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Mercury Poisoning at a Home Day Care Center — Hillsborough County, Florida, 2015

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On November 12, 2015, the Florida Poison Information Center Tampa notified the Florida Department of Health in Hillsborough County of a boy aged 3 years with a urine mercury level of 79 μg/L (normal <10 μg/L). The patient had been admitted to the hospital on October 9, 2015 after a 3–4 week history of anorexia, weight loss, and lethargy. In the hospital, he developed a maculopapular rash, acrodynia (painful, pink discoloration of the hands and feet), tachycardia, hypertension, weakness, sweating, excessive salivation, and altered mental status. Subsequent investigation identified the source of the mercury exposure to be a broken sphygmomanometer (blood pressure monitor) at the home day care center attended by the child.

Investigation and Results

The patient's father was interviewed to identify exposures to mercury, such as fish, employment industries or hobbies, or broken mercury-containing items, including thermometers, sphygmomanometers, and fluorescent light bulbs (*1*). No apparent exposures were identified, and on November 13, the family's rented home was tested by the Florida Department of Environmental Protection, which found no evidence of contamination. On November 19, the child began chelation therapy according to recommendations of the Southeast Pediatric Environmental Health Specialty Unit* and the Florida Poison Information Center Tampa.

Because the patient's clinical signs and symptoms suggested chronic exposure to mercury vapors, investigators focused on a large family-run home day care center attended by the child (*2*). The day care center owner was interviewed to identify possible exposure sources and was asked about illnesses among other children and staff members (*1*). No similar illnesses were reported; however, the owner reported purchasing a sphygmomanometer at an antique auction and placing it in the children's play area in early July, with the intention of providing a realistic experience for learning. The device was removed 3 weeks later because the children had pulled off the two attached hoses. The day care center owner was not aware that the sphygmomanometer contained mercury, and no loose mercury was observed.

Public Health Response

Mercury testing of the day care center was conducted on November 18, and revealed hazardous mercury vapor levels as high as 89 $\mu g/m^3$. The day care center was immediately closed, and the home's residents were advised to relocate until remediation was completed. On November 19, an Environmental Protection Agency (EPA) response team coordinated with local contractors to complete the home

* Pediatric Environmental Health Specialty Units are located in 10 U.S. regions to provide education and consultation for health professionals, public health professionals, family members, and others about children's environmental health. Pediatric Environmental Health Specialty Units were formed as part of its ongoing cooperative agreements with the Agency for Toxic Substances and Disease Registry and the Environmental Protection Agency.

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remediation. A small bead of mercury was observed in the sphygmomanometer, which had been stored in the family's unattached garage after its removal from the home. EPA estimated that approximately 80 g (6 mL) of mercury were originally in the sphygmomanometer. The carpet, carpet pads, and other mercury-contaminated household items were removed; beads of mercury were observed on the floor when the carpets were removed. The floors were cleaned with an Epsom salt wash, followed by heating and ventilation of the home. The remediation was completed within 2 days, and the home was cleared by EPA to reopen when mercury concentrations were 1.63 $\mu g/m^3$, a level consistent with the Agency for Toxic Substances and Disease Registry's recommended action level for mercury vapors in schools (≤3 $\mu g/m^3$) (*3*). Hillsborough County Child Care Licensing inspected the home on November 25, and the day care center resumed operation on November 30, after the Thanksgiving holiday.

Parents of day care attendees and persons who visited the day care home since July 2015 were informed about the exposure and advised to be screened for heavy metal exposure. To determine whether children might have tracked mercury out of the day care center on their shoes or clothes, parents' cars were screened for mercury. All cars screened negative; therefore, screening of any of the children's homes was deemed unnecessary.

A case of day care center–associated mercury exposure was defined as a blood or urine mercury level >10 $\mu g/L$ in a person exposed at the day care center and a diagnosis of mercury poisoning by a medical professional. Twenty-six potential exposures were identified, excluding parents,[†] who only entered the facility briefly to drop off and pick up their children. A total of 23 persons were tested, among whom 13 (57%) met the case definition, including 10 day care attendees (*4*); the median age of attendees was 2.6 years (range = 1–4 years). The remaining three cases occurred in residents of the home (median age = 54 years). Testing was recommended, but not completed, for one adult and two children who occasionally visited the home in the evenings. Most persons with elevated mercury levels were asymptomatic or experienced mild symptoms; however, some self-reported and parent-reported symptoms of long-term exposure included anxiety, excessive shyness, irritability, eye irritation, vision changes, hypertension, and excessive sweating. Two additional cases were identified in children who were residents of another state and had visited the home; they received chelation therapy by their primary care providers.

Succimer, an oral chelating agent used to remove lead and heavy metals from the body, was recommended by the Southeast Pediatric Environmental Health Specialty Unit and the Florida Poison Information Center Tampa for seven patients. Although approved for the treatment of lead poisoning, succimer is used off-label for treating mercury toxicity (*5*). All seven patients received a 19-day course of succimer. After treatment, five patients had urine mercury levels that remained

[†] One parent who was pregnant was advised to be tested out of an abundance of caution; she had urine mercury levels below the reference minimum.

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Summary

What is already known about this topic?

When mercury is spilled indoors it can result in numerous health effects, particularly among young children with developing nervous systems. The relative rarity of mercury toxicity might make attributing clinical signs and symptoms to mercury poisoning difficult. Thus, epidemiologic investigations rely on identification of sources of mercury and exposure locations.

What is added by this report?

In November 2015, 13 cases of mercury poisoning were detected among attendees and residents of a home day care center after identification of elevated urine mercury levels in a hospitalized child who attended the day care center. The source of the mercury was an antique sphygmomanometer that was placed in the day care center as an educational toy. The owners were unaware that the device was leaking elemental mercury without appearing to be broken. Exposure continued for nearly 6 months before detection during an epidemiologic investigation.

What are the implications for public health practice?

Although the awareness of the dangers of mercury-containing items has increased over time, exposure to mercury can still occur. A home day care center serves as both a home and a business, and hobbies, collections, cultural practices, and occupational exposures of residents in the home might inadvertently expose day care attendees. Education and regulation of mercury containing items among home day care providers could prevent exposures leading to serious health effects.

above reference ranges. None received additional chelation treatment. As of March 2016, all patients had mercury levels <10 μg/L with no signs or symptoms of mercury toxicity.

Discussion

Children are at increased risk for exposure to mercury poisoning because they are more likely to play on floors and because their smaller lung capacity facilitates increased breathing of mercury vapors (*2*,*3*). Little is known about long-term effects of exposure to mercury vapors in children; however, the central nervous system is most affected by mercury vapor exposure, and long-term cognitive impairments have been observed (*6*,*7*).

As a result of this investigation, the Florida Department of Health developed an educational health notice about mercury for day care providers highlighting the dangers associated with exposure to mercury from broken medical devices such as thermometers and sphygmomanometers (*8*). The Florida Department of Children and Families, who regulate day care centers, were provided with copies of a mercury fact sheet to include in their direct mail outreach and also emailed the fact sheet to other facilities. When day care settings are identified as possible sites of mercury exposure, every effort should be made to explore and test these sites thoroughly. Failure to educate day care staff members about the types of items that contain mercury could place attendees and staff members at risk. Including education about mercury poisoning in day care licensing and regulatory guidelines could reduce mercury exposure to young children in these settings.

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References

1. Florida Department of Health. Environmental health mercury poisoning case report form. Tallahassee, Florida: Florida Department of Health; 2016. http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-mercury.pdf
2. Agency for Toxic Substances and Disease Registry. Children's exposure to elemental mercury: a national review of exposure events. Atlanta, GA: US Department of Health and Human Services, CDC, Agency for Toxic Substances and Disease Registry; 2009. https://www.atsdr.cdc.gov/mercury/docs/mercuryrtcfinal2013345.pdf
3. Agency for Toxic Substances and Disease Registry. Health effects of mercury. Atlanta, GA: US Department of Health and Human Services, CDC, Agency for Toxic Substances and Disease Registry: 1999. https://www.atsdr.cdc.gov/emergency_response/action_levels_for_elemental_mercury_spills_2012.pdf
4. Florida Department of Health. Mercury poisoning. Tallahassee, FL: Florida Department of Health; 2016. http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/cd-mercury.pdf
5. National Institute of Diabetes and Digestive and Kidney Disease. LiverTox: succimer. Bethesda, MD: National Library of Medicine, National Institute of Diabetes and Digestive and Kidney Disease; 2012. https://livertox.nih.gov/Succimer.htm
6. Brodkin E, Copes R, Mattman A, Kennedy J, Kling R, Yassi A. Lead and mercury exposures: interpretation and action. CMAJ 2007;176:59–63. https://doi.org/10.1503/cmaj.060790
7. Agency for Toxic Substances and Disease Registry. Toxicological profile for mercury. Atlanta, GA: US Department of Health and Human Services, CDC, Agency for Toxic Substances and Disease Registry; 1999. https://www.atsdr.cdc.gov/toxprofiles/tp46.pdf
8. Florida Department of Health. Mercury spills. Tallahassee, FL: Florida Department of Health; 2015. http://www.floridahealth.gov/environmental-health/mercury-spills/documents/liquid-mercury-day cares.pdf

Progress Toward Measles Elimination — African Region, 2013–2016

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In 2011, the 46 World Health Organization (WHO) African Region (AFR) member states established a goal of measles elimination* by 2020, by achieving 1) ≥95% coverage of their target populations with the first dose of measles-containing vaccine (MCV1) at national and district levels; 2) ≥95% coverage with measles-containing vaccine (MCV) per district during supplemental immunization activities (SIAs); and 3) confirmed measles incidence of <1 case per 1 million population in all countries (*1*). Two key surveillance performance indicator targets include 1) investigating ≥2 cases of nonmeasles febrile rash illness per 100,000 population annually, and 2) obtaining a blood specimen from ≥1 suspected measles case in ≥80% of districts annually (*2*). This report updates the previous report (*3*) and describes progress toward measles elimination in AFR during 2013–2016. Estimated regional MCV1 coverage† increased from 71% in 2013 to 74% in 2015.§ Seven (15%) countries achieved ≥95% MCV1 coverage in 2015.¶ The number of countries providing a routine second MCV dose (MCV2) increased from 11 (24%) in 2013 to 23 (49%) in 2015. Forty-one (79%) of 52 SIAs** during 2013–2016 reported ≥95% coverage. Both surveillance targets were met in 19 (40%) countries in 2016. Confirmed measles incidence in AFR decreased from 76.3 per 1 million population to 27.9 during 2013–2016. To eliminate measles by 2020, AFR countries and partners need to 1) achieve ≥95% 2-dose MCV coverage through improved immunization services, including second dose (MCV2) introduction; 2) improve SIA quality by preparing 12–15 months in advance, and using readiness, intra-SIA, and post-SIA assessment tools; 3) fully implement elimination-standard surveillance††; 4) conduct annual district-level risk assessments; and 5) establish national committees and a regional commission for the verification of measles elimination.

Immunization Activities

WHO and the United Nations Children's Fund (UNICEF) estimate vaccination coverage using annual government-reported administrative data and data from independent surveys. During 2013–2015, the estimated MCV1 coverage in AFR increased from 71% to 74%, while the number of AFR countries with ≥95% MCV1 coverage decreased from eight (17%) to seven (15%) (Table 1). In 2015, national MCV1 coverage was highest in Mauritius (99%), Tanzania (99%), and Seychelles (98%), and lowest in South Sudan (20%), Equatorial Guinea (27%), and the Central African Republic (49%). The number of countries providing a routine MCV2 dose increased from 11 (24%) in 2013 to 23 (49%) in 2015. Estimated regional MCV2 coverage increased from 7% in 2013 to 18% in 2015. During 2013–2016, approximately 300 million children received MCV during 52 SIAs conducted in 42 (89%) countries (Table 2). In 41 (79%) SIAs, reported administrative coverage was ≥95%. Among 25 (48%) SIAs for which a post-SIA coverage survey was conducted, estimated coverage of ≥95% was achieved in eight (32%).

* Measles elimination is defined as the absence of endemic measles virus transmission in a defined geographic area (e.g., region or country) for ≥12 months in the presence of a well performing surveillance system. Regional verification of measles elimination takes place after 36 months of interrupted endemic measles virus transmission. More information is available in the WHO Framework for Elimination of Measles and Rubella published in 2013 (http://www.who.int/wer/2013/wer8809.pdf?ua=1).

† http://www.who.int/immunization_monitoring/routine/immunization_coverage/en/index4.htm.

§ As of March 31, 2017, coverage estimates were not yet available for 2016; thus, the coverage estimates for 2015 were used in this analysis.

¶ The number of countries used in the denominator is 46 for 2013 and 47 for 2014–2016. South Sudan did not join the World Health Organization (WHO) African Region (AFR) until late 2013 and was not included in the count for 2013.

** Supplemental immunization activities (SIAs) are carried out using two target age ranges. An initial, nationwide catch-up SIA focuses on all children aged 9 months–14 years, with the goal of eliminating susceptibility to measles in the general population. Periodic follow-up SIAs then focus on all children born since the last SIA. Follow-up SIAs generally are conducted nationwide every 2–4 years, depending on routine immunization coverage, and focus on children aged 9–59 months; their goal is to eliminate any measles susceptibility that has developed in recent birth cohorts and to protect children who did not respond to MCV1. The target age range for follow-up SIAs might be widened to include older children based on the measles susceptibility pattern in countries. Administrative coverage is calculated as the number of vaccine doses provided divided by the total number of children in the age group targeted, multiplied by 100.

†† The 2015 WHO African Regional Guidelines for Measles and Rubella Surveillance recommend that all Member States implement case-based measles surveillance with lab confirmation, and that countries with sustained low incidence of measles implement elimination-standard surveillance. The surveillance system currently used and the indicators utilized to measure performance by 44 of 47 countries in the Africa Region, have been in place since 2002, and are not considered sensitive enough in countries with very low measles incidence nearing measles elimination. However, to move to a more sensitive system of elimination-standard surveillance, the financial and human resources required to investigate and obtain a blood specimen for every suspected case do not currently exist. The indicators used in this analysis are the main measles surveillance indicators.

TABLE 1. Estimated coverage with the first dose (MCV1)* and second dose (MCV2)*,† of measles-containing vaccine, number of confirmed measles cases,§ and confirmed measles incidence per 1 million population,¶ by country — World Health Organization (WHO) African Region, 2013–2016

Country	2013			2014			2015			2016
	Coverage (%)		No. of confirmed cases§ (incidence¶)	Coverage (%)		No. of confirmed cases§ (incidence¶)	Coverage (%)		No. of confirmed cases§ (incidence¶)	No. of confirmed cases§ (incidence¶)
	MCV1	MCV2†		MCV1	MCV2†		MCV1	MCV2†		
Algeria	95	93	0 (0.0)	95	99	0 (0.0)	95	99	62 (1.6)	27 (0.7)
Angola	66	—	6,297 (268.5)	60	—	11,648 (480.8)	55	26	67 (2.7)	33 (1.3)
Benin	68	—	735 (71.2)	68	—	768 (72.5)	75	—	53 (4.9)	90 (8.1)
Botswana	97	83	1 (0.5)	97	85	88 (39.6)	97	85	2 0.9)	1 (0.4)
Burkina Faso	82	—	431 (25.2)	88	17	433 (24.6)	88	50	99 (5.5)	222 (11.9)
Burundi	98	51	0 (0.0)	94	60	5 (0.5)	93	65	9 (0.8)	17 (1.5)
Cameroon	83	—	766 (34.5)	80	—	720 (31.6)	79	—	1,785 (76.5)	324 (13.5)
Cape Verde	91	89	0 (0.0)	93	79	0 (0.0)	92	95	0 (0.0)	0 (0.0)
Central African Republic	25	—	370 (78.5)	49	—	212 (44.1)	49	—	147 (30.0)	156 (31.2)
Chad	59	—	185 (14.1)	54	—	1,237 (91.0)	62	—	435 (31.0)	147 (10.1)
Comoros	82	—	0 (0.0)	80	—	0 (0.0)	81	—	0 (0.0)	0 (0.0)
Congo	80	—	123 (28.0)	80	—	70 (15.5)	80	—	1,358 (293.9)	292 (61.6)
Cote d'Ivoire	76	—	48 (2.2)	62	—	50 (2.3)	72	—	40 (1.8)	52 (2.2)
Democratic Republic of Congo	76	—	2,470 (34.0)	77	—	1,595 (21.3)	79	—	4,471 (57.9)	4,790 (60.1)
Equatorial Guinea	42	—	6 (7.5)	44	—	9 (11.0)	27	—	1,232 (1,457.9)	1,685 (1,937.7)
Eritrea	94	—	47 (9.4)	90	—	1 (0.2)	85	75	91 (17.4)	59 (11.0)
Ethiopia	62	—	6,029 (63.8)	70	—	12,485 (128.8)	78	—	16,123 (162.2)	4,484 (44.0)
Gabon	70	—	127 (77.0)	61	—	42 (24.9)	68	—	37 (21.4)	1,274 (722.6)
Gambia	96	53	1 (0.5)	96	73	2 (1.0)	97	77	21 (10.5)	40 (19.5)
Ghana	89	54	318 (12.2)	92	67	143 (5.3)	89	63	51 (1.9)	53 (1.9)
Guinea	62	—	39 (3.3)	52	—	35 (2.9)	52	—	29 (2.3)	130 (10.0)
Guinea-Bissau	69	—	0 (0.0)	69	—	0 (0.0)	69	—	0 (0.0)	0 (0.0)
Kenya	73	—	215 (4.9)	79	—	356 (7.9)	75	28	110 (2.4)	61 (1.3)
Lesotho	90	82	2 (1.0)	90	82	4 (1.9)	90	82	2 (0.9)	13 (6.0)
Liberia	74	—	0 (0.0)	58	—	0 (0.0)	64	—	433 (96.1)	391 (84.7)
Madagascar	63	—	8 (0.3)	64	—	3 (0.1)	58	—	7 (0.3)	22 (0.9)
Malawi	88	—	1 (0.1)	85	—	2 (0.1)	87	8	19 (1.1)	4 (0.2)
Mali	80	—	308 (18.6)	80	—	274 (16.0)	76	—	240 (13.6)	107 (5.9)
Mauritania	80	—	3 (0.8)	84	—	14 (3.5)	70	—	1 (0.2)	13 (3.1)
Mauritius	99	85	0 (0.0)	98	85	0 (0.0)	99	85	0 (0.0)	0 (0.0)
Mozambique	85	—	57 (2.2)	85	—	80 (2.9)	85	—	78 (2.8)	84 (2.9)
Namibia	82	—	495 (210.9)	83	—	718 (298.8)	85	—	216 (87.8)	13 (5.2)
Niger	76	—	790 (43.0)	72	3	294 (15.4)	73	16	603 (30.3)	591 (28.5)
Nigeria	47	—	50,585 (292.7)	51	—	4,470 (25.2)	54	—	11,494 (63.1)	11,499 (61.5)
Rwanda	95	—	17 (1.5)	97	—	5 (0.4)	97	87	1 (0.1)	57 (4.8)
Sao Tome and Principe	91	—	0 (0.0)	92	71	0 (0.0)	93	76	0 (0.0)	0 (0.0)
Senegal	84	—	13 (0.9)	80	13	38 (2.6)	80	54	58 (3.8)	159 (10.2)
Seychelles	97	97	0 (0.0)	99	98	0 (0.0)	98	98	0 (0.0)	0 (0.0)
Sierra Leone	83	—	13 (2.1)	78	—	44 (7.0)	76	60	139 (21.5)	195 (29.6)
South Africa	66	53	61 (1.1)	70	60	98 (1.8)	76	63	18 (0.3)	24 (0.4)
South Sudan	30	—	0 (0.0)	22	—	0 (0.0)	20	—	341 (27.6)	845 (66.4)
Swaziland	85	89	0 (0.0)	86	89	0 (0.0)	78	89	0 (0.0)	1 (0.8)
Tanzania	99	—	191 (3.8)	99	29	61 (1.2)	99	57	19 (0.4)	36 (0.7)
Togo	72	—	321 (46.3)	82	—	168 (23.6)	85	—	21 (2.9)	29 (3.9)
Uganda	82	—	452 (12.4)	82	—	313 (8.3)	82	—	478 (12.2)	250 (6.2)
Zambia	80	—	1 (0.1)	85	33	16 (1.0)	90	47	20 (1.2)	7 (0.4)
Zimbabwe	93	—	3 (0.2)	92	—	65 (4.3)	86	—	1 (0.1)	2 (0.1)
African Region	**71**	**7**	**71,529 (76.3)**	**72**	**11**	**36,566 (38.0)**	**74**	**18**	**40,411 (40.9)**	**28,279 (27.9)**

* WHO-United Nations Children's Fund (UNICEF) estimate.

† Cells containing "—" indicate that the corresponding country has not yet introduced MCV2.

§ Measles case-based surveillance. Confirmed cases were defined by laboratory criteria, epidemiologic linkage, or clinical criteria. Laboratory-confirmed was defined as having a measles-specific immunoglobulin M–positive test result and not receiving a measles vaccination during the 30 days before rash onset. Epidemiologically linked was defined as meeting the suspected measles case definition and having contact (i.e., lived in the same district or an adjacent district, with plausibility of transmission) with a patient with a laboratory-confirmed measles case with rash onset within the preceding 30 days. Clinically compatible was defined as meeting the case definition for measles, with no specimen available for laboratory testing and no evidence of epidemiologic linkage to a laboratory-confirmed case. A suspected measles case was defined as an illness characterized by rash, fever, and one or more of the following symptoms: conjunctivitis, coryza, or cough, or an illness in any patient in whom the clinician suspected measles.

¶ Incidence per 1 million population was calculated using the United Nations Population Division World Population Prospects: 2015 revision.

TABLE 2. Characteristics of national and subnational measles supplementary immunization activities (SIAs),*,†,§ by year and country — World Health Organization African Region, 2013–2016

Year	Country	Type of SIA*	Age group targeted	Extent of SIA	Children reached in target age group		% of districts with ≥95% administrative coverage¶,**	Estimated SIA coverage by survey (%)**
					No.	Administrative coverage (%)†,¶		
2013	Botswana	Follow-up M	9–59 m	N	198,341	95	54	—
2013	Cape Verde	Catch-up MR	9 m–24 y	N	240,166	95	46	—
2013	Comoros	Follow-up M	6–59 m	N	86,516	86	59	93
2013	Congo	Follow-up M	6–59 m	N	726,979	92	58	86
2013	Democratic Republic of the Congo	Follow-up M	6 m–9 y	SN	11,019,958	100	—	—
2013	Ethiopia	Follow-up M	9–59 m	N	11,608,063	99	66	91
2013	Ghana	Catch-up MR	9 m–14 y	N	11,062,605	99	70	96
2013	Lesotho	Follow-up M	9–59 m	N	147,676	73	90	92
2013	Madagascar	Follow-up M	9–59 m	N	3,316,542	92	56	84
2013	Malawi	Follow-up M	9–59 m	N	2,405,108	105	100	96
2013	Mozambique	Follow-up M	9–59 m	N	4,078,637	102	95	81
2013	Nigeria	Follow-up M	9–59 m	SN	30,579,666	103	—	75
2013	Rwanda	Catch-up MR	9 m–14 y	N	4,391,081	103	90	98
2013	Senegal	Catch-up MR	9 m–14 y	N	6,097,155	101	76	97
2013	South Africa	Follow-up M	6–59 m	N	4,186,191	100	60	—
2013	Swaziland	Follow-up M	6–59 m	N	119,207	97	—	91
2013	Togo	Follow-up M	9 m–9 y	N	1,641,635	96	83	—
2014	Angola	Follow-up M	6 m–9 y	N	7,829,940	117	84	97
2014	Benin	Follow-up M	9 m–9 y	N	3,009,405	101	82	97
2014	Burkina Faso	Catch-up MR	9 m–14 y	N	8,517,508	107	100	—
2014	Chad	Follow-up M	6 m–9 y	SN	2,549,188	103	94	—
2014	Côte d'Ivoire	Follow-up M	6 m–9 y	N	9,640,512	92	95	95
2014	Democratic Republic of Congo	Follow-up M	6 m–9 y	SN	20,699,401	101	87	—
2014	Mauritania	Follow-up M	9 m–14 y	N	1,489,563	105	92	—
2014	South Sudan	Follow-up M	6–59 m	N	1,715,139	122	98	77
2014	Tanzania	Catch-up MR	9 m–14 y	N	20,529,629	97	59	89
2015	Benin	Follow-up M	9 m–9 y	N	408,511	102	—	—
2015	Cameroon	Catch-up MR	9 m–14 y	N	9,229,739	98	80	89
2015	Eritrea	Follow-up M	9–59 m	N	350,765	80	36	—
2015	Guinea-Bissau	Follow-up M	9–59 m	N	223,673	86	18	—
2015	Liberia	Follow-up M	6–59 m	N	596,545	99	80	90
2015	Mali	Follow-up M	9 m–14 y	N	9,312,619	112	91	94
2015	Niger	Follow-up M	9–59 m	N	3,299,923	96	75	—
2015	Nigeria	Follow-up M	9–59 m	N	43,134,811	110	88	85
2015	Sierra Leone	Follow-up M	9–59 m	N	1,205,865	97	71	—
2015	Togo	Follow-up M	9 m–9 y	SN	820,335	99	94	—
2015	Uganda	Follow-up M	6–59 m	N	6,349,182	95	56	—
2015	Zimbabwe	Catch-up MR	9 m–14 y	N	5,337,029	103	100	94
2016	Botswana	Catch-up MR	9 m–14 y	N	674,150	95	67	—
2016	Central African Republic	Follow-up M	6–59 m	N	1,529,441	84	20	—
2016	Chad	Follow-up M	6–59 m	N	2,342,341	112	99	—
2016	Comoros	Follow-up M	6–59 m	N	80,614	74	41	—
2016	Democratic Republic of Congo	Follow-up M	6–59 m	N	10,921,820	101	93	—
2016	Equatorial Guinea	Follow-up M	6–59 m	N	127,874	85	61	—
2016	Gambia	Catch-up MR	9 m–14 y	N	779,654	97	86	—
2016	Guinea	Follow-up M	9–59 m	N	2,412,923	103	94.7	92.7
2016	Kenya	Catch-up MR	9 m–14 y	N	19,154,577	101	77	95
2016	Madagascar	Follow-up M	9–59 m	N	3,547,456	95	75	—
2016	Namibia	Catch-up MR	9 m–39 y	N	1,908,193	103	77	—
2016	Sao Tome and Principe	Catch-up MR	9 m–14 y	N	77,285	107	100	—
2016	Swaziland	Catch-up MR	9 m–14 y	N	373,508	90	—	94
2016	Zambia	Catch-up MR	9 m–14 y	N	7,741,505	108	97	—
TOTAL	—	—	—	—	**299,826,149**	**102**	—	—

Abbreviations: M = measles vaccination; MR = measles-rubella vaccination; m = months; N = national; SN = subnational; y = years.

* SIAs generally are carried out using two target age ranges. An initial, nationwide catch-up SIA focuses on all children aged 9 months–14 years, with the goal of eliminating susceptibility to measles in the general population. Periodic follow-up SIAs then focus on all children born since the last SIA. Follow-up SIAs generally are conducted nationwide every 2–4 years, depending on routine immunization coverage, and focus on children aged 9–59 months; their goal is to eliminate any measles susceptibility that has developed in recent birth cohorts and to protect children who did not respond to the first dose of measles-containing vaccine. The target age range for follow-up SIAs might be widened to include older children based on the measles susceptibility pattern in countries. Countries introducing rubella vaccine do so via wide age-range combined measles-rubella vaccine campaigns.

† Data source is the World Health Organization, African Region. Data were last updated March 10, 2017.

§ This table excludes seven outbreak response immunization campaigns that occurred in five countries (Ethiopia, Guinea, Malawi, Sierra Leone, and South Sudan) and which vaccinated approximately 40.4 million children.

¶ Administrative coverage is defined as the number of vaccine doses provided divided by the total number of children in the age group targeted, multiplied by 100.

** Cells containing "— " indicate that data was not available at time of publication or that no coverage survey was performed.

Surveillance Activities

Countries performing measles case-based surveillance electronically report surveillance data[§§] weekly to the WHO AFR office. Measles case-based surveillance involves completing a case investigation form[¶¶] and collecting a blood specimen for laboratory testing (*2*). Suspected measles cases are confirmed by laboratory testing, epidemiologic linkage to a confirmed case, or by clinical criteria.[***] During 2013–2016, all but three AFR countries[†††] conducted case-based surveillance with access to standardized quality-controlled testing at 47 laboratories within the WHO Global Measles and Rubella Laboratory Network[§§§] (*4*). During 2013–2016, the number of countries that met both surveillance targets (i.e., investigated two or more cases of nonmeasles febrile rash illness per 100,000 population annually and obtained a blood specimen from at least one suspected measles case in ≥80% of districts) (19 countries), one of the surveillance targets (12), and neither surveillance target (16) remained stable (Figure). Although the total number of countries per category remained constant, performance declined in seven (15%) countries, improved in nine (19%), and was unchanged in 31 (66%).

Disease Incidence

Overall, 176,785 confirmed measles cases were reported in AFR through case-based surveillance during 2013–2016 (Table 1). The number of confirmed measles cases declined 60%, from 71,529 in 2013 to 28,279 in 2016. During 2013–2016, a total of 103,161 (60%) reported measles cases occurred among children aged 9–59 months, 79% of whom were either unvaccinated or had unknown vaccination status. Confirmed measles incidence decreased 63% from 76.3 per 1 million population in 2013 to 27.9 in 2016 (Table 1). The largest percentage decreases in incidence occurred in Angola (99%), Namibia (97%), and Togo (92%). The highest confirmed measles incidences in 2016 were reported in Equatorial Guinea (1,938 per 1 million), Gabon (723), and Liberia (85). The number of countries that reported less than one case per 1 million population decreased from 19 (41%) to 15 (32%). During 2013–2016, 249 measles virus genotype results were reported from 14 (30%) countries; all were genotype B3.

Discussion

Although measles incidence decreased 63% in AFR during 2013–2016, the region did not meet vaccination coverage, surveillance, and disease incidence targets needed to achieve measles elimination by 2020. During 2013–2015, estimated MCV1 coverage increased only 3%, and in 2015 was <95% in 87% of AFR countries. Among the estimated 8.9 million infants in AFR who did not receive MCV1 in 2015, approximately 4.8 million (54%) resided in Nigeria (3 million), Ethiopia (0.7 million), the Democratic Republic of the Congo (DRC) (0.6 million), and Angola (0.5 million) (*4*). WHO recommends that all countries include a second routine dose of MCV in their national vaccination schedules, irrespective of the level of MCV1 coverage (*5*); only half of all AFR countries have done so. Eliminating the previous stringent MCV1 coverage requirement[¶¶¶] allows all countries to introduce MCV2 and establish a well-child visit during the second year of life, providing a timely catch-up opportunity for children missing MCV1 or other vaccines (6). WHO advises continuation of national follow-up SIAs until high population immunity (≥93%–95% coverage) is achieved and sustained in all districts with a routine 2-dose MCV schedule (*5*).

[§§] Case-based surveillance is the collection of epidemiologic information about each individual case; effective case-based measles surveillance includes confirmatory laboratory testing or epidemiologic linkage to a previous, laboratory-confirmed case.

[¶¶] For countries implementing elimination-standard case-based surveillance, WHO recommends that information be collected on 12 core variables: name, sex, age/date of birth, date of rash onset, date of notification, date of investigation, date of specimen collection, vaccination status, date of last measles vaccination, district of residence, reporting district, and travel history 7–21 days before date of rash onset.

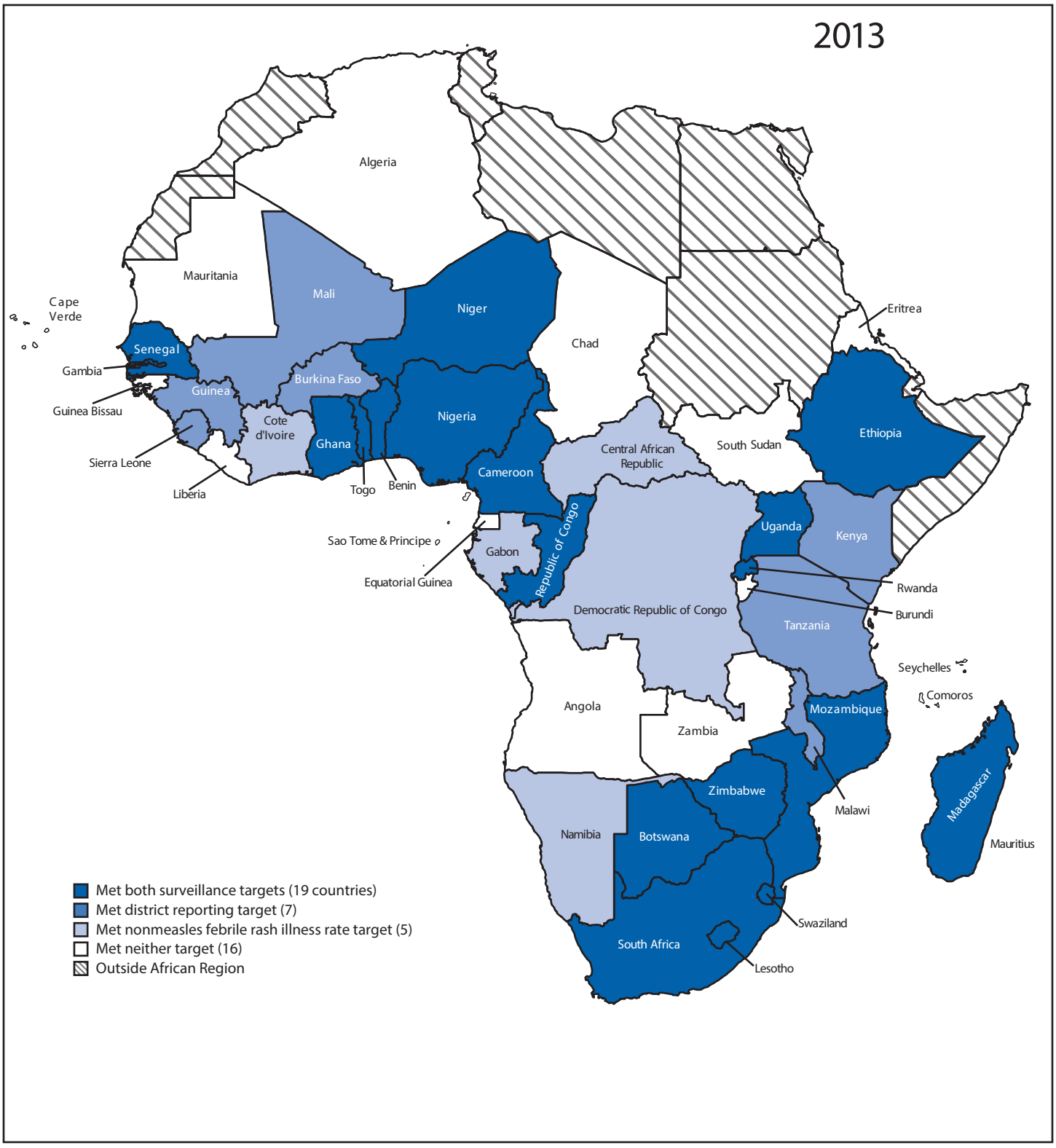
[***] Measles cases are defined as laboratory confirmed, epidemiologically confirmed, or clinically compatible. Laboratory confirmed cases are suspected measles cases with detectable measles virus-specific immunoglobulin class M antibodies, or from whom measles virus can be isolated or measles virus RNA can be detected in appropriate clinical specimens by a proficient laboratory. Epidemiologically linked confirmed measles cases are those suspected measles cases that have not been confirmed by a laboratory but are geographically and temporally related to a laboratory-confirmed case or, in the event of a chain of transmission, to another epidemiologically confirmed measles case, with dates of rash onset occurring 7–21 days apart. Clinically compatible measles cases are a suspected measles cases with fever and maculopapular rash and at least one of the following: cough, coryza, or conjunctivitis, for which no adequate clinical specimen was collected and which have not been linked epidemiologically to a laboratory-confirmed case of measles or to laboratory-confirmed case of another communicable disease.

[†††] Mauritius, Sao Tome and Principe, and Seychelles performed clinical surveillance, which entails notifying and reporting suspected cases using symptom-based case definitions, without any laboratory testing, to the national level in a timely manner. Clinical surveillance is performed because these three countries did not have national laboratories for measles testing. These countries did not report through the AFR case-based surveillance system for 2013–2106. WHO is supporting these countries to establish national serologic laboratories.

[§§§] The WHO Global Measles and Rubella Laboratory Network supports standardized methods and quality assurance measures in national laboratories across countries, as well as in three regional reference laboratories (Abidjan, Cote d'Ivoire; Entebbe, Uganda; and Johannesburg, South Africa). The lab network sequences the 450 nucleotides coding for the carboxy-terminal 150 amino acids of the nucleoprotein. Data (as of March 29, 2017) are available from the Measles Nucleotide Surveillance database. http://www.who-measles.org/Public/Web_Front/main.php.

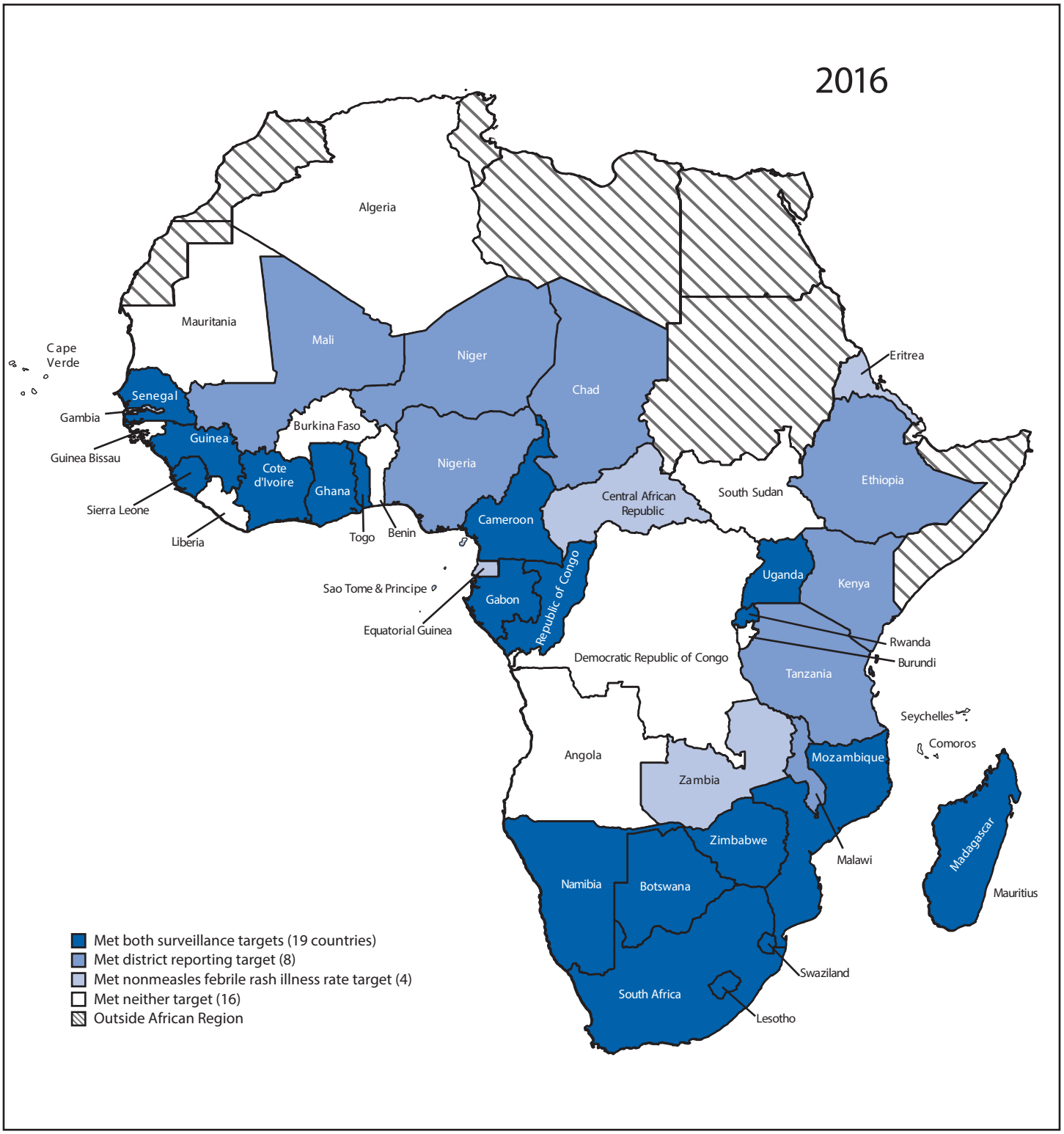
[¶¶¶] Previous WHO recommendations from 2009 regarding the introduction of MCV2 required that national coverage of MCV1 be ≥80% for 3 consecutive years and that in the African region, at least one of the two main surveillance indicators be met for ≥2 years before introducing a second dose of measles vaccine into routine immunization.

FIGURE. Measles case-based surveillance performance* by country — World Health Organization African Region, 2013 and 2016



See figure footnote on next page.

FIGURE. (*Continued*) Measles case-based surveillance performance* by country — World Health Organization African Region, 2013 and 2016



* Two key surveillance performance indicator targets were 1) investigate ≥2 cases of nonmeasles febrile rash illness per 100,000 population annually (nonmeasles febrile rash illness rate target), and 2) obtain a blood specimen from ≥1 suspected measles case in ≥80% of districts annually (district reporting target).

Summary

What is already known about this topic?

In 2012, the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) estimated first dose of measles-containing vaccine (MCV1) coverage in countries of the WHO African Region (AFR) to be 73% and >90% in 13 (28%) of 46 AFR countries. Among 35 measles supplementary immunization activities (SIAs) conducted during 2011–2012, 23 (66%) had >95% administrative coverage. Nineteen (44%) countries met the two key surveillance performance indicator targets. In 2012, only 16 (37%) countries met the incidence target of <5 cases per 1 million population.

What is added by this report?

In 2015, WHO-UNICEF estimated MCV1 coverage in AFR to be 74%; seven (15%) countries reported ≥95% MCV1 coverage. Among 52 measles SIAs conducted during 2013–2016, 41 (79%) reported ≥95% administrative coverage. In 2016, 19 (40%) countries met both surveillance performance indicator targets. In 2016, only 15 (32%) countries met the target of <1 case per 1 million population.

What are the implications for public health practice?

To eliminate measles by 2020, AFR countries need to achieve high (95%) 2-dose measles vaccination coverage, through introduction of a second MCV dose into routine immunization programs, increasing routine immunization coverage, improving SIA quality, fully implementing elimination-standard surveillance, conducting annual district-level risk assessments, and establishing national verification committees and a regional commission for the verification of measles elimination.

During 2013–2016, only 32% of 25 SIAs where a postcampaign survey was conducted had estimated coverage ≥95%, although >100% administrative coverage was reported by nearly half of all 52 SIAs. To achieve SIA coverage targets, WHO SIA guidelines and tools**** should be used to prepare and implement high-quality campaigns, which are subsequently evaluated by coverage surveys. SIA planning should begin 12–15 months before the SIA, and intra-SIA and post-SIA monitoring should be performed to identify low MCV coverage areas so that vaccination of children missed during the SIA can be arranged.

Nearly two-thirds of countries did not attain surveillance indicator targets in 2016, and 15% of countries had poorer surveillance performance in 2016 than in 2013. Fifteen (32%) countries achieved the target of <1 case per 1 million population in 2016. However, most confirmed cases detected during 2013–2016 were among children aged 9–59 months who were unvaccinated or had unknown vaccination status. In addition, 84% of cases were reported from the same four countries that accounted for half of children who missed MCV1: Nigeria (44%), Ethiopia (22%), Angola (10%), and DRC (8%). The recent WHO Measles and Rubella Global Strategic Plan Midterm Review emphasized the limits of MCV coverage data as an indicator and recommended, with SAGE endorsement, using measles disease incidence as another indicator to guide elimination efforts (*7*). To measure measles incidence accurately, however, high-quality, case-based surveillance is crucial; this requires increasing resources for full implementation, particularly as countries transition polio eradication resources to other public health priorities.

The findings in this report are subject to at least two limitations. First, vaccination coverage data can be either incorrectly high or low because of inaccurate target population size estimates, erroneous reporting of doses delivered, and inclusion of SIA doses administered to children outside the target age group. Second, surveillance data underestimate the actual number of cases because not all patients with measles seek care, and not all of those seeking care are reported. In 2016, large discrepancies in the number of case-based and aggregate reported measles cases existed, particularly in DRC.†††† Integrated Disease Surveillance and Response system reports of aggregate measles cases in AFR have historically included more measles cases than those reported through case-based surveillance (*3*). In addition, reported suspected measles cases without confirmatory laboratory testing might actually be rubella cases. Underreporting of measles through case-based surveillance markedly limits case characteristic analysis to guide programs. Strengthening of reporting through case-based surveillance systems is needed to provide more robust data.

To eliminate measles by 2020, AFR countries need to introduce MCV2 and increase coverage through immunization services by better managing human and financial resources, enhancing capacity of health staff for improved access, and increasing demand with community-linked immunization services. SIA quality can be improved through country ownership and SIA preparation starting 12–15 months in advance. Fully implementing laboratory-supported case-based surveillance that meets standards for elimination will require human and financial resources. Annual risk assessments using the WHO programmatic measles risk assessment tool§§§§ are necessary

**** Information on planning and implementing high-quality SIAs can be found at http://www.who.int/immunization/diseases/measles/en/.

†††† World Health Organization. African Regional Measles and Rubella Surveillance feedback summary for 2016. Data as of January 21, 2017.

§§§§ The WHO measles programmatic risk assessment tool (http://www.who.int/immunization/monitoring_surveillance/routine/measles_assessment/en) was developed to help national programs identify areas not meeting measles programmatic targets, and based on the findings, guide and strengthen measles elimination program activities and reduce the risk for outbreaks. This Excel-based tool assesses subnational programmatic risk as the sum of indicator scores in four categories: population immunity, surveillance quality, program performance, and threat assessment. Each subnational area is assigned to a programmatic risk category of low, medium, high, or very high risk based on the overall risk score. Scoring for each indicator was developed based on expert consensus.

to identify districts needing surveillance and programmatic strengthening (*8*). As 2020 approaches, a next step will be to establish national verification committees and a regional commission for the verification of measles elimination (*9*) that can review and document progress toward measles elimination and provide supportive oversight and advocacy for elimination efforts in AFR.

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References

1. World Health Organization Regional Committee for Africa. Measles elimination by 2020: a strategy for the African Region. Yamoussoukro, Côte d'Ivoire: World Health Organization Regional Committee for Africa; 2011. http://www.afro.who.int/en/sixty-first-session.html
2. World Health Organization Regional Office for Africa. African regional guidelines for measles and rubella surveillance. Brazzaville, Congo: World Health Organization Regional Office for Africa; 2015. http://www.afro.who.int/index.php?option=com_docman&task=doc_download&gid=10814&Itemid=2593
3. Masresha BG, Kaiser R, Eshetu M, et al. Progress toward measles preelimination—African Region, 2011–2012. MMWR Morb Mortal Wkly Rep 2014;63:285–91.
4. World Health Organization. Immunization, vaccines, and biologicals: data, statistics, and graphics. Geneva, Switzerland: World Health Organization; 2014. http://www.who.int/immunization/monitoring_surveillance/data/en/
5. World Health Organization. Measles vaccines: WHO position paper—April 2017. Wkly Epidemiol Rec 2017;92:205–27.
6. World Health Organization. A guide to introducing a second dose of measles vaccine into routine immunization schedules. Geneva, Switzerland: World Health Organization; 2013. http://apps.who.int/iris/bitstream/10665/85900/1/WHO_IVB_13.03_eng.pdf
7. World Health Organization Strategic Advisory Group of Experts. Midterm review of the Global Measles and Rubella Strategic Plan 2012–2020. Geneva, Switzerland: World Health Organization; 2016. http://apps.who.int/iris/bitstream/10665/251810/1/WER9148.pdf?ua=1
8. Lam E, Schluter WW, Masresha BG, et al. Development of a district-level programmatic assessment tool for risk of measles virus transmission. Risk Anal 2015. Epub May 15, 2015. https://doi.org/10.1111/risa.12409
9. World Health Organization African Region. Report of the Regional Immunization Technical Advisory Group Meeting. Dakar, Senegal: December 12–13, 2016. http://www.who.int/immunization/sage/meetings/2017/april/4_AFRO_RITAG_Meeting_Report_Final.pdf

Vital Signs: Racial Disparities in Age-Specific Mortality Among Blacks or African Americans — United States, 1999–2015

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Abstract

Background: Although the overall life expectancy at birth has increased for both blacks and whites and the gap between these populations has narrowed, disparities in life expectancy and the leading causes of death for blacks compared with whites in the United States remain substantial. Understanding how factors that influence these disparities vary across the life span might enhance the targeting of appropriate interventions.

Methods: Trends during 1999–2015 in mortality rates for the leading causes of death were examined by black and white race and age group. Multiple 2014 and 2015 national data sources were analyzed to compare blacks with whites in selected age groups by sociodemographic characteristics, self-reported health behaviors, health-related quality of life indicators, use of health services, and chronic conditions.

Results: During 1999–2015, age-adjusted death rates decreased significantly in both populations, with rates declining more sharply among blacks for most leading causes of death. Thus, the disparity gap in all-cause mortality rates narrowed from 33% in 1999 to 16% in 2015. However, during 2015, blacks still had higher death rates than whites for all-cause mortality in all groups aged <65 years. Compared with whites, blacks in age groups <65 years had higher levels of some self-reported risk factors and chronic diseases and mortality from cardiovascular diseases and cancer, diseases that are most common among persons aged ≥65 years.

Conclusions and Implications for Public Health Practice: To continue to reduce the gap in health disparities, these findings suggest an ongoing need for universal and targeted interventions that address the leading causes of deaths among blacks (especially cardiovascular disease and cancer and their risk factors) across the life span and create equal opportunities for health.

Introduction

Blacks or African Americans (referred to as blacks in this report) are the third largest racial/ethnic population in the United States, after whites and Hispanics (*1*). In 2014, life expectancy at birth was 75.6 years for blacks and 79.0 years for whites, an increase of 3.8 years from 71.8 years and an increase of 1.7 years from 77.3 years in 2000, respectively (*2*). Despite this improvement, disparities in the leading causes of deaths for blacks compared with whites are pronounced by early and middle adulthood, especially deaths from homicide and chronic conditions such as heart disease and diabetes (*2*,*3*). In addition, blacks have the highest death rate and shorter survival rate for all cancers combined compared with whites in the United States (*4*). Although many of these chronic conditions are usually associated with adulthood, the initial stages of some chronic conditions arise early in life (*5*). The analyses presented in this report used recent mortality and two national surveillance data sets to compare rates for the leading causes of death and the prevalences of chronic diseases, related health behaviors, health-related quality of life indicators, and health care utilization practices for blacks compared with whites by age group to identify disparities across the life span; such information could facilitate targeted interventions.

Methods

Age-adjusted death rates for blacks and whites of all ages (including children) and also age-specific trends for the leading selected causes of death among blacks for four adult age groups (18–34, 35–49, 50–64, and ≥65 years) were examined for the period 1999–2015. In addition, age-specific sociodemographic characteristics and death rates were examined and compared by race and age group. Age-specific prevalences of selected self-reported chronic diseases, related health behaviors, health-related quality of life indicators, and health care utilization practices were also examined and compared by race and age group.

Key Points

- In the United States, there were fewer age-adjusted deaths per 100,000 during 2015 compared with 1999, with 284 fewer among blacks and 120 fewer among whites.
- Despite of the narrowing of disparities in death rate for blacks and whites, disparities in the leading causes of deaths for blacks compared with whites remain large and persistent across the life span. Blacks had higher death rates than whites for all-cause mortality in all age groups <65 years.
- Blacks had significantly lower educational attainment and home ownership and almost twice the proportion of households below the poverty level compared with whites across the life span. This might help explain disparities in mortality via chronic disease related–behaviors, health-related quality of life, and health care utilization.
- Universal and targeted interventions are needed to reduce black-white health disparities across the life span.
- Additional information is available at https://www.cdc.gov/vitalsigns/.

Mortality data were analyzed using the CDC WONDER system, an interactive Web-based tool.* CDC WONDER mortality data are provided by the National Vital Statistics System and are based on information from all resident death certificates filed in the 50 states and the District of Columbia. CDC WONDER queries generated age-specific death rates and 95% confidence intervals for blacks and whites for all causes of death and leading causes of death among blacks† compared with whites in each age group during 1999–2015. Age-adjusted death rates also were obtained for all ages combined, including children. Rate ratios compared death rates for blacks to those for whites; the 95% confidence interval (CI) for each rate ratio was calculated (*6*), and statistical significance was determined at alpha = 0.05; 95% CIs that did not include 1.0 were considered indicative of a statistically significant difference between blacks and whites.

Population numbers, the sex distribution, and the percentage of each race with a Hispanic origin were obtained for each age group from the most recent available estimated postcensal population counts for 2014§ from the U.S. Census Bureau. Selected socioeconomic characteristics (U.S. nativity, education <12 years education, household poverty, home ownership by the household head, and lack of health insurance) of the 2014 population by race and age group were obtained from the 2014 American Community Survey Public Use Microdata Sample,¶ which is an ongoing national household survey of the U.S. Census Bureau.

Self-reported information on chronic diseases, health behaviors, health-related quality of life indicators, and health care utilization practices were obtained from the 2015 Behavioral Risk Factor Surveillance System (BRFSS), which is an annual state-based, random-digit-dialed telephone (cell phone and landline) survey of the noninstitutionalized U.S. population aged ≥18 years.** The median state response rate for the combined landline and cell phone surveys was 47.2%. Self-reported health behaviors among all respondents included current cigarette smoking (having smoked at least 100 cigarettes in the lifetime and smoking daily or somedays), lack of leisure-time physical activity in the past 30 days, and binge drinking (five or more drinks for men, or four or more drinks for women on any occasion) in the past 30 days. Weight status indicators included having a normal body weight (body mass index of 18.5–24.9 kg/m^2), and having obesity (body mass index ≥30 kg/m^2) based on self-reported height and weight. Health care access and utilization indicators included having a personal doctor or health care provider, not being able to see a doctor in the past year because of cost, and taking medication to control high blood pressure (among adults with high blood pressure). Self-reported health-related quality of life indicators included fair or poor health status, frequent mental distress (≥14 days in past 30 days), and frequent physical distress (≥14 days in past 30 days). Chronic disease conditions included reporting ever being told by a doctor or other health professional that the respondent had asthma, chronic obstructive pulmonary disease, high blood pressure, high blood

* https://wonder.cdc.gov.

† Leading causes of death are defined by *International Classification of Diseases, Tenth Revision* (ICD-10) codes for diseases that are reported as the underlying cause of death on the death certificate. Among blacks in 2015, the 10 leading causes of death for ages 18–34 years were 1) homicide (U01–U02, X85–Y09, Y87.1); 2) unintentional injury (V01–X59, Y85–Y86), 3) diseases of heart (I00–I09, I11, I13, I20–I51); 4) suicide (U03, X60–X84, Y87.0); 5) malignant neoplasms (C00–C997); 6) human immunodeficiency virus (HIV) disease (B20–B24), 7) diabetes mellitus (E10–E14); 8) pregnancy, childbirth and the puerperium (O00–O99); 9) cerebrovascular disease (I60–I69); and 10) anemias (D50–D64) . For ages 35–49 years the leading causes were 1) diseases of heart; 2) malignant neoplasms; 3) unintentional injury; 4) homicide; 5) diabetes mellitus; 6) cerebrovascular disease; 7) HIV disease; 8) suicide; 9) nephritis, nephrotic syndrome and nephrosis (N00–N07, N17–N19, N25–N27); and 10) septicemia (A40–A41). For ages 50–64 years the leading causes were 1) malignant neoplasms; 2) diseases of heart; 3) unintentional injury; 4) diabetes mellitus; 5) cerebrovascular disease; 6) chronic lower respiratory disease (J40–J47); 7) nephritis, nephrotic syndrome and nephrosis; 8) chronic liver disease and cirrhosis (K70, K73–K74); 9) septicemia; and 10) HIV disease. For ages ≥65 years the leading causes were 1) diseases of heart; 2) malignant neoplasms; 3) cerebrovascular disease; 4) diabetes mellitus; 5) Alzheimer's disease (G30); 6) chronic lower respiratory disease; 7) nephritis, nephrotic syndrome and nephrosis; 8) septicemia; 9) influenza and pneumonia (J09–J18); and 10) essential hypertension and hypertensive renal disease (I10, I12, I15).

§ https://www.census.gov/programs-surveys/popest.html.

¶ https://www.census.gov/programs-surveys/acs/data/pums.html.

** https://www.cdc.gov/brfss/annual_data/annual_2015.html.

cholesterol, diabetes, coronary heart disease (including heart attack or angina), stroke, or cancer (excluding skin cancer).

Statistical software that accounts for the complex sampling design of the BRFSS was used for analyses to obtain age-specific prevalences by race, prevalence ratios that compared blacks with whites, and CIs. For comparisons of BRFSS indicators by race, statistical significance ($p<0.05$) was determined in age-specific logistic regression by the Wald F-test.

Results

In 1999, age-adjusted death rates for any cause of death were 1,135.7 per 100,000 blacks and 854.6 per 100,000 whites (Table 1). By 2015, the racial gap had narrowed with age-adjusted death rates of 851.9 per 100,000 blacks and 735.0 per 100,000 whites. The age-adjusted death rate in 2015 relative to that in 1999 had declined 25% for blacks and 14% for whites; there were 284 fewer age-adjusted deaths per 100,000 blacks during 2015 compared with 1999, whereas there were 120 fewer age-adjusted deaths per 100,000 whites. The disparity gap in all-cause mortality rates decreased from 33% in 1999 to 16% in 2015. Among adults aged ≥65 years, the death rate in 2015 relative to that in 1999 declined 27% for blacks and 17% for whites, resulting in a crossover in death rates beginning in 2010, when blacks had lower death rates than whites (Figure 1).

Age-specific deaths for selected leading causes of death among blacks declined between 1999 and 2015 (Figure 2). Notable declines, for example, included heart disease (15%), cancer (24%), and human immunodeficiency virus (HIV) disease (80%) at ages 18–34 years; heart disease (22%), cancer (38%), and HIV disease (79%) at ages 35–49 years; and heart disease (32% and 43%), cancer (27% and 29%) and cerebrovascular disease (34% and 41%) for the 50–64 and ≥65 age groups (Table 1).

During 2014, sociodemographic characteristics differed by race (Table 2). Blacks in each age group were more likely than whites to have <12 years of education, to be unemployed, live below the poverty level, and less likely to live in a household where the head of household owned the home. Blacks were more likely to have no health insurance than whites for the 18–34, 35–49, and 50–64 age groups, but few persons in either population reported having no health insurance at age ≥65 years.

During 2015, health behaviors differed between the two populations (Table 3). Blacks were more likely to be obese, to have no leisure time physical activity, and less likely to have a normal body weight in all age groups compared with whites. In contrast, blacks were less likely to report binge drinking than whites. Although blacks had higher prevalences of current cigarette smoking than whites at ages 50–64 years and ≥65 years, they had a lower prevalence at ages 18–34 years.

In all age groups, blacks were more likely than whites to report not being able to see a doctor in the past year because of cost. Blacks aged 18–34 years were less likely to have a personal doctor or health care provider than whites (Table 3). Blacks with high blood pressure were more likely than whites in each age group to report taking medication to control it.

Blacks in all age groups were more likely to report fair to poor health status than whites (Table 3). Blacks were more likely than whites to report frequent mental distress and frequent physical distress at age ≥50 years. The prevalence of having diagnoses of some chronic conditions was higher among blacks than whites across age groups, including for asthma, high blood pressure, diabetes, and stroke. In contrast, blacks across all age groups were less likely than whites to report a cancer diagnosis.

In 2015, blacks had 40% higher death rates than whites for all-cause mortality in all age groups <65 years (Table 4). At ages 18–34 years, blacks had higher death rates than whites for eight of the 10 leading causes of death among blacks in that age group (heart disease; cancer; cerebrovascular disease; diabetes mellitus; homicide; HIV disease; and conditions resulting from pregnancy, childbirth, and the puerperium). At ages 35–49 years, blacks had higher death rates than whites for heart disease; cancer; cerebrovascular disease; diabetes mellitus; homicide; nephritis, nephrotic syndrome, and nephrosis; septicemia; and HIV disease. At ages 50–64 years, blacks had higher death rates than whites for leading chronic diseases (heart disease, cancer; cerebrovascular disease; diabetes mellitus; and nephritis, nephrotic syndrome, and nephrosis) as well as for unintentional injury, septicemia, and HIV disease. Death rates from heart disease, cancer, cerebrovascular disease, diabetes mellitus, and homicide began increasing at earlier ages among blacks than among whites. There were significant declines in deaths from HIV disease in the past 17 years for both racial populations. Among persons aged 35–49 years, there were 45 fewer HIV disease deaths per 100,000 among blacks during 2015 compared with 1999, while among whites there were six fewer HIV disease deaths (Table 1). However, during 2015, blacks in age groups 18–34, 35–49, and 50–64 were seven to nine times more likely than whites to die from HIV disease. Some age groups of blacks had lower death rates than whites for four leading causes of death: ages 18–49 years for unintentional injuries, ages 50–64 years for chronic liver disease and cirrhosis, ages ≤49 years for suicide, and ages ≥65 years for Alzheimer's disease.

Conclusions and Comment

During 1999–2015, age-adjusted death rates decreased by 25% for blacks and 14% for whites, with 284 fewer age-adjusted deaths per 100,000 blacks and 120 fewer age-adjusted deaths per 100,000 whites during 2015 compared with 1999.

Among persons aged ≥65 years, there was a black-white mortality crossover, whereby blacks had slightly lower age-adjusted deaths than whites beginning in 2010. In addition, during 1999–2015, blacks saw declines in the two leading causes of death, heart disease and cancer, across all age groups. However, despite substantive reductions in death rates among blacks in the United States, blacks continue to have higher death rates overall, higher prevalence of many chronic health conditions, and lower prevalence of some healthy behaviors. Blacks were less likely to participate in leisure-time physical activity and maintain a healthy weight. Blacks were more likely to report not being able to see a doctor because of cost, even though, across age groups, the percentages of blacks and whites who reported having a personal doctor or health care provider were approximately equal.

In addition, this analysis shows that blacks had significantly lower educational attainment and home ownership and almost twice the proportion of households living below the poverty level and unemployed than whites in all age groups. Such social factors are posited as "fundamental causes" because they influence chronic conditions, related behaviors, health-related quality of life, and health care utilization by constraining persons' abilities to engage in prevention or treatment (*7*,*8*). These differences in "fundamental causes," health behaviors, and access to health care contribute to the excess deaths and chronic conditions among younger black adults that are most common among persons aged ≥65 years. For example, blacks in age groups 18–34 and 35–49 were nearly twice as likely to die from heart disease, stroke, and diabetes as whites. These findings are generally consistent with previous reports that use the term "weathering" to suggest that blacks experience premature aging and earlier health decline than whites, and that this decline in health accumulates across the entire life span and potentially across generations, as a consequence of psychosocial, economic, and environmental stressors (*9*,*10*).

Taken in the context of other research, the substantial differences in mortality, health behaviors, access to health care, and social factors across the life span identified in this analysis highlight the importance of a dual strategy of universal and targeted interventions to address disparities in black health (*11*). Opportunities for interventions have been identified that decision-makers, public health programs, clinicians, and communities can use. The Community Preventive Services Task Force has recommendations for interventions with proven effectiveness for the prevention of obesity, physical inactivity, tobacco use, promotion of cancer screening, and medication adherence (https://www.thecommunityguide.org/). CDC has also released a series of violence prevention technical packages to help communities use the strategies with the best available evidence (https://www.cdc.gov/violenceprevention/pub/technical-packages.html). To ensure continued progress in improving health for all U.S. residents, targeted interventions for populations living in vulnerable social and economic conditions (e.g., poverty or racially segregated neighborhoods with fewer resources) also should be considered. The U.S. Department of Health and Human Services Action Plan to Reduce Racial and Ethnic Health Disparities promotes targeted interventions to reduce these disparities (https://www.minorityhealth.hhs.gov/npa/files/Plans/HHS/HHS_Plan_complete.pdf). In addition, The Racial and Ethnic Approaches to Community Health (REACH) program, which supports targeted interventions through community-based, participatory approaches, identified strategies to address health disparities for blacks and other racial/ethnic populations (*12*–*15*).

The findings in this report are subject to at least six limitations. First, information about many characteristics were self-reported and subject to recall and social desirability biases, although this is unlikely to account for large disparities within the analyses (*16*). Second, this was a cross-sectional analysis, and data do not allow a comparison of rates for the same cohort as they aged (*16*). Third, the American Community Survey and BRFSS are household surveys and exclude persons living in institutions, long-term care facilities, and prisons. Fourth, there are technical and conceptual limitations associated with examining race in epidemiologic analyses because it is complex and generally represents other economic, psychosocial, and environmental factors (*17*–*19*). Fifth, although whites were considered as the benchmark (*20*), or referent in this analysis, blacks had lower death rates for unintentional injury and suicide in some age groups and lower prevalences of binge drinking. Finally, differences within blacks and whites by sex, socioeconomic characteristics, and Hispanic subgroups were not considered, yet might modulate some of the relationships seen overall.

Optimizing health for all U.S. residents while also eliminating disparities remains an integral part of disease prevention and health promotion activities. Although significant strides have been made in the United States in the last 17 years, disparities still exist. To continue to improve the health of the black population, there is a continued need to translate research results into effective universal and targeted interventions across the life span to inform action.

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References

1. Colby SL, Ortman JM. Projections of the size and composition of the U.S. population: 2014 to 2060. Washington, DC: US Department of Commerce, Economics and Statistics and Administration, Bureau of the Census; 2014.
2. National Center for Health Statistics. Health, United States 2015: with special feature on racial and ethnic disparities. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics, 2015.
3. Mensah GA, Mokdad AH, Ford ES, Greenlund KJ, Croft JB. State of disparities in cardiovascular health in the United States. Circulation 2005;111:1233–41. https://doi.org/10.1161/01.CIR.0000158136.76824.04
4. Jemal A, Ward EM, Johnson CJ, et al. Annual report to the nation on the status of cancer, 1975–2014, featuring survival. J Natl Cancer Inst 2017;109. https://doi.org/10.1093/jnci/djx030
5. Braveman P, Barclay C. Health disparities beginning in childhood: a life-course perspective. Pediatrics 2009;124(Suppl 3):S163–75. https://doi.org/10.1542/peds.2009-1100D
6. Rothman KJ, Greenland S, Lash TL. Modern epidemiology. 3rd ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2008.
7. Link BG, Phelan J. Social conditions as fundamental causes of disease. J Health Soc Behav 1995;35:80–94. https://doi.org/10.2307/2626958
8. Phelan JC, Link BG, Tehranifar P. Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. J Health Soc Behav 2010;51(Suppl):S28–40. https://doi.org/10.1177/0022146510383498
9. Geronimus AT. The weathering hypothesis and the health of African-American women and infants: evidence and speculations. Ethn Dis 1992;2:207–21.
10. Geronimus AT, Hicken M, Keene D, Bound J. "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. Am J Public Health 2006;96:826–33. https://doi.org/10.2105/AJPH.2004.060749
11. Hutchins SS, Jiles R, Bernier R. Elimination of measles and of disparities in measles childhood vaccine coverage among racial and ethnic minority populations in the United States. J Infect Dis 2004;189(Suppl 1):S146–52. https://doi.org/10.1086/379651
12. Giles WH, Tucker P, Brown L, et al. Racial and ethnic approaches to community health (REACH 2010): an overview. Ethn Dis 2004;14(Suppl 1):S5–8.
13. Giles WH. The US perspective: lessons learned from the Racial and Ethnic Approaches to Community Health (REACH) Program. J R Soc Med 2010;103:273–6.
14. Jenkins C, Pope C, Magwood G, et al. Expanding the chronic care framework to improve diabetes management: the REACH case study. Prog Community Health Partnersh 2010;4:65–79. https://doi.org/10.1353/cpr.0.0108
15. Howell SL, Tucker P, Liburd L. Environmental and policy approaches to increasing physical activity: improving access to places for physical activity and dissemination of information. Glob Health Promot Educ 2011;18:43–6. https://doi.org/10.1177/1757975910393170
16. Szklo M, Nieto FJ. Epidemiology: beyond the basics. 2nd ed. Sudbury, MA: Jones and Bartlett Publishers; 2007.
17. Cooper RS, Freeman VL. Limitations in the use of race in the study of disease causation. J Natl Med Assoc 1999;91:379–83.
18. Kaufman JS, Cooper RS. Seeking causal explanations in social epidemiology. Am J Epidemiol 1999;150:113–20. https://doi.org/10.1093/oxfordjournals.aje.a009969
19. Berkman LF, Kawachi I, Glymour MM. Social epidemiology. 2nd ed. Oxford, England: Oxford University Press; 2014.
20. Levine RS, Foster JE, Fullilove RE, et al. Black-white inequalities in mortality and life expectancy, 1933-1999: implications for healthy people 2010. Public Health Rep 2001;116:474–83. https://doi.org/10.1093/phr/116.5.474

FIGURE 1. Death rates among blacks and whites, by age group (years) — United States, 1999–2015

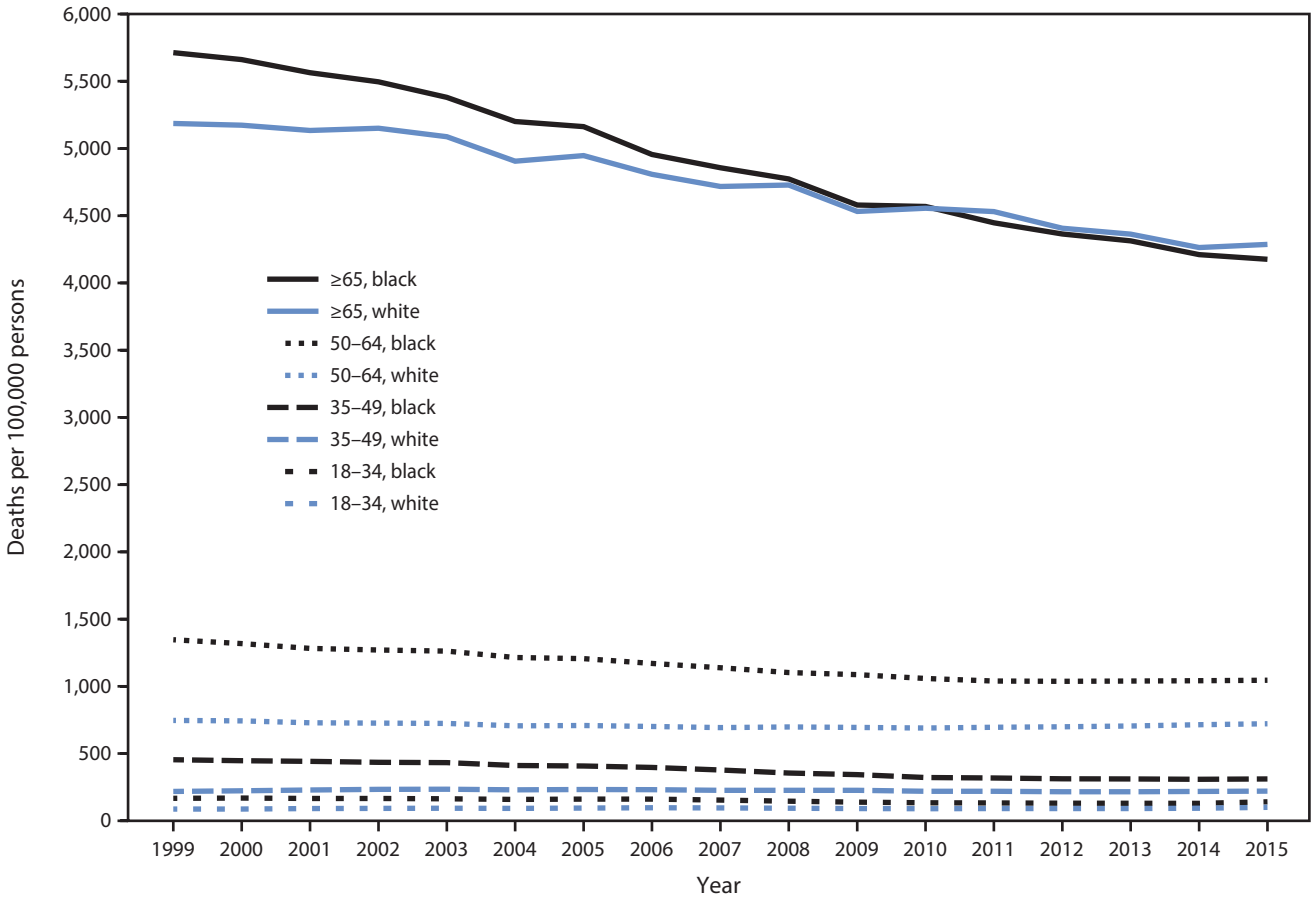

FIGURE 2. Death rates for selected leading causes of death among black and white adults, by age group (years) — United States, 1999–2015

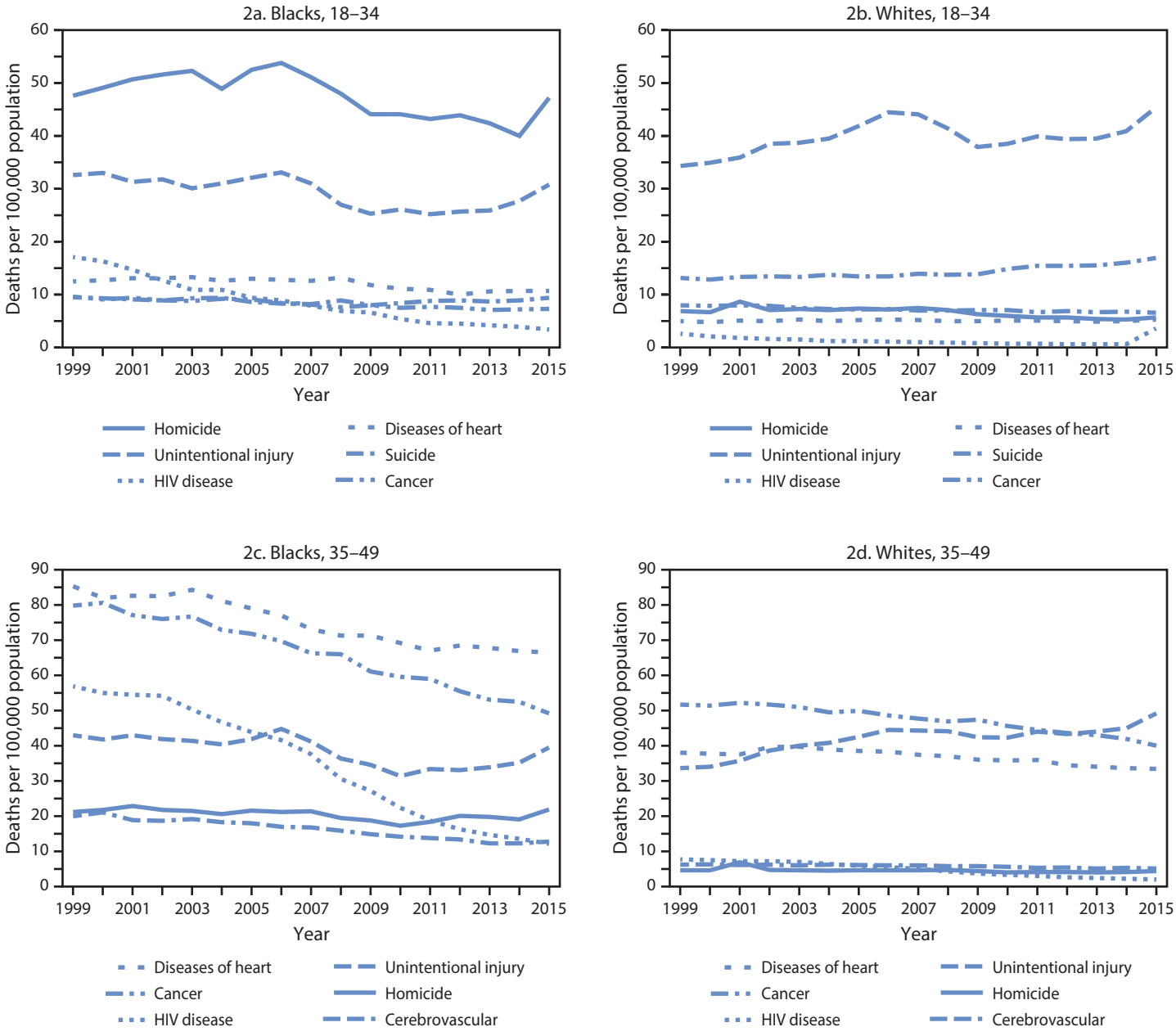

FIGURE 2. (*Continued*) Death rates for selected leading causes of death among black and white adults, by age group (years) — United States, 1999–2015

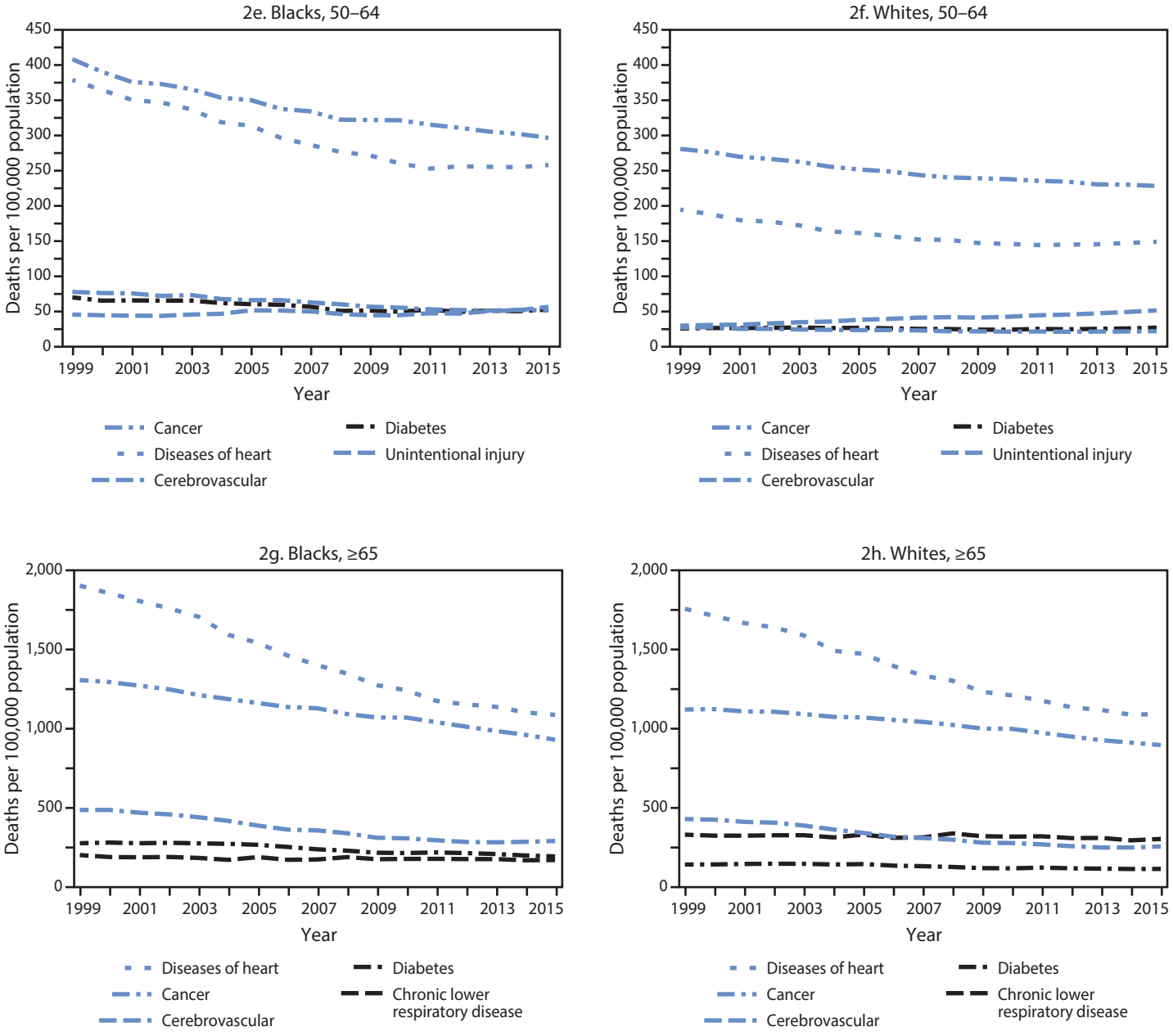

TABLE 1. Death rates per 100,000 population for selected leading causes of death, percentage changes, and death rate disparities between blacks and whites, by age group — National Vital Statistics System, United States, 1999 and 2015

Cause of death by age group (yrs)	Blacks			Whites			Death rate disparity relative to whites*	
	1999 rate	2015 rate	% change (1999 to 2015)	1999 rate	2015 rate	% change (1999 to 2015)	1999 (%)	2015 (%)
1. All causes								
All ages†	1,135.7	851.9	-25.0§	854.6	735.0	-14.1§	+32.9§	+15.9§
18–34	167.8	141.5	-15.6§	87.5	100.3	+14.6§	+91.8§	+41.1§
35–49	454.3	311.5	-31.4§	218.2	220.3	+1.0§	+108.2§	+41.4§
50–64	1,346.5	1,046.0	-22.3§	746.5	722.4	-3.2§	+80.4§	+44.8§
≥65	5,712.7	4,176.0	-26.9§	5,186.0	4,286.9	-17.3§	+10.2§	-2.6§
2. Diseases of the heart								
All ages	334.3	205.1	-38.7§	262.0	167.9	-35.9§	+27.6§	+22.2§
18–34	12.5	10.7	-14.5§	4.8	5.1	+5.2	+158.7§	+110.3§
35–49	85.3	66.5	-22.0§	37.9	33.3	-12.0§	+125.2§	+99.7§
50–64	378.6	257.5	-32.0§	193.9	148.1	-23.6§	+95.2§	+73.9§
≥65	1,902.6	1,085.5	-42.9§	1,756.7	1,091.8	-37.9§	+8.3§	-0.6
3. Malignant neoplasms								
All ages	252.5	180.1	-28.7§	198.0	159.4	-19.4§	+27.6§	+13.0§
18–34	9.6	7.3	-23.8§	7.8	6.4	-17.4§	+22.7§	+13.2§
35–49	79.8	49.2	-38.3§	51.6	39.9	-22.6§	+54.6§	+23.2§
50–64	408.2	296.2	-27.4§	280.4	227.6	-18.8§	+45.6§	+30.1§
≥65	1,305.0	927.7	-28.9§	1,118.8	893.9	-20.1§	+16.6§	+3.8§
4. Cerebrovascular diseases								
All ages	81.8	50.8	-37.9§	59.6	36.4	-39.0§	+37.4§	+39.8§
18–34	1.9	1.6	-17.2	1.0	0.8	-15.5§	+97.9§	+93.9§
35–49	20.0	12.8	-36.2§	6.0	4.9	-17.4§	+236.2§	+159.8§
50–64	76.8	50.5	-34.3§	25.9	21.0	-18.9§	+196.5§	+140.3§
≥65	483.4	287.2	-40.6§	426.1	252.5	-40.7§	+13.4§	+13.8
5. Unintentional injury								
All ages	40.1	36.8	-8.0§	35.2	46.0	+30.7§	+13.8§	-20.0§
18–34	32.6	30.8	-5.6§	34.3	45.4	+32.4§	-4.9§	-32.1§
35–49	43.0	39.5	-8.0§	33.5	49.1	+46.8§	+28.4§	-19.5§
50–64	44.6	55.4	+24.4§	28.6	50.5	+76.3§	+55.7§	+9.9§
≥65	88.6	69.8	-21.2§	94.0	114.4	+21.7§	-5.7§	-39.0§
6. Diabetes mellitus								
All ages	49.7	37.0	-25.6§	22.6	19.6	-13.3§	+120.0§	+88.7§
18–34	2.1	2.7	+26.9§	0.9	1.1	+18.3§	+128.0§	+144.5§
35–49	12.8	13.1	+2.9	5.2	6.2	+19.6§	+148.0§	+113.3§
50–64	69.0	51.8	-24.9§	24.7	25.9	+4.8§	+179.3§	+100.2§
≥65	273.0	189.4	-30.6§	137.9	110.4	-19.9§	+97.9§	+71.5§
7. Homicide								
All ages	20.1	19.8	-1.6	3.8	3.3	-13.0§	+434.3§	+504.3§
18–34	47.6	47.2	-0.8	6.8	5.5	-18.5§	+605.0§	+758.7§
35–49	21.2	21.9	+3.1	4.4	4.2	-5.9§	+380.7§	+426.5§
50–64	9.5	10.1	+6.2	2.7	2.8	+5.3	+255.6§	+258.9§
≥65	6.6	4.1	-38.0§	2.1	1.8	-16.0§	+212.7§	+130.9§
8. HIV disease								
All ages	23.6	7.9	-66.8§	2.9	1.1	-63.8§	+706.8§	+641.5§
18–34	17.1	3.4	-80.3§	2.4	0.4	-84.8§	+622.4§	+838.9§
35–49	56.9	12.2	-78.5§	7.5	1.8	-76.5§	+657.2§	+590.4§
50–64	33.2	19.7	-40.7§	3.5	2.7	-22.6§	+847.7§	+625.8§
≥65	9.1	10.5	+15.8§	0.7	1.1	+55.7§	+1,197.1§	+864.2§
9. Suicide								
All ages	5.6	5.6	+0.5	11.3	15.1	+33.8§	-50.7§	-62.9§
18–34	9.5	9.4	-0.4	13.0	16.8	+29.2§	-27.1§	-43.8§
35–49	7.3	7.5	+3.6	15.8	20.8	+31.1§	-54.2§	-63.8§
50–64	4.9	5.5	+13.4	13.8	22.8	+64.6§	-64.9§	-75.8§
≥65	5.7	4.0	-30.0§	16.9	18.4	+9.0§	-66.4§	-78.4§

Abbreviation: HIV = human immunodeficiency virus.

* Disparity (%) = (Black rate minus white rate) divided by white rate times 100.

† "All ages" category includes infants and children. Death rates for all ages were age-standardized to the 2000 U.S. projected population.

§ Z-statistic significant at p<0.05 for the rate change from 1999 to 2015 or for the difference between black and white populations.

TABLE 2. Selected sociodemographic characteristics of blacks and whites, by age group — U.S. Census Bureau, United States, 2014

Characteristic	All ages		18–34 years		35–49 years		50–64 years		≥65 years	
	Black	White	Black	White	Black	White	Black	White	Black	White
Census population (no. in millions)*	**45.7**	**253.7**	**12.1**	**57.6**	**8.6**	**48.1**	**7.7**	**51.2**	**4.2**	**39.7**
Sex										
Male	47.9	49.5	49.4	51.2	47.0	50.3	46.0	49.0	40.0	44.4
Female	52.1	50.5	50.6	48.8	53.0	49.7	54.0	51.0	60.0	55.6
Other characteristics (%)										
Hispanic*	7.4	19.8	8.0	24.3	6.9	21.6	4.5	12.5	3.6	8.3
U.S.-born†	88.4	87.3	87.7	85.0	83.6	81.6	85.6	87.8	87.8	89.8
<12 years education†	38.4	29.5	13.8	10.1	11.0	9.9	15.2	9.4	29.4	15.2
Unemployed†	6.0	3.0	12.5	6.2	7.6	3.8	5.2	3.1	1.1	0.7
Household below poverty level†	25.0	12.2	24.6	15.5	19.4	10.3	19.7	9.2	17.1	7.8
Household head owns home†	40.9	65.2	30.7	47.2	42.8	65.5	54.5	77.7	62.9	79.7
No health insurance†	13.7	10.1	24.0	17.7	19.3	14.8	13.7	9.8	1.5	0.6

* Number and percentage based on estimated postcensal population counts for 2014 from the U.S. Census Bureau.
† Percentage based on population counts obtained from the Public Use Microdata Sample of the 2014 American Community Survey of the U.S. Census Bureau.

TABLE 3. Comparison of selected health characteristics reported by black and white adults, by age group and prevalence ratio (PR) — Behavioral Risk Factor Surveillance Survey, United States, 2015

Health characteristic	Adults ≥18 years*		18–34 years		35–49 years		50–64 years		≥65 years	
	Black	White	Black	White	Black	White	Black	White	Black	White
Unweighted sample size (no.)	**36,362**	**359,668**	**6,818**	**49,089**	**7,673**	**63,011**	**11,712**	**113,443**	**10,159**	**134,125**
Estimated noninstitutionalized population (no. in millions)	**31.1**	**183.7**	**10.7**	**51.2**	**8.0**	**41.9**	**7.8**	**50.0**	**4.6**	**40.6**
Health behaviors: % (95% CI)										
Current smoker	19.2 (18.5–20.0)	17.5 (17.3–17.8)	19.0 (17.5–20.5)	19.7 (19.1–20.3)	19.8 (18.3–21.3)	19.8 (19.3–20.4)	23.9 (22.4–25.4)	18.4 (18.0–18.8)	11.7 (10.6–12.9)	8.5 (8.2– 8.7)
PR (95% CI)	1.09 (1.05–1.14)†	—	0.96 (0.88–1.05)	—	1.00 (0.92–1.08)	—	1.30 (1.21–1.39)†	—	1.38 (1.25–1.54)†	—
No leisure-time physical activity in past 30 days	31.0 (30.1–32.0)	24.6 (24.2–24.9)	25.7 (23.9–27.4)	18.6 (18.0–19.2)	30.2 (28.4–32.1)	24.7 (24.1–25.4)	35.1 (33.4–36.8)	27.7 (27.2–28.3)	36.6 (34.6–38.6)	31.1 (30.6–31.6)
PR (95% CI)	1.26 (1.22–1.30)†	—	1.38 (1.28–1.49)†	—	1.22 (1.14–1.31)†	—	1.26 (1.20–1.33)†	—	1.18 (1.11–1.24)†	—
Binge drinking (men ≥5; women ≥4 drinks) on any occasion in past 30 days	13.5 (12.8–14.2)	18.4 (18.1–18.7)	19.3 (17.9–20.8)	27.7 (27.0–28.4)	14.6 (13.2–16.1)	20.4 (19.8–21.0)	10.3 (9.2–11.4)	13.4 (13.0–13.8)	4.7 (3.9– 5.7)	4.6 (4.4–4.8)
PR (95% CI)	0.73 (0.69–0.77)†	—	0.70 (0.64–0.76)†	—	0.72 (0.65–0.80)†	—	0.77 (0.69–0.86)†	—	1.03 (0.85–1.25)	—
Weight status: % (95% CI)										
Normal (body mass index of 18.5–24.9 kg/m^2)	26.0 (25.2–26.9)	34.4 (34.0–34.7)	38.9 (37.0–40.8)	44.5 (43.8–45.3)	19.9 (18.4–21.5)	30.2 (29.5–30.9)	18.6 (17.3–19.9)	27.4 (26.9–27.9)	23.8 (22.1–25.6)	32.1 (31.7–32.6)
PR (95% CI)	0.76 (0.74–0.79)†	—	0.87 (0.83–0.92)†	—	0.66 (0.61–0.71)†	—	0.68 (0.63–0.73)†	—	0.74 (0.69–0.80)†	—
Obesity (body mass index of ≥30 kg/m^2)	37.4 (36.5–38.3)	28.4 (28.1–28.7)	28.7 (27.1–30.5)	22.1 (21.5–22.8)	42.8 (40.8–44.7)	32.3 (31.6–33.0)	43.3 (41.5–45.1)	33.3 (32.8–33.8)	35.8 (33.9–37.7)	27.0 (26.5–27.4)
PR (95% CI)	1.31 (1.27–1.35)†	—	1.30 (1.22–1.39)†	—	1.33 (1.26–1.39)†	—	1.30 (1.24–1.36)†	—	1.33 (1.25–1.40)†	—
Health care utilization: % (95% CI)										
Has a personal doctor or health care provider	77.4 (76.6–78.2)	78.5 (78.2–78.8)	61.5 (59.7–63.3)	64.2 (63.5–64.9)	77.6 (75.9–79.3)	77.3 (76.7–77.9)	86.7 (85.5–87.9)	87.7 (87.3–88.1)	93.9 (92.9–94.8)	95.2 (95.5–95.4)
PR (95% CI)	0.99 (0.98–1.00)	—	0.96 (0.93–0.99)†	—	1.00 (0.98–1.03)	—	0.99 (0.98–1.00)	—	0.99 (0.98–1.00)	—
Could not see doctor in past year because of cost	17.3 (16.5–18.0)	12.6 (12.3–12.8)	19.4 (17.9–20.9)	15.1 (14.6–15.7)	18.8 (17.4–20.3)	15.0 (14.4–15.5)	17.7 (16.5–19.1)	12.3 (11.9–12.7)	10.1 (8.8–11.5)	4.2 (4.0– 4.4)
PR (95% CI)	1.37 (1.31–1.44)†	—	1.28 (1.17–1.39)†	—	1.26 (1.15–1.37)†	—	1.44 (1.33–1.56)†	—	2.41 (2.09–2.78)†	—
Take antihypertensive medication to control blood pressure among adults with high blood pressure	65.4 (63.8–67.0)	57.7 (56.9–58.4)	31.5 (27.3–36.1)	22.2 (20.4–24.1)	70.5 (67.5–73.3)	59.3 (57.8–60.7)	88.2 (86.8–89.5)	81.1 (80.4–81.8)	94.9 (94.0–95.7)	92.6 (92.3–92.9)
PR (95% CI)	1.08 (1.07–1.09)†	—	1.42 (1.21–1.67)†	—	1.19 (1.13–1.25)†	—	1.09 (1.07–1.11)†	—	1.03 (1.02–1.04)†	—

See table footnotes on next page.

TABLE 3. (*Continued*) Comparison of selected health characteristics reported by black and white adults, by age group and prevalence ratio (PR) — Behavioral Risk Factor Surveillance Survey, United States, 2015

	Adults ≥18 years*		18–34 years		35–49 years		50–64 years		≥65 years	
Health characteristic	**Black**	**White**	**Black**	**White**	**Black**	**White**	**Black**	**White**	**Black**	**White**
Health-related quality of life: % (95% CI)										
Fair or poor health status	21.7 (21.0–22.5)	15.9 (15.6–16.1)	11.9 (10.7–13.2)	9.1 (8.6– 9.5)	17.7 (16.3–19.1)	14.5 (14.0–15.1)	29.8 (28.3–31.3)	21.2 (20.7–21.7)	36.1 (34.2–38.0)	23.7 (23.3–24.2)
PR (95% CI)	1.36 (1.32–1.42)†	—	1.31 (1.17–1.47)†	—	1.22 (1.12–1.33)†	—	1.40 (1.33–1.48)†	—	1.52 (1.44–1.61)†	—
Frequent mental distress (≥14 days in past 30 days)	13.0 (12.4–13.6)	11.7 (11.4–11.9)	13.8 (12.5–15.2)	13.0 (12.5–13.6)	13.2 (12.0–14.4)	12.6 (12.2–13.1)	14.3 (13.2–15.5)	12.1 (11.7–12.4)	9.2 (8.1–10.4)	7.1 (6.8–7.4)
PR (95% CI)	1.11 (1.05–1.17)†	—	1.06 (0.96–1.17)	—	1.04 (0.94–1.15)	—	1.19 (1.09–1.30)†	—	1.30 (1.14–1.48)†	—
Frequent physical distress (≥14 days in past 30 days)	12.8 (12.3–13.5)	11.6 (11.4–11.8)	6.3 (5.4– 7.4)	6.4 (6.1– 6.8)	11.5 (10.3–12.8)	10.5 (10.1–11.0)	18.3 (17.0–19.6)	16.3 (15.9–16.8)	20.1 (18.6–21.7)	16.8 (16.4–17.2)
PR (95% CI)	1.11 (1.05–1.16)†	—	0.99 (0.84–1.16)	—	1.09 (0.98–1.23)	—	1.12 (1.04–1.21)†	—	1.20 (1.10–1.30)†	—
Chronic conditions: % (95% CI)										
Asthma	10.8 (10.2–11.3)	8.8 (8.6– 9.0)	11.1 (10.0–12.3)	9.4 (9.0– 9.9)	11.0 (9.9–12.2)	8.6 (8.3– 9.0)	11.0 (10.1–12.0)	8.9 (8.6– 9.2)	9.5 (8.5–10.7)	8.1 (7.8– 8.4)
PR (95% CI)	1.22 (1.15–1.29)†	—	1.18 (1.05–1.32)†	—	1.28 (1.16–1.45)†	—	1.24 (1.13–1.36)†	—	1.18 (1.05–1.33)†	—
Chronic obstructive pulmonary disease	5.9 (5.5–6.3)	6.1 (6.0– 6.3)	2.9 (2.4–3.5)	2.4 (2.2–2.7)	4.4 (3.8–5.1)	4.0 (3.7–4.2)	8.2 (7.4–9.0)	9.0 (8.7–9.3)	11.0 (9.8–12.2)	12.9 (12.6–13.3)
PR (95% CI)	0.96 (0.90–1.03)	—	1.23 (1.00–1.52)	—	1.11 (0.94–1.31)	—	0.91 (0.82–1.00)	—	0.85 (0.76–0.95)†	—
High blood pressure	40.3 (39.5–41.1)	28.9 (28.6–29.2)	12.0 (11.0–13.2)	9.9 (9.4–10.3)	32.7 (31.0–34.5)	21.9 (21.3–22.5)	61.2 (59.6–62.9)	40.8 (40.3–41.4)	77.0 (75.1–78.8)	60.3 (59.8–60.8)
PR (95% CI)	1.37 (1.34–1.40)†	—	1.22 (1.10–1.35)†	—	1.49 (1.41–1.59)†	—	1.50 (1.45–1.55)†	—	1.28 (1.25–1.31)†	—
High blood cholesterol	31.3 (30.4–32.2)	31.5 (31.2–31.8)	11.5 (10.1–13.2)	13.1 (12.4–13.7)	26.7 (24.9–28.6)	28.2 (27.5–28.9)	47.5 (45.7–49.3)	44.9 (44.3–45.5)	54.3 (52.2–56.3)	54.9 (54.4–55.4)
PR (95% CI)	1.00 (0.97–1.02)	—	0.88 (0.76–1.02)	—	0.95 (0.88–1.02)	—	1.06 (1.02–1.10)†	—	0.99 (0.95–1.03)	—
Diabetes	14.4 (13.9–15.0)	8.7 (8.6–8.9)	1.5 (1.2–1.8)	1.4 (1.2–1.5)	9.7 (8.6–10.9)	5.8 (5.4– 6.1)	23.1 (21.7–24.6)	13.7 (13.3–14.1)	34.9 (33.0–36.8)	20.8 (20.3–21.2)
PR (95% CI)	1.64 (1.57–1.71)†	—	1.06 (0.82–1.38)	—	1.68 (1.48–1.92)†	—	1.69 (1.58–1.81)†	—	1.68 (1.59–1.78)†	—
Coronary heart disease (including history of heart attack or angina)	6.0 (5.6–6.4)	5.7 (5.6–5.8)	0.7 (0.5–1.1)	0.7 (0.6–0.9)	3.1 (2.6–3.7)	2.5 (2.3–2.7)	9.8 (8.8–11.1)	7.8 (7.5–8.1)	15.7 (14.3–17.3)	17.6 (17.2–18.0)
PR (95% CI)	1.06 (0.99–1.14)	—	1.00 (0.67–1.51)	—	1.23 (1.00–1.51)	—	1.26 (1.13–1.42)†	—	0.89 (0.81–0.98)†	—
Stroke	4.1 (3.8–4.4)	2.6 (2.5–2.7)	0.7 (0.5–1.1)	0.4 (0.4–0.5)	2.4 (1.9– 2.9)	1.3 (1.2–1.5)	6.8 (6.0–7.7)	3.5 (3.3–3.7)	9.6 (8.5–10.8)	7.4 (7.2– 7.7)
PR (95% CI)	1.60 (1.47–1.75)†	—	1.73 (1.09–2.75)†	—	1.77 (1.39–2.24)†	—	1.95 (1.70–2.23)†	—	1.29 (1.14–1.46)†	—
Cancer (excluding skin cancer)	5.1 (4.8–5.5)	6.5 (6.3–6.6)	0.9 (0.6–1.3)	1.5 (1.4–1.7)	2.3 (1.8–2.9)	3.4 (3.2–3.7)	6.6 (5.9–7.4)	8.1 (7.8–8.4)	15.8 (14.4–17.2)	18.4 (18.0–18.8)
PR (95% CI)	0.80 (0.74–0.86)†	—	0.58 (0.38–0.89)†	—	0.67 (0.53–0.86)†	—	0.82 (0.72–0.92)†	—	0.86 (0.78–0.94)†	—

Abbreviation: CI = confidence interval.
* Percentages for adults aged ≥18 years were age-standardized to the U.S. 2000 population aged ≥18 years.
† Statistical significance at alpha = 0.05; 95% CI did not include 1.0.

TABLE 4. Comparison of death rates* for selected leading causes of death (ranked by rate) among blacks and whites, by age group and rate ratio (RR) — United States, 2015

Leading causes of death†	All ages*		18–34 years		35–49 years		50–64 years		≥65 years	
	Black	White	Black	White	Black	White	Black	White	Black	White
U.S. resident population (no. in millions)	**44.9**	**251.9**	**11.8**	**56.8**	**8.5**	**47.5**	**7.8**	**51.3**	**4.4**	**40.8**
All causes	**851.9 (848.9–855.0)**	**735.0 (734.1–736.0)**	**141.5 (139.4–143.7)**	**100.3 (99.5–101.1)**	**311.5 (307.7–315.2)**	**220.3 (218.9–221.6)**	**1,046.0 (1,038.8–1,053.2)**	**722.4 (720.1–724.8)**	**4,176.0 (4,156.9–4,195.0)**	**4,286.9 (4,280.6–4,293.3)**
RR (95% CI)	**1.16 (1.15–1.16)§**	—	**1.41 (1.39–1.44)§**	—	**1.41 (1.40–1.43)§**	—	**1.45 (1.44–1.46)§**	—	**0.97 (0.97–0.98)§**	—
1. Diseases of the heart (also 1 among whites)	205.1 (203.5–206.6)	167.9 (167.4–168.3)	10.7 (10.1–11.3)	5.1 (4.9–5.3)	66.5 (64.8–68.3)	33.1 (32.8–33.8)	257.5 (254.0–261.1)	148.1 (147.0–149.1)	1,085.5 (1,075.8–1,095.2)	1,091.8 (1,088.6–1,095.0)
RR (95% CI)	1.22 (1.21–1.23)§	—	2.10 (1.97–2.25)§	—	2.00 (1.94–2.06)§	—	1.74 (1.71–1.78)§	—	0.99 (0.98–1.00)	—
2. Malignant neoplasms (2)	180.1 (178.8–181.5)	159.4 (159.0–160.0)	7.3 (6.8–7.8)	6.4 (6.2–6.7)	49.2 (47.7–50.7)	39.9 (39.4–40.5)	296.2 (292.4–300.0)	227.6 (226.3–228.9)	927.7 (918.7–936.7)	909.6 (906.6–912.5)
RR (95% CI)	1.13 (1.12–1.14)§	—	1.13 (1.05–1.22)§	—	1.23 (1.19–1.27)§	—	1.30 (1.28–1.32)§	—	1.04 (1.03–1.05)§	—
3. Cerebrovascular diseases (5)	50.8 (50.1–51.6)	36.4 (36.2–36.6)	1.6 (1.4–1.8)	0.8 (0.8–0.9)	12.8 (12.0–13.5)	4.9 (4.7–5.1)	50.5 (48.9–52.1)	21.0 (20.6–21.4)	287.2 (282.2–292.2)	245.7 (244.2–247.3)
RR (95% CI)	1.40 (1.38–1.42)§	—	1.94 (1.64–2.30)§	—	2.60 (2.42–2.79)§	—	2.40 (2.32–2.49)§	—	1.14 (1.12–1.16)§	—
4. Unintentional injury (4)	36.8 (36.3–37.4)	46.0 (45.8–46.3)	30.8 (29.8–31.8)	45.4 (44.9–46.0)	39.5 (38.2–40.9)	49.1 (48.5–49.8)	55.5 (53.8–57.1)	50.5 (49.9–51.1)	—	—
RR (95% CI)	0.80 (0.79–0.81)§	—	0.68 (0.66–0.70)§	—	0.80 (0.78–0.83)§	—	1.10 (1.06–1.13)§	—	—	—
5. Diabetes mellitus (7)	37.0 (36.3–37.6)	19.6 (19.4–19.8)	2.7 (2.4–3.0)	1.1 (1.0–1.2)	13.1 (12.4–13.9)	6.2 (5.9–6.4)	51.8 (50.2–53.4)	25.9 (25.5–26.3)	189.4 (185.3–193.4)	109.9 (108.8–110.9)
RR (95% CI)	1.89 (1.85–1.92)§	—	2.45 (2.14–2.80)§	—	2.13 (1.99–2.29)§	—	2.00 (1.93–2.07)§	—	1.72 (1.68–1.76)§	—
6. Chronic lower respiratory disease (3)	28.9 (28.4–29.5)	44.5 (44.2–44.7)	—	—	—	—	30.5 (29.3–31.7)	35.1 (34.6–35.6)	167.0 (163.2–170.8)	291.1 (289.4–292.8)
RR (95% CI)	0.65 (0.64–0.66)§	—	—	—	—	—	0.87 (0.83–0.91)§	—	0.58 (0.56–0.59)§	—
7. Homicide (18)	19.8 (19.4–20.2)	3.3 (3.2–3.3)	47.2 (46.0–48.5)	5.5 (5.3–5.7)	21.9 (20.9–22.8)	4.2 (4.0–4.3)	—	—	—	—
RR (95% CI)	6.04 (5.86–6.23)§	—	8.59 (8.22–8.97)§	—	5.27 (4.94–5.61)§	—	—	—	—	—
8. Nephritis, nephrotic syndrome, and nephrosis (10)	25.4 (24.9–26.0)	12.2 (12.1–12.3)	—	—	6.5 (6.0–7.0)	1.8 (1.7–1.9)	27.1 (26.0–28.3)	8.6 (8.4–8.9)	143.3 (139.7–146.8)	82.5 (81.6–83.4)
RR (95% CI)	2.08 (2.04–2.12)§	—	—	—	3.63 (3.26–4.04)§	—	3.15 (2.99–3.32)§	—	1.74 (1.70–1.79)§	—
9. Alzheimer's disease (6)	26.6 (26.1–27.2)	30.5 (30.3–30.7)	—	—	—	—	—	—	181.7 (177.7–185.7)	212.2 (210.7–213.6)
RR (95% CI)	0.87 (0.85–0.89)§	—	—	—	—	—	—	—	0.75 (0.73–0.77)§	—
10. Septicemia (12)	18.1 (17.6–18.5)	10.4 (10.3–10.5)	—	—	5.4 (4.9–5.9)	2.6 (2.4–2.5)	21.8 (20.8–22.9)	10.7 (10.4–10.9)	95.8 (92.9–98.7)	61.3 (60.5–62.0)
RR (95% CI)	1.74 (1.69–1.78)§	—	—	—	2.12 (1.91–2.36)§	—	2.05 (1.94–2.16)§	—	1.52 (1.47–1.57)§	—
11.Essential hypertension and hypertensive renal disease (14)	—	—	—	—	—	—	—	—	89.4 (86.6–92.2)	51.0 (50.3–51.7)
RR (95% CI)	—	—	—	—	—	—	—	—	1.70 (1.65–1.76)§	—
12. Influenza and pneumonia (8)	—	—	—	—	—	—	—	—	89.4 (86.7–92.2)	98.9 (97.9–99.8)
RR (95% CI)	—	—	—	—	—	—	—	—	0.86 (0.83–0.89)§	—
14. HIV disease (27)	—	—	3.4 (3.1–3.7)	0.4 (0.3–0.4)	12.2 (11.5–13.0)	1.8 (1.7–1.9)	19.7 (18.7–20.6)	2.7 (2.6–2.9)	—	—
RR (95% CI)	—	—	9.39 (7.94–11.10)§	—	6.90 (6.30–7.56)§	—	7.26 (6.75–7.80)§	—	—	—

See table footnotes on next page.

TABLE 4. (Con*tinued*) Comparison of death rates* for selected leading causes of death (ranked by rate) among blacks and whites, by age group and rate ratio (RR) — United States, 2015

Leading causes of death†	All ages*		18–34 years		35–49 years		50–64 years		≥65 years	
	Black	White	Black	White	Black	White	Black	White	Black	White
15. Chronic liver disease and cirrhosis (11)	—	—	—	—	—	—	23.1 (22.1–24.2)	32.0 (31.5–32.5)	—	—
RR (95% CI)	—	—	—	—	—	—	0.72 (0.69–0.76)§	—	—	—
16. Suicide (9)	—	—	9.5 (8.9–10.0)	16.8 (16.5–17.1)	7.5 (6.9–8.1)	20.8 (20.4–21.2)	—	—	—	—
RR (95% CI)	—	—	0.56 (0.53–0.60)§	—	0.36 (0.33–0.39)§	—	—	—	—	—
22. Anemias (25)	—	—	1.5 (1.3–1.7)	—¶	—	—	—	—	—	—
28. Pregnancy, childbirth, and the puerperium (31)	—	—	1.6 (1.4–1.9)	0.6 (0.5–0.7)	—	—	—	—	—	—
RR (95% CI)	—	—	2.63 (2.21–3.13)§	—	—	—	—	—	—	—

Abbreviations: CI = confidence interval; HIV = human immunodeficiency virus; RR = rate ratio comparing death rates for blacks to that for whites.

* Rates (per 100,000 population) are provided for both blacks and whites. Overall death rates (per 100,000 population) for all ages including infants and children are age-standardized to the U.S. 2000 projected population.

† Presented in rank order for the total black U.S. population (all ages) based on total numbers of death in 2015 with rank order for the total white U.S. population in parentheses. Age-specific data are provided for both race groups only for the top 10 leading causes of death among the black U.S. population in each age group.

§ Statistical significance at alpha=0.05; 95% CI did not include 1.0.

¶ Unstable death rate for whites aged 18–49 years because there were only 35 deaths from anemias in this subgroup in 2015.

Morbidity and Mortality Weekly Report

Addressing a Yellow Fever Vaccine Shortage — United States, 2016–2017

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Recent manufacturing problems resulted in a shortage of the only U.S.-licensed yellow fever vaccine. This shortage is expected to lead to a complete depletion of yellow fever vaccine available for the immunization of U.S. travelers by mid-2017. CDC, the Food and Drug Administration (FDA), and Sanofi Pasteur are collaborating to ensure a continuous yellow fever vaccine supply in the United States. As part of this collaboration, Sanofi Pasteur submitted an expanded access investigational new drug (eIND) application to FDA in September 2016 to allow for the importation and use of an alternative yellow fever vaccine manufactured by Sanofi Pasteur France, with safety and efficacy comparable to the U.S.-licensed vaccine; the eIND was accepted by FDA in October 2016. The implementation of this eIND protocol included developing a systematic process for selecting a limited number of clinic sites to provide the vaccine. CDC and Sanofi Pasteur will continue to communicate with the public and other stakeholders, and CDC will provide a list of locations that will be administering the replacement vaccine at a later date.

Yellow fever is an acute viral disease caused by infection with the yellow fever virus, a flavivirus primarily transmitted to humans through the bite of an infected mosquito and endemic to sub-Saharan Africa and tropical South America (*1*). Most infected persons are asymptomatic (*1*). However, the case-fatality ratio is 20%–50% among the approximately 15% of infected persons who develop severe disease (*2*). In recent years, multiple yellow fever outbreaks in Angola, the Democratic Republic of the Congo, and, most recently, Brazil, have underscored the ongoing and substantial global burden of this disease (*3*–*5*).

Yellow fever disease can be prevented by a live-attenuated virus vaccine that produces neutralizing antibodies in 80%–100% of vaccinees by 10 days after vaccination (*2*). For most travelers, only one lifetime dose is necessary (*1*). Vaccination is recommended for international travelers visiting areas with endemic or epidemic yellow fever virus transmission. In addition, proof-of-vaccination is required for entry into certain countries as permitted by the International Health Regulations 2015 (*1*,*6*). To provide proof of vaccination, practitioners at yellow fever vaccination clinics must validate a traveler's vaccine record using a proof-of-vaccination stamp. CDC has regulatory authority over the designation of U.S. yellow fever vaccination clinics. For nonfederal yellow fever vaccination clinics, this authority to designate is generally delegated and overseen through a collaboration between CDC and state and territorial health departments. CDC maintains the online U.S. Yellow Fever Vaccination Center Registry of these designated clinics.

In 2015, approximately eight million U.S. residents traveled to 42 countries with endemic yellow fever virus transmission (*1*) (Data In, Intelligence Out [https://www.diio.net], unpublished data, 2016). Yellow fever virus can be exported by unimmunized travelers returning to countries where the virus is not endemic. Reports of yellow fever in at least 10 unimmunized returning U.S. and European travelers were recorded during 1970–2013 (*1*). Most recently, yellow fever virus was exported from Angola during the 2016 outbreak to three countries, with resulting local transmission in the Democratic Republic of the Congo (*4*). The Angola outbreak caused 965 confirmed cases from 2015 to 2017 (*4*). The ongoing outbreak in Brazil has resulted in 681 confirmed yellow fever cases from December 2016 through April 25, 2017 (*7*).

In the United States, only one yellow fever vaccine is licensed for use (YF-VAX; Sanofi Pasteur, Swiftwater, PA, 2017); approximately 500,000 doses are distributed annually to vaccinate military and civilian travelers. Approximately two thirds of these doses are distributed among approximately 4,000 civilian clinical sites (Sanofi Pasteur, unpublished data, 2017).

The current YF-VAX supply depletion began in November 2015 (*8*). Sanofi Pasteur was transitioning YF-VAX production from an older to a newer facility set to open in 2018, but a manufacturing complication resulted in the loss of a large number of doses. In response, Sanofi Pasteur instituted YF-VAX ordering restrictions to extend the existing supply while assessing options. In spring 2016, Sanofi Pasteur notified CDC of a probable complete depletion of YF-VAX later in the year. Sanofi Pasteur succeeded in producing additional doses of YF-VAX in late 2016; this additional supply has delayed the anticipated complete depletion until mid-2017 but remains insufficient to cover anticipated demand during the interval between permanent closure of the old facility and the 2018 opening of the new YF-VAX vaccine manufacturing facility.

Concerns about maintaining a continuous U.S. yellow fever vaccine supply, in conjunction with the large yellow fever outbreak that began in Angola, led to discussions among CDC, Sanofi Pasteur, FDA, and the U.S. Department of Defense in spring 2016. Although fractional yellow fever vaccine dosing

was discussed, it was deemed a nonviable option based on limited efficacy data. Sanofi Pasteur submitted an eIND application for U.S. importation and civilian use of Stamaril, a yellow fever vaccine manufactured by Sanofi Pasteur France that is not licensed in the United States; the Department of Defense submitted its own eIND application. Stamaril uses the same vaccine substrain 17D-204 as YF-VAX, and has comparable safety and efficacy (*9*). Stamaril has been licensed and distributed in approximately 70 countries worldwide since 1986. Sanofi Pasteur France manufactures both multidose vials for use in global yellow fever outbreak responses and single-dose vials reserved for vaccination of international travelers living outside the United States. Sanofi Pasteur projects that importing Stamaril single-dose vials into the United States under the eIND application will not substantially affect the Stamaril supply intended for global use.

FDA accepted Sanofi Pasteur's eIND application in October 2016. Implementation of the eIND protocol included a systematic process to select sites where Stamaril will be distributed; this process was important to manage the logistics involved in outreach and training of providers regarding adherence to the eIND protocol and FDA guidance. Sanofi Pasteur, in consultation with CDC, developed a two-tiered scheme for the selection of U.S. clinic sites to be invited to participate in the eIND protocol (Table). The primary goal was to recruit large-volume sites with adequate geographic range. Tier 1 sites were those that ordered at least 250 doses of yellow fever vaccine in 2016. Additional, smaller-volume sites were added to this tier to ensure access to Stamaril in all 50 states, the District of Columbia, and the three U.S. territories (Guam, Puerto Rico, and the U.S. Virgin Islands) with yellow fever vaccination centers. Sites were also added to guarantee vaccine access for civilian U.S. government employees needing yellow fever vaccination for official work-related travel, including critical public health response work. Tier 2 sites included multisite clinical organizations in which the aggregate number of doses ordered from their affiliated sites met the threshold of at least 250 doses in 2016. In these cases, the organization was invited to select one of its clinic sites to participate as a tier 2 site in implementing the Stamaril protocol. As of April 2017, approximately 250 clinics were targeted for inclusion. This is a sizable reduction from the estimated 4,000 civilian clinics currently providing YF-VAX.

The eIND protocol rollout began in April 2017. Sanofi Pasteur and CDC are collaborating to develop an effective communication plan. Sanofi Pasteur is recruiting and communicating with selected sites and will train personnel at participating sites by webinar in April and May 2017.

TABLE. Systematic tiered distribution plan for Stamaril yellow fever vaccine — United States, 2016

Tier	Characteristic	No. of proposed sites
1	Individual sites that ordered at least 250 doses in 2016	193
	Smaller sites to ensure coverage of all 50 states, DC, and U.S. territories	
	Sites that serve non-military U.S. government employees	
2	Sites that are part of a multisite clinical organization whose aggregate number of orders was at least 250 doses in 2016	59
Total		**252**

Abbreviation: DC = District of Columbia.

Discussion

CDC and Sanofi Pasteur have worked to assure a continuous yellow fever vaccine supply in the United States after the anticipated complete depletion of YF-VAX in mid-2017. As the eIND protocol rollout begins in April, Sanofi Pasteur will coordinate site recruitment and training, and CDC will help to resolve any problems that arise. Although the systematic site selection process for the distribution of Stamaril took into account site volume (giving preference to larger sites) and adequate geographic reach, accessibility difficulties for some international travelers might occur, because of the decrease in the number of clinics nationwide that provide yellow fever vaccination from 4,000 to 250. CDC and Sanofi Pasteur will monitor for critical gaps in vaccine access and collaborate to address any issues, including considering the possibility of recruiting additional clinics to participate as necessary.

CDC will notify state and territorial health department immunization programs about the Stamaril protocol. Information about which clinics will be eligible to receive Stamaril will be available to the public and other stakeholders, and discussed with the Advisory Committee on Immunization Practices. CDC and Sanofi Pasteur continue to monitor the domestic yellow fever vaccine supply and will provide updates to health care providers and the public as new information becomes available.

Updates regarding yellow fever vaccine and the anticipated complete depletion of vaccine stock will be available on CDC's Travelers' Health website at https://wwwnc.cdc.gov/travel/ and Sanofi Pasteur's website at http://www.sanofipasteur.us/vaccines/yellowfevervaccine. Once available, CDC will provide a complete list of clinics where travelers can receive Stamaril at https://wwwnc.cdc.gov/travel/yellow-fever-vaccination-clinics/search.

Acknowledgments

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Summary

What is already known about this topic?

Effective and safe yellow fever vaccines are available to prevent yellow fever disease among persons traveling to countries with yellow fever virus transmission and to comply with individual country yellow fever vaccination entry requirements; only one yellow fever vaccine (YF-VAX) is currently licensed for use in the United States. Periodic, temporary yellow fever vaccine shortages have occurred in the United States as a result of manufacturing problems, including a manufacturing complication in 2016 that resulted in the loss of a large number of U.S.-licensed yellow fever vaccine doses.

What is added by this report?

To avoid a lapse in yellow fever vaccine availability to persons in the U.S. population for whom yellow fever vaccination is indicated, public health officials and private partners collaborated in pursuing an expanded access investigational new drug (eIND) application for the importation of Stamaril yellow fever vaccine into the United States. Stamaril is produced by Sanofi Pasteur, the manufacturer of the U.S.-licensed YF-VAX, and it uses the same vaccine substrain. A systematic, tiered process was developed to select clinics to participate in the eIND protocol, with the goal of reasonable accessibility to yellow fever vaccination for all U.S. residents, while assuring that clinic personnel could be adequately trained to participate in the protocol.

What are the implications for public health practice?

Providers need to be aware that there is a yellow fever vaccine shortage and there is a plan for providing safe vaccine at a limited number of clinics until the supply is replenished. Domestic production of yellow fever vaccine in the United States should resume in 2018, and as the eIND protocol is implemented, CDC and Sanofi Pasteur will need to continue to collaborate throughout site recruitment and training, partner to resolve issues that arise, and maintain communication with health care providers and the general public.

Conflict of Interest

J.R., D.P.G., and R.M. are full-time employees and stockholders of Sanofi Pasteur. No other conflicts of interest were reported.

[1]Division of Global Migration and Quarantine, CDC; [2]Sanofi Pasteur Inc., Swiftwater, Pennsylvania.

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References

1. Gershman MD, Staples JE. Yellow fever. In: Brunette GW; CDC, eds. CDC health information for international travel 2016. New York, NY: Oxford University Press; 2016.
2. Staples JE, Gershman M, Fischer M. Yellow fever vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2010;59(No. RR-7):1–27.
3. World Health Organization. Emergency preparedness, response: yellow fever. Geneva, Switzerland: World Health Organization; 2017. http://www.who.int/csr/don/archive/disease/yellow_fever/en/
4. World Health Organization. Yellow fever outbreak Angola, Democratic Republic of the Congo and Uganda 2016–2017. Geneva, Switzerland: World Health Organization; 2017. http://www.who.int/emergencies/yellow-fever/en/
5. World Health Organization. Brazil works to control yellow fever outbreak, with PAHO/WHO support. Geneva, Switzerland: World Health Organization; 2017. http://www2.paho.org/hq/index.php?option=com_content&view=article&id=13098%3Abrazil-control-yellow-fever-outbreak-paho-support&catid=740%3Apress-releases&Itemid=1926&lang=en
6. World Health Organization. International health regulations, 2005. Geneva, Switzerland: World Health Organization; 2008. http://apps.who.int/iris/bitstream/10665/43883/1/9789241580410_eng.pdf
7. Pan American Health Organization. Epidemiological update yellow fever. Washington, DC: Pan American Health Organization; 2017. http://www2.paho.org/hq/index.php?option=com_docman&task=doc_view&Itemid=270&gid=39639&lang=en
8. CDC. Announcement: yellow fever vaccine shortage. Atlanta, GA: US Department of Health and Human Services, CDC; 2016. https://wwwnc.cdc.gov/travel/news-announcements/yellow-fever-vaccine-shortage-2016
9. Plotkin S, Orenstein WA, Offit PA, eds. Vaccines. 6th ed. Philadelphia: Elsevier Saunders; 2013.

Announcements

Global Road Safety Week, May 8–14, 2017

Road traffic crashes are the world's leading cause of death among persons aged 15–29 years and the leading cause of death among U.S. teens aged 16–19 years (*1*). In the United States, 35,092 persons died in crashes during 2015; speeding was a factor in more than a quarter (27%) of these deaths (*2*). In October 2016, the National Safety Council, in partnership with the National Highway Traffic Safety Administration, the Federal Highway Administration, and the Federal Motor Carrier Safety Administration, announced the Road to Zero initiative, with the goal of eliminating traffic fatalities within 30 years (*3*).

As part of the Decade of Action for Road Safety 2011–2020, the Fourth United Nations (U.N.) Global Road Safety Week is May 8–14, 2017. This year's theme is "SaveLives #SlowDown" with a focus on speed management and preventing speed-related injuries and deaths (*4,5*).

CDC supported the World Health Organization in preparing "Save LIVES: A road safety technical package," which describes evidence-based measures that are most likely to impact road traffic deaths, including 22 interventions related to speed management, infrastructure design, vehicle safety, laws and their enforcement, emergency post-crash care and leadership on road safety (*6*).

In April 2016, the U.N. General Assembly adopted a resolution on "Improving global road safety" reaffirming the 2030 Agenda for Sustainable Development target numbers 3.6 (reducing global road traffic deaths and injuries by 50% by 2020) and 11.2 (providing access to safe, affordable, accessible and sustainable transport systems for all by 2030). The resolution acknowledges these targets and calls for action to reduce road traffic deaths and injuries as a pressing development priority (*7*).

Additional information about #SlowDown is available at http://www.who.int/violence_injury_prevention/publications/road_traffic/SlowDown_Days/en/. Additional information about U.N. Global Road Safety Week is available at https://www.unroadsafetyweek.org/en/home. Additional information about motor vehicle safety is available at https://www.cdc.gov/motorvehiclesafety/.

References

1. CDC. Motor vehicle safety. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. https://www.cdc.gov/motorvehiclesafety/
2. National Highway Traffic Safety Administration. Traffic safety facts: 2015 motor vehicle crashes overview. Washington, DC: US Department of Transportation, National Highway Traffic Safety Administration; 2016. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812318
3. National Safety Council. Road to zero. New partnership aims to end traffic fatalities within 30 years. Itasca, IL: National Safety Council; 2017. http://www.nsc.org/learn/NSC-Initiatives/Pages/The-Road-to-Zero.aspx
4. United Nations Road Safety Collaboration. Road safety week: save lives #SlowDown. Geneva, Switzerland: World Health Organization, Department for Management of Noncommunicable Diseases, Disability, Violence and Injury Prevention, United Nations Road Safety Collaboration; 2017. https://www.unroadsafetyweek.org/en/about
5. World Health Organization. Violence and injury prevention. Managing speed. Geneva, Switzerland: World Health Organization; 2017. http://www.who.int/violence_injury_prevention/publications/road_traffic/managing-speed/en/
6. World Health Organization. Save LIVES: a technical package. Geneva, Switzerland: World Health Organization; 2017. http://www.who.int/roadsafety/Appendix_5_SaveLIVES_update.pdf?ua=1
7. World Health Organization. Violence and injury prevention. UN General Assembly adopts a resolution on "improving global road safety." Geneva, Switzerland: World Health Organization; 2017. http://www.who.int/violence_injury_prevention/media/news/2016/15_04/en/

Community Preventive Services Task Force Recommendation for Built Environment Interventions to Increase Physical Activity

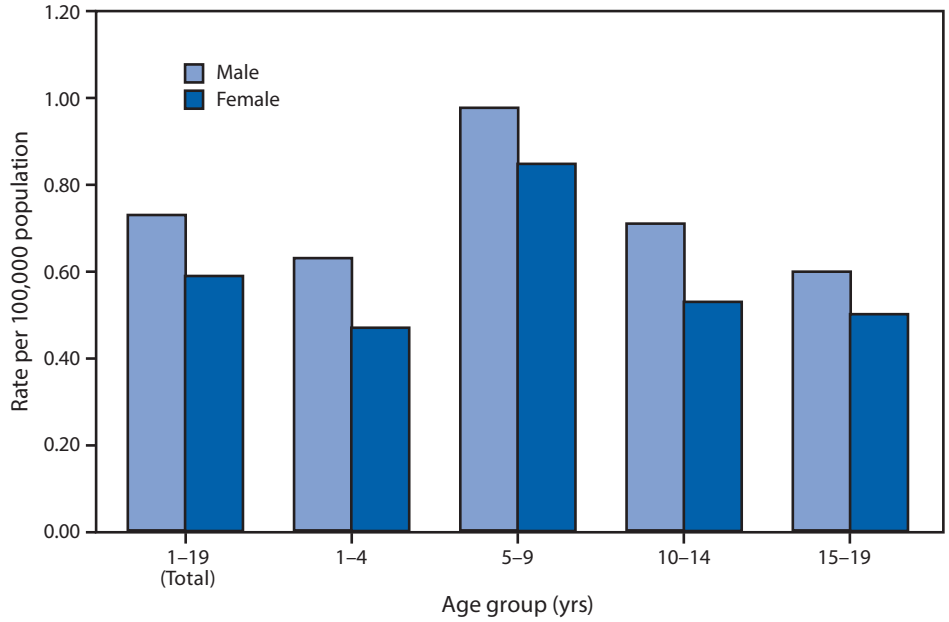
The Community Preventive Services Task Force recently posted new information on its website: "Physical Activity: Built Environment Approaches Combining Transportation System Interventions with Land Use and Environmental Design." This information is available at https://www.thecommunityguide.org/findings/physical-activity-built-environment-approaches.

Established in 1996 by the U.S. Department of Health and Human Services, the task force is an independent, nonfederal, panel of public health and prevention experts whose members are appointed by the director of CDC. The task force 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 task force, 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

Brain Cancer Death Rates Among Children and Teens Aged 1–19 Years,* by Sex† and Age Group — United States, 2013–2015



* Includes *International Classification of Disease, Tenth Revision* underlying cause of death code, brain cancer (C71), for a total of 1,562 deaths during 2013–2015.
† Difference in rates for males and females tested for significance at $p<0.05$.

The death rate for brain cancer, the most common cancer cause of death for children and teens aged 1–19 years, was 24% higher in males (0.73 per 100,000) than females (0.59) aged 1–19 years during 2013–2015. Death rates were higher for males than females for all age groups, but the difference did not reach statistical significance for the age group 5–9 years. Death rates caused by brain cancer were highest at ages 5–9 years (0.98 for males and 0.85 for females).

Sources: National Vital Statistics System mortality data. https://www.cdc.gov/nchs/nvss/deaths.htm. NCHS data brief, no 257. https://www.cdc.gov/nchs/products/databriefs/db257.htm.

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