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National, State, and Local Area Vaccination Coverage Among Children Aged 19–35 Months — United States, 2012

The National Immunization Survey (NIS) is a random-digit–dialed telephone survey used to monitor vaccination coverage among U.S. children aged 19–35 months. This report describes national, state, and selected local area vaccination coverage estimates for children born during January 2009–May 2011, based on results from the 2012 NIS. *Healthy People 2020** objectives set childhood vaccination targets of 90% for ≥1 doses of measles, mumps, and rubella vaccine (MMR); ≥3 doses of hepatitis B vaccine (HepB); ≥3 doses of poliovirus vaccine; ≥1 doses of varicella vaccine; ≥4 doses of diphtheria, tetanus, and pertussis vaccine (DTaP); ≥4 doses of pneumococcal conjugate vaccine (PCV); and the full series of *Haemophilus influenzae* type b vaccine (Hib). Vaccination coverage remained near or above the national *Healthy People 2020* target for ≥1 doses of MMR (90.8%), ≥3 doses of poliovirus vaccine (92.8%), ≥3 doses of HepB (89.7%), and ≥1 doses of varicella vaccine (90.2%). Coverage increased from 68.6% in 2011 to 71.6% in 2012 for the birth dose of HepB.† Coverage was below the *Healthy People 2020* target and either decreased or remained stable relative to 2011 for ≥4 doses of DTaP (82.5%), the full series of Hib (80.9%), and ≥4 doses of PCV (81.9%). Coverage also remained stable relative to 2011 and below the *Healthy People 2020* targets of 85% and 80%, respectively, for ≥2 doses of hepatitis A vaccine (HepA) (53.0%), and rotavirus vaccine (68.6%). The percentage of children who had not received any vaccinations remained <1.0%. Although disparities in coverage were not observed for most racial/ethnic groups, children living in families with incomes below the federal poverty level had lower coverage than children living in families at or above the poverty level for ≥4 doses of DTaP (by 6.5 percentage points), the full Hib series (by 7.6 percentage points), ≥4 doses of PCV (by 8.6 percentage points), ≥2 doses of HepA (by 6.0 percentage points), and rotavirus vaccine (by 9.5 percentage points). Maintaining high coverage levels is important to maintain the current low burden of vaccine-preventable diseases in the United States and prevent their resurgence (*1*).

NIS uses a quarterly, random-digit–dialed sample of telephone numbers to reach households with children aged 19–35 months in the 50 states and selected local areas and territories,§

*Additional information available at http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=23. The *Healthy People 2020* targets for children aged 19–35 months are 90%, except for rotavirus vaccine (80%) and ≥2 doses of HepA (85%).

†The *Healthy People 2020* target for the birth dose (0–3 days) of HepB is 85%, measured by annual birth cohort. In the two most recent complete birth cohorts captured by NIS, coverage with the birth dose of HepB was 65.0% for children born in 2008 and 70.6% for children born in 2009.

§The eight local areas separately sampled for the 2012 NIS included six areas that receive federal Section 317 immunization funds and are included in the NIS sample every year (District of Columbia; Chicago, Illinois; New York, New York; Philadelphia County, Pennsylvania; Bexar County, Texas; and Houston, Texas) and two additional sampled areas (Dallas County, Texas, and El Paso County, Texas). The territory of the U.S. Virgin Islands (including St. Croix, St. Thomas, and St. John) was included in the 2012 NIS landline sample, but data from the U.S. Virgin Islands are excluded from national coverage estimates.

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followed by a mail survey sent to the children's vaccination providers to collect vaccination information. Data were weighted to represent the population of children aged 19–35 months, with adjustments for households with multiple telephone lines and mixed telephone use (landline and cellular), household nonresponse, and exclusion of households without telephone service.[¶] Beginning in 2011, NIS changed from sampling only landline telephones to a dual-frame sampling scheme, with interviews conducted via landline or cellular telephone. The response rate[**] for the 2012 NIS was 64.7% for the landline telephone sample (including the U.S. Virgin Islands) and 30.6% for the cellular telephone sample. Providers returned vaccination records for 67.6% of the 12,727 children with completed household interviews from the landline sample and 63.9% of the 13,009 children with completed household interviews from the cellular telephone sample, for a total of 16,916 children with provider-reported vaccination records included in this report. Of this total, 8,313 (49%) were from the cellular telephone sample, of whom 5,281 were from households with only cellular telephone service. Because the number of Hib[††] and rotavirus vaccine[§§] doses required differs according to manufacturer, coverage estimates for these vaccines take into account the type of vaccine used. Logistic regression was used to examine differences among racial/ethnic groups, controlling for poverty status. Statistical analyses were conducted using t-tests based on weighted data and accounting for the complex survey design. A p-value of <0.05 was considered statistically significant.

In 2012, national vaccination coverage among children aged 19–35 months was 82.5% for ≥4 doses of DTaP, 92.8% for ≥3 doses of poliovirus vaccine, 90.8% for ≥1 doses of MMR, 89.7% for ≥3 doses of HepB, and 90.2% for ≥1 doses of varicella vaccine (Table 1). Although this represents a decline in coverage from 2011 of 1–2 percentage points for DTaP,

¶ A description of the statistical methodology of the NIS is available at http://www.cdc.gov/nchs/data/series/sr_02/sr02_138.pdf and ftp://ftp.cdc.gov/pub/health_statistics/nchs/dataset_documentation/nis/nispuf11_dug.pdf.

** The Council of American Survey Research Organization (CASRO) household response rate, calculated as the product of the resolution rate (percentage of the total telephone numbers called that were classified as nonworking, nonresidential, or residential), screening completion rate (percentage of known households that were successfully screened for the presence of age-eligible children), and the interview completion rate (percentage of households with one or more age-eligible children that completed the household survey). Additional information is available at http://casro.org. The CASRO response rate is equivalent to the American Association for Public Opinion Research (AAPOR) type 3 response rate. Information about AAPOR response rates is available at http://www.aapor.org/am/template.cfm?section=standard_definitions1&template=/cm/contentdisplay.cfm&contentid=1814.

†† Coverage for the primary Hib series was based on receipt of ≥2 or ≥3 doses, depending on product type received. The PRP-OMB Hib products require a 2-dose primary series with doses at ages 2 months and 4 months. All other Hib products require a 3-dose primary series with doses at ages 2, 4, and 6 months. Coverage for the full series, which includes the primary series and a booster dose, was based on receipt of ≥3 or ≥4 doses, depending on product type received. All Hib products require a booster dose at age 12–15 months.

§§ Coverage for rotavirus vaccine was based on ≥2 or ≥3 doses, depending on product type received (≥2 doses for Rotarix [RV1], licensed in April 2008, and ≥3 doses for RotaTeq [RV5], licensed in February 2006).

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TABLE 1. Estimated vaccination coverage among children aged 19–35 months, by selected vaccines and dosages — National Immunization Survey, United States, 2008–2012*

Vaccine and dosage	2008		2009		2010		2011		2012	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
DTaP										
≥3 doses	96.2	(±0.5)	95.0	(±0.6)	95.0	(±0.6)	95.5	(±0.5)	94.3	(±0.7)†
≥4 doses	84.6	(±1.0)	83.9	(±1.0)	84.4	(±1.0)	84.6	(±1.0)	82.5	(±1.2)†
Poliovirus (≥3 doses)	93.6	(±0.6)	92.8	(±0.7)	93.3	(±0.7)	93.9	(±0.6)	92.8	(±0.7)†
MMR (≥1 doses)	92.1	(±0.7)	90.0	(±0.8)	91.5	(±0.7)	91.6	(±0.8)	90.8	(±0.8)
Hib§										
Primary series	N/A		92.1	(±0.8)	92.2	(±0.8)	94.2	(±0.6)	93.3	(±0.7)
Full series	N/A		54.8	(±1.4)	66.8	(±1.3)	80.4	(±1.1)	80.9	(±1.2)
HepB										
≥3 doses	93.5	(±0.7)	92.4	(±0.7)	91.8	(±0.7)	91.1	(±0.7)	89.7	(±0.9)†
1 dose by 3 days (birth)¶	55.3	(±1.3)	60.8	(±1.3)	64.1	(±1.3)	68.6	(±1.3)	71.6	(±1.4)†
Varicella (≥1 doses)	90.7	(±0.7)	89.6	(±0.8)	90.4	(±0.8)	90.8	(±0.7)	90.2	(±0.8)
PCV										
≥3 doses	92.8	(±0.6)	92.6	(±0.7)	92.6	(±0.8)	93.6	(±0.6)	92.3	(±0.8)†
≥4 doses	80.1	(±1.1)	80.4	(±1.2)	83.3	(±1.0)	84.4	(±1.0)	81.9	(±1.1)†
HepA**										
≥1 doses	70.5	(±1.1)	75.0	(±1.1)	78.3	(±1.1)	81.2	(±1.0)	81.5	(±1.1)
≥2 doses	40.4	(±1.2)	46.6	(±1.4)	49.7	(±1.4)	52.2	(±1.4)	53.0	(±1.5)
Rotavirus††	N/A		43.9	(±1.4)	59.2	(±1.4)	67.3	(±1.3)	68.6	(±1.4)
Combined series										
4:3:1:3*:3:1:4§§	N/A		44.3	(±1.4)	56.6	(±1.3)	68.5	(±1.3)	68.4	(±1.4)
Children who received no vaccinations	0.6	(±0.2)	0.6	(±0.1)	0.7	(±0.2)	0.8	(±0.2)	0.8	(±0.1)

Abbreviations: CI = confidence interval; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine (includes children who might have been vaccinated with diphtheria and tetanus toxoids and pertussis vaccine or diphtheria and tetanus toxoids vaccine); MMR = measles, mumps, and rubella vaccine; Hib = *Haemophilus influenzae* type b vaccine; N/A = not available (estimate not available if the unweighted sample size for the denominator was <30 or 95% CI half width / estimate >0.588 or 95% CI half width >10); HepB = hepatitis B vaccine; HepA = hepatitis A vaccine; PCV = pneumococcal conjugate vaccine.

* For 2008, includes children born during January 2005–June 2007; for 2009, children born during January 2006–July 2008; for 2010, children born during January 2007–July 2009; for 2011, children born during January 2008–May 2010; and for 2012, children born during January 2009–May 2011.

† Statistically significant change in coverage compared with 2011 (p<0.05).

§ Hib primary series: receipt of ≥2 or ≥3 doses, depending on product received. Full series: receipt of ≥3 or ≥4 doses, depending on product received (primary series and booster dose). Hib coverage for primary or full series not available until 2009.

¶ HepB administered from birth through age 3 days.

** HepA coverage not available before 2008.

†† Rotavirus vaccine includes ≥2 or ≥3 doses, depending on the product received (≥2 doses for Rotarix [RV1] or ≥3 doses for RotaTeq [RV5]). Estimates of rotavirus vaccine coverage not available before 2009.

§§ 4:3:1:3*:3:1:4 series, referred to as routine, includes ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, ≥1 doses of measles vaccine, full series of Hib (3 or 4 doses, depending on product), ≥3 doses of HepB, ≥1 doses of varicella vaccine, and ≥4 doses of PCV.

poliovirus, and HepB, coverage for these vaccines has remained high and stable for at least the past decade.¶¶ Coverage with ≥4 doses of PCV decreased from 84.4% in 2011 to 81.9% in 2012. Coverage with the birth dose of HepB increased from 68.6% in 2011 to 71.6% in 2012. Coverage with the full series of Hib, which steadily increased during 2009–2011 after a vaccine shortage that occurred from December 2007 to September 2009 (*2*), was similar in 2012 at 80.9% compared with 2011. Similarly, coverage with ≥2 doses of HepA and rotavirus vaccine remained similar to 2011 levels at 53.0% and 68.6% in 2012, respectively.

Coverage with the combined vaccine series (4:3:1:3*:3:1:4)*** was 68.4% in 2012, also similar to coverage in 2011.

Children in families with incomes below the federal poverty level††† had lower coverage than children in families at or above the poverty level for ≥3 and ≥4 doses of DTaP, primary and full series of Hib, ≥3 and ≥4 doses of PCV, ≥2 doses of HepA, rotavirus vaccine, and the combined vaccine series (Table 2).

¶¶ Information on coverage with individual vaccines since the inception of NIS in 1994 through 2012 is available at http://www.cdc.gov/vaccines/stats-surv/nis/figures/2012_map.htm.

*** The 4:3:1:3*:3:1:4 vaccine series includes ≥4 doses of DTaP/diphtheria and tetanus toxoids vaccine/diphtheria and tetanus toxoids and pertussis vaccine, ≥3 doses of poliovirus vaccine, ≥1 doses of measles vaccine, ≥3 or ≥4 doses of Hib (depending on product type of vaccine), ≥3 doses of HepB, ≥1 doses of varicella vaccine, and ≥4 doses of PCV.

††† Poverty level uses income and family size to categorize households into 1) at or above the poverty level and 2) below the poverty level. Poverty level was based on 2011 U.S. Census poverty thresholds, available at http://www.census.gov/hhes/www/poverty/data/threshld.

TABLE 2. Estimated vaccination coverage among children aged 19–35 months, by selected vaccines and dosages, race/ethnicity,* and poverty level† — National Immunization Survey, United States, 2012§

	Race/Ethnicity												Poverty level			
	White, non-Hispanic		Black, non-Hispanic		Hispanic		American Indian/ Alaska Native		Asian		Multiracial, non-Hispanic		At or above		Below	
Vaccine and dosage	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
DTaP																
≥3 doses	94.8	(±0.8)	94.0	(±1.6)	93.5	(±1.9)	95.6	(±3.3)	96.1	(±2.1)	95.1	(±2.0)	95.0	(±0.9)	93.4	(±1.3)**
≥4 doses	83.6	(±1.5)	79.6	(±3.1)¶	80.8	(±2.9)	88.2	(±5.9)	88.1	(±4.3)	85.6	(±3.6)	85.0	(±1.4)	78.5	(±2.3)**
Poliovirus (≥3 doses)	93.0	(±0.9)	92.9	(±1.8)	92.5	(±1.8)	95.2	(±3.4)	92.3	(±3.6)	93.3	(±2.3)	93.4	(±0.9)	91.8	(±1.4)
MMR (≥1 doses)	90.9	(±1.0)	90.9	(±2.1)	90.7	(±2.0)	92.0	(±5.0)	89.8	(±5.2)	92.3	(±2.6)	91.4	(±1.0)	89.9	(±1.6)
Hib††																
Primary series	93.7	(±0.9)	91.1	(±2.2)	93.5	(±1.7)	94.5	(±3.9)	94.9	(±2.2)	94.0	(±2.2)	94.3	(±0.8)	91.9	(±1.4)**
Full series	82.2	(±1.4)	77.5	(±3.3)¶	79.5	(±2.8)	84.7	(±7.1)	86.1	(±4.4)	82.5	(±3.9)	84.0	(±1.4)	76.4	(±2.2)**
HepB																
≥3 doses	89.3	(±1.1)	89.7	(±2.2)	89.4	(±2.1)	94.0	(±3.9)¶	93.2	(±2.7)¶	92.2	(±2.6)	89.8	(±1.1)	89.4	(±1.5)
1 dose by 3 days (birth)§§	69.2	(±1.6)	74.9	(±3.6)¶	73.9	(±3.4)¶	NA		71.6	(±6.6)	75.9	(±4.8)¶	69.4	(±1.7)	75.8	(±2.5)**
Varicella (≥1 doses)	89.8	(±1.0)	90.4	(±2.1)	90.9	(±2.1)	92.5	(±4.5)	91.9	(±3.2)	90.9	(±2.9)	90.6	(±1.0)	89.7	(±1.7)
PCV																
≥3 doses	92.7	(±1.0)	91.2	(±2.0)	92.4	(±1.8)	94.0	(±4.0)	90.7	(±3.3)	94.0	(±2.2)	93.4	(±0.9)	90.7	(±1.5)**
≥4 doses	83.5	(±1.4)	77.1	(±3.5)¶	82.1	(±2.5)	NA		80.7	(±5.1)	84.1	(±3.7)	85.3	(±1.2)	76.7	(±2.3)**
HepA (≥2 doses)	52.6	(±1.8)	52.0	(±3.9)	54.4	(±3.4)	NA		57.5	(±7.7)	49.4	(±5.7)	55.4	(±1.8)	49.4	(±2.7)**
Rotavirus¶¶	70.5	(±1.6)	60.4	(±4.0)¶	70.0	(±3.1)	NA		69.9	(±7.1)	69.3	(±5.4)	72.5	(±1.6)	63.0	(±2.5)**
Combined series																
4:3:1:3*:3:1:4***	69.3	(±1.7)	64.8	(±3.8)¶	67.8	(±3.2)	NA		71.6	(±6.6)	71.5	(±4.8)	71.6	(±1.6)	63.4	(±2.7)**

Abbreviations: CI = confidence interval; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine (includes children who might have been vaccinated with diphtheria and tetanus toxoids and pertussis vaccine or diphtheria and tetanus toxoids vaccine); Hib = *Haemophilus influenzae* type b vaccine; MMR = measles, mumps, and rubella vaccine; N/A = not available (estimate not available if the unweighted sample size for the denominator was <30 or 95% CI half width / estimate >0.588 or 95% CI half width >10); HepB = hepatitis B vaccine; HepA = hepatitis A vaccine; PCV = pneumococcal conjugate vaccine.

* Native Hawaiian or other Pacific Islanders not included because of small sample sizes.

† Poverty level was determined for all children. Children were classified as below poverty if their total family income was less than the poverty threshold specified for the applicable family size and number of children aged <18 years. All others were classified as at or above poverty. Poverty thresholds reflect yearly changes in the Consumer Price Index. Thresholds and guidelines available at http://www.census.gov/hhes/www/poverty.html.

§ Children in the 2012 National Immunization Survey were born during January 2009–May 2011.

¶ Estimates are statistically significant at p<0.05. Children identified as non-Hispanic white were the reference group.

** Estimates are statistically significant at p<0.05. Children living at or above poverty were the reference group.

†† Hib primary series: receipt of ≥2 or ≥3 doses, depending on product received; full series: primary series and booster dose includes receipt of ≥3 or ≥4 doses, depending on product received.

§§ HepB (≥1 doses) administered from birth through age 3 days.

¶¶ Includes ≥2 or ≥3 doses, depending on product received (≥2 doses for Rotarix [RV1] or ≥3 doses for RotaTeq [RV5]).

*** 4:3:1:3:3:1:4 series includes ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, ≥1 doses of measles vaccine, full series of Hib (3 or 4 doses, depending on type), ≥3 doses of HepB, ≥1 doses of varicella vaccine, and ≥4 doses of PCV.

Children in families below the poverty level had higher HepB birth dose coverage than children living at or above the poverty level. No differences by poverty status were observed for poliovirus vaccine, MMR, ≥3 doses of HepB, or varicella vaccine.

Compared with white children,§§§ black children had lower coverage for ≥4 doses of DTaP, the full series of Hib, ≥4 doses of PCV, rotavirus vaccine, and the combined 4:3:1:3*:3:1:4 series (Table 2). After adjustment for poverty status, black race was not associated with coverage with any of these vaccines except for rotavirus. American Indian/Alaska Native (AI/AN) children and Asian children had higher coverage for ≥3 doses of HepB compared with white children. Black, Hispanic, and multiracial children had higher coverage for the birth dose of HepB compared with white children. With the exception of the difference in HepB birth dose coverage between Hispanic and white children, all of these associations with ≥3 doses of HepB and the birth dose of HepB remained statistically significant after adjustment for poverty status.

Vaccination coverage varied by state, with coverage for the combined vaccine series ranging from 59.5% in Alaska to 80.2% in Hawaii (Table 3). Fifteen states had point estimates of MMR coverage below the *Healthy People 2020* target of 90%, and only Connecticut, Delaware, and the District of Columbia had coverage ≥90% for ≥4 doses of DTaP. Variations in coverage were widest for the birth dose of HepB (ranging from 36.0%

§§§ Child's race/ethnicity was reported by their parent or guardian. Children categorized in this report as white, black, Asian, American Indian/Alaska Native, or multiracial were identified as non-Hispanic by their parent or guardian. Children identified as multiracial had more than one race category selected. Persons identified as Hispanic might be of any race.

TABLE 3. Estimated vaccination coverage among children aged 19–35 months, by selected individual vaccines and vaccination series* and state/local area — National Immunization Survey, United States, 2012†

State/Area	MMR (≥1 doses)		DTaP (≥4 doses)		HepB (birth)§		HepA (≥2 doses)¶		Rotavirus**		Combined series*	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
United States	**90.8**	**(±0.8)**	**82.5**	**(±1.2)** §§	**71.6**	**(±1.4)**††	**53.0**	**(±1.5)**	**68.6**	**(±1.4)**	**68.4**	**(±1.4)**
Alabama	93.1	(±3.5)	84.8	(±5.9)	83.8	(±4.9)††	49.2	(±7.4)	66.0	(±7.4)§§	71.3	(±6.8)
Alaska	86.2	(±5.1)	79.4	(±5.8)	56.8	(±6.9)	50.1	(±6.9)	60.3	(±6.8)	59.5	(±6.8)
Arizona	88.3	(±4.9)	82.7	(±5.8)	83.0	(±5.3)††	55.2	(±6.9)	71.6	(±6.7)	67.5	(±7.5)
Arkansas	92.3	(±4.0)	79.8	(±6.4)	81.7	(±6.5)	40.1	(±7.5)	56.3	(±8.0)	66.4	(±7.6)
California	91.5	(±4.3)	81.6	(±6.6)	61.5	(±7.5)	54.6	(±7.8)	71.0	(±6.8)	66.8	(±7.5)
Colorado	91.5	(±4.5)	82.8	(±6.7)	64.0	(±8.4)	56.2	(±8.6)	73.5	(±7.7)	71.7	(±7.9)
Connecticut	94.8	(±2.9)	91.3	(±3.8)	75.7	(±5.7)	65.5	(±6.3)††	72.5	(±6.4)	77.1	(±5.7)
Delaware	94.4	(±3.4)	90.9	(±4.3)	72.3	(±6.7)	65.7	(±7.1)††	76.5	(±6.5)	72.6	(±6.7)
District of Columbia	93.0	(±3.7)	90.7	(±4.0)	78.2	(±5.4)	62.3	(±6.6)	54.2	(±6.8)	73.4	(±6.2)
Florida	91.0	(±4.8)	83.3	(±6.5)	62.6	(±7.6)	51.9	(±8.1)	66.0	(±7.9)	68.6	(±7.5)
Georgia	91.9	(±4.2)	86.7	(±5.2)	87.6	(±5.1)	65.9	(±7.6)	71.8	(±7.2)	74.7	(±6.8)
Hawaii	95.0	(±2.7)	87.9	(±4.6)	82.7	(±5.2)††	58.1	(±7.1)	70.6	(±6.5)††	80.2	(±5.5)
Idaho	93.3	(±3.6)	76.6	(±6.7)	70.1	(±7.8)	52.8	(±8.6)	68.2	(±7.2)	63.0	(±8.2)
Illinois	91.6	(±2.7)	85.3	(±2.6)	71.3	(±5.0)	48.2	(±5.4)	67.2	(±5.2)	68.5	(±4.9)
City of Chicago	86.8	(±6.1)	79.4	(±7.6)	70.3	(±8.4)	45.2	(±8.7)	69.5	(±8.7)	60.4	(±8.8)§§
Rest of state	93.2	(±2.9)	87.4	(±4.1)	71.7	(±6.0)	49.3	(±6.6)	66.4	(±6.3)	71.4	(±5.8)
Indiana	90.0	(±4.5)	76.8	(±6.5)	78.2	(±6.0)	48.0	(±7.5)	63.9	(±7.4)	61.4	(±7.4)
Iowa	93.3	(±3.4)††	88.2	(±4.4)	68.3	(±7.5)	59.3	(±7.2)††	70.2	(±7.5)	74.8	(±6.3)
Kansas	88.5	(±4.6)	79.0	(±6.0)§§	78.3	(±5.4)	58.5	(±6.9)	59.9	(±7.0)	65.0	(±6.7)
Kentucky	89.2	(±4.4)	83.0	(±5.4)	80.8	(±5.6)	48.4	(±7.0)	69.0	(±6.4)	68.2	(±6.6)
Louisiana	90.5	(±4.0)	77.8	(±6.6)	76.6	(±6.8)	46.9	(±7.3)	65.0	(±7.4)	68.5	(±7.1)
Maine	91.2	(±4.2)	87.9	(±5.1)	74.2	(±5.8)	52.5	(±7.4)††	64.7	(±7.0)	72.6	(±6.6)
Maryland	92.5	(±4.8)	83.2	(±6.2)	73.3	(±6.6)	53.1	(±7.3)	71.2	(±6.9)	67.1	(±7.1)
Massachusetts	93.7	(±3.4)	88.2	(±4.5)	74.0	(±6.2)	57.5	(±6.9)	82.4	(±5.6)	73.5	(±6.2)
Michigan	91.4	(±4.4)	81.5	(±6.7)	78.9	(±6.1)	40.9	(±7.4)§§	64.3	(±7.4)	70.5	(±7.3)
Minnesota	90.1	(±5.6)	84.2	(±5.6)	62.8	(±7.4)	55.4	(±7.7)	76.6	(±6.4)	66.2	(±7.6)
Mississippi	93.4	(±4.3)	83.6	(±6.4)	81.6	(±6.5)	39.7	(±8.2)	63.8	(±8.0)	77.5	(±7.0)
Missouri	92.7	(±4.1)	81.9	(±7.0)	78.7	(±6.2)	56.3	(±7.9)	69.3	(±7.8)	63.9	(±8.0)
Montana	91.5	(±4.0)	86.6	(±4.4)††	64.5	(±6.8)§§	50.5	(±7.3)	61.3	(±7.4)	66.5	(±7.1)
Nebraska	89.0	(±4.4)§§	84.5	(±5.2)§§	79.4	(±5.8)	60.6	(±7.0)	74.2	(±6.2)	72.6	(±6.5)
Nevada	89.8	(±4.1)	81.0	(±5.5)	70.5	(±6.3)	52.2	(±7.0)	62.7	(±6.7)	65.3	(±6.6)
New Hampshire	93.7	(±3.4)	88.7	(±4.7)	72.2	(±6.6)	57.0	(±7.0)	83.0	(±5.8)	80.1	(±5.7)††
New Jersey	94.8	(±2.7)	84.7	(±5.1)	52.6	(±6.9)	45.9	(±6.9)	68.0	(±6.6)††	71.5	(±6.4)
New Mexico	88.8	(±4.4)	87.0	(±4.9)	68.9	(±7.0)	51.9	(±7.6)	78.4	(±5.8)	71.6	(±6.6)
New York	90.2	(±2.9)	83.8	(±3.5)	61.5	(±4.7)††	45.9	(±4.7)	65.5	(±4.5)	63.7	(±4.6)
City of New York	90.3	(±3.9)	82.9	(±5.3)	60.5	(±6.4)††	44.4	(±6.6)	56.8	(±6.8)	62.8	(±6.5)
Rest of state	90.0	(±4.2)	84.6	(±4.7)	62.4	(±6.8)	47.5	(±6.7)	74.1	(±5.9)††	64.6	(±6.5)

See table footnotes on page 738.

in Vermont to 87.6% in Georgia), ≥2 doses of HepA (ranging from 32.3% in Wyoming to 65.9% in Georgia), and rotavirus vaccine (ranging from 54.2% in the District of Columbia to 83.0% in New Hampshire).

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Editorial Note

The results of the 2012 NIS indicate that vaccination coverage among children aged 19–35 months continues to be near or above the *Healthy People 2020* target of 90% for MMR, poliovirus vaccine, HepB, and varicella vaccine. Although coverage estimates for many vaccines had small but statistically significant decreases compared with 2011, estimates are not directly comparable between years because NIS methods were changed. The number of interviews conducted via cellular telephone increased in 2012, such that approximately half of the 2012 NIS unweighted sample came from the cellular telephone sampling frame, compared with 11% of the 2011 unweighted sample. In 2012, an estimated 45% of U.S. children aged <18 years lived in households with cellular telephones only (*3*). The proportion of children aged 19–35 months living in households with only cellular telephone service estimated from the weighted 2012 NIS sample was 52.7%. Thus, the NIS sample now more closely resembles the U.S. population with respect to telephone service, and these 2012 vaccination

TABLE 3. (*Continued*) Estimated vaccination coverage among children aged 19–35 months, by selected individual vaccines and vaccination series* and state/local area — National Immunization Survey, United States, 2012†

State/Area	MMR (≥1 doses)		DTaP (≥4 doses)		HepB (birth)§		HepA (≥2 doses)¶		Rotavirus**		Combined series*	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
North Carolina	89.0	(±4.9)	85.9	(±5.4)	78.2	(±5.9)	48.5	(±7.3)	68.0	(±7.1)	75.4	(±6.5)
North Dakota	90.6	(±5.4)	85.1	(±6.2)	82.3	(±5.6)	59.8	(±7.5)	75.4	(±7.1)	72.2	(±7.2)
Ohio	90.3	(±4.9)	83.3	(±6.0)	77.8	(±6.2)	53.8	(±7.0)	67.4	(±7.5)	66.8	(±6.9)
Oklahoma	90.0	(±4.8)	79.1	(±6.0)	67.4	(±7.4)	56.1	(±7.4)	56.4	(±7.7)	61.0	(±7.6)
Oregon	87.3	(±4.7)	81.2	(±5.8)	65.4	(±6.6)	57.6	(±7.0)	66.1	(±6.7)	66.7	(±6.7)
Pennsylvania	87.0	(±4.6)§§	80.1	(±5.3)	83.2	(±4.3)††	58.5	(±6.1)	72.5	(±5.5)	68.3	(±5.9)
Philadelphia County	92.6	(±4.3)	85.4	(±5.7)	78.1	(±6.0)	58.1	(±7.6)	68.0	(±7.2)	73.8	(±7.1)
Rest of state	85.9	(±5.5)§§	79.1	(±6.2)	84.2	(±5.1)††	58.6	(±7.1)	73.4	(±6.4)	67.2	(±6.9)
Rhode Island	94.3	(±3.1)	89.0	(±4.9)	68.3	(±6.7)	57.3	(±6.9)	79.8	(±6.4)	72.5	(±6.5)
South Carolina	93.2	(±3.5)	80.9	(±6.0)	78.4	(±5.8)††	48.5	(±7.3)	70.6	(±6.7)††	71.8	(±6.7)
South Dakota	93.3	(±3.0)	79.2	(±5.5)	76.6	(±5.6)	45.3	(±6.8)††	59.5	(±7.0)	63.6	(±6.4)
Tennessee	92.2	(±4.0)	82.0	(±6.0)	68.8	(±7.0)	55.4	(±7.7)	64.3	(±7.6)	73.1	(±6.8)
Texas	89.7	(±2.4)§§	77.4	(±3.6)§§	74.6	(±3.7)	57.4	(±4.0)	67.5	(±3.9)	64.8	(±4.0)§§
Bexar County	90.9	(±4.0)	77.5	(±6.4)	76.4	(±6.4)††	62.6	(±7.6)	67.5	(±7.4)	65.7	(±7.5)
City of Houston	92.2	(±4.7)	83.4	(±6.8)	84.3	(±5.6)	64.4	(±8.4)	79.7	(±7.6)††	70.9	(±7.9)
Dallas County	86.5	(±5.6)	78.8	(±6.6)	72.3	(±7.0)§§	56.8	(±8.0)	72.0	(±7.2)	69.8	(±7.5)
El Paso County	87.1	(±4.7)	76.5	(±6.1)	77.9	(±5.6)	57.4	(±6.7)	68.4	(±6.7)	62.3	(±6.7)
Rest of state	89.7	(±3.3)§§	76.2	(±5.0)	72.8	(±5.2)	55.7	(±5.6)	64.5	(±5.4)§§	62.9	(±5.6)§§
Utah	87.3	(±5.5)	80.5	(±6.6)	78.6	(±6.3)	57.1	(±7.7)	74.5	(±6.8)	73.0	(±7.2)
Vermont	91.7	(±3.8)	86.0	(±5.0)	36.0	(±6.7)††	37.4	(±6.4)	64.2	(±6.6)	63.2	(±6.7)
Virginia	94.3	(±3.9)	82.7	(±6.6)	71.4	(±7.4)	50.0	(±8.3)	71.9	(±7.9)	69.8	(±7.7)
Washington	84.8	(±5.8)	84.0	(±5.5)	73.2	(±6.5)	51.0	(±7.4)	68.6	(±7.0)	65.2	(±7.2)
West Virginia	84.6	(±6.0)	79.1	(±6.8)	74.4	(±6.6)††	54.9	(±7.9)	62.6	(±7.8)	60.8	(±7.9)
Wisconsin	89.3	(±5.2)	87.8	(±5.3)	72.2	(±6.5)	55.6	(±7.4)	67.4	(±7.1)	75.2	(±6.5)
Wyoming	91.2	(±3.9)	79.4	(±6.0)	64.8	(±7.1)	32.3	(±6.8) §§	69.1	(±6.7)††	67.2	(±6.8)
U.S. Virgin Islands	63.7	(±7.4)§§	55.6	(±7.7)	72.8	(±7.0)	12.0	(±4.7)	15.6	(±5.7)	41.5	(±7.6)

Abbreviations: CI = confidence interval; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine (includes children who might have been vaccinated with diphtheria and tetanus toxoids and pertussis vaccine or diphtheria and tetanus toxoids vaccine); HepB = hepatitis B vaccine; HepA = hepatitis A vaccine; Hib = *Haemophilus influenzae* type b vaccine; MMR = measles, mumps, and rubella vaccine; PCV = pneumococcal conjugate vaccine.

* Includes ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, ≥1 doses of measles vaccine, full series of Hib (3 or 4 doses, depending on product), ≥3 doses of HepB, ≥1 doses of varicella vaccine, and ≥4 doses of PCV.

† Children in the 2012 National Immunization Survey were born during January 2009–May 2011.

§ HepB administered from birth through age 3 days.

¶ ≥2 doses HepA and measured among children aged 19–35 months.

** ≥2 or ≥3 doses of rotavirus vaccine, depending on product received (≥2 doses for Rotarix [RV1] or ≥3 doses for RotaTeq [RV5]).

†† Statistically significant increase in coverage compared with 2011 (p<0.05).

§§ Statistically significant decrease in coverage compared with 2011 (p<0.05).

coverage estimates should be considered a baseline against which subsequent trends in coverage can be evaluated.

After a sustained increase from 2009 to 2011, likely attributable to recovery from a Hib vaccine shortage that occurred from December 2007 to June 2009 (*2*), coverage with the full series of Hib vaccine has reached levels in 2012 similar to those of DTaP and PCV, vaccines that also require a booster dose during the second year of life. Because the frequency of recommended well-child visits declines after age 12 months, fewer opportunities for catch-up doses with these vaccines exist when children fall behind schedule. CDC encourages the use of provider and system-based interventions aimed at encouraging adherence to well-child visits and facilitating delivery of vaccines at these visits. Examples include use of immunization information systems, provider assessment and feedback, provider reminders, standing orders, and provider education in conjunction with other interventions (*4*).

Coverage with HepA and rotavirus, the more recently recommended vaccines, also remained similar in 2012 compared with 2011, after several years of continued increase. Similar to Hib, DTaP, and PCV, the plateau in coverage for HepA might be attributable to fewer opportunities for catch-up doses, as the first dose of HepA is recommended during age 12–23 months. Children's vaccination status in NIS is determined up to age 19–35 months, so some children might have received their second dose, or might be due for the second dose, after the survey was conducted (the second dose is recommended 6–18 months after the first dose) (*5*). For rotavirus vaccine, the first dose should be given before age 14 weeks and 6 days because of insufficient evidence of safety in children aged >15 weeks, and the final dose should be given by age 8 months (*5*). These age restrictions might preclude infants from starting or completing the series. Health-care providers should make every

What is already known on this topic?

Healthy People 2020 set childhood vaccination targets of 90% for ≥1 doses of measles, mumps, rubella vaccine (MMR); ≥3 doses of hepatitis B vaccine (HepB); ≥3 doses of poliovirus vaccine; ≥1 doses of varicella vaccine; ≥4 doses of diphtheria, tetanus, and pertussis vaccine; ≥4 doses of pneumococcal conjugate vaccine; and the full series of *Haemophilus influenzae* type b vaccine. The National Immunization Survey estimates coverage among U.S. children aged 19–35 months for these and other vaccines.

What is added by this report?

In 2012, childhood vaccination coverage remains near or above national target levels for ≥1 doses of MMR (90.8%), ≥3 doses of HepB (89.7%), ≥3 doses of poliovirus vaccine (92.8%), and ≥1 doses of varicella vaccine (90.2%); however, coverage varied by state and tended to be lower among children in families with incomes below the federal poverty level.

What are the implications for public health practice?

Sustaining current coverage levels and increasing coverage for those vaccines below national target levels is needed to maintain the low levels of vaccine-preventable diseases and prevent a resurgence of these diseases in the United States. Ensuring systems such as client reminder/recall and vaccination programs are in place in settings such as Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clinics and child-care facilities can help support high vaccination coverage.

effort to start and complete administration of the rotavirus vaccine series on time.

Although few differences in coverage by racial/ethnic group were observed after adjustment for poverty status, differences in coverage by poverty level remained for many vaccines. The Vaccines For Children program[¶¶¶] has been successful in removing differences in coverage between children living above and below the poverty level that once existed for vaccines such as MMR, polio, and HepB (*6*); however, coverage among children living below the poverty level still lags behind coverage of children living at or above the poverty level for newer vaccines (HepA and rotavirus) and vaccines that require 4 doses to complete the series.

Vaccination coverage continues to vary across states. Clusters of unvaccinated children leave communities vulnerable to outbreaks of disease. The continued occurrence of measles outbreaks among unvaccinated persons in the United States (*7*) underscores the importance of maintaining uniformly high coverage to prevent transmission of imported disease. Recent budget cuts to state and local health departments (*8*) as well as differences by state in factors such as population characteristics, immunization program activities, vaccination requirements for child-care centers, and vaccine financing policies might contribute to variations in vaccination coverage.

The findings in this report are subject to at least four limitations. First, the proportion of the NIS sampled by cellular telephone in 2012 was about half compared with only 11% in 2011 and zero in earlier years. Living in a household with only cellular telephone service is associated with poverty and other demographic factors that might be related to vaccination status (*3*). Second, underestimates of vaccination coverage might have resulted from the exclusive use of provider-reported vaccination histories because completeness of these records is unknown. Third, bias resulting from nonresponse and exclusion of households without telephone service might persist after weighting adjustments, although estimated bias from these sources for the 2011 NIS was low for selected vaccines examined, ranging from 0.3 (for MMR) to 1.5 (for ≥4 DTaP) percentage points (*9*). The potential for nonresponse bias was increased in 2012 because of the lower response rate for the cellular telephone sample. However, a comparison of vaccination coverage estimates from the NIS from July 2011 through June 2012 with those from the National Health Interview Survey during the same period yielded similar results, both overall and for children living in cellular-only households, despite largely different response rates between the two surveys (Assessment Branch, Immunization Services Division, National Center for Immunization and Respiratory Diseases, and Survey Planning and Special Surveys Branch, Division of Health Interview Statistics, National Center for Health Statistics, CDC; unpublished data; 2013). Finally, although national coverage estimates are precise, estimates for state and local areas should be interpreted with caution because of smaller sample sizes and wider confidence intervals.

High vaccination coverage among preschool-aged children has resulted in historically low levels of most vaccine-preventable diseases in the United States (*1*). The results of the 2012 NIS indicate that vaccination coverage among young children remained relatively stable and the proportion of children who do not receive any vaccinations has remained low. Slight decreases in coverage for some vaccines relative to 2011 cannot be immediately explained but could be attributable to a change in NIS methods. The 2012 results should be considered a baseline against which future trends in coverage can be evaluated. Careful monitoring of coverage levels overall and in subpopulations (e.g., racial/ethnic and geographic) is important to ensure that all children remain adequately protected. Parents and health-care providers should work to sustain high coverage and improve coverage for the more recently recommended vaccines and those that require booster doses after age 12 months. In addition to health system–based

[¶¶¶] Additional information about the Vaccines for Children program is available at http://www.cdc.gov/vaccines/programs/vfc/default.htm.

interventions previously described, national, state and local immunization programs should continue to partner with providers to implement the *Guide to Community Preventive Services*–recommended interventions aimed at increasing community demand for vaccination, such as client reminder/recall and client or family incentives. Enhanced access to health services also is recommended, through reduced out-of-pocket costs, home visits, and vaccination programs in child-care centers, schools, and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) settings**** (*4*). Health insurance reforms of the Affordable Care Act require health plans to cover recommended immunizations without cost to the enrollee when administered by an in-network provider (*10*).††††

**** Additional information about WIC is available at http://www.fns.usda.gov/wic.

†††† Enrollment in the new Health Insurance Marketplace begins October 1, 2013. The Health Insurance Marketplace will offer individuals and small businesses a streamlined process to compare health plans, get answers to questions, find out if they are eligible for tax credits for private insurance or health programs like the Children's Health Insurance Program (CHIP), and enroll in a health plan that meets their needs. Consumers can learn more about the Marketplace at http://www.healthcare.gov or the Spanish-language site http://www.cuidadodesalud.gov or by calling the 24-hour consumer call center at 1-800-318-2596. Hearing impaired callers using TTY/TDD technology can call 1-855-889-4325 for assistance.

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Measles — United States, January 1–August 24, 2013

Measles is a highly contagious, acute viral illness that can lead to complications and death. Although measles elimination (i.e., interruption of continuous transmission lasting ≥12 months) was declared in the United States in 2000 (*1*), importation of measles cases continues to occur. During 2001–2012, the median annual number of measles cases reported in the United States was 60 (range: 37–220), including 26 imported cases (range: 18–80). The median annual number of outbreaks reported to CDC was four (range: 2–16). Since elimination, the highest numbers of U.S. cases were reported in 2008 (140 cases) and 2011 (220) (Figure 1) (*2,3*). To update measles data, CDC evaluated cases reported by 16 states during January 1–August 24, 2013. A total of 159 cases of measles were reported during this period. Most cases were in persons who were unvaccinated (131 [82%]) or had unknown vaccination status (15 [9%]). Forty-two importations were reported, and 21(50%) were importations from the World Health Organization (WHO) European Region. Eight outbreaks accounted for 77% of the cases reported in 2013, including the largest outbreak reported in the United States since 1996 (58 cases) (*4*). These outbreaks demonstrate that unvaccinated persons place themselves and their communities at risk for measles and that high vaccination coverage is important to prevent the spread of measles after importation.

Confirmed measles cases in the United States are reported by state and local health departments to CDC using a standard case definition.* A measles case is confirmed in a person with febrile rash illness and laboratory confirmation or a direct epidemiologic link to a confirmed case. Laboratory confirmation involves serologic detection of measles-specific immunoglobulin M, a significant increase in measles immunoglobulin G level, isolation of measles virus, or detection of measles virus by nucleic acid amplification in a clinical specimen (e.g., nasopharyngeal or oropharyngeal swab, nasal aspirate, throat wash, or urine). Cases are considered imported if exposure to measles virus occurred outside the United States 7–21 days before rash onset and rash occurred within 21 days of entry into the United States, with no known exposure to measles in the United States during that period. Import-associated cases include 1) imported cases, 2) cases that are linked epidemiologically to imported cases, and 3) cases for which an epidemiologic link has not been identified but the viral genotype detected suggests recent importation.† An outbreak of measles is defined as a chain of transmission with three or more confirmed cases.

During January 1–August 24, 2013, a total of 159 cases were reported to CDC from 16 states and New York City (Figure 2). Patients ranged in age from 0 days to 61 years; 18 (11%) were aged <12 months, 40 (25%) were aged 1–4 years, 58 (36%) were aged 5–19 years, and 43 (27%) were aged ≥20 years. Among the 159 cases, 17 (11%) persons required hospitalization, including four patients diagnosed with pneumonia. No deaths were reported.

Among the 159 cases, 157 (99%) were import-associated, and two had an unknown source. Forty-two (26%) importations (23 returning U.S residents and 19 visitors to the United States) from 18 countries were reported, and 21 (50%) of the importations were from the WHO European Region. Genotypes identified to date are D8 (47 cases), B3 (six), H1 (four), D9 (three), and D4 (two).

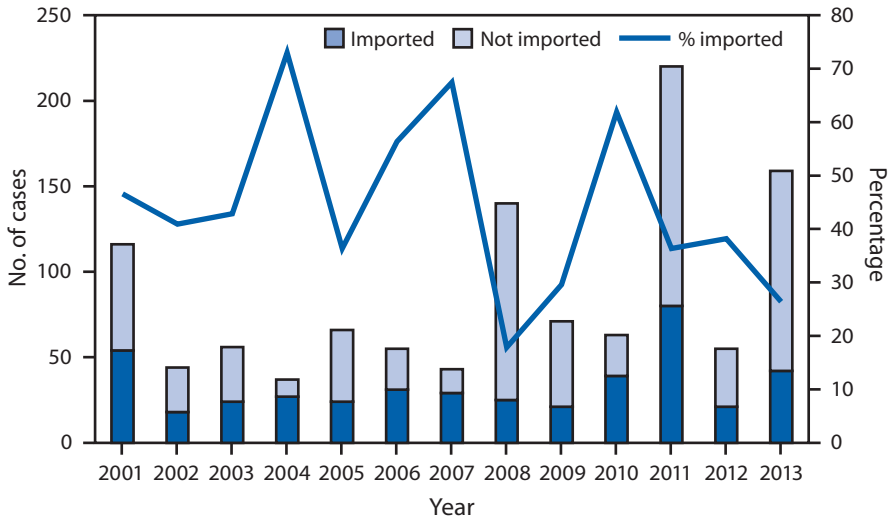
Most cases were in persons who were unvaccinated (131 [82%]) or had unknown vaccination status (15 [9%]). Thirteen (8%) of the patients had been vaccinated, of whom three had received 2 doses of measles, mumps, and rubella (MMR) vaccine. Among 140 U.S. residents who acquired measles, 117 (84%) were unvaccinated, and 11(8%) had unknown vaccination status. Of those who were unvaccinated, 92 (79%) had philosophical objections to vaccination, six (5%) had missed opportunities for vaccination, 15 (13%) occurred among infants aged <12 months who were not eligible for vaccination, and for four (3%) the reason for no vaccination was unknown (Figure 3). Among the 21 U.S resident patients who traveled abroad and were aged ≥6 months, 14 (67%) were unvaccinated, five (24%) had unknown vaccination status, and two had received 1 dose of MMR vaccine.

To date in 2013, eight outbreaks have accounted for 77% of the cases, and outbreaks have ranged from three to 58 cases. The largest outbreak occurred in New York City (*4*). None of these patients had documentation of vaccination at the time of exposure, including 12 (21%) who were aged <12 months. Of those who were eligible for vaccination, 31 (67%) had objected or had parental objection to vaccination because of religious or philosophical beliefs (*4*). The second largest outbreak, in North Carolina (23 cases, including a California resident), occurred mainly among persons not vaccinated because of personal belief exemptions (*5*). In an ongoing outbreak in Texas, 20 confirmed cases have been reported as of August 24 among members of a church community. Nineteen (95%) cases were in patients aged >12 months, and 17 (85%) of the patients were unvaccinated. The index patient was an adult with unknown measles vaccination history who traveled to Indonesia.

* Available at http://wwwn.cdc.gov/nndss/script/casedef.aspx?condyrid=908&datepub=1/1/2013%2012:00:00%20am.

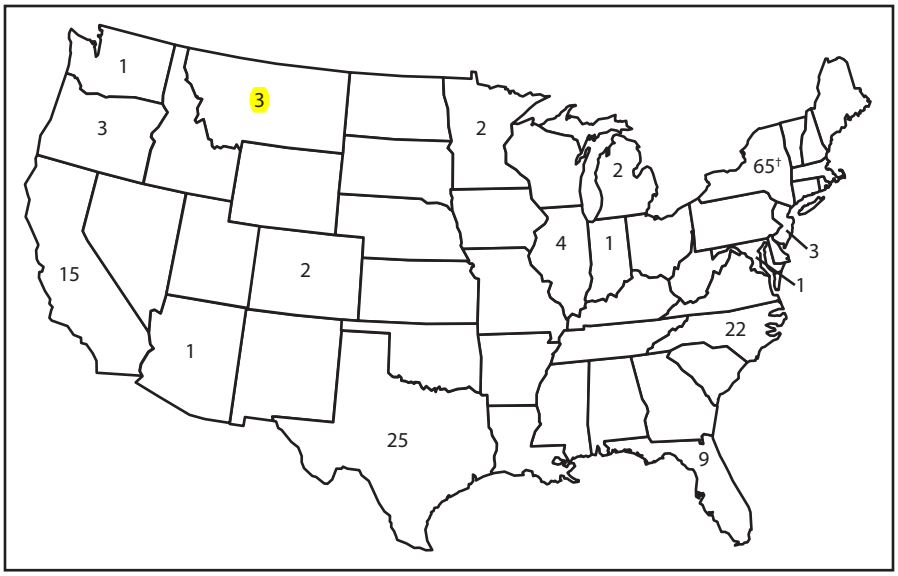
† Additional information available at http://www.cdc.gov/vaccines/pubs/surv-manual/chpt07-measles.html.

FIGURE 1. Number and percentage of measles cases that were directly imported and number of cases that were not directly imported* — United States, 2001–2013†



* Directly imported cases are those in patients who acquired measles outside the United States and brought their infection into the United States. Cases not directly imported include those that were acquired in the United States but linked to directly imported cases, imported virus, and cases with unknown sources.
† As of Aug 24, 2013.

FIGURE 2. Number of measles cases (N = 159), by state — United States, 2013*



* As of August 24, 2013.
† Includes New York City.

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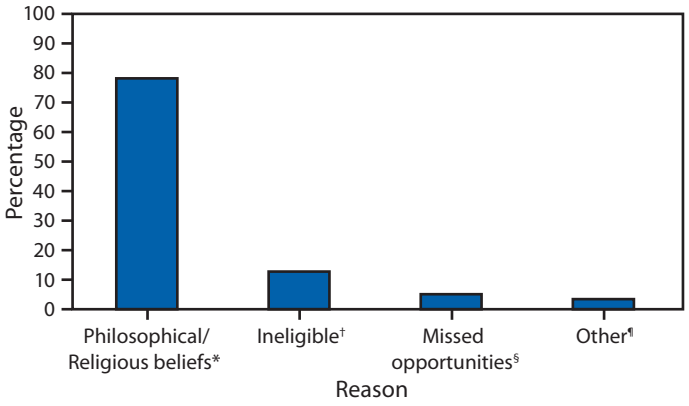
Editorial Note

Measles elimination has been maintained in the United States since it was declared in 2000. However, an estimated 20 million cases of measles occur each year worldwide, and cases continue to be imported into the United States. The increase in measles cases in the United States in 2013 serves as a reminder that imported measles cases can result in large outbreaks, particularly if introduced into areas with pockets of unvaccinated persons.

During 2013, nearly two thirds of the cases came from three outbreaks. In these outbreaks, transmission occurred after introduction of measles into communities with pockets of persons unvaccinated because of philosophical or religious beliefs. This allowed for spread to occur, mainly in households and community gatherings, before public health interventions could be implemented. Despite progress in global measles control and elimination, measles importations are likely to continue posing risks of measles outbreaks in unvaccinated communities. Maintaining high MMR vaccination coverage is essential to prevent measles outbreaks and sustain measles elimination in the United States.

To date in 2013, 23 measles importations have been reported by U.S. residents, most of whom were aged ≥6 months and unvaccinated. The source of imported cases continues to be most often the WHO European Region, a popular destination for U.S. travelers and an area where measles continues to circulate. All persons aged ≥6 months without evidence of measles immunity who travel outside the United States should be vaccinated before travel with 1 dose of MMR vaccine for infants aged 6–11 months and 2 doses for persons aged ≥12 months, at least 28 days apart. Routine MMR vaccination is recommended for all children at age 12–15 months, with a second dose at age 4–6 years. Two doses of MMR vaccine are also recommended for health-care personnel and students attending post–high school educational institutions, unless they have other evidence of immunity. Other adults without evidence of measles immunity should receive 1 dose of MMR vaccine. Health-care providers should encourage timely vaccination of all eligible patients and should remind parents

FIGURE 3. U.S residents with measles who were unvaccinated (n = 117), by reasons for not receiving measles vaccine — United States, January 1–July 13, 2013



* Includes persons who were unvaccinated because of their own or their parents' beliefs.
† Includes persons ineligible for measles vaccination, generally those aged <12 months.
§ Includes children aged 16 months–4 years who had not been vaccinated and international travelers aged ≥6 months who were unvaccinated but had no exemption.
¶ Includes persons who were known to be unvaccinated and the reason was unknown.

who plan to travel internationally with children of the increased risk for measles and the importance of vaccination (*6*).

Patients with measles often seek medical care; therefore, health-care providers should maintain a high awareness of measles and suspect measles in persons who have a febrile rash illness and clinically compatible symptoms and who have recently traveled abroad or have had contact with travelers. Providers should implement isolation precautions immediately, collect an appropriate laboratory specimen, and promptly report suspected measles case to their local health department (*7*). Early reporting and rapid control efforts by states and local public health agencies are essential to limit the spread of disease. Timely response plays an important role in limiting the size of outbreaks and preventing spread of measles, even in communities with large numbers of unvaccinated persons.

High MMR vaccine coverage in the United States (91% among children aged 19–35 months) limits the size of measles outbreaks; however, some states have coverage levels <90% (*8*). Additionally, unvaccinated children tend to cluster geographically and socially, increasing the risk for outbreaks (*9*). Increases in the proportion of persons declining vaccination for themselves or their children might lead to large-scale and sustained outbreaks, threatening the elimination of measles in the United States (*10*). Maintenance of high, 2-dose MMR vaccine coverage, early detection of cases, and rapid public health response to a case are the key factors that will lead to sustained elimination, despite the continued importation of cases into the United States.

What is already known on this topic?

Measles elimination has been maintained in the United States since it was declared in 2000. However, an estimated 20 million cases of measles occur each year worldwide, with continued importation of cases into the United States.

What is added by this report?

During January 1–August 24, 2013, a total of 159 cases of measles were reported to CDC, of which 146 (92%) were in persons who were unvaccinated or had unknown vaccination status and 42 (26%) cases were imported. Nearly two thirds of the cases were reported from three outbreaks that occurred after introduction of measles into communities with pockets of philosophical or religious exemptions.

What are the implications for public health practice?

Importation of measles into communities with unvaccinated persons can lead to large outbreaks and threaten the elimination of measles in the United States. Maintenance of high coverage with 2 doses of measles, mumps, and rubella vaccine, early detection of cases, and rapid public health response to reports of measles are key factors that will lead to sustained elimination.

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Influenza Vaccination Practices of Physicians and Caregivers of Children with Neurologic and Neurodevelopmental Conditions — United States, 2011–12 Influenza Season

Cognitive dysfunction, seizure disorders (epilepsy), and other neurologic disorders are conditions associated with a high risk for complications of influenza virus infection (*1*–*3*). This risk was observed during the 2009 influenza pandemic; among 336 pediatric deaths, 146 occurred in children with underlying neurologic disorders, most commonly intellectual disability (76%) and epilepsy (51%) (*4*). Because little is known about influenza-related knowledge and practices among the families and health-care providers of children with neurologic or neurodevelopmental (NND) conditions, CDC worked with Family Voices and the American Academy of Pediatrics to survey parents and physicians during the 2011–12 influenza season to assess these factors. Among 1,005 children with NND conditions, parents reported that 50% of children were vaccinated or had a vaccine appointment scheduled. Vaccination rates were low for children with intellectual disability (52%) and epilepsy (59%). Physician recognition of high-risk conditions was low for intellectual disability (46%) and epilepsy (52%). Efforts to improve physician awareness are essential because physicians are in a key position to educate parents of children with NND conditions about their increased risk for influenza complications and the importance of prevention through vaccination. Further research also is needed to identify barriers to influenza vaccination among families and health-care providers of these children.

CDC collaborated with Family Voices, a national advocacy group for children with special health-care needs, to recruit via listservs parents of children with chronic medical conditions. An online survey was distributed to members of the Family Voices listservs and administered from September 6 through October 24, 2011. Parents or other caregivers were asked about their knowledge, attitudes, and practices related to having their children vaccinated with seasonal influenza vaccine.

This report focuses on vaccination behavior during the 2011–12 influenza season. For purposes of this study, vaccination rates were calculated by dividing the number of children reported to have been vaccinated or for whom a vaccination appointment was scheduled by the number of children for whom a response was obtained. Only children aged ≥6 months with high-risk conditions as defined by the Advisory Committee on Immunization Practices (*1*) were included in the analysis.

CDC also collaborated with the American Academy of Pediatrics to recruit primary-care and specialty physicians who provide care for children at high risk for influenza complications, specifically children with neurologic conditions. Physicians were recruited through American Academy of Pediatrics specialty listservs, including the Council on Children with Disabilities, the Committee on Practice and Ambulatory Medicine, and the Section on Neurology. An online survey was available from March 7 through May 15, 2011. This survey collected basic information regarding practice setting, specialty, and vaccination practices for various patient populations. Respondents also were asked which chronic medical conditions were associated with increased risk for severe illness from influenza.

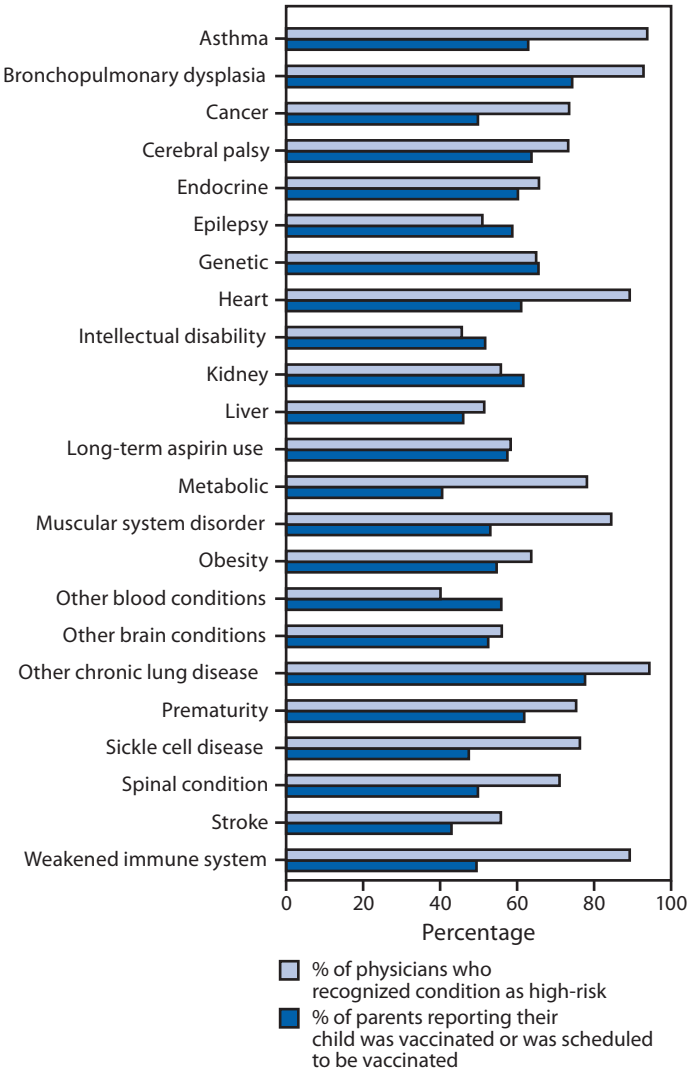
Descriptive statistics were summarized as percentages. Between-group differences were assessed using chi-square testing. A p-value of <0.05 was considered to be statistically significant.

A total of 1,940 surveys were completed by parents of children with a high-risk condition. Seasonal influenza vaccination rates categorized by high-risk condition ranged from 41% for children with metabolic conditions to 78% for children with chronic lung disease (Figure). Among 1,005 parents of children with NND conditions, 50% reported their child had received or had an appointment scheduled to receive influenza vaccine at the time of survey completion.

Among all respondents, health-care providers were reported most frequently (75%) as the source of information about vaccines in general, and influenza vaccine specifically. Parents of vaccinated children were more likely (80% versus 64% [$p<0.001$]) to report using health-care providers as a source of information. Use of the Internet (24%) and family support or disability advocacy organizations (22%) were less frequently reported as sources of information and did not differ between families of vaccinated and unvaccinated children.

A total of 412 physicians participated in the online survey. Of those, 183 (44%) respondents identified themselves as primary-care providers. Among the remaining physicians, the predominant specialties were neurology (65), emergency medicine (56), critical care (28) and genetics/metabolism (24). A total of 393 physicians completed the question about high-risk conditions (Figure). Intellectual disability and hematologic disorders other than sickle cell disease were considered to be high-risk conditions by a minority of respondents. Further analyses were performed on a subset of physicians most likely to provide outpatient medical care to children with NND conditions: primary-care pediatricians, neurologists, geneticists, developmental pediatricians, and physiatrists. These physicians caring for children with NND conditions were more likely than other pediatricians to

FIGURE. Influenza vaccination coverage among children at high risk for complications of influenza and physician recognition of high-risk conditions — United States, 2010–11 influenza season



indicate cerebral palsy (79% versus 63%), epilepsy (57% versus 39%), spinal cord conditions (76% versus 60%), stroke (63% versus 41%), and other brain conditions (62% versus 44%) as high-risk conditions ($p<0.05$ for all comparisons). They were not more likely to rate intellectual disability as a high-risk condition.

Reported by

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What is already known on this topic?

Since 2005, the Advisory Committee on Immunization Practices has included cognitive dysfunction, spinal cord injuries, seizure disorders, and other neuromuscular disorders as high-risk conditions for complications associated with influenza virus infection. A review of pediatric influenza deaths during the 2009 H1N1 pandemic revealed that 146 (43%) of the 336 deaths occurred in children with an underlying neurologic condition.

What is added by this report?

Parents of children with neurologic or neurodevelopmental disorders and physicians caring for such children were surveyed by CDC during the 2011–12 influenza season. Parents responding to an online survey reported that 50% of 1,005 children with a neurologic disorder were vaccinated against influenza or had a vaccine appointment scheduled. Among the physicians, intellectual disability was recognized as a high-risk condition by 46% of respondents and epilepsy by 52%.

What are the implications for public health practice?

Vaccination coverage levels among children with neurologic conditions are comparable with those of healthy children, despite the fact that they are at increased risk for poor outcomes. Further research among families and health-care providers is needed to identify barriers to influenza immunization.

Editorial Note

Annual influenza vaccination is recommended for all children aged 6 months–18 years. Although they are at greater risk for poor outcomes related to infection with influenza viruses, influenza vaccination of children with NND conditions was similar to that observed in the general pediatric population. The results of this survey are consistent with 2011–12 national seasonal influenza vaccination coverage estimates of 52% among children aged 6 months–17 years in the general population (*5*). In contrast, the *Healthy People 2020* goal (IID-12) is to increase the percentage of children who are vaccinated annually to 80% (*6*). Parents and caregivers reported that health-care providers were the most important source of information about vaccines. Intellectual disability and epilepsy were the two most common NND conditions among children who died during the 2009 influenza pandemic (*2*) but were two of the three conditions least likely to be recognized as high-risk by physicians.

The findings in this report are subject to at least four limitations. First, selection bias likely affected the results. Both the health-care provider and caregiver surveys were distributed via listserv services that require a subscription, which might have led to the exclusion of non–American Academy of Pediatrics member physicians who treat children at high risk for influenza complications. In addition, physicians especially interested in influenza prevention and treatment might be overrepresented in the sample. Similarly, the caregiver survey excludes parents

and caregivers who are not on Family Voices listservs. Second, although it was not possible to calculate response rates because both surveys were distributed to multiple listservs, participation bias also likely affected the results. Third, the results of both surveys are based on self-report and might not reflect actual vaccination practices. Also, because this study assessed parental intent to vaccinate and parents were surveyed early in the influenza season, current vaccination and scheduled vaccination appointments were combined. However, parental intent to vaccinate a child might not have always resulted in vaccination. Finally, the physicians who participated in the health-care provider survey were not the same physicians who treated the patients in the parent survey. Therefore, their responses might not be representative of the experiences the caregivers had with their own health-care providers.

Despite these limitations, the results of these surveys demonstrate that children with NND conditions are no more likely to be vaccinated than healthy children, despite the fact that they are at increased risk for poor outcomes. Health-care providers remain the primary source of information regarding influenza vaccination. Increased outreach and communication efforts to both primary- and subspecialty-care providers might help reduce influenza-related morbidity and mortality among these children.

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Comparison of Provisional with Final Notifiable Disease Case Counts — National Notifiable Diseases Surveillance System, 2009

States report notifiable disease cases to CDC through the National Notifiable Diseases Surveillance System (NNDSS). This allows CDC to assist with public health action and monitor infectious diseases across jurisdictional boundaries nationwide. The *Morbidity and Mortality Weekly Report* (*MMWR*) is used to disseminate these data on infectious disease incidence. The extent to which the weekly notifiable conditions are overreported or underreported can affect public health understanding of changes in the burden, distribution, and trends in disease, which is essential for control of communicable diseases (*1*). NNDSS encourages state health departments to notify CDC of a case when initially reported. These cases are included in the weekly provisional counts. The status of reported cases can change after further investigation by the states, resulting in differences between provisional and final counts. Increased knowledge of these differences can help in guiding the use of information from NNDSS. To quantify the extent to which final counts differ from provisional counts of notifiable infectious disease in the United States, CDC analyzed 2009 NNDSS data for 67 conditions. The results of this analysis demonstrate that for five conditions, final case counts were lower than provisional counts, but for 59 conditions, final counts were higher than provisional counts. The median difference between final and provisional counts was 16.7%; differences were ≤20% for 39 diseases but >50% for 12. These differences occur for various diseases and in all states. Provisional case counts should be interpreted with caution and an understanding of the reporting process.

Reporting of cases of certain diseases is mandated at the state or local level, and states, the Council of State and Territorial Epidemiologists (CSTE), and CDC establish policies and procedures for submitting data from these jurisdictions to NNDSS. Not all notifiable diseases are reportable at the state level, and although disease reporting is mandated by legislation or regulation, state reporting to CDC is voluntary. States send reports of cases of nationally notifiable diseases to CDC on a weekly basis in one of several standard formats. Amended reports can be sent, as well as new reports. Cases are reported by week of notification to CDC. Cases reported each week to CDC and published in *MMWR* are deemed provisional. The NNDSS database is open throughout the year, allowing states to update their records as new information becomes available. Annually, CDC provides each state epidemiologist with a cutoff date (usually 6 months after the end of the reporting year) by which all records must be reconciled and no additional updates are accepted for that reporting period. After the database is closed, final case counts, prepared after the states have reconciled the year-to-date data with local reporting units, are approved by state epidemiologists as accurate reflections of final case counts for the year and are published in the *MMWR Summary of Notifiable Diseases — United States.* Data for 2009 were published in 2011 (*2*).

CDC's publication schedule allows states time to complete case investigation tasks. To examine the extent that provisional counts of infectious diseases differ from final counts, CDC compared the cumulative case counts published for week 52 of 2009 in the *MMWR* of January 8, 2010 to the case counts published in the NNDSS final data set for 2009 (cutoff date of June 2010) published in *MMWR* on August 20, 2010. To assess whether discrepancies between provisional and final counts were more common in specific states or regions, or everywhere, reporting was examined, by state, of four diverse diseases: one sexually transmitted disease (*Chlamydia trachomatis*, genital infection), one vaccine-preventable disease (pertussis), one foodborne disease (salmonellosis), and one vectorborne disease (Lyme disease). Data are not presented for tuberculosis and human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome because these data are published quarterly rather than weekly in *MMWR*. Weekly reports of these conditions to the public health community are of limited value because of differences in reporting patterns for these diseases, and long-term variations in the number of cases are more important to public health practitioners than weekly variations (*3*).

Reported data for 67 notifiable diseases were reviewed. Final counts were lower than provisional counts for five diseases, the same as provisional counts for three, and higher for 59 (Table 1). The median difference between final and provisional counts was 16.7%; differences were ≤20% for 39 diseases but >50% for 12. Among diseases with ≥10 cases reported in 2009, final counts were lower than provisional counts for just four: invasive *Haemophilus influenzae* disease, ages <5 years, unknown serotype (final: 166, provisional: 218); acute hepatitis C (final: 782, provisional: 844); toxic-shock syndrome, other than streptococcal (final: 74, provisional: 76); and influenza-associated pediatric mortality (final: 358, provisional: 360). Final counts were higher than provisional counts for 51 diseases. The greatest percentage differences between provisional and final case counts were for arboviral disease, West Nile virus (neuro/nonneuro) (final: 720, provisional: 0); mumps (final: 1,991, provisional: 982); and Hansen disease (final: 103, provisional: 59).

TABLE 1. Comparison of provisional and finalized notifiable diseases data — National Notifiable Diseases Surveillance System, 2009

Disease	Final data	Provisional data	Absolute change	Change (%)
Anthrax	1	—	1	
Arboviral disease, California serogroup (neuro/nonneuro)	55	41	14	(34.1)
Arboviral disease, Eastern equine (neuro/nonneuro)	4	4	0	(0.0)
Arboviral disease, Powassan (neuro)	6	1	5	(500.0)
Arboviral disease, St. Louis encephalitis (neuro/nonneuro)	12	10	2	(20.0)
Arboviral disease, West Nile virus (neuro/nonneuro)	720	—	720	
Botulism, total	118	92	26	(28.3)
Brucellosis	115	100	15	(15.0)
Chancroid	28	25	3	(12.0)
Chlamydia trachomatis, genital infections	1,244,180	1,100,230	143,950	(13.1)
Cholera	10	8	2	(25.0)
Coccidioidomycosis	12,926	12,729	197	(1.5)
Cryptosporidiosis, total	7,654	6,652	1,002	(15.1)
Cyclosporiasis	141	123	18	(14.6)
Ehrlichiosis, *Ehrlichia chaffeen*	944	801	143	(17.9)
Ehrlichiosis, *Ehrlichia ewingii*	7	6	1	(16.6)
Ehrlichiosis, *Anaplasma phagocytophilum*	1,161	690	471	(68.3)
Ehrlichiosis, undetermined	155	122	33	(27.0)
Giardiasis	19,399	17,548	1,851	(10.6)
Gonorrhea	301,174	260,530	40,644	(15.6)
Haemophilus influenzae, invasive disease, all ages, both sexes	3,022	2,896	126	(4.4)
Haemophilus influenzae, invasive disease, ages <5 yrs, serotype b	38	25	13	(52.0)
Haemophilus influenzae, invasive disease, ages <5 yrs, nonserotype b	245	203	42	(20.7)
Haemophilus influenzae, invasive disease, ages <5 yrs, unknown serotype	166	218	−52	(−23.9)
Hansen disease	103	59	44	(74.6)
Hantavirus pulmonary syndrome	20	12	8	(66.7)
Hemolytic uremic syndrome postdiarrheal	242	210	32	(15.2)
Hepatitis A, viral, acute	1,987	1,849	138	(7.5)
Hepatitis B, viral, acute	3,405	3,020	385	(12.7)
Hepatitis C, viral, acute	782	844	−62	(−7.4)
Influenza-associated pediatric mortality	358	360	−2	(−0.6)
Legionellosis	3,522	3,145	377	(12.0)
Listeriosis	851	755	96	(12.7)
Lyme disease, total	38,468	29,780	8,688	(29.2)
Malaria	1,451	1,169	282	(24.1)
Measles, total	71	61	10	(16.4)
Meningococcal disease, all serogroups	980	887	93	(10.5)
Mumps	1,991	982	1,009	(102.8)
Pertussis	16,858	13,506	3,352	(24.8)
Plague	8	7	1	(14.3)
Polio	1	—	1	
Psittacosis	9	9	0	(0.0)
Q fever, total	113	95	18	(19.0)
Rabies, animal	5,343	3,581	1,762	(49.2)
Rabies, human	4	4	0	(0.0)
Rocky Mountain spotted fever, total	1,815	1,393	422	(30.3)
Rubella	3	4	−1	(−25.0)
Rubella, congenital syndrome	2	1	1	(100.0)
Salmonellosis	49,192	44,468	4,724	(10.6)
Shiga toxin-producing *Escherichia coli* (STEC)	4,643	4,323	320	(7.4)
Shigellosis	15,931	14,581	1,350	(9.3)
Streptococcal disease, invasive group A	5,279	4,861	418	(8.6)
Streptococcal toxic-shock syndrome	161	125	36	(28.8)
Streptococcus pneumoniae, invasive disease, drug resistant, all ages	3,370	2,823	547	(19.4)
Streptococcus pneumoniae, invasive disease, drug resistant, ages <5 yrs	583	464	119	(25.7)
Streptococcus pneumoniae, invasive disease, nondrug resistant, ages <5 yrs	1,988	1,768	220	(12.4)
Syphilis, congenital	427	257	170	(66.2)
Syphilis, primary and secondary	13,997	12,833	1,164	(9.1)
Tetanus	18	14	4	(28.6)
Toxic-shock syndrome (other than streptococcal)	74	76	−2	(−2.6)
Trichinellosis	13	12	1	(8.3)
Tularemia	93	79	14	(17.7)
Typhoid fever	397	324	73	(22.5)
Vancomycin-intermediate *Staphylococcus aureus* (VISA)	78	70	8	(11.4)
Vancomycin-resistant *Staphylococcus aureus* (VRSA)	1	—	1	
Varicella (chickenpox morbidity)	20,480	16,944	3,536	(20.9)
Vibriosis	789	593	196	(33.1)

Examining four diverse but commonly reported diseases in detail revealed no consistent association between state or region and the magnitude of the discrepancy between final and provisional counts (Table 2). For *Chlamydia trachomatis*, genital infections, the final case count was 13.1% higher than the provisional count nationally; it was <2% lower everywhere and ≥20% higher in six states. Two states, Arkansas and North Carolina, reported no cases provisionally, but reported final case counts of 14,354 and 41,045, respectively. For Lyme disease, the final case count was 29.2% higher than the provisional count nationally. Only 23 jurisdictions reported >100 cases, including 21 states, upstate New York, and New York City. Of these, four states reported a final count lower than their provisional count (range: 13.4%–29.2%) and eight jurisdictions reported final counts ≥20% higher. The greatest percentage differences between provisional and final case counts were in Connecticut (final: 4,156, provisional: none), Minnesota, (final: 1,543, provisional: 169), Texas (final: 276, provisional: 48), and New York City (final: 1,051, provisional: 262). For pertussis, the final case count was 24.8% higher than the provisional count nationally; it was <2% lower everywhere and ≥20% higher in 18 states and the District of Columbia (DC). Of the five states that reported >1,000 cases, the states with the greatest percentage differences between provisional and final counts were Minnesota (final: 1,121, provisional: 165) and Texas (final: 3,358, provisional: 2,437). For salmonellosis, the final case count was 10.6% higher than provisional count nationally. Six states reported a final count lower than their provisional count (range: 0.1%–2.9%) and nine states plus DC reported final counts ≥20% higher, the highest being DC (final: 100, provisional: 26), Louisiana (final: 1,180, provisional: 599), and Indiana (final: 629, provisional: 349).

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Editorial Note

The findings in this report corroborate previous observations that provisional NNDSS data should be interpreted with caution (*1,4,5*). The primary appeal of provisional counts is timeliness; in comparison, final counts are more complete and accurate. As additional information is collected during investigations, final case counts might be higher or lower than the provisional counts. Local and state health departments collect reportable surveillance data primarily to assist with disease control and prevention efforts (i.e., to monitor local outbreaks of infectious diseases), to measure disease burden among high-risk populations, and to assess effectiveness of local interventions. At the national level, these data can be compared with baseline data to detect unusual disease occurrences. Final data sets are useful in monitoring national trends and for determining the effectiveness of national intervention efforts. In 2009, final case counts did not differ from end-of-year provisional counts by >20% for two thirds of the 67 notifiable diseases examined. Understanding how provisional counts relate to final counts is essential for interpreting provisional data (*6,7*).

What is already known on this topic?

Provisional counts of notifiable diseases usually differ from final counts; they are most often lower.

What is added by this report?

In 2009, finalized case counts were higher than the provisional case counts for 59 of 67 notifiable diseases. The median difference between final and provisional counts was 16.7%; differences were ≤20% for 39 diseases but >50% for 12. These differences occur, to a greater or lesser extent, for a wide variety of diseases and in all states.

What are the implications for public health practice?

Notifiable disease data are subject to case reclassification leading to undernotification or overnotification. Provisional case counts should be interpreted with caution because of the reporting process. The primary appeal of provisional counts is timeliness; in comparison, final counts are more complete and accurate.

Final counts might be higher than provisional counts for several possible reasons: 1) as amended records are sent by states during the notification process, cases might be reclassified among confirmed, probable, suspected, and not-a-case categories; 2) states vary in their practices regarding when they report cases with incomplete data or that are under investigation, leading to variable delays; 3) allocation of cases to a state can be delayed; 4) laboratory testing, case investigation, and data entry can be delayed as a result of temporary staff absences (e.g., leave, furlough, or turnover); 5) states sometimes delay sending some reports to CDC until the end of the year; and 6) internal CDC data processing problems can cause a discrepancy.

The findings in this report are subject to at least one limitation. It was impossible to determine when final counts were known to the state and local jurisdictions so that they could take public health action. This report focuses only on counts published in *MMWR*. The jurisdictions might have been aware of final case counts sooner, and only notification to CDC was delayed. Although this study examined 1 year of data, previous research using multiple years of data for hepatitis A and B concluded that provisional data generally tend to underrepresent the final data counts for those conditions (*1*). The addition of

TABLE 2. Comparison of provisional and final reported cases of notifiable diseases for selected conditions, by state and area — National Notifiable Diseases Surveillance System, United States, 2009

Area	Chlamydia			Lyme disease			Pertussis			Salmonellosis		
	Final	Provisional	Change (%)	Final	Provisional	Change (%)	Final	Provisional	Change (%)	Final	Provisional	Change (%)
United States	**1,244,180**	**1,100,230**	**(13.1)**	**38,468**	**29,780**	**(29.2)**	**16,858**	**13,506**	**(24.8)**	**49,191**	**44,468**	**(10.6)**
New England	40,776	39,850	(2.3)	12,440	6,314	(97.0)	626	592	(5.7)	2,174	2,110	(3.0)
Connecticut	12,127	11,532	(5.2)	4,156	—		56	48	(16.7)	430	406	(5.9)
Maine	2,431	2,386	(1.9)	970	894	(8.5)	80	78	(2.6)	121	119	(1.7)
Massachusetts	19,315	19,538	(–1.2)	5,256	3,662	(43.5)	358	348	(2.9)	1,155	1,159	(–0.4)
New Hampshire	2,102	1,633	(28.7)	1,415	1,156	(22.4)	76	76	(0.0)	261	243	(7.4)
Rhode Island	3,615	3,614	(0.0)	235	212	(10.9)	45	31	(45.2)	144	122	(18.0)
Vermont	1,186	1,147	(3.4)	408	390	(4.6)	11	11	(0.0)	63	61	(3.3)
Mid-Atlantic	159,111	154,989	(2.7)	16,346	16,691	(–2.1)	1,222	1,101	(11.0)	5,514	5,001	(10.3)
New Jersey	23,974	21,181	(13.2)	4,973	4,163	(19.5)	244	158	(54.4)	1,132	802	(41.2)
New York (Upstate)	33,722	32,099	(5.1)	4,600	4,179	(10.1)	265	252	(5.2)	1,370	1,321	(3.7)
New York City	58,347	59,370	(–1.7)	1,051	262	(301.2)	98	92	(6.5)	1,253	1,171	(7.0)
Pennsylvania	43,068	42,339	(1.7)	5,722	8,087	(–29.2)	615	599	(2.7)	1,759	1,707	(3.1)
Eastern North Central	197,133	167,016	(18.0)	2,969	2,359	(25.9)	3,206	2,990	(7.2)	5,169	4,597	(12.4)
Illinois	60,542	48,929	(23.7)	136	126	(7.9)	648	570	(13.7)	1,484	1,294	(14.7)
Indiana	21,732	21,111	(2.9)	83	62	(33.9)	392	338	(16.0)	629	349	(80.2)
Michigan	45,714	44,873	(1.9)	103	99	(4.0)	900	854	(5.4)	960	911	(5.4)
Ohio	48,239	34,036	(41.7)	58	56	(3.6)	1,096	1,096	(0.0)	1,407	1,407	(0.0)
Wisconsin	20,906	18,067	(15.7)	2,589	2,016	(28.4)	170	132	(28.8)	689	636	(8.3)
Western North Central	70,396	66,205	(6.3)	1,693	303	(458.8)	2,840	1,678	(69.3)	2,679	2,472	(8.4)
Iowa	9,406	9,311	(1.0)	108	96	(12.5)	235	192	(22.4)	408	398	(2.5)
Kansas	10,510	9,798	(7.3)	18	14	(28.6)	240	146	(64.4)	398	269	(48.0)
Minnesota	14,197	12,222	(16.2)	1,543	169	(813.0)	1,121	165	(579.4)	575	572	(0.5)
Missouri	25,868	25,698	(0.7)	3	3	(0.0)	1,015	975	(4.1)	656	667	(–1.7)
Nebraska	5,443	5,262	(3.4)	5	20	(–75.0)	141	141	(0.0)	341	337	(1.2)
North Dakota	1,957	1,769	(10.6)	15	—		30	29	(3.5)	103	73	(41.1)
South Dakota	3,015	2,145	(40.6)	1	1	(0.0)	58	30	(93.3)	198	156	(26.9)
South Atlantic	249,979	194,409	(28.6)	4,466	3,778	(18.2)	1,632	1,551	(5.2)	14,478	13,488	(7.3)
Delaware	4,718	4,718	(0.0)	984	952	(3.4)	13	13	(0.0)	142	137	(3.7)
District of Columbia	6,549	6,414	(2.1)	61	20	(205.0)	7	3	(133.3)	100	26	(284.6)
Florida	72,931	71,731	(1.7)	110	127	(–13.4)	497	500	(–0.6)	6,741	6,749	(–0.1)
Georgia	39,828	29,934	(33.1)	40	53	(–24.5)	223	194	(15.0)	2,362	2,365	(–0.1)
Maryland	23,747	22,138	(7.3)	2,024	1,775	(14,0)	148	134	(10.5)	803	784	(2.4)
North Carolina	41,045	—		96	63	(52.4)	220	223	(–1.4)	1,810	1,053	(71.9)
South Carolina	26,654	25,014	(6.7)	42	39	(7.7)	262	252	(4.0)	1,195	1,153	(3.6)
Virginia	30,903	30,881	(0.1)	908	579	(56.8)	222	198	(12.1)	1,095	1,004	(9.1)
West Virginia	3,604	3,579	(0.7)	201	170	(18.2)	40	34	(17.7)	230	217	(6.0)
Eastern South Central	92,522	87,926	(5.2)	41	36	(13.9)	803	760	(5.7)	3,077	2,937	(4.8)
Alabama	25,929	22,833	(13.6)	3	3	(0.0)	305	285	(7.0)	932	850	(9.7)
Kentucky	13,293	13,166	(1.0)	1	1	(0.0)	226	219	(3.2)	453	451	(0.4)
Mississippi	23,589	22,146	(6.5)	—	—		75	66	(13.6)	899	853	(5.4)
Tennessee	29,711	29,781	(–0.2)	37	32	(15.6)	197	190	(3.7)	793	783	(1.3)
Western South Central	162,915	136,836	(19.1)	278	48	(479.2)	3,993	2,882	(38.6)	6,411	4,751	(34.9)
Arkansas	14,354	—		—	—		369	278	(32.7)	615	607	(1.3)
Louisiana	27,628	25,308	(9.2)	—	—		149	90	(65.6)	1,180	599	(97.0)
Oklahoma	15,023	12,959	(15.9)	2	—		117	77	(52.0)	652	615	(6.0)
Texas	105,910	98,569	(7.5)	276	48	(475.0)	3,358	2,437	(37.8)	3,964	2,930	(35.3)
Mountain	80,476	73,912	(8.9)	57	44	(30.0)	1,019	890	(14.5)	3,028	2,812	(7.7)
Arizona	26,002	25,110	(3.6)	7	6	(16.7)	277	224	(23.7)	1,086	1,051	(3.3)
Colorado	19,998	16,362	(22.2)	1	1	(0.0)	231	233	(–0.9)	619	621	(–0.3)
Idaho	3,842	3,501	(9.7)	16	15	(6.7)	99	99	(0.0)	174	172	(1.2)
Montana	2,988	2,913	(2.6)	3	3	(0.0)	61	57	(7.0)	110	99	(11.1)
Nevada	10,045	9,743	(3.1)	13	5	(160.0)	24	9	(166.7)	252	173	(45.7)
New Mexico	9,493	8,947	(6.1)	5	5	(0.0)	85	66	(28.8)	369	325	(13.5)
Utah	6,145	5,466	(12.4)	9	7	(28.6)	220	181	(21.6)	321	283	(13.4)
Wyoming	1,963	1,870	(5.0)	3	2	(50.0)	22	21	(4.8)	97	88	(10.2)
Pacific	190,872	179,087	(6.6)	178	207	(–14.0)	1,517	1,062	(42.8)	6,662	6,300	(5.8)
Alaska	5,166	4,412	(17.1)	7	3	(133.0)	59	49	(20.4)	68	70	(–2.9)
California	146,796	139,689	(5.1)	117	154	(–24.0)	869	473	(83.7)	5,003	4,757	(5.2)
Hawaii	6,026	5,610	(7.4)	—*	—*		46	29	(58.6)	338	297	(13.8)
Oregon	11,497	10,245	(12.2)	38	35	(8.6)	252	246	(2.4)	433	416	(4.1)
Washington	21,387	19,131	(11.8)	16	15	(6.7)	291	265	(9.8)	820	760	(7.9)

* Not notifiable in Hawaii.

more years to the current research, which examined multiple notifiable conditions and documents substantial differences across states, regions, and numerous conditions, would not be expected to change the overall results.

Interpreting weekly incidence data is complex because of surveillance system limitations. Nonetheless, health practitioners have to respond to public health threats based on preliminary surveillance information. In 2006, CDC and CSTE reconsidered data presentation formats and included additional information (e.g., 5-year weekly average, previous 52 weeks median, and maximum number of cases) to aid interpreting these data (*3*). However, the findings in this report illustrate that major challenges still exist in presenting and interpreting provisional data and highlights the need to examine specific factors that can contribute to late reporting of cases (e.g., late case reporting by providers to health departments or late reporting of cases by health departments to CDC) (*4*). Although information technology has improved notifiable disease reporting (*8*), NNDSS data remain subject to reporting artifacts. Understanding specific reasons for the variation between the provisional and final case counts for each condition can improve the use of provisional data for disease surveillance and notification.

Acknowledgments

Richard Hopkins, MD, Florida Dept of Health. John Davis-Cole, PhD, District of Columbia Dept of Health. Michael Landen, MD, New Mexico Dept of Health. Participating state health departments and reporting jurisdictions.

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Notes from the Field

Measles Outbreak Among Members of a Religious Community — Brooklyn, New York, March–June 2013

On March 13, 2013, an intentionally unvaccinated adolescent aged 17 years returned to New York City from London, United Kingdom, while infectious with measles. This importation led to the largest outbreak of measles in the United States since 1996 (*1*).

Investigation of suspected cases included patient interviews, medical record reviews, and ascertainment of immunization records. Testing for measles immunoglobulin G (IgG) and immunoglobulin M (IgM) and testing for measles virus RNA by reverse-transcription polymerase chain reaction (RT-PCR) were performed, and measles genotype was determined. Cases were identified in residents of New York City and classified according to the Council of State and Territorial Epidemiologists clinical case definition (*2*). Exposed contacts were identified, and control measures were implemented.

A total of 58 cases* were identified, including six generations of measles infection in two neighborhoods of the borough of Brooklyn. All cases were in members of the orthodox Jewish community. No case was identified in a person who had documented measles vaccination at the time of exposure; 12 (21%) of the cases were in infants too young (aged <12 months) for routine immunization with measles, mumps, and rubella (MMR) vaccine. The outbreak was first recognized in Brooklyn's Borough Park neighborhood, where the median age of 28 infected persons was 10 years (range: 0–32 years), and 79% of cases in persons aged ≥12 months were in three extended families whose members declined use of measles vaccine. The outbreak spread to the Williamsburg neighborhood, where the median age of 30 infected persons was 19 months (range: 0 months–32 years), and the primary reasons for lack of vaccination were refusal (nine, 30%) and delay (eight, 27%). Forty-eight (83%) of all cases were confirmed by positive measles IgM or RT-PCR result and 10 (17%) by epidemiologic linkage (*2*). Genotype D8 was identified in 17 cases, consistent with known current circulation of this genotype in the United Kingdom. No other genotype was identified among the cases.

In 31% of cases, no medical care for rash illness had been sought and, therefore, the cases had not been reported to the New York City Department of Health and Mental Hygiene (DOHMH) by a medical provider. In 9% of cases, patients saw a medical provider at the time of rash illness but were not reported when the diagnosis of measles was first considered. In 52% of cases, measles was likely acquired from a relative. Complications included pneumonia in one child; two pregnant women required hospitalization, including one who miscarried. The last case onset occurred on June 9, 2013.

Approximately 3,500 contacts were identified in health-care, school, and home settings. Control measures included administration of immune globulin or MMR vaccine post-exposure prophylaxis; home isolation; alerts to medical providers; active recall of children in medical practices who were not up-to-date with measles vaccine; notifications to families, schools and day care providers through letters, flyers, and advertisements in newspapers; immunization audits of schools; and meetings with religious leaders and elected officials. DOHMH recommended that obstetricians in affected communities test for measles immunity during pregnancy and vaccinate women without evidence of measles immunity postpartum. Because infants were affected, vaccination recommendations during the outbreak period were expanded to include MMR vaccine for all children aged 6–11 months in the affected communities, with the second dose of MMR vaccine administered early, as soon as 4 weeks after the first dose of MMR vaccine.

Measles elimination was declared in the United States in 2000. However, importations of measles continue to present risks for outbreaks in the United States. This outbreak was propagated by a few extended families whose members declined MMR vaccine and by children with delays in receiving MMR vaccine in densely populated neighborhoods (*3*). High vaccination coverage within the Brooklyn orthodox Jewish community likely limited the scope of the outbreak. The insular nature of the affected community and high population-level vaccination coverage outside this community likely prevented further spread of measles.

Reported by

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* Includes 57 confirmed cases and one case in a newborn who was culture-positive and born to an infected mother but did not have documentation of clinical symptoms.

Notes from the Field

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Measles Outbreak Associated with a Traveler Returning from India — North Carolina, April–May 2013

On April 14, 2013, public health officials in North Carolina were notified of suspected measles infections in two unvaccinated members of a family. Measles was confirmed by laboratory testing at the State Laboratory of Public Health on April 16, 2013. Investigators learned that a third unvaccinated member of the household had developed fever and rash 11 days earlier, after returning to the United States from a 3-month visit to India, but measles had not been suspected until household contacts sought evaluation for similar symptoms.

During April and May, direct and indirect transmission from the returning traveler resulted in 22 identified cases of measles (including the two cases first reported), for a total of 23 cases overall. Most cases were among residents of a largely unvaccinated religious community in rural North Carolina. Eighteen (78%) of the 23 patients were unvaccinated, three (13%) had been fully vaccinated with 2 doses of measles vaccine, and two (9%) had unknown vaccination status. The 23 patients ranged in age from 1 to 59 years. Measles was confirmed by laboratory testing of specimens from 16 patients (70%). Specimens collected from eight cases were sent to the Vaccine Preventable Disease Reference Center at the Wisconsin State Laboratory of Hygiene for molecular characterization. Genotype D8, the most commonly identified measles genotype in India (*1*), was identified in the specimens from all eight cases.

This outbreak required extensive resources from both state and local public health agencies. Estimates provided by local health departments indicated that approximately 2,200 hours were spent on control efforts. Isolation orders were issued to 30 persons with suspected or confirmed measles infection. Investigation of the contacts of these persons led to the identification of approximately 1,000 exposed persons from various settings, including health-care facilities, schools, and community events. Contacts without evidence of measles immunity were offered postexposure prophylaxis with measles vaccine or immune globulin as indicated (*2*). Written quarantine orders were issued to 72 (81%) of 89 susceptible contacts who did not receive measles vaccine within 72 hours of exposure, and oral quarantine orders were issued to the remaining 17 (19%).

Although measles is no longer endemic in the United States (*2*), importation of measles virus continues to occur. This outbreak consumed resources from state and local public health agencies for many weeks and resulted in restrictions on the movement, through isolation or quarantine measures, of approximately 115 persons in the community. Preventing future travel-associated outbreaks in North Carolina and the United States will require maintaining high rates of immunization (particularly among travelers to areas where measles is endemic), rapid identification of cases, and swift public health response.

Reported by

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Announcements

National Child Passenger Safety Week — September 15–21, 2013

In the United States, motor vehicle–related injuries are a leading cause of death among children (*1*). In 2011, a total of 656 passenger vehicle occupants aged 0–12 years died as a result of a crash (*2*). During 1975–2011, child restraints saved an estimated 9,874 lives of children aged 0–4 years (*2*). Seating position also contributes to child passenger safety. To keep child passengers as safe as possible, drivers should properly restrain children aged <13 years in a back seat and follow the American Academy of Pediatrics' child passenger safety recommendations (*3*).

For 2013, National Child Passenger Safety Week is September 15–21. As part of the campaign, September 21 is designated as National Seat Check Saturday, when drivers with child passengers are encouraged to visit a child safety seat inspection station to have a certified technician inspect their car seat and give hands-on advice free of charge. Additional information and an inspection station locator are available from the National Highway Traffic Safety Administration at http://www.nhtsa.gov/Safety/CPS. Promotional materials (in English and Spanish) are available at http://www.trafficsafetymarketing.gov/cps.

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CDC's New Healthy Aging Data Portfolio

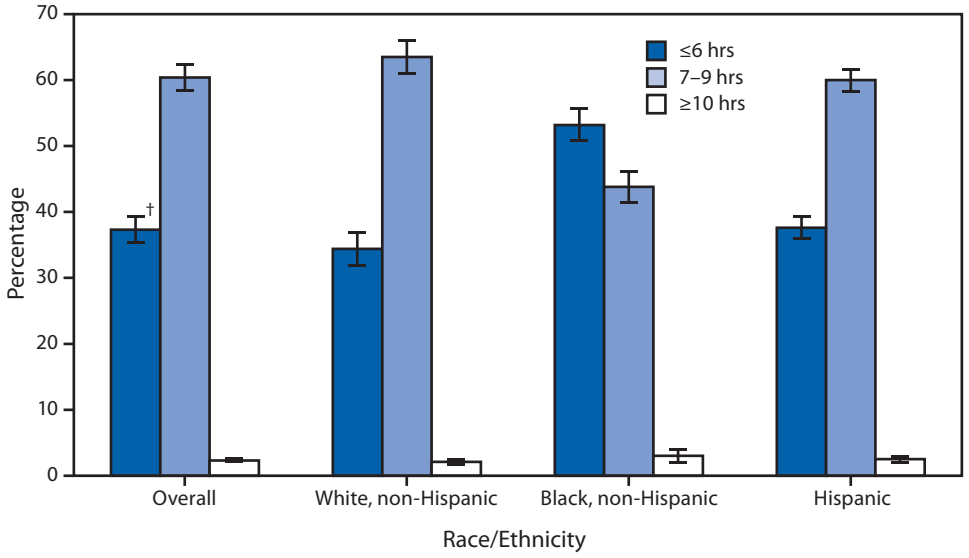
The CDC Healthy Aging Program has released a Healthy Aging Data Portfolio (available at http://nccd.cdc.gov/dph_aging/default.aspx) that focuses on the health and well-being of older persons in the United States. Two factors will significantly affect health and social systems in the United States: longer adult life spans and a dramatic increase in the number of older adults, primarily because of the aging of "baby boomers" (persons born during 1946–1964). The population of U.S. residents aged ≥65 years is expected to double during the next 25 years, to about 72 million persons.

The portfolio is a compilation of previously published reports that focus on adults aged 50–64 years or ≥65 years, depending on the nature of the report. The portfolio includes the newly released report, *The State of Aging and Health in America 2013*, which provides data on key indicators and strategies to improve the health and quality of life for adults aged ≥65 years. National, state, and local public health and aging services network professionals, researchers, health-care providers, journalists, decision makers, and others interested in the health of older adults can use the portfolio to examine national, state, and selected local area data, create custom reports, learn about related expert recommendations and *Healthy People 2020* objectives, and find links to informational resources. Additional information about CDC's work on healthy aging is available at http://www.cdc.gov/aging.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Sleep Duration* Among Adults Aged ≥20 Years, by Race/Ethnicity — National Health and Nutrition Examination Survey, United States, 2007–2010



* Data on sleep duration come from the question, "How much sleep do you usually get at night on weekdays or workdays?" All estimates are age-adjusted to the 2000 projected U.S. standard population using the age groups 20–39, 40–59, and ≥60 years.
† 95% confidence interval.

During 2007–2010, 60.4% of U.S. adults aged ≥20 years slept 7–9 hours at night, 37.3% slept 6 hours or less, and 2.3% slept 10 hours or more. Non-Hispanic black adults were less likely to report sleeping 7–9 hours and more likely to report sleeping 6 hours or less than non-Hispanic white and Hispanic adults.

Source: CDC. National Health and Nutrition Examination Survey. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2007–2010. Available at http://www.cdc.gov/nchs/nhanes.htm.

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Data presented by the Notifiable Disease Data Team and 122 Cities Mortality Data Team in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30333 or to *mmwrq@cdc.gov.*

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