaccinators at outreach stations were more likely to be inexperienced and to administer vaccines incorrectly. Collectively, vaccinators at both fixed sites and outreach stations could have benefited from better training and more rigorous precampaign planning. Further, all vaccinators need to be properly trained on procedures for reporting adverse events. Although social mobilizers were the principal drivers of awareness, the quality of mobilization activities before and during the campaign was suboptimal, especially in rural union councils. Detailed microplanning, including the creation and use of route maps, should be prioritized to facilitate social mobilization activities for future campaigns.

An earlier fIPV campaign in India demonstrated the operational feasibility of achieving high vaccination coverage with the vaccine in response to VDPV2 isolation from sewage (*7*). The fIPV campaign in Pakistan corroborates the feasibility of achieving high coverage, but it also highlights the operational challenges encountered during such campaigns. Current World Health Organization protocol recommends monovalent OPV type 2 (mOPV2) as the appropriate response vaccine when circulation of VDPV2 is confirmed because of its effectiveness in interrupting poliovirus transmission (*9*). IPV use is not routinely recommended, largely because it might diminish the ability to achieve high quality rounds of mOPV2 vaccination that will stop poliovirus transmission and because IPV recipients, while protected against paralysis, can continue to transmit poliovirus in an ongoing outbreak. If, however, a country elects to respond to a single VDPV isolate with fIPV, meticulous planning and preparation is required to ensure judicious and effective use of the limited global IPV stock (*1*,*10*).

Acknowledgments

Office of Public Health Preparedness and Response, CDC; World Health Organization Global Polio Laboratory Network.

Conflict of Interest

No conflicts of interest were reported.

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Summary

What is already known about this topic?

Wild poliovirus type 2 was declared eradicated in September 2015, prompting a synchronized switch from trivalent to bivalent (types 1 and 3) oral poliovirus vaccine in April 2016. Any subsequent isolation of vaccine-derived poliovirus type 2 (VDPV2) following the switch represents a potential public health emergency for which response activities might be warranted. Vaccination options for these activities include the use of monovalent oral poliovirus vaccine type 2 (mOPV2) and/or inactivated poliovirus vaccine (IPV) for polio vaccination campaigns.

What is added by this report?

Because of the limited global stock of IPV, fractional-dose intradermal IPV (fIPV), which is one fifth of the full intramuscular dose, has been developed and is being used for polio vaccination activities. Several studies have indicated that fIPV is not inferior to full dose IPV, and it has been used successfully for polio response activities in India. In response to a VDPV2 isolate from sewage samples taken from Hyderabad, Pakistan, fIPV was used in a polio vaccination campaign targeting children aged 4–23 months in four districts of Sindh province, Pakistan. Although relatively high coverage (82%) was achieved, operational challenges related to the use of an intradermally injected vaccine were encountered during the campaign.

What are the implications for public health practice?

Given current recommendations in favor of mOPV2 use for VDPV2 response activities, countries should weigh the potential benefits of using fIPV against the operational challenges associated with its use. If countries determine that fIPV use is warranted, meticulous planning and preparation should precede such activities to ensure judicious use of the limited global stock of IPV.

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Vital Signs: Human Immunodeficiency Virus Testing and Diagnosis Delays — United States

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Abstract

Background: Persons unaware of their human immunodeficiency virus (HIV) infection account for approximately 40% of ongoing transmissions in the United States. Persons are unaware of their infection because of delayed HIV diagnoses that represent substantial missed opportunities to improve health outcomes and prevent HIV transmission.

Methods: Data from CDC's National HIV Surveillance System were used to estimate, among persons with HIV infection diagnosed in 2015, the median interval (and range) from infection to diagnosis (diagnosis delay), based on the first CD4 test after HIV diagnosis and a CD4 depletion model indicating disease progression and, among persons living with HIV in 2015, the percentage with undiagnosed infection. Data from CDC's National HIV Behavioral Surveillance were analyzed to determine the percentage of persons at increased risk for HIV infection who had tested in the past 12 months and who had missed opportunities for testing.

Results: An estimated 15% of persons living with HIV in 2015 were unaware of their infection. Among the 39,720 persons with HIV infection diagnosed in 2015, the estimated median diagnosis delay was 3.0 years (interquartile range = 0.7–7.8 years); diagnosis delay varied by race/ethnicity (from 2.2 years among whites to 4.2 years among Asians) and transmission category (from 2.0 years among females who inject drugs to 4.9 years among heterosexual males). Among persons interviewed through National HIV Behavioral Surveillance, 71% of men who have sex with men, 58% of persons who inject drugs, and 41% of heterosexual persons at increased risk for HIV infection reported testing in the past 12 months. In each risk group, at least two thirds of persons who did not have an HIV test had seen a health care provider in the past year.

Conclusions: Delayed HIV diagnoses continue to be substantial for some population groups and prevent early entry to care to improve health outcomes and reduce HIV transmission to others.

Implications for Public Health Practice: Health care providers and others providing HIV testing can reduce HIV-related adverse health outcomes and risk for HIV transmission by implementing routine and targeted HIV testing to decrease diagnosis delays.

Introduction

Persons unaware of their human immunodeficiency virus (HIV) infection are estimated to account for approximately 40% of ongoing transmissions in the United States (*1*). As a result of increased testing, the percentage of persons living with HIV who are aware of their infection has steadily increased; at the end of 2014, an estimated 85% of persons living with HIV were aware of their infection, approaching the national goal of 90% by 2020 (*2*). Persons aware of their HIV infection reduce their transmission risk behaviors and can enter HIV care and take antiretroviral treatment to achieve viral suppression (a viral load result of <200 copies/mL, or undetectable levels) (*3*). Viral suppression not only preserves immune function, decreasing a person's risk for morbidity and mortality, but also profoundly reduces risk for sexual transmission to others (*4*–*6*). Early detection of HIV infection maximizes these benefits.

CDC recommends routine testing for HIV infection for persons aged 13–64 years in health care settings and testing at least annually for persons at high risk for HIV infection (*7*). Yet, according to National HIV Behavioral Surveillance (NHBS), one third of gay, bisexual, and other men who have sex with men (MSM) have not been tested in the past year, with even lower percentages of recent testing reported among other population segments at high risk for HIV infection.

Methods

Data reported to CDC's National HIV Surveillance System from 50 states and the District of Columbia through June 2017

Key Points

- Persons unaware of their human immunodeficiency virus (HIV) infection account for approximately 40% of ongoing transmissions in the United States.
- Eighty-four percent of sexual transmission from men who have sex with men (MSM) and heterosexuals is estimated to occur from MSM.
- Among persons with HIV infection diagnosed in 2015, the estimated median interval from infection to diagnosis was 3 years.
- Prior year testing increased over time among groups at high risk for HIV infection. However, 29% of MSM, 42% of persons who inject drugs, and 59% of heterosexual persons at increased risk did not report testing in the past 12 months.
- In each risk group, at least two thirds of persons who did not have an HIV test had seen a health care provider in the past year.
- Continued efforts to ensure routine and targeted testing can help reduce the number of persons who are unaware of their infection, diagnosis delays, missed opportunities for care and treatment, and HIV transmission.
- Additional information is available at https://www.cdc.gov/vitalsigns/.

were used to estimate the total number of persons living with HIV infection (diagnosed and undiagnosed infection, or prevalence) at year-end 2015 and the median number of years and interquartile range between infection and diagnosis (diagnosis delay) of persons with HIV diagnosed in 2015 (8,9). The first CD4 test after HIV diagnosis and a CD4 depletion model indicating disease progression were used to estimate year of infection and the distribution of time from HIV infection to diagnosis among persons with diagnosed infection (9). The distribution of diagnosis delay was used to estimate the annual number of HIV infections, which includes persons with diagnosed infection and persons with undiagnosed infection. HIV prevalence (persons with diagnosed or undiagnosed HIV infection) was estimated by subtracting reported cumulative deaths among persons with HIV infection from cumulative HIV infections.

The number of persons with undiagnosed HIV infection was estimated by subtracting the number of reported cumulative diagnoses from the number of estimated cumulative infections. The percentage of undiagnosed infections was determined by dividing the number of undiagnosed infections by the total HIV prevalence.

Data from NHBS were used to determine the percentage of persons at increased risk for infection who were tested in the past 12 months and the percentage who missed opportunities for testing.* NHBS monitors HIV-associated behaviors and HIV prevalence in cities† with high acquired immunodeficiency syndrome (AIDS) prevalence among three populations with HIV risk behaviors: MSM, persons who inject drugs, and heterosexual persons at increased risk for HIV infection.

Cross-sectional data reported in this analysis are from MSM, persons who inject drugs, and heterosexual persons at increased risk for HIV infection recruited for face-to-face interviews and HIV testing through venue-based sampling (MSM) and respondent-driven sampling (persons who inject drugs and heterosexual persons) in NHBS surveys from 2008 to 2016. NHBS sampling procedures have been previously described (*10*). Persons were eligible to participate if they resided in a participating city, could complete the survey in English or Spanish, and met cycle-specific inclusion criteria (MSM: born male, aged ≥18 years, identified as male, and had oral or anal sex with another man; persons who inject drugs: aged ≥18 years, injected drugs in the past 12 months; and heterosexual persons: male or female [not transgender], aged 18–60 years, had sex with a member of the opposite sex in the past 12 months, never injected drugs, and met low income or low education criteria).§ For inclusion in current analyses, participants must have tested negative during the NHBS cycle, MSM must have had sex with another man in the past 12 months, and persons who inject drugs must have been male or female (not transgender). Data were analyzed by sex, age, and race/ethnicity (American Indian or Alaska Native; Asian; black or African American [blacks]; Hispanic or Latino; Native Hawaiian or Other Pacific Islander; white; and multiple race).

* Past year testing was assessed during the interview by asking participants, "When did you have your most recent HIV test? Please tell me the month and year." A missed opportunity was defined as a visit to a health care provider in the past 12 months for a person who did not report past year HIV testing or as not being offered an HIV test at any health care visits for a person who did not report past year HIV testing and had visited a health care provider in the past year.

† During 2008–2015, 20 cities were included; during 2016, 17 cities were included. The following cities were included in all years: Atlanta, Georgia; Boston, Massachusetts; Dallas, Texas; Denver, Colorado; Los Angeles, California; Miami, Florida; Nassau–Suffolk, New York; New Orleans, Louisiana; Newark, New Jersey; Philadelphia, Pennsylvania; San Diego, California; San Francisco, California; San Juan, Puerto Rico; Washington, D.C. Additional cities were included as follows: 2008–2015, Baltimore, Maryland; Chicago, Illinois; Detroit, Michigan; Houston, Texas; New York City, New York; Seattle, Washington; 2016, Memphis, Tennessee; Portland, Oregon; Virginia Beach/Norfolk, Virginia.

§ Social-structural variables were used to identify a representative sample for NHBS of heterosexual persons at increased risk of HIV infection. Heterosexual persons at increased risk were defined as male or female (not transgender) in a metropolitan statistical area with high AIDS prevalence, who had sex with a member of the opposite sex in the past 12 months, never injected drugs, and met low income or low education criteria. Low income was defined as not exceeding U.S. Department of Health and Human Services poverty guidelines and low education as having a high school education or less.

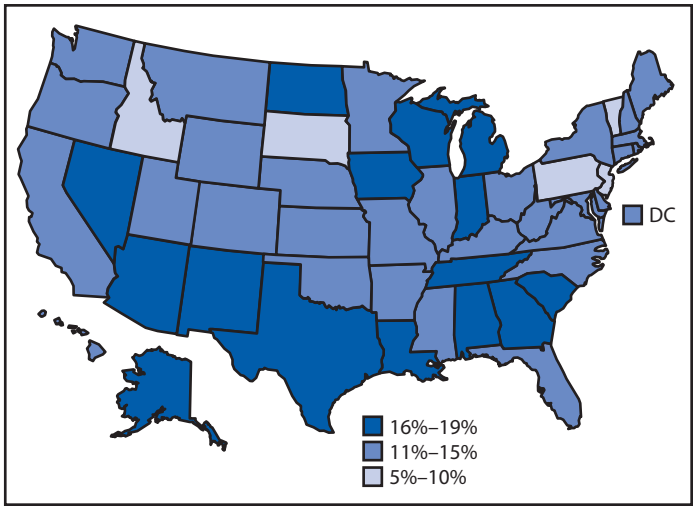
Results

In 2015, among 1,122,900 persons living with HIV infection, 162,500 (14.5%) were unaware of their infection. The percentage of undiagnosed HIV infections ranged from 5.7% to 18.5% across states (Figure 1); 50.5% of undiagnosed infections were in the South. Among 39,720 persons with HIV infection diagnosed in 2015, 21.6% had stage 3 infection (AIDS) at the time of diagnosis, and the estimated median interval from HIV infection to diagnosis was 3.0 years (Table 1). Diagnosis delays were longer among persons who were older at diagnosis than among those who were younger (median = 4.5 years among persons aged ≥55 years compared with 2.4 years among persons aged 13–24 years) (p<0.01). By race/ethnicity, median diagnosis delay ranged from 2.2 years among whites to 4.2 years among Asians (p<0.01). Diagnosis delay was longer among males (median = 3.1 years) than among females (median = 2.4 years) (p<0.01). By transmission category, diagnosis delay was longest among males with infection attributed to heterosexual contact (median = 4.9 years).

Among persons interviewed through NHBS, the percentage reporting an HIV test in the 12 months preceding the interview increased over time among MSM (from 63% in 2008 to 71% in 2014), persons who inject drugs (from 50% in 2009 to 58% in 2015), and heterosexual persons at increased risk for infection (from 34% in 2010 to 41% in 2016) (Figure 2). The prevalence of testing in the past 12 months was higher among females than among males, among both persons who inject drugs (males, 57%; females, 59%), and heterosexual persons at increased risk (males, 39%; females, 42%). Prevalence of testing was also higher among black persons who inject drugs (and heterosexual Asians, although the numbers were small) than among persons of other race/ethnicity and persons aged 25–34 years (and persons aged 35–44 years who inject drugs) than among other age categories in each risk group (Table 2).

Among persons interviewed through NHBS who were not tested in the past year, most MSM reported that their main reason for not testing was that they believed their risk for infection was low, whereas most persons who inject drugs and heterosexual persons at increased risk reported that they had no particular reason for not testing. In each risk group, at least two thirds of persons who did not have an HIV test had seen a health care provider in the past year (Table 2). Among those who had not tested in the past year and had visited a health care provider, approximately three quarters reported not having been offered an HIV test at any of their health care visits.

FIGURE 1. Percentage of undiagnosed infections*,† among persons aged ≥13 years§ living with diagnosed or undiagnosed human immunodeficiency virus (HIV) infection — United States, 2015



* Overall percentage of undiagnosed infections = 14.5%.
† Data classified manually.
§ Estimates were derived by using HIV surveillance data for persons aged ≥13 years at diagnosis in the 50 states and the District of Columbia.

Discussion

Fifty percent of persons with HIV infection diagnosed in 2015 had been infected for at least 3 years, and a quarter had been infected for ≥7 years. Diagnosis delays varied substantially by population. Although the percentage of persons testing increased over time among groups at high risk, overall, 15% of persons were unaware of their infection. The prevalence of persons unaware of their infection varied among states, and half (50.5%) of persons with undiagnosed HIV infection in 2015 were living in the South. Gaps in testing remain, and missed opportunities for testing at health care visits are prevalent. Improved testing coverage and frequency are needed to meet the goal of at least 90% of persons living with HIV knowing their infection status and to reduce diagnosis delays and ultimately reduce HIV incidence in the United States (*11*).

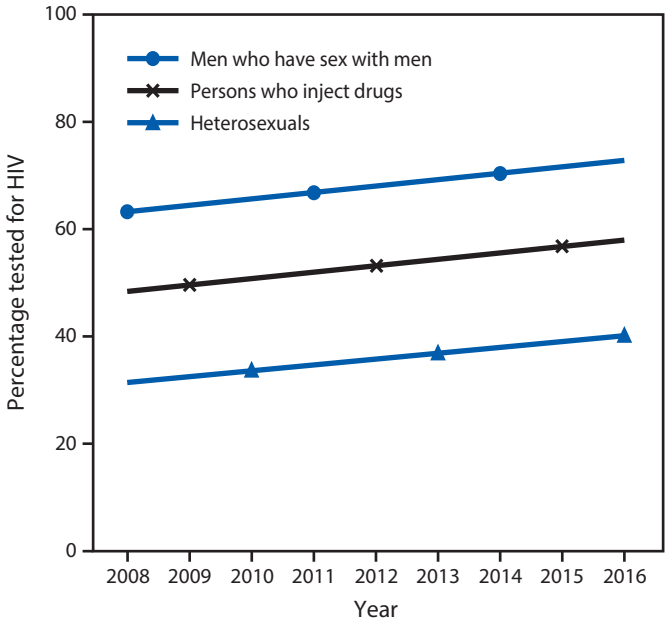
Cultural factors (e.g., stigma, fear, discrimination, and homophobia) might contribute to longer diagnosis delays in some populations (*12*). Asians accounted for the highest percentage of persons living with undiagnosed HIV infection compared with all other race/ethnicity groups (*13*). Although blacks were more likely than whites to report testing in the past 12 months across all groups at risk, the median diagnosis delay was 1 year longer for blacks (median = 3.3 years) than for whites (median = 2.2 years). The testing results might reflect national efforts to improve access to testing among blacks, and black MSM in particular, through prevention programs and media campaigns. In 2007, CDC launched the Expanded Testing Initiative (https://www.cdc.gov/hiv/policies/eti.html) to facilitate HIV diagnosis and linkage to care among blacks and continues to support high levels of testing. CDC's MSM Testing Initiative (https://www.researchgate.net/publication/287201580) scaled

TABLE 1. Diagnoses of human immunodeficiency virus (HIV) infection and estimated median number of years infected at time of HIV diagnosis — National HIV Surveillance System, United States, 2015

Characteristic	HIV diagnoses No. (%)	Years infected at time of diagnosis: Median	Interquartile range*	p-value†
Total	**39,720**	**3.0**	**(0.7–7.8)**	—
Sex				
Male	32,294 (81.3)	3.1	(0.7–7.8)	Referent
Female	7,426 (18.7)	2.4	(0.6–8.0)	<0.01
Age group at diagnosis (yrs)				
13–24	8,956 (22.5)	2.4	(0.7–5.6)	Referent
25–34	13,059 (32.9)	2.6	(0.6–7.6)	0.27
35–44	7,669 (19.3)	3.5	(0.7–9.6)	<0.01
45–54	6,306 (15.9)	4.0	(0.8–10.6)	<0.01
≥55	3,730 (9.4)	4.5	(0.8– 0.6)	<0.01
Race/Ethnicity				
American Indian or Alaska Native	195 (0.5)	3.4	(0.7–7.7)	0.06
Asian	938 (2.4)	4.2	(0.9–8.2)	<0.01
Black or African American	17,331 (43.6)	3.3	(0.7–7.6)	<0.01
Hispanic or Latino	9,678 (24.4)	3.3	(0.7–8.2)	<0.01
Native Hawaiian or Other Pacific Islander	80 (0.2)	3.9	(0.8–8.2)	0.01
White	10,445 (26.3)	2.2	(0.6–7.6)	Referent
Multiple races	1,053 (2.7)	3.0	(0.7–8.6)	0.01
Transmission category				
Male				
Male-to-male sexual contact	26,459 (81.9)	3.0	(0.7–7.4)	<0.01
Injection drug use	1,343 (4.2)	2.9	(0.7–8.2)	<0.01
Male-to-male sexual contact and injection drug use	1,270 (3.9)	2.1	(0.6–7.3)	<0.01
Heterosexual contact	3,187 (9.9)	4.9	(0.8–11.5)	Referent
Female				
Injection drug use	1,004 (13.5)	2.0	(0.6–5.4)	<0.01
Heterosexual contact	6,401 (86.2)	2.5	(0.6–8.5)	<0.01

* The interquartile range describes the middle 50% of values (i.e., 25% of values are less than the lower value and 25% are greater than the higher value).
† p-value is for testing the difference between two medians.

FIGURE 2. Percentage of persons tested for human immunodeficiency virus (HIV) in the past 12 months among men who have sex with men, persons who inject drugs, and heterosexual persons at increased risk for infection — National HIV Behavioral Surveillance (NHBS), United States, 2008–2016*



* Data include all participants with complete valid survey data who tested negative during NHBS and cycle-specific inclusion criteria: men who have sex with men (born male, identified as male, and had oral or anal sex with another man); persons who inject drugs (injected drugs in the past 12 months); heterosexual persons at increased risk (male or female [not transgender], had sex with a member of the opposite sex in the past 12 months, never injected drugs, and met low income [not exceeding U.S. Department of Health and Human Services poverty guidelines] or low education [high school education or less] criteria). Groups are mutually exclusive.

up HIV testing and linkage-to-care activities among black and Hispanic or Latino MSM in 11 cities. In addition, CDC implemented Testing Makes Us Stronger (https://www.cdc.gov/actagainstaids/campaigns/tmus), a public education campaign to increase testing among black MSM, from 2011 to 2015.

The longer diagnosis delay among non-white racial/ethnic groups might partly reflect the higher proportion of infections attributable to heterosexual contact among these groups compared with whites (*14*), given that heterosexual persons had longer diagnosis delays. Among all transmission categories, males with infection attributed to heterosexual contact had the longest median diagnosis delay (4.9 years). This observation was consistent with the finding that heterosexual males at increased risk for infection were less likely to report testing in the past 12 months than were heterosexual females at increased risk. Heterosexual men are less likely to visit a health care provider than are both women and MSM, leading to fewer opportunities for testing (*15*). Moreover, compared with other risk groups, heterosexual persons at increased risk were less likely to have been offered an HIV test even when visiting a health care provider in the past 12 months, possibly because of low perceived risk for infection (*15*,*16*). This finding highlights the importance of implementing routine screening in health care settings.

A previous estimate[¶] of diagnosis delays among persons who received a diagnosis of HIV infection in 2011 indicated that half had been infected for 3.6 years. The median diagnosis delay of 3.0 years among HIV diagnoses in 2015 reflects an absolute reduction of 0.6 years (7 months) and a relative reduction of 17%, representing a considerable decrease over a 4-year period (*8*). Earlier detection of HIV combined with prompt linkage

[¶] The 2011 estimate of diagnosis delay is based on the same CD4 methodology used in this report, but CD4 model parameters were updated, and more CD4 data are available in recent years; therefore, results are not directly comparable.

TABLE 2. Human immunodeficiency virus (HIV) testing in the past 12 months, reasons for not testing, and missed opportunities for testing among men who have sex with men, persons who inject drugs, and heterosexual persons* at increased risk for acquisition of HIV infection — National HIV Behavioral Surveillance, United States, 2014–2016

Characteristic	MSM, 2014†		Persons who inject drugs, 2015§		Heterosexual persons at increased risk, 2016¶	
	No. in sample	No. (%)	No. in sample	No. (%)	No. in sample	No. (%)
HIV testing, past year (overall)	**6,834**	**4,862 (71.1)**	**9,574**	**5,537 (57.8)**	**7,256**	**2,972 (41.0)**
Sex						
Male	6,834	4,862 (71.1)	6,905	3,962 (57.4)	3,257	1,276 (39.2)
Female	NA	NA	2,669	1,575 (59.0)	3,999	1,696 (42.4)
Race/Ethnicity						
American Indian or Alaska Native	43	31 (72.1)	94	52 (55.3)	51	19 (37.3)
Asian	144	106 (73.6)	27	15 (55.6)	11	6 (54.6)
Black or African American	1,536	1,169 (76.1)	3,098	1,948 (62.9)	5,205	2,398 (46.1)
Hispanic or Latino	1,932	1,316 (68.1)	2,145	1,214 (56.6)	1,461	368 (25.2)
Native Hawaiian or Other Pacific Islander	37	31 (83.8)	15	6 (40.0)	21	5 (23.8)
White	2,789	1,951 (70.0)	3,804	2,081 (54.7)	216	58 (26.9)
Other/Multiple races	317	230 (72.6)	374	211 (56.4)	279	114 (40.9)
Age group (yrs)						
18–24	1,576	1,169 (74.2)	570	312 (54.7)	1,504	628 (41.8)
25–34	2,656	2,024 (76.2)	2,317	1,379 (59.5)	1,843	870 (47.2)
35–44	1,198	836 (69.8)	2,108	1,254 (59.5)	1,401	601 (42.9)
45–54	966	588 (60.9)	2,458	1,397 (56.8)	1,727	604 (35.0)
≥55	438	245 (55.9)	2,121	1,195 (56.3)	781	269 (34.4)
Persons not tested who visited an HCP in past year	**1,971**	**1,325 (67.2)**	**4,036**	**2,887 (71.5)**	**4,284**	**3,205 (74.8)**
Persons not tested who visited an HCP in the past year but were not offered an HIV test	**1,316**	**1,052 (79.9)**	**2,849**	**2,146 (75.3)**	**3,183**	**2,511 (78.9)**
Main reason for not testing, no. (column %)						
Think risk for infection is low	—	896 (45.2)	—	790 (19.6)	—	740 (17.3)
Afraid of finding out they had HIV	—	327 (16.5)	—	836 (20.8)	—	642 (15.0)
Didn't have time	—	203 (10.3)	—	467 (11.6)	—	532 (12.4)
Some other reason	—	89 (4.5)	—	195 (4.8)	—	164 (3.8)
No particular reason	—	466 (23.5)	—	1,737 (43.2)	—	2,201 (51.4)
Total	—	**1,981 (100.0)**	—	**4,025 (100.0)**	—	**4,279 (100.0)**

Abbreviations: HCP = health care provider; MSM = men who have sex with men; NA = not applicable.
* Aged 18–60 years.
† Data include all participants with complete, valid survey data from 20 cities who reported having sex with another man in the 12 months before interview and who had negative HIV test results.
§ Data include all participants with complete, valid survey data from 20 cities who reported male or female gender and who had negative HIV test results.
¶ Data include all participants with complete, valid survey data from 17 cities who reported male or female gender, who ever had sex with a member of the opposite sex, never injected drugs, and who had negative HIV test results.

to care and initiation of antiretroviral treatment enhances preservation of immune function and, if viral suppression is achieved and maintained, reduces risk for sexual transmission of HIV (*4*). In addition, persons who know they have HIV infection substantially reduce their HIV-related risk behaviors: the prevalence of unprotected anal or vaginal intercourse was found to be 53% lower among persons aware of their HIV status than among those who were unaware of their status (*17*).

For HIV treatment to be effective in reducing HIV incidence, infections need to be diagnosed as quickly as possible. This requires increasing HIV testing coverage and frequency. CDC recommends testing all persons aged 13–64 years at least once as a routine part of medical care and more frequent testing (at least annually) for persons at high risk for HIV infection (*7*). A large proportion (84%) of HIV sexually transmitted from MSM and heterosexual persons is transmitted by MSM (*1*). Some sexually active MSM might benefit from more frequent testing (e.g., every 3 to 6 months) (*18*). Testing according to CDC guidelines is critical to diagnosing HIV infection, so that anyone who receives a diagnosis of HIV infection can start antiretroviral treatment. Overall, prior year testing increased among groups at high risk over time. However, 29% of MSM (in 2014), 42% of persons who inject drugs (in 2015), and 59% of heterosexual persons at increased risk (in 2016) did not report testing in the past 12 months. In addition, it is important to note that these data are from persons residing in large metropolitan statistical areas in the United States. Studies have found that persons residing in rural areas are less likely to report prior HIV testing, including in the past 12 months, compared with their urban counterparts, and that persons living in rural areas are more likely to have HIV infection diagnosed at a late stage (*19*,*20*). Barriers to implementing

routine testing include lack of time, competing priorities, and concerns about reimbursement on the health care provider's part and stigma and lack of perceived risk on the client's part (*21*). Lack of perceived risk was also one of the main reasons cited by MSM in NHBS for not testing in the past 12 months.

A recent analysis of HIV testing frequency using NHBS data indicated that among persons at high risk for HIV infection who were ever tested, the estimated average interval between two successive HIV tests decreased from 10.5 months (2009) to 7.7 months (2014) among MSM, from 14.4 months (2009) to 11.5 months (2015) among persons who inject drugs, and from 21.1 months (2010) to 19.9 months (2013) among heterosexual persons at increased risk for HIV acquisition (*22*). Although the decreases in testing intervals are encouraging and indicate that, on average, MSM and persons who inject drugs are meeting recommendations for annual testing, these data are among persons already testing. Limited data suggest that MSM who have never been tested for HIV might engage in higher risk behaviors than do MSM who have been previously tested. One study found that MSM who had never been tested were 1.46 times as likely (95% confidence interval = 1.17–1.81) to report condomless anal sex in the past 3 months with an HIV-positive or serostatus-unknown partner than were persons who tested previously (*23*).

The findings in this report are subject to at least four limitations. First, missing CD4 test results could be caused by either incomplete reporting or not having had a CD4 test done. However, 89.4% of persons with HIV infection diagnosed in 2015 had a first CD4 test after diagnosis reported by June 2017. Second, adjustment for missing risk factors might be inaccurate if factors associated with these were not accounted for in the model. Third, NHBS is not a nationally representative sample, so results are not generalizable to all cities or to all groups at high risk in participating cities. Finally, behavioral data are self-reported and subject to social desirability bias.

The interval from HIV infection to diagnosis has decreased in recent years, but diagnosis delays continue to be substantial for some population segments. Whereas testing in the past 12 months has increased in recent years among groups at high risk, a high proportion of persons in all risk groups remain untested, with many missed opportunities for testing. Diagnosis delays lead to missed opportunities for HIV care and treatment and prolong the time a person is unaware of their infection, increasing the potential for HIV transmission. For care and treatment to reduce HIV incidence effectively, a high proportion of cases need to be diagnosed and treated soon after infection occurs. Continued efforts to determine why cases are not being diagnosed soon after infection and to assure implementation of routine and targeted testing can help reduce both the number of persons unaware of their infection and diagnosis delays.

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Conflict of Interest

No conflicts of interest were reported.

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Notes from the Field

Absence of Asymptomatic Mumps Virus Shedding Among Vaccinated College Students During a Mumps Outbreak — Washington, February–June 2017

Jesse Bonwitt, BVSc[1,2]; Vance Kawakami, DVM,[3]; Adam Wharton, MS[4]; Rachel M. Burke, PhD[1,4]; Neil Murthy, MD[1,4]; Adria Lee, MSPH[4]; BreeAnna Dell, DVM[5]; Meagan Kay, DVM[3]; Jeff Duchin, MD[3,6]; Carole Hickman, PhD[4]; Rebecca J. McNall, PhD[4]; Paul A. Rota, PhD[4]; Manisha Patel, MD[4]; Scott Lindquist, MD[2]; Chas DeBolt, MPH[2]; Janell Routh, MD[4]

On February 8, 2017, a suspected case of mumps in a member of a fraternity or sorority at the University of Washington, Seattle campus (UW) was reported to Public Health—Seattle & King County (PHSKC). Additional confirmed and probable mumps cases were subsequently identified among UW students and staff members according to the national case definition.* By July 19, 2017, a total of 42 (16 confirmed and 26 probable) mumps cases were reported among UW students and associated community members, with symptom onset February 6–June 4 (Figure).

Among the 42 cases, 32 (76%) occurred in UW fraternity and sorority members. Of these, 12 (37.5%) were confirmed cases, and 20 (62.5%) were probable cases. Cases occurred in residents in 20 (38.5%) of 52 fraternity and sorority houses that lodged 2,259 (48.6%) of 4,646 total fraternity and sorority members on the UW campus (42,000 students). All mumps patients had received ≥2 documented doses of measles-mumps-rubella (MMR) vaccine, as is currently recommended (*1*); 2-dose MMR coverage among all UW students exceeded 99%. Genotyping of viral isolates from four patients with confirmed mumps identified genotype G in all four, and molecular sequencing demonstrated differences between circulating strains at UW and a concurrent community outbreak in Washington.

On the basis of CDC guidance, PHSKC recommended an additional dose of MMR vaccine to protect fraternity and sorority members who were subject to potential mumps exposure (*2*). During March 6–9, the week before spring break, PHSKC administered 235 doses of MMR vaccine to members of the eight fraternity and sorority houses reporting the highest number of cases (Figure); the vaccination clinics were open to members of other fraternity and sorority houses.

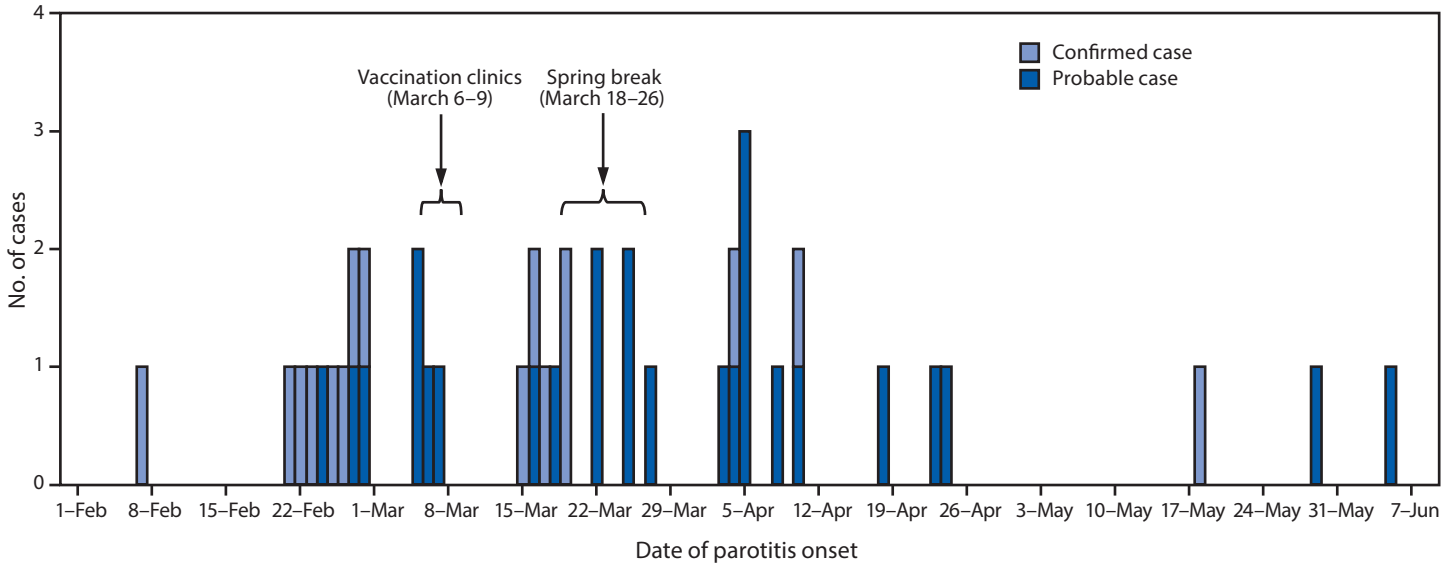
Previous studies have suggested that mumps might be propagated by vaccinated persons with nonspecific symptoms or asymptomatic infection (*3*). Before licensure of mumps vaccine in 1967, 15%–27% of mumps infections were asymptomatic (*2*). How vaccination modifies clinical signs and symptoms of mumps is unknown (*2*). The prevalence of asymptomatic infection has not been assessed in the postvaccination era.

To assess the presence, prevalence, symptoms, and associated risk factors of asymptomatic mumps virus shedding in vaccinated persons, PHSKC, Washington State Department of Health, and CDC recruited a convenience sample of students at each MMR vaccination clinic. Participants provided written consent, completed a symptom and risk factor questionnaire, and provided a bilateral buccal swab immediately before or after vaccination. The Washington State Institutional Review Board determined this project to be nonresearch and exempt from review. Buccal swabs were collected from 160 of the 161 student participants, who represented at least eight fraternities and sororities; 80 (49.7%) were male. Participants reported the following symptoms during the preceding month, none of which required hospitalization: fever (10, 6%), cough (55, 34%), sore throat (37, 23%), and swelling or pain of the parotid gland or jaw not attributable to dental problems (eight, 5%). Specimens were processed at CDC. All 160 buccal swabs were mumps-virus negative by real-time reverse transcription–polymerase chain reaction; positive control testing in the laboratory indicated >99% successful specimen collection and processing.

The majority of mumps cases in this outbreak occurred among fraternity and sorority members; other studies have demonstrated that close contact is required for mumps transmission to occur in a population with high mumps vaccination coverage (*4*,*5*). This evaluation found no laboratory evidence of asymptomatic mumps virus shedding. Limitations include timing of sample collection, which might have missed the period when viral shedding was highest among infected persons, and the lack of serologic testing to identify infected participants. Serial sampling of exposed persons might yield different results. Mumps outbreaks have increased in recent years in the United States; from 2015 through 2016, the proportion of outbreak-related cases increased from 63% to 78% (*6*). Further evaluations to better understand the prevalence of mumps virus shedding among vaccinated populations are needed to guide outbreak surveillance and control.

* https://wwwn.cdc.gov/nndss/conditions/mumps/case-definition/2012/.

FIGURE. Number of confirmed and probable mumps cases among fraternity and sorority members and associated community members, by date of parotitis onset — University of Washington, February–June 2017.



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Conflict of Interest

No conflicts of interest were reported.

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Announcement

Community Preventive Services Task Force Recommendation for Text Messaging Interventions to Improve Medication Adherence for Chronic Disease Management

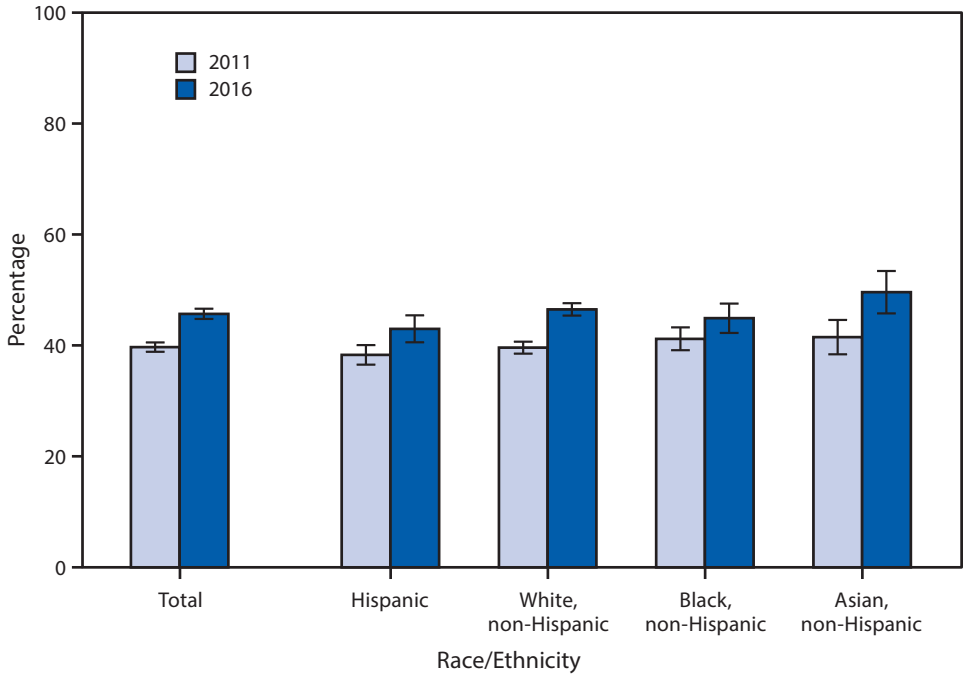
The Community Preventive Services Task Force (CPSTF) recommends text messaging interventions to improve medication adherence among patients with chronic diseases. "Health Information Technology: Text Messaging Interventions for Medication Adherence Among Patients with Chronic Diseases" is available at https://www.thecommunityguide.org/findings/health-information-technology-text-messaging-medication-adherence-chronic-disease.

Established in 1996 by the U.S. Department of Health and Human Services, the CPSTF is an independent, nonfederal panel of public health and prevention experts whose members are appointed by the director of CDC. The CPSTF provides information for a wide range of persons who make decisions about programs, services, and other interventions to improve population health. Although CDC provides administrative, scientific, and technical support for the CPSTF, the recommendations developed are those of the task force and do not undergo review or approval by CDC.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged 20–64 Years With a Fasting Test in the Past 12 Months for High Blood Sugar or Diabetes,† by Race/Ethnicity§ — National Health Interview Survey,¶ United States, 2011 and 2016



* With 95% confidence intervals shown with error bars.
† Based on a positive response to the question "Have you had a fasting test for high blood sugar or diabetes during the past 12 months?"
§ Categories shown are for Hispanic adults, who might be of any race or combination of races, and non-Hispanic adults who selected one racial group. Not all racial groups are shown. Total bar is based on all U.S. adults aged 20–64 years.
¶ 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.

The percentage of U.S. adults aged 20–64 years who had a fasting test for high blood sugar or diabetes in the past 12 months increased from 39.7% in 2011 to 45.7% in 2016. From 2011 to 2016, there was an increase in the percentage for all racial/ethnic groups examined: Hispanic (38.3% to 43.0%), non-Hispanic white (39.6% to 46.5%), non-Hispanic black (41.2% to 44.9%), and non-Hispanic Asian (41.5% to 49.6%) adults. In 2011, there was no statistically significant difference among the four groups examined, but in 2016, Hispanic adults were less likely than non-Hispanic white and non-Hispanic Asian adults to have had a fasting test, and non-Hispanic Asian adults were more likely than non-Hispanic black adults to have had one.

Source: National Health Interview Survey, 2011 and 2016 data. https://www.cdc.gov/nchs/nhis.htm.

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