



# MMWR™

## Morbidity and Mortality Weekly Report

www.cdc.gov/mmwr

Weekly

September 5, 2008 / Vol. 57 / No. 35

### National, State, and Local Area Vaccination Coverage Among Children Aged 19–35 Months — United States, 2007

The National Immunization Survey (NIS) provides vaccination coverage estimates among children aged 19–35 months for each of the 50 states and selected urban areas.\* This report describes the results of the 2007 NIS, which provided coverage estimates among children born during January 2004–July 2006. *Healthy People 2010* established vaccination coverage targets of 90% for each of the vaccines included in the combined 4:3:1:3:3:1<sup>†</sup> vaccine series and a target of 80% for the combined series (1). Findings from the 2007 NIS indicated that  $\geq 90\%$  coverage was achieved for most of the routinely recommended vaccines (2). The majority of parents were vaccinating their children, with less than 1% of children receiving no vaccines by age 19–35 months. The coverage level for the 4:3:1:3:3:1 series remained steady at 77.4%, compared with 76.9% in 2006. Among states and local areas, substantial variability continued, with estimated vaccination coverage ranging from 63.1% to 91.3%. Coverage remained high across all racial/ethnic groups and was not significantly different among racial/ethnic groups after adjusting for poverty status. However, for some vaccines, coverage remained lower among children living below the poverty level compared with children living at or above the poverty level. Maintaining high

vaccination coverage and continued attention to reducing current poverty disparities is needed to limit the spread of preventable diseases and ensure that children are protected.

To collect vaccination information on age-eligible children (i.e., those aged 19–35 months), NIS uses a quarterly, random-digit-dialing sample of telephone numbers for each survey area. When respondents grant permission to contact providers, the telephone interview is followed by a mail survey of the children's vaccination providers to validate immunization information. NIS methodology, including how the responses are weighted to represent the population of children aged 19–35 months, has been described previously (3). During 2007, the household response rate (4) was 64.9%; a total of 17,017 children with provider-verified vaccination records were included in this report, representing 68.6% of all children with completed household interviews. Statistical analyses were conducted using t-tests. Differences were considered statistically significant at  $p < 0.05$ . A poverty status variable<sup>§</sup> was added to the logistic regression models to control for racial/ethnic differences among children living at or above the poverty level and children living below the poverty level. This report describes coverage levels for vaccines that have been included in the routine childhood vaccination schedule recommended by the Advisory Committee on Immunization Practices (ACIP) since 2000 or before (2).

\* Fourteen local areas were sampled separately for the 2007 NIS. These included six areas that receive federal immunization grant 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); seven previously sampled areas (Alameda County, California; Los Angeles County, California; San Bernardino County, California; Miami-Dade County, Florida; Marion County, Indiana; Dallas County, Texas; and El Paso County, Texas); and one area sampled for the first time (western Washington). Local areas sampled in the NIS might change yearly as state immunization programs target local assessments where they are most needed.

<sup>†</sup>  $\geq 4$  doses of diphtheria, tetanus toxoid, and any acellular pertussis vaccine, which can include diphtheria and tetanus toxoid vaccine or diphtheria, tetanus toxoid, and pertussis vaccine (DTaP);  $\geq 3$  doses of poliovirus vaccine;  $\geq 1$  dose of measles, mumps, and rubella vaccine;  $\geq 3$  doses of *Haemophilus influenzae* type b vaccine;  $\geq 3$  doses of hepatitis B vaccine; and  $\geq 1$  dose of varicella vaccine).

<sup>§</sup> Poverty status was based on 2006 U.S. Census poverty thresholds (available at <http://www.census.gov/hhes/www/poverty.html>).

#### INSIDE

- 967 Laboratory Surveillance for Wild and Vaccine-Derived Polioviruses — Worldwide, January 2007–June 2008
- 970 Notices to Readers
- 971 QuickStats

The *MMWR* series of publications is published by the Coordinating Center for Health Information and Service, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30333.

**Suggested Citation:** Centers for Disease Control and Prevention. [Article title]. *MMWR* 2008;57:[inclusive page numbers].

#### Centers for Disease Control and Prevention

Julie L. Gerberding, MD, MPH  
*Director*

Tanja Popovic, MD, PhD  
*Chief Science Officer*

James W. Stephens, PhD  
*Associate Director for Science*

Steven L. Solomon, MD  
*Director, Coordinating Center for Health Information and Service*

Jay M. Bernhardt, PhD, MPH  
*Director, National Center for Health Marketing*

Katherine L. Daniel, PhD  
*Deputy Director, National Center for Health Marketing*

#### Editorial and Production Staff

Frederic E. Shaw, MD, JD  
*Editor, MMWR Series*

Susan F. Davis, MD  
*(Acting) Assistant Editor, MMWR Series*

Teresa F. Rutledge  
*Managing Editor, MMWR Series*

Douglas W. Weatherwax  
*Lead Technical Writer-Editor*

Donald G. Meadows, MA  
Jude C. Rutledge  
*Writers-Editors*

Peter M. Jenkins  
*(Acting) Lead Visual Information Specialist*

Malbea A. LaPete  
Stephen R. Spriggs  
*Visual Information Specialists*

Kim L. Bright, MBA  
Quang M. Doan, MBA  
Erica R. Shaver

*Information Technology Specialists*

#### Editorial Board

William L. Roper, MD, MPH, Chapel Hill, NC, Chairman  
Virginia A. Caine, MD, Indianapolis, IN  
David W. Fleming, MD, Seattle, WA  
William E. Halperin, MD, DrPH, MPH, Newark, NJ  
Margaret A. Hamburg, MD, Washington, DC  
King K. Holmes, MD, PhD, Seattle, WA  
Deborah Holtzman, PhD, Atlanta, GA  
John K. Iglehart, Bethesda, MD  
Dennis G. Maki, MD, Madison, WI  
Sue Mallonee, MPH, Oklahoma City, OK  
Patricia Quinlisk, MD, MPH, Des Moines, IA  
Patrick L. Remington, MD, MPH, Madison, WI  
Barbara K. Rimer, DrPH, Chapel Hill, NC  
John V. Rullan, MD, MPH, San Juan, PR  
William Schaffner, MD, Nashville, TN  
Anne Schuchat, MD, Atlanta, GA  
Dixie E. Snider, MD, MPH, Atlanta, GA  
John W. Ward, MD, Atlanta, GA

In 2007, national coverage with the 4:3:1:3:3:1 series was 77.4%; this coverage has been stable since 2004. Coverage with the combined 4:3:1:3:3:1:4 vaccine series (i.e., the 4:3:1:3:3:1 series plus  $\geq 4$  doses of 7-valent pneumococcal conjugate vaccine [PCV7]) is being reported for the first time and was 66.5%. National coverage was  $\geq 90\%$  for each of the vaccines included in the 4:3:1:3:3:1 series except for  $\geq 4$  doses of DTaP (84.5%); coverage with  $\geq 3$  doses of DTaP was 95.5% (Table 1). Coverage with  $\geq 1$  dose of varicella vaccine (VAR) reached 90% for the first time. VAR coverage among American Indian/Alaska Native (AI/AN)<sup>§</sup> children increased significantly, from 85.4% in 2006 to 94.9% in 2007. National vaccination coverage estimates for PCV7 continued to increase, from 86.9% in 2006 to 90.0% in 2007 for  $\geq 3$  doses and from 68.4% to 75.3% for  $\geq 4$  doses. Among AI/AN children, coverage with the fourth dose of PCV7 increased significantly, from 62.7% to 80.4%.

Substantial differences were observed in vaccination coverage among states and local areas (Table 2). Estimated coverage for the 4:3:1:3:3:1 series ranged from 91.3% in Maryland to 63.1% in Nevada. Among the 14 local areas included in the 2007 NIS, coverage with the 4:3:1:3:3:1 series ranged from 82.2% in Philadelphia, Pennsylvania, to 69.6% in San Bernardino, California.

Vaccination coverage levels were higher among AI/ANs compared with whites for measles, mumps, and rubella (MMR) vaccine, hepatitis B (HepB) vaccine, and VAR (Table 3). Coverage with the fourth dose of DTaP and the fourth dose of PCV7 among black children was not significantly lower than white children after controlling for poverty status. Vaccination coverage with the fourth dose of DTaP and the fourth dose of PCV7 was lower among children living below the poverty level compared with children living at or above the poverty level, but this difference declined from 6.1% in 2006 to 4.8% in 2007 for  $\geq 4$  doses of DTaP and from 9.4% in 2006 to 3.5% in 2007 for  $\geq 4$  doses of PCV7. Vaccination coverage levels were similar across all racial/ethnic groups for the 4:3:1:3:3:1 series. Coverage differed for this series among children living at or above the poverty level compared with children living below the poverty level, but this difference declined from 4.9% in 2006 to 3.2% in 2007. Coverage between white and black children with the 4:3:1:3:3:1:4 series was not significantly different after controlling for poverty status.

<sup>§</sup> For this report, persons identified as white, black, Asian, or American Indian/Alaska Native are all non-Hispanic. Persons identified as Hispanic might be of any race.

**TABLE 1. Estimated vaccination coverage among children aged 19–35 months, by selected vaccines and dosages — National Immunization Survey, United States, 2003–2007**

Vaccine	2003*		2004†		2005§		2006¶		2007**	
	%	(95% CI)††	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
DTP/DT/DTaP§§										
≥3 doses	96.0	(±0.5)	95.9	(±0.5)	96.1	(±0.5)	95.8	(±0.5)	95.5	(±0.5)
≥4 doses	84.8	(±0.8)	85.5	(±0.8)	85.7	(±0.9)	85.2	(±0.9)	84.5	(±0.9)
Poliovirus	91.6	(±0.7)	91.6	(±0.7)	91.7	(±0.7)	92.8	(±0.6)	92.6	(±0.7)
MMR¶¶ ≥1 dose	93.0	(±0.6)	93.0	(±0.6)	91.5	(±0.7)	92.3	(±0.6)	92.3	(±0.7)
Hib*** ≥3 doses	93.9	(±0.6)	93.5	(±0.6)	93.9	(±0.6)	93.4	(±0.6)	92.6	(±0.7)
Hepatitis B ≥3 doses	92.4	(±0.6)	92.4	(±0.6)	92.9	(±0.6)	93.3	(±0.6)	92.7	(±0.7)
Varicella ≥1 dose	84.8	(±0.8)	87.5	(±0.7)	87.9	(±0.8)	89.2	(±0.7)	90.0	(±0.7)
PCV7†††										
≥3 doses	68.1	(±1.0)	73.2	(±1.0)	82.8	(±1.0)	86.9	(±0.8)	90.0	(±0.8)
≥4 doses	35.8	(±1.0)	43.4	(±1.1)	53.7	(±1.3)	68.4	(±1.1)	75.3	(±1.2)
Combined series										
4:3:1§§§	82.2	(±0.9)	83.5	(±0.9)	83.1	(±1.0)	83.1	(±0.9)	82.8	(±1.0)
4:3:1:3¶¶¶	81.3	(±0.9)	82.5	(±0.9)	82.4	(±1.0)	82.1	(±1.0)	81.8	(±1.0)
4:3:1:3:3****	79.4	(±0.9)	80.9	(±0.9)	80.8	(±1.0)	80.5	(±1.0)	80.1	(±1.0)
4:3:1:3:3:1††††	72.5	(±1.0)	76.0	(±1.0)	76.1	(±1.1)	76.9	(±1.0)	77.4	(±1.1)
4:3:1:3:3:1:4§§§§	30.8	(±1.0)	38.4	(±1.1)	47.2	(±1.3)	60.1	(±1.2)	66.5	(±1.3)
Children who received no vaccinations	0.4	(±0.1)	0.4	(±0.2)	0.4	(±0.1)	0.4	(±0.1)	0.6	(±0.2)

\* Born during January 2000–July 2002.

† Born during January 2001–July 2003.

§ Born during February 2002–July 2004.

¶ Born during January 2003–June 2005 (2006 estimates based on National Immunization Survey dataset, which was rereleased on February 25, 2008, after correcting for Hispanic overcount in nine states).

\*\* Born during January 2004–July 2006.

†† Confidence interval.

§§ Diphtheria, tetanus toxoids and pertussis vaccines, diphtheria and tetanus toxoids, and diphtheria, tetanus toxoids, and any acellular pertussis vaccine.

¶¶ Measles, mumps, and rubella vaccine.

\*\*\* *Haemophilus influenzae* type b (Hib) vaccine.

††† 7-valent pneumococcal conjugate vaccine (PCV7).

§§§ ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, and ≥1 dose of any measles-containing vaccine.

¶¶¶ 4:3:1 plus ≥3 doses of Hib vaccine.

\*\*\*\* 4:3:1:3 plus ≥3 doses of hepatitis B vaccine.

†††† 4:3:1:3:3 plus ≥1 dose of varicella vaccine.

§§§§ 4:3:1:3:3:1 plus ≥4 doses of PCV7.

**Reported by:** N Darling, MPH, M Kolasa, MPH, KG Wooten, MA, Immunization Svcs Div, National Center for Immunization and Respiratory Diseases, CDC.

**Editorial Note:** NIS is the only population-based, provider-verified survey to provide national, state, and local area estimates of vaccination coverage among children aged 19–35 months. The results of the 2007 survey indicate that vaccination coverage for vaccines recommended routinely by ACIP since 2000 and before (2) reached record high levels. Improvements in vaccination coverage for VAR meant that national coverage estimates for all individual vaccines in the 4:3:1:3:3:1 series were ≥90%, except coverage with ≥4 doses of DTaP. Coverage with ≥4 doses of PCV7 also was <90%. However, 3-dose coverage for both DTaP and PCV7 remained high. Coverage with ≥4 doses of PCV7 increased significantly to 75.3% in 2007, a substantial increase since PCV7 was first recommended in 2000 (5). However, coverage with ≥4 doses of DTaP has not changed during the past 5 years. Increasing coverage for the fourth dose of DTaP and the fourth dose of PCV7 would improve national coverage for the 4:3:1:3:3:1 series and the 4:3:1:3:3:1:4 series, which will be used to monitor the *Healthy People 2010* immunization objectives begin-

ning with 2009 NIS data. The vaccine shortage that ended in September 2004 (6) might have reduced coverage with the fourth dose of PCV7 among children in the 2007 NIS cohort (i.e., those born during January 2004–July 2006). Use of effective interventions, such as parent and provider reminder/recall, reducing out-of-pocket costs, increasing access to vaccination, and multicomponent interventions that include education might further improve overall coverage in areas where coverage is low (7). In addition, closing the coverage gap between areas with the highest and lowest coverage remains a priority. To achieve this, further collaborative efforts among CDC, state immunization coordinators, immunization programs, and other entities are essential.

Vaccination coverage among AI/AN children for VAR, MMR vaccine, and the fourth dose of PCV7 increased significantly in 2007 compared with 2006; in 2007, coverage levels among AI/AN children were higher for two of these vaccines (VAR and MMR vaccine) compared with white children. Improved exchange of data between the Indian Health Service information system and state immunization information systems and implementation of evidence-based strategies such as reminder/recall at Indian Health Service and tribal

**TABLE 2. Estimated vaccination coverage for the 4:3:1:3:3:1\* and 4:3:1:3:3:1:4† vaccination series and selected individual vaccines among children aged 19–35 months, by state and selected local areas — National Immunization Survey, United States, 2007§**

State/Area	≥4 DTap¶		≥1 MMR**		≥1 VAR††		≥4 PCV7§§		4:3:1:3:3:1		4:3:1:3:3:1:4	
	%	(95% CI¶¶)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
<b>United States</b>	<b>84.5</b>	<b>(±0.9)</b>	<b>92.3</b>	<b>(±0.7)</b>	<b>90.0</b>	<b>(±0.7)</b>	<b>75.3</b>	<b>(±1.2)</b>	<b>77.4</b>	<b>(±1.1)</b>	<b>66.5</b>	<b>(±1.3)</b>
Alabama	85.4	(±5.2)	95.0	(±2.8)	92.0	(±4.5)	79.6	(±5.7)	78.2	(±6.3)	67.3	(±7.0)
Alaska	81.7	(±5.6)	89.7	(±4.1)	80.5	(±6.0)	80.9	(±6.0)	70.1	(±6.8)	64.4	(±7.3)
Arizona	85.4	(±5.7)	89.0	(±4.8)	86.0	(±5.4)	76.8	(±6.6)	75.2	(±6.7)	66.1	(±7.3)
Arkansas	78.8	(±5.8)	92.5	(±3.1)	89.2	(±4.2)	65.4	(±6.4)	72.3	(±6.2)	57.4	(±6.5)
California	84.9	(±4.0)	94.6	(±2.4)	93.2	(±2.6)	78.8	(±4.8)	77.1	(±4.7)	67.7	(±5.4)
Alameda County	83.1	(±5.4)	91.6	(±4.4)	89.6	(±4.5)	80.7	(±5.7)	76.3	(±5.8)	69.4	(±6.2)
Los Angeles County	84.0	(±5.3)	95.8	(±2.8)	93.9	(±3.3)	74.8	(±6.2)	78.0	(±5.9)	65.0	(±6.7)
San Bernardino County	74.8	(±6.2)	90.3	(±4.3)	89.8	(±4.4)	68.6	(±6.4)	69.6	(±6.5)	57.5	(±6.8)
Rest of state	86.4	(±5.8)	94.7	(±3.5)	93.5	(±3.8)	81.3	(±7.1)	77.4	(±7.0)	69.7	(±8.1)
Colorado	82.1	(±7.0)	91.2	(±4.5)	88.9	(±5.9)	70.7	(±8.7)	78.0	(±7.8)	64.3	(±9.1)
Connecticut	91.1	(±4.4)	95.3	(±2.8)	94.2	(±3.3)	88.8	(±4.9)	86.8	(±5.0)	81.2	(±5.9)
Delaware	86.9	(±4.5)	94.8	(±3.3)	92.1	(±3.8)	77.3	(±6.2)	80.3	(±5.7)	68.6	(±6.7)
District of Columbia	85.1	(±5.6)	95.2	(±3.3)	94.0	(±3.5)	77.5	(±6.2)	81.6	(±5.9)	71.0	(±6.7)
Florida	85.0	(±5.2)	92.3	(±4.1)	90.2	(±4.4)	66.1	(±6.7)	80.3	(±5.5)	61.8	(±6.8)
Miami-Dade County	86.0	(±5.0)	95.4	(±3.0)	90.8	(±4.5)	61.2	(±7.3)	76.1	(±6.3)	53.8	(±7.4)
Rest of state	84.9	(±6.0)	91.8	(±4.8)	90.1	(±5.1)	67.0	(±7.8)	81.0	(±6.4)	63.2	(±7.9)
Georgia	85.5	(±5.2)	91.4	(±4.2)	91.6	(±4.1)	75.5	(±6.7)	79.6	(±6.0)	65.9	(±7.2)
Hawaii	90.6	(±3.8)	93.8	(±3.7)	95.5	(±2.6)	80.7	(±5.8)	87.5	(±4.5)	77.4	(±6.1)
Idaho	77.2	(±6.3)	86.1	(±5.2)	75.5	(±6.4)	66.6	(±7.2)	65.6	(±7.2)	52.9	(±7.6)
Illinois	81.6	(±4.2)	93.1	(±2.7)	88.7	(±3.4)	76.0	(±4.5)	73.5	(±4.8)	65.8	(±5.0)
City of Chicago	78.2	(±6.4)	89.5	(±4.7)	88.8	(±4.2)	69.0	(±6.7)	71.0	(±6.7)	60.6	(±6.8)
Rest of state	82.7	(±5.2)	94.4	(±3.2)	88.7	(±4.4)	78.5	(±5.6)	74.4	(±6.0)	67.6	(±6.3)
Indiana	80.3	(±4.4)	90.4	(±3.3)	88.3	(±3.5)	70.4	(±5.2)	74.0	(±4.6)	61.8	(±5.3)
Marion County	80.8	(±5.2)	87.5	(±4.6)	86.0	(±4.6)	75.0	(±5.7)	71.4	(±5.9)	63.2	(±6.3)
Rest of state	80.2	(±5.2)	91.0	(±3.9)	88.8	(±4.2)	69.4	(±6.1)	74.5	(±5.4)	61.5	(±6.3)
Iowa	83.0	(±5.9)	93.0	(±3.8)	88.2	(±4.6)	72.3	(±6.6)	75.9	(±6.3)	64.2	(±6.9)
Kansas	87.0	(±4.9)	93.1	(±3.5)	88.7	(±4.1)	75.0	(±6.2)	76.0	(±6.0)	64.8	(±6.8)
Kentucky	85.2	(±5.8)	90.8	(±4.6)	87.9	(±5.1)	69.7	(±6.5)	78.2	(±6.2)	63.3	(±6.7)
Louisiana	80.1	(±5.9)	92.9	(±3.4)	91.5	(±3.7)	76.0	(±6.0)	77.0	(±6.1)	66.9	(±6.9)
Maine	86.7	(±5.4)	90.2	(±4.8)	85.5	(±5.3)	82.5	(±5.6)	72.9	(±6.9)	67.0	(±7.2)
Maryland	94.8	(±2.4)	97.1	(±2.0)	96.8	(±1.9)	84.4	(±5.9)	91.3	(±3.1)	79.9	(±6.2)
Massachusetts	90.0	(±5.0)	93.3	(±4.6)	87.4	(±5.6)	85.1	(±6.3)	77.9	(±7.3)	76.0	(±7.4)
Michigan	84.3	(±6.1)	89.5	(±5.3)	89.5	(±5.3)	71.1	(±7.4)	78.8	(±6.7)	66.9	(±7.5)
Minnesota	88.9	(±4.7)	94.9	(±2.8)	89.1	(±4.7)	82.1	(±6.2)	80.5	(±6.1)	72.8	(±6.9)
Mississippi	81.0	(±6.8)	87.2	(±5.8)	88.4	(±5.6)	65.8	(±7.8)	77.1	(±7.0)	61.2	(±7.9)
Missouri	80.6	(±6.5)	89.0	(±5.2)	89.4	(±5.0)	73.7	(±7.0)	76.1	(±6.9)	64.7	(±7.5)
Montana	79.1	(±5.8)	89.6	(±4.0)	78.5	(±5.8)	70.7	(±6.7)	65.3	(±6.9)	58.0	(±7.0)
Nebraska	87.8	(±5.3)	94.0	(±3.7)	93.8	(±3.8)	80.5	(±6.5)	82.9	(±6.0)	74.4	(±7.1)
Nevada	71.4	(±7.3)	86.3	(±4.9)	83.3	(±5.5)	61.7	(±7.5)	63.1	(±7.6)	50.7	(±7.5)
New Hampshire	94.4	(±3.5)	96.6	(±2.6)	95.2	(±3.1)	87.3	(±5.3)	90.6	(±4.3)	80.5	(±6.2)
New Jersey	85.3	(±5.9)	91.2	(±5.5)	92.5	(±4.8)	69.3	(±7.8)	80.5	(±6.4)	62.3	(±7.9)
New Mexico	81.6	(±7.0)	90.6	(±3.6)	88.8	(±3.9)	72.0	(±7.6)	76.0	(±7.2)	65.4	(±7.7)
New York	88.9	(±2.9)	93.6	(±2.1)	88.4	(±3.2)	75.1	(±4.5)	77.8	(±4.1)	65.2	(±4.9)
City of New York	84.7	(±4.5)	91.9	(±3.2)	89.0	(±3.9)	73.4	(±5.4)	76.3	(±5.3)	64.4	(±6.0)
Rest of state	92.8	(±3.8)	95.2	(±2.6)	87.8	(±5.1)	76.7	(±7.2)	79.1	(±6.3)	65.9	(±7.6)
North Carolina	85.8	(±5.0)	96.9	(±2.0)	93.3	(±4.1)	81.7	(±5.6)	77.3	(±6.5)	70.1	(±7.0)
North Dakota	85.5	(±4.9)	95.2	(±2.9)	91.5	(±3.8)	81.4	(±5.5)	77.2	(±5.7)	68.9	(±6.3)
Ohio	86.6	(±4.9)	90.7	(±3.7)	89.1	(±4.1)	74.7	(±6.0)	77.7	(±5.8)	64.5	(±6.5)
Oklahoma	82.7	(±6.0)	89.9	(±5.0)	89.7	(±5.0)	58.3	(±7.8)	78.5	(±6.3)	53.3	(±7.7)
Oregon	77.8	(±7.3)	88.9	(±5.3)	84.2	(±6.3)	70.1	(±7.5)	70.5	(±7.6)	62.7	(±7.8)
Pennsylvania	86.4	(±3.6)	93.8	(±2.5)	91.9	(±2.8)	79.1	(±4.4)	78.8	(±4.3)	68.3	(±4.9)
Philadelphia County	88.3	(±5.4)	92.2	(±4.5)	91.8	(±4.4)	81.2	(±6.5)	82.2	(±6.2)	73.0	(±7.3)
Rest of state	86.0	(±4.2)	94.1	(±2.8)	92.0	(±3.2)	78.8	(±5.1)	78.2	(±4.9)	67.5	(±5.7)
Rhode Island	84.9	(±6.1)	94.7	(±3.9)	92.1	(±4.1)	90.7	(±4.4)	75.0	(±7.0)	69.2	(±7.4)
South Carolina	84.2	(±4.5)	92.5	(±3.2)	91.5	(±3.3)	80.8	(±4.8)	79.5	(±5.0)	74.9	(±5.3)
South Dakota	88.7	(±4.5)	95.0	(±2.4)	85.3	(±5.2)	54.3	(±7.4)	76.9	(±6.1)	45.8	(±7.4)

\* Includes ≥4 doses of diphtheria, tetanus toxoid, and any acellular pertussis vaccine (DTaP) (also can include diphtheria and tetanus toxoid vaccine or diphtheria, tetanus toxoid, and pertussis vaccine); ≥3 doses of poliovirus vaccine; ≥1 dose of any measles-containing vaccine; ≥3 doses of *Haemophilus influenzae* type b vaccine; ≥3 doses of hepatitis B vaccine; and ≥1 dose of varicella vaccine.

† 4:3:1:3:3:1 plus ≥4 doses of 7-valent pneumococcal conjugate vaccine (PCV7).

§ Children in the 2007 National Immunization Survey were born during January 2004–July 2006.

¶ ≥4 doses of DTaP.

\*\* ≥1 dose of measles, mumps, and rubella vaccine.

†† ≥1 dose of varicella vaccine at or after child's first birthday.

§§ ≥3 doses of PCV7.

¶¶ Confidence interval.

**TABLE 2. (Continued) Estimated vaccination coverage for the 4:3:1:3:3:1\* and 4:3:1:3:3:1:4† vaccination series and selected individual vaccines among children aged 19–35 months, by state and selected local areas — National Immunization Survey, United States, 2007§**

State/Area	≥4 DTaP¶		≥1 MMR**		≥1 VAR††		≥4 PCV7§§		4:3:1:3:3:1		4:3:1:3:3:1:4	
	%	(95% CI¶¶)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Tennessee	84.8	(±6.0)	94.5	(±4.3)	92.3	(±4.7)	72.6	(±7.5)	78.7	(±6.7)	64.3	(±7.7)
Texas	82.1	(±3.5)	90.4	(±2.6)	90.0	(±2.6)	75.7	(±4.0)	77.3	(±3.8)	68.5	(±4.4)
Bexar County	85.5	(±4.8)	90.9	(±3.9)	88.8	(±4.3)	79.1	(±5.5)	80.1	(±5.3)	74.0	(±5.8)
City of Houston	77.9	(±5.6)	89.4	(±3.8)	89.6	(±3.8)	71.6	(±5.9)	73.0	(±5.7)	64.1	(±6.2)
Dallas County	77.0	(±6.0)	89.9	(±4.1)	90.0	(±4.1)	70.8	(±6.3)	71.9	(±6.2)	61.0	(±6.8)
El Paso County	81.8	(±5.7)	90.3	(±4.8)	91.1	(±4.7)	69.3	(±6.9)	77.4	(±6.2)	63.1	(±7.1)
Rest of state	83.4	(±5.1)	90.6	(±3.8)	90.2	(±3.8)	77.4	(±5.8)	78.7	(±5.6)	70.4	(±6.4)
Utah	82.2	(±5.3)	90.9	(±4.0)	86.6	(±4.8)	70.7	(±6.4)	73.6	(±6.1)	61.4	(±6.8)
Vermont	81.9	(±7.5)	93.6	(±5.2)	77.6	(±7.8)	84.2	(±7.0)	67.3	(±8.3)	62.7	(±8.5)
Virginia	84.1	(±4.8)	90.9	(±3.8)	87.8	(±4.5)	79.1	(±5.1)	75.5	(±5.7)	67.9	(±6.1)
Washington	80.9	(±5.4)	90.5	(±3.9)	84.0	(±4.9)	73.8	(±6.0)	69.0	(±6.1)	64.6	(±6.2)
Western Washington	88.1	(±4.8)	91.9	(±3.9)	80.8	(±5.9)	82.3	(±5.8)	71.3	(±6.7)	66.8	(±7.0)
Rest of state	79.3	(±6.4)	90.2	(±4.6)	84.8	(±5.8)	71.9	(±7.2)	68.4	(±7.3)	64.1	(±7.4)
West Virginia	84.5	(±4.9)	96.2	(±2.1)	89.2	(±3.8)	75.8	(±5.7)	75.5	(±5.6)	64.9	(±6.2)
Wisconsin	82.0	(±6.1)	91.4	(±4.6)	86.7	(±5.4)	78.7	(±6.5)	77.1	(±6.6)	69.6	(±7.2)
Wyoming	78.7	(±6.1)	87.5	(±5.2)	78.5	(±6.3)	68.0	(±6.7)	70.2	(±6.8)	58.7	(±7.1)

**TABLE 3. Estimated vaccination coverage among children aged 19–35 months, by selected vaccines and dosages, race/ethnicity,\* and poverty level† — National Immunization Survey, United States, 2007§**

Vaccine	White		Black		Hispanic		American Indian/ Alaska Native		Asian		Below poverty level		At or above poverty level	
	%	(95% CI¶)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
DTaP**														
≥3 doses	95.5	(±0.7)	93.9	(±1.8)	96.1	(±1.1)	97.3	(±2.9)	96.4	(±2.4)	94.1	(±1.2)	96.0	(±0.6)
≥4 doses	85.3	(±1.2)	82.3	(±2.7)	83.8	(±2.2)	86.4	(±7.1)	87.5	(±4.0)	81.1	(±2.1)	85.9	(±1.1)
Poliovirus	92.6	(±0.9)	91.1	(±2.1)	93.0	(±1.6)	94.8	(±5.5)	95.0	(±2.6)	91.9	(±1.3)	92.8	(±0.9)
MMR†† ≥1 dose	92.1	(±0.8)	91.5	(±2.0)	92.6	(±1.6)	96.2	(±3.2)	93.9	(±3.5)	91.3	(±1.4)	92.6	(±0.8)
Hib§§ ≥3 doses	92.9	(±0.9)	90.8	(±2.2)	93.5	(±1.4)	95.0	(±4.1)	91.0	(±3.4)	91.0	(±1.5)	93.1	(±0.8)
Hepatitis B ≥3 doses	92.5	(±0.9)	91.2	(±2.1)	93.6	(±1.6)	96.7	(±3.0)	93.8	(±2.9)	92.1	(±1.4)	92.9	(±0.9)
Varicella ≥1 dose	89.2	(±1.0)	89.8	(±2.2)	90.6	(±1.7)	94.9	(±3.5)	93.7	(±2.9)	89.2	(±1.6)	90.1	(±0.9)
PCV7¶¶														
≥3 doses	89.8	(±0.9)	89.5	(±2.2)	91.0	(±1.7)	94.0	(±4.3)	86.8	(±4.7)	89.0	(±1.6)	90.3	(±0.9)
≥4 doses	76.6	(±1.4)	70.3	(±3.4)	75.4	(±2.6)	80.4	(±7.1)	75.0	(±5.9)	72.8	(±2.4)	76.3	(±1.4)
Combined series														
4:3:1:3***	82.6	(±1.2)	79.5	(±2.9)	81.5	(±2.3)	85.3	(±7.2)	81.9	(±5.1)	78.8	(±2.2)	82.9	(±1.2)
4:3:1:3:3†††	81.0	(±1.3)	77.5	(±3.1)	79.8	(±2.4)	85.1	(±7.3)	80.7	(±5.2)	76.9	(±2.3)	81.4	(±1.2)
4:3:1:3:3:1§§§	77.5	(±1.3)	75.3	(±3.2)	78.0	(±2.5)	82.7	(±7.5)	79.4	(±5.3)	75.0	(±2.3)	78.2	(±1.3)
4:3:1:3:3:1:4¶¶¶	67.0	(±1.6)	62.0	(±3.6)	67.0	(±2.8)	74.6	(±8.4)	68.6	(±6.5)	64.7	(±2.7)	66.9	(±1.5)

\* Persons identified as white, black, Asian, or American Indian/Alaska Native are all non-Hispanic. Persons identified as Hispanic might be of any race. Native Hawaiian or other Pacific Islanders and multiple races were not included because of small sample sizes.

† Poverty status was based on 2006 U.S. Census poverty thresholds (available at <http://www.census.gov/hhes/www/poverty.html>).

§ Children in the 2007 National Immunization Survey were born during January 2004–July 2006.

¶ Confidence interval.

\*\* Diphtheria, tetanus toxoid, and any acellular pertussis vaccine, which can include diphtheria and tetanus toxoid vaccine or diphtheria, tetanus toxoid, and pertussis vaccine.

†† Measles, mumps, and rubella vaccine.

§§ *Haemophilus influenzae* type b (Hib) vaccine.

¶¶ 7-valent pneumococcal conjugate vaccine (PCV7).

\*\*\* ≥4 doses of DTP/DT/DTaP; ≥3 doses of poliovirus vaccine, and ≥1 dose of any measles-containing vaccine, and ≥3 doses of Hib vaccine.

††† 4:3:1:3 plus ≥3 doses of hepatitis B vaccine.

§§§ 4:3:1:3:3 plus ≥1 dose of varicella vaccine.

¶¶¶ 4:3:1:3:3:1 plus ≥4 doses of PCV7.

facilities, might have contributed to these increases in vaccination coverage (A. Groom, CDC, personal communication, August 2008). However, further monitoring is needed to determine whether these levels will be sustained.

As in 2006, the results of the 2007 NIS indicate that differences in poverty status accounted for the observed differences in coverage between white and black children for the fourth dose of DTaP and fourth dose of PCV7. In 2007, these differences in coverage between children living at or above the poverty level compared with children living below the poverty level were reduced by one percentage point for DTaP and by nearly six percentage points for PCV7. Continued efforts are needed to improve vaccination coverage among children of all racial and ethnic groups living below the poverty level.

The 2007 NIS results confirm that the majority of parents are vaccinating their children, with less than 1% of children receiving no vaccines by age 19–35 months. Although vaccination coverage in this age group remains high, recent outbreaks of measles have occurred in certain communities (8). Several factors might explain this apparent paradox. Despite record high coverage with MMR vaccine, nearly 8% of children aged 19–35 months surveyed for the 2007 NIS remained unvaccinated. Measles is highly contagious, and clustering of unimmunized children within geographic areas can increase risk for measles and other vaccine-preventable disease transmission. Clusters of unimmunized children might not be detected by NIS methods and might not be visible in national and state rates. Furthermore, any changes in vaccination behaviors among parents of children born after July 2006 would not have been detected by the 2007 survey. Increased attention to parental concerns about vaccine safety has become apparent in recent years (9). The 2008 NIS is collecting information on parental concerns about vaccine safety to better assess parental attitudes and beliefs about vaccines. In addition, CDC and its partners are developing new educational materials that can assist parents in making fully informed decisions about immunizing their children.\*\*

The findings in this report are subject to at least three limitations. First, NIS is a telephone survey, and statistical adjustments might not compensate fully for nonresponse and households without landline telephones. Second, underestimates of vaccination coverage might have resulted from the exclusive use of provider-verified vaccination histories because completeness of these records is unknown. Finally, although national

coverage estimates are precise, annual estimates and trends for state and local areas should be interpreted with caution because of smaller sample sizes and wider confidence intervals.

Achieving and maintaining high vaccination coverage levels is important to further reduce the burden of vaccine-preventable diseases and prevent a resurgence of measles and other diseases that have been eliminated in the United States (10). Although vaccination coverage estimates were at record highs and above the *Healthy People 2010* target for most of the routinely recommended vaccines in 2007, ongoing efforts through partnerships among national, state, local, private, and public entities are needed to sustain these levels and ensure that vaccination programs in the United States remain strong.

#### Acknowledgments

The findings in this report are based, in part, on contributions by PJ Smith, PhD, Immunization Svcs Div, and BP Bell, MD, Office of the Director, National Center for Immunization and Respiratory Diseases, CDC.

#### References

1. US Department of Health and Human Services. *Healthy people 2010* (conference ed, in 2 vols). Washington, DC: US Department of Health and Human Services; 2000. Available at <http://www.healthypeople.gov/document/html/objectives/14-24.htm>.
2. CDC. Recommendations and guidelines: 2008 child & adolescent immunization schedules for persons aged 0–6 years, 7–18 years, and catch-up schedule. Atlanta, GA: US Department of Health and Human Services, CDC; 2008. Available at <http://www.cdc.gov/vaccines/recs/schedules/child-schedule.htm>.
3. CDC. Statistical methodology of the National Immunization Survey, 1994–2002. *Vital Health Stat* 2005;2(138). Available at [http://www.cdc.gov/nchs/data/series/sr\\_02/sr02\\_138.pdf](http://www.cdc.gov/nchs/data/series/sr_02/sr02_138.pdf).
4. Ezzati-Rice TM, Frankel MR, Hoaglin DC, Loft JD, Coronado VG, Wright RA. An alternative measure of response rate in random-digit-dialing surveys that screen for eligible subpopulations. *J Econ Soc Meas* 2000;26:99–109.
5. CDC. Preventing pneumococcal disease among infants and young children: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2000;49(No. RR-9).
6. CDC. Pneumococcal conjugate vaccine shortage resolved. *MMWR* 2004;53:851–2.
7. Briss PA, Rodewald LE, Hinman AR, et al. Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. The Task Force on Community Preventive Services. *Am J Prev Med* 2000;18:97–140.
8. CDC. Update: measles—United States, January–July 2008. *MMWR* 2008;57:893–6.
9. Cooper LZ, Larsen HJ, Katz SL. Protecting public trust in immunization. *Pediatrics* 2008;122:149–53.
10. CDC. Measles—United States, January 1–April 25, 2008. *MMWR* 2008;57:494–8.

\*\* Additional information available at <http://www.cdc.gov/vaccines>.