

## World Hepatitis Day — July 28, 2014

July 28, 2014, marks the 4th annual World Hepatitis Day. Nearly 400 million persons are living with hepatitis B or hepatitis C, and more than 1 million die annually as a result of their infection. This year, the 67th World Health Assembly (WHA) reaffirmed the global commitment to prevent and control viral hepatitis through the passage of resolution WHA 67.6 (1), which calls for raising public awareness, improving surveillance, strengthening prevention interventions, and increasing access to care and treatment services.

Blood transfusions save lives, and globally more than 100 million units of blood are donated annually. Ensuring access to safe blood is a key strategy for the prevention of hepatitis B and C. In many of the poorest countries of the world, less than 50% of the blood supply comes from voluntary, unpaid donors that were adequately screened for transfusion transmitted infections, including hepatitis B and C.

Prevention and control of hepatitis remains a major challenge in sub-Saharan Africa. This issue of *MMWR* includes a report from sub-Saharan Africa describing substantial increases in the number of blood units donated and screened for hepatitis B and C during the last decade. Despite these gains, the report demonstrates that the risk for transmission of hepatitis B and C through transfusion persists in many countries in the region. It is estimated that in sub-Saharan Africa, more than 45,000 hepatitis B virus or hepatitis C virus infections are transmitted through contaminated transfusions annually (2).

Resources and information about World Hepatitis Day are available at <http://www.cdc.gov/hepatitis/worldhepday.htm>.

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## Progress Toward Prevention of Transfusion-Transmitted Hepatitis B and Hepatitis C Infection — Sub-Saharan Africa, 2000–2011

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Infections with hepatitis B virus (HBV) and hepatitis C virus (HCV) are major causes of morbidity and mortality globally, primarily because of sequelae of chronic liver disease including cirrhosis and hepatocellular carcinoma (1). The risks for HBV and HCV transmission via blood transfusions have been described previously (2) and are believed to be higher in countries in sub-Saharan Africa (3). Reducing the risk for transfusion-transmitted human immunodeficiency virus (HIV), HBV, and HCV infection is a priority for international aid organizations, such as the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), the Global Fund to Combat

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HIV/AIDS, Malaria, and Tuberculosis, and the World Health Organization (WHO). Over the last decade, PEPFAR and the Global Fund have supported blood safety programs in many sub-Saharan African countries with heavy burdens of HIV and acquired immunodeficiency syndrome (AIDS), hepatitis, malaria, and maternal mortality. This report summarizes HBV- and HCV-related surveillance data reported by the blood transfusion services of WHO member states to WHO's Global Database on Blood Safety (GDBS) (4). It also evaluates the performance of blood safety programs in screening for HBV and HCV in 38 sub-Saharan Africa countries.\* Selected GDBS indicators were compared for the years 2000 and 2004 (referred to as the 2000/2004 period) and 2010 and 2011 (referred to as the 2010/2011 period). From 2000/2004 to 2010/2011, the median of the annual number of units donated per country increased, the number of countries screening at least 95% of blood donations for HBV and HCV increased, and the median of the national prevalence of HBV and HCV marker-reactive blood donations decreased. These findings suggest that during the past decade, more blood has been donated and screened for HBV and HCV, resulting in a safer blood supply. Investments

in blood safety should be continued to further increase the availability and safety of blood products in sub-Saharan Africa.

Since 1998, WHO member states have submitted blood safety and availability indicators to GDBS. The database contains 49 variables related to blood donations, including screening for HBV, HCV, HIV, and syphilis. Data are self-reported from each country's routine blood collection and testing operations, which typically are conducted at blood transfusion service facilities and then sent to WHO, usually on an annual or biennial basis. At the time of this analysis, GDBS contained data for the following years: 2000, 2004, 2006, 2008, 2010, and 2011.

The years 2000/2004 and 2010/2011 were selected for analysis because these periods correspond to the earliest and latest GDBS data available at the time of analysis. Data available for 38 sub-Saharan African countries were analyzed, including the median number of blood donations per year for 2000/2004 and 2010/2011, the number of donations screened for hepatitis B surface antigen (HBsAg) and hepatitis C antibody (anti-HCV), and the number and proportion of donations that were reported as HBsAg-reactive and anti-HCV-reactive. For the purpose of this analysis, the term marker-reactive (i.e., HBsAg-reactive or anti-HCV reactive) was used because data on confirmatory test results were not collected. Country-specific means were calculated for the percentage of blood donations screened for HBV and HCV during the 2000/2004 and 2010/2011 periods. Screening percentages for both HBsAg and anti-HCV were classified into one of three categories: 95%–100%, 80%–94%,

\* Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Republic of the Congo, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

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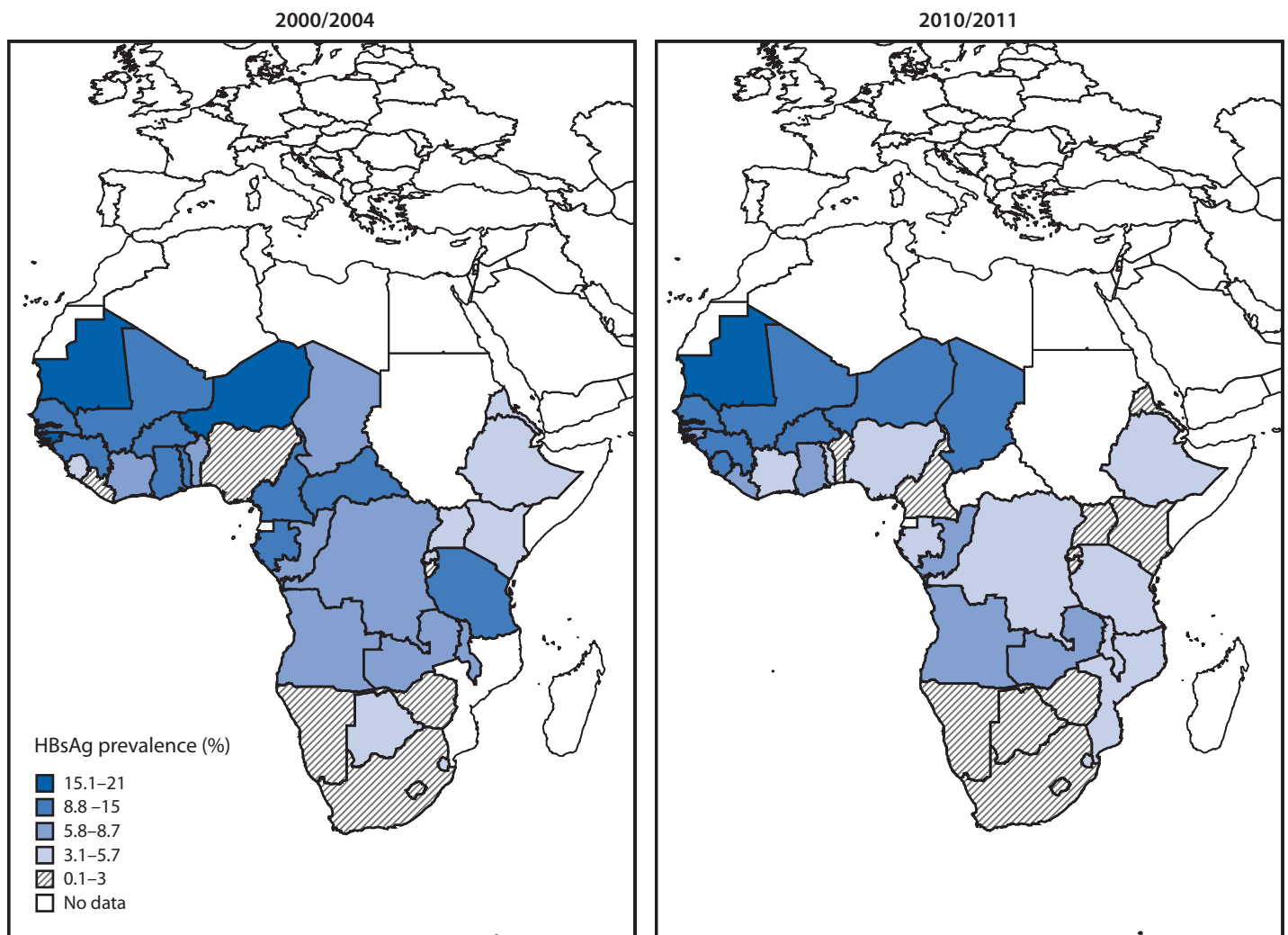
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or <80%. The prevalence of HBV and HCV marker-reactive donations was calculated as the total number of marker-reactive donations for each period (2000/2004 or 2010/2011) divided by the total number of donations for each period. To quantify changes in the prevalence of marker-reactive donations from 2000/2004 to 2010/2011, rate ratios (2010/2011 to 2000/2004) of HBV and HCV infection prevalence were calculated for each country. The z-test was used to determine if the rate ratio reflected a statistically significant change ( $p < 0.05$ ). If data were missing for either 2000 or 2004, the data for the single available year were used in the analysis. Similarly, if data were missing for 2010 or 2011, the data for the single available year were used. If data were missing for both years in either period, the country was excluded from the analysis. For this reason, the numbers of countries in the comparisons across periods were not always the same for all variables analyzed.

The median number of donations increased from 31,368 units (36 countries; interquartile range [IQR] = 12,987–80,629 units) to 86,328 units (38 countries; IQR = 30,139–139,207) from 2000/2004 to 2010/2011, and the number of countries testing at least 95% of donations for HBsAg increased from 29 (76%) of 38 countries to 33 (94%) of 35 countries during the same interval. The number of countries testing at least 95% of donations for HCV antibody increased from 13 (34%) of 38 reporting countries to 30 (86%) of 35 countries from 2000/2004 to 2010/2011.

The median percentage of HBV marker-reactive blood donations was 7.1% (36 reporting countries; IQR = 4.1%–11.1%) in 2000/2004 and 4.4% (36 countries; IQR = 2.2%–7.4%) in 2010/2011 (Figure 1, Table 1). The median percentage of anti-HCV marker-reactive donations was 1.4% (31 countries; IQR = 0.6%–3.1%) and 0.9% (36 countries;

FIGURE 1. Prevalence of HBsAg-reactive blood donations, by country — sub-Saharan Africa, 2000/2004 and 2010/2011



Abbreviation: HBsAg = hepatitis B surface antigen.  
Source: Global Database for Blood Safety.

TABLE 1. HBV prevalence in blood donations (i.e., donations reactive for HBsAg), by country — sub-Saharan Africa, 2000/2004 and 2010/2011

Country	2000/2004		2010/2011		Ratio of HBV prevalence (2010/2011: 2000/2004)*	Direction of change
	HBV prevalence (%)	Total donations	HBV prevalence (%)	Total donations		
Angola	8.68	78,000	6.74	78,275	0.78	↓
Benin	7.51	62,949	1.65	122,675	0.22	↓
Botswana	4.21	25,210	2.21	36,930	0.52	↓
Burkina Faso	12.48	64,620	9.85	140,706	0.79	↓
Burundi	2.79	N/A	2.77	76,301	N/A	N/A
Cameroon	15.00	70,000	1.34	54,248	0.09	↓
Central African Republic	10.45	10,600	N/A	14,500	N/A	N/A
Chad	7.76	5,000	10.10	30,123	1.30	↑
Republic of the Congo	6.40	31,756	7.35	94,020	1.15	↑
Côte d'Ivoire	6.93	139,031	5.31	194,775	0.77	↓
Democratic Republic of the Congo	7.31	21,740	3.43	722,577	0.47	↓
Eritrea	3.60	12,500	2.27	20,686	0.63	↓
Ethiopia	4.00	24,000	3.42	94,218	0.86	↓
Gabon	10.49	25,500	4.57	30,186	0.44	↓
Gambia	N/A	12,153	N/A	17,880	N/A	N/A
Ghana	11.75	130,000	6.58	194,399	0.56	↓
Guinea	11.20	23,430	9.79	53,110	0.84	↓
Guinea-Bissau	18.42	3,601	6.1	2,970	0.33	↓
Kenya	5.31	210,000	1.75	244,228	0.33	↓
Lesotho	1.37	6,600	0.90	9,675	0.66	↓
Liberia	0.50	N/A	7.40	13,472	N/A	N/A
Malawi	6.90	24,000	3.43	122,132	0.50	↓
Mali	11.33	45,000	14.27	94,819	1.26	↑
Mauritania	21.00	3,846	18.82	17,259	0.90	↓
Mozambique	N/A	114,223	5.30	222,087	N/A	N/A
Namibia	2.41	37,235	0.78	23,338	0.32	↓
Niger	20.00	7,000	11.78	103,238	0.59	↓
Nigeria	3.00	60,000	4.12	93,863	1.37	↑
Rwanda	4.39	55,433	1.75	78,793	0.40	↓
Senegal	10.50	44,400	10.51	105,816	1.00	↑
Sierra Leone	5.73	13,149	11.60	29,114	2.02	↑
South Africa	0.28	1,700,000	0.12	1,872,095	0.42	↓
Swaziland	4.81	16,500	3.11	21,328	0.65	↓
Togo	11.48	18,884	3.46	73,195	0.30	↓
Uganda	5.00	110,000	2.28	383,985	0.46	↓
Tanzania	11.00	8,437	5.11	189,740	0.47	↓
Zambia	7.56	88,514	6.02	168,295	0.80	↓
Zimbabwe	1.56	150,000	0.92	134,709	0.59	↓
Median	7.12	—	4.35	—	—	—

**Abbreviations:** HBV = hepatitis B virus; HBsAg = hepatitis B surface antigen; N/A = not available (missing or incomplete data).

**Source:** Global Database for Blood Safety.

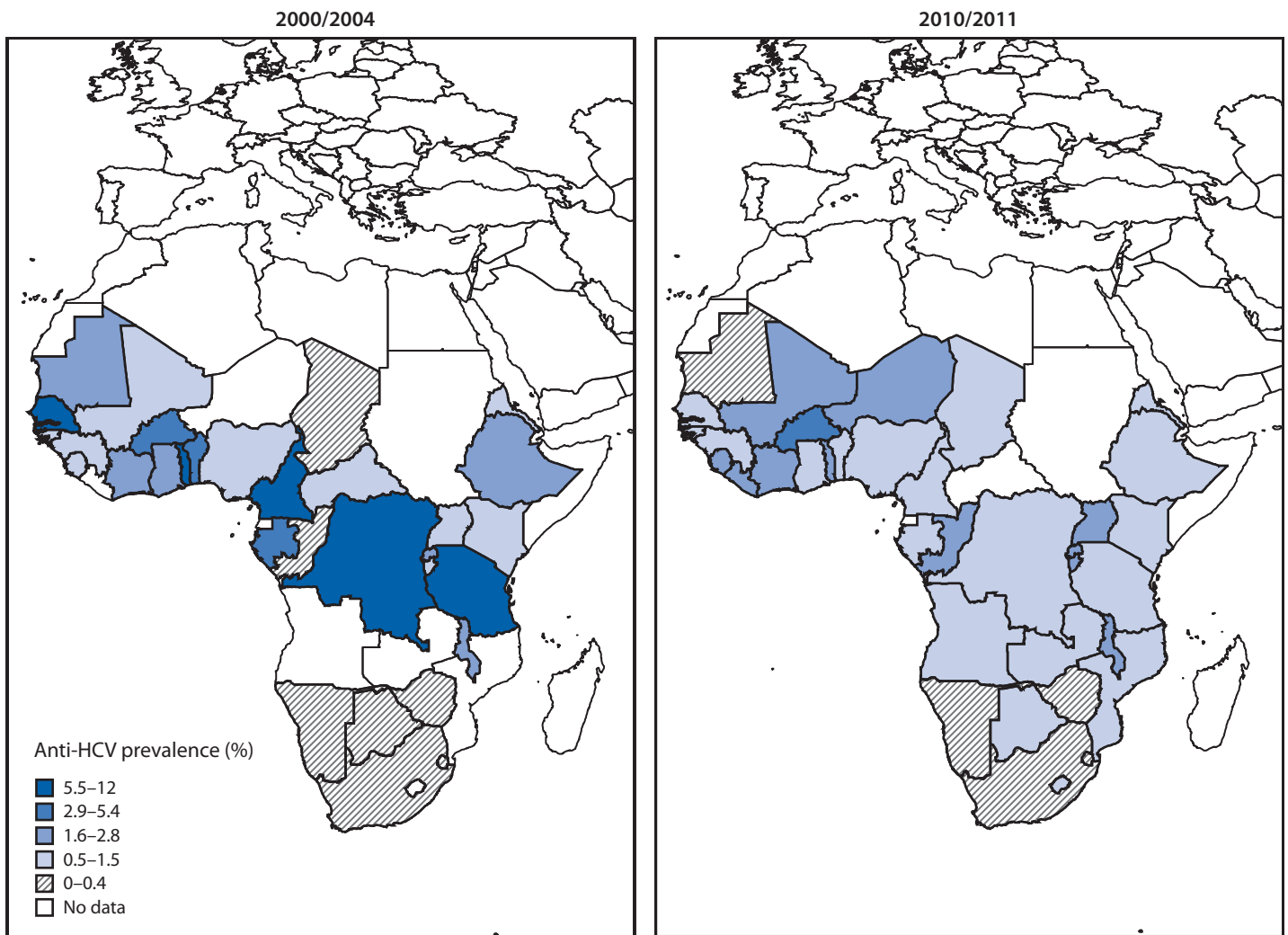
\* 2010/2011:2000/2004 prevalence ratios are statistically significant at  $p < 0.05$  for all countries except Senegal.

IQR = 0.5%–1.7%) in 2000/2004 and 2010/2011, respectively (Figure 2, Table 2). From 2000/2004 to 2010/2011, 28 (82%) of 34 reporting countries reported a statistically significant ( $p < 0.05$ ) decrease in HBsAg marker-reactive donations, and 14 (48%) of 29 reporting countries reported a significant decrease in anti-HCV marker-reactive donations. Overall, combined data from all countries showed a 37% decrease ( $p = 0.07$ ; 34 reporting countries) in the proportion of HBsAg-reactive donations and a 51% decrease ( $p = 0.04$ ; 29 reporting countries) in the proportion of anti-HCV-reactive donations between the periods analyzed.

## Discussion

This report highlights substantial increases in the number of blood units donated in sub-Saharan Africa, a region known to have blood shortages (5). It also describes increases in the number of countries testing for HBsAg and HCV antibody, and decreases in the proportion of donations screening positive for markers of HBV and HCV, likely reducing the risk for HBV and HCV infection through blood transfusions in sub-Saharan Africa during the last decade. To reduce the risk for transfusion-transmitted infection and increase the availability of blood, WHO recommends implementation of an integrated and comprehensive strategy based on five key elements: 1) establish a nationally coordinated blood transfusion service,

FIGURE 2. Prevalence of anti-HCV reactive blood donations, by country — sub-Saharan Africa, 2000/2004 and 2010/2011



**Abbreviation:** anti-HCV = hepatitis C antibody.  
**Source:** Global Database for Blood Safety.

2) collect blood from regular, voluntary, non-remunerated donors from low-risk populations, 3) test for transfusion-transmissible infections, blood group, and compatibility using quality-assured procedures, 4) reduce unnecessary transfusion through appropriate use of blood, and 5) implement quality systems for the entire transfusion process, from donor recruitment to the follow-up of the recipients of transfusion (5,6). PEPFAR-support for blood transfusion service programs based on WHO recommendations have been shown to reduce the risk for HIV transmission via transfusion while increasing the supply of safe blood (5). However, not all countries are reporting screening at least 95% of their blood donations for HBV and HCV, and high rates of HBV and HCV infection among donors were noted in some countries, indicating continued risk for transfusion recipients. Two previous reports have shown an increase in HIV screening, an increase in donations, and a

decrease in the prevalence of HIV-positive donations in African countries (5,7). This report demonstrates that many African countries have made similar progress with screening donations for HBV and HCV and decreasing the prevalence of HBV and HCV marker-reactive donations.

The epidemiology of HBV and HCV infection is poorly described in sub-Saharan Africa. The findings in this report offer additional data to better understand the burden of HBV and HCV infection in the region. Marker-reactive rates of HBV among blood donors were high, with most countries having rates exceeding 3%; countries of West Africa had particularly high rates, several with rates exceeding 10%. Rates for HCV infection were generally lower, most with rates less than 2%. The risk for developing chronic HBV infection is greatest when infection occurs during birth (up to 90%) and during childhood (30%), and most chronic HBV infection in sub-Saharan



TABLE 2. HCV prevalence in blood donations (i.e., donations reactive for anti-HCV), by country — sub-Saharan Africa, 2000/2004 and 2010/2011

Country	2000/2004		2010/2011		Ratio of HCV prevalence (2010/2011: 2000/2004)*	Direction of change
	HCV prevalence (%)	Total donations	HCV prevalence (%)	Total donations		
Angola	N/A	78,000	0.57	78,275	N/A	N/A
Benin	3.82	62,949	0.53	122,675	0.14	↓
Botswana	0.34	25,210	0.49	36,930	1.41	↑
Burkina Faso	4.58	64,620	5.21	140,706	1.14	↑
Burundi	1.41	N/A	1.54	76,301	N/A	N/A
Cameroon	10.00	70,000	0.76	54,248	0.08	↓
Central African Republic	1.20	7,000	N/A	14,500	N/A	N/A
Chad	0.20	3,000	0.51	30,123	2.56	↑
Republic of the Congo	0.40	31,756	1.98	94,020	4.92	↑
Côte d'Ivoire	2.29	139,031	1.56	194,775	0.68	↓
Democratic Republic of the Congo	7.20	17,138	1.46	722,577	0.21	↓
Eritrea	0.88	12,500	0.53	20,686	0.60	↓
Ethiopia	2.00	24,000	0.47	94,218	0.23	↓
Gabon	5.39	25,500	0.77	30,186	0.14	↓
Gambia	N/A	12,153	N/A	17,880	N/A	N/A
Ghana	2.40	70,000	1.00	194,399	0.42	↓
Guinea	0.60	11,430	1.07	53,110	1.78	↑
Guinea-Bissau	0.70	1,739	0.80	2,970	1.08	↑
Kenya	0.70	120,000	0.78	244,228	1.12	↑
Lesotho	N/A	6,600	0.81	9,675	N/A	N/A
Liberia	N/A	N/A	2.30	13,472	N/A	N/A
Malawi	2.00	24,000	2.00	122,132	1.00	↑
Mali	1.00	45,000	2.20	94,819	2.20	↑
Mauritania	1.78	7,855	0.02	9,164	0.01	↓
Mozambique	N/A	114,223	0.91	222,087	N/A	N/A
Namibia	0.03	37,235	0.09	22,018	2.60	↑
Niger	N/A	7,000	2.02	103,238	N/A	N/A
Nigeria	1.50	60,000	1.31	93,863	0.88	↓
Rwanda	2.83	55,433	1.97	78,793	0.70	↓
Senegal	12.00	19,400	0.63	105,816	0.05	↓
Sierra Leone	0.67	13,149	2.20	29,114	3.25	↑
South Africa	0.04	1,700,000	0.01	1,872,095	0.14	↓
Swaziland	0.01	16,500	0.25	21,328	14.18	↑
Togo	8.04	18,884	1.83	73,195	0.23	↓
Uganda	0.75	110,000	1.71	383,985	2.28	↑
Tanzania	8.00	8,437	0.55	189,740	0.07	↓
Zambia	N/A	88,514	0.93	168,295	N/A	N/A
Zimbabwe	0.03	80,000	0.34	134,709	11.41	↑
Median	1.41	—	0.86	—	—	—

**Abbreviations:** HCV = hepatitis C virus; anti-HCV = hepatitis C antibody; N/A = not available (missing or incomplete data).

**Source:** Global Database for Blood Safety.

\* 2010/2011:2000/2004 prevalence ratios are statistically significant at  $p < 0.05$  for all countries except Guinea-Bissau.

Africa is thought to be the result of transmission during birth or childhood (9). Chronic hepatitis C develops in up to 85% of those who are infected with HCV (9). Coinfection with HIV increases the risk for HBV- and HCV-related liver disease. The risk factors for transmission of HBV and HCV infection in sub-Saharan Africa might include receipt of medical or dental care associated with poor infection control practices, injection drug use, receipt of contaminated blood products, and scarification. Childbirth, inapparent exposures during childhood, and sexual exposure pose a greater risk for HBV than HCV. Because risk factors for transmission of HBV and HCV in sub-Saharan Africa have not been well described, screening by blood collection agencies for recognized risk behaviors, such

as injection drug use, might not be as helpful in identifying most cases of chronic HBV or HCV infection in sub-Saharan Africa compared with other parts of the world.

The findings in this report are subject to at least five limitations. First, the data are self-reported by each country and cannot be independently verified. Second, the quality of laboratory screening is not known and might vary within and between countries and between the 2000/2004 and 2010/2011 periods. However, in some PEPFAR countries, efforts to improve the quality of laboratory screening for transfusion-transmissible infections, such as proficiency testing, have been implemented. Third, the data do not represent all health facilities (e.g., private, faith-based, or military facilities) that collect blood

**What is already known on this topic?**

In sub-Saharan Africa and other resource-limited settings, transfusion-transmitted hepatitis B virus (HBV) and hepatitis C virus (HCV) infections remain a public health burden. Reducing the prevalence of hepatitis virus infections in donated blood is a priority for countries seeking ways to increase the safety and adequacy of national blood supplies.

**What is added by this report?**

From 2000 to 2011, the number of countries in sub-Saharan Africa screening at least 95% of donated blood units for HBV and HCV increased from 76% to 94% and 34% to 86%, respectively. During the same period, the median percentage of HBV marker-reactive units decreased from 7.1% to 4.4%, and the median percentage of HCV marker-reactive units decreased from 1.4% to 0.9%.

**What are the implications for public health practice?**

This study provides important data and highlights trends to help focus existing and future strategies and investments by national governments and global health programs to reach countries' goals for safe and adequate blood supplies. The analyses demonstrate the continued risk for transfusion-transmitted HBV and HCV infections throughout sub-Saharan Africa. Although great progress in reducing this risk has been made in some of these countries, substantial progress in others is yet to be seen.

outside the national blood transfusion service network. Fourth, countries that had missing data for both years in 2000/2004 or 2010/2011 (four countries for HBV and nine for HCV) were excluded from the comparison of the overall changes in prevalence of HBsAg and anti-HCV reactive blood donations in sub-Saharan Africa. Finally, the screening does not include testing persons for evidence of active HCV infection (i.e., HCV RNA).

Improving the quality of laboratory screening of blood for HBV and HCV is only one component in reducing the risk for transfusion-transmitted HBV and HCV. Critical adjuncts to laboratory screening for improved blood safety include 1) targeting outreach and blood collection efforts among populations with low-risk behavioral profiles, 2) collecting blood from regular, voluntary, non-remunerated donors, 3) providing educational materials in donation settings to help infected persons defer themselves from donation (self-deferral) without publicly disclosing their infection status, 4) providing post-donation counselling and referral to care and treatment for blood donors who screen positive for transfusion-transmissible infections, and 5) increasing the proper use of donor

history questionnaires to defer persons with high-risk behaviors. Monitoring the prevalence of transfusion-transmissible infections among blood donors is one way to measure the effectiveness of these risk-reduction strategies. Data showing significantly reduced prevalence of laboratory-detected transfusion-transmissible infections suggests improvements in donor recruitment and selection practices.

During the 2010/2011 period, six countries reported high percentages (i.e., 10%–19%) of blood donations to be marker-reactive for HBV, and one country reported a high percentage (i.e., exceeding 5%) of its blood donations to be marker-reactive for HCV. Rates of HBV and HCV marker-reactive donations indicate that regional prevalence of chronic HBV and HCV infections remain high among blood donors. Although surveillance of infectious disease rates among blood donors might be of benefit to blood services and public health agencies, reductions in prevalence among blood donors might not be indicative of similar changes among the general population. Despite the progress described in this report, sustained commitment to blood safety programs will be required to further decrease the risk for transfusion-transmitted infections throughout sub-Saharan Africa.

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# Human Papillomavirus Vaccination Coverage Among Adolescents, 2007–2013, and Postlicensure Vaccine Safety Monitoring, 2006–2014 — United States

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Since mid-2006, a licensed human papillomavirus (HPV) vaccine has been available and recommended by the Advisory Committee on Immunization Practices (ACIP) for routine vaccination of adolescent girls at ages 11 or 12 years (1). Two vaccines that protect against HPV infection are currently available in the United States. Both the quadrivalent (HPV4) and bivalent (HPV2) vaccines protect against HPV types 16 and 18, which cause 70% of cervical cancers; HPV4 also protects against HPV types 6 and 11, which cause 90% of genital warts (1,2). In 2011, the ACIP also recommended HPV4 for the routine vaccination of adolescent boys at ages 11 or 12 years (3). HPV vaccines can be safely co-administered with other routinely recommended vaccines, and ACIP recommends administration of all age-appropriate vaccines during a single visit (4). To assess progress with HPV vaccination coverage among adolescents aged 13–17 years,\* characterize adherence with recommendations for HPV vaccination by the 13th birthday, and describe HPV vaccine adverse reports received postlicensure, CDC analyzed data from the 2007–2013 National Immunization Survey-Teen (NIS-Teen) and national postlicensure vaccine safety data among females and males. Vaccination coverage with ≥1 dose of any HPV vaccine increased significantly from 53.8% (2012) to 57.3% (2013) among adolescent girls and from 20.8% (2012) to 34.6% (2013) among adolescent boys. Receipt of ≥1 dose of HPV among girls by age 13 years increased with each birth cohort; however, missed vaccination opportunities were common. Had HPV vaccine been administered to adolescent girls born in 2000 during health care visits when they received another vaccine, vaccination coverage for ≥1 dose by age 13 years for this cohort could have reached 91.3%. Postlicensure monitoring data continue to indicate that HPV4 is safe. Improving practice patterns so that clinicians use every opportunity to recommend HPV vaccines and address questions from parents can help realize reductions in vaccine-preventable infections and cancers caused by HPV.

\* For each survey year, eligible participants were born during the following periods: 2007, October 1989–February 1995; 2008, January 1990–February 1996; 2009, January 1991–February 1997; 2010, January 1992–February 1998; 2011, January 1993–February 1999; 2012, January 1994–February 2000; and 2013, January 1995–February 2001.

## Vaccination Coverage

Since 2006, NIS-Teen has collected vaccination information for adolescents aged 13–17 years in the 50 states, the District of Columbia, and selected areas,<sup>†</sup> using a random-digit-dialed sample of landline and, starting in 2011, cell phone numbers.<sup>§</sup> After a teen's parent/guardian grants permission to contact their teen's vaccination provider(s), a questionnaire is mailed to each provider to obtain a vaccination history from medical records.<sup>¶</sup> Analysis for this report was limited to adolescent girls and boys with provider-reported vaccination histories.\*\* HPV vaccination coverage represents receipt of any HPV vaccine and does not distinguish between HPV2 or HPV4. NIS-Teen methodology, including weighting procedures, has been described previously (5). Differences in vaccination coverage were evaluated using t-tests and were considered statistically significant if  $p < 0.05$ .

Vaccination coverage was assessed for each dose of the HPV vaccination series. For girls and boys, respectively, and for each vaccine series dose, HPV vaccination coverage estimates in 2013 were significantly higher compared with 2012 (Table 1).

<sup>†</sup> Six areas that received federal Section 317 immunization grants were sampled separately: District of Columbia; Chicago, Illinois; New York, New York; Philadelphia County, Pennsylvania; Bexar County, Texas; and Houston, Texas.

<sup>§</sup> All identified cell phone households were eligible for interview. Sampling weights were adjusted to correct for dual-frame (landline and cell phone) sampling, nonresponse, noncoverage, and overlapping samples of mixed telephone users. A description of NIS-Teen dual-frame survey methodology and its effect on reported vaccination estimates is available at <http://www.cdc.gov/vaccines/stats-surv/nis/dual-frame-sampling-082812.htm>.

<sup>¶</sup> In 2013, the Council of American Survey Research Organizations (CASRO) landline response rate was 51.1%. A total of 6,039 adolescents with vaccination provider-reported vaccination records were included, representing 59.5% of all adolescents from the landline sample with completed household interviews. The cell phone sample CASRO response rate was 23.3%. A total of 12,225 adolescents with vaccination provider-reported vaccination records are included, representing 54.5% of all adolescents from the cell phone sample with completed household interviews. The CASRO response rate is the product of three other rates, 1) the resolution rate, which is the proportion of telephone numbers that can be identified as either for a business or residence; 2) the screening rate, which is the proportion of qualified households that complete the screening process; and 3) the cooperation rate, which is the proportion of contracted eligible households for which a completed interview is obtained. CASRO response rates for survey years 2007–2012 are available at [http://www.cdc.gov/nchs/nis/data\\_files\\_teen.htm](http://www.cdc.gov/nchs/nis/data_files_teen.htm).

\*\* The number of adolescent girls with provider-reported vaccination histories for each survey year were as follows: 2007, 1,440; 2008, 8,607; 2009, 9,621; 2010, 9,220; 2011, 11,236; 2012, 9,058; and 2013, 8,710. The number of adolescent boys with provider-reported vaccination histories for each survey year were as follows: 2011, 12,328; 2012, 10,141; and 2013, 9,554.



**TABLE 1. Estimated human papillomavirus vaccination\* coverage among adolescent boys and girls aged 13–17 years — National Immunization Survey-Teen, United States, 2007–2013**

Sex/Doses	Survey year <sup>†</sup>													
	2007		2008		2009		2010		2011		2012		2013	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Adolescent girls														
≥1 dose	25.1	(22.3–28.1)	37.2	(35.2–39.3) <sup>§</sup>	44.3	(42.4–46.1) <sup>§</sup>	48.7	(46.9–50.5) <sup>§</sup>	53.0	(51.4–54.7) <sup>§</sup>	53.8	(52.0–55.7)	57.3	(55.4–59.2) <sup>§</sup>
≥2 dose	16.9	(14.6–19.6)	28.3	(26.4–30.3) <sup>§</sup>	35.8	(34.1–37.6) <sup>§</sup>	40.7	(38.9–42.5) <sup>§</sup>	43.9	(42.3–45.6) <sup>§</sup>	43.4	(41.5–45.2)	47.7	(45.7–49.6) <sup>§</sup>
≥3 dose	5.9	(4.4–7.8)	17.9	(16.3–19.6) <sup>§</sup>	26.7	(25.2–28.3) <sup>§</sup>	32.0	(30.3–33.6) <sup>§</sup>	34.8	(33.2–36.4) <sup>§</sup>	33.4	(31.7–35.2)	37.6	(35.7–39.6) <sup>§</sup>
Adolescent boys														
≥1 dose	—	—	—	—	—	—	—	—	8.3	(7.4–9.3)	20.8	(19.4–22.4) <sup>§</sup>	34.6	(32.7–36.5) <sup>§</sup>
≥2 dose	—	—	—	—	—	—	—	—	3.8	(3.2–4.5)	12.7	(11.5–14.0) <sup>§</sup>	23.5	(21.8–25.3) <sup>§</sup>
≥3 dose	—	—	—	—	—	—	—	—	1.3	(1.0–1.7)	6.8	(5.9–7.8) <sup>§</sup>	13.9	(12.5–15.3) <sup>§</sup>

**Abbreviation:** CI = confidence interval.

\* Human papillomavirus vaccine, either quadrivalent or bivalent.

<sup>†</sup> The number of adolescent girls with provider reported vaccination histories for each survey year were as follows: 2007, 1,440; 2008, 8,607; 2009, 9,621; 2010, 9,220; 2011, 11,236; 2012, 9,058; and 2013, 8,710. The number of adolescent boys with provider reported vaccination histories for each survey year were as follows: 2011, 12,328; 2012, 10,141; and 2013, 9,554.

<sup>§</sup> Statistically significant difference ( $p < 0.05$ ) compared with the previous year's estimate.

To evaluate receipt of ≥1 dose of HPV vaccine by age 13 years among adolescent girls, data during 2007–2013 NIS-Teen survey years were combined and analyzed by birth cohort.<sup>††</sup> Among girls, receipt of ≥1 dose of HPV by age 13 years has increased an average of 5.9% (95% confidence interval [CI] = 2.8%–9.0%) with each new birth cohort, reaching 46.8% (CI = 41.2%–52.5%) for the 2000 birth cohort (Figure). Missed opportunities to receive the HPV vaccine by age 13 years also were evaluated. A missed opportunity for adolescent girls was defined as a health care encounter occurring on or after the 11th birthday and before the 13th birthday and on or after March 23, 2007 (the publication date of the ACIP HPV4 recommendation for girls), during which the adolescent received at least one vaccine but did not receive the first dose of the HPV vaccine. The percentage of unvaccinated girls at age 13 years with at least one missed opportunity for HPV vaccination ranged from 9.3% (CI = 8.1%–10.8%) for the 1994 cohort to 83.7% (CI = 77.8%–88.2%) for the 2000 cohort (Figure). If all missed opportunities for HPV vaccination had been eliminated for the 2000 birth cohort, vaccination coverage with ≥1 dose of HPV vaccine could have reached 91.3% (CI = 87.9%–93.8%) by age 13 years, a 42.7 percentage-point difference from the actual coverage level.

The percentage of parents reporting that they received a recommendation for the HPV vaccine from their clinician was significantly higher in 2013 compared with 2012 for both parents of girls (64.4% compared with 61.0%) and parents of boys (41.6% compared with 28.0%). More parents of vaccinated teens (girls: 73.7%; boys: 71.7%) reported receiving

a recommendation compared with parents of unvaccinated teens (girls: 52.0%; boys: 25.7%).

The 2013 NIS-Teen asked parents who reported they were not likely to vaccinate their teen in the 12 months after interviews or were unsure of their vaccination plans (girls: 23.0% [CI = 21.5%–24.6%]; boys: 37.4% [CI = 35.7%–39.1%]) to identify the main reason why their teen would remain unvaccinated. The top five responses from the parents of girls and parents of boys were the same, differing only in order of frequency (Table 2). More than 30% of the parents of girls and boys cited as their main reason lack of knowledge (girls and boys: both 15.5%) or belief that the vaccine was not needed or necessary (girls: 14.7%; boys: 17.9%). Among parents of boys, 22.8% reported that the main reason was that HPV vaccination had not been recommended; among parents of girls, 13.0% reported that HPV had not been recommended.

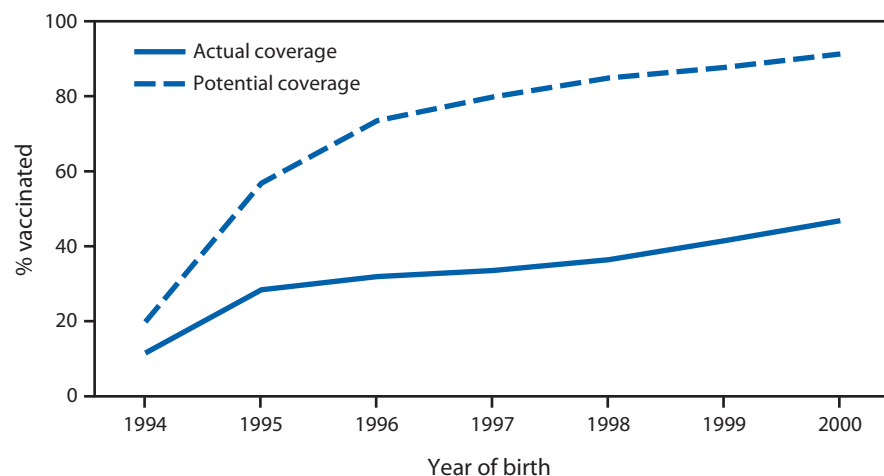
## Vaccine Safety

In the United States, postlicensure vaccine safety monitoring and evaluation are conducted independently by federal agencies and vaccine manufacturers. From June 2006 through March 2014, approximately 67 million doses of HPV4 were distributed in the United States, and from October 2009 through March 2014, a total of 719,000 doses of HPV2 were distributed. Overall, HPV4 has accounted for approximately 99% of doses distributed since 2006. Multiple studies have provided evidence supporting HPV vaccine safety (6). During June 2006–March 2014, the Vaccine Adverse Event Reporting System (VAERS)<sup>§§</sup> received a total of 25,176 adverse event reports after HPV vaccination in the United States. Among

<sup>††</sup> This analysis was not performed for adolescent boys because the majority of the boys included in the NIS-Teen sample were unable to receive the vaccine by age 13 years because of their birthdates relative to the 2011 recommendation to vaccinate males.

<sup>§§</sup> Additional information about the Vaccine Adverse Event Reporting System (VAERS) is available at <http://www.cdc.gov/vaccinesafety/activities/vaers.html>.

**FIGURE. Actual and potentially achievable vaccination coverage with  $\geq 1$  dose of human papillomavirus (HPV) vaccine if missed vaccination opportunities had been eliminated among girls by age 13 years,\* by birth cohort (1994–2000) — National Immunization Survey-Teen, United States, 2007–2013 combined**



\* Missed opportunity was defined as a health care encounter occurring on or after a girl's 11th birthday and before her 13th birthday, and on or after March 23, 2007, during which a girl received at least one vaccination, but not the first dose of the HPV vaccine series.

these, HPV4 was cited in 99% of reports (22,867 and 2,196 reports among females and males, respectively); 92.4% of the HPV4 reports were classified as nonserious.<sup>¶¶</sup> Since October 2009, when HPV4 was licensed for males, the most commonly reported symptoms among males were similar to those among females, including injection site reactions, dizziness, syncope, nausea, and headache. Overall, reporting of adverse events to VAERS is consistent with prelicensure clinical trial data and consistent with the 2009 published summary of the first 2.5 years of postlicensure reporting to VAERS (7).

### Discussion

After a year of unchanging HPV vaccination coverage among adolescent girls (6), results from the 2013 NIS-Teen show a

<sup>¶¶</sup> Serious reports are those in which one or more of the following were noted in the report: death, life-threatening illness, hospitalization, prolongation of an existing hospitalization, or permanent disability.

**TABLE 2. Top five reasons for not vaccinating adolescents with human papillomavirus (HPV) vaccine\* — National Immunization Survey-Teen, United States, 2013**

Reason	Parents of girls		Reason	Parents of boys	
	%	(95% CI)		%	(95% CI)
Lack of knowledge	15.5	(13.0–18.5)	Not recommended	22.8	(20.6–25.0)
Not needed or necessary	14.7	(12.5–17.3)	Not needed or necessary	17.9	(15.9–20.1)
Safety concern/Side effects	14.2	(11.8–16.8)	Lack of knowledge	15.5	(13.7–17.6)
Not recommended	13.0	(10.8–15.5)	Not sexually active	7.7	(6.4–9.2)
Not sexually active	11.3	(9.1–13.9)	Safety concern/Side effects	6.9	(5.6–8.5)

**Abbreviation:** CI = confidence interval.

\* Analysis limited to parents reporting that they were not likely to seek HPV vaccination for their teen in the next 12 months or were unsure of their HPV vaccination plans.

modest increase in coverage; however, coverage levels remain low. From 2012 to 2013, the percentage of adolescents receiving  $\geq 1$  dose of HPV vaccine increased 3.5 percentage points for girls and 13.8 percentage points for boys. A cohort analysis also was performed to evaluate receipt of  $\geq 1$  dose of HPV vaccine by age 13 years over time and found an increase since 2007; however, missed vaccination opportunities persist. Had HPV vaccine been administered during health care visits when another vaccine was administered, vaccination coverage for  $\geq 1$  dose could have reached 91.3% by age 13 years for adolescent girls born in 2000.

Despite availability of safe and effective HPV vaccines, the main reasons reported for not vaccinating teens against HPV underscore that addressing knowledge gaps among parents as well as increasing clinicians' HPV vaccination recommendations are critical to protecting teens against HPV-associated cancers and genital warts. In 2013, the percentage of parents who reported receiving a recommendation for the HPV vaccine increased. Nevertheless, it is concerning that approximately one third of parents of girls and over half of parents of boys reported that their child's clinician had not recommended that their child receive an HPV vaccination. The lack of a clinician recommendation among parents of boys might reflect knowledge limitations among clinicians because the recommendation for routine HPV vaccination for boys has only been in place since December 2011. HPV infections can cause serious, life-threatening cancers among men (3); it is important to continue to educate vaccination providers and parents to ensure that adolescent boys are protected from HPV-associated cancers and genital warts.

The President's Cancer Panel 2012–2013 report released in February 2014 (available at <http://deainfo.nci.nih.gov/advisory/pcp/annualreports/hpv/index.htm>) recommended three

**What is already known on this topic?**

The Advisory Committee on Immunization Practices recommends human papillomavirus (HPV) vaccination for girls and boys at ages 11 or 12 years. The 2012 National Immunization Survey-Teen indicated only 53.8% of girls and 20.8% of boys aged 13–17 years had received  $\geq 1$  dose of HPV vaccine.

**What is added by this report?**

Vaccination coverage significantly increased in 2013; 57.3% of girls and 34.6% of boys received  $\geq 1$  dose of HPV vaccine. The percentage of parents reporting that they received a clinician recommendation for the HPV vaccine was significantly higher in 2013 compared with 2012 for both parents of girls (64.4% versus 61.0%) and parents of boys (41.6% versus 28.0%). Analysis of provider records showed that if HPV vaccine had been administered at health care encounters when other recommended vaccines were administered,  $\geq 1$  HPV vaccination coverage by age 13 years for the most recent birth cohort of girls could have been as high as 91%. National safety monitoring data continue to indicate that the HPV vaccine is safe.

**What are the implications for public health practice?**

Despite the availability of safe and effective HPV vaccines, many adolescents have not been vaccinated. Vaccination coverage of adolescent girls by age 13 years increased across seven birth cohorts but missed vaccination opportunities persist. Improving practice patterns so that clinicians and their staff members use every opportunity to recommend HPV vaccines for boys and girls and address questions from parents is necessary to reduce vaccine-preventable HPV infections and cancers caused by HPV.

critical goals that must be achieved to increase HPV vaccination coverage in the United States, including 1) reducing missed clinical opportunities to recommend and administer HPV vaccines; 2) increasing parents', caregivers', and adolescents' acceptance of HPV vaccination; and 3) maximizing access to HPV vaccination services. CDC, in partnerships with state and local immunization programs, is working with health professional organizations to reduce missed opportunities for HPV vaccination and support clinicians' capacities to give HPV vaccination recommendations consistent with national vaccination recommendations.

To address gaps in clinician knowledge and communication skills, several resources have been developed by CDC including a dedicated website for health care professionals on HPV vaccine resources (<http://www.cdc.gov/vaccines/youarethekey>), a tip sheet for talking about the HPV vaccine with parents, and continuing education programs for pediatricians and family physicians regarding the clinical impact of persistent HPV infection and the importance of vaccinating adolescents at ages 11–12 years. To improve public acceptance of HPV vaccination, CDC continues to use research data to create an evidence-based communication campaign to reach the target audiences. Although it is still too early to evaluate the impact

of activities implemented since publication of the 2012 NIS-Teen results (6,8), which documented that HPV vaccination coverage rates among girls did not increase compared with 2011, results from the 2013 NIS-Teen indicate that initial progress has been made.

The findings in this report are subject to at least four limitations. First, the cell phone household response rate was only 23.3%, and the landline household response rate was only 51.1%. Sampling weights were designed to minimize nonresponse and noncoverage bias (from exclusion of households without landline telephones), but some bias might remain in weighted estimates. Second, vaccination histories reported by providers might be incomplete, which would contribute to underestimation of vaccination coverage. Third, evaluation of missed opportunities only included health care encounters in which a vaccination was administered, and thus estimates of potential coverage would be underestimated if there were additional health care encounters in which a vaccination could have been administered. Finally, VAERS is a passive reporting system that accepts reports from anyone, including health care providers, patients, or family members. VAERS cannot determine cause and effect; a report of an adverse event to VAERS does not mean that a vaccine caused the event. Underreporting might occur, and serious medical events are more likely to be reported than minor ones.

The cohort analysis presented in this report combines data from subjects over multiple survey years; the denominator for the 2000 cohort might not be the same as the denominator for females aged 13 years included in the 2013 NIS-Teen data (9). In addition, the cohort analysis focuses on coverage by age 13 years, whereas 2013 NIS-Teen analyses for females aged 13 years could reflect doses that were received by girls after their 13th birthday and before interview dates. As a result, the cohort estimate is lower than that reported for females aged 13 years (9).

Progress with HPV vaccination is occurring, but at a slow pace. In 2013, only 57.3% of girls and 34.6% of boys had initiated the HPV vaccine series. CDC will continue its efforts to partner with state and local immunization programs, professional organizations, cancer organizations, and other stakeholders to educate parents and clinicians. Collaborative efforts remain critical to promoting HPV vaccination so that the nation's adolescents are protected against vaccine-preventable, HPV-associated cancers.

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## National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, 2013

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The Advisory Committee on Immunization Practices (ACIP) recommends that adolescents routinely receive 1 dose of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine, 2 doses of meningococcal conjugate (MenACWY) vaccine, and 3 doses of human papillomavirus (HPV) vaccine (1,2).<sup>\*</sup> ACIP also recommends administration of “catch-up”<sup>†</sup> vaccinations, such as measles, mumps, and rubella (MMR), hepatitis B, and varicella, and, for all persons aged  $\geq 6$  months, an annual influenza vaccination (1). ACIP recommends administration of all age-appropriate vaccines during a single visit (3). To assess vaccination coverage among adolescents aged 13–17 years, CDC analyzed data from the 2013 National Immunization Survey-Teen (NIS-Teen).<sup>§</sup> This report summarizes the results of that analysis, which show that from 2012 to 2013, coverage increased for each of the vaccines routinely recommended for adolescents: from 84.6% to 86.0% for  $\geq 1$  Tdap dose; from 74.0% to 77.8% for  $\geq 1$  MenACWY dose; from 53.8% to 57.3% for  $\geq 1$  HPV dose among females, and from 20.8% to 34.6% for  $\geq 1$  HPV dose among males. Coverage varied by state and local jurisdictions and by U.S. Department of Health and Human Services (HHS) region. *Healthy People 2020* vaccination targets for adolescents aged 13–15 years (4) were reached in 42 states for  $\geq 1$  Tdap dose, 18 for  $\geq 1$  MenACWY dose, and 11 for  $\geq 2$  varicella doses. No

state met the target for  $\geq 3$  HPV doses.<sup>¶</sup> Use of patient reminder and recall systems, immunization information systems, coverage assessment and feedback to clinicians, clinician reminders, standing orders, and other interventions can help make use of every health care visit to ensure that adolescents are fully protected from vaccine-preventable infections and cancers (5), especially when such interventions are coupled with clinicians’ vaccination recommendations.

Vaccination coverage was assessed using 2013 NIS-Teen data for adolescents aged 13–17 years in the 50 states, the District of Columbia, selected local areas,<sup>\*\*</sup> Guam, and the U.S. Virgin Islands, using a random-digit-dialed sample of landline and cell phones.<sup>††</sup> Telephone interviews were conducted with the parent or guardian of age-eligible adolescents to obtain information about the adolescent’s demographic characteristics and to request vaccination provider contact information.<sup>§§</sup> After receiving a respondent’s consent, a questionnaire was mailed to each vaccination provider to obtain provider-confirmed immunization information. In 2013, national estimates were based on responses for 18,264 adolescents (8,710 females and

<sup>\*</sup> Adolescents who receive their first MenACWY vaccine dose as routinely recommended at age 11–12 years should receive a second dose at 16 years. Adolescents who receive their first dose at ages 13–15 years should receive a second dose at age 16–18 years, with a minimum interval of  $\geq 8$  weeks between doses. Adolescents who receive a MenACWY vaccine dose at age  $\geq 16$  years do not need a second dose.

<sup>†</sup> Catch-up vaccination is recommended for some vaccines routinely recommended in childhood. MMR vaccine is recommended for any adolescents who have not had 2 doses of MMR vaccine. Catch-up vaccination for varicella is recommended for persons aged 7–18 years without evidence of immunity (MMWR 2007;56 [No. RR-4]). Adolescents should have received 2 doses of varicella vaccine. Catch up vaccination for hepatitis B is recommended for any unvaccinated persons, and they should complete a 3-dose series. However, a 2-dose series (doses separated by at least 4 months) of adult formulation Recombivax HB is licensed for use in children aged 11–15 years (1).

<sup>§</sup> Eligible participants were born during January 1995–February 2001. Except as noted, coverage for  $\geq 1$  and  $\geq 2$  varicella doses were obtained among persons with no history of varicella disease. HPV vaccination coverage represents receipt of any HPV vaccine and does not distinguish between bivalent or quadrivalent vaccines. Some adolescents, both males and females, might have received more than the 3 recommended HPV doses. Influenza vaccination coverage estimates are not included in this report but are available online at <http://www.cdc.gov/flu/fluview/index.htm>.

<sup>¶</sup> *HP2020* objectives and targets were established for females only in 2010 (4), before ACIP’s 2011 recommendation for routine use of the quadrivalent HPV vaccine among males aged 11–12 years (2). In April 2014, the federal *HP2020* work group approved a new *HP2020* objective to reach an 80% vaccination target with 3 doses of HPV vaccine among adolescent males aged 13–15 years (Office of Policy, Office of the Director, National Center for Immunization and Respiratory Diseases, CDC, unpublished data, April 2014).

<sup>\*\*</sup> Local areas that received Federal Section 317 immunization funds were sampled separately: Chicago, Illinois; New York, New York; Philadelphia County, Pennsylvania; Bexar County, Texas; and Houston, Texas.

<sup>††</sup> All identified cell phone households were eligible for interview. Sampling weights adjusted to correct for dual-frame (landline and cell phone) sampling, nonresponse, noncoverage, and overlapping samples of mixed telephone users. A description of NIS-Teen dual-frame survey methodology and its effect on reported vaccination estimates is available at <http://www.cdc.gov/vaccines/stats-surv/nis/dual-frame-sampling-082812.htm>.

<sup>§§</sup> The Council of American Survey Research Organizations (CASRO) response rate for the landline and cell phone samples were 51.1% and 23.3%, respectively. For completed interviews, 6,039 by landline (59.5%) and 12,225 by cell phone (54.5%) had adequate provider data. Overall, 33% of completed interviews with adequate provider data were from landlines, and 67% were from cell phones. For USVI, the landline and cell phone sample CASRO rate was 60.6% and 31.5%, respectively. For Guam, landline and cell phone sample CASRO was 45.6% and 21.0%, respectively. The CASRO response rate is the product of three other rates: 1) the resolution rate (the proportion of telephone numbers that can be identified as either for business or residence), 2) the screening rate (the proportion of qualified households that complete the screening process), and 3) the cooperation rate (the proportion of contacted eligible households for which a completed interview is obtained).

9,554 males).<sup>¶¶</sup> Details of NIS-Teen methodology, including methods for synthesizing provider-reported immunization histories and weighting, have been described previously.<sup>\*\*\*</sup> NIS-Teen data from 2006–2013 were used in this report to describe vaccination coverage over time. Weighted linear regression<sup>†††</sup> was used to assess coverage trends for vaccines recommended routinely for adolescents. T-tests were used to assess vaccination coverage differences by survey year (2013 compared with 2012), age, sex, race/ethnicity, and poverty status for all vaccines included in this report. Results were considered statistically significant at  $p < 0.05$ .

## National Vaccination Coverage

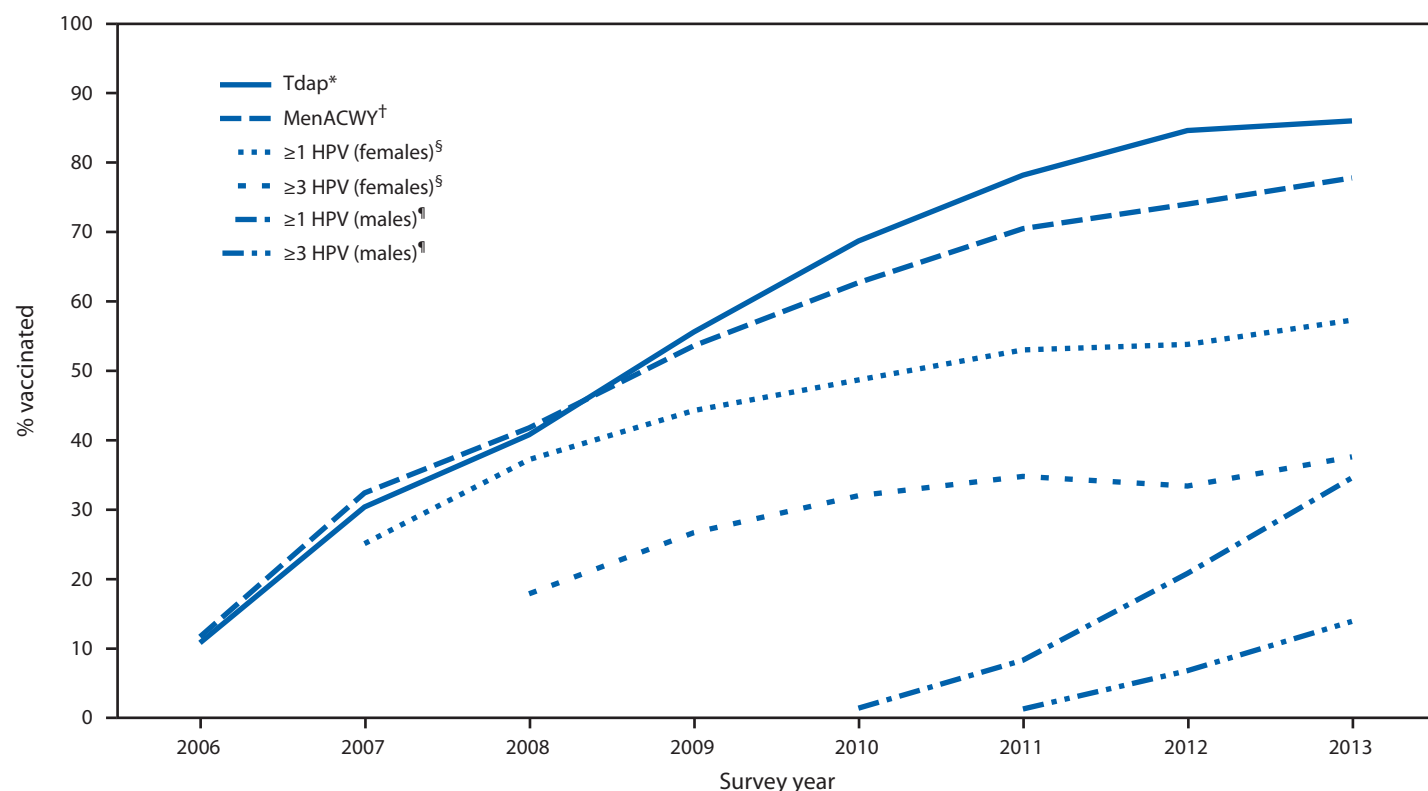
During 2006–2013, NIS-Teen data show that coverage trends differed substantially for Tdap, MenACWY, and HPV vaccination (Figure). Coverage estimates for  $\geq 1$  Tdap dose and  $\geq 1$  MenACWY dose increased significantly each year from 2006 to 2013, with average increases of 10.4 percentage points (95% confidence interval [CI] = 7.8–13.1) for Tdap and 8.9 percentage points (CI = 6.5–11.3) for MenACWY. Coverage for  $\geq 1$  HPV dose increased an average of 4.5 percentage points (CI = 2.7–6.3) annually from 2007 to 2013 for females, and by 9.9 percentage points (CI = 4.8–15.0) from 2010 to 2013 for males. In 2013, Tdap and MenACWY coverage estimates were 86.0% and 77.8%, respectively (Table 1). From 2012 to 2013, coverage with  $\geq 1$ ,  $\geq 2$ , and  $\geq 3$  HPV doses increased for both sexes. Coverage with  $\geq 1$  HPV dose in 2013 was 57.3% for females and 34.6% for males. No statistically significant changes occurred from 2012 to 2013 in coverage for  $\geq 2$  doses of MMR vaccine or  $\geq 3$  doses of hepatitis B vaccine. However, coverage for  $\geq 2$  doses of varicella vaccine increased

<sup>¶¶</sup> Adolescents from the U.S. Virgin Islands (156 females and 176 males) and from Guam (164 females and 199 males) were excluded from the national estimates.

<sup>\*\*\*</sup> Additional information available at [ftp://ftp.cdc.gov/pub/health\\_statistics/nchs/dataset\\_documentation/nis/nisteepuf12\\_dug.pdf](ftp://ftp.cdc.gov/pub/health_statistics/nchs/dataset_documentation/nis/nisteepuf12_dug.pdf).

<sup>†††</sup> Annual estimates of vaccination coverage were regressed on survey year via a weighted linear regression, with regression weights calculated using the inverse of the estimated variance of the vaccination coverage point estimate.

**FIGURE.** Estimated vaccination coverage with selected vaccines and doses among adolescents aged 13–17 years, by survey year — National Immunization Survey-Teen, United States, 2006–2013



**Abbreviations:** Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; MenACWY = meningococcal conjugate; HPV = human papillomavirus.

\*  $\geq 1$  dose Tdap vaccine on or after age 10 years.

†  $\geq 1$  dose MenACWY vaccine.

§ HPV vaccine, either bivalent or quadrivalent, among females. The Advisory Committee on Immunization Practices (ACIP) recommends either bivalent or quadrivalent vaccine for females.

¶ HPV vaccine, either bivalent or quadrivalent, among males. ACIP recommends the quadrivalent vaccine for males; however, some males might have received bivalent vaccine.

**TABLE 1. Estimated vaccination coverage with selected vaccines among adolescents aged 13–17 years,\* by age at interview — National Immunization Survey–Teen (NIS-Teen), United States, 2013**

Vaccine	Age at interview (yrs)										Total			
	13 (n = 3,735)		14 (n = 3,841)		15 (n = 3,645)		16 (n = 3,783)		17 (n = 3,260)		2013 (N = 18,264)		2012† (N = 19,199)	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Tdap <sup>§</sup> ≥ 1 dose	87.2	(±1.9)	87.0	(±2.1)	88.4	(±1.7)	84.3	(±2.1)	83.0	(±2.7) <sup>¶</sup>	86.0	(±0.9)**	84.6	(±0.9)
MenACWY <sup>††</sup> ≥ 1 dose	76.1	(±2.4)	78.2	(±2.3)	80.0	(±2.3) <sup>¶</sup>	77.8	(±2.5)	76.7	(±2.9)	77.8	(±1.1)**	74.0	(±1.1)
HPV <sup>§§</sup> vaccination														
Females														
≥1 dose	50.6	(±4.1)	55.1	(±4.2)	58.8	(±4.3) <sup>¶</sup>	60.0	(±4.5) <sup>¶</sup>	62.3	(±4.5) <sup>¶</sup>	57.3	(±1.9)**	53.8	(±1.9)
≥2 dose	39.2	(±4.2)	43.3	(±4.2)	48.7	(±4.5) <sup>¶</sup>	51.1	(±4.6) <sup>¶</sup>	56.8	(±4.5) <sup>¶</sup>	47.7	(±2.0)**	43.4	(±1.9)
≥3 doses	25.8	(±3.8)	32.1	(±3.9) <sup>¶</sup>	39.4	(±4.6) <sup>¶</sup>	43.1	(±4.5) <sup>¶</sup>	48.2	(±4.5) <sup>¶</sup>	37.6	(±1.9)**	33.4	(±1.7)
Males														
≥1 dose	33.5	(±4.5)	35.1	(±4.4)	36.2	(±4.1)	35.9	(±4.0)	32.1	(±4.1)	34.6	(±1.9)**	20.8	(±1.5)
≥2 dose	23.4	(±4.3)	24.3	(±4.0)	23.8	(±3.8)	23.2	(±3.7)	22.9	(±3.5)	23.5	(±1.7)**	12.7	(±1.3)
≥3 doses	11.7	(±2.7)	13.6	(±3.3)	15.3	(±3.5)	13.7	(±3.1)	15.1	(±3.0)	13.9	(±1.4)**	6.8	(±1.0)
HPV <sup>§§</sup> 3-dose series completion <sup>¶¶</sup>														
Females	56.1	(±6.7)	64.7	(±5.7)	72.1	(±5.0) <sup>¶</sup>	75.9	(±5.6) <sup>¶</sup>	79.5	(±4.6) <sup>¶</sup>	70.4	(±2.5)**	66.7	(±2.6)
Males	41.6	(±9.4)	47.1	(±9.3)	51.0	(±8.7)	48.8	(±8.2)	53.4	(±8.5)	48.3	(±4.0)	45.1	(±5.0)
MMR <sup>***</sup> ≥2 doses	92.6	(±1.4)	93.1	(±1.4)	91.4	(±2.1)	92.0	(±1.6)	89.7	(±2.3) <sup>¶</sup>	91.8	(±0.8)	91.4	(±0.8)
Hepatitis B ≥3 doses	94.7	(±1.3)	94.0	(±1.3)	92.5	(±1.9)	93.1	(±1.5)	91.4	(±2.2) <sup>¶</sup>	93.2	(±0.7)	92.8	(±0.7)
Varicella														
History of varicella <sup>†††</sup>	15.6	(±2.1)	19.5	(±2.4) <sup>¶</sup>	25.1	(±2.5) <sup>¶</sup>	30.6	(±2.8) <sup>¶</sup>	37.1	(±3.0) <sup>¶</sup>	25.4	(±1.2)**	30.6	(±1.2)
Among adolescents with no history of varicella														
≥1 dose vaccine	97.4	(±0.8)	95.4	(±1.6) <sup>¶</sup>	94.6	(±2.0) <sup>¶</sup>	94.0	(±1.9) <sup>¶</sup>	91.9	(±3.3) <sup>¶</sup>	94.9	(±0.9)	94.7	(±0.8)
≥2 doses vaccine	83.1	(±2.2)	80.2	(±2.5)	78.7	(±3.0) <sup>¶</sup>	76.6	(±3.1) <sup>¶</sup>	71.6	(±4.0) <sup>¶</sup>	78.5	(±1.3)**	74.9	(±1.4)
History of varicella or received ≥2 doses varicella vaccination	85.7	(±1.9)	84.1	(±2.1)	84.0	(±2.3)	83.7	(±2.3)	82.2	(±2.8) <sup>¶</sup>	84.0	(±1.0)	82.6	(±1.0)

**Abbreviations:** CI = confidence interval; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; MenACWY = meningococcal conjugate; HPV = human papillomavirus; MMR = measles, mumps, and rubella.

\* Adolescents (N = 18,264) in the 2013 NIS-Teen were born January 11, 1995, through February 13, 2001.

† Estimates for overall NIS-Teen data for 2012 are provided as a comparison with overall 2013 NIS-Teen data.

§ Includes percentages receiving Tdap vaccine at or after age 10 years.

¶ Statistically significant difference (p<0.05) in estimated vaccination coverage by age: reference group was adolescents aged 13 years.

\*\* Statistically significant difference (p<0.05) compared with 2012 NIS-Teen overall estimates.

†† Includes percentages receiving MenACWY or meningococcal-unknown type vaccine.

§§ HPV vaccine, either quadrivalent or bivalent may be used for females, and only quadrivalent may be used for males. Percentage reported among females (n = 8,710) and males (n = 9,554). Some adolescents might have received more than the recommended 3 doses of HPV vaccine.

¶¶ The completion rate for the 3-dose HPV vaccination series represents the percentage of adolescents who received ≥3 doses among those who had ≥1 HPV vaccine dose with at least 24 weeks between the first dose and the interview date. The calculation was limited to 4,611 females and 2,580 males who met the criteria of having received ≥1 HPV vaccine dose and having at least 24 weeks between the first dose and the interview date.

\*\*\* ≥2 doses of MMR vaccine.

††† By parent/guardian report or provider records.

from 74.9% to 78.5% among adolescents with no history of disease (Table 1).

Coverage with the second MenACWY dose was calculated as the proportion of adolescents aged 17 years on date of interview who received a second MenACWY dose on or after their 16th birthday, among those who had received a first dose before their 16th birthday (only second doses received on or after their 16th birthday and at least 8 weeks after the first dose were counted). All of these adolescents were aged 16 years after the MenACWY second dose was recommended by ACIP in October 2010 (n = 2,310) (6). The MenACWY 2-dose completion rate was 29.6% (CI = 26.4%–33.0%).

## Vaccination Coverage by Selected Characteristics

In 2013, among females, ≥1 HPV dose coverage was significantly higher among adolescents aged 15–17 years compared with younger adolescents (Table 1). However, ≥1 HPV dose coverage for males did not vary by age. In 2013, as found previously, most vaccination coverage rates were similar by sex; however, females had greater vaccination coverage than males for ≥1, ≥2, and ≥3 HPV doses and 3-dose HPV series completion<sup>§§§</sup> (Table 1). Also, females had significantly higher

§§§ The completion rate for 3-dose HPV vaccination series represents the percentage of adolescents who received ≥3 doses among those who had ≥1 HPV dose and ≥24 weeks between the first dose and the interview date.

vaccination coverage than males for  $\geq 2$  varicella doses (80.0% [CI = 78.1%–81.7%] versus 77.2% [CI = 75.2%–79.0%]).

In 2013, there were no racial or ethnic differences in vaccination coverage for  $\geq 1$  Tdap,  $\geq 3$  hepatitis B, or  $\geq 2$  varicella (Table 2). However,  $\geq 1$  MenACWY dose coverage was higher among Hispanic and Asian adolescents compared with white adolescents. Among females,  $\geq 1$ ,  $\geq 2$ , and  $\geq 3$  HPV dose

coverage was higher among Hispanic compared with white adolescents. Among males,  $\geq 1$ ,  $\geq 2$ , and  $\geq 3$  HPV dose coverage was higher among black and Hispanic adolescents compared with white adolescents. Black adolescent females had lower HPV 3-dose series completion compared with white adolescent females and, in contrast to findings in 2012, series completion among Hispanic females was similar to coverage among

**TABLE 2. Estimated vaccination coverage among adolescents aged 13–17 years,\* by race/ethnicity,<sup>†</sup> poverty level,<sup>§</sup> and selected vaccines and doses — National Immunization Survey–Teen (NIS-Teen), United States, 2013**

Vaccines	Race/Ethnicity						Poverty status									
	White, non-Hispanic (n = 12,064)		Black, non-Hispanic (n = 1,647)		Hispanic (n = 2,741)		American Indian/Alaska Native, non-Hispanic (n = 284)		Asian, non-Hispanic (n = 561)		Multiracial (n = 886)		Below poverty level (n = 3,078)		At or above poverty level (n = 14,754)	
	%	(95% CI) <sup>¶</sup>	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Tdap** $\geq 1$ dose	85.9	(±1.1)	84.1	(±3.0)	87.1	(±2.4)	85.3	(±7.2)	89.7	(±3.6)	85.4	(±4.9)	85.2	(±2.3)	86.4	(±1.0)
MenACWY <sup>††</sup> $\geq 1$ dose	75.6	(±1.3)	77.0	(±3.3)	83.4	(±2.8) <sup>§§</sup>	71.7	(±11.1)	83.8	(±7.1) <sup>§§</sup>	76.3	(±5.1)	78.4	(±2.6)	77.5	(±1.2)
HPV <sup>¶¶</sup> vaccination																
Females																
$\geq 1$ dose	53.1	(±2.3)	55.8	(±5.2)	67.5	(±5.0) <sup>§§</sup>	73.3	(±14.7) <sup>§§</sup>	57.0	(±11.4)	57.6	(±9.3)	66.8	(±4.3) <sup>§§</sup>	54.6	(±2.2)
$\geq 2$ dose	44.0	(±2.2)	45.6	(±5.2)	57.7	(±5.4) <sup>§§</sup>	57.3	(±15.2)	47.2	(±11.2)	46.2	(±9.5)	55.2	(±4.6) <sup>§§</sup>	45.3	(±2.2)
$\geq 3$ doses	34.9	(±2.1)	34.2	(±4.8)	44.8	(±5.6) <sup>§§</sup>	43.2	(±14.2)	40.4	(±11.0)	40.3	(±9.3)	41.5	(±4.6)	36.4	(±2.1)
Males																
$\geq 1$ dose	26.7	(±1.9)	42.2	(±5.5) <sup>§§</sup>	49.6	(±5.2) <sup>§§</sup>	38.6	(±14.0)	26.3	(±8.9)	34.5	(±7.3) <sup>§§</sup>	46.7	(±4.5) <sup>§§</sup>	30.8	(±2.0)
$\geq 2$ dose	18.5	(±1.7)	27.5	(±4.8) <sup>§§</sup>	34.5	(±5.3) <sup>§§</sup>	24.8	(±11.4)	19.5	(±8.0)	19.1	(±5.2)	28.7	(±4.0) <sup>§§</sup>	22.0	(±1.9)
$\geq 3$ doses	11.1	(±1.3)	15.7	(±3.8) <sup>§§</sup>	20.3	(±4.5) <sup>§§</sup>	NA	NA	9.1	(±4.5)	12.5	(±4.2)	16.7	(±3.0) <sup>§§</sup>	13.0	(±1.6)
HPV <sup>¶¶</sup> 3-dose series completion***																
Females	71.8	(±2.9)	63.7	(±7.3) <sup>§§</sup>	69.5	(±6.1)	60.1	(±16.9)	77.2	(±12.1)	75.1	(±13.8)	66.2	(±5.7)	71.9	(±2.8)
Males	51.1	(±4.7)	44.8	(±8.8)	47.4	(±9.0)	48.4	(±20.0)	40.0	(±18.8)	49.3	(±13.9)	44.3	(±7.2)	50.4	(±4.8)
MMR <sup>†††</sup> $\geq 2$ doses	92.8	(±0.8)	91.1	(±2.4)	90.2	(±2.3) <sup>§§</sup>	93.5	(±5.2)	90.8	(±6.0)	89.8	(±3.7)	91.7	(±1.7)	91.8	(±0.9)
Hepatitis B $\geq 3$ doses	93.8	(±0.8)	93.2	(±2.1)	92.8	(±2.0)	93.4	(±5.3)	87.8	(±6.6)	91.7	(±3.1)	93.2	(±1.6)	93.1	(±0.9)
Varicella																
History of varicella <sup>§§§</sup>	26.8	(±1.4)	22.6	(±3.5) <sup>§§</sup>	24.6	(±3.0)	36.6	(±10.6)	24.2	(±6.7)	18.5	(±3.9) <sup>§§</sup>	29.0	(±3.0) <sup>§§</sup>	24.0	(±1.2)
Among adolescents with no history of varicella																
$\geq 1$ dose vaccine	95.3	(±0.8)	94.3	(±2.6)	94.5	(±2.5)	95.7	(±3.7)	94.3	(±6.7)	94.4	(±3.0)	94.7	(±1.9)	95.2	(±1.0)
$\geq 2$ dose vaccine	77.7	(±1.5)	77.9	(±3.6)	80.3	(±3.5)	78.7	(±9.8)	85.2	(±8.1)	76.7	(±6.4)	77.3	(±3.0)	79.0	(±1.5)
History of varicella or received $\geq 2$ doses varicella vaccination	83.7	(±1.1)	82.9	(±3.0)	85.2	(±2.7)	86.5	(±6.4)	88.8	(±6.3)	81.0	(±5.4)	83.8	(±2.3)	84.0	(±1.1)

**Abbreviations:** CI = confidence interval; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; MenACWY = meningococcal conjugate; HPV = human papillomavirus; NA = not available (estimate not reported because unweighted sample size for the denominator was <30 or 95% CI half width/estimate >0.6); MMR = measles, mumps, and rubella.

\* Adolescents (N = 18,264) in the 2013 NIS-Teen were born January 11, 1995, through February 13, 2001.

<sup>†</sup> Adolescent's race/ethnicity was reported by parent or guardian. Adolescents identified in this report as white, black, Asian, American Indian/Alaska Native or multiracial were reported by the parent or guardian as non-Hispanic. Adolescents identified as multiracial had more than one race category selected. Adolescents identified as Hispanic might be of any race. Native Hawaiian or other Pacific Islanders were not included in the table because of small sample sizes.

<sup>§</sup> Adolescents were classified as below poverty level if their total family income was less than the federal poverty level specified for the applicable family size and number of children aged <18 years. All others were classified as at or above the poverty level. Additional information available at <http://www.census.gov/hhes/www/poverty.html>. Poverty status was unknown for 432 adolescents.

<sup>¶</sup> Estimates with 95% CI half-widths >10 might not be reliable.

\*\* Includes percentages receiving Tdap vaccine at or after age 10 years.

<sup>††</sup> Includes percentages receiving MenACWY and meningococcal-unknown type vaccine.

<sup>§§</sup> Statistically significant difference ( $p < 0.05$ ) in estimated vaccination coverage by race/ethnicity or poverty level; referent groups were non-Hispanic white adolescents and adolescents living at or above poverty level, respectively.

<sup>¶¶</sup> HPV vaccine, either quadrivalent or bivalent may be used for females, and only quadrivalent may be used for males. Percentage reported among females (n = 8,710) and males (n = 9,554). Some adolescents might have received more than the 3 recommended HPV vaccine doses.

<sup>\*\*\*</sup> The completion rate for the 3-dose HPV vaccination series represents the percentage of adolescents who received  $\geq 3$  doses among those who had  $\geq 1$  HPV vaccine dose with at least 24 weeks between the first dose and the interview date. The calculation was limited to 4,611 females and 2,580 males who met the criteria of having received  $\geq 1$  HPV vaccine dose and having  $\geq 24$  weeks between the first dose and the interview date.

<sup>†††</sup> Includes  $\geq 2$  doses of MMR vaccine.

<sup>§§§</sup> By parent/guardian report or provider records.



white adolescent females. There were no statistically significant racial/ethnic differences among males for HPV 3-dose series completion. In 2013, vaccination coverage did not vary by poverty level<sup>\*\*\*</sup> for  $\geq 1$  Tdap,  $\geq 1$  MenACWY,  $\geq 2$  MMR,  $\geq 3$  hepatitis B,  $\geq 2$  varicella, or HPV 3-dose series completion (for males or females) (Table 2). However, those living below the poverty level had higher  $\geq 1$ ,  $\geq 2$ , and  $\geq 3$  HPV dose coverage (for males) and  $\geq 1$  and  $\geq 2$  HPV dose coverage (for females), compared with their counterparts living at or above the poverty level. These findings in 2013 data that females had no difference in 3-dose HPV completion by poverty status were not observed in 2012 (7).

### State and Regional Vaccination Coverage

In 2013, there was wide variation among states in coverage (Table 3). Coverage for  $\geq 1$  Tdap ranged from 60.2% (Mississippi) to 95.5% (Rhode Island), whereas coverage estimates for  $\geq 1$  MenACWY ranged from 40.4% (Arkansas) to 93.7% (North Dakota). Among females, coverage for  $\geq 1$  HPV doses ranged from 39.9% (Kansas) to 76.6% (Rhode Island) and for  $\geq 3$  HPV doses ranged from 20.5% (Utah) to 56.5% (Rhode Island). For males, coverage for  $\geq 1$  HPV doses ranged from 11.0% (Utah) to 69.3% (Rhode Island) and for  $\geq 3$  HPV doses ranged from 7.3% (Nevada) to 43.2% (Rhode Island). Coverage for  $\geq 2$  MMR doses ranged from 83.2% (West Virginia) to 97.4% (New Hampshire and Louisiana). Coverage for  $\geq 2$  varicella doses ranged from 50.6% (South Dakota) to 95.8% (Connecticut).

Coverage with  $\geq 1$  HPV doses in females increased from 2012 to 2013 in five states (Illinois, Michigan, New Hampshire, New Mexico, and South Carolina), with percentage point increases ranging from 12.0 (Illinois) to 18.5 (South Carolina). HPV coverage with  $\geq 1$  doses in females also increased by 6.0 percentage points (CI = 0.1–12.0) in HHS Region IV (southeastern states) and by 7.8 percentage points (CI = 2.1–13.4) in HHS Region V (north central states) (Table 3).

### Healthy People 2020 Targets

The *Healthy People 2020* national targets for vaccination coverage among adolescents aged 13–15 years are 80.0% for  $\geq 1$  Tdap dose,  $\geq 1$  MenACWY dose, and  $\geq 3$  HPV doses (among females) and 90.0% for  $\geq 2$  varicella doses (4). Among adolescents aged 13–15 years, vaccination coverage in 2013 was 87.5% (CI = 86.4%–88.6%) for  $\geq 1$  Tdap dose, 78.1% (CI = 76.7%–79.4%) for  $\geq 1$  MenACWY dose, 32.7%

(CI = 30.3%–35.2%) for  $\geq 3$  HPV doses (among females), and 80.7% (79.2%–82.1%) for  $\geq 2$  varicella doses. From 2012 to 2013, vaccination coverage for these national targets increased by 2.2–4.6 percentage points. The number of states meeting or exceeding the target was 42 for  $\geq 1$  Tdap dose (up from 36 in 2012), 18 for  $\geq 1$  MenACWY dose (up from 12 in 2012), 11 for  $\geq 2$  varicella doses (up from 9 in 2012), and for  $\geq 3$  HPV doses among females, none.

### Discussion

From 2012 to 2013, coverage for adolescents aged 13–17 years increased for all vaccinations routinely recommended for adolescents, with increases ranging from 1.4 percentage points for  $\geq 1$  Tdap dose to 13.8 percentage points for  $\geq 1$  HPV dose in males. Nationally, the *Healthy People 2020* vaccination coverage target for adolescents aged 13–15 years was reached for Tdap (87.5%) for the third survey year, and progress continues for MenACWY (78.1%) and varicella (80.7%). These high vaccination coverage levels confirm that established targets of 80%–90% are achievable for adolescents for vaccination and vaccination series, just as they are for young children. However, coverage for  $\geq 3$  HPV doses among females aged 13–15 years in 2013 was 32.7%, and trends measured by 2013 and earlier NIS-Teen data demonstrate that the 80% *Healthy People 2020* target will be difficult to achieve without changes in clinical practices, leaving adolescents vulnerable to develop the cancers that safe, effective HPV vaccines can prevent. Accelerating progress in HPV vaccination will require the collaboration of numerous stakeholders (e.g., clinicians, parents, adolescents, and public health professionals) to overcome barriers to use of HPV vaccines (8). A variety of factors, including knowledge, attitudes, and behaviors among clinicians and parents likely contribute to lower HPV vaccination initiation compared with Tdap and MenACWY vaccinations. Addressing barriers to HPV vaccination at the recommended ages of 11–12 years could reduce missed opportunities to administer all recommended adolescent vaccines during the same clinical encounter. Another analysis of 2013 NIS-Teen data indicates that for adolescent females born in 2000, coverage with at least 1 dose of HPV vaccine before age 13 years could have reached 91.3% if opportunities to administer HPV vaccine when other vaccines were given had not been missed (9).

Although HPV vaccination of adolescent females increased by only 3.5 percentage points from 2012 to 2013, this increase was significantly greater than that observed from 2011 to 2012, when first dose HPV coverage among adolescent females stagnated. Whether increased health promotion activities aimed at clinicians (e.g., <http://www.cdc.gov/vaccines/youarethekey>) and parents initiated during 2013 account for the modest increase is not known. Vaccination coverage increases in 2013

<sup>\*\*\*</sup> Adolescents were classified as below the federal poverty level if their family's total income was less than the federal poverty level specified for their family size and number of children aged <18 years. All others were classified as at or above the poverty level. Poverty status was unknown for 432 adolescents. Additional information available at <http://www.census.gov/hhs/www/poverty>.

**TABLE 3. Estimated vaccination coverage with selected vaccines and doses\* among adolescents aged 13–17 years† by HHS region and state/selected local area — National Immunization Survey–Teen (NIS-Teen), United States, 2013**

Regional/State/ Local area					Females (n = 8,264)			Males (n = 9,554)		
	≥2 MMR <sup>§</sup> % (95% CI)†††	≥2 VAR <sup>¶</sup> % (95% CI)	≥1 Tdap <sup>**</sup> % (95% CI)	≥1 MenACWY <sup>††</sup> % (95% CI)	≥1 HPV <sup>§§</sup> % (95% CI)	≥2 HPV <sup>¶¶</sup> % (95% CI)	≥3 HPV <sup>***</sup> % (95% CI)	≥1 HPV <sup>§§</sup> % (95% CI)	≥2 HPV <sup>¶¶</sup> % (95% CI)	≥3 HPV <sup>***</sup> % (95% CI)
<b>United States overall</b>	<b>91.8 (±0.8)</b>	<b>78.5 (±1.3)<sup>§§§</sup></b>	<b>86.0 (±0.9)<sup>§§§</sup></b>	<b>77.8 (±1.1)<sup>§§§</sup></b>	<b>57.3 (±1.9)<sup>§§§</sup></b>	<b>47.7 (±2.0)<sup>§§§</sup></b>	<b>37.6 (±1.9)<sup>§§§</sup></b>	<b>34.6 (±1.9)<sup>§§§</sup></b>	<b>23.5 (±1.7)<sup>§§§</sup></b>	<b>13.9 (±1.4)<sup>§§§</sup></b>
<b>HHS Region I</b>	<b>95.7 (±1.4)</b>	<b>90.9 (±2.3)</b>	<b>92.7 (±1.7)</b>	<b>87.7 (±2.1)</b>	<b>61.9 (±4.6)</b>	<b>51.8 (±4.8)</b>	<b>41.8 (±4.7)</b>	<b>51.4 (±4.6)<sup>§§§</sup></b>	<b>36.9 (±4.5)<sup>§§§</sup></b>	<b>23.0 (±3.9)<sup>§§§</sup></b>
Connecticut	97.3 (±2.4)	95.8 (±3.2)	90.8 (±4.3)	90.6 (±4.2)	56.0 (±9.2)	49.0 (±9.3)	40.1 (±9.1)	52.3 (±9.2) <sup>§§§</sup>	36.4 (±8.9) <sup>§§§</sup>	23.4 (±7.9) <sup>§§§</sup>
Maine	88.8 (±4.4) <sup>¶¶¶</sup>	71.0 (±7.2)	83.0 (±4.7)	71.2 (±5.6)	60.2 (±8.8)	55.4 (±8.9)	45.8 (±8.8)	42.2 (±8.5) <sup>§§§</sup>	31.1 (±7.9) <sup>§§§</sup>	17.6 (±6.0)
Massachusetts	95.8 (±2.6)	91.1 (±4.2)	94.9 (±2.6)	89.6 (±3.6)	62.3 (±8.3)	48.9 (±8.6)	39.3 (±8.4)	52.8 (±8.2) <sup>§§§</sup>	37.8 (±8.0) <sup>§§§</sup>	21.8 (±7.0)
New Hampshire	97.4 (±2.2)	91.6 (±4.1)	94.7 (±2.9)	85.6 (±4.4)	68.0 (±8.3) <sup>§§§</sup>	57.2 (±8.6) <sup>§§§</sup>	43.2 (±8.6)	41.4 (±8.4) <sup>§§§</sup>	28.5 (±7.9) <sup>§§§</sup>	17.8 (±6.7)
Rhode Island	95.6 (±2.9)	93.2 (±3.6)	95.5 (±2.9)	92.0 (±3.5)	76.6 (±8.1)	68.5 (±8.7)	56.5 (±9.3)	69.3 (±8.5) <sup>§§§</sup>	58.0 (±9.0) <sup>§§§</sup>	43.2 (±9.0) <sup>§§§</sup>
Vermont	94.5 (±2.7)	90.9 (±4.5)	91.8 (±3.7)	79.2 (±5.3)	60.2 (±9.0)	53.5 (±9.2)	42.7 (±9.1)	41.3 (±8.8) <sup>§§§</sup>	26.3 (±8.0)	21.7 (±7.7) <sup>§§§</sup>
<b>HHS Region II</b>	<b>93.8 (±2.0)</b>	<b>79.1 (±3.6)</b>	<b>88.2 (±2.6)</b>	<b>86.1 (±2.6)</b>	<b>56.5 (±5.3)</b>	<b>50.2 (±5.4)</b>	<b>40.8 (±5.4)</b>	<b>36.6 (±5.1)<sup>§§§</sup></b>	<b>28.1 (±4.8)<sup>§§§</sup></b>	<b>17.5 (±4.1)<sup>§§§</sup></b>
New Jersey	94.9 (±3.2)	79.2 (±6.6)	85.5 (±5.3)	91.8 (±4.1)	45.8 (±9.7)	39.1 (±9.6)	31.4 (±9.2)	32.4 (±8.9) <sup>§§§</sup>	25.7 (±8.4) <sup>§§§</sup>	14.2 (±7.0)
New York	93.3 (±2.5)	79.1 (±4.3)	89.5 (±2.9)	83.3 (±3.4)	61.7 (±6.2)	55.6 (±6.4)	45.4 (±6.6)	38.6 (±6.1) <sup>§§§</sup>	29.3 (±5.8) <sup>§§§</sup>	19.1 (±5.1)
NY-City of New York	90.9 (±4.2)	80.6 (±6.3) <sup>§§§</sup>	88.9 (±4.5)	83.0 (±5.2)	64.2 (±9.0)	56.1 (±9.4)	45.2 (±9.6)	46.2 (±9.6) <sup>§§§</sup>	36.0 (±9.3) <sup>§§§</sup>	29.6 (±9.0)
NY-Rest of State	94.8 (±3.1)	78.1 (±5.9)	89.8 (±3.8)	83.6 (±4.4)	60.1 (±8.5)	55.3 (±8.7)	45.6 (±9.6)	33.8 (±7.9) <sup>§§§</sup>	25.1 (±7.5)	12.5 (±5.9)
<b>HHS Region III</b>	<b>92.6 (±2.0)</b>	<b>80.4 (±3.4)</b>	<b>85.8 (±2.7)</b>	<b>79.7 (±3.2)</b>	<b>55.1 (±5.5)</b>	<b>48.0 (±5.4)</b>	<b>37.8 (±5.1)</b>	<b>36.5 (±5.0)<sup>§§§</sup></b>	<b>24.5 (±4.5)<sup>§§§</sup></b>	<b>14.6 (±3.7)<sup>§§§</sup></b>
Delaware	95.3 (±2.4)	79.8 (±6.3)	84.4 (±4.6)	81.8 (±5.1)	68.7 (±8.1)	59.4 (±8.7)	51.7 (±8.9)	37.1 (±8.5)	25.0 (±7.5)	18.1 (±6.8)
Dist. of Columbia	85.9 (±8.6)	82.1 (±10.2)	83.1 (±8.3)	91.3 (±7.0)	55.6 (±14.6)	43.0 (±14.4)	30.2 (±12.3)	67.7 (±13.9) <sup>§§§</sup>	40.2 (±14.5) <sup>§§§</sup>	24.5 (±13.0) <sup>§§§</sup>
Maryland	93.8 (±3.9)	78.9 (±7.1)	83.2 (±6.2)	78.0 (±6.6)	50.0 (±11.5)	45.5 (±11.4)	33.4 (±10.7)	34.2 (±10.2) <sup>§§§</sup>	23.1 (±9.0)	NA
Pennsylvania	93.8 (±2.8)	92.1 (±3.4)	89.9 (±3.5)	90.4 (±3.6)	59.5 (±8.1)	53.5 (±8.2)	45.9 (±8.1)	44.1 (±7.8) <sup>§§§</sup>	26.8 (±6.9) <sup>§§§</sup>	15.4 (±5.5) <sup>§§§</sup>
PA-Philadelphia	90.2 (±4.6)	91.8 (±4.5)	89.6 (±4.1)	92.1 (±3.8)	78.4 (±7.3)	71.2 (±8.0)	54.5 (±9.1)	55.8 (±9.7)	35.7 (±8.9)	15.8 (±6.2)
PA-Rest of State	94.3 (±3.1)	92.2 (±3.8)	89.9 (±3.9)	90.2 (±4.0)	57.0 (±9.0)	51.1 (±9.1)	44.7 (±9.1)	42.7 (±8.7) <sup>§§§</sup>	25.7 (±7.7) <sup>§§§</sup>	15.4 (±6.2)
Virginia	92.0 (±4.9)	68.0 (±9.1)	83.6 (±6.5)	64.2 (±8.5)	51.9 (±12.7)	41.4 (±12.3)	27.6 (±10.6)	26.4 (±10.6) <sup>§§§</sup>	22.4 (±10.7) <sup>§§§</sup>	NA
West Virginia	83.2 (±4.8)	59.4 (±8.1)	76.7 (±5.6)	77.3 (±5.5) <sup>§§§</sup>	49.7 (±9.4)	43.6 (±9.2)	38.4 (±9.0)	29.4 (±8.5)	19.2 (±7.3)	15.1 (±6.6)
<b>HHS Region IV</b>	<b>92.2 (±1.6)<sup>¶¶¶</sup></b>	<b>76.5 (±2.8)<sup>§§§</sup></b>	<b>82.5 (±2.3)</b>	<b>70.9 (±2.6)<sup>§§§</sup></b>	<b>53.0 (±4.1)<sup>§§§</sup></b>	<b>42.9 (±4.1)</b>	<b>33.9 (±3.9)</b>	<b>28.4 (±3.8)<sup>§§§</sup></b>	<b>18.6 (±3.2)<sup>§§§</sup></b>	<b>11.1 (±2.6)<sup>§§§</sup></b>
Alabama	93.4 (±3.2)	79.1 (±6.1) <sup>§§§</sup>	87.3 (±4.5)	69.5 (±6.0)	54.7 (±9.2)	46.6 (±9.2)	39.6 (±9.0)	18.4 (±6.9)	10.9 (±5.2)	NA
Florida	93.5 (±3.8)	76.0 (±7.0)	84.8 (±5.4)	72.3 (±6.4)	49.7 (±10.2)	40.7 (±10.0)	34.3 (±9.8)	27.8 (±8.6)	16.0 (±6.6)	13.2 (±6.2)
Georgia	96.4 (±3.1)	93.7 (±5.2)	82.0 (±6.6)	76.9 (±7.0)	53.7 (±10.8)	42.3 (±10.4)	33.2 (±9.5)	40.5 (±11.5) <sup>§§§</sup>	31.0 (±10.7) <sup>§§§</sup>	15.3 (±8.2)
Kentucky	92.7 (±3.7)	66.5 (±7.7)	84.4 (±5.1)	71.2 (±6.3)	47.6 (±9.8)	38.6 (±9.5)	26.8 (±8.5)	19.0 (±7.4)	10.8 (±5.2)	NA
Mississippi	92.3 (±3.9)	55.7 (±8.2)	60.2 (±6.7)	50.1 (±6.9)	53.1 (±9.5)	35.6 (±9.3) <sup>§§§</sup>	25.2 (±8.6) <sup>§§§</sup>	13.6 (±6.6)	NA	NA
North Carolina	87.1 (±4.7) <sup>¶¶¶</sup>	74.0 (±6.6)	89.4 (±4.0)	72.4 (±5.7)	59.3 (±9.5)	47.4 (±9.7)	32.8 (±9.1)	33.2 (±8.8) <sup>§§§</sup>	24.4 (±8.0) <sup>§§§</sup>	12.4 (±6.3)
South Carolina	91.0 (±3.8)	58.6 (±8.1)	71.9 (±6.6)	68.7 (±6.6) <sup>§§§</sup>	60.4 (±9.7) <sup>§§§</sup>	53.0 (±10.1) <sup>§§§</sup>	40.7 (±10.4) <sup>§§§</sup>	22.2 (±9.0)	13.1 (±6.7)	NA
Tennessee	88.4 (±4.6)	79.7 (±6.5)	80.0 (±5.4)	67.8 (±6.1)	48.9 (±9.5)	39.8 (±9.4)	35.9 (±9.1)	28.9 (±8.2)	18.0 (±7.1)	NA
<b>HHS Region V</b>	<b>93.6 (±1.3)<sup>§§§</sup></b>	<b>83.0 (±2.4)<sup>§§§</sup></b>	<b>86.3 (±1.9)<sup>§§§</sup></b>	<b>79.9 (±2.1)<sup>§§§</sup></b>	<b>57.4 (±3.8)<sup>§§§</sup></b>	<b>46.1 (±3.8)<sup>§§§</sup></b>	<b>35.0 (±3.6)</b>	<b>28.3 (±3.4)<sup>†††</sup></b>	<b>18.2 (±2.9)<sup>†††</sup></b>	<b>12.2 (±2.5)<sup>†††</sup></b>
Illinois	93.5 (±2.5) <sup>§§§</sup>	79.9 (±5.1) <sup>§§§</sup>	86.2 (±4.2) <sup>§§§</sup>	79.0 (±4.5) <sup>§§§</sup>	53.2 (±7.6) <sup>§§§</sup>	42.6 (±7.5) <sup>§§§</sup>	33.8 (±7.2) <sup>§§§</sup>	34.8 (±7.5)	21.2 (±6.6)	16.5 (±6.4)
IL-City of Chicago	88.8 (±5.4)	79.4 (±8.3)	89.7 (±5.2) <sup>§§§</sup>	83.3 (±6.3)	61.8 (±12.7)	49.2 (±12.8)	38.6 (±12.1)	50.0 (±11.7)	29.1 (±10.4)	19.8 (±8.5)
IL-Rest of State	94.6 (±2.8) <sup>§§§</sup>	80.0 (±6.1) <sup>§§§</sup>	85.4 (±5.0) <sup>§§§</sup>	78.0 (±5.4) <sup>§§§</sup>	51.2 (±9.0) <sup>§§§</sup>	41.1 (±8.9) <sup>§§§</sup>	32.6 (±8.5) <sup>§§§</sup>	31.4 (±8.9)	19.4 (±7.8)	15.8 (±7.6)
Indiana	93.7 (±3.1)	91.8 (±4.2)	90.6 (±3.3)	93.5 (±2.7)	54.1 (±8.3)	44.2 (±8.2)	34.6 (±7.7)	18.2 (±6.3)	13.5 (±5.6)	8.1 (±4.3)
Michigan	94.0 (±3.4)	92.2 (±3.8)	81.0 (±5.2)	90.7 (±3.9)	66.0 (±9.1) <sup>§§§</sup>	49.4 (±9.9)	34.5 (±9.4)	30.0 (±8.1) <sup>§§§</sup>	16.8 (±6.7)	7.7 (±4.5)
Minnesota	94.0 (±3.2)	86.3 (±6.0)	91.4 (±3.8)	66.3 (±6.2)	59.3 (±9.3)	45.8 (±9.4)	37.6 (±9.0)	22.0 (±6.7)	13.1 (±5.6)	8.6 (±4.5)
Ohio	92.9 (±3.4)	66.2 (±7.4)	84.4 (±4.9) <sup>§§§</sup>	69.2 (±6.1)	54.8 (±9.3)	47.6 (±9.4)	35.0 (±8.8)	26.5 (±8.2) <sup>§§§</sup>	19.7 (±7.1) <sup>§§§</sup>	14.7 (±6.4)
Wisconsin	93.9 (±3.2)	93.4 (±3.7)	89.6 (±4.2)	81.4 (±4.9)	59.4 (±9.1)	47.8 (±9.4)	36.8 (±9.0)	31.7 (±8.5) <sup>§§§</sup>	20.9 (±7.7) <sup>§§§</sup>	13.7 (±6.7)
<b>HHS Region VI</b>	<b>89.0 (±2.5)</b>	<b>77.8 (±3.5)</b>	<b>84.9 (±2.6)</b>	<b>81.5 (±2.5)</b>	<b>56.2 (±5.2)</b>	<b>46.9 (±5.3)</b>	<b>38.1 (±5.2)<sup>§§§</sup></b>	<b>33.1 (±4.6)<sup>§§§</sup></b>	<b>24.2 (±4.2)<sup>§§§</sup></b>	<b>14.5 (±3.3)<sup>§§§</sup></b>
Arkansas	89.5 (±3.8)	59.6 (±7.6)	77.7 (±5.3) <sup>§§§</sup>	40.4 (±6.5)	44.3 (±9.2)	35.4 (±8.9)	24.4 (±8.0)	17.7 (±7.5)	NA	NA
Louisiana	97.4 (±2.4) <sup>§§§</sup>	89.1 (±4.4)	87.9 (±4.5)	87.7 (±4.4)	59.8 (±9.2)	54.1 (±9.6)	42.1 (±9.8)	27.0 (±8.1)	20.5 (±7.6)	13.5 (±6.6)
New Mexico	92.3 (±3.1)	72.5 (±6.3) <sup>§§§</sup>	85.6 (±4.5)	70.9 (±5.6) <sup>§§§</sup>	67.1 (±8.6) <sup>§§§</sup>	56.1 (±9.2) <sup>§§§</sup>	44.3 (±9.2) <sup>§§§</sup>	31.4 (±7.6) <sup>§§§</sup>	27.0 (±7.2) <sup>§§§</sup>	19.2 (±6.6)
Oklahoma	89.5 (±3.4)	67.3 (±6.2)	78.1 (±4.9)	66.2 (±5.4)	54.8 (±8.7)	46.5 (±8.7)	35.4 (±8.3)	45.2 (±7.5) <sup>§§§</sup>	31.1 (±6.9) <sup>§§§</sup>	17.3 (±5.7)
Texas	87.3 (±3.6)	79.4 (±4.9)	86.1 (±3.6)	87.6 (±3.5)	56.2 (±7.4)	46.3 (±7.4)	38.9 (±7.4)	34.1 (±6.5) <sup>§§§</sup>	25.2 (±5.9) <sup>§§§</sup>	15.0 (±4.6) <sup>§§§</sup>
TX-Bexar County	87.0 (±4.4)	78.9 (±6.2)	86.6 (±4.5)	87.2 (±4.2)	54.8 (±9.1)	45.7 (±9.2)	32.5 (±8.8)	32.4 (±8.7) <sup>§§§</sup>	19.1 (±6.9)	9.6 (±4.7)
TX-City of Houston	86.8 (±5.3)	82.1 (±7.2)	86.5 (±5.6)	91.4 (±4.6)	62.0 (±10.8)	51.9 (±11.3)	33.9 (±10.6)	40.3 (±9.8)	27.8 (±8.5)	17.5 (±7.0)
TX-Rest of State	87.3 (±4.1)	79.2 (±5.6)	86.0 (±4.1)	87.4 (±4.0)	55.9 (±8.6)	45.9 (±8.6)	39.8 (±8.5)	33.7 (±7.4) <sup>§§§</sup>	25.4 (±6.8) <sup>§§§</sup>	15.2 (±5.3) <sup>§§§</sup>

See table footnotes on next page.

were primarily observed in the last quarter of the year, which could reflect the impact of health promotion activities initiated during the summer and fall of 2013.

The high number of measles cases reported in the United States in 2014 (580 cases through July 18) (<http://www.cdc.gov/measles/index.html>) is a reminder of the importance of achieving and maintaining high 2-dose MMR vaccination coverage among children and adolescents throughout the country.

Whereas eight states had 2-dose coverage >95%, 13 states and the District of Columbia had 2-dose coverage <90%, reflecting a vulnerability to measles transmission.

In 2013, there were racial and ethnic differences for some vaccines (MenACWY, MMR, and HPV). Compared with whites, vaccination coverage among Hispanics was higher for ≥1 MenACWY dose and each HPV dose among males and females, but lower for ≥2 MMR doses. Vaccination coverage was similar

**TABLE 3. (Continued) Estimated vaccination coverage with selected vaccines and doses\* among adolescents aged 13–17 years† by HHS region and state/selected local area — National Immunization Survey–Teen (NIS-Teen), United States, 2013**

Regional/State/ Local area					Females (n = 8,264)			Males (n = 9,554)		
	≥2 MMR <sup>§</sup> % (95% CI)†††	≥2 VAR <sup>¶</sup> % (95% CI)	≥1 Tdap <sup>**</sup> % (95% CI)	≥1 MenACWY <sup>††</sup> % (95% CI)	≥1 HPV <sup>§§</sup> % (95% CI)	≥2 HPV <sup>¶¶</sup> % (95% CI)	≥3 HPV <sup>***</sup> % (95% CI)	≥1 HPV <sup>§§</sup> % (95% CI)	≥2 HPV <sup>¶¶</sup> % (95% CI)	≥3 HPV <sup>***</sup> % (95% CI)
<b>HHS Region VII</b>	<b>89.0 (±2.5)</b>	<b>67.4 (±4.5)</b>	<b>82.4 (±2.9)</b>	<b>62.5 (±3.7)</b>	<b>49.7 (±5.6)</b>	<b>41.7 (±5.4)</b>	<b>31.7 (±4.9)</b>	<b>26.0 (±4.4)<sup>§§§</sup></b>	<b>16.6 (±3.5)<sup>§§§</sup></b>	<b>9.4 (±2.7)<sup>§§§</sup></b>
Iowa	90.2 (±4.0)	62.1 (±7.4)	79.6 (±5.0)	63.6 (±5.9)	57.0 (±8.7)	52.2 (±8.8)	41.9 (±8.8)	30.3 (±8.0)	24.0 (±7.3) <sup>§§§</sup>	13.7 (±5.4)
Kansas	86.9 (±4.6)	80.7 (±6.1)	84.6 (±4.9) <sup>¶¶¶</sup>	55.9 (±6.8)	39.9 (±9.9)	29.9 (±9.2)	21.0 (±8.2)	25.1 (±8.6) <sup>§§§</sup>	19.3 (±7.8)	NA
Missouri	88.3 (±4.8)	58.6 (±8.6)	81.5 (±5.4)	60.7 (±7.1)	46.1 (±10.6)	38.1 (±10.1)	28.8 (±9.0)	20.5 (±7.7)	NA	NA
Nebraska	92.3 (±3.2)	84.6 (±5.5)	86.1 (±4.7)	77.5 (±5.2)	65.1 (±9.2)	55.3 (±9.3)	41.5 (±9.1)	38.2 (±8.7) <sup>§§§</sup>	26.4 (±7.8) <sup>§§§</sup>	19.7 (±7.2) <sup>§§§</sup>
<b>HHS Region VIII</b>	<b>91.0 (±2.1)</b>	<b>71.8 (±3.8)</b>	<b>86.1 (±2.5)</b>	<b>67.0 (±3.3)</b>	<b>52.6 (±5.0)</b>	<b>43.4 (±5.0)</b>	<b>33.1 (±4.7)</b>	<b>24.3 (±4.4)</b>	<b>16.6 (±3.8)</b>	<b>8.6 (±2.5)</b>
Colorado	92.4 (±3.3)	78.5 (±5.7)	87.1 (±4.4) <sup>¶¶¶</sup>	73.6 (±5.6)	58.2 (±8.6)	50.0 (±8.8)	39.1 (±8.7)	33.5 (±8.6)	21.7 (±7.5)	9.9 (±4.8)
Montana	90.5 (±4.0)	58.6 (±8.6)	84.3 (±5.1)	51.6 (±6.6)	45.8 (±9.6)	37.9 (±9.0)	28.3 (±8.1) <sup>¶¶¶</sup>	23.8 (±8.1)	17.2 (±7.0)	9.4 (±4.6)
North Dakota	96.1 (±1.9) <sup>§§§</sup>	86.0 (±5.3) <sup>§§§</sup>	95.0 (±2.9)	93.7 (±3.2)	57.5 (±9.4)	51.0 (±9.4)	41.1 (±9.1)	36.1 (±9.1) <sup>§§§</sup>	26.6 (±8.4) <sup>§§§</sup>	18.4 (±7.5)
South Dakota	94.1 (±3.2)	50.6 (±8.4)	70.0 (±6.4)	51.7 (±6.7) <sup>§§§</sup>	56.0 (±9.7)	52.0 (±9.7)	42.3 (±9.6)	22.1 (±7.1)	17.0 (±6.4)	8.4 (±4.2)
Utah	87.5 (±4.6)	62.2 (±8.4)	86.2 (±4.9)	61.0 (±6.7)	44.3 (±9.6)	30.9 (±8.9)	20.5 (±7.8)	11.0 (±5.8)	NA	NA
Wyoming	90.6 (±4.0)	90.1 (±4.5)	92.3 (±3.0) <sup>§§§</sup>	63.1 (±6.2)	54.3 (±9.4)	49.5 (±9.4)	42.1 (±9.3)	16.6 (±6.0)	12.3 (±5.3)	8.4 (±4.5)
<b>HHS Region IX</b>	<b>90.7 (±3.4)</b>	<b>77.4 (±5.2)</b>	<b>89.7 (±3.5)</b>	<b>80.6 (±4.5)</b>	<b>66.0 (±7.5)</b>	<b>54.8 (±8.0)</b>	<b>43.3 (±8.1)</b>	<b>48.7 (±7.8)<sup>§§§</sup></b>	<b>32.5 (±7.7)<sup>§§§</sup></b>	<b>16.4 (±6.3)</b>
Arizona	85.4 (±4.6)	67.8 (±7.1)	84.4 (±5.0)	86.7 (±4.6)	64.1 (±8.7)	47.9 (±9.5)	37.4 (±9.2)	44.4 (±8.7) <sup>§§§</sup>	33.5 (±8.4) <sup>§§§</sup>	19.5 (±6.9)
California	91.5 (±4.2)	79.0 (±6.5)	91.1 (±4.4)	80.9 (±5.7)	67.6 (±9.4)	57.3 (±10.0)	45.8 (±10.2)	50.9 (±9.7) <sup>§§§</sup>	33.2 (±9.7) <sup>§§§</sup>	16.6 (±8.0)
Hawaii	90.4 (±4.5)	83.3 (±5.7)	80.2 (±5.4)	75.0 (±6.0)	52.7 (±10.1)	46.6 (±10.0)	34.4 (±9.5)	39.7 (±8.9)	29.0 (±8.1)	15.1 (±6.0)
Nevada	92.8 (±3.5)	74.6 (±6.6)	88.3 (±4.1)	64.0 (±6.1)	53.8 (±9.4)	38.9 (±9.2)	27.4 (±8.3)	31.9 (±8.5) <sup>§§§</sup>	20.4 (±7.2)	7.3 (±3.9)
<b>HHS Region X</b>	<b>90.0 (±2.4)</b>	<b>75.3 (±4.6)</b>	<b>84.1 (±3.0)</b>	<b>72.7 (±3.5)<sup>§§§</sup></b>	<b>61.0 (±5.8)</b>	<b>51.2 (±5.9)</b>	<b>40.7 (±5.9)</b>	<b>32.0 (±5.0)<sup>§§§</sup></b>	<b>19.3 (±4.0)<sup>§§§</sup></b>	<b>11.6 (±3.2)<sup>§§§</sup></b>
Alaska	92.0 (±3.7)	80.7 (±6.1)	74.3 (±5.8)	55.2 (±6.5)	52.2 (±9.4)	36.1 (±9.0)	27.1 (±8.2)	27.6 (±7.9) <sup>§§§</sup>	17.8 (±6.9) <sup>§§§</sup>	8.5 (±4.7)
Idaho	85.2 (±5.5)	63.8 (±9.4)	74.6 (±6.6) <sup>§§§</sup>	71.6 (±7.0)	55.0 (±10.6)	45.8 (±10.5)	31.3 (±9.6)	34.5 (±10.2) <sup>§§§</sup>	21.6 (±8.8)	NA
Oregon	92.3 (±3.2)	84.3 (±4.7) <sup>§§§</sup>	87.0 (±4.3)	65.3 (±5.8)	66.3 (±8.4)	54.9 (±8.8)	39.5 (±8.8)	35.8 (±8.1) <sup>§§§</sup>	20.8 (±6.9) <sup>§§§</sup>	12.2 (±5.0)
Washington	89.9 (±4.0)	71.6 (±8.1)	86.2 (±5.0)	79.0 (±5.6)	60.7 (±9.7)	52.3 (±9.9)	45.3 (±9.8)	29.8 (±8.0) <sup>§§§</sup>	18.0 (±6.3) <sup>§§§</sup>	12.5 (±5.2)
<b>Range</b>	<b>(83.2–97.4)</b>	<b>(50.6–95.8)</b>	<b>(60.2–95.5)</b>	<b>(40.4–93.7)</b>	<b>(39.9–76.6)</b>	<b>(29.9–68.5)</b>	<b>(20.5–56.5)</b>	<b>(11.0–69.3)</b>	<b>(10.8–58.0)</b>	<b>(7.3–43.2)</b>
<b>Territory</b>										
Guam	84.8 (±4.6)	43.7 (±8.5)	73.8 (±5.4)	72.4 (±5.7)	69.1 (±8.2)	45.2 (±8.9)	33.6 (±8.3)	21.8 (±7.0)	8.6 (±4.2)	NA
U.S. Virgin Islands	92.0 (±3.0)	77.9 (±5.3)	76.4 (±5.2)	38.4 (±6.0)	33.2 (±8.5)	17.7 (±6.7)	9.5 (±4.9)	17.2 (±6.6)	NA	NA

**Abbreviations:** CI = confidence interval; HHS = U.S. Department of Health and Human Services; MMR = measles, mumps, and rubella; VAR = varicella; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; MenACWY = meningococcal conjugate; HPV = human papillomavirus; NA = not available (estimate not reported because unweighted sample size for the denominator was <30 or 95% CI half width/estimate >0.6).

\* Vaccination estimates for additional measures, including ≥3 doses hepatitis B, and ≥1 dose varicella vaccines are available at <http://www.cdc.gov/vaccines/stats-surv/nis/default.htm#nisteen>.

† Adolescents (N = 18,264) in the 2013 NIS-Teen were born January 11, 1995, through February 13, 2001.

§ ≥2 doses of MMR vaccine.

¶ ≥2 doses of VAR vaccine among adolescents without a reported history of varicella.

\*\* ≥1 dose Tdap vaccine on or after age 10 years.

†† ≥1 dose of MenACWY or meningococcal-unknown type vaccine.

§§ ≥1 dose of HPV vaccine, either quadrivalent or bivalent may be used for females, and only quadrivalent may be used for males. For ≥1, ≥2, and ≥3 dose measures, separate percentages are reported among females only (n = 8,710) and among males only (n = 9,554).

¶¶ ≥2 doses of HPV vaccine, either quadrivalent or bivalent may be used for females, and only quadrivalent may be used for males.

\*\*\* ≥3 doses of HPV vaccine, either quadrivalent or bivalent may be used for females, and only quadrivalent may be used for males.

††† Estimates with 95% CI half-widths >10 might not be reliable.

§§§ Statistically significant (p<0.05) percentage point increase from 2012.

¶¶¶ Statistically significant (p<0.05) percentage point decrease from 2012.

by poverty level except for HPV vaccination, with higher coverage with ≥1, ≥2, and ≥3 HPV doses for males and ≥1 and ≥2 HPV doses for females among those living below poverty level compared with those living at or above the poverty level. The higher coverage among some racial/ethnic minorities and those living below poverty level might be partly attributable to the continued effectiveness of the Vaccines for Children program (VFC), which provides recommended vaccines at no cost to eligible children.\*\*\*\*

\*\*\*\* Children aged ≤18 years who are Medicaid-eligible, uninsured, or American Indian/Alaska Native (as defined by the Indian Health Care Improvement Act) are eligible to receive vaccines from providers through the VFC program. Children categorized as “underinsured” (because their health plans do not include coverage for recommended vaccinations) are eligible to receive VFC vaccines if they are served by a rural health clinic or federally qualified health center or under an approved deputization agreement. Additional information is available at <http://www.cdc.gov/vaccines/programs/vfc/providers/eligibility.html>.

However, the significantly lower rates of HPV vaccine series completion in black females compared with white females warrants investigation of possible differences (e.g., access to quality care, such as access to clinicians with reminder-recall systems) that might limit vaccine series completion in some populations. Learning what factors are fostering achievement of increasing and comparatively higher HPV vaccination coverage among Hispanic adolescents might inform strategies for the general population. The similar or higher vaccination coverage among adolescents living below the poverty threshold contrasts with findings for coverage with some early childhood vaccinations (10). Among children aged 19–35 months, poverty has been associated with lower coverage of newer vaccines (e.g., rotavirus), and some vaccines



**What is already known on this topic?**

The Advisory Committee on Immunization Practices (ACIP) recommends that adolescents receive 1 dose of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis (Tdap) vaccine, 2 doses of meningococcal conjugate (MenACWY) vaccine, and 3 doses of human papillomavirus (HPV) vaccine. ACIP also recommends administration of these and all age-appropriate vaccines during a single visit. During 2006–2012, national vaccination coverage for  $\geq 1$  Tdap and  $\geq 1$  MenACWY increased steadily, with Tdap coverage in 2011 reaching national target levels for adolescents. During 2007–2011, coverage for  $\geq 1$  HPV vaccine dose among females increased steadily, but from 2011 to 2012, there were no changes in coverage. Coverage for  $\geq 1$  HPV vaccine dose among males increased from 2011–2012.

**What is added by this report?**

From 2012 to 2013, vaccination coverage among U.S. adolescents increased to 86.0% for  $\geq 1$  dose of Tdap vaccine, 77.8% for  $\geq 1$  dose of MenACWY vaccine, 57.3% for  $\geq 1$  dose of HPV vaccine among females, and 34.6% for  $\geq 1$  dose of HPV vaccine among males. Vaccination coverage levels continued to vary widely among states. Although HPV vaccination coverage increased among both females and males, levels are still low and reflect many missed opportunities. Five states had substantial increases in HPV coverage from 2012 to 2013, suggesting greater progress is feasible.

**What are the implications for public health practice?**

Lower vaccination coverage for HPV compared with Tdap and MenACWY vaccines indicates clinicians, parents, and adolescents are missing opportunities for infection and cancer prevention. Clinician recommendations strongly influence the decisions of parents to vaccinate their children; to maximize coverage, clinicians should clearly and consistently recommend all ACIP-recommended vaccines, including HPV. Health care systems interventions, including use of client reminder and recall systems, immunization information systems, clinician reminders, and standing orders, should be employed to improve protection of adolescents from vaccine-preventable infections and future cancers.

that require doses during the second year of life (e.g., DTaP and PCV) (10).

Geographic differences in coverage continue to vary by vaccine. Factors contributing to state or regional differences might include different state school vaccination requirements, different stages of vaccine policy implementation, increased vaccine demand in response to local disease, differing parental knowledge and attitudes toward or access to vaccination, inconsistent clinician adherence to and knowledge about vaccine recommendations, and other factors. Although there was an overall increase in HPV vaccination coverage among females, there was continued wide variability among states and HHS Regions. HPV coverage among females increased significantly

from 2012 to 2013 in only five states (Illinois, Michigan, New Hampshire, New Mexico, and South Carolina) for  $\geq 1$  HPV dose and in four states (Illinois, Mississippi, New Mexico, and South Carolina) for  $\geq 3$  HPV doses. These states have undertaken diverse initiatives that likely contributed to the significant increases in HPV vaccination coverage, including 1) developing partnerships with state chapters of the American Academy of Pediatrics and with the Academy of Family Physicians to promote HPV immunization, 2) working actively with Immunization Coalitions and Cancer Collaboratives to incorporate HPV immunization into strategic plans and ensuring that clinical and immunization conferences highlight HPV vaccination topics, 3) developing an HPV Vaccine Task Force to discuss and facilitate HPV vaccination health promotion activities and interventions, 4) providing peer-to-peer physician HPV vaccination training onsite, and 5) increasing provider assessment and feedback visits focused on increasing vaccination coverage among adolescents. Understanding the extent to which vaccination programs and policies, provider practices, and parental knowledge and access influence these geographic differences might help inform public health action.

The findings in this report are subject to at least three limitations. First, the household response rates for landline and cell phone samples were 51.1% and 23.3%, respectively. Furthermore, only 59.5% of landline and 54.5% of cell phone completed interviews had adequate vaccine provider data. Therefore, estimates might have been biased, even after weighting adjustments for nonresponse and exclusion of households without telephones. A total survey error model of 2011 NIS-Teen that included comparison with provider-reported data collected from a sample of National Health Interview Survey participants indicated coverage estimates were approximately 2, 3, and 6 percentage points too high for Tdap, MenACWY, and HPV (among females) vaccinations, respectively, as a result of noncoverage and nonresponse error.<sup>††††</sup> Estimates of bias do not include errors in vaccination status (e.g., underascertainment from incomplete vaccination provider identification and unknown medical record completeness) (7). Second, although response rates have been stable in recent years and weights have been adjusted to reflect the increasing prevalence of cell phone-only households over time, it is possible that nonresponse bias might have changed over time, which could affect interpretation of comparisons across data years. Finally, some of the state-specific and racial/ethnic-specific analyses might be unreliable because of small sample sizes (7). Estimates with confidence half-widths wider than 10 are less reliable, and this impacts estimates for some racial and ethnic populations. For

<sup>††††</sup> Additional information available at <http://www.amstat.org/meetings/jsm/2012/onlineprogram/abstractdetails.cfm?abstractid=304324>.



HPV coverage analyses by state and sex, small sample sizes decrease the power to detect differences.

High Tdap coverage levels among adolescents aged 13–17 years indicate that similar coverage levels are attainable for other vaccines recommended for adolescents. Improved adherence of clinicians and parents to the ACIP recommendation to administer all age-appropriate vaccines during a single visit could substantially increase lagging vaccination coverage levels. At each encounter with a clinician, every adolescent's immunization history should be reviewed to ensure complete vaccination consistent with ACIP recommendations. Additionally, clinicians should provide strong, consistent recommendations for all ACIP-recommended vaccines. HPV vaccine should be recommended with the same emphasis and at the same time as the other vaccines for adolescents. Recommended strategies to improve vaccination coverage include use of combinations of strategies such as patient reminder and recall systems, standing orders, and use of immunization information systems (5). Coverage levels should continue to be monitored to describe coverage disparities, to use estimates to identify target populations for interventions to increase coverage, and to inform development of additional policies that will support further efforts to reduce vaccine-preventable diseases, including cancers.

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## WHO Global Rotavirus Surveillance Network: A Strategic Review of the First 5 Years, 2008–2012

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Since 2008, the World Health Organization (WHO) has coordinated the Global Rotavirus Surveillance Network, a network of sentinel surveillance hospitals and laboratories that report to ministries of health (MoHs) and WHO clinical features and rotavirus testing data for children aged <5 years hospitalized with acute gastroenteritis. In 2013, WHO conducted a strategic review to assess surveillance network performance, provide recommendations for strengthening the network, and assess the network's utility as a platform for other vaccine-preventable disease surveillance. The strategic review team determined that during 2011 and 2012, a total of 79 sites in 37 countries met reporting and testing inclusion criteria for data analysis. Of the 37 countries with sites meeting inclusion criteria, 13 (35%) had introduced rotavirus vaccine nationwide. All 79 sites included in the analysis were meeting 2008 network objectives of documenting presence of disease and describing disease epidemiology, and all countries were using the rotavirus surveillance data for vaccine introduction decisions, disease burden estimates, and advocacy; countries were in the process of assessing the use of this surveillance platform for other vaccine-preventable diseases. However, the review also indicated that the network would benefit from enhanced management, standardized data formats, linkage of clinical data with laboratory data, and additional resources to support network functions. In November 2013, WHO's Strategic Advisory Group of Experts on Immunization (SAGE) endorsed the findings and recommendations made by the review team and noted potential opportunities for using the network as a platform for other vaccine-preventable disease surveillance. WHO will work to implement the recommendations to improve the network's functions and to provide higher quality surveillance data for use in decisions related to vaccine introduction and vaccination program sustainability.

### Background

Rotavirus is a leading cause of severe gastroenteritis among children aged <5 years worldwide, accounting for approximately 5% of child deaths annually (1). Since 2009, WHO has recommended that rotavirus vaccines be included in all national immunization programs, particularly in countries with high diarrhea-related child mortality (2). As of April 2014, a

total of 56 (29%) of 194 WHO member states had introduced rotavirus vaccine, with 20 (36%) of those countries eligible for financial support from the GAVI Alliance, a public-private global health partnership that has helped increase access to immunization in poor countries (3–4). Key factors for countries to consider in the decision to introduce rotavirus vaccine include local burden, trends, and age distribution of disease (5). Disease surveillance systems can play a key role in providing such information and potentially serve as platforms for impact assessments after vaccine introduction.

In 2008, WHO brought together existing regional surveillance networks to establish a standardized global sentinel hospital surveillance network for rotavirus disease, with financial support from the GAVI Alliance. The Global Rotavirus Surveillance Network includes sentinel surveillance hospitals and laboratories that report to MoHs and WHO clinical features and rotavirus testing data for children aged <5 years hospitalized with acute gastroenteritis. In addition to managerial oversight, WHO provides technical assistance to countries, as well as financial support to countries eligible for GAVI Alliance funding for surveillance activities. During the prevaccination introduction period, original objectives of the network were to 1) provide data for describing disease epidemiology, including disease burden, 2) establish a platform to measure impact after vaccine introduction, and 3) identify circulating strains and strain distribution. Objectives after vaccine introduction were to 1) assess disease trends, 2) monitor changes in circulating strains, and 3) use the platform for vaccine effectiveness studies.

During 2008–2012, WHO established a network of sentinel hospital and national laboratories supported by regional reference laboratories and a global reference laboratory. Additionally, WHO launched an annual external quality assessment program targeting participating laboratories, developed a standardized protocol for sentinel site assessments, provided technical advice and laboratory supplies to sites, and shared data semiannually via a global surveillance and information bulletin.\* In 2011, WHO established an informal Technical Advisory Group of experts for new vaccines surveillance (iTAG) and a laboratory technical working group to provide guidance

\* Available at [http://www.who.int/immunization/monitoring\\_surveillance/resources/NUVI](http://www.who.int/immunization/monitoring_surveillance/resources/NUVI).

for further improving and standardizing the global surveillance network. By 2012, the global network had expanded to 178 sentinel surveillance sites in 60 countries (72% of which were eligible for GAVI Alliance support) from all six WHO regions.

In 2013, WHO conducted a strategic review of surveillance network performance in the context of the recommendation for quality case-based disease surveillance in the 2011–2020 Global Vaccine Action Plan (6). The objectives of the review were to 1) assess whether and to what extent the 2008 objectives for the network were met, 2) assess MoH perspectives on the need and value of the network, 3) assess laboratory network management, 4) review existing data management systems, 5) assess the adequacy of resources available to WHO, and 6) provide recommendations for strengthening the network and assess the network's utility as a platform for other vaccine-preventable disease surveillance.

### Structure of the strategic review

WHO, under the direction of iTAG and with guidance from technical partners, performed the following assessments to review surveillance network performance during 2008–2012: 1) questionnaires to obtain country-level expert and MoH staff opinions about the value of the surveillance data for supporting national decisions on vaccine introduction, 2) reviews of the laboratory network and data management systems by external consultants, 3) review of published literature and GAVI Alliance vaccine introduction applications to evaluate use of rotavirus surveillance data, and 4) internal review of WHO activities and funding disbursement. WHO also analyzed data from sentinel sites that reported  $\geq 10$  months of data and tested  $\geq 100$  stool specimens each year in 2011 and 2012. Data analysis for sites that met these inclusion criteria included description of the burden, trends, and age distribution of rotavirus disease, rotavirus genotype distribution, and rotavirus disease trends before and after vaccine introduction in countries that had sufficient data.

WHO and iTAG members discussed review methodology and preliminary findings during monthly teleconferences, leading to a comprehensive review of all findings during a September 2013 meeting. Findings and proposed actions to strengthen the surveillance network and further improve surveillance data quality and use were presented to SAGE in November 2013.<sup>†</sup>

### Summary of strategic review findings

Countries in all six WHO regions valued and used the rotavirus surveillance platform and data for vaccine introduction

decisions, as well as for disease burden estimates and advocacy. In some cases, countries used the platform to conduct special studies to assess vaccination impact on rotavirus disease. During 2011–2012, a total of 169 sites in 55 countries reported rotavirus surveillance data for both years to WHO (Figure). Seventy-nine (47%) sites in 37 countries met the reporting and testing inclusion criteria for data analysis, including 63 (80%) sites in 32 countries eligible for GAVI Alliance support. Thirteen (35%) of the 37 countries with sites meeting inclusion criteria had introduced rotavirus vaccine nationwide; one had introduced rotavirus vaccine subnationally in a single province. Among sites included in the analysis, the median monthly percentage of eligible children enrolled in surveillance was 93%. The mean percentage of rotavirus detection among 75,353 tested children during January 2011–December 2012 was 36%, with the largest percentage positive (42%) in infants aged 6–11 months. The most frequently observed rotavirus genotypes during 2009–2012 were the five considered globally prevalent (G1P[8], G2P[4], G3P[8], G4P[8], and G9P[8]), although regional differences were observed.

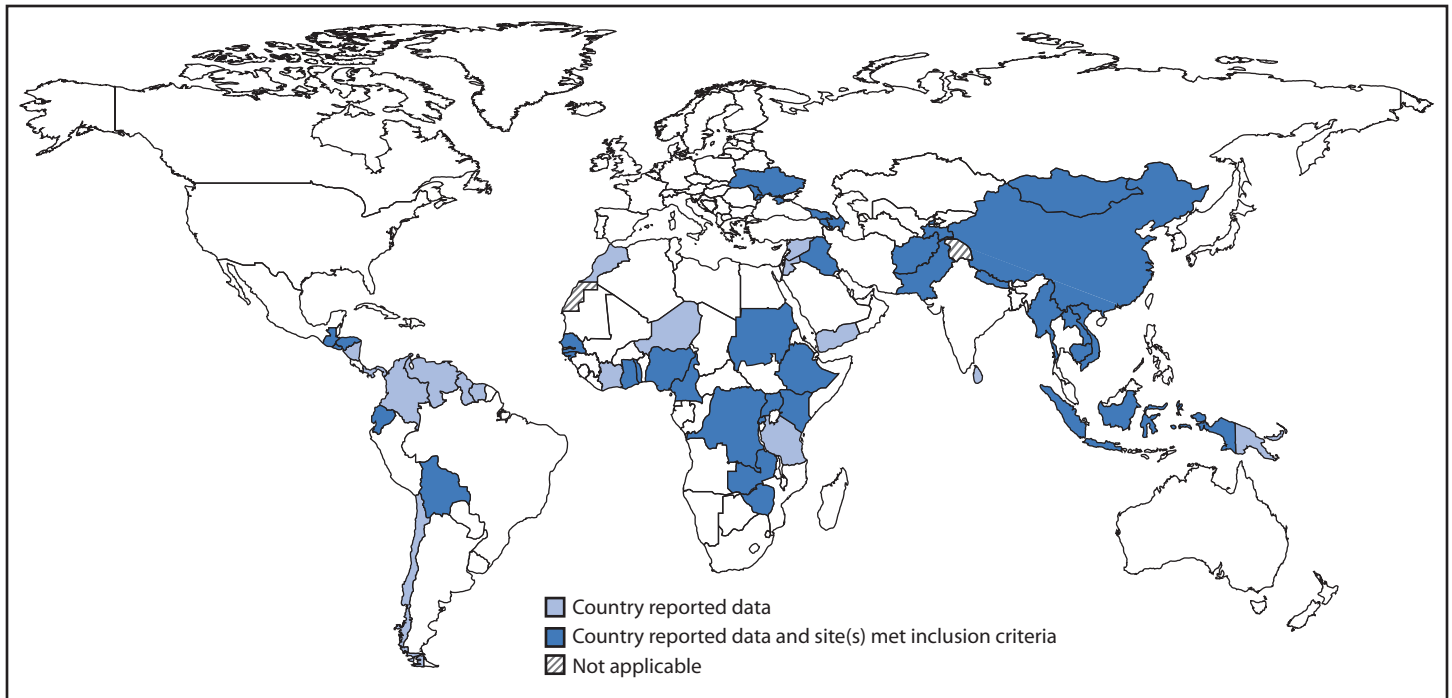
The strategic review team concluded that sites included in the analysis were meeting the 2008 objectives for documenting presence of disease, describing disease epidemiology, using surveillance as a platform for special studies in some countries, and using the data for policy decisions. The majority of countries eligible for GAVI Alliance support and sites receiving financial support consistently met performance indicator targets for recruitment, testing, and reporting. The review team noted that the network would benefit from enhanced management to ensure accountability at all levels and noted that a lack of standardized data formats and incomplete linkage of clinical and laboratory data in some locations limited the network's ability to undertake real-time performance monitoring and analyses. To fully support the global network, additional human and financial resources are needed at all levels to support management, data processing and analysis, and recommended on-site assessments, and also to support countries not eligible for GAVI Alliance support. Short-term, year-to-year funding inhibited longer-term program planning and investment at all network levels.

### SAGE-endorsed findings and recommendations

In November 2013, SAGE endorsed the strategic review findings and agreed that the experience of the network's first 5 years should inform future surveillance needs, including potential use of the network as a platform for other vaccine-preventable disease surveillance (7). SAGE also noted that surveillance data will be essential to secure long-term national funding for rotavirus vaccines in some countries, and that demonstrating vaccine impact in epidemiologic settings not

<sup>†</sup> Additional information about SAGE is available at <http://www.who.int/immunization/sage>.

FIGURE. Reporting countries and countries with sentinel sites meeting inclusion criteria — World Health Organization, Global Rotavirus Surveillance Network, 2011–2012



included in existing impact data is important (7). SAGE recommended the following:

1. revision of the surveillance objectives to align more closely with the current and future vaccine introduction landscape;
2. further standardization to ensure the generation of credible, well-defined data with linking of clinical and laboratory data at all levels and real-time monitoring of system performance;
3. sharing of standardized, case-based data at all levels; use of identifiers for linking of clinical and laboratory results; zero/negative reporting to differentiate absence of cases from lack of reporting; and progress on data management, including the use of software with editing and verification capability;
4. development of performance measures and agreements on a) sentinel site eligibility for ongoing participation in the network, b) standards for the reference laboratories, including site visits, conduct of specialized testing, and testing of a systematic sample of specimens from all sites for laboratory quality control, and c) WHO roles in support of the network, and
5. additional human and financial resources to strengthen the networks, through increased access to technical assistance, laboratory quality assurance/control processes, data management systems, exchange of lessons learned, and collaboration.

## Discussion

The WHO-coordinated Global Rotavirus Surveillance Network has met its original objectives of documenting and describing rotavirus disease burden and providing useful data for policy decisions. However, the network can be enhanced further and will require continual performance monitoring for it to be responsive to the changing information needs of all immunization stakeholders. WHO, under guidance of the iTAG and technical immunization partners, will work to implement the strategic review recommendations and to monitor sentinel hospital site and laboratory performance quarterly. WHO has developed a management framework that defines implementation activities and timelines. Implementation of the strategic review recommendations will improve the network's functions and ability to integrate with other surveillance platforms, and will provide higher quality surveillance data for use in decisions related to vaccine introduction and vaccination program sustainability.

## Acknowledgments

Ministries of health, sentinel hospitals, the regional and national reference laboratories, WHO staff, iTAG, and the GAVI Alliance.



**What is already known on this topic?**

Rotavirus disease is a leading cause of severe diarrhea morbidity and mortality among children aged <5 years worldwide. The World Health Organization (WHO) recommends the inclusion of rotavirus vaccine in all national immunization programs. Disease surveillance systems provide data on local disease burden and epidemiology, which can play a key role in vaccine introduction decisions.

**What is added by this report?**

By 2012, the Global Rotavirus Surveillance Network included 178 sentinel surveillance sites in 60 countries. A network performance review determined that during 2011 and 2012, a total of 79 sites in 37 countries met reporting and testing inclusion criteria for data analysis. Of the 37 countries with sites meeting inclusion criteria, 13 (35%) had introduced rotavirus vaccine nationwide. All 79 sites included in the analysis were meeting 2008 network objectives of documenting presence of disease and describing disease epidemiology, and many countries were using the rotavirus surveillance data for vaccine introduction decisions, disease burden estimates, and advocacy. WHO's Strategic Advisory Group of Experts on Immunization (SAGE) has endorsed recommendations to enhance network management, standardize data formats, link clinical and laboratory data, and provide additional resources to support network functions.

**What are the implications for public health practice?**

Implementing recommendations for strengthening the Global Rotavirus Surveillance Network will improve the network's functions and ability to integrate with other surveillance platforms, and will provide higher quality surveillance data for use in decisions related to rotavirus vaccine introduction and vaccination program sustainability.

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## Nutritional Status of Women and Child Refugees from Syria — Jordan, April–May 2014

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As a result of civil war, an estimated 2.8 million refugees have fled Syria and reside in neighboring countries, mainly Lebanon, Turkey, Jordan, and Iraq. The largest Syrian refugee camp in the region is Zaatari camp in Jordan, with approximately 79,000 refugees; another estimated 500,000 Syrian refugees live in Jordanian cities, towns, and villages, mostly in the capital (Amman) and in four northern governorates (Irbid, Mafraq, Jarash, and Zarqa). Although all registered refugees in Jordan receive food vouchers from the World Food Programme (WFP) and vulnerable refugees receive cash assistance from the United Nations High Commissioner for Refugees (UNHCR) and nongovernmental organizations, the nutritional status of some refugees might be compromised because of displacement, lack of income, and limited access to nutritious foods. To assess the nutritional status of Syrian refugees, UNHCR, WFP, the United Nations Children's Fund (UNICEF), Medair International (a nongovernmental organization), and CDC, in collaboration with the United Nations Population Fund and the World Health Organization (WHO), conducted cross-sectional, population-representative cluster surveys in Zaatari camp and among refugees residing in the host community. The surveys were conducted during April–May 2014 with the principal objective of assessing nutritional status of refugee children aged 6–59 months and nonpregnant women of reproductive age (15–49 years). Preliminary findings indicated a high prevalence of anemia in Zaatari camp among both children and women (48.4% and 44.8%, respectively). Nutrition policies aimed at ensuring optimal child and maternal micronutrient status and addressing the underlying risk factors for anemia are likely to result in improved health outcomes and a reduction in anemia.

Global acute malnutrition in children aged 6–59 months is the principal indicator of nutritional status in humanitarian emergencies. Hemoglobin measurement is the most feasible method for assessing anemia, as a proxy for micronutrient status of the population in emergency field conditions. The cluster sample in Zaatari camp was selected using the UNHCR population estimates of camp districts and blocks, with systematic random selection of households within clusters. A representative cluster sample of refugees residing in the host community in Jordan was selected using lists of registered

refugees provided by UNHCR. Six teams of four members each (an interviewer, two anthropometry measurers, and a hemoglobin measurer) received 6 days of training, including a field test. Children were measured using standard anthropometric procedures (1), and nutritional status was classified based on 2006 WHO growth standards (2). Hemoglobin in women and children was measured using HemoCue Hb 301. Anemia was diagnosed according to WHO thresholds\* (3). Oral informed consent was obtained before the interviews and hemoglobin testing.

Data collection in Zaatari camp and in the host community lasted 6 and 10 days, respectively. The final samples in Zaatari camp and the host community included 327 and 483 children aged 6–59 months and 314 and 630 nonpregnant women aged 15–49 years, respectively.

Preliminary findings indicated that the prevalence of global acute malnutrition among children was low both in Zaatari and outside the camp: 1.2% and 0.8%, respectively (Table). Mean weight-for-height z-scores in Zaatari and outside the camp were 0.26 and 0.23, above the WHO standard population mean, indicating that Syrian refugee children in Jordan on average were slightly overweight rather than suffering from wasting. The prevalence of chronic malnutrition (stunting) was significantly higher ( $p < 0.05$ ) in Zaatari compared with children outside the camp: 17.0% compared with 9.0%. Anemia prevalence in Zaatari camp in both children and women exceeded 40% (48.4% and 44.8%, respectively), indicating a problem of major public health significance, according to WHO classification (3). Anemia prevalence outside the camp was 26.1% among children and 31.1% among women, significantly lower ( $p < 0.001$  for both children and women) than the prevalence in Zaatari camp (Table).

Unlike in many other humanitarian emergencies, preliminary results indicate that global acute malnutrition is relatively low in the Syrian refugee population in Jordan. The low prevalence of global acute malnutrition among refugee children might result, in part, from the ongoing infant and child feeding interventions supported by UNICEF and blanket distribution

\* Definitions of anemia for children aged 6–59 months. Mild anemia: hemoglobin 10 to  $< 11$  g/dL; moderate anemia: hemoglobin 7 to  $< 10$  g/dL; severe anemia: hemoglobin  $< 7$  g/dL. Definitions of anemia for nonpregnant women aged 15–49 years. Mild anemia: hemoglobin 11 to  $< 12$  g/dL; moderate anemia: hemoglobin 8 to  $< 11$  g/dL; severe anemia: hemoglobin  $< 8$  g/dL.

**TABLE. Prevalence of global acute malnutrition, stunting, and anemia among Syrian women and child refugees residing in Zaatari camp and outside the camp in the host community — Jordan, April–May 2014**

Nutrition standard	In Zaatari camp		Outside the camp in the host community	
	%	(95% CI)	%	(95% CI)
<b>Children aged 6–59 mos</b>				
Global acute malnutrition*				
Total (WHZ <-2 or bilateral pitting edema)	1.2	(0.5–3.2)	0.8	(0.3–2.2)
Moderate (WHZ -3 to <-2)	0.9	(0.3–2.9)	0.8	(0.3–2.2)
Severe (WHZ <-3 or bilateral pitting edema)	0.3	(0.0–2.4)	0	—
Stunting†				
Total (HAZ <-2)	17.0	(11.7–24.0) <sup>§</sup>	9.0	(6.5–12.3) <sup>§</sup>
Moderate (HAZ -3 to <-2)	14.1	(9.6–20.3)	8.1	(5.9–11.2)
Severe (HAZ <-3)	2.9	(1.4–5.8)	0.9	(0.3–2.2)
Anemia¶				
Any anemia (Hb <11 g/dL)	48.4	(42.0–54.9)**	26.1	(21.3–30.8)**
Mild (Hb 10 to <11 g/dL)	27.7	(23.0–32.3) <sup>§</sup>	18.5	(14.8–22.2) <sup>§</sup>
Moderate (Hb 7 to <10 g/dL)	20.4	(16.3–24.5)**	7.6	(5.0–10.1)**
Severe (Hb <7 g/dL)	0.31	(0–0.95)	0	—
<b>Nonpregnant women aged 15–49 yrs</b>				
Anemia††				
Any anemia (Hb <12 g/dL)	44.8	(38.5–51.0)**	31.1	(27.2–35.0)**
Mild (Hb 11 to <12 g/dL)	21.2	(16.7–25.7)	17.6	(14.6–20.7)
Moderate (Hb 8 to <11 g/dL)	22.5	(17.5–27.5)**	12.9	(10.7–15.2)**
Severe (Hb <8.0 g/dL)	1.0	(0–2.4)	0.5	(0–1.05)

**Abbreviations:** CI = confidence interval; WHZ = weight-for-height z-score; HAZ = height-for-age z-score; Hb = hemoglobin.

\* Sample sizes: in Zaatari camp, 325; outside the camp, 479.

† Sample sizes: in Zaatari camp, 312; outside the camp, 467.

<sup>§</sup> Statistically significant difference between in Zaatari camp and outside the camp,  $p < 0.05$ .

¶ Sample sizes: in Zaatari camp, 318; outside the camp, 476.

\*\* Statistically significant difference between in Zaatari camp and outside the camp,  $p < 0.001$ .

†† Sample sizes: in Zaatari camp, 306; outside the camp, 618.

of food vouchers by WFP. In contrast, the prevalence of anemia suggests a serious public health problem, especially in Zaatari camp. A nutrition survey conducted in 2013 among Syrian refugees residing in Lebanon reported slightly lower prevalences of anemia compared with the prevalences observed in this survey among refugees residing in the host community: 21.0% compared with 26.1% among children aged 6–59 months and 26.1% compared with 31.1% among women aged 15–49 years, respectively (4).

Nutrition policies aimed at ensuring optimal child and maternal micronutrient status and addressing the underlying risk factors for anemia, especially among refugees in camps, are likely to result in improved health outcomes and a reduction in anemia. Jordan has an existing micronutrient fortification program, supplying the fortified flour for the bread that is provided to refugees in the camp and available for purchase by refugees in the host community. Therefore, one option is to focus on supporting the national fortification program to ensure that refugees have full access to fortified flour products and sustained access to public health programs directed at improving sanitation and hygiene and reducing the risk for morbidity, which might contribute to improving nutritional status.

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## Errata

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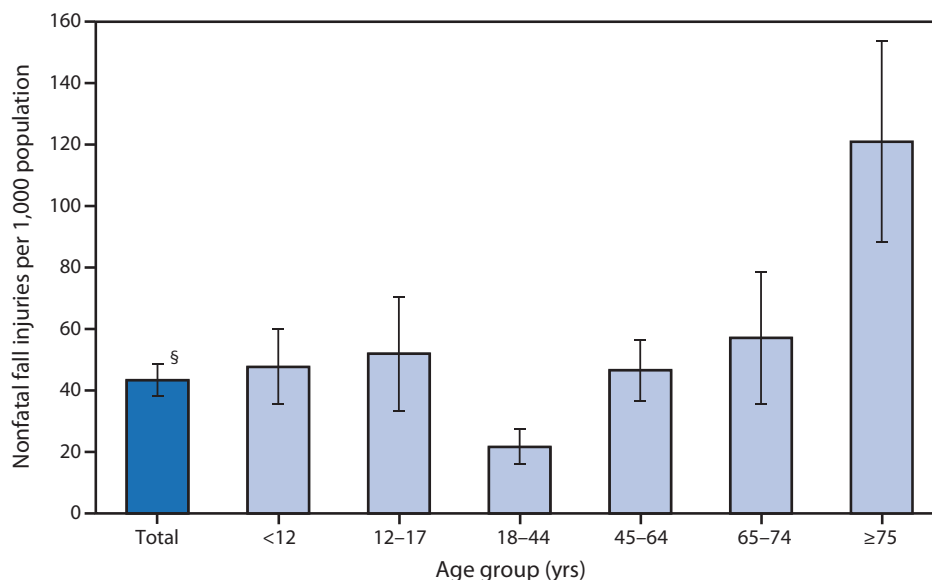
In the report, “State Medicaid Coverage for Tobacco Cessation Treatments and Barriers to Coverage — United States, 2008–2014,” several errors occurred. A listing of the errors and corrections provided by CDC’s Office for Smoking and Health is available online at [http://www.cdc.gov/tobacco/data\\_statistics/mmwr/byyear/2014/mm6312a3/errata.htm](http://www.cdc.gov/tobacco/data_statistics/mmwr/byyear/2014/mm6312a3/errata.htm).



## QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

## Rate of Nonfatal Fall Injuries Receiving Medical Attention,\* by Age Group — National Health Interview Survey,† United States, 2012



\* Annualized rate per 1,000 population for fall injury episodes for which a health-care professional was contacted either in person or by telephone for advice or treatment.

† Estimates are based on household interviews of a sample of the noninstitutionalized civilian population.

§ 95% confidence interval.

In 2012, the U.S. rate of nonfatal fall injuries receiving medical attention was 43 per 1,000 population. Rates increased with age for adults aged  $\geq 18$  years. Adults aged 18–44 years had the lowest rate of falls (22 per 1,000), and the rate for those aged  $\geq 75$  years was higher (121 per 1,000) than for all other age groups.

**Source:** Adams PF, Kirzinger WK, Martinez ME. Summary health statistics for the U.S. population: National Health Interview Survey, 2012. *Vital Health Stat* 2013;10(259).

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