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National, State, and Local Area Vaccination Coverage Among Children Aged 19–35 Months — United States, 2011

High vaccination coverage in children by age 2 years has resulted in historically low levels of most vaccine-preventable diseases in the United States (*1*), but coverage must be maintained to reduce the burden of disease further and prevent a resurgence of these diseases, particularly in populations with lower vaccination coverage. This report describes national, state, and selected local area vaccination coverage by age 19–35 months for children born during January 2008–May 2010, based on 2011 National Immunization Survey (NIS) results. Vaccination coverage remained above the national *Healthy People 2020* target* of 90% for ≥1 dose measles, mumps, rubella vaccine (MMR) (91.6%), ≥3 doses of hepatitis B vaccine (HepB) (91.1%), ≥3 doses of poliovirus vaccine (93.9%), and ≥1 dose of varicella vaccine (90.8%). For the birth dose of HepB, coverage increased from 64.1% in 2010 to 68.6% in 2011; for the more recently recommended ≥2 doses of hepatitis A vaccine (HepA) and rotavirus vaccines, coverage increased from 49.7% to 52.2% and from 59.2% to 67.3%, respectively; and for the full series of *Haemophilus influenzae* type b vaccine (Hib), coverage increased from 66.8% to 80.4%, reflecting recovery from the Hib shortage that occurred during December 2007–September 2009 (*2*). The percentage of children who had not received any vaccinations remained at <1%. Children living below the poverty level had lower coverage than children living at or above poverty for ≥4 doses of diphtheria, tetanus toxoid, and acellular pertussis vaccine (DTaP) and ≥4 doses of pneumococcal conjugate vaccine (PCV) (by 6 percentage points each); the full Hib series (by 8 percentage points); and for rotavirus vaccination (by 10 percentage points). Continued partnerships among national, state, local, private, and public entities are needed to sustain current coverage levels and ensure that coverage for the more recently recommended vaccines continues to increase for all children.

*Additional information available at http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=23.

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,† 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, surveys included landline and cellular telephone households.¶

† The nine local areas separately sampled for the 2011 NIS 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) and two previously sampled areas (Dallas County, Texas, and El Paso County, Texas). Prince George's County, Maryland, was newly sampled in 2011. The territory of the U.S. Virgin Islands (including St. Croix, St. Thomas, St. John, and Water Island) was included in the July–September 2011 NIS sample. Data from the U.S. Virgin Islands are excluded from national coverage estimates.

§ 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/nispuf10_dug.pdf.

¶ A description of the dual-frame sampling methodology is available at http://www.cdc.gov/vaccines/stats-surv/nis/dual-frame-sampling-08282012.htm.

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Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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During 2011, the response rate** was 61.7% for the landline telephone sample and 25.2% for the cellular telephone sample. Providers returned adequate vaccination records for 71.6% of children with completed household interviews, for a total of 19,534 children with provider-reported vaccination records included in this report: 17,309 from the landline sampling frame and 2,225 from the cellular telephone sampling frame. 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, and to test for significant interactions between race/ethnicity and 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.

From 2010 to 2011, national vaccination coverage increased from 66.8% to 80.4% for the full series of Hib, from 64.1% to 68.6% for the birth dose of HepB, from 49.7% to 52.2% for ≥2 doses of HepA, and from 59.2% to 67.3% for rotavirus vaccine (Table 1). For vaccines recommended before the inception of the NIS in 1994, coverage has remained stable since the mid-1990s,¶¶ with 2011 levels of 91.6% for ≥1 dose of MMR, 84.6% for ≥4 doses of DTaP, 91.1% for ≥3 doses of HepB, 90.8% for ≥1 dose of varicella vaccine, and 93.9% for ≥3 doses of poliovirus vaccine. Coverage with ≥4 doses of PCV was 84.4% in 2011, similar to coverage in 2010. As in 2009 and 2010, the seven-vaccine series (4:3:1:3:3:1:4)*** reported in 2011 excluded Hib because of the Hib shortage that occurred during December 2007–September 2009 (*2*).

** 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/codeofstandards.cfm. 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).

¶¶ Information on coverage with individual vaccines since the inception of NIS in 1994 through 2011 is available at http://wwwdev.cdc.gov/vaccines/stats-surv/nis/figures/2011_map.htm.

*** The 4:3:1:3:3:1:4 vaccine series includes ≥4 doses of DTaP/DT/DTP, ≥3 doses of poliovirus vaccine, ≥1 dose of measles-containing vaccine, ≥3 doses of Hib, ≥3 doses of HepB, ≥1 dose of varicella vaccine, and ≥4 doses of PCV.

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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, 2007–2011*

Vaccine	2007		2008		2009		2010		2011	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
DTaP										
≥3 doses	95.5	(±0.5)	96.2	(±0.5)	95.0	(±0.6)	95.0	(±0.6)	95.5	(±0.5)
≥4 doses	84.5	(±0.7)	84.6	(±1.0)	83.9	(±1.0)	84.4	(±1.0)	84.6	(±1.0)
Poliovirus	92.6	(±0.9)	93.6	(±0.6)	92.8	(±0.7)	93.3	(±0.7)	93.9	(±0.6)
MMR ≥1 doses	92.3	(±0.9)	92.1	(±0.7)	90.0	(±0.8)	91.5	(±0.7)	91.6	(±0.8)
Hib†										
≥3 doses	92.9	(±0.7)	90.9	(±0.7)	83.6	(±1.0)	90.4	(±0.9)	94.0	(±0.6)§
Primary series	NA		NA		92.1	(±0.8)	92.2	(±0.8)	94.2	(±0.6)§
Full series	NA		NA		54.8	(±1.4)	66.8	(±1.3)	80.4	(±1.1)§
HepB										
≥3 doses	92.7	(±0.7)	93.5	(±0.7)	92.4	(±0.7)	91.8	(±0.7)	91.1	(±0.7)
1 dose by 3 days (birth)¶	53.2	(±1.3)	55.3	(±1.3)	60.8	(±1.3)	64.1	(±1.3)	68.6	(±1.3)§
Varicella ≥1 doses	90.0	(±0.7)	90.7	(±0.7)	89.6	(±0.8)	90.4	(±0.8)	90.8	(±0.7)
PCV										
≥3 doses	90.0	(±1.0)	92.8	(±0.6)	92.6	(±0.7)	92.6	(±0.8)	93.6	(±0.6)§
≥4 doses	75.3	(±1.3)	80.1	(±1.1)	80.4	(±1.2)	83.3	(±1.0)	84.4	(±1.0)
HepA**										
≥1 dose	NA		70.5	(±1.1)	75.0	(±1.1)	78.3	(±1.1)	81.2	(±1.0)§
≥2 doses	NA		40.4	(±1.2)	46.6	(±1.4)	49.7	(±1.4)	52.2	(±1.4)§
Rotavirus††	NA		NA		43.9	(±1.4)	59.2	(±1.4)	67.3	(±1.3)§
Combined series										
4:3:1:3*:3:1§§	NA		NA		48.3	(±1.4)	59.2	(±1.3)	71.0	(±1.2)§
4:3:1:-:3:1¶¶	78.3	(±1.1)	78.7	(±1.1)	77.5	(±1.1)	77.8	(±1.1)	77.6	(±1.2)
4:3:1:3*:3:1:4***	NA		NA		44.3	(±1.4)	56.6	(±1.3)	68.5	(±1.3)§
4:3:1:-:3:1:4†††	67.0	(±1.3)	70.6	(±1.2)	70.5	(±1.2)	72.7	(±1.2)	73.6	(±1.2)
Children who received no vaccinations	0.6	(±0.1)	0.6	(±0.2)	0.6	(±0.1)	0.7	(±0.2)	0.8	(±0.2)

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

* For 2007, includes children born during January 2004–July 2006; for 2008, 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; and for 2011, children born during January 2008–May 2010.

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

§ Statistically significant increase in coverage compared with 2010 ($p<0.05$).

¶ HepB administered between birth and age 3 days.

** HepA coverage not available before 2008.

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

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

¶¶ Includes ≥4 doses of DTaP/DT/DTP, ≥3 doses of poliovirus vaccine, ≥1 doses of measles-containing vaccine, ≥3 doses of HepB, and ≥1 dose of varicella vaccine. Hib is excluded.

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

††† Includes ≥4 doses of DTaP/DT/DTP, ≥3 doses of poliovirus vaccine, ≥1 doses of measles-containing vaccine, ≥3 doses of HepB, ≥1 dose of varicella vaccine, and ≥4 doses of PCV. Hib is excluded.

Coverage with the seven-vaccine series, excluding Hib, was 73.6% in 2011, similar to coverage in 2010. However, coverage with the seven-vaccine series (4:3:1:3*:3:1:4)††† that included the full series of Hib increased from 56.6% in 2010 to 68.5% in 2011 (Table 1).

Children living below the poverty level§§§ had lower coverage than children living at or above the poverty level for ≥3 doses of DTaP, ≥4 doses of DTaP, primary and full series of Hib, ≥4 doses of PCV, rotavirus vaccine, and the seven-vaccine series (including and excluding Hib) (Table 2). Children living

††† The 4:3:1:3*:3:1:4 vaccine series includes ≥4 doses of DTaP/DT/DTP, ≥3 doses of poliovirus vaccine, ≥1 dose of measles-containing vaccine, ≥3 or ≥4 doses of Hib (depending on product type of vaccine), ≥3 doses of HepB, ≥1 dose of varicella vaccine, and ≥4 doses of PCV.

§§§ Poverty status 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 2010 U.S. Census poverty thresholds, available at http://www.census.gov/hhes/www/poverty.html.

TABLE 2. Estimated vaccination coverage among children aged 19–35 months, by selected vaccines and dosages by race/ethnicity* and poverty level† — National Immunization Survey, United States, 2011§

	Race/Ethnicity ¶												Poverty level			
	White		Black		Hispanic		American Indian/ Alaska Native		Asian		Multiracial		Below		At or above	
Vaccine	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
DTaP																
≥ 3 doses	95.5	(±0.7)	94.7	(±1.5)	95.6	(±1.0)	89.6	(±7.3)	97.9	(±1.3)**	95.3	(±2.7)	94.7	(±1.0)††	96.2	(±0.6)
≥ 4 doses	85.0	(±1.3)	81.3	(±2.9)**	84.1	(±2.2)	72.7	(±9.5)**	92.0	(±2.5)**	87.1	(±3.7)	81.0	(±1.9)††	86.8	(±1.1)
Poliovirus	93.9	(±0.8)	93.9	(±1.6)	93.8	(±1.4)	88.1	(±7.4)	96.5	(±1.7)**	93.5	(±3.0)	93.6	(±1.0)	94.2	(±0.7)
MMR ≥ 1 doses	91.1	(±0.9)	90.8	(±2.2)	92.4	(±1.8)	94.8	(±4.8)	93.9	(±2.8)	91.1	(±3.6)	91.3	(±1.3)	91.7	(±1.0)
Hib§§																
Primary series	94.2	(±0.8)	93.0	(±1.8)	94.5	(±1.2)	91.7	(±6.6)	94.6	(±2.3)	94.4	(±2.8)	92.9	(±1.1)††	95.4	(±0.6)
Full series	81.0	(±1.4)	74.6	(±3.3)**	81.6	(±2.2)	73.7	(±9.6)	83.5	(±4.7)	82.0	(±4.6)	75.5	(±2.1)††	83.4	(±1.2)
HepB																
≥ 3 doses	90.3	(±1.0)	92.1	(±1.8)	91.5	(±1.6)	92.6	(±6.5)	95.5	(±2.0)**	90.7	(±3.7)	91.8	(±1.2)	91.2	(±0.8)
1 dose by 3 days (birth)¶¶	66.0	(±1.6)	73.4	(±3.4)**	70.8	(±2.9)**	83.6	(±5.9)**	69.0	(±6.5)	65.2	(±6.0)	73.3	(±2.2)††	65.6	(±1.6)
Varicella ≥ 1 doses	89.6	(±1.0)	91.2	(±2.3)	92.0	(±1.5)**	90.1	(±7.2)	93.5	(±2.5)**	91.9	(±3.2)	90.2	(±1.4)	90.9	(±0.8)
PCV																
≥ 3 doses	93.4	(±0.8)	93.4	(±1.7)	94.3	(±1.2)	85.5	(±8.7)	92.5	(±2.9)	94.4	(±2.8)	93.4	(±1.1)	94.0	(±0.7)
≥ 4 doses	85.3	(±1.2)	81.3	(±2.8)**	84.6	(±2.1)	75.3	(±9.3)**	84.9	(±4.7)	84.0	(±4.2)	80.6	(±1.9)††	86.9	(±1.1)
HepA (≥ 2 doses)	50.0	(±1.6)	50.9	(±3.7)	56.3	(±3.2)**	NA		56.9	(±7.1)**	50.2	(±6.6)	50.7	(±2.5)	53.4	(±1.6)
Rotavirus***	68.3	(±1.6)	62.5	(±3.5)**	68.3	(±2.9)	57.7	(±9.5)	66.9	(±6.1)	67.8	(±5.7)	61.1	(±2.4)††	71.1	(±1.4)
Combined series																
4:3:1:3*:3:1:4†††	68.8	(±1.6)	63.7	(±3.7)**	69.5	(±2.8)	65.9	(±9.5)	70.8	(±6.1)	70.9	(±5.5)	63.6	(±2.4)††	71.6	(±1.5)
4:3:1:-:3:1:4§§§	73.7	(±1.5)	70.7	(±3.4)	74.4	(±2.6)	69.5	(±9.5)	76.6	(±5.4)	74.5	(±5.1)	70.0	(±2.2)††	76.0	(±1.4)

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

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

† 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 2011 National Immunization Survey were born during January 2008–May 2010.

¶ Native Hawaiian or other Pacific Islanders were not included in the table because of small sample sizes.

** Statistically significant difference (p<0.05) in estimate compared with white, non-Hispanic children.

†† Statistically significant difference (p<0.05) in estimate compared with children living at or above the poverty level.

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

¶¶ HepB administered between birth and age 3 days.

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

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

§§§ Includes ≥4 doses of DTaP/DT/DTP, ≥3 doses of poliovirus vaccine, ≥1 doses of measles-containing vaccine, ≥3 doses of HepB, ≥1 dose of varicella vaccine, and ≥4 doses of PCV. Hib is excluded.

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, varicella vaccine, ≥3 doses of PCV, or ≥2 doses of HepA.

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 complete 4:3:1:3*:3:1:4 series (Table 2). However, the association of race with coverage did not persist after adjustment for poverty status. American Indian/Alaska Native (AI/AN) children had lower coverage for ≥4 doses of DTaP and ≥4 doses of PCV compared with white children. These differences remained after adjustment for poverty status. Black children and AI/AN children had higher HepB birth dose coverage than white children, which remained significant after adjustment for poverty. In unadjusted analyses, Hispanic children had higher coverage than white children for the birth dose of HepB, varicella vaccine, and ≥2 doses of HepA. However, differences in coverage between Hispanic and white children varied by poverty status, with Hispanic children having higher coverage compared with white children only among those children living below the poverty level for ≥4 doses of DTaP (84.2% for Hispanic children compared with 78.6% for white children), the full series of Hib (80.7% compared with 71.7%), ≥4 doses of PCV (84.1% compared with 77.5.%), ≥2 doses of HepA (57.8% compared with 45.0%), and rotavirus vaccine (66.1% compared with 57.4%). The observed difference in coverage between Hispanic and white children for varicella vaccine existed for children on both sides

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

of the poverty line; the difference in coverage for the birth dose if HepB was no longer observed after adjustment for poverty status. Coverage was higher for Asian children compared with white children, independent of poverty status, for ≥3 doses of DTaP, ≥4 doses of DTaP, poliovirus vaccine, ≥3 doses of HepB, and varicella vaccine. Asian children had higher full Hib series coverage than white children only among children living below the poverty level (81.5% for Asian children compared with 71.7% for white children). All other observed differences in coverage between Hispanic and Asian children and white children did not persist after adjustment for poverty.

Vaccination coverage varied by state, with the largest variations for the birth dose of HepB and the more recently recommended vaccinations of HepA and rotavirus (Table 3). HepB birth dose coverage ranged from 23.1% in Vermont to 83.4% in Indiana and North Dakota, ≥2 doses of HepA coverage ranged from 29.3% in South Dakota to 69.2% in Nebraska, and rotavirus vaccine coverage ranged from 52.2% in Wyoming to 80.0% in Massachusetts. Although state-specific coverage was less variable for vaccines with longer-standing recommendations (e.g., MMR and DTaP), 15 states had coverage below the *Healthy People 2020* objective of 90% for MMR vaccine, and only two states (Nebraska and Hawaii) had coverage ≥90% for ≥4 doses of DTaP.

Reported by

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Editorial Note

The results of the 2011 NIS indicate that vaccination coverage among children aged 19–35 months remained stable or increased compared with 2010 for all recommended vaccines. Coverage continued to meet or exceed national *Healthy People 2020* objectives of 90% for MMR, HepB, poliovirus, and varicella vaccine. Coverage with the full series of Hib increased 13.6 percentage points compared with 2010. This increase likely reflects a recovery from the effect of the recommendation to defer the booster Hib dose during the Hib shortage that occurred during December 2007–June 2009 (*2,3*).

Coverage continued to increase for the more recently recommended vaccinations, including HepA and rotavirus, and the birth dose of HepB. PCV reached coverage levels comparable to those for DTaP, a vaccine that also requires 4 doses but with longer-standing recommendations. Although coverage did not yet reach the *Healthy People 2020* objectives for these vaccines, the reduction in disease already has been substantial. Incidence of hepatitis A in the United States has decreased an estimated 93% relative to the prevaccine era (*1*). Hospitalizations associated with rotavirus infection among infants and young children have decreased 66%–89% (*4,5*). Although coverage with ≥4 doses PCV is not yet at 90%, the incidence of invasive pneumococcal disease in children <5 years caused by the serotypes of *Streptococcus pneumoniae* contained in the heptavalent PCV had decreased by 99% by 2007 (*6*). Incidence of all invasive pneumococcal disease is expected to decrease even further since the introduction of the 13-valent PCV in 2010.

Coverage for many vaccines differs by poverty level. Although the Vaccines For Children program**** has been successful in eliminating differences in coverage between children living above and below the poverty level that once existed for vaccines such as MMR, polio, and HepB (*7*), coverage among children living below poverty still lags behind coverage of children living at or above poverty for newer vaccines and vaccines that require 4 doses to complete the series.

Few differences by racial/ethnic group were observed after adjustment for poverty status. Differences in coverage between white and black children could be explained by a higher

What is already known on this topic?

Healthy People 2020 has set childhood vaccination targets of 90% for ≥1 dose measles, mumps, rubella vaccine (MMR), ≥3 doses of hepatitis B vaccine (HepB), ≥3 doses of poliovirus vaccine, ≥1 dose 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. For these and other vaccines, the National Immunization Survey estimates coverage among U.S. children aged 19–35 months.

What is added by this report?

Childhood vaccination coverage remains at or above national target levels for ≥1 dose of MMR (91.6%), ≥3 doses of HepB (91.1%), ≥3 doses of poliovirus vaccine (93.9%), and ≥1 dose of varicella vaccine (90.8%) , and coverage with the more recently recommended vaccines continues to increase; however, coverage levels vary by state, and differences in coverage by poverty level still exist.

What are the implications for public health practice?

Continued partnerships among national, state, local, private, and public entities are needed to sustain current coverage levels and ensure that coverage levels for the more recently recommended vaccines continue to increase to reduce the burden of vaccine-preventable diseases and prevent a resurgence of these diseases in the United States.

**** Additional information on the Vaccines for Children program is available at http://www.cdc.gov/vaccines/programs/vfc/default.htm.

TABLE 3. Estimated vaccination coverage for vaccination series (modified)* and selected individual vaccines among children aged 19–35 months, by state and local area — National Immunization Survey, United States, 2011†

State/Area	MMR (≥1 doses)		DTaP (≥4 doses)		HepB (birth)§		HepA (≥2 doses)¶		Rotavirus**		Vaccine series (modified)	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
U.S. National	91.6	(±0.8)	84.6	(±1.0)	68.6	(±1.3)††	52.2	(±1.4)††	67.3	(±1.3)††	73.6	(±1.2)
Alabama	94.0	(±2.9)	87.5	(±4.7)	75.3	(±5.8)	53.7	(±6.5)	75.5	(±5.7)††	73.3	(±5.9)
Alaska	90.8	(±3.9)	77.4	(±6.4)	63.9	(±7.1)	48.9	(±7.6)	55.6	(±7.5)	69.0	(±7.0)
Arizona	86.7	(±6.7)	86.0	(±6.0)	71.2	(±8.2)	51.2	(±9.1)	64.6	(±8.7)	65.1	(±8.8)
Arkansas	93.7	(±3.2)	84.5	(±5.5)	81.9	(±6.9)	33.2	(±7.2)	62.1	(±7.5)††	71.5	(±7.1)
California	91.0	(±3.7)	87.7	(±3.9)††	58.4	(±6.3)	59.6	(±6.4)	71.1	(±5.8)††	78.0	(±4.9)
Colorado	88.4	(±5.4)	81.0	(±7.7)	57.8	(±8.4)	46.8	(±8.5)	67.7	(±8.1)††	70.3	(±8.5)
Connecticut	95.0	(±2.6)	88.8	(±3.6)	71.1	(±5.6)††	53.9	(±6.8)	69.6	(±6.0)	79.0	(±5.0)
Delaware	90.6	(±5.1)	83.7	(±6.0)	68.4	(±6.7)	54.5	(±7.3)	72.5	(±6.9)§§	68.6	(±7.0)
District of Columbia	93.5	(±3.0)	87.4	(±4.6)	74.1	(±6.6)††	55.8	(±7.3)	62.1	(±7.0)	76.3	(±5.8)
Florida	90.8	(±4.1)	84.6	(±5.3)§§	52.7	(±6.9)	45.4	(±6.9)	59.5	(±6.7)	71.6	(±6.2)§§
Georgia	94.1	(±2.8)	87.5	(±4.4)	82.1	(±4.9)	65.3	(±6.5)	66.0	(±6.6)	79.5	(±5.6)
Hawaii	94.2	(±3.5)	90.6	(±4.1)	72.9	(±8.0)	51.9	(±8.3)	58.7	(±8.3)	78.5	(±6.9)
Idaho	89.5	(±4.8)	79.0	(±6.6)	70.2	(±7.5)	45.2	(±8.6)	62.0	(±8.2)††	66.9	(±7.7)
Illinois	90.8	(±3.3)	84.0	(±4.6)	69.4	(±5.2)	42.8	(±5.5)	64.1	(±5.5)	71.8	(±5.2)
City of Chicago	90.6	(±4.5)	87.7	(±5.1)	77.3	(±6.1)	50.9	(±7.7)	68.3	(±7.4)	74.1	(±6.5)
Rest of state	90.8	(±4.2)	82.7	(±6.0)	66.6	(±6.8)	40.0	(±6.9)	62.6	(±7.0)	71.1	(±6.7)
Indiana	90.6	(±3.9)	82.2	(±5.5)	83.4	(±4.6)	50.5	(±6.7)	63.9	(±6.7)	70.1	(±6.3)
Iowa	86.7	(±5.6)§§	85.7	(±5.5)	69.4	(±6.6)††	48.8	(±7.3)	69.9	(±7.0)	77.1	(±6.4)
Kansas	91.0	(±4.4)	87.6	(±5.1)	77.7	(±7.4)	60.8	(±8.2)††	63.6	(±8.2)	79.7	(±6.1)
Kentucky	91.4	(±4.9)	87.2	(±5.6)	83.3	(±6.3)	48.5	(±8.6)	66.0	(±7.7)	80.6	(±6.5)††
Louisiana	92.6	(±3.6)	84.2	(±5.1)	76.7	(±6.0)††	55.5	(±7.0)	68.9	(±6.9)††	76.5	(±6.0)
Maine	90.3	(±4.0)	88.9	(±4.5)	68.8	(±6.2)	40.5	(±6.7)††	59.4	(±6.7)††	76.6	(±5.6)
Maryland	95.2	(±2.6)	89.5	(±3.8)	75.1	(±5.5)	55.5	(±6.1)	66.0	(±6.0)††	78.0	(±5.4)††
Prince George's County	94.6	(±3.3)	87.5	(±5.3)	81.9	(±5.6)	50.0	(±7.3)	68.5	(±7.0)	76.9	(±6.3)
Rest of state	95.3	(±3.0)	89.9	(±4.5)	73.8	(±6.4)	56.6	(±7.1)	65.5	(±7.0)	78.2	(±6.3)
Massachusetts	93.1	(±4.8)	88.4	(±6.2)	70.0	(±7.3)	55.5	(±7.9)	80.0	(±6.4)††	76.9	(±7.3)
Michigan	87.6	(±6.2)	81.7	(±6.7)§§	79.7	(±6.7)	53.5	(±7.8)	63.7	(±7.6)	71.8	(±7.4)§§
Minnesota	96.0	(±3.4)	86.7	(±6.1)	56.8	(±8.0)	52.6	(±8.0)	72.0	(±8.0)	74.9	(±6.9)
Mississippi	89.6	(±4.9)	80.8	(±6.4)	76.1	(±6.8)	42.6	(±7.8)	69.3	(±7.8)††	71.3	(±7.3)
Missouri	88.2	(±4.0)	80.8	(±5.3)	72.9	(±5.8)	46.5	(±6.2)	62.7	(±6.2)	67.9	(±6.0)
Montana	87.8	(±5.2)	76.8	(±7.9)	81.1	(±5.9)††	43.9	(±9.1)	59.8	(±8.8)	66.8	(±8.6)
Nebraska	95.3	(±3.5)	92.3	(±3.9)	77.5	(±6.1)††	69.2	(±7.3)	75.5	(±7.2)	82.6	(±5.6)
Nevada	90.5	(±4.6)	75.2	(±8.0)	65.2	(±8.8)	52.8	(±8.9)	56.6	(±9.0)	66.0	(±8.5)
New Hampshire	92.0	(±4.1)	84.6	(±5.8)	70.7	(±6.9)	54.6	(±7.7)	74.2	(±6.8)	72.6	(±7.1)
New Jersey	91.3	(±3.5)	86.7	(±4.1)	47.3	(±6.2)††	42.8	(±6.1)	56.3	(±6.2)	73.9	(±5.6)††
New Mexico	93.1	(±3.6)	86.7	(±4.7)††	64.0	(±7.6)	50.0	(±7.7)	72.9	(±6.6)††	75.6	(±6.0)
New York	91.0	(±2.8)	82.6	(±3.9)	53.7	(±5.1)	41.9	(±5.1)	60.7	(±5.1)††	65.1	(±5.1)
City of New York	91.5	(±3.6)	83.2	(±5.4)	46.3	(±7.4)	43.8	(±7.2)	60.5	(±7.2)††	66.6	(±7.0)
Rest of state	90.6	(±4.3)	82.0	(±5.5)	61.0	(±7.0)	40.0	(±7.2)	60.9	(±7.2)	63.7	(±7.5)

See table footnotes on page 695.

prevalence of poverty among black children. AI/AN children had lower coverage compared with white children for many vaccines, which could not be explained by other, readily apparent factors such as poverty or the introduction of the cellular telephone sampling frame. Coverage among AI/AN children decreased from 81.8% in 2010 to 72.7% in 2011 for ≥4 doses of DTaP, and from 85.3% to 75.3% for ≥4 doses of PCV. Because of a relatively small sample size for AI/AN children, differences could be attributable to random variation in the sample. Coverage among children in all other racial/ethnic groups was similar to or higher than coverage among white children for most vaccines.

Vaccination coverage continues to vary across states. Although coverage remains high nationally for many vaccines, clusters of unvaccinated children in geographically localized areas leave communities vulnerable to outbreaks of disease. Fifteen states have MMR coverage below 90%. The recent increases in measles outbreaks in the United States (*8*) underscore the importance of maintaining uniformly high coverage to protect from importation and transmission of disease.

The findings in this report are subject to at least four limitations. First, this was the first year that the NIS used a dual-frame sampling scheme that included landline and cellular telephone households. Estimates might not be comparable with those from previous years when surveys were conducted only via landline

TABLE 3. (*Continued*) Estimated vaccination coverage for vaccination series (modified)* and selected individual vaccines among children aged 19–35 months, by state and local area — National Immunization Survey, United States, 2011†

State/Area	MMR (≥1 doses)		DTaP (≥4 doses)		HepB (birth)§		HepA (≥2 doses)¶		Rotavirus**		Vaccine series (modified)	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
North Carolina	92.3	(±5.1)	81.3	(±7.5)	75.0	(±6.7)	40.8	(±7.6)	70.5	(±7.6)	73.3	(±7.7)
North Dakota	95.8	(±3.0)	89.7	(±4.8)	83.4	(±6.6)	63.0	(±9.0)	74.9	(±8.4)	83.5	(±6.4)
Ohio	93.3	(±4.2)	85.2	(±7.3)	81.9	(±6.2)	44.7	(±8.2)	64.3	(±7.9)	76.4	(±8.3)
Oklahoma	94.0	(±3.3)	84.1	(±5.3)	70.9	(±6.8)	62.6	(±7.2)	57.6	(±7.4)††	72.7	(±6.4)††
Oregon	90.6	(±4.2)	76.6	(±7.8)	66.5	(±7.5)	56.6	(±8.0)	62.2	(±8.0)	65.2	(±8.1)
Pennsylvania	92.8	(±2.7)	85.8	(±3.8)	72.8	(±5.0)	59.2	(±5.3)	76.6	(±4.5)††	73.0	(±4.9)
Philadelphia County	93.1	(±4.0)	85.4	(±5.6)	75.6	(±6.3)	61.7	(±7.1)	68.9	(±7.0)	70.3	(±7.0)
Rest of state	92.8	(±3.1)	85.9	(±4.5)	72.2	(±5.9)	58.8	(±6.2)	78.0	(±5.2)††	73.5	(±5.6)
Rhode Island	96.6	(±2.0)	84.5	(±5.4)	73.2	(±6.1)	49.3	(±6.9)	75.7	(±6.3)	76.7	(±5.8)
South Carolina	89.3	(±4.9)	79.5	(±6.1)	69.2	(±7.0)	42.6	(±7.5)	55.8	(±7.6)	69.8	(±7.0)
South Dakota	89.2	(±6.9)	75.8	(±9.7)	70.9	(±9.6)	29.3	(±7.9)	NA		NA	
Tennessee	91.1	(±3.9)	81.9	(±5.8)§§	61.9	(±7.1)	55.7	(±7.2)	71.1	(±6.6)	73.3	(±6.4)
Texas	94.3	(±1.7)	82.7	(±3.7)	78.6	(±3.8)††	60.2	(±4.6)	72.3	(±3.8)††	74.9	(±3.9)
Bexar County	91.5	(±4.1)	77.0	(±6.3)	63.1	(±6.9)	55.2	(±7.1)	69.1	(±6.6)	69.4	(±6.8)
City of Houston	95.3	(±2.9)	87.2	(±4.7)	79.6	(±5.8)††	64.9	(±7.2)	65.6	(±8.0)	73.9	(±6.5)
Dallas County	90.8	(±4.3)	78.9	(±6.3)	82.9	(±4.8)††	55.2	(±7.4)	62.7	(±7.3)	71.3	(±6.7)
El Paso County	92.8	(±4.1)	79.1	(±6.6)	80.5	(±6.1)	53.8	(±7.7)	72.8	(±7.0)	69.0	(±7.2)
Rest of state	95.1	(±2.3)	83.1	(±5.3)	79.3	(±5.5)	60.9	(±6.6)	75.4	(±5.2)††	76.6	(±5.6)
Utah	88.8	(±4.6)	82.0	(±5.6)	74.2	(±6.8)	55.6	(±7.3)	68.1	(±6.8)	70.3	(±6.7)
Vermont	95.3	(±2.3)	88.2	(±4.7)	23.1	(±5.8)	44.4	(±7.1)	65.7	(±6.8)††	73.4	(±6.2)
Virginia	89.0	(±5.2)	84.4	(±6.0)	64.4	(±7.9)	52.3	(±7.9)	75.4	(±6.5)	72.2	(±6.9)
Washington	89.3	(±4.4)	85.5	(±5.3)	71.7	(±6.5)	51.4	(±7.4)	67.7	(±6.7)††	75.3	(±6.0)
West Virginia	85.8	(±4.3)§§	78.4	(±5.1)	60.7	(±6.1)	56.0	(±6.2)	60.2	(±6.2)††	67.0	(±5.9)
Wisconsin	94.9	(±2.7)	88.4	(±5.4)	74.5	(±6.6)††	48.5	(±7.7)	73.8	(±7.3)	79.2	(±6.5)
Wyoming	85.6	(±9.1)	75.5	(±9.5)	70.8	(±7.3)	45.3	(±8.9)††	52.2	(±9.2)	63.2	(±9.7)
U.S. Virgin Islands	73.6	(±5.2)	61.8	(±5.7)	78.6	(±4.7)	9.5±	(±3.4)	18.1	(±4.7)	46.3	(±5.8)

Abbreviations: CI = confidence interval; MMR = measles, mumps, and rubella vaccine; DTaP/DT/DTP = diphtheria, tetanus toxoids, and acellular pertussis vaccine (includes children who might have been vaccinated with diphtheria, tetanus toxoids, and pertussis vaccine [DTP] and diphtheria and tetanus toxoids vaccine [DT]; HepB = hepatitis B vaccine; HepA = hepatitis A vaccine; PCV = pneumococcal conjugate vaccine.

* Includes ≥4 doses DTaP/DT/DTP, ≥3 doses of poliovirus vaccine, ≥1 dose of any measles-containing vaccine, ≥3 doses of HepB, ≥1 dose of varicella vaccine, and ≥4 doses of PCV; *Haemophilus influenza* type B vaccine is excluded.

† Children in the 2011 National Immunization Survey were born during January 2008–May 2010.

§ 1 or more doses of HepB administered between birth and age 3 days.

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

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

†† Statistically significant increase in coverage compared with 2010 ($p<0.05$).

§§ Statistically significant decrease in coverage compared with 2010 ($p<0.05$).

telephone. Although differences between national landline and dual-frame estimates for specific vaccines in the 2011 NIS were small, with absolute magnitude <1%, larger variations were observed for state-specific coverage estimates. Comparisons of 2011 estimates with those of previous years at the state level should be interpreted with caution. Second, underestimates of vaccination coverage might have resulted from the exclusive use of provider-reported vaccination histories because completeness of these records is unknown, and estimates might have been biased upwards or downwards if coverage among children for whom provider records were not returned differed from coverage among children with adequate provider data. Third, bias resulting from nonresponse and exclusion of households without telephone service might persist after weighting adjustments. 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.

Most vaccine-preventable diseases have declined to historically low levels in the United States as a result of high vaccination coverage among preschool-aged children (*1*). Careful monitoring of coverage levels overall and in subpopulations (e.g., by race/ethnicity and by geographic area) is important to ensure that all children remain adequately protected. Many states can supplement NIS estimates with use of immunization information systems to track vaccination coverage at the community level. The results of the 2011 NIS indicate that coverage among young children has remained stable for vaccines with long-standing recommendations and continues to increase for more recently recommended vaccines. CDC encourages the use of evidence-based methods for improving and sustaining

coverage, including components such as parent and provider reminders, reducing out-of-pocket costs, standing orders, home visits to vulnerable populations, vaccination requirements for child care centers, use of immunization information systems, and vaccination programs in child care centers and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) settings†††† (*9*). 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.

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Prevalence of Cholesterol Screening and High Blood Cholesterol Among Adults — United States, 2005, 2007, and 2009

High blood cholesterol is a leading risk factor in the development of atherosclerosis and coronary heart disease (CHD) (*1,2*). The risks associated with high blood cholesterol can be reduced by screening and early intervention (*3*). Current clinical practice guidelines provide evidenced-based standards for detection, treatment, and control of high blood cholesterol (*4*). *Healthy People 2020* monitors national progress related to screening and controlling high blood cholesterol through the National Health Interview Survey and the National Health and Nutrition Examination Survey (NHANES). State-level estimates of self-reported cholesterol screening and high blood cholesterol prevalence are available using Behavioral Risk Factor Surveillance System (BRFSS) data. To assess recent trends in the percentage of adults aged ≥18 years who had been screened for high blood cholesterol during the preceding 5 years, and the percentage among those who had been screened within the previous 5 years and who were ever told they had high blood cholesterol, CDC analyzed BRFSS data from 2005, 2007, and 2009. The results of that analysis showed that the percentage of adults reporting having been screened for high blood cholesterol within the preceding 5 years increased overall from 72.7% in 2005 to 76.0% in 2009. In addition, the percentage who had ever been told they had high cholesterol increased from 33.2% to 35.0%. Both self-reported screening and high cholesterol varied by state and sociodemographic subgroup. To reach the *Healthy People 2020* target for cholesterol screening, public health practitioners should emphasize the importance of screening, especially among younger adults, men, Hispanics, and persons with lower levels of education.

BRFSS is a state-based, random-digit–dialed telephone survey conducted annually since 1984 with assistance from CDC. The survey is conducted among noninstitutionalized, U.S. adult civilians aged ≥18 years. Cholesterol questions have been asked in odd-numbered years. In 2005, 2007, and 2009, three questions were asked: "Have you ever had your blood cholesterol checked?" "About how long has it been since you last had your blood cholesterol checked?" and "Have you ever been told by a doctor, nurse, or other health professional that your blood cholesterol is high?" Median response rates were 51.1%, 50.6%, and 52.5% in 2005, 2007, and 2009, respectively.

The percentages of respondents who reported being screened for cholesterol during the preceding 5 years were calculated, and general comparisons were made with the target for *Healthy People 2020* objective HDS-6.* Because measured blood cholesterol is not available in BRFSS, direct comparison of results could not be made with two other *Healthy People 2020* objectives that are based on measured results from NHANES (HDS-7, reduce the proportion of adults with high total blood cholesterol levels of >240 mg/dL; and HDS-8, reduce the mean total blood cholesterol levels among adults). However, self-reported health-care provider diagnosis of high blood cholesterol has been used previously to monitor prevalence of high blood cholesterol nationally and at the state level (*5*). Therefore, this report provides an update of the percentage of respondents who were ever told they had high blood cholesterol among those who had been screened within the preceding 5 years.

Data were analyzed by age group (18–44, 45–64, and ≥65 years), sex, race/ethnicity (white, black, Hispanic, Asian/Pacific Islander, and American Indian/Alaskan Native†), and education (less than high school diploma, high school diploma, some college, college degree or higher). All reported percentages were age-standardized using the 2000 U.S. standard projected population, distribution no. 8 (*6*), except for age groups, for which age-specific percentages were reported. Linear trends across survey periods were assessed using orthogonal polynomial coefficients, and results with a p-value <0.05 were considered significant. The total number of respondents ranged from 356,112 in 2005 to 432,607 in 2009. State-specific (including the District of Columbia [DC]) sample sizes ranged from 2,432 (Alaska, 2009) to 39,549 (Florida, 2007).

From 2005 to 2009, the overall percentage of adults screened for high blood cholesterol during the preceding 5 years increased from 72.7% to 76.0% (Table 1). Increases in the percentage of persons screened for high blood cholesterol were observed across all age, sex, racial/ethnic, and education categories. The percentage of respondents screened for high blood cholesterol in 2009 was significantly higher among persons aged 45–64 years (88.8%) and ≥65 years (94.7%) than 18–44 years (63.2%); women (77.6%) compared with men (74.5%); blacks (77.6%), whites (77.3%), and Asian/Pacific Islanders (77.2%) compared with Hispanics (69.2%); and those with some college (77.5%) and a college degree or higher (83.0%) compared with those with a high school diploma (71.0%) and less than a high school diploma (61.4%).

* Available at http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=21.

† Persons identified as Hispanic might be of any race. Persons identified as white, black, Asian/Pacific Islander, or American Indian/Alaska Native are all non-Hispanic. The five racial/ethnic categories are mutually exclusive.

TABLE 1. Age-specific and age-adjusted* percentage of adults aged ≥18 years who had been screened for high blood cholesterol during the preceding 5 years by sex, race/ethnicity, and state of residence — Behavioral Risk Factor Surveillance System, United States, 2005, 2007, and 2009

Characteristic	2005		2007		2009		% change from 2005 to 2009	p-value for linear trend
	%	(95% CI)	%	(95% CI)	%	(95% CI)		
Total	**72.7**	**(72.4–73.1)**	**74.7**	**(74.4–75.1)**	**76.0**	**(75.7–76.3)**	**4.5**	**<0.001**
Age group (yrs)†								
18–44	58.6	(58.1–59.1)	62.1	(61.5–62.7)	63.2	(62.6–63.8)	7.8	<0.001
45–64	86.2	(85.8–86.6)	87.7	(87.4–88.0)	88.8	(88.5–89.1)	3.0	<0.001
≥65	92.8	(92.4–93.2)	93.8	(93.5–94.1)	94.7	(94.5–95.9)	2.0	<0.001
Sex								
Men	71.0	(70.5–71.5)	73.1	(72.6–73.6)	74.5	(74.0–74.9)	4.9	<0.001
Women	74.6	(74.2–74.9)	76.4	(76.0–76.8)	77.6	(77.2–78.0)	4.0	<0.001
Race/Ethnicity§								
White	74.7	(74.4–75.0)	76.5	(76.1–76.8)	77.3	(77.0–77.7)	3.5	<0.001
Black	75.5	(74.6–76.5)	76.8	(75.7–77.8)	77.6	(76.6–78.7)	2.8	0.004
Hispanic	62.3	(61.2–63.5)	65.1	(64.0–66.2)	69.2	(68.2–70.1)	11.1	<0.001
Asian/Pacific Islander	72.2	(69.8–74.5)	76.5	(74.1–78.8)	77.2	(75.3–79.1)	6.9	0.001
American Indian/Alaska Native	68.4	(65.5–71.1)	74.0	(71.1–76.8)	73.6	(70.9–76.1)	7.6	0.007
Education								
Less than high school diploma	57.1	(56.0–58.3)	58.5	(57.3–59.7)	61.4	(60.3–62.5)	7.5	<0.001
High school diploma	68.9	(68.3–69.5)	70.6	(70.0–71.2)	71.0	(70.4–71.6)	3.0	<0.001
Some college	75.1	(74.6–75.7)	76.8	(76.2–77.4)	77.5	(77.0–78.1)	3.2	<0.001
College degree or higher	80.1	(79.5–80.7)	81.8	(81.1–82.4)	83.0	(82.3–83.5)	3.6	<0.001
State								
Alabama	72.0	(69.8–74.0)	75.8	(74.1–77.5)	75.8	(73.9–77.6)	5.3	0.007
Alaska	68.3	(65.7–70.7)	71.7	(69.0–74.3)	71.4	(68.5–74.1)	4.6	0.099
Arizona	66.1	(63.5–68.7)	70.7	(67.6–73.6)	72.3	(69.7–74.6)	9.2	<0.001
Arkansas	66.6	(65.0–68.1)	68.9	(67.3–70.6)	71.6	(69.0–74.1)	7.6	<0.001
California	72.3	(70.9–73.8)	75.0	(73.4–76.5)	74.7	(73.7–75.7)	3.3	0.008
Colorado	71.2	(69.9–72.5)	73.6	(72.5–74.7)	75.2	(73.8–76.4)	5.5	<0.001
Connecticut	78.0	(76.2–79.8)	79.7	(78.1–81.2)	80.4	(78.6–82.2)	3.1	0.062
Delaware	77.9	(76.0–79.6)	79.4	(77.1–81.5)	80.2	(78.1–82.2)	3.0	0.089
District of Columbia	79.7	(77.8–81.5)	83.9	(82.0–85.8)	84.5	(82.3–86.4)	6.0	<0.001
Florida	74.3	(72.7–75.8)	75.6	(74.3–76.8)	78.8	(76.9–80.6)	6.1	<0.001
Georgia	75.3	(73.6–76.9)	78.9	(77.2–80.4)	77.0	(74.9–79.1)	2.3	0.193
Hawaii	71.6	(70.1–73.1)	72.9	(71.3–74.4)	75.0	(73.3–76.6)	4.7	0.003
Idaho	66.2	(64.6–67.7)	66.0	(64.2–67.7)	67.7	(65.7–69.6)	2.3	0.242
Illinois	71.1	(69.5–72.7)	73.3	(71.6–75.0)	75.0	(73.4–76.7)	5.5	<0.001
Indiana	70.7	(69.3–72.1)	72.5	(70.9–74.2)	74.3	(72.8–75.8)	5.1	<0.001
Iowa	70.6	(69.0–72.2)	70.7	(69.1–72.3)	73.5	(71.8–75.1)	4.0	0.017
Kansas	69.6	(67.4–70.8)	71.4	(70.0–72.7)	73.7	(72.7–74.6)	5.8	<0.001
Kentucky	73.1	(71.5–74.7)	73.6	(71.5–75.5)	75.7	(73.8–77.6)	3.5	0.043

See table footnotes on page 699.

By state, in 2009, the percentage of respondents screened for high blood cholesterol ranged from 67.7% in Idaho to 84.5% in DC. From 2005 to 2009, the percentage increased significantly in most states; two states (Missouri and South Carolina) showed a decreased percentage of respondents screened, but neither difference was statistically significant. Sixteen states showed no significant change in the percentage screened. In general, prevalence of cholesterol screening was higher among residents of eastern states than western states (Figure).

Among respondents who had been screened for high blood cholesterol within the previous 5 years, the percentage who reported being told by a health-care provider that their blood cholesterol was high increased from 33.2% in 2005 to 35.0% in 2009 (Table 2). Increases were observed across all age, sex, and education categories and among whites, blacks, and Hispanics. The prevalence of high blood cholesterol was significantly higher among persons aged ≥65 years (54.4%) than 18–44 years (23.7%) and 45–64 years (46.1%); men (37.5%) compared with women (32.6%); Hispanics (36.3%) and Asian/Pacific Islanders (37.5%) compared with blacks (33.1%); and those with less than a high school diploma (39.9%) compared with those with some college (35.2%) and a college degree or higher (33.2%).

By state, in 2009, the prevalence of self-reported high blood cholesterol ranged from 30.5% in New Mexico to 38.8% in Texas. From 2005 to 2009, approximately one third of states showed a significant increase. Certain states showed decreased prevalence, but none of the decreases were statistically significant (Table 2, Figure).

TABLE 1. (*Continued*) Age-specific and age-adjusted* percentage of adults aged ≥18 years who had been screened for high blood cholesterol during the preceding 5 years by sex, race/ethnicity, and state of residence — Behavioral Risk Factor Surveillance System, United States, 2005, 2007, and 2009

Characteristic	2005		2007		2009		% change from 2005 to 2009	p value for linear trend
	%	(95% CI)	%	(95% CI)	%	(95% CI)		
Louisiana	73.8	(71.7–75.7)	73.0	(71.5–74.5)	75.4	(73.8–76.9)	2.3	0.191
Maine	76.7	(74.9–78.5)	79.2	(77.7–80.7)	79.7	(78.1–81.2)	3.9	0.013
Maryland	78.6	(77.3–79.9)	79.2	(77.7–80.6)	82.0	(80.4–83.4)	4.2	<0.001
Massachusetts	78.2	(76.8–79.4)	82.2	(81.2–83.2)	82.4	(81.1–83.7)	5.5	<0.001
Michigan	75.1	(74.1–76.1)	77.4	(75.9–78.7)	78.7	(77.3–80.0)	4.7	<0.001
Minnesota	74.9	(72.8–76.8)	75.8	(74.1–77.5)	76.1	(74.3–77.8)	1.6	0.374
Mississippi	69.8	(68.0–71.5)	72.5	(71.0–74.0)	73.1	(71.6–74.5)	4.7	0.005
Missouri	72.0	(70.1–73.8)	72.4	(70.5–74.2)	71.0	(68.8–73.1)	-1.3	0.504
Montana	66.6	(64.8–68.4)	69.0	(67.3–70.8)	69.0	(67.2–70.8)	3.6	0.066
Nebraska	70.2	(68.7–71.6)	72.0	(70.0–73.9)	71.4	(69.6–73.2)	1.8	0.274
Nevada	66.0	(63.5–68.5)	69.8	(67.5–71.9)	73.1	(70.4–75.6)	10.6	<0.001
New Hampshire	79.0	(77.5–80.4)	77.9	(76.3–79.4)	80.2	(78.3–80.2)	1.5	0.327
New Jersey	76.2	(75.1–77.3)	78.4	(76.6–80.1)	80.9	(79.4–82.3)	6.1	<0.001
New Mexico	66.4	(64.8–68.0)	68.1	(66.4–69.7)	70.8	(69.2–72.4)	6.7	<0.001
New York	76.7	(75.3–78.0)	78.5	(76.9–80.1)	80.8	(79.2–82.4)	5.4	<0.001
North Carolina	71.4	(70.5–72.4)	77.0	(75.8–78.2)	76.9	(75.3–78.4)	7.7	<0.001
North Dakota	70.9	(69.2–72.5)	71.4	(69.7–73.2)	74.9	(73.1–76.7)	5.7	0.001
Ohio	71.8	(70.1–73.5)	72.2	(70.8–73.4)	75.0	(73.4–76.6)	4.4	0.008
Oklahoma	70.3	(68.8–71.7)	69.2	(67.8–70.7)	72.2	(70.6–73.8)	2.8	0.068
Oregon	67.0	(66.0–68.1)	69.0	(67.2–70.8)	71.7	(69.4–73.8)	6.9	<0.001
Pennsylvania	73.2	(72.0–74.4)	75.0	(73.5–76.5)	76.4	(74.9–77.9)	4.4	0.001
Rhode Island	79.7	(77.9–81.4)	79.6	(77.7–81.5)	82.5	(80.8–84.2)	3.6	0.021
South Carolina	77.9	(76.7–79.0)	77.3	(75.9–78.7)	76.5	(74.8–78.2)	-1.7	0.212
South Dakota	69.9	(68.4–71.3)	71.8	(70.1–73.4)	72.0	(70.1–73.8)	3.1	0.075
Tennessee	75.4	(73.3–77.3)	77.0	(74.8–79.1)	78.6	(76.4–80.7)	4.3	0.029
Texas	66.9	(65.4–68.3)	70.0	(68.9–71.2)	71.3	(69.7–72.9)	6.6	<0.001
Utah	66.1	(64.6–67.6)	68.7	(67.0–70.3)	70.0	(68.7–71.2)	5.8	<0.001
Vermont	74.4	(73.0–75.7)	74.3	(72.8–75.7)	75.2	(73.5–76.8)	1.1	0.428
Virginia	77.4	(75.7–79.0)	77.9	(76.0–79.7)	79.8	(77.7–81.8)	3.2	0.067
Washington	70.7	(69.9–71.5)	72.2	(71.4–73.0)	71.3	(70.3–72.3)	0.9	0.336
West Virginia	74.1	(72.2–75.9)	75.2	(73.4–76.9)	77.6	(75.8–79.3)	4.7	0.008
Wisconsin	71.7	(70.1–73.3)	75.7	(73.9–77.3)	75.6	(73.4–77.8)	5.5	0.005
Wyoming	72.9	(71.3–74.3)	71.9	(70.4–73.4)	73.8	(72.0–75.5)	1.3	0.423

Abbreviation: CI = confidence interval.
* Age-adjusted to the 2000 U.S. standard population; weighted estimates.
† Not age-adjusted.
§ Persons identified as Hispanic might be of any race. Persons identified as white, black, Asian/Pacific Islander, or American Indian/Alaska Native are all non-Hispanic. The five racial/ethnic categories are mutually exclusive.

Reported by

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Editorial Note

The results presented in this report show that during 2005–2009, the national and state-specific age-standardized percentages of adult respondents who had been screened for cholesterol during the preceding 5 years increased significantly. Also, the percentage of respondents who had been screened and who were ever told that they had high blood cholesterol increased overall and in many states. Differences in the prevalence of self-reported screening in the preceding 5 years and prevalences of self-reported high blood cholesterol were found among states and sociodemographic subgroups.

In 2005, using BRFSS data, CDC reported trends in cholesterol screening and prevalence of high blood cholesterol among adults, with a significant increase in both measures from 1991 to 2003 (*5*). Similar to those findings, this report shows that from 2005 to 2009 the prevalence of respondents screened and the prevalence of self-reported high blood cholesterol increased. These results indicate that screening for high blood cholesterol was lowest among those aged 18–44 years, Hispanics, and those with lower levels of education.

The finding of increasing self-reported high blood cholesterol might be attributable to increasing awareness of the health risks

TABLE 2. Age-specific and age-adjusted* percentage of adults aged ≥18 years who had ever been screened for cholesterol and were told by a health-care provider that they had high blood cholesterol, by sex, race/ethnicity, and state of residence — Behavioral Risk Factor Surveillance System, United States, 2005, 2007, and 2009

Characteristic	2005		2007		2009		% change from 2005 to 2009	p-value for linear trend
	%	(95% CI)	%	(95% CI)	%	(95% CI)		
Total	**33.2**	**(32.8–33.6)**	**34.3**	**(33.9–34.6)**	**35.0**	**(34.6–35.4)**	**5.4**	**<0.001**
Age group (yrs)†								
18–44	21.8	(21.2–22.3)	22.9	(22.3–23.5)	23.7	(23.1–24.3)	8.7	<0.001
45–64	44.7	(44.1–45.3)	45.8	(45.3–46.3)	46.1	(45.7–46.5)	3.1	<0.001
≥65	52.0	(51.3–52.7)	53.9	(53.3–54.5)	54.4	(53.9–54.9)	4.6	<0.001
Sex								
Men	34.9	(34.4–35.5)	36.9	(36.2–37.5)	37.5	(37.0–38.1)	7.4	<0.001
Women	31.5	(31.1–32.0)	31.8	(31.4–32.3)	32.6	(32.1–33.0)	3.5	0.001
Race/Ethnicity§								
White	33.3	(33.0–33.7)	34.5	(34.1–34.9)	34.8	(34.4–35.2)	4.5	<0.001
Black	30.7	(29.5–31.9)	32.0	(30.9–33.0)	33.1	(32.0–34.3)	7.8	0.004
Hispanic	34.0	(32.5–35.6)	34.6	(33.2–36.1)	36.3	(35.1–37.5)	6.8	0.020
Asian/Pacific Islander	34.7	(31.8–37.8)	33.0	(29.7–36.5)	37.5	(35.0–40.0)	8.1	0.172
American Indian/Alaska Native	31.1	(27.6–34.7)	34.0	(31.1–36.9)	34.0	(31.2–37.0)	9.3	0.202
Education								
Less than high school diploma	37.5	(35.8–39.2)	38.6	(37.0–40.2)	39.9	(38.5–41.3)	6.4	0.035
High school diploma	34.4	(33.7–35.2)	36.1	(35.4–36.9)	36.8	(36.1–37.5)	7.0	<0.001
Some college	33.3	(32.6–33.9)	34.1	(33.4–34.8)	35.2	(34.5–35.8)	5.7	<0.001
College degree or higher	31.8	(31.1–32.5)	32.7	(31.9–33.5)	33.2	(32.5–33.9)	4.4	0.005
State								
Alabama	35.0	(32.6–37.5)	35.7	(33.8–37.7)	35.0	(32.9–37.1)	-0.1	0.989
Alaska	30.6	(27.9–33.4)	35.0	(31.5–38.7)	32.9	(29.8–36.2)	7.5	0.286
Arizona	30.1	(27.6–32.7)	36.7	(32.8–40.8)	36.8	(33.4–40.3)	22.2	0.002
Arkansas	33.1	(31.4–34.9)	35.3	(33.5–37.1)	33.2	(31.0–35.5)	0.4	0.930
California	33.3	(31.5–35.1)	32.6	(30.7–34.5)	34.2	(33.1–35.4)	2.8	0.385
Colorado	31.5	(29.9–33.2)	31.6	(30.4–32.7)	33.9	(32.3–35.6)	7.6	0.043
Connecticut	31.5	(29.5–33.5)	35.2	(33.2–37.2)	35.0	(32.7–37.3)	11.1	0.024
Delaware	35.7	(33.5–37.9)	34.5	(32.5–36.6)	33.8	(31.8–35.9)	-5.3	0.213
District of Columbia	31.3	(29.2–33.6)	34.7	(32.4–37.1)	33.7	(31.7–35.8)	7.5	0.121
Florida	35.4	(33.7–37.2)	33.5	(31.9–35.0)	34.2	(32.5–36.1)	-3.3	0.357
Georgia	30.5	(28.7–32.3)	36.2	(34.5–38.0)	35.2	(32.9–37.5)	15.3	0.002
Hawaii	31.9	(29.9–33.9)	31.8	(29.9–33.6)	35.9	(33.8–38.1)	12.6	0.008
Idaho	32.7	(31.0–34.5)	33.7	(31.9–35.6)	33.4	(31.4–35.4)	1.9	0.643
Illinois	33.7	(31.9–35.6)	33.0	(31.2–34.9)	35.0	(33.1–36.9)	3.7	0.367
Indiana	34.9	(33.2–36.6)	34.3	(32.5–36.2)	36.5	(34.8–38.2)	4.6	0.186
Iowa	32.4	(30.6–34.3)	32.7	(31.0–34.5)	33.6	(31.7–35.5)	3.8	0.371
Kansas	30.8	(29.4–32.2)	33.4	(31.8–35.1)	35.2	(34.0–36.3)	14.1	<0.001

See table footnotes on page 701.

posed by high blood cholesterol or increasing prevalence of high blood cholesterol among adults ever screened, or both. A recent report using nationally representative data revealed that from 1999–2000 to 2009–2010, the prevalence of high total serum cholesterol (≥240 mg/dL) among the U.S. population aged ≥20 years with measured serum cholesterol levels declined from 18.3% to 13.4% (*7*). This suggests that the increasing prevalence of self-reported high blood cholesterol was more likely a result of improved awareness of the risks of high blood cholesterol than an actual increase in the prevalence of high blood cholesterol.

The findings in this report are subject to at least three limitations. First, BRFSS includes only the noninstitutionalized U.S. population and, during 2005–2009, did not include households with no telephone or only cellular telephones. Second, BRFSS data are self-reported. Because no measurement of blood cholesterol is taken with BRFSS, self-reported high blood cholesterol cannot be substantiated, and treatment and control cannot be assessed. Third, median response rates were <55% in all 3 years. However, despite these limitations, BRFSS is a large, population-based survey that provides the only state-level assessment of high blood cholesterol screening and prevalence every 2 years.

Early detection of high blood cholesterol through screening is the first important step to treatment and reducing the risk for heart attack and stroke (*4*). To reach high blood cholesterol

TABLE 2. (*Continued*) Age-specific and age-adjusted* percentage of adults aged ≥18 years who had ever been screened for cholesterol and were told by a health-care provider that they had high blood cholesterol, by sex, race/ethnicity, and state of residence — Behavioral Risk Factor Surveillance System, United States, 2005, 2007, and 2009

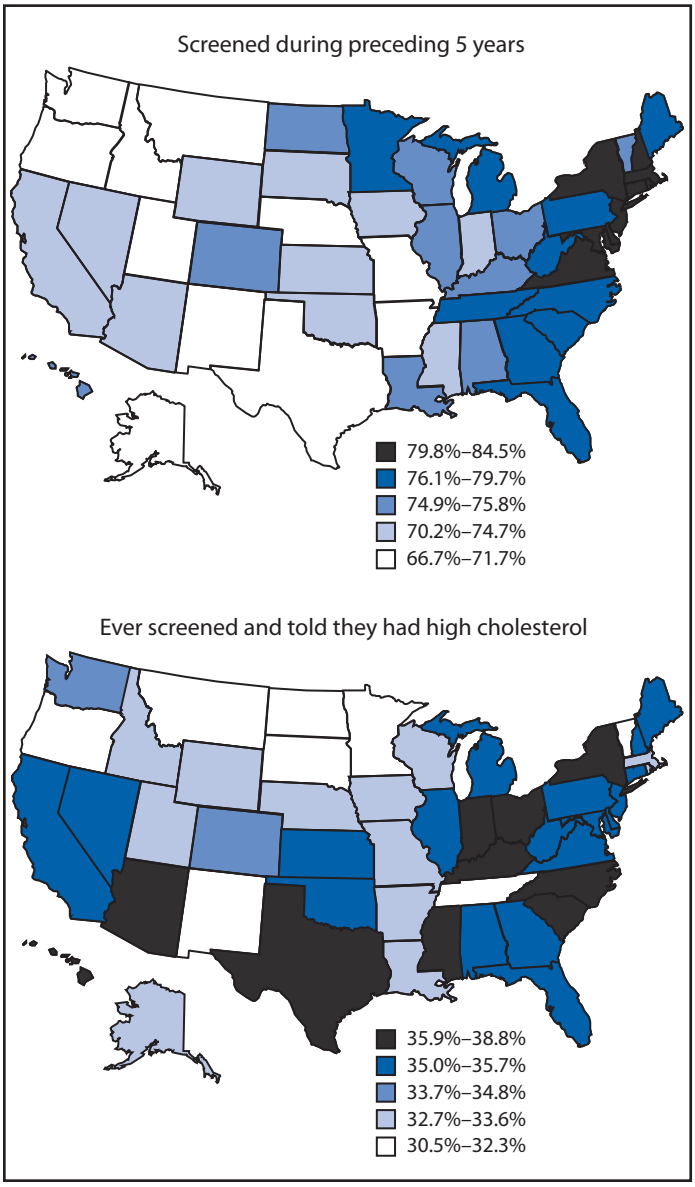
Characteristic	2005		2007		2009		% change from 2005 to 2009	p-value for linear trend
	%	(95% CI)	%	(95% CI)	%	(95% CI)		
Kentucky	35.2	(33.4–37.1)	35.0	(33.1–37.0)	37.9	(35.9–39.9)	7.6	0.056
Louisiana	27.8	(25.8–30.0)	31.6	(29.7–33.6)	33.1	(31.6–34.7)	19.1	<0.001
Maine	32.9	(31.0–34.9)	36.8	(34.9–38.8)	34.0	(32.6–35.4)	3.2	0.382
Maryland	31.7	(30.2–33.2)	34.8	(33.1–36.5)	35.7	(33.9–37.5)	12.6	<0.001
Massachusetts	33.5	(31.8–35.3)	33.2	(32.1–34.2)	33.3	(31.8–34.9)	-0.6	0.864
Michigan	35.8	(34.6–37.0)	36.5	(34.9–38.2)	34.7	(33.3–36.2)	-2.9	0.274
Minnesota	30.7	(28.5–33.0)	29.4	(27.7–31.2)	32.0	(29.6–34.5)	4.3	0.430
Mississippi	34.6	(32.6–36.5)	34.7	(33.1–36.4)	36.8	(35.4–38.3)	6.5	0.070
Missouri	35.5	(33.1–38.0)	36.1	(33.6–38.7)	33.2	(31.2–35.3)	-6.4	0.167
Montana	30.6	(28.5–32.7)	30.5	(28.6–32.5)	32.3	(30.2–34.4)	5.5	0.270
Nebraska	32.2	(30.5–33.9)	32.9	(30.9–34.9)	32.7	(31.2–34.4)	1.8	0.626
Nevada	34.9	(32.2–37.8)	34.1	(31.7–36.6)	35.2	(32.3–38.2)	0.8	0.889
New Hampshire	32.7	(31.1–34.3)	35.4	(33.4–37.5)	35.7	(33.5–38.0)	9.4	0.031
New Jersey	34.1	(32.9–35.3)	36.2	(34.1–38.2)	34.4	(32.9–35.9)	0.9	0.763
New Mexico	27.3	(25.6–29.1)	30.6	(28.9–32.2)	30.5	(39.0–32.1)	11.8	0.008
New York	33.2	(31.6–34.8)	35.2	(33.4–37.1)	36.1	(34.3–37.9)	8.7	0.019
North Carolina	33.2	(32.1–34.3)	36.5	(35.1–38.0)	36.3	(34.7–37.9)	9.2	0.002
North Dakota	31.4	(29.5–33.5)	32.4	(30.5–34.3)	31.2	(29.4–33.0)	-0.8	0.847
Ohio	32.7	(30.9–34.6)	35.5	(34.0–37.0)	36.4	(34.5–38.3)	11.2	0.007
Oklahoma	34.3	(32.7–35.9)	36.0	(34.4–37.6)	35.6	(34.0–37.2)	3.8	0.259
Oregon	32.5	(31.3–33.8)	33.4	(31.6–35.3)	31.8	(29.4–34.3)	-2.2	0.610
Pennsylvania	33.6	(32.0–35.2)	35.1	(33.5–36.7)	35.0	(33.3–36.7)	4.4	0.224
Rhode Island	31.7	(29.9–33.5)	34.9	(32.9–37.0)	33.1	(31.4–34.9)	4.6	0.249
South Carolina	34.4	(33.0–35.8)	35.4	(34.0–36.8)	38.4	(36.2–40.6)	11.6	0.003
South Dakota	30.4	(28.9–32.0)	30.8	(29.0–32.7)	31.8	(29.8–34.0)	4.7	0.283
Tennessee	30.5	(28.6–32.5)	32.1	(29.5–34.8)	30.6	(28.3–32.9)	0.3	0.954
Texas	32.0	(30.4–33.6)	36.0	(34.7–37.3)	38.8	(36.7–40.9)	21.2	<0.001
Utah	32.2	(30.4–34.1)	32.3	(30.5–34.3)	32.7	(31.4–34.2)	1.7	0.636
Vermont	31.8	(30.3–33.5)	32.4	(30.1–34.8)	31.9	(30.2–33.6)	0.1	0.979
Virginia	34.7	(32.8–36.5)	34.2	(32.1–36.3)	35.0	(32.5–37.6)	1.0	0.820
Washington	33.8	(32.8–34.7)	33.8	(32.8–34.7)	34.8	(33.7–35.9)	3.1	0.162
West Virginia	35.5	(33.5–37.5)	37.2	(35.2–39.2)	34.6	(32.6–36.5)	-2.6	0.519
Wisconsin	32.7	(30.8–34.7)	31.7	(30.1–33.4)	32.8	(30.6–35.2)	0.3	0.948
Wyoming	32.4	(30.8–34.1)	34.3	(32.4–36.1)	32.7	(31.0–34.4)	0.9	0.804

Abbreviation: CI = confidence interval.
* Age-adjusted to the 2000 U.S. standard population; weighted estimates.
† Not age-adjusted.
§ Persons identified as Hispanic might be of any race. Persons identified as white, black, Asian/Pacific Islander, or American Indian/Alaska Native are all non-Hispanic. The five racial/ethnic categories are mutually exclusive.

screening targets, public health practitioners, health-care providers, and educators should emphasize cholesterol screening, especially for young adults, men, Hispanics, and those with lower levels of education.

A wide variety of community and medical treatment activities address cholesterol screening and treatment. For example, CDC's National Heart Disease and Stroke Prevention programs support states implementing evidence-based practices in community and clinical settings, specifically highlighting cholesterol control within communities (*8*). Therapeutic lifestyle changes are an important approach that incorporates a low-fat, high-fiber diet and physical activity on most days (*9*). If cholesterol-lowering drugs are needed, they are used together with therapeutic lifestyle changes. The National Cholesterol Education Program provides evidenced-based resources and recommendations to health-care providers, and new guidelines for cholesterol are currently being developed (*4*). *Healthy People 2020* objectives aim to increase awareness of current cholesterol recommendations and provide targets for stakeholders. The Million Hearts initiative, a federal/private partnership, is a recent, innovative alignment and coordination of clinical and community activities targeting leading causes of cardiovascular disease morbidity and mortality, including high blood cholesterol (*10*). These and other community and clinical activities are important measures to combat the deleterious effects of high blood cholesterol.

FIGURE. Age-adjusted* percentage of adults aged ≥18 years who had been screened for high blood cholesterol during the preceding 5 years and percentage who had ever been screened for cholesterol and were told by a health-care provider that they had high blood cholesterol — Behavioral Risk Factor Surveillance System, United States, 2009



* Age-adjusted to the 2000 U.S. standard population; weighted estimates.

What is already known on this topic?

Cholesterol is a major risk factor for cardiovascular disease. In 2003, the percentage of adults who had their cholesterol screened during the preceding 5 years was 73.1%. Among those who had a cholesterol screening, 31.1% reported ever being told they had high cholesterol. The prevalence of cholesterol screening has been reported as higher among the elderly, women, whites, and blacks.

What is added by this report?

Behavioral Risk Factor Surveillance System data indicate that cholesterol screening increased from 72.7% in 2005 to 76.0% in 2009, whereas the percentage of those screened who reported being told they had high cholesterol increased from 33.2% to 35.0%. Previously identified demographic disparities persist.

What are the implications for public health practice?

Nationally, the percentage of adults screened for high cholesterol during the preceding 5 years remains lower than the *Healthy People 2020* target of 82.1%, and the percentage of those tested reporting being told they had high cholesterol has increased. The overall and state-specific findings in this report can be used to assess current national and state trends and target resources toward at-risk populations.

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Vital Signs: Awareness and Treatment of Uncontrolled Hypertension Among Adults — United States, 2003–2010

On September 4, 2012, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

Abstract

Background: Hypertension is a leading risk factor for cardiovascular disease and a significant cause of morbidity and mortality. This report uses data from the National Health and Nutrition Examination Survey (NHANES) to examine awareness and pharmacologic treatment of uncontrolled hypertension among U.S. adults with hypertension and focuses on three groups: those who are unaware of their hypertension, those who are aware but not treated with medication, and those who are aware and pharmacologically treated with medication but still have uncontrolled hypertension.

Methods: CDC analyzed data from the NHANES 2003–2010 to estimate the prevalence of hypertension awareness and treatment among adults with uncontrolled hypertension. Hypertension was defined as an average systolic blood pressure (SBP) ≥140 mmHg or an average diastolic blood pressure (DBP) ≥90 mmHg, or currently using blood pressure (BP)–lowering medication. Uncontrolled hypertension was defined as an average SBP ≥140 mmHg or an average DBP ≥90 mmHg, among those with hypertension.

Results: The overall prevalence of hypertension among U.S. adults aged ≥18 years in 2003–2010 was 30.4% or an estimated 66.9 million. Among those with hypertension, an estimated 35.8 million (53.5%) did not have their hypertension controlled. Among these, an estimated 14.1 million (39.4%) were not aware of their hypertension, an estimated 5.7 million (15.8%) were aware of their hypertension but were not receiving pharmacologic treatment, and an estimated 16.0 million (44.8%) were aware of their hypertension and were being treated with medication. Of the 35.8 million U.S. adults with uncontrolled hypertension, 89.4% reported having a usual source of health care, and 85.2% reported having health insurance.

Implications for Public Health Practice: Nearly 90% of U.S. adults with uncontrolled hypertension have a usual source of health care and insurance, representing a missed opportunity for hypertension control. Improved hypertension control will require an expanded effort and an increased focus on BP from health-care systems, clinicians, and individuals.

Introduction

Hypertension is a leading risk factor for cardiovascular disease, a major cause of morbidity and mortality, and costs $131 billion annually in health-care expenditures (*1–3*). A previous report documented that during 2005–2008, nearly one third of U.S. adults had hypertension, and less than half had it under control (*4*). Uncontrolled hypertension among adults with hypertension is associated with increased mortality (*5*). Adequate hypertension treatment and control can reduce the incidence of first and recurrent heart attacks and strokes, heart failure, and chronic kidney disease, and can save lives (*1,2,5,6*). This report uses data from the National Health and Nutrition Examination Survey (NHANES) to examine awareness and treatment among U.S. adults with uncontrolled hypertension. This report focuses on three groups of adults with uncontrolled hypertension: those who are unaware of their hypertension, those who are aware but not treated with medication, and those who are aware and treated with medication but still have uncontrolled hypertension. The findings in this report can be used to target populations to improve hypertension control in the United States.

Methods

NHANES is a complex, multistage probability sample of the U.S civilian, noninstitutionalized population (*7*). The survey includes a household interview and a detailed physical examination. To obtain statistically stable estimates, data were analyzed from the most recent four 2-year survey cycles (2003–2010) in which a total of 22,992 participants aged ≥18 years were interviewed and examined.* Excluded from this analysis were pregnant women (n = 732), those missing blood pressure (BP) measurements or missing information on self-reported current use of hypertension medication (n = 1,318), and participants

*Mobile examination center response rates for NHANES ranged from 75% to 77% during the study period.

missing data on covariates of interest (n = 183). Some participants were excluded based on more than one criterion, yielding an eligible sample of 20,811. Hypertension was defined as an average systolic BP (SBP) ≥140 mmHg or an average diastolic BP (DBP) ≥90 mmHg, based on the average of up to three BP measurements[†] (*7*), or currently using BP-lowering medication. Uncontrolled hypertension was defined as an average SBP ≥140 mmHg or an average DBP ≥90 mmHg, among those with hypertension. Participants with uncontrolled hypertension were considered aware of their condition if they responded "yes" to the question "Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?" Participants were classified as being treated for their hypertension if they answered "yes" to both of the following questions: "Because of your high blood pressure/hypertension, have you ever been told to take prescribed medicine?" and "Are you currently taking medication to lower your blood pressure?" Health insurance coverage referred to coverage at the time of interview; public insurance includes Medicaid, Children's Health Insurance Program (CHIP), state-sponsored or other government-sponsored health plan, Medicare, or military health plan (e.g., TRICARE, VA, or CHAMP-VA). The prevalence of uncontrolled hypertension was examined among those with hypertension, as well as the prevalence of awareness and treatment among those with uncontrolled hypertension. In addition, the prevalence of stage 2 hypertension (SBP ≥160 mmHg or DBP ≥100 mmHg) was estimated among those with uncontrolled hypertension (*1*).

All analyses were conducted using statistical software to account for sampling weights and to adjust variance estimates for the multistage, clustered sample design. Because trends over time were not examined and multiple cycles of the survey were collapsed, prevalence estimates were not age adjusted. Population counts were calculated using the Current Population Surveys provided by NHANES, by averaging the population for the four cycles examined.[§]

Results

The overall prevalence of hypertension among U.S. adults aged ≥18 years during 2003–2010 was 30.4%, representing an estimated 66.9 million persons, of whom an estimated 35.8 million (53.5%) had uncontrolled hypertension (Figure). The prevalence of uncontrolled hypertension among adults with hypertension was highest among those who reported receiving no medical care in the previous year (93.3%), those without a usual source of health care (87.4%), and those without health insurance (71.8%) (Table 1). Among the 35.8 million persons with uncontrolled hypertension, 32.0 million (89.4%) reported having a usual source of health care, 31.4 million (87.7%) received medical care in the previous year, and 30.5 million (85.2%) had health insurance. More than half (51.8%), an estimated 14.1 million, of Medicare beneficiaries with hypertension had uncontrolled hypertension. Approximately 9.1 million adults had stage 2 hypertension, representing 13.6% of all adults with hypertension and 25.4% of those with uncontrolled hypertension.

Among adults with uncontrolled hypertension, an estimated 14.1 million (39.4%) were unaware of their hypertension (Table 2); the prevalence of being unaware was highest among those who reported not receiving health care in the previous year (71.5%), those without a usual source of health care (64.3%), adults aged 18–44 years (56.6%), and those without health insurance (51.9%). An estimated 5.7 million adults (15.8%) were aware but not pharmacologically treated for hypertension; the prevalence of being aware yet untreated for hypertension was highest among those without a usual source of health care (25.6%), adults aged 18–44 years (25.4%), those of Hispanic ethnicity other than Mexican-Americans (24.8%), and those without health insurance (23.5%). An estimated 16.0 million (44.8%) were aware of their hypertension and pharmacologically treated; the prevalence of being aware and treated with medication was highest among Medicare beneficiaries (60.6%), those aged ≥65 years (59.9%), and those who reported receiving medical care two or more times in the previous year (55.3%).

Conclusion and Comment

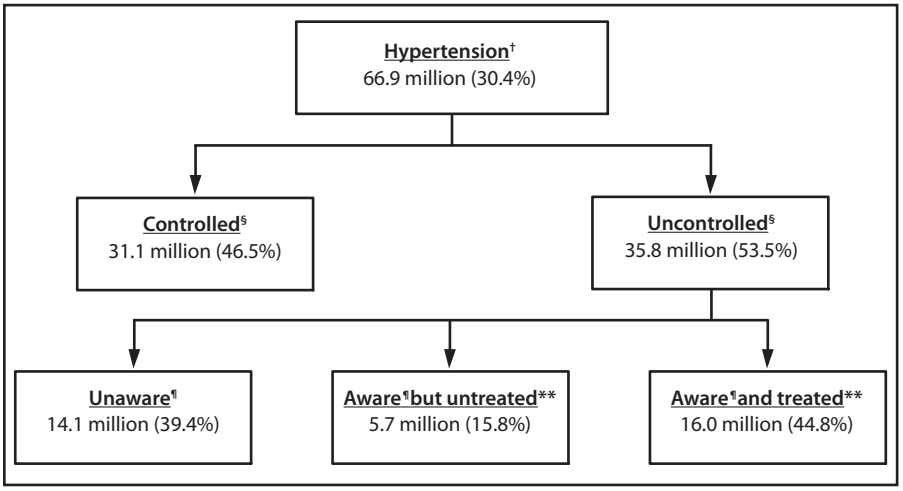
The results of this analysis indicate that more than half (53.5%) of the estimated 66.9 million U.S. adults with hypertension had uncontrolled hypertension during the period 2003–2010. Nearly 90% of the 35.8 million U.S. adults with uncontrolled hypertension had a usual source of health care, had health insurance coverage, and received health care in the previous year, all of which indicate potential missed opportunities by individuals, health-care providers, and health-care systems to improve hypertension control. Improved hypertension control will require an expanded effort and increased focus on hypertension from patients, health-care systems, and clinicians.

Hypertension control can be challenging to achieve, with barriers to hypertension control attributed to patients, health-care providers, and health-care systems, and the silent nature of the disease (*8*). Moreover, even modest elevations in BP increase the risk for cardiovascular disease and mortality. For

[†] This study used the average of up to three BP measurements, obtained under standardized conditions during a single physical examination at the mobile examination center. Approximately 95% of participants had two or three complete BP measurements during the study period. For participants with only one BP measurement, that single measurement was used.

[§] Additional information is available at http://www.cdc.gov/nchs/nhanes/response_rates_cps.htm.

FIGURE. Number and percentage of adults aged ≥18 years who had hypertension, who had controlled or uncontrolled hypertension, and who were aware and/or pharmacologically treated for hypertension among those with uncontrolled hypertension — National Health and Nutrition Examination Survey (NHANES), United States, 2003–2010*



* Weighted population counts based on the Current Population Survey totals averaged across the four NHANES cycles (2003–2004, 2005–2006, 2007–2008, and 2009–2010).

† Hypertension is defined as an average systolic blood pressure ≥140 mmHg, an average diastolic blood pressure ≥90 mmHg, or reported current use of blood pressure–lowering medication.

§ Uncontrolled hypertension is defined as an average systolic blood pressure ≥140 mmHg or an average diastolic blood pressure ≥90 mmHg, among those with hypertension.

¶ Unaware defined as a "no" answer to the question, "Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?" Aware defined as a "yes" answer to that question. Calculated among those with uncontrolled hypertension.

** Treated defined as an answer of "yes" to both of the following questions: "Because of your high blood pressure/hypertension, have you ever been told to take prescribed medicine?" and "Are you currently taking medication to lower your blood pressure?" Untreated defined as an answer of "no" to either of these questions. Calculated among those with uncontrolled hypertension.

every 20-mmHg increase in SBP beginning at 115 mmHg, or 10-mmHg increase in DBP beginning at 75 mmHg, mortality from ischemic heart disease and stroke are doubled (*1*). Furthermore, nearly 30% of adults with uncontrolled hypertension who are aware of their hypertension and pharmacologically treated have stage 2 hypertension (SBP ≥160 mmHg or DBP ≥100 mmHg); these patients have significantly elevated BP and are at high risk for adverse cardiovascular events (*1*). Increased focus on BP from clinicians and health-care systems is essential for improving hypertension control, with all health-care providers participating, not just primary-care providers. Clinical strategies to improve hypertension control include using evidence-based practice guidelines, innovative health-care delivery models, such as team-based care, patient-centered medical homes, and interventions to promote medication adherence (Box). Team-based care, recommended by the Community Preventive Services Task Force, promotes improved communication with patients and other health-care providers and adherence to evidence-based guidelines, such as BP guidelines from the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (*1,9,10*). In addition, individuals also can play an important role in achieving greater hypertension control by improving medication adherence, measuring their own BP, and eating a lower-sodium diet.

BP screening, measurement, and control are key performance measures for several quality-improvement and reporting initiatives from the Centers for Medicare & Medicaid Services and other health-improvement initiatives and are based on National Quality Forum and Healthcare Effectiveness Data and Information Set hypertension-control measures. A number of programs contain quality reporting measures addressing hypertension control.¶ BP measures are key components of most electronic health records (EHRs). Health information technology, including EHRs, registries, and clinical decision support, helps clinicians improve care and target interventions to patients needing intensified care (*9*). A recent study indicated that hypertension was underdiagnosed in EHRs in outpatient clinics in the San Francisco Bay area, which serves approximately 600,000 patients (*11*). For patients with two or more BP readings of ≥140/90 or an antihypertensive medication prescription, only 63% had an appropriate hypertension diagnosis noted in the EHR. A study from the Geisinger Health System had a similar finding in which 30% of patients in their outpatient clinics had blood pressure measurements recorded in the EHR that met the definition for hypertension, yet were not documented as having hypertension and were not prescribed BP-lowering medications (Nirav Shah, New York State Department of Health, personal communication, 2012).

Health-care systems can adopt system-wide approaches facilitating increased hypertension identification and drug and lifestyle

¶ Information about the Physician Quality Reporting System, for example, is available at https://www.cms.gov/medicare/quality-initiatives-patient-assessment-instruments/pqrs/downloads//2012pqrs_medicareehr-incentpilot_final508_1-13-2012.pdf. Information about Meaningful Use Stage 1 and 2 Clinical Quality Measures is available at http://www.hrsa.gov/healthit/meaningfuluse/mu%20stage1%20cqm/mucqm_.html and http://www.gpo.gov/fdsys/pkg/FR-2012-03-07/pdf/2012-4443.pdf, respectively. Information about the Million Hearts initiative is available at http://millionhearts.hhs.gov/aboutmh/achieving-goals.html. Information about the Healthcare Effectiveness Data and Information Set is available at http://www.ncqa.org/LinkClick.aspx?fileticket=J8kEuhuPqxk%3d&tabid=836. Information about the National Committee for Quality Assurance's recognition program for patient-centered medical homes is available at http://www.ncqa.org/tabid/631/default.aspx. Information about Accountable Care Organizations is available at http://www.cms.gov/medicare/medicare-fee-for-service-payment/sharedsavingsprogram/downloads/aco_qualitymeasures.pdf. Finally, information about *Healthy People 2020* is available at http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=21.

TABLE 1. Prevalence of uncontrolled hypertension* among adults aged ≥18 years with hypertension,† by selected characteristics — National Health and Nutrition Examination Survey (NHANES), United States, 2003–2010

Characteristic	No. in sample§	%¶	(95% CI)	No.**	p-value††
Total	**7,350**	**53.5**	**(51.5–55.4)**	**35.8**	
Sex					
Men	3,626	55.0	(52.3–57.7)	17.5	0.034
Women	3,724	52.1	(50.1–54.1)	18.4	
Age group (yrs)					
18–44	867	61.6	(56.7–66.3)	6.6	
45–64	2,872	51.1	(48.3–54.0)	15.3	
≥65	3,611	53.0	(50.9–55.1)	13.4	<0.001
65–79	2,538	49.7	(47.3–52.0)	9.0	
≥80	1,073	62.1	(58.4–65.7)	4.5	<0.001
Race/Ethnicity§§					
White, non-Hispanic	3,792	51.5	(49.2–53.9)	24.9	<0.001¶¶¶
Black, non-Hispanic	1,798	57.0	(54.3–59.7)	5.4	
Hispanic	1,498	63.1	(59.5–66.6)	3.5	
Mexican-American	1,062	64.6	(61.7–67.3)	2.2	<0.001****
Other Hispanic	436	60.7	(52.9–68.0)	1.4	
Poverty to income ratio¶¶					
<100%	1,163	59.0	(54.4–63.6)	4.0	<0.001
100%–299%	3,210	55.6	(53.0–58.1)	14.3	
300%–499%	1,317	52.1	(48.4–55.9)	8.0	
≥500%	1,108	47.5	(44.3–50.8)	7.1	
Education (among those aged ≥25 yrs)					
<High school diploma	2,461	57.4	(54.9–59.8)	8.7	<0.001
High school diploma	1,868	53.2	(50.3–56.1)	9.9	
Some college	1,791	54.4	(51.0–57.6)	10.1	
≥College degree	1,152	47.0	(42.9–51.1)	6.5	
Usual source of care***					
Yes	6,869	51.1	(49.2–53.1)	32.0	<0.001
No	481	87.4	(81.6–91.5)	3.8	
Times received health care in past 12 mos†††					
0	538	93.3	(89.6–95.7)	4.3	<0.001
1	797	68.0	(62.1–73.4)	5.6	
≥2	6,015	47.8	(45.9–49.7)	25.8	
Health insurance status§§§					
Any health insurance	6,433	51.2	(49.3–53.2)	30.5	<0.001††††
Medicare	3,697	51.8	(49.8–53.9)	14.1	<0.001§§§§
Private	2,142	51.0	(47.9–54.1)	14.1	
Public	594	49.1	(43.3–54.9)	2.3	
Uninsured	917	71.8	(67.9–75.3)	5.3	

Abbreviation: CI = confidence interval.

* Uncontrolled hypertension was defined as an average systolic blood pressure ≥140 mmHg or an average diastolic blood pressure ≥90 mmHg. Calculated among those with hypertension. Pregnant women were excluded.

† Hypertension was defined as an average systolic blood pressure ≥140 mmHg, or an average diastolic blood pressure ≥90 mmHg, or self-reported current use of blood pressure–lowering medication.

§ Unweighted sample size.

¶ Weighted, unadjusted estimates.

** Weighted population counts (in millions) based on the Current Population Survey totals averaged across the four NHANES cycles (2003–2004, 2005–2006, 2007–2008, and 2009–2010).

†† Unadjusted chi-square test for differences in the prevalence of uncontrolled hypertension by characteristics. Those of "other" racial/ethnic groups, those missing poverty to income ratio, or those aged <25 years (for education status) were not included in tests of independence between those subgroups and blood pressure control.

§§ Participants of other racial/ethnic groups included in analysis but not reported.

¶¶ Participants missing poverty to income ratio included in analysis but not reported.

*** Participants were asked, "Is there a place that you usually go when you are sick or need advice about your health?" Yes responses include those who answered "yes" or "there is more than one place."

††† Participants were asked, "During the last 12 months how many times have you seen a doctor or other health professional about your health at a doctor's office, a clinic, hospital emergency room, at home or some other place? Do not include times you were hospitalized overnight."

§§§ Medicare includes all participants who had Medicare. Private does not include those participants with Medicare. Other public insurance includes participants who only reported Indian Health Service. Uninsured includes participants with single service plan only.

¶¶¶ Unadjusted chi-square test of independence for the prevalence of uncontrolled hypertension between the following racial/ethnic groups: non-Hispanic white, non-Hispanic black, and Hispanics.

**** Unadjusted chi-square test of independence for the prevalence of uncontrolled hypertension between the following racial/ethnic groups: non-Hispanic white, non-Hispanic black, Mexican-American, and other Hispanic.

†††† Unadjusted chi-square test of independence for the prevalence of uncontrolled hypertension between having any health insurance versus having no health insurance.

§§§§ Unadjusted chi-square test of independence for the prevalence of uncontrolled hypertension between the following health insurance status groups among those with any health insurance: Medicare, private insurance, and public insurance.

TABLE 2. Prevalence of awareness* and pharmacologic treatment status† among adults aged ≥18 years with uncontrolled hypertension,§ by selected characteristics — National Health and Nutrition Examination Survey (NHANES), United States, 2003–2010

Characteristic	No. in sample¶	Unaware*			Aware* and untreated†			Aware* and treated†			p-value§§
		%**	(95% CI)	No.††	%**	(95% CI)	No.††	%**	(95% CI)	No.††	
Total	**4,056**	**39.4**	**(37.2–41.5)**	**14.1**	**15.8**	**(14.0–17.8)**	**5.7**	**44.8**	**(42.5–47.2)**	**16.0**	
Sex											
Men	2,047	43.7	(40.8–46.8)	7.6	18.3	(15.9–20.9)	3.2	38.0	(35.3–40.8)	6.6	<0.001
Women	2,009	35.0	(32.3–37.9)	6.4	13.4	(11.2–16.1)	2.5	51.6	(48.7–54.4)	9.5	
Age group (yrs)											
18–44	570	56.6	(51.4–61.7)	3.7	25.4	(21.0–30.3)	1.7	18.0	(14.7–21.9)	1.2	
45–64	1,500	38.4	(35.3–41.6)	5.9	19.1	(16.6–22.0)	2.9	42.5	(39.1–45.9)	6.5	
≥65	1,986	32.4	(29.7–35.2)	4.4	7.7	(6.3–9.3)	1.0	59.9	(57.3–62.5)	8.0	<0.001
65–79	1,309	31.2	(27.6–35.0)	2.8	7.3	(5.7–9.5)	0.7	61.5	(58.0–64.8)	5.5	
≥80	677	35.1	(31.2–39.1)	1.6	8.3	(6.3–11.0)	0.4	56.6	(52.5–60.6)	2.6	<0.001
Race/Ethnicity¶¶											
White, non-Hispanic	1,987	40.4	(37.6–43.2)	10.0	15.3	(13.1–17.8)	3.8	44.3	(41.5–47.2)	11.0	0.001****
Black, non-Hispanic	1,017	33.2	(29.4–37.3)	1.8	15.6	(13.5–17.9)	0.8	51.2	(47.0–55.4)	2.7	
Hispanic	899	43.8	(39.5–48.2)	1.5	18.8	(14.6–23.9)	0.7	37.4	(33.2–41.7)	1.3	
Mexican-American	662	48.1	(43.2–53.0)	1.0	15.4	(11.7–20.0)	0.3	36.6	(30.8–42.8)	0.8	0.001††††
Other Hispanic	237	36.4	(28.1–45.6)	0.5	24.8	(17.2–34.5)	0.3	38.8	(31.9–46.2)	0.5	
Poverty to income ratio* **											
<100%	691	36.5	(31.0–42.5)	1.5	16.2	(13.1–19.9)	0.6	47.3	(41.5–53.1)	1.9	0.030
100%–299%	1,823	38.1	(35.4–40.8)	5.5	13.6	(11.8–15.7)	1.9	48.3	(45.4–51.3)	6.9	
300%–499%	678	38.2	(34.2–42.4)	3.1	19.5	(15.8–23.7)	1.6	42.3	(38.1–46.6)	3.4	
≥500%	541	45.1	(39.2–51.1)	3.2	15.1	(11.1–20.3)	1.1	39.8	(34.7–45.2)	2.8	
Education (among those aged ≥25 yrs)											
<High school diploma	1,438	36.6	(33.3–40.1)	3.2	15.4	(12.6–18.6)	1.3	48.0	(45.0–51.0)	4.2	0.278
High school diploma	1,022	37.6	(34.6–40.7)	3.7	15.7	(13.1–18.7)	1.6	46.7	(43.1–50.3)	4.6	
Some college	974	38.3	(34.1–42.6)	3.9	15.6	(12.7–19.1)	1.6	46.1	(41.8–50.4)	4.7	
≥College degree	556	44.0	(38.5–49.7)	2.9	16.2	(12.5–20.7)	1.1	39.8	(34.1–45.8)	2.6	
**Usual source of care††† **											
Yes	3,635	36.4	(34.0–38.9)	11.7	14.7	(12.8–16.7)	4.7	48.9	(46.3–51.5)	15.7	<0.001
No	421	64.3	(57.5–70.5)	2.4	25.6	(20.4–31.7)	1.0	10.1	(7.0–14.5)	0.4	
Times received health care in past 12 mos§§§											
0	496	71.5	(66.0–76.4)	3.1	22.0	(17.2–27.8)	0.9	6.5	(4.1–10.1)	0.3	<0.001
1	557	53.1	(47.8–58.3)	3.0	20.8	(16.3–26.1)	1.2	26.1	(22.0–30.7)	1.5	
≥2	3,003	31.0	(28.5–33.6)	8.0	13.7	(11.9–15.7)	3.5	55.3	(52.7–58.0)	14.3	
Health insurance status¶¶¶											
Any health insurance	3,403	37.2	(35.0–39.4)	11.3	14.5	(12.7–16.6)	4.4	48.3	(45.8–50.8)	14.7	<0.001§§§§
Medicare	1,977	31.1	(28.4–33.8)	4.4	8.3	(7.0–9.9)	1.2	60.6	(57.8–63.3)	8.6	<0.001¶¶¶¶
Private	1,140	42.9	(39.1–46.7)	6.0	20.3	(17.1–24.0)	2.9	36.8	(33.1–40.6)	5.2	
Public	286	40.0	(32.5–48.0)	0.9	17.1	(11.7–24.2)	0.4	42.9	(35.1–51.1)	1.0	
Uninsured	653	51.9	(46.7–57.1)	2.7	23.5	(20.0–27.3)	1.2	24.6	(20.0–29.8)	1.3	

Abbreviation: CI = confidence interval.

* Unaware defined as a "no" answer to the question, "Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?" Aware defined as a "yes" answer to that question. Calculated among those with uncontrolled hypertension.

† Treated defined as an answer of "yes" to both of the following questions: "Because of your high blood pressure/hypertension, have you ever been told to take prescribed medicine?" and "Are you currently taking medication to lower your blood pressure?" Untreated defined as an answer of "no" to either of these questions. Calculated among those with uncontrolled hypertension.

§ Uncontrolled hypertension was defined as an average systolic blood pressure ≥140 mmHg or an average diastolic blood pressure ≥90 mmHg. Calculated among those with hypertension. Pregnant women were excluded.

¶ Unweighted sample size.

** Weighted, unadjusted estimates.

†† Weighted population counts (in millions) based on the Current Population Survey totals averaged across the four NHANES cycles (2003–2004, 2005–2006, 2007–2008, and 2009–2010).

§§ Unadjusted chi-square test for differences in awareness/treatment status, by selected characteristics. Those of "other" racial/ethnic groups, those missing poverty to income ratio, or those aged <25 years (for education status) were not included in tests of independence between those subgroups and awareness/treatment status.

¶¶ Participants of other racial/ethnic groups included in analysis but not reported.

*** Participants missing poverty to income ratio included in analysis but not reported.

††† Participants were asked, "Is there a place that you usually go when you are sick or need advice about your health?" Yes responses include those who answered "yes" or "there is more than one place."

§§§ Participants were asked, "During the last 12 months how many times have you seen a doctor or other health professional about your health at a doctor's office, a clinic, hospital emergency room, at home or some other place? Do not include times you were hospitalized overnight."

¶¶¶ Medicare includes all participants who had Medicare. Private does not include those participants with Medicare. Other public insurance includes participants who only reported Indian Health Service. Uninsured includes participants with single service plan only.

**** Unadjusted chi-square test of independence between awareness/treatment status and the following racial/ethnic groups: non-Hispanic white, non-Hispanic black, and Hispanics.

†††† Unadjusted chi-square test of independence between awareness/treatment status and the following racial-ethnic groups: non-Hispanic white, non-Hispanic black, Mexican-American, and other Hispanic.

§§§§ Unadjusted chi-square test of independence between awareness/treatment status and having any health insurance versus having no health insurance.

¶¶¶¶ Unadjusted chi-square test of independence between awareness/treatment status and the following insurance status groups among those with any health insurance: Medicare, private insurance, and public insurance.

BOX. Strategies to improve hypertension control in the clinical setting

- Improve recognition and diagnosis of hypertension.
- Increase knowledge of and adherence to hypertension guidelines.
- Use innovative health-care delivery models, such as team-based care, patient-centered medical homes, pharmacist interventions, and other interventions to promote medication adherence.
- Optimize dosing and use of effective combinations of antihypertensive medications and lifestyle counseling through an organized regular review of the patients' treatment.
- Monitor patients' progress towards hypertension control.
- Promote self-monitoring of blood pressure by patients and provide effective self-management education.
- Promote healthy lifestyles for all patients
  - Eating a healthy diet, including reduced sodium consumption, and increased consumption of potassium, fruits, and vegetables.
  - Regular physical activity.
  - Weight loss among those who are overweight or obese.

Sources: Glynn LG, Murphy AW, Smith SM, Schroeder K, Fahey T. Interventions used to improve control of blood pressure in patients with hypertension. Cochrane Database Syst Rev 2010;(3):CD005182.

Institute of Medicine. A population-based policy and systems change approach to prevent and control hypertension. Washington, DC: The National Academies Press; 2010. Available at http://www.nap.edu/catalog.php?record_id=12819.

treatment strategies when indicated. Hypertension control rates improved from 45.7% in 2000 to 76.3% in 2010 in 15 Veterans Affairs medical centers with the implementation of system-wide strategies, including a BP-control performance measure, automatic notification of health-care providers regarding a patient's previously elevated BP readings, electronic reminders of treatment guidelines, and systematic scheduling of follow-up visits (*12*). In South Carolina, the Outpatient Quality Improvement Network improved hypertension control from 49% in 2000 to 66% in 2005 among a cohort of 208,547 patients with hypertension after implementation of a hypertension initiative, including education of health-care providers regarding hypertension and the use of evidence-based guidelines, participation in a central database, and receipt of quarterly feedback reports (*13*).

Million Hearts, a U.S. Department of Health and Human Services initiative co-led by CDC and the Centers for Medicare & Medicaid Services, is focusing efforts on a common goal of preventing 1 million heart attacks and strokes by 2017 (*9*).** Focused clinical and policy strategies and more effective application of health information technology are being used to improve the clinical management of hypertension, along with interventions such as aspirin therapy, cholesterol management, and smoking cessation (*9*). With respect to hypertension, this initiative has the goal of increasing by 10 million the number of persons in the United States whose hypertension is under control, which will help reach the objective of preventing 1 million heart attacks and strokes by 2017.

The findings in this report are subject to at least three limitations. First, NHANES surveys only the noninstitutionalized U.S. population. Military personnel and persons residing in nursing homes and other institutions are not included, which might result in underestimation of hypertension prevalence, given that older nursing home residents might have a higher prevalence of age-related hypertension. Moreover, the exclusion of military personnel might result in overestimation of the prevalence of hypertension because they might be younger, more physically fit, and have a lower prevalence of hypertension. Second, self-reported data on hypertension awareness and medication use might be subject to recall bias. Finally, this report examined hypertension treatment based only on medication use, not accounting for those using lifestyle or dietary approaches to reducing BP.

Uncontrolled hypertension affects nearly 36 million adults in the United States, yet 32 million of these adults have a usual source of health care, and 30 million have health insurance, representing a missed opportunity for hypertension control. The findings in this report can be used to target populations and refine interventions to improve hypertension control. Improved hypertension control will require an expanded effort from patients, health-care providers, and health-care systems.

Reported by

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** Additional information is available at http://millionhearts.hhs.gov/index.html.

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Key Points

- Hypertension is a major risk factor for heart disease and stroke in the United States.
- Nearly one third of U.S. adults surveyed during 2003–2010 had hypertension; about half did not have it under control (systolic blood pressure [BP] <140 mmHg and diastolic BP <90 mmHg).
- About 36 million U.S. adults had uncontrolled hypertension. About 39% did not know they had it, 16% knew but were not being treated with medicines, and 45% were taking medicine but did not have it controlled.
- Nearly one fourth of adults with uncontrolled hypertension have stage 2 hypertension (systolic BP ≥160 mmHg or a diastolic BP ≥100 mmHg), putting them at higher risk for heart disease or stroke.
- Surprisingly, most people with uncontrolled hypertension did have a usual source of health care (89%). About 88% got medical care during the previous year, and 85% had health insurance.
- Improving hypertension control will take an expanded effort by health-care systems, health-care providers of all types working together, and greater attention to BP by patients.
- For more information, see www.cdc.gov/vitalsigns.

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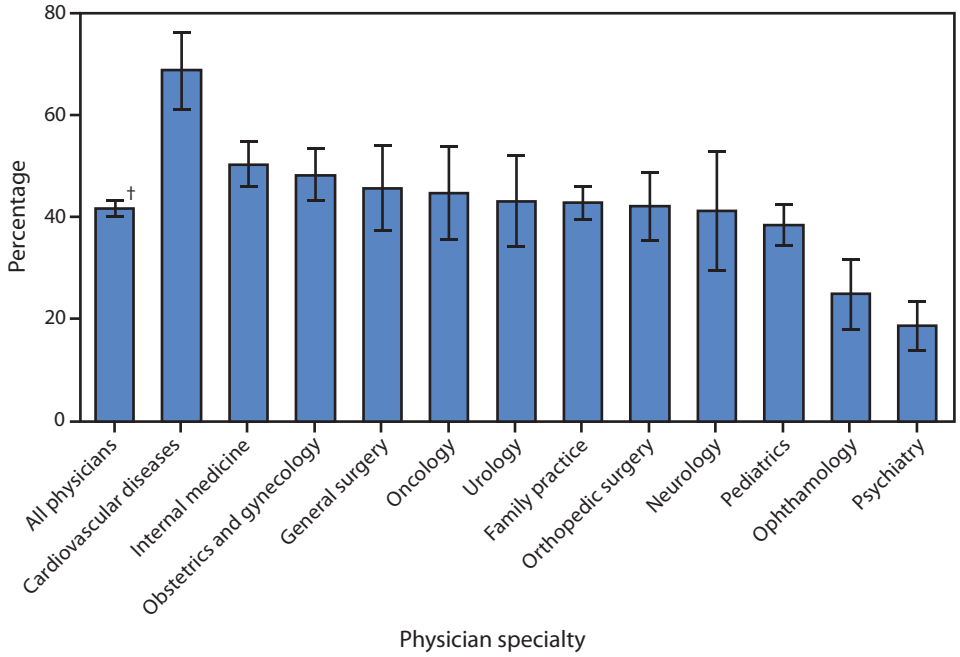
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Physicians with Electronic Health Record (EHR) Systems That Meet Federal Standards,* by Physician Specialty — Physician Workflow Survey, United States, 2011



* Data represent office-based physicians who reported having adopted EHR systems that qualify as certified by the U.S. Department of Health and Human Services. The physician sample includes non-federal office–based physicians and excludes radiologists, anesthesiologists, and pathologists.
† 95% confidence interval.

An estimated 42% of all physicians have an EHR system that meets federal standards. Ophthalmologists (25%) and psychiatrists (19%) were least likely, and cardiovascular diseases specialists (69%) were most likely to use a federally approved system.

Sources: National Center for Health Statistics. Physician workflow survey, 2011. Available at http://www.cdc.gov/nchs/ahcd.htm.

Jamoom E, Beatty P, Bercovitz A, Woodwell D, Palso K, Rectsteiner E. Physician adoption of electronic health record systems: United States, 2011. NCHS data brief no. 98. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2012. Available at http://www.cdc.gov/nchs/data/databriefs/db98.htm.

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