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Healthy Vision Month — May 2019

May is Healthy Vision Month, an annual observance dedicated to making vision and eye health a national priority. During this month, CDC's Vision Health Initiative (VHI) in the Division of Diabetes Translation joins with the National Eye Institute's National Eye Health Education Program to educate the public about preventing vision loss and promoting eye health. Almost 3.22 million U.S. persons are affected by vision impairment, which can be associated with social isolation, disability, and decreased quality of life (https://www.cdc.gov/visionhealth/risk/burden.htm).

In this issue of *MMWR*, VHI staff members report findings from their study examining the association of vision impairment and functional limitations related to subjective cognitive decline (SCD), defined as the experience of worsening or more frequent confusion or memory loss (*1*). Analysis of data from the Behavioral Risk Factor Surveillance System survey for the years 2015–2017 indicated that persons with vision impairment were 3.5 times more likely to report functional limitations related to SCD than were those with no vision impairment.

With the number of U.S. adults with vision impairment projected to double in the next 30 years (*2*), understanding the impact of comorbid vision and SCD on functioning is just one of many important public health concerns related to vision loss. For information on topics related to vision and eye health, including common eye disorders, prevention, and related state and community programs, please visit the VHI web page (https://www.cdc.gov/visionhealth).

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Vision Impairment and Subjective Cognitive Decline–Related Functional Limitations — United States, 2015–2017

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Vision impairment affects approximately 3.22 million persons in the United States and is associated with social isolation, disability, and decreased quality of life (*1*). Cognitive decline is more common in adults with vision impairment (*2*,*3*). Subjective cognitive decline (SCD), which is the self-reported experience of worsening or more frequent confusion or memory loss within the past 12 months, affects 11.2% of adults aged ≥45 years in the United States (*4*). One consequence of SCD is the occurrence of functional limitations, especially those related to usual daily activities; however, it is not known whether persons with vision impairment are more likely to have functional limitations related to SCD (*4*). This report describes the association of vision impairment and SCD-related functional limitations using Behavioral Risk Factor Surveillance System (BRFSS) surveys for the years 2015–2017. Adjusting for age group, sex, race/ethnicity,

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education level, health insurance, and smoking status, 18% of adults aged ≥45 years who reported vision impairment also reported SCD-related functional limitations, compared with only 4% of those without vision impairment. Preventing, reducing, and correcting vision impairments might lead to a decrease in SCD-related functional limitations among adults in the United States.

This analysis used data from the BRFSS, an annual state-based, cross-sectional telephone survey of noninstitutionalized adults aged ≥18 years, combining data from 2015, 2016, and 2017.* During those 3 years, 208,601 respondents aged ≥45 years in 49 states (all except Pennsylvania), Puerto Rico, and the District of Columbia (DC) completed the optional cognitive decline module.†,§,¶ For states that administered the module in multiple years, only the most recent year's data were included. For the BRFSS surveys in 2015, 2016, and 2017, the combined landline and cellular telephone response rates among states, Puerto Rico, and DC ranged from 30.6% to 64.1% (median = 45.7%).

Among all respondents aged ≥45 years, those classified as having SCD responded affirmatively to the question "During the past 12 months, have you experienced confusion or memory loss that is happening more often or is getting worse?" Respondents with SCD were then asked two follow-up questions: 1) "During the past 12 months, as a result of confusion or memory loss, how often have you given up day-to-day household activities or chores you used to do, such as cooking, cleaning, taking medications, driving, or paying bills?" and 2) "During the past 12 months, how often has confusion or memory loss interfered with your ability to work, volunteer, or engage in social activities outside the home?" Responses of "always," "usually," and "sometimes" were classified as positive responses, and responses of "rarely" and "never" were classified as negative responses (*4*). Functional limitations caused by SCD were defined as a positive response to either of the two follow-up questions. Vision impairment was defined as a yes response to the question "Are you blind or do you have serious difficulty seeing, even when wearing glasses?" Descriptive analyses examined population characteristics by vision impairment and SCD-related functional limitations status. Covariates included age group (45–64 years, 65–74 years, or ≥75 years); sex (male or female); race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic multiracial, Hispanic, or non-Hispanic other); education level (less than high school, high school graduate or some college, or college graduate); smoking status (never, former, or current); and having health insurance (yes or no). Multivariate logistic regression models were used to calculate predicted marginal proportions and examine the relationship between vision impairment and SCD-related functional limitations, adjusting for age, sex, race/ethnicity, education level,

* https://www.cdc.gov/brfss.
† https://www.cdc.gov/brfss/annual_data/2015/pdf/2015-sdqr.pdf.
§ https://www.cdc.gov/brfss/annual_data/2016/pdf/2016-sdqr.pdf.
¶ https://www.cdc.gov/brfss/annual_data/annual_2017.html.

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and smoking status. All estimates used the BRFSS-provided sampling weights to account for the complex survey design and nonresponse. Analysis was completed using SUDAAN (version 11.0.3; RTI International).

The overall prevalence of vision impairment among respondents was 6.2% (95% confidence interval [CI] = 6.0%–6.3%), and the overall prevalence of SCD with functional limitations was 5.5% (95% CI = 5.3%–5.7%). The prevalence of vision impairment without functional limitations related to SCD increased with age from 4.4% (95% CI = 4.2%–4.7%) among those aged 45–64 years to 7.2% (95% CI = 6.7%–7.6%) for those aged ≥75 years (Table). Among adults reporting SCD-related functional limitations without vision impairment, the proportion in each of the three age groups was similar (range = 2.8 [65–74 years] to 4.4 [45–64 years]), as was the age distribution among those with vision impairment (range = 0.9% [age 65–74 years] to 1.8 [45–64 years]). Similarly, no significant differences in report of SCD-related functional limitations among those with and without vision impairment were seen when stratified by race/ethnicity. Vision impairment without SCD related limitations was highest among Hispanics (10.4%, 95% CI = 9.3–11.6) and lowest among non-Hispanic whites (3.6%, 95% CI = 3.5%–3.8%). However, prevalences of vision impairment and SCD-related functional limitations were higher among adults with less than a high school diploma (4.1%, 95% CI = 3.6%–4.6%), who were current smokers (3.6%, 95% = 3.2%–4.0%), and who did not have health insurance (3.0%, 95% CI = 2.5%–3.7%) than among college graduates (0.4%, 95% CI = 0.3%–0.4%), those who had never smoked (0.9%, 95% CI = 0.8%–1.1%), and those who had health insurance (1.4%, 95% CI =1.3%–1.5%).

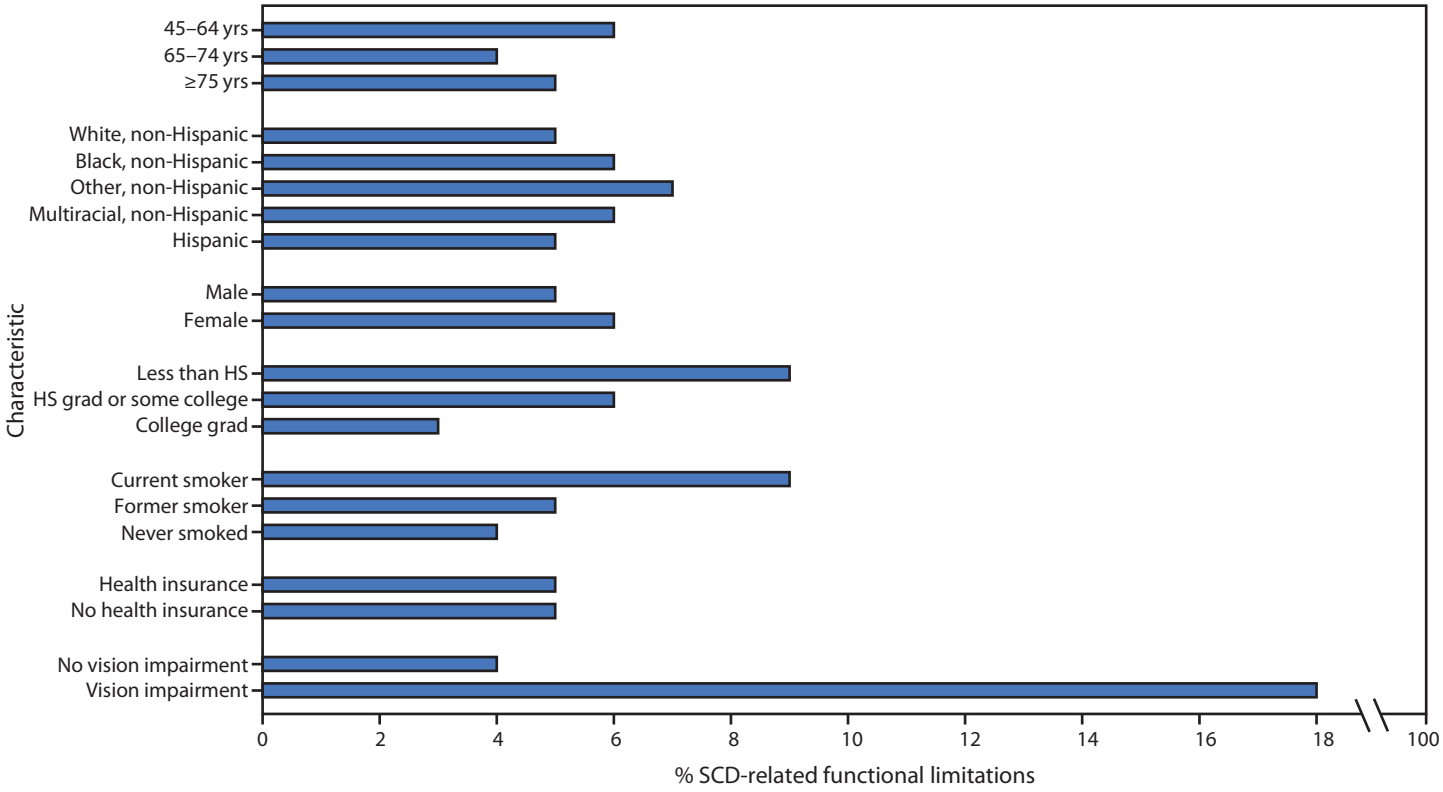
After adjusting for demographics, smoking status, and vision impairment, the prevalence of functional limitations related to SCD was highest among persons aged 45–64 years (6%) and lowest among those aged 65–74 years (4%; p<0.001) (Figure). In addition, non-Hispanic whites and Hispanics reported the lowest prevalences (5%), and non-Hispanic persons of other races reported the highest prevalence (8%) (p<0.001). The prevalence of SCD-related functional limitations among persons having less than a high school education (9%) was three times that of those reporting being a college graduate (3%) (p<0.001). Being a current smoker was associated with a higher prevalence of SCD-related functional limitations (9%), compared with being a former smoker (5%) or a person

TABLE. Percentage of adults aged ≥45 years who reported vision impairment with and without subjective cognitive decline (SCD)–related functional limitations (FL), by selected characteristics — Behavioral Risk Factor Surveillance System, 49 states, Puerto Rico, and District of Columbia, 2015–2017

Characteristic	Overall	Vision and SCD-related FL status, % (95% CI)			
		No vision impairment, no SCD-related FL	No vision impairment, with SCD-related FL	Vision impairment, no SCD-related FL	Vision impairment, with SCD-related FL
Overall	**100**	**89.7 (89.4–89.9)**	**3.9 (3.8–4.1)**	**4.9 (4.7– 5.1)**	**1.5 (1.4–1.6)**
Age group (yrs)					
45–64	63.1 (62.8–63.3)	89.4 (89.0–89.8)	4.4 (4.1–4.6)	4.4 (4.2–4.7)	1.8 (1.6–2.0)
65–74	21.6 (21.4–21.8)	91.8 (91.4–92.2)	2.8 (2.5–3.0)	4.6 (4.3–4.9)	0.9 (0.8–1.0)
≥75	15.3 (15.2–15.5)	87.8 (87.2–88.4)	3.9 (3.6–4.3)	7.2 (6.7–7.6)	1.1 (0.9–1.3)
Sex					
Male	47.0 (46.8–47.3)	90.1 (89.7–90.5)	3.9 (3.7–4.1)	4.7 (4.4–4.9)	1.3 (1.2–1.5)
Female	53.0 (52.7–53.2)	89.3 (88.9–89.7)	4.0 (3.8–4.2)	5.1 (4.8–5.4)	1.6 (1.5–1.8)
Race/Ethnicity*					
White, non-Hispanic	68.4 (68.1–68.8)	91.7 (91.4–91.9)	3.6 (3.5–3.8)	3.6 (3.5–3.8)	1.0 (0.9–1.2)
Black, non-Hispanic	10.1 (9.9–10.3)	85.4 (84.3–86.3)	4.9 (4.3–5.4)	7.0 (6.2–7.8)	2.8 (2.4–3.3)
Multiracial, non-Hispanic	1.2 (1.2–1.3)	84.6 (82.0–86.9)	5.9 (4.6–7.6)	7.6 (5.9–9.7)	1.9 (1.3–2.8)
Hispanic	13.9 (13.6–14.2)	82.2 (80.8–83.6)	4.5 (3.9–5.2)	10.4 (9.3–11.6)	2.9 (2.3–3.5)
Other, non-Hispanic	6.4 (6.1–6.6)	88.8 (87.1–90.3)	4.4 (3.6–5.4)	5.0 (4.0–6.2)	1.8 (1.2–2.7)
Education level					
Less than high school graduate	14.7 (14.4–14.9)	76.5 (75.3–77.7)	7.3 (6.7–8.0)	12.1 (11.1–13.1)	4.1 (3.6–4.6)
High school graduate/Some college	57.0 (56.7–57.3)	89.7 (89.4–90.1)	4.3 (4.0–4.5)	4.5 (4.3–4.8)	1.5 (1.3–1.6)
College graduate	28.3 (28.1–28.6)	95.7 (95.5–95.9)	1.7 (1.6–1.9)	2.2 (2.1–2.4)	0.4 (0.3–0.4)
Smoking status					
Never smoked	54.0 (53.7–54.3)	91.8 (91.4–92.1)	3.0 (2.8–3.2)	4.3 (4.0–4.5)	0.9 (0.8–1.1)
Former smoker	31.9 (31.7–32.2)	90.0 (89.5–90.4)	3.7 (3.5–4.0)	4.8 (4.5–5.1)	1.5 (1.3–1.8)
Current smoker	14.1 (13.9–14.3)	81.2 (80.3–82.1)	7.8 (7.2–8.4)	7.4 (6.7–8.1)	3.6 (3.2–4.0)
Health insurance status					
Health insurance	93.0 (92.8–93.1)	90.1 (89.9–90.4)	3.8 (3.7–4.0)	4.6 (4.5–4.8)	1.4 (1.3–1.5)
No health insurance	7.0 (6.9–7.2)	83.2 (81.6–84.7)	5.3 (4.5–6.3)	8.5 (7.3–9.8)	3.0 (2.5–3.7)

Abbreviation: CI = confidence interval.
* Whites, blacks, multiracial, and other races/ethnicities were non-Hispanic; Hispanic persons could be of any race.

FIGURE. Adjusted percentage* of subjective cognitive decline (SCD)–related functional limitations among adults aged ≥45 years, by demographic characteristics, smoking status, and vision impairment — Behavioral Risk Factor Surveillance System, 49 states,† Puerto Rico, and the District of Columbia, 2015–2017



Abbreviation: HS = high school.
* Adjusted prevalence based on predicted marginal from logistic regression models adjusting for age, sex, race/ethnicity, smoking status, health insurance status, and vision impairment.
† Excluding Pennsylvania.

who had never smoked (4%) (p<0.001). After adjusting for demographics and smoking status, the highest prevalence of SCD-related functional limitations (18%) was among adults with vision impairment; prevalence among those with no reported vision impairment was 4% (p<0.001).

Discussion

Functional limitations have been reported by 50% of adults aged ≥45 years with SCD (*4*), and vision impairment has been reported by 6% (*5*). Previous studies have determined that vision impairment and cognitive decline might co-occur (*2*) and might be causally related (*3*). Recent studies have pointed to changes in the retina as a potential biomarker for dementia (*6*), highlighting the link between vision impairment and cognitive decline. However, the association of vision impairment with SCD-related functional limitations has not been well characterized. This report found that among adults aged ≥45 years, SCD-related functional limitations were three and one half times higher among adults with vision impairment than among those with no vision impairment. The number of adults in the United States with vision impairment is projected to double in the next 30 years (*5*); therefore, understanding the impact of co-occurring vision impairment and SCD on functional abilities is an important public health concern.

Vision impairment might lead to decreased quality of life, functional limitations, and an increased risk of mortality (*7*,*8*). Vision impairment might prevent persons from performing instrumental activities of daily living. However, a previous study found that the relationship between vision impairment and cognitive decline might be modified by a tailored vision rehabilitation program (*9*). Further work can help to determine whether vision rehabilitation is also an effective strategy to improve functional limitations associated with SCD.

Vision impairment can be caused by treatable forms of vision loss such as cataracts and refractive errors, along with age-related macular degeneration, diabetic retinopathy, and glaucoma. Measures to prevent vision impairment and vision loss include receiving eye care and a comprehensive eye exam. Additional ways to protect eyes and prevent vision loss include knowing family history of eye health, eating healthy,

Summary

What is already known about this topic?

Vision impairment often co-occurs with cognitive decline, which can be associated with functional limitations. The association between vision impairment and functional limitations related to subjective (self-reported) cognitive decline (SCD) has not been well characterized.

What is added by this report?

Analysis of 2015–2017 Behavioral Risk Factor Surveillance System data determined that, after adjusting for age and other demographic and smoking characteristics, 18% of adults who reported vision impairment also reported SCD-related functional limitations, compared with only 4% of those without vision impairment.

What are the implications for public health practice?

Prevention or correction of vision impairment might be important in in reducing functional limitations related to cognitive decline in adults aged ≥45 years.

maintaining healthy weight, wearing protective eyewear, quitting or never starting smoking, washing hands before removing contact lens, and practicing workplace eye safety.

The findings in this report are subject to at least three limitations. First, these results are based on self-reported vision difficulty and SCD-related functional limitations. Objective measures of cognitive and visual functioning were not administered as part of BRFSS (*4*). Second, response bias might have affected the response to questions on vision impairment, SCD, and functional limitations. For example, older persons might be less likely to report SCD-related functional limitations if they consider them to be part of the aging process, thus reducing the reported prevalence of these limitations in this population. Finally, BRFSS is only administered to noninstitutionalized adults, thereby excluding those living in long-term care facilities where nearly one third of residents might have vision and cognitive impairments (*10*). These limitations might have biased these results toward the null hypothesis and might limit their generalizability across all populations. The strength of this analysis is that it includes nearly all states, Puerto Rico, and DC, representing 253 million U.S. adults.

Vision impairment is an important, growing public health concern in the United States (*5*). Adults with vision impairment might have higher levels of difficulties with activities of daily living (e.g., eating and bathing) and instrumental activities of daily living (e.g., managing finances and using a telephone) (*10*). Having vision impairment might increase the likelihood that persons with SCD report related functional limitations. Addressing vision impairment through prevention or corrective treatment might reduce functional SCD-associated limitations in the adult population.

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Progress Toward Polio Eradication — Worldwide, January 2017–March 2019

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Since the Global Polio Eradication Initiative (GPEI) began in 1988, transmission of wild poliovirus (WPV) has been interrupted in all countries except Afghanistan, Nigeria, and Pakistan. WPV type 2 (WPV2) was declared eradicated in 2015; WPV type 3 has not been detected since 2012 (*1*). After the certification of the eradication of WPV2, a global switch from trivalent oral poliovirus vaccine (tOPV, containing vaccine virus types 1, 2, and 3) to bivalent oral poliovirus vaccine (bOPV, containing types 1 and 3) was completed in April 2016. Nigeria last reported WPV type 1 (WPV1) cases in 2016. This report describes global progress toward poliomyelitis eradication during January 1, 2017–March 31, 2019, and updates previous reports (*1*,*2*). Afghanistan and Pakistan reported their lowest annual number of WPV cases (22) in 2017; however, 33 WPV1 cases were reported in 2018. During January–March 2019 (as of May 3), 12 WPV1 cases had been reported worldwide, four more than the eight reported during the corresponding period in 2018. The occurrence of polio cases caused by circulating vaccine-derived poliovirus (cVDPV) is rare and occurs where oral poliovirus vaccine (OPV) coverage has been low and vaccine virus reverts to neurovirulence (*3*). Eight countries (Democratic Republic of the Congo [DRC], Indonesia, Mozambique, Niger, Nigeria, Papua New Guinea, Somalia, and Syria) reported 210 cVDPV cases during 2017–2019 (as of May 3). Reaching children during supplemental immunization activities (SIAs), accessing mobile populations at high risk, and variations in surveillance performance represent ongoing challenges. Innovative efforts to vaccinate every child and strengthen coordination efforts between Afghanistan and Pakistan will help achieve eradication. For cVDPV outbreak responses to promptly stop transmission, intensified programmatic improvements are needed to make the responses more effective and limit the risk for generating future outbreaks.

Poliovirus Vaccination

Estimated global coverage with 3 doses of poliovirus vaccines (Pol3, mostly OPV) through routine immunization services among infants aged >1 year was 88% in 2017 (the most recent year for which data are available).* However, national coverage estimates often mask low coverage and poor SIA quality in a substantial number of subnational areas. In the countries with endemic WPV transmission, estimated national Pol3 coverage in 2017 was 60% in Afghanistan, 40% in Nigeria, and 75% in Pakistan (*4*–*6*).

In 2017, a total of 172 SIAs were conducted in five World Health Organization (WHO) regions, during which nearly 1.8 billion total OPV and inactivated poliovirus vaccine (IPV) doses were allocated for use; 161 SIAs were conducted in 2018, with approximately 1.7 billion bOPV and IPV doses. Inaccessible areas and the inability to reach all children in fully accessible areas continue to pose barriers to achieving higher coverage.

Since the global withdrawal of all type 2–containing OPV vaccines, countries experiencing confirmed cVDPV type 2 (cVDPV2) outbreaks have requested authorization from the WHO Director-General to release monovalent OPV type 2 (mOPV2) vaccine for use. In 2017, 59 million mOPV2 doses (3.2% of total OPV) were used for outbreak response; 107 million mOPV2 doses (6.5%) were used in 2018.

Poliovirus Surveillance

The primary means for detecting WPV and cVDPV transmission is through surveillance for acute flaccid paralysis (AFP) among children aged <15 years, with laboratory testing of stool specimens by WHO-accredited laboratories within the Global Polio Laboratory Network (*7*,*8*). The performance of AFP surveillance is assessed through two principal indicators. The first indicator is achieving an annual nonpolio AFP detection rate of ≥1 case per 100,000 population aged <15 years in countries in the WHO regions certified as polio-free, or ≥2 in all other countries; this rate is considered sufficiently sensitive to detect a case of polio. The second indicator is the collection of adequate stool specimens (i.e., two stool specimens collected >24 hours apart, within 14 days of paralysis onset, with arrival at the laboratory in good condition [cool and without leakage or desiccation]) from ≥80% of reported AFP patients.

Among countries reporting WPV or cVDPV cases in 2017, Afghanistan and Pakistan met both surveillance performance indicators nationally; DRC and Syria did not. Among the nine countries reporting WPV or cVDPV cases in 2018, Afghanistan, Indonesia, Mozambique, Niger, Nigeria, Pakistan, and Somalia met both surveillance performance indicators nationally; DRC and Papua New Guinea did not. Even when performance indicators are met nationally, surveillance gaps

* WHO-UNICEF estimates of Pol3 coverage. http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswucoveragepol3.html.

at the subnational level pose an impediment to reliable surveillance data that are necessary to ascertain the absence of poliovirus transmission. In many countries at high risk, AFP surveillance is supplemented by environmental surveillance (the testing of sewage samples).

Poliovirus Cases and Isolations

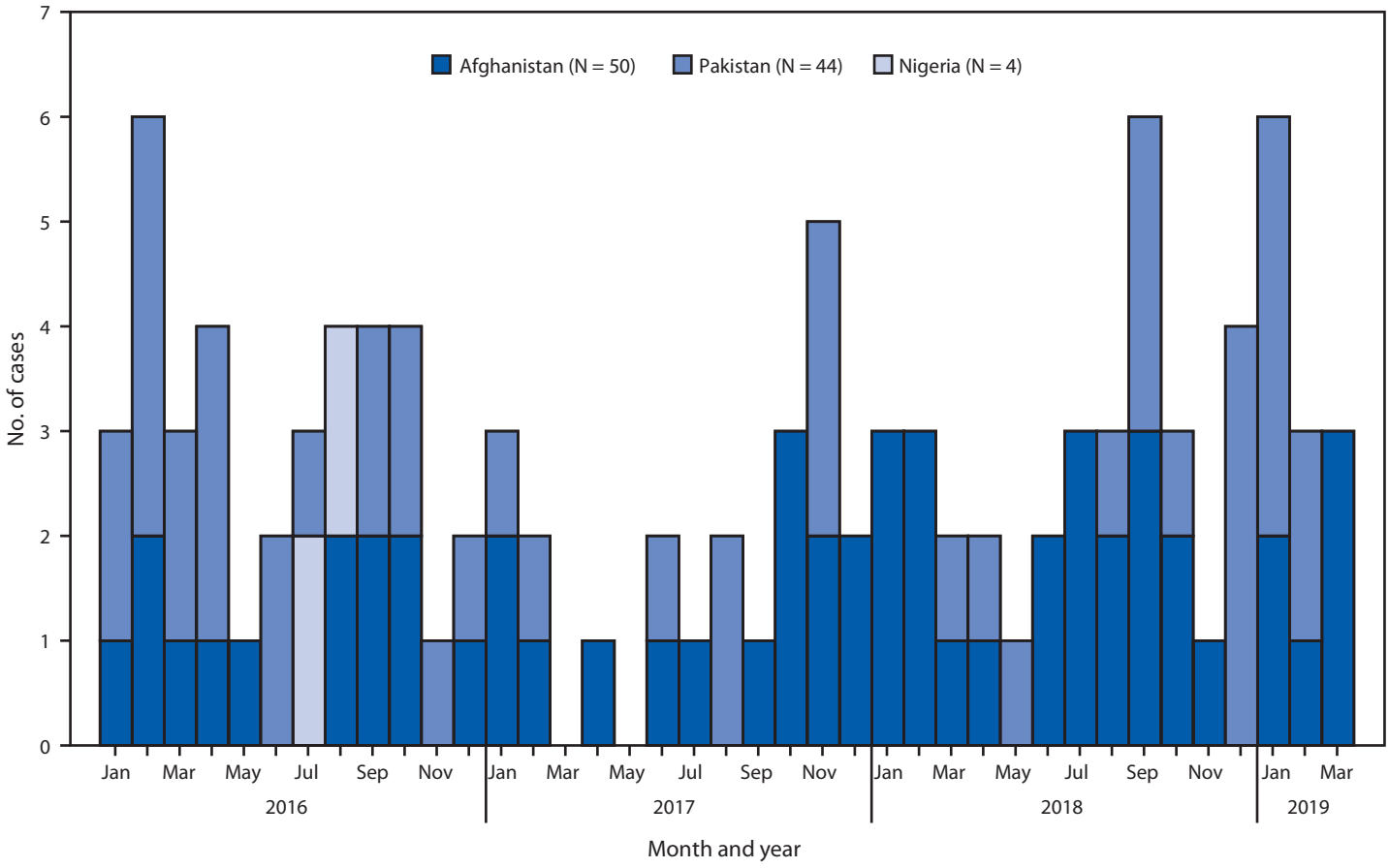
Countries reporting WPV cases and isolations. In 2017, 22 WPV1 cases were reported, including 14 (64%) in Afghanistan and eight (36%) in Pakistan. In 2018, 33 WPV1 cases were detected, including 21 (64%) in Afghanistan and 12 (36%) in Pakistan. No WPV cases have been identified in countries other than Afghanistan, Nigeria, and Pakistan since 2015; Nigeria last reported WPV1 cases in September 2016. During January 1–March 31, 2019, 12 WPV1 cases were confirmed; six were detected in Afghanistan and six in Pakistan (Figure).

Afghanistan reported 21 WPV1 cases in 14 districts in 2018, representing a 50% increase over the 14 cases reported in 2017 and a 55% increase in the number of affected districts. During January–March, 2019, six WPV1 cases were detected: one in each of two districts of Kandahar Province, two districts of Helmand Province, and two districts of Uruzgan Province, compared with a total of seven WPV1 cases reported in five districts of three provinces (Kandahar, Kunar, and Nangarhar) during the same period in 2018.

Pakistan confirmed 12 WPV1 cases in six districts in 2018, a 50% increase over the eight cases reported in 2017 and a 14% decrease from the seven districts that confirmed cases in 2017. During January–March, 2019, six WPV1 cases were detected: one in each of six districts located in three provinces (Khyber Pakhtunkhwa, Punjab, and Sindh), compared with only one case in Balochistan Province during the corresponding period in 2018.

Environmental surveillance is accounting for an increasing proportion of poliovirus detections worldwide. In Afghanistan, WPV1 was detected in 42 (13%) of 316 sewage samples collected at regular intervals in 2017 and 83 (24%) of 339 samples in 2018. In Pakistan, WPV1 was detected in 107 (17%) of 630 samples in 2017 and 141 (21%) of 677 samples

FIGURE. Number of cases of wild poliovirus, by country and month of onset — worldwide, January 2016–March 2019*



* As of May 3, 2019.

in 2018 (Table 1). Genomic sequencing of poliovirus isolates from both environmental samples and confirmed AFP cases indicates multiple chains of transmission; five genetic clusters (groups of isolates sharing ≥95% of genetic relatedness) persisted during the reporting period in the core reservoirs along shared transnational population movement corridors between Afghanistan and Pakistan (*4*,*5*).

Countries reporting cVDPV cases and isolations. During January 2017–March 2019, cVDPV transmission was confirmed in nine countries. Two countries (Indonesia and Papua New Guinea) reported separate cVDPV type 1 (cVDPV1) circulation, with 27 AFP cases and seven positive environmental samples. Seven countries (DRC, Kenya, Mozambique, Niger, Nigeria, Somalia, and Syria) detected nine emergences of cVDPV2 with isolates from 176 AFP cases and 97 environmental samples. Nigeria reported no cVDPV isolates in 2017; however, in 2018, two cVDPV2 outbreaks were confirmed. One, centered in Sokoto, was detected through environmental surveillance; the other was initially detected in Jigawa State with subsequent detections in six other states and bordering Niger. An additional outbreak detected through environmental surveillance was confirmed in Bauchi State in March 2019. During 2018–2019 to date, 41 cVDPV2 cases have been detected in Nigeria and 10 in Niger. Since 2017, five independent cVDPV2 outbreaks, with 43 cases, have been reported in DRC. cVDPV2 transmission was detected from five AFP patients and three environmental surveillance sites in Somalia, and a genetically linked isolate was detected from an environmental surveillance site in Nairobi, Kenya. cVDPV type 3 transmission involving six AFP patients[†] and 11 environmental samples was detected in Somalia (Table 2) (*9*).

Discussion

No WPV1 cases have been detected in the WHO Africa Region in approximately 30 months. Continuing improvements in vaccinating children and surveillance in northeast Nigeria and other Lake Chad Basin countries suggest that WPV transmission might have been interrupted in the Africa Region. Additional analyses to assess surveillance sensitivity are needed to allow the Regional Commission for the Certification of Poliomyelitis Eradication to certify interruption.

For the first time since 2014, the number of annual WPV case reports in Afghanistan and Pakistan rose in 2018, in spite of targeted efforts to increase immunization in security-compromised districts, reduce vaccine refusal, and reach highly

[†] One AFP patient detected in Somalia was coinfected with cVDPV type 2 and type 3.

TABLE 1. Number of samples containing wild poliovirus type 1 (WPV1) detected through environmental surveillance — Afghanistan, Nigeria, and Pakistan, January 1, 2017–March 31, 2019*

	Surveillance period							
	2017		2018		Jan–Mar 2018		Jan–Mar 2019	
Country	No. of samples	WPV1 (%)	No. of samples	WPV1 (%)	No. of samples	WPV1 (%)	No. of samples	WPV1 (%)
Afghanistan	316	42 (13)	339	83 (24)	84	16 (19)	68	21 (31)
Nigeria	1,623	0 (0)	1,661	0 (0)	320	0 (0)	481	0 (0)
Pakistan	645	107 (17)	677	141 (21)	162	22 (14)	177	82 (46)

* Data as of May 3, 2019.

TABLE 2. Number of poliovirus cases, by country — worldwide, January 1, 2017–March 31, 2019*

	Period of onset							
	2017		2018		Jan–Mar 2018		Jan–Mar 2019	
Countries	WPV1	cVDPV	WPV1	cVDPV	WPV1	cVDPV	WPV1	cVDPV
Countries with endemic WPV1								
Afghanistan	14	0	21	0	6	0	6	0
Nigeria	0	0	0	34	0	0	0	7
Pakistan	8	0	12	0	2	0	6	0
Countries with reported cVDPV cases								
Democratic Republic of the Congo	0	22	0	20	0	4	0	1
Indonesia	0	0	0	1	0	0	0	0
Mozambique	0	0	0	1	0	0	0	0
Niger	0	0	0	10	0	0	0	0
Papua New Guinea	0	0	0	26	0	0	0	0
Somalia	0	0	0	12[†]	0	0	0	1
Syria	0	74	0	0	0	0	0	0

Abbreviations: cVDPV = circulating vaccine-derived poliovirus; WPV1 = wild poliovirus type 1.
* Data as of May 3, 2019.
[†] One patient with acute flaccid paralysis was coinfected with cVDPV type 2 and type 3.

mobile populations. Genomic sequence analysis of isolates from AFP patients and environmental samples demonstrates not only persistent local transmission in reservoirs in both countries, but also ongoing transmission along two common corridors because of transnational population movements (*4*,*5*). Efforts are underway to enhance continuous immunization at border points in both countries. A ban on house-to-house vaccination in Kandahar Province since mid-2018 has negatively affected SIA effectiveness, and both countries' programs continue to miss vaccinating a substantial number of eligible children in areas accessible to vaccinators. A need exists to comprehensively address local weaknesses in SIA implementation to increase population immunity and interrupt transmission.

Genetic characterization of the index isolates in nearly all cVDPV outbreaks suggested transmission for many years, indicating imprecise AFP surveillance systems. Indonesia and Papua New Guinea had last reported polio cases more than a decade ago; in both countries, there has been low routine immunization coverage before the emergence and spread of independent cVDPV1 (*10*). The multiple cVDPV2 outbreaks in DRC and Nigeria reflect the risk for cVDPV2 transmission where the number of SIAs had been insufficient or the quality of SIAs had been inadequate to increase type 2 immunity before the 2016 global switch from tOPV to bOPV (*9*). The SIAs in response to many of the cVDPV2 outbreaks have not been sufficiently timely or of sufficiently high quality to promptly interrupt transmission or to prevent the seeding of additional cVDPV emergences.

The persistence of WPV transmission and the number of cVDPV outbreaks underscore the need for country programs to more adequately assess and address the challenges to vaccinating all children. GPEI program goals for interruption of poliovirus transmission have been refocused through the development of the Polio Endgame Strategy 2019–2023.[§] Adopting locally relevant, innovative approaches will increase effective implementation of the core strategies. In Afghanistan, goals include overcoming inaccessibility by renegotiating access to communities and engaging with local and religious leaders until house-to-house vaccination is reinstated. In Pakistan, increasing SIA quality will be addressed by more effectively engaging with communities to reduce the number of OPV refusals and to increase demand for immunization services, while also focusing on underperforming local areas. Unfortunately, rumors about the safety of OPV severely decreased the effectiveness of a recent SIA in Pakistan. A reassessment of risk communication and community engagement is ongoing, and a revised approach will be implemented in the most affected districts starting with the SIAs in June.

Periodic annual increases in the number of polio cases in the past have always been followed by a recommitment to interventions that work and innovative activities to access underimmunized populations. This commitment has enabled GPEI to reduce the number of countries with endemic poliovirus transmission to three since 2012 and the number of WPV cases to fewer than 100 every year since 2015. The critical objective is to reduce the number of areas with active transmission in Afghanistan and Pakistan simultaneously or within a short period. Revised emergency action plans for each country provide the roadmaps to further intensify and improve program operations and will need to be fully implemented in every locality to ensure the successful eradication of polio.

Summary

What is already known about this topic?

Wild poliovirus (WPV) transmission has not been interrupted in Afghanistan, Nigeria, and Pakistan. Rare circulating vaccine-derived poliovirus (cVDPV) outbreaks can occur in areas with low oral poliovirus vaccination coverage.

What is added by this report?

No WPV cases have been detected in Nigeria since 2016. WPV transmission has continued in Afghanistan and Pakistan in all previously identified reservoirs. The number and extent of cVDPV outbreaks increased in 2018. Countries with endemic polio have revised emergency action plans to innovate and intensify strategies to reach and vaccinate every child in underimmunized populations.

What are the implications for public health practice?

Successful implementation of locally relevant strategies in all areas will be essential to interrupting WPV transmission.

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[§] World Health Organization. The Polio Endgame Strategy 2019–2023: Eradication, Integration, Containment and Certification. http://polioeradication.org/who-we-are/polio-endgame-strategy-2019-2023.

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Notes from the Field

Verona Integron-Encoded Metallo-β-Lactamase–Producing Carbapenem-Resistant *Pseudomonas aeruginosa* Infections in U.S. Residents Associated with Invasive Medical Procedures in Mexico, 2015–2018

Ian Kracalik, PhD[1,2]; Cal Ham, MD[1]; Amanda R. Smith, PhD[3]; Maureen Vowles, MPH[3]; Kelly Kauber, MPH[4]; Melba Zambrano, MSN[5]; Gretchen Rodriguez, MPH[5]; Kelley Garner, MPH[6]; Kaitlyn Chorbi, MPH[7]; P. Maureen Cassidy, MPH[8]; Shannon McBee, MPH[9]; Rhett Stoney, MPH[10]; Allison C. Brown, PhD[1]; Kathleen Moser, MD[10]; Margarita E. Villarino, MD[10]; Maroya Spalding Walters, PhD[1]

Verona integron-encoded metallo-β-lactamase–producing carbapenem-resistant *Pseudomonas aeruginosa* (VIM-CRPA) and other carbapenemase-producing organisms represent an emerging U.S. public health threat because of high levels of antibiotic resistance and the potential for rapid spread in health care facilities (*1*,*2*). During September 18–November 19, 2018, CDC received 31 reports of VIM-CRPA through the Antibiotic Resistance Laboratory Network. Six cases (19%) occurred in U.S. patients who had recently undergone invasive medical procedures in Mexico. To identify additional cases (defined as isolation of VIM-CRPA from a patient who had an invasive procedure in Mexico in the month preceding specimen collection), CDC and state partners posted an Epi-X alert on November 19, 2018, and issued notifications through the Emerging Infections Network and to medical professional societies. As of January 18, 2019, a total of 12 cases had been identified in seven states, including four in Utah, three in Washington, and one each in Arizona, Arkansas, Oregon, Texas, and West Virginia; specimen collection months ranged from November 2015 through December 2018 (Figure).

Among the 11 patients whose age was reported, the median age was 39 years (range = 29–62 years); among seven patients whose sex was reported, six were women. Eleven of the 12 patients were medical tourists (i.e., persons whose primary purpose for international travel was medical care) who underwent bariatric surgery. One patient, who was not a medical tourist, underwent endoscopic retrograde cholangiopancreatography in September 2018, after becoming ill while traveling.

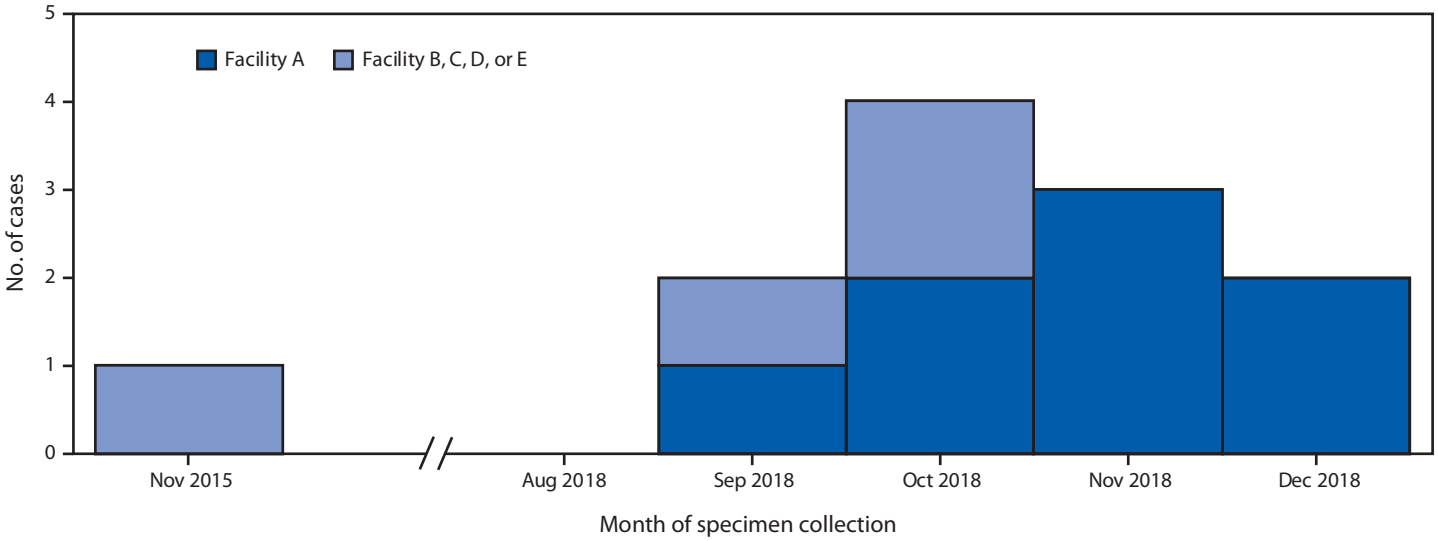
Patients reported procedures at five hospitals in Tijuana, Baja California, Mexico, including facility A, where eight patients had bariatric surgery; the four other facilities (B–E) were identified by one patient each. The median interval from procedure to specimen collection was 11 days (range = 7–22 days); culture sources reported for 10 patients included the incision site (eight), blood (one), and an intra-abdominal abscess (one). Six patients were hospitalized in the United States for their VIM-CRPA infection. The patient who had a bloodstream infection died. Following notification by CDC, the Secretariat of Health of Mexico performed an onsite infection control assessment at facility A in December 2018 that identified numerous infection control breaches. A travel notice was posted on the CDC website from January to May 2019 informing U.S. residents of the risks associated with invasive procedures at facility A and recommending against surgery at facility A until the outbreak was over.*

This investigation highlights the potential for acquiring infections with highly antibiotic-resistant organisms not commonly found in the United States when receiving health care abroad that, once imported into this country, can spread within U.S. health care facilities. Persons considering medical care abroad should 1) visit a travel medicine specialist for advice tailored to their specific health needs at least 1 month before departure (e.g., current medical conditions should be well-controlled, travelers should have enough medication for the duration of their trip, and all medical tourists should be up-to-date on all routine vaccinations and consider immunization against hepatitis B virus); 2) check the qualifications of the providers who will be doing the procedure and the credentials of the facility, remembering that foreign standards for health care providers and facilities might be different from those of the United States; and 3) be cognizant that all medical and surgical procedures carry attendant risks (*3*).[†,§]

Patients who become ill after returning to the United States following medical treatment abroad should report any hospitalizations or other medical care to their medical providers. Providers caring for patients who have undergone medical procedures abroad should obtain cultures when clinically appropriate, perform antimicrobial susceptibility testing to guide treatment, and test for carbapenemases in indicated carbapenem-resistant gram-negative bacteria (i.e., *Acinetobacter* spp., *Pseudomonas* spp., and Enterobacteriaceae). Any patient with an overnight stay in a health care facility outside the United States in the preceding 6 months should undergo rectal screening for carbapenemases on admission to a U.S. health care facility. Carbapenemase testing for carbapenem-resistant

* https://wwwnc.cdc.gov/travel/page/medical-tourism.
† https://www.cdc.gov/features/medicaltourism/index.html.
§ https://stacks.cdc.gov/view/cdc/25250.

FIGURE. Number of U.S. patients (N = 12) who developed Verona integron-encoded metallo-β-lactamase–producing carbapenem-resistant *Pseudomonas aeruginosa* infections after surgical procedures in Tijuana, Mexico, by surgical facility and month of specimen collection — November 2015–December 2018



Enterobacteriaceae (CRE) and CRPA and rectal screening for carbapenemases are available free of charge via the Antibiotic Resistance Laboratory Network.¶

This investigation also underscores the importance of testing for the presence of carbapenemases in carbapenem-resistant *P. aeruginosa*. In the United States, carbapenemases are less frequently the cause of carbapenem-resistance in *P. aeruginosa* than they are in carbapenem-resistant Enterobacteriaceae (*4*). Because bacteria like *P. aeruginosa* can potentially harbor carbapenemase-producing genes, which are able to transfer antibiotic resistance to other organisms, early detection of carbapenemase-producing CRPA and associated public health responses might prevent spread of these resistant organisms. Clinical laboratories with capacity for carbapenemase testing should consider testing for both CRPA and CRE. For any patients infected or colonized with carbapenemase-producing organisms, CDC recommends implementation of infection control precautions to limit potential spread.**

¶ https://www.cdc.gov/drugresistance/solutions-initiative/ar-lab-network.html.
** https://www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html.

Acknowledgment

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All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

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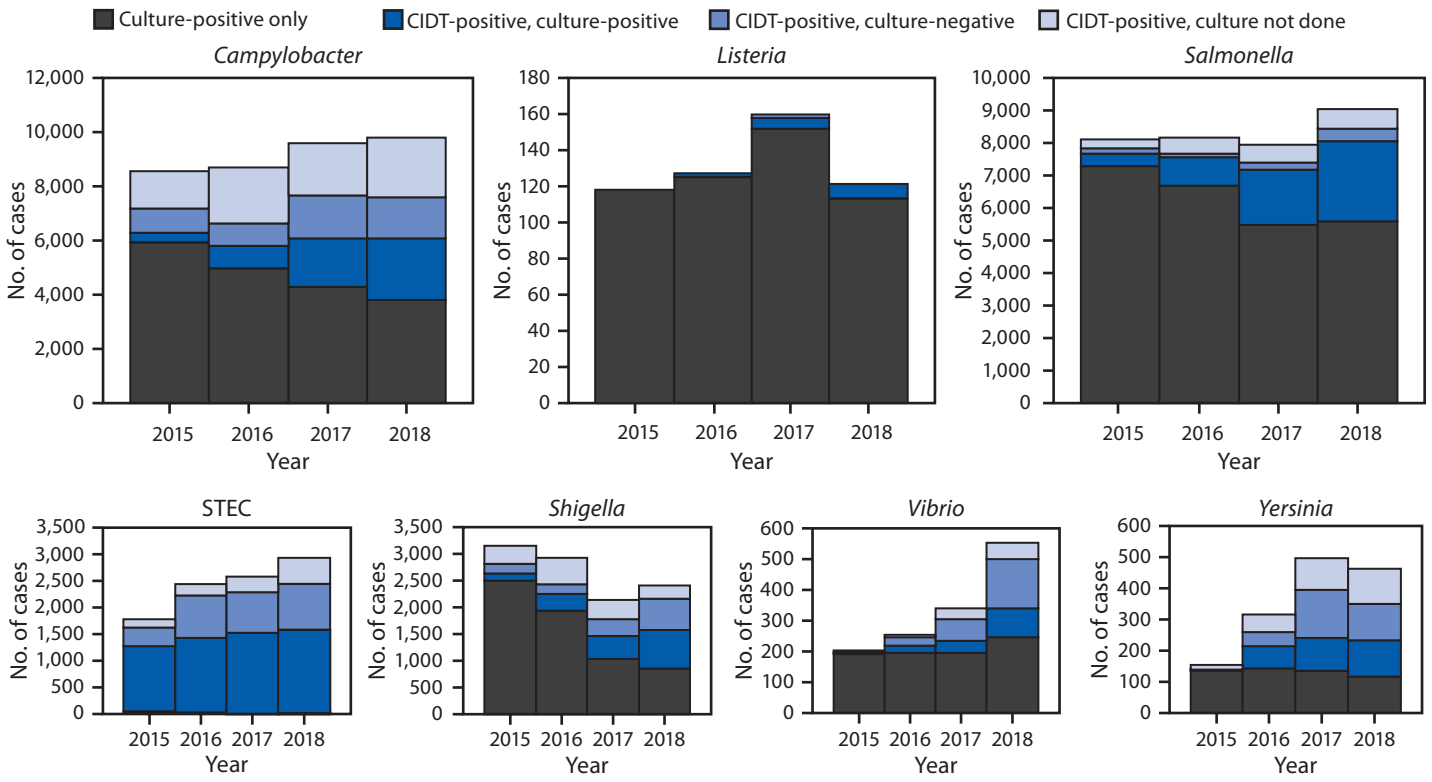
Erratum

Vol. 68, No. 16

In the report "Preliminary Incidence and Trends of Infections with Pathogens Transmitted Commonly Through Food — Foodborne Diseases Active Surveillance Network, 10 U.S. Sites, 2015–2018," on page 371, in Figure 1, for Shiga toxin–producing *Escherichia coli* (STEC), the value for 2018 culture-independent diagnostic test (CIDT)–positive, culture-positive cases should have been **1,559**, resulting in a total of **2,925** STEC cases in 2018, as seen in the Table on page 370.

FIGURE 1. Number of infections diagnosed by culture or culture-independent diagnostic tests (CIDTs), by pathogen, year, and culture status — CDC's Foodborne Diseases Active Surveillance Network,* 2015–2018†

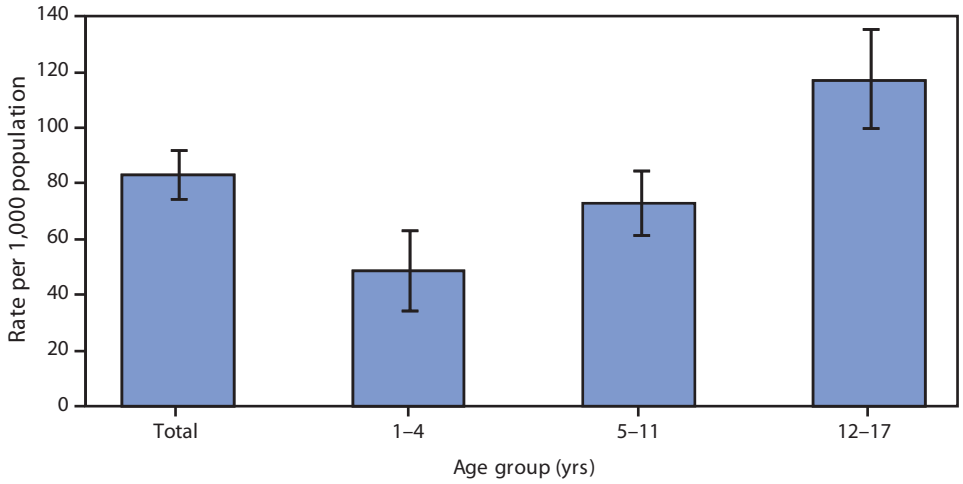


Abbreviation: STEC = Shiga toxin–producing *Escherichia coli*.
* Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York.
† Data for 2018 are preliminary.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Rates* of Injury† from Sports, Recreation, and Leisure Activities§ Among Children and Adolescents Aged 1–17 Years, by Age Group — National Health Interview Survey,¶ United States, 2015–2017



* Rates are per 1,000 persons with 95% confidence intervals indicated by error bars.
† Defined as an injury episode in the last 5 weeks, for which a health care professional was contacted for advice or treatment.
§ Selected by respondents from a list of activities at the time of the injury.
¶ Estimates are based on household interviews of a sample of the noninstitutionalized U.S. civilian population.

In 2015–2017, the rate of sports, recreation, and leisure injuries among children and adolescents aged 1–17 years was 82.9 per 1,000 population. The rate of sports, recreation, and leisure injuries increased with age from 48.4 for those aged 1–4 years, to 72.7 for those aged 5–11 years, and to 117.1 for those aged 12–17 years.

Source: National Health Interview Survey, 2015–2017.

Reported by: LaJeana D. Hawkins, MPH, LDHawkins@cdc.gov, 301-458-4611; Sibeso N. Joyner, MPH.

For more information on this topic, CDC suggests the following link: https://www.cdc.gov/safechild/index.html.

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