



# EARLY CHILDHOOD VACCINATION TRENDS IN AMERICA

PUBLISHED JANUARY 18, 2018



HealthCore®

## BLUE CROSS BLUE SHIELD, THE HEALTH OF AMERICA REPORT

## EXECUTIVE SUMMARY

Childhood vaccination is considered one of the top public health accomplishments of the 20th century.<sup>1,2</sup> In this new report, the Blue Cross Blue Shield Association, in partnership with HealthCore and Blue Health Intelligence (BHI), examines early childhood vaccination trends for U.S. commercially insured children. The report looks at claims data for children in four birth cohorts (those born in 2010, 2011, 2012 and 2013) and follows their care continuously from birth through 3 years of age.<sup>3</sup> This study focuses on completion rates of vaccines in the Centers for Disease Control and Prevention's recommended seven-vaccine series for children between the years 2013 (by which time the vaccines should have been completed for the first birth cohort) and 2016.<sup>4,5,6</sup> (See Appendix A for details on the seven-vaccine series and other CDC-recommended vaccinations and Appendices B and C for specific study methodology.)

This study finds early childhood vaccination rates increased steadily over time. However, wide variation in vaccination rates exists throughout the country at both the state and local levels. Missed well-child visits are a primary driver of under-vaccinated children.

### Vaccines Included in the CDC-Recommended Seven-Vaccine Series

Diphtheria, Tetanus, and acellular Pertussis (DTaP)

Haemophilus influenzae type b (Hib)

Hepatitis B (Hep B)

Inactivated Poliovirus (IPV)

Measles, Mumps, & Rubella (MMR)

Pneumococcal Conjugate (PCV)

Varicella

<sup>1</sup> For more information, see: <https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases>

<sup>2</sup> In recent years, emphasis has been placed on the lack of vaccination during unexpected outbreaks of preventable health conditions. For example, at least 569 people have been infected and 17 have died from the Hepatitis A virus since November in San Diego, Santa Cruz and Los Angeles counties. (For more information, see: <http://www.latimes.com/local/California/la-me-in-hepatitis-outbreaks-20171006-htmistory.html>) In addition, 79 cases of measles were reported in Minnesota between January and May 2017, exceeding the total number of measles cases among the entire U.S. population in 2016. (For more information, see: <https://www.cdc.gov/measles/cases-outbreaks.html>)

<sup>3</sup> While claims data are a useful vehicle for consistent comparisons of vaccination rates across geographies and over time among commercially insured Americans, they do not capture vaccinations obtained from sources where an insurance claim is not filed. One way to supplement claims derived vaccination rates is to leverage state vaccination registries. In fact, a number of insurers use these registries to refine the vaccination rate estimates that they report publicly for HEDIS and other purposes. However, to incorporate registry information systematically into a national trend report such as this one would require that payers in all states have access to them. This is currently not the case. For a comparison of the differences in the underlying methodology used in this report and those used in HEDIS measurement of vaccination rates, see Appendix C.

<sup>4</sup> Although the CDC recommends that these vaccines should be completed before 18 months of age, this report looks at whether a child has completed these recommended vaccinations by 27 months, or age 2 years and 3 months.

<sup>5</sup> The CDC estimates that for each U.S. birth cohort that receives the recommended childhood immunizations, about 20 million illnesses and more than 40,000 deaths are prevented, resulting in 70 billion dollars in financial savings. Despite this achievement, many measures indicate that vaccination rates in the U.S. remain below national public health goals, such as the 90 to 95 percent vaccination rates needed to achieve herd immunity for certain diseases. For more information, see: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4927017/>

<sup>6</sup> While the CDC's seven-series vaccine was chosen as a summary measure, the methodology for calculating vaccine rates in this report differs substantially from the methodology used by the CDC. The methodology in this report uses claims data as its source while the CDC uses a survey with follow-up chart review. This report also looks at commercially insured children by birth cohort while the CDC looks at a sample of all children 19 to 35 months of age in a calendar year. These differences sometimes lead to differences in estimated rates, particularly for specific geographies. Despite differences in approach, national estimates of the seven-series rates are very similar to the CDC numbers with estimates differing less than two percentage points for the years 2013 through 2015.



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### Specific Findings

- Early childhood vaccination rates continue to improve among commercially insured children in the U.S. Seventy-seven percent of children born in 2013 completed their CDC-recommended seven-vaccine series by 2016, up from 69 percent for children born in 2010 and completing the seven-vaccine series by 2013.
- The individual rates for each vaccine in this series also increased during this period, with all vaccines reaching 80 percent by 2016. However, despite these improvements, some of these vaccines remain below the CDC and World Health Organization (WHO) optimum levels to ensure herd immunity in the population, including vaccines for diphtheria, pertussis and measles.
- There is still wide geographic variation in vaccine rates across the country. For example, in 2016, the seven-vaccine series completion rates by state for children in the 2013 birth cohort ranged from a high of 86 percent in North Dakota to a low of 63 percent in Nevada.
- **Vaccine refusals:** Documented parental/guardian refusals increased nearly 70 percent for children born in 2013 compared to children born in 2010 (4.2 percent versus 2.5 percent, respectively).
- **Under vaccination:** Failure to attend routine well-child visits is the predominant reason identified in the data for under vaccination among commercially insured children. Missed well-child visits were identified as the reason for under vaccination 62 percent of the time among children completing their vaccinations in 2016. Among these same under-vaccinated children, documented parental/guardian refusal was identified 6 percent of the time.

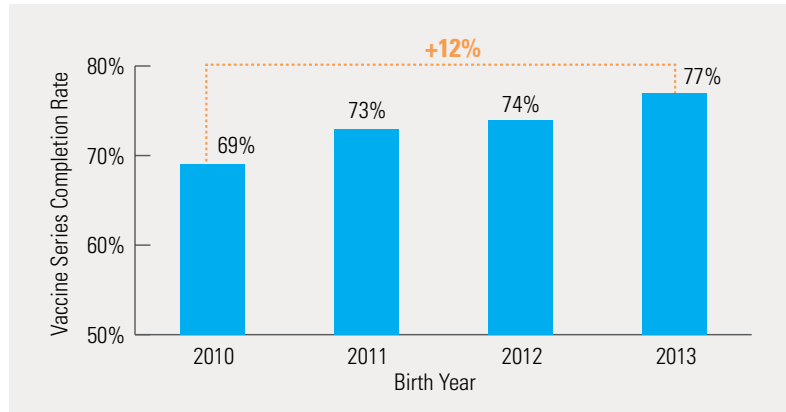


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# Early Childhood Vaccination Trends

The proportion of children up-to-date on the CDC-recommended seven-vaccine series by 27 months of age rose steadily in recent years (see Exhibit 1). Completion rates have increased 12 percent nationally from 69 percent for children born in 2010 (who completed the series by 2013) to 77 percent for children born in 2013 (who completed the series by 2016).

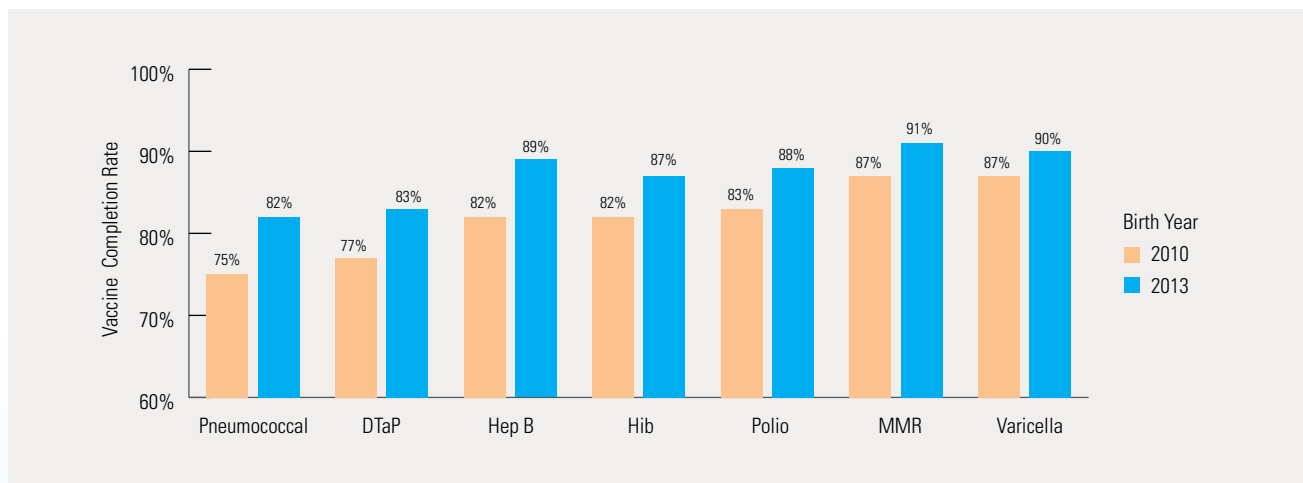
**EXHIBIT 1: PERCENTAGE OF CHILDREN COMPLETING THE CDC-RECOMMENDED SEVEN-VACCINE SERIES BY BIRTH YEAR**



Completion rates for each of the seven individual vaccine regimens increased for children born in 2013 when compared to children born in 2010, with each vaccine now exceeding 80 percent (see Exhibit 2).

Despite these improvements, some vaccines remain below the CDC and WHO recommended levels to ensure herd immunity in the population.<sup>7</sup> For example, diphtheria may need vaccination rates as high as 86 percent, and pertussis and measles as high as 94 percent, to ensure herd immunity. The vaccine rates (DTaP and MMR) for these diseases are currently 83 percent and 91 percent nationally, respectively. (See Appendix D.)

**EXHIBIT 2: PERCENTAGE OF CHILDREN COMPLETING INDIVIDUAL VACCINE REGIMENS**



<sup>7</sup> The CDC defines herd immunity as: "A situation in which a sufficient proportion of a population is immune to an infectious disease (through vaccination and/or prior illness) to make its spread from person to person unlikely. Even individuals not vaccinated (such as newborns and those with chronic illnesses) are offered some protection because the disease has little opportunity to spread within the community." For more information, see: <https://www.cdc.gov/vaccines/terms/glossary.html#commimmunity>; [http://sitn.hms.harvard.edu/wp-content/uploads/2010/09/Lecture\\_1.2.pdf](http://sitn.hms.harvard.edu/wp-content/uploads/2010/09/Lecture_1.2.pdf); and <https://academic.oup.com/cid/article/52/7/911/299077>.

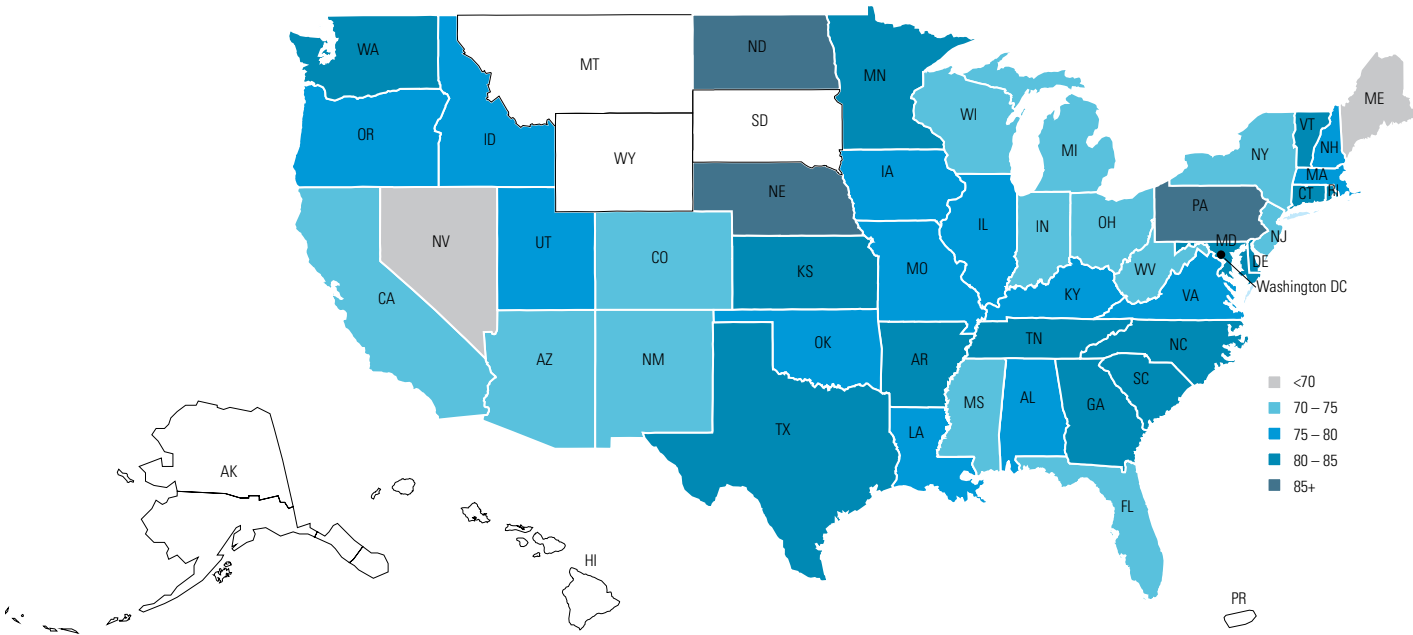
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# Geographic Variation of Early Childhood Vaccinations

Wide geographic variation exists for completion rates of the CDC-recommended seven-vaccine series when comparing these rates by state, metropolitan statistical areas (MSAs) and counties. (See Appendix E.)

State-level completion rates for children born in 2013 (based on data collected through 2016) ranged from a high of 86 percent in North Dakota to a low of 63 percent in Nevada (see Exhibit 3).<sup>8</sup>

**EXHIBIT 3: PERCENTAGE OF CHILDREN COMPLETING THE CDC-RECOMMENDED SEVEN-VACCINE SERIES BY STATE FOR CHILDREN BORN IN 2013 (AND COMPLETING VACCINES BY 2016)**



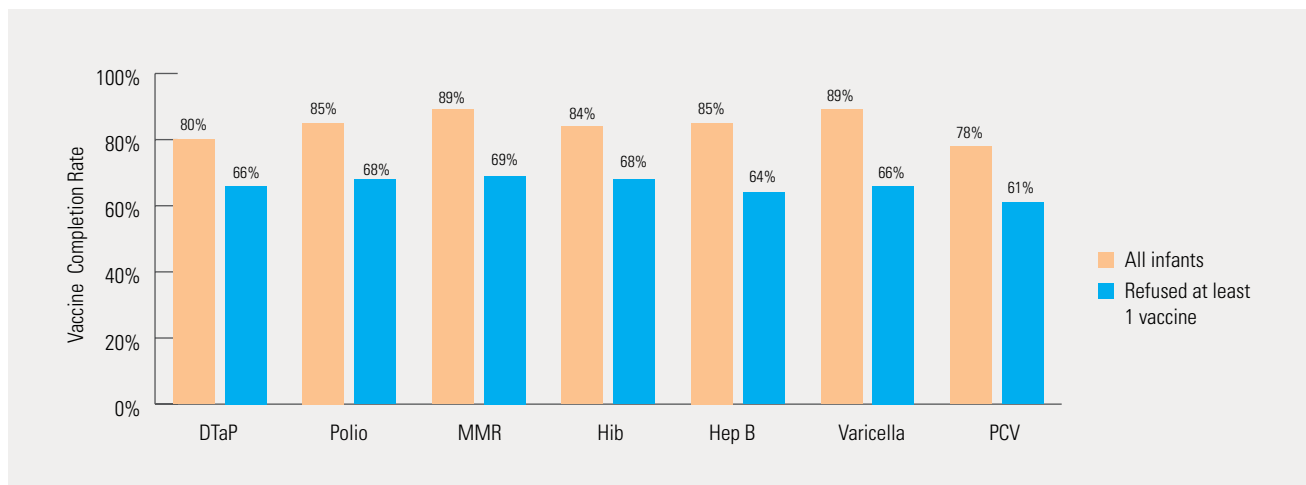
<sup>8</sup> Alaska, Hawaii, Montana, South Dakota, Washington, D.C. and Wyoming were excluded from reporting due to an insufficient study population.

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### Rates of Vaccine Refusals

Among all children, the proportion with one or more documented parental/guardian vaccine refusal increased from 2.5 percent for children born in 2010 to 4.2 percent for children born in 2013 (see Appendix E). Refusals for the 2013 birth cohort are spread fairly evenly across all of the seven vaccines in the CDC-recommended series. This spread suggests that no single vaccine is more likely to result in a refusal than any other vaccine (see Exhibit 4).<sup>9</sup>

**EXHIBIT 4: PERCENTAGE OF CHILDREN COMPLETING EACH OF THE VACCINATIONS IN THE CDC-RECOMMENDED SEVEN-VACCINE SERIES BY 27 MONTHS OF AGE – ALL BIRTH COHORTS**



Documented parental/guardian vaccine refusal rates also vary by state and MSA (see Appendix E). Higher rates of refusal are found in the Northeast—particularly the New York City area—and in the Pacific Northwest, while lower rates are found in the South and Midwest.

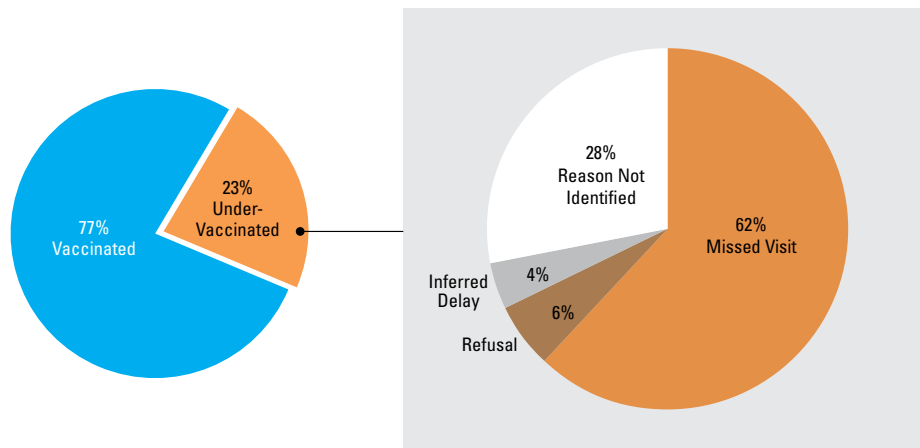
<sup>9</sup> Documented refusal rates are based on all ten CDC-recommended vaccines for early childhood. Forty percent of children with a documented parental/guardian vaccine refusal caught up on all of the CDC-recommended vaccines in the seven-vaccine series by their 27th month of age, suggesting that some initial refusals are not based on a sustained objection to vaccinations.

### Reasons for Under-Vaccinated Children by Age 27 Months

Overall, early childhood vaccination rates are strong nationwide and increasing in recent years, yet there remains opportunity for improvement in many areas. Reasons identified in the data for under vaccination in children (those who fail to complete their seven-vaccine series by age 27 months) are presented in Exhibit 5.<sup>10</sup>

Among children scheduled to complete their vaccinations by 2016, 23 percent missed one or more of the vaccines in the CDC-recommended seven-vaccine series. Missed well-child visits accounted for 62 percent of all of these under-vaccinated children (see Exhibit 5). In contrast, documented vaccine refusals accounted for 6 percent of these under-vaccinated children. Delays due to scheduling vaccinations where children eventually completed the seven-vaccine series (called inferred delays) accounted for 4 percent of these under-vaccinated children.

**EXHIBIT 5: REASONS FOR UNDER VACCINATION FOR CHILDREN SCHEDULED TO COMPLETE THE CDC-RECOMMENDED SEVEN-VACCINE SERIES BY 2016**



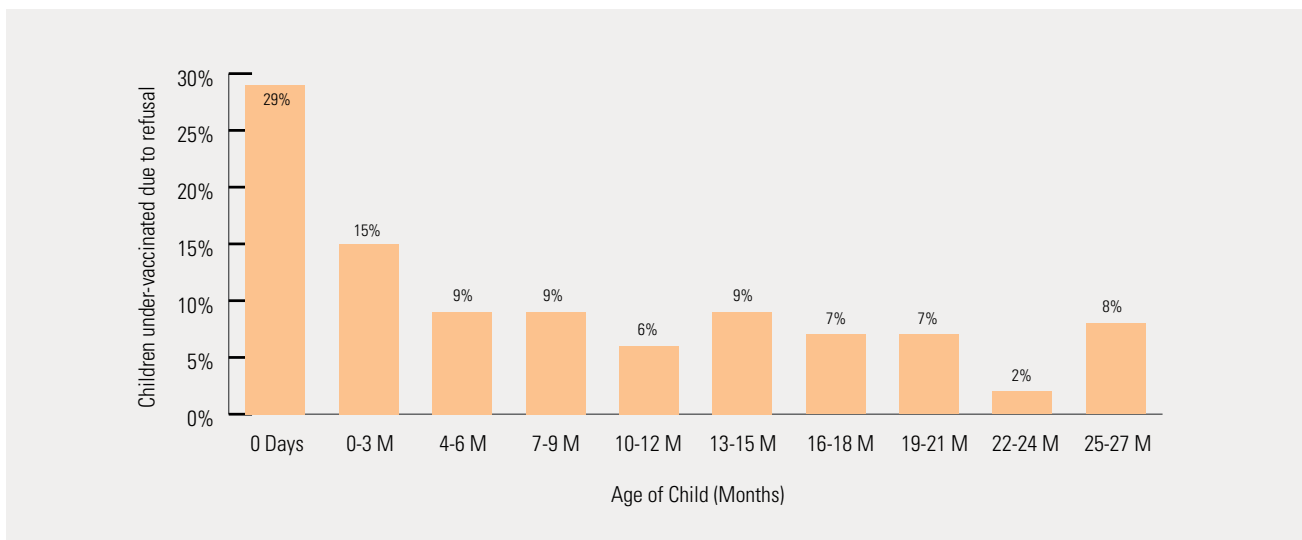
<sup>10</sup> Under-vaccinated children as defined here should not be confused with children with a “documented parental/guardian refusal” as defined in the previous section. Children in the former group do not complete their seven vaccine series by age 27 months. Forty percent of children in the latter group with a documented parental/guardian refusal eventually do complete the vaccine series despite the initial refusal.

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In general, children who have attended more well-child visits have higher vaccine completion rates. On average, sufficiently vaccinated children completing the seven-vaccine series by 27 months of age had two more well-child visits than children who did not complete the series.<sup>11</sup>

For the 6 percent of under-vaccinated children where a parental/guardian vaccine refusal was the reason for under vaccination, 29 percent of refusals took place on the first day of life (see Exhibit 6). An additional 15 percent of refusals took place before reaching 4 months of age. Parental/guardian vaccine refusals decrease rapidly as children grow older.

**EXHIBIT 6: PERCENTAGE OF PARENT/GUARDIAN DOCUMENTED REFUSALS BY AGE OF THE CHILD WHEN THE REFUSAL OCCURRED – ALL BIRTH COHORTS**



<sup>11</sup> The American Academy of Pediatrics (AAP) recommends 10 well child visits by age 2.



## CONCLUSION

This report, sponsored by the Blue Cross Blue Shield Association, in partnership with HealthCore and Blue Health Intelligence, demonstrates that early childhood vaccination rates are on the rise nationwide but there is room for further improvement. While the national rate of fully vaccinated children grew, there is still significant geographic variation. Missed well-child visits appear to be the largest reason for under-vaccination among children from birth to age 2 years 3 months. This study suggests continued awareness, education and compliance with the recommended well-child visits could improve vaccination rates. Administration of the seven-vaccine series will sustain improvements in vaccination rates of children in America.

# Appendix

## Appendix A: CDC-Recommended Vaccinations by Age Group

### CDC-Recommended Vaccines for Children by Age 18 months

Vaccine	# of doses
Diphtheria, Tetanus, and acellular Pertussis (DTaP)	4
Haemophilus influenzae type b (Hib)	3 or 4 (depending on manufacturer)
Hepatitis B (Hep B)	1 at birth* + 2 outpatient
Inactivated Poliovirus (IPV)	3
Measles, mumps, & rubella (MMR)	1
Pneumococcal conjugate (PCV)	4
Varicella	1

\* This report excludes birth dose of Hepatitis B.

This report focuses on the seven-vaccine series as the definitive CDC summary measure of childhood vaccinations. The CDC also recommends two vaccinations for Hepatitis A, two or three for rotavirus (depending on the manufacturer of the vaccine), and the seasonal flu shot to be given by age 18 months (24 months in the case of the Hepatitis A vaccine)

For more information, see: <https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6539a4.pdf>

## Appendix B: Methodology

### Data and Study Population

This is the seventeenth study of the Blue Cross Blue Shield: The Health of America Report series, a collaboration between the Blue Cross Blue Shield Association and Blue Health Intelligence, which uses a market-leading claims database to uncover key trends and insights into healthcare affordability and access to care. Analysis was performed by and also includes medical claims data from HealthCore, a wholly owned and independently operated health outcomes subsidiary of Anthem, Inc.

This study looks at medical claims for services taking place between January 1, 2010 through December 31, 2016. Children with three years of continuous medical eligibility in a commercial BCBS plan were included in the study as summarized below:

Birth cohorts under study	Continuous eligibility requirement
Children born 2010 through 2013	Age 0 through 3.0 years

Total sample size (the number of children contributing data to the childhood vaccination rates) was 843,610 children.

For the children in this study, each birth cohort is labeled by the year in which the child is born, followed by data for three years for each cohort. As a result, for children born in 2010, data from 2010, 2011, 2012 and 2013 are included; for children born in 2011, data from 2011, 2012, 2013 and 2014 are included, and so on for the next two birth years.

Children are counted as fully immunized with the series or individual vaccines as long as they receive the needed vaccine(s) by age 27 months, allowing nine months of buffer time for parents/guardians running behind schedule to take their children to their physician to receive their vaccines.

The report does not capture members who will receive the childhood vaccines after 27 months of age or members who received vaccines from a free public or private local program that does not generate a medical claim.

For more information and to read past reports from The Health of America Report series, visit [www.bcbs.com/the-health-of-america](http://www.bcbs.com/the-health-of-america).

### Methodological Notes

- The analysis included all medical claims for vaccine utilization.
- Metrics were adjusted for presence of "administration-only" vaccination claims.
- States, metropolitan statistical areas and counties with less than 500 children in a given sample were excluded from display.

### **Under Vaccination Rationale Hierarchy**

A reason for under vaccination was assigned for each insufficiently vaccinated case based on information available in the claims data and following the order indicated below. When more than one reason is identified for a given child, the highest ranked item below was taken as the reason for under vaccination:

1. Child had a contraindication for vaccination, for example HIV.
2. Child's parent/guardian refused at least one vaccine as identifiable by diagnosis code.
3. Child had the disease the vaccine is meant to prevent.
  - For example: A diagnosis code for varicella (chicken pox) would be a "reason" for non-compliance with the varicella vaccine.
  - Presence of disease was assessed from birth to age 2 years and 3 months.
4. Child missed at least two well-child visits to a physician.
  - Number of well-child visits up to age 2 years and 3 months was less than nine visits. (AAP recommends 10 well-child visits by this age.)
5. Inferred delay
  - Child was not up-to-date as of age 2 years and 3 months but was up-to-date as of age 3 years.
6. Unknown reason

### **Data Exclusion**

Data from Anthem BCBS were excluded from California because of the prevalence of capitated payments to primary care providers, reducing the incentive for providers to submit claims for primary care, and under representing vaccination rates in that state. Additionally, in several cases, insufficient sample sizes resulted in the exclusion of certain states or metropolitan statistical areas from the reporting of results. Sample size minimums exclude the reporting of results from Alaska, Hawaii, Montana, South Dakota, Washington D.C. and Wyoming and select metropolitan areas.

## Appendix C: Comparison with HEDIS Childhood Immunization Status Methodology

The vaccination rates in the report use different data sources and different methodology and have no direct connection to the HEDIS measurements published by individual health plans. HEDIS measures rely on multiple sources including medical records and state immunization data, whereas this report relies on claims data to ensure consistency across all areas of the country. Moreover, HEDIS measures are health plan or product-specific, while the measures in this report look at the entire BCBS commercially insured population and are reported based on the child's state of residence. See below for a detailed comparison with HEDIS measures. The report also does not capture vaccinations that may be administered without a medical claim through public health departments and local programs.

Methodological Detail	HEDIS Method – “Hybrid” Specification	BCBS Study Method
Data source(s)	Administrative claims, medical record review, and state-based immunization information systems (where made available)	Administrative claims
Age of children in study population	Children who turn 2 years of age during the measurement year	Children aged 2 years and 3 months
Unit of reporting	Plans: Separate measures for HMO and PPO; members are assigned to their plan state, i.e., the state where their insurance contract was written/issued.	States of residence: Members contribute data to the state where they live, based on zip code at beginning of eligibility.
Continuous enrollment required for inclusion in study, including allowable gaps	Twelve months continuous enrollment prior to child's 2nd birthday, with no more than one gap of up to 45 days.	Continuous enrollment from birth to 3rd birthday, with allowable gaps of 30 days at the beginning of life and 2 days after that.
Inclusion of birth dose of hepatitis B in measure scope	Included in some measures	Not included in study scope
Inclusion of annual vaccination for seasonal flu in measure scope	Included in some measures	Not included in study scope
Minimum interval between doses of a given vaccine/antigen	Minimum age imposed (e.g., vaccination on 10th day of life does not count)	Minimum age and minimum 28-day interval between doses imposed
Children with contraindications for vaccination	Children with contraindication(s) are excluded from the calculation of the measure	Contraindication is considered a “reason” for not getting vaccinated
Children who “had the disease” (e.g., diagnosis code for chickenpox)	Count toward numerator	Considered a reason for not getting vaccinated

Sources for HEDIS measure details:

- National Committee for Quality Assurance, “Childhood Immunization Status,” available <http://www.ncqa.org/portals/0/Childhood%20Immunization%20Status.pdf>.
- Centers for Medicare and Medicaid Services, “2017 Quality Rating System Measure Technical Specifications,” Page 111: [https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/QualityInitiativesGenInfo/Downloads/2017\\_QRS-Measure\\_Technical\\_Specifications.pdf](https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/QualityInitiativesGenInfo/Downloads/2017_QRS-Measure_Technical_Specifications.pdf)



## Appendix D: Vaccination Rates for CDC-Recommended Vaccines

### National Childhood Vaccination Rates for CDC-Recommended Vaccines by Birth Year for Children Age 18 Months or Younger (Measured at 2 years and 3 months)

National Percentage of Infants Born in Given Year and Fully Vaccinated by Age 2 Years, 3 Months with Given Vaccine					
Vaccine	Born 2010	Born 2011	Born 2012	Born 2013	Percent Change From 2010 to 2013
7-Vaccine Series	68.7%	72.1%	74.0%	76.7%	11.7%
DTaP - 3 doses	87.4%	89.3%	90.4%	92.0%	5.2%
DTaP - 4 doses	76.6%	79.2%	80.9%	83.4%	8.9%
Hep A - 1 dose	81.2%	83.7%	85.4%	86.8%	7.0%
Hep A - 2 doses	59.4%	63.0%	65.7%	68.2%	14.7%
Hep B - 2 doses	82.5%	84.4%	86.3%	88.6%	7.5%
Hib - 3/4 doses	81.6%	83.9%	85.0%	86.7%	6.3%
MMR - 1 dose	87.2%	88.7%	90.0%	91.1%	4.6%
Pneumococcal - 3 doses	85.4%	87.4%	88.6%	90.0%	5.4%
Pneumococcal - 4 doses	74.8%	77.7%	79.3%	81.5%	9.1%
Polio - 3 doses	82.7%	84.4%	85.1%	87.7%	6.0%
Rotavirus - 2/3 doses	69.0%	73.4%	75.6%	78.3%	13.6%
Varicella - 1 dose	86.7%	88.2%	89.3%	90.1%	3.9%

## Appendix E-1: Seven-vaccine Series Vaccination Rates by State

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months				
State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
AL	76.4%	78.5%	2.8%	77.8%	NC	74.5%	81.9%	10.0%	79.8%
AR	72.0%	82.3%	14.3%	75.0%	ND	85.8%	86.4%	0.8%	83.8%
AZ	68.3%	73.8%	8.1%	71.5%	NE	75.2%	85.7%	14.0%	81.3%
CA	70.8%	74.3%	4.9%	73.7%	NH	72.6%	78.2%	7.8%	75.9%
CO	70.3%	74.9%	6.5%	72.3%	NJ	69.3%	71.2%	2.8%	70.9%
CT	69.4%	84.9%	22.4%	77.6%	NM	66.5%	72.9%	9.7%	69.2%
DE	73.9%	83.3%	12.7%	81.6%	NV	57.7%	62.7%	8.7%	60.1%
FL	69.4%	72.8%	5.0%	71.6%	NY	59.4%	70.6%	18.8%	64.2%
GA	75.6%	80.4%	6.3%	78.4%	OH	69.3%	74.3%	7.3%	71.9%
IA	70.6%	78.7%	11.5%	74.6%	OK	72.9%	76.7%	5.2%	74.6%
ID	71.9%	77.7%	8.1%	75.0%	OR	70.7%	75.3%	6.4%	72.7%
IL	69.1%	79.1%	14.4%	74.9%	PA	81.9%	85.4%	4.3%	83.8%
IN	62.2%	73.2%	17.7%	68.6%	RI	77.0%	82.0%	6.5%	80.1%
KS	*	80.4%	*	*	SC	75.0%	80.1%	6.9%	77.8%
KY	75.0%	78.8%	5.1%	77.6%	TN	75.2%	80.5%	7.1%	78.9%
LA	*	78.6%	*	*	TX	78.4%	82.1%	4.7%	80.6%
MA	66.7%	77.9%	16.7%	72.9%	UT	71.7%	77.0%	7.3%	72.9%
MD	73.4%	81.8%	11.5%	77.7%	VA	69.8%	75.6%	8.3%	73.9%
ME	74.0%	68.6%	-7.3%	70.8%	VT	*	83.6%	*	*
MI	57.6%	74.1%	28.6%	67.8%	WA	77.6%	81.4%	4.9%	79.7%
MN	76.3%	83.5%	9.3%	81.3%	WI	71.5%	74.0%	3.5%	72.2%
MO	*	78.3%	*	*	WV	70.1%	74.5%	6.2%	73.4%
MS	*	73.9%	*	*	<b>National</b>	<b>69.2%</b>	<b>77.2%</b>	<b>11.6%</b>	<b>73.5%</b>

\* Insufficient data

## Appendix E-2: Seven-vaccine Series Vaccination Rates by MSA

MSA	Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months			
	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
AKRON, OH	80.3%	78.2%	-2.6%	78.9%
ALBANY-SCHENECTADY-TROY, NY	49.5%	56.1%	13.3%	53.5%
ALBUQUERQUE, NM	69.6%	71.5%	2.6%	71.8%
ALLENTOWN-BETHLEHEM-EASTON, PA	82.1%	82.7%	0.7%	82.9%
ALTOONA, PA	81.5%	88.7%	8.8%	86.7%
ANN ARBOR, MI	62.1%	72.3%	16.4%	68.7%
APPLETON-OSHKOSH-NEENAH, WI	87.4%	84.0%	-3.9%	82.1%
ATLANTA, GA	75.7%	80.4%	6.2%	78.8%
AUGUSTA-AIKEN, GA-SC	76.9%	81.8%	6.4%	79.9%
AUSTIN-SAN MARCOS, TX	73.7%	76.4%	3.7%	75.3%
BALTIMORE, MD	76.7%	84.4%	10.0%	79.5%
BATON ROUGE, LA	70.0%	83.9%	19.9%	*
BEAUMONT-PORT ARTHUR, TX	74.7%	81.0%	8.5%	78.3%
BENTON HARBOR, MI	*	80.4%	*	*
BERGEN-PASSAIC, NJ	67.3%	67.4%	0.2%	66.4%
BIRMINGHAM, AL	73.8%	72.3%	-2.1%	76.1%
BISMARCK, ND	85.7%	86.0%	0.3%	85.8%
BLOOMINGTON, IN	*	79.3%	*	*
BLOOMINGTON-NORMAL, IL	*	89.6%	*	*
BOISE CITY, ID	73.6%	81.0%	10.1%	77.9%
BOSTON-CAMBRIDGE-QUINCY, MA*	66.1%	76.0%	15.0%	71.6%
BRAZORIA, TX	81.8%	88.9%	8.7%	84.1%
BRYAN-COLLEGE STATION, TX	80.4%	88.2%	9.6%	83.4%
BUFFALO-NIAGARA FALLS, NY	80.6%	84.1%	4.4%	82.4%
CANTON-MASSILLON, OH	70.6%	68.9%	-2.4%	68.3%
CHARLESTON, WV	74.0%	75.0%	1.4%	76.4%
CHARLESTON-NORTH CHARLESTON, SC	75.4%	80.7%	7.0%	79.7%
CHARLOTTE-GASTONIA-ROCK HILL, NC-SC	71.5%	80.7%	12.8%	78.2%
CHARLOTTESVILLE, VA	59.4%	64.9%	9.3%	64.0%
CHATTANOOGA, TN-GA	*	80.6%	*	*
CHICAGO, IL	70.6%	79.0%	11.9%	75.6%
CINCINNATI, OH-KY-IN	76.2%	78.9%	3.6%	77.8%
CLEVELAND-LORAIN-ELYRIA, OH	68.5%	72.4%	5.7%	70.4%

\* The Boston-Cambridge-Quincy MSA includes the counties of Middlesex, Essex, Suffolk, Norfolk and Plymouth, Massachusetts.

**Seven-vaccine Series Vaccination Rates by MSA (continued)**

MSA	Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months			
	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
COLORADO SPRINGS, CO	72.5%	67.5%	-6.9%	67.1%
COLUMBIA, SC	79.2%	78.5%	-0.9%	78.3%
COLUMBUS, GA-AL	82.3%	84.3%	2.5%	81.9%
COLUMBUS, OH	73.6%	78.7%	6.9%	77.4%
DALLAS, TX	80.9%	83.1%	2.7%	82.3%
DAVENPORT-ROCK ISLAND-MOLINE, IA-IL	74.6%	78.6%	5.4%	76.3%
DAYTON-SPRINGFIELD, OH	74.3%	77.4%	4.3%	75.7%
DENVER, CO	72.9%	78.1%	7.2%	75.9%
DETROIT, MI	54.6%	70.9%	29.8%	64.7%
DOVER, DE	77.4%	78.8%	1.8%	78.4%
DULUTH-SUPERIOR, MN-WI	72.2%	80.2%	11.1%	74.8%
DUTCHESS COUNTY, NY	*	74.6%	*	*
EL PASO, TX	68.9%	78.7%	14.2%	73.9%
ELKHART-GOSHEN, IN	62.4%	69.5%	11.4%	66.6%
ERIE, PA	78.8%	82.3%	4.4%	78.4%
EVANSVILLE-HENDERSON, IN-KY	75.6%	84.8%	12.1%	81.2%
FARGO-MOORHEAD, ND-MN	85.6%	92.2%	7.6%	83.8%
FAYETTEVILLE-SPRINGDALE-ROGERS, AR	69.3%	84.0%	21.2%	76.3%
FLINT, MI	57.2%	72.8%	27.2%	67.9%
FORT COLLINS-LOVELAND, CO	70.4%	71.7%	1.7%	69.1%
FORT LAUDERDALE, FL	71.5%	73.0%	2.1%	73.7%
FORT WAYNE, IN	53.3%	69.2%	29.8%	63.4%
FORT WORTH-ARLINGTON, TX	80.1%	78.9%	-1.4%	79.9%
GALVESTON-TEXAS CITY, TX	71.8%	81.0%	12.8%	80.5%
GARY, IN	61.3%	72.5%	18.1%	67.6%
GRAND FORKS, ND-MN	82.7%	87.7%	6.1%	86.3%
GRAND RAPIDS-MUSKEGON-HOLLAND, MI	68.0%	86.2%	26.8%	78.4%
GREELEY, CO	53.5%	68.8%	28.7%	62.5%
GREENSBORO--WINSTON-SALEM--HIGH POINT, NC	79.9%	80.3%	0.5%	80.5%
GREENVILLE-SPARTANBURG-ANDERSON, SC	74.4%	81.8%	9.9%	78.2%
HAMILTON-MIDDLETOWN, OH	69.9%	75.6%	8.1%	71.7%
HARRISBURG-LEBANON-CARLISLE, PA	82.4%	87.3%	5.9%	85.4%
HOUMA, LA	*	76.5%	*	*
HOUSTON, TX	82.0%	85.2%	3.9%	84.1%

**Seven-vaccine Series Vaccination Rates by MSA (continued)**

MSA	Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months			
	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
HUNTINGTON-ASHLAND, WV-KY-OH	64.2%	68.3%	6.3%	65.3%
HUNTSVILLE, AL	82.5%	79.0%	-4.3%	78.6%
INDIANAPOLIS, IN	71.8%	76.9%	7.1%	74.4%
JACKSONVILLE, FL	73.5%	65.7%	-10.6%	69.5%
JERSEY CITY, NJ	63.2%	68.6%	8.6%	66.4%
JOHNSON CITY-KINGSPORT-BRISTOL, TN-VA	69.1%	79.6%	15.3%	74.1%
JOHNSTOWN, PA	85.6%	88.3%	3.2%	85.9%
JONESBORO, AR	81.6%	82.7%	1.4%	78.8%
JOPLIN, MO	58.1%	69.4%	19.5%	65.7%
KALAMAZOO-BATTLE CREEK, MI	64.7%	81.3%	25.6%	75.3%
KANKAKEE, IL	67.6%	73.5%	8.8%	73.7%
KANSAS CITY, MO-KS	*	79.4%	*	*
KNOXVILLE, TN	70.4%	78.7%	11.8%	77.7%
LAFAYETTE, IN	*	84.8%	*	*
LAFAYETTE, LA	71.0%	78.3%	10.3%	*
LAKE CHARLES, LA	*	67.5%	*	*
LAKELAND-WINTER HAVEN, FL	69.7%	76.6%	9.8%	74.2%
LANCASTER, PA	79.1%	83.8%	6.0%	81.6%
LANSING-EAST LANSING, MI	62.0%	73.9%	19.2%	65.2%
LAREDO, TX	*	72.4%	*	*
LAS VEGAS, NV-AZ	50.2%	63.5%	26.7%	57.7%
LEXINGTON, KY	80.6%	73.8%	-8.4%	77.7%
LINCOLN, NE	77.2%	83.6%	8.3%	79.6%
LITTLE ROCK-NORTH LITTLE ROCK, AR	81.8%	86.4%	5.6%	84.5%
LOS ANGELES-LONG BEACH, CA	69.2%	71.4%	3.2%	72.0%
LOUISVILLE, KY-IN	76.7%	80.9%	5.5%	78.5%
LUBBOCK, TX	85.8%	84.3%	-1.7%	82.0%
LYNCHBURG, VA	65.4%	65.0%	-0.5%	67.4%
MADISON, WI	57.9%	57.6%	-0.5%	56.0%
MCALLEN-EDINBURG-MISSION, TX	65.3%	69.9%	7.1%	71.1%
MEMPHIS, TN-AR-MS	78.8%	79.5%	1.0%	78.3%
MIAMI, FL	64.9%	70.8%	9.0%	68.2%
MIDDLESEX-SOMERSET-HUNTERDON, N	65.4%	65.1%	-0.4%	65.1%
MILWAUKEE-WAUKESHA, WI	73.1%	75.6%	3.3%	74.4%



**Seven-vaccine Series Vaccination Rates by MSA (continued)**

MSA	Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months			
	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
MINNEAPOLIS-ST. PAUL, MN-WI	76.9%	83.8%	9.0%	82.3%
MONMOUTH-OCEAN, NJ	62.9%	63.8%	1.4%	64.9%
MYRTLE BEACH, SC	74.3%	80.6%	8.5%	77.3%
NASHVILLE, TN	79.0%	81.6%	3.3%	80.9%
NASSAU-SUFFOLK, NY	59.5%	60.3%	1.3%	59.5%
NEW ORLEANS, LA	68.0%	80.4%	18.2%	*
NEW YORK-NEWARK, NY-NJ-PA	56.3%	62.4%	10.7%	59.3%
NEWARK, NJ	63.4%	67.4%	6.3%	66.3%
NEWBURGH, NY-PA	53.6%	63.9%	19.4%	58.2%
NORFOLK-VIRGINIA BEACH-NEWPORT NEWS, VA-NC	70.8%	78.5%	10.9%	74.8%
OAKLAND, CA	80.2%	78.8%	-1.7%	77.9%
ODESSA-MIDLAND, TX	76.5%	77.3%	1.0%	77.4%
OKLAHOMA CITY, OK	75.6%	79.3%	4.9%	77.8%
OMAHA, NE-IA	83.2%	88.0%	5.7%	86.2%
ORANGE COUNTY, CA	72.6%	75.6%	4.1%	74.1%
ORLANDO, FL	65.8%	72.1%	9.6%	69.3%
PEORIA-PEKIN, IL	*	81.7%	*	*
PHILADELPHIA, PA-NJ	82.9%	86.7%	4.6%	85.4%
PHOENIX-MESA, AZ	68.2%	75.5%	10.7%	72.4%
PITTSBURGH, PA	81.5%	85.0%	4.3%	82.8%
PORTLAND-VANCOUVER,OR-WA	70.5%	75.4%	7.0%	72.4%
RALEIGH-DURHAM-CHAPEL HILL, NC	75.5%	84.3%	11.7%	80.9%
READING, PA	83.8%	85.8%	2.3%	84.7%
RICHLAND-KENNEWICK-PASCO, WA	73.7%	77.8%	5.6%	72.7%
RICHMOND-PETERSBURG, VA	72.4%	79.1%	9.3%	76.7%
RIVERSIDE-SAN BERNADINO, CA	69.2%	63.6%	-8.1%	68.9%
ROANOKE, VA	67.4%	78.7%	16.7%	75.6%
ROCHESTER, NY	*	87.7%	*	*
ROCKFORD, IL	69.4%	76.7%	10.4%	73.6%
SAGINAW-BAY CITY-MIDLAND, MI	*	73.5%	*	*
SALT LAKE CITY-OGDEN, UT	70.9%	76.5%	7.9%	73.1%
SAN ANTONIO, TX	80.3%	84.1%	4.7%	82.8%

**Seven-vaccine Series Vaccination Rates by MSA (continued)**

MSA	Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months			
	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
SAN DIEGO, CA	71.7%	78.5%	9.5%	75.5%
SAN FRANCISCO, CA	77.1%	75.2%	-2.4%	78.1%
SCRANTON-WILKES-BARRE-HAZLETON, PA	74.9%	78.5%	4.8%	76.1%
SEATTLE-BELLEVUE-EVERETT, WA	80.7%	84.2%	4.3%	82.8%
SHARON, PA	78.7%	82.7%	5.1%	79.0%
SHREVEPORT-BOSSIER CITY, LA	57.1%	70.4%	23.2%	*
SIOUX FALLS, SD	76.4%	74.7%	-2.2%	72.5%
SOUTH BEND, IN	57.4%	68.2%	18.7%	63.0%
SPOKANE, WA	68.0%	70.6%	3.7%	69.4%
SPRINGFIELD, IL	68.2%	80.0%	17.3%	76.5%
SPRINGFIELD, MO	74.9%	75.7%	1.2%	76.2%
ST. CLOUD, MN	80.6%	84.1%	4.3%	83.8%
ST. LOUIS, MO-IL	77.9%	82.4%	5.9%	80.7%
STATE COLLEGE, PA	80.2%	84.9%	5.9%	85.2%
SYRACUSE, NY	78.8%	85.4%	8.4%	84.4%
TACOMA, WA	68.3%	76.1%	11.3%	72.0%
TAMPA-ST. PETERSBURG-CLEARWATER, FL	71.8%	80.2%	11.6%	77.2%
TOLEDO, OH	65.4%	75.4%	15.3%	71.0%
TOPEKA, KS	*	87.2%	*	*
TULSA, OK	72.2%	77.5%	7.3%	73.9%
WASHINGTON, DC-MD-VA-WV	69.9%	75.0%	7.3%	73.5%
WEST PALM BEACH-BOCA RATON, FL	69.3%	73.0%	5.3%	74.4%
WICHITA, KS	*	74.8%	*	*
WILMINGTON-NEWARK, DE-MD	70.9%	84.2%	18.7%	81.7%
YORK, PA	84.1%	87.1%	3.6%	86.5%
YOUNGSTOWN-WARREN, OH	66.7%	67.6%	1.4%	65.5%
<b>National</b>	<b>69.2%</b>	<b>77.2%</b>	<b>11.6%</b>	<b>73.5%</b>

### Appendix E-3: Seven-vaccine Series Vaccination Rates by County

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
Jefferson	AL	73.6%	70.7%	-3.9%	74.2%
Madison	AL	82.5%	80.3%	-2.7%	80.3%
Benton	AR	66.2%	83.8%	26.6%	75.8%
Craighead	AR	81.6%	82.7%	1.4%	78.8%
Faulkner	AR	87.9%	75.0%	-14.7%	81.8%
Pulaski	AR	81.5%	88.1%	8.2%	85.3%
Washington	AR	75.3%	84.3%	11.9%	77.4%
Maricopa	AZ	69.0%	75.9%	10.0%	73.1%
Los Angeles	CA	69.0%	72.9%	5.6%	72.9%
Orange	CA	72.6%	75.6%	4.1%	74.1%
Riverside	CA	66.5%	61.1%	-8.1%	66.3%
San Diego	CA	71.7%	78.5%	9.5%	75.5%
Santa Clara	CA	78.9%	73.8%	-6.5%	78.6%
Adams	CO	70.1%	78.0%	11.3%	75.7%
Arapahoe	CO	74.3%	81.6%	9.7%	78.4%
Boulder	CO	53.5%	68.8%	28.7%	62.5%
Denver	CO	77.7%	81.7%	5.1%	78.1%
Douglas	CO	78.9%	77.4%	-1.9%	79.0%
El Paso	CO	72.5%	67.5%	-6.9%	67.1%
Jefferson	CO	65.5%	76.3%	16.3%	72.6%
Larimer	CO	70.4%	71.7%	1.7%	69.1%
Weld	CO	69.7%	73.5%	5.4%	71.7%
Fairfield	CT	70.3%	79.1%	12.5%	74.8%
Hartford	CT	72.0%	86.1%	19.6%	80.5%
New Haven	CT	68.1%	87.2%	28.0%	78.3%
New London	CT	76.4%	93.1%	21.8%	82.0%
Kent	DE	77.4%	78.8%	1.8%	78.4%
New Castle	DE	70.9%	83.4%	17.6%	81.4%
Sussex	DE	90.0%	87.6%	-2.7%	85.6%
Broward	FL	71.5%	73.0%	2.1%	73.7%
Duval	FL	73.6%	59.1%	-19.6%	65.0%
Hillsborough	FL	75.4%	81.1%	7.5%	78.5%
Miami-Dade	FL	64.9%	70.8%	9.0%	68.2%

**Seven-vaccine Series Vaccination Rates by County** (continued)

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
Orange	FL	60.7%	72.1%	18.9%	67.2%
Palm Beach	FL	69.3%	73.0%	5.3%	74.4%
Polk	FL	69.7%	76.6%	9.8%	74.2%
Cherokee	GA	77.8%	68.5%	-11.9%	76.2%
Cobb	GA	74.3%	85.2%	14.7%	81.1%
DeKalb	GA	73.3%	84.5%	15.3%	78.9%
Forsyth	GA	79.2%	77.5%	-2.1%	82.3%
Fulton	GA	78.8%	81.1%	2.9%	80.8%
Gwinnett	GA	78.1%	85.2%	9.2%	81.6%
Muscogee	GA	83.2%	83.3%	0.1%	81.5%
Ada	ID	74.9%	83.5%	11.4%	79.3%
Canyon	ID	69.2%	74.6%	7.8%	74.0%
Cook	IL	69.6%	78.6%	12.9%	74.8%
DeKalb	IL	62.6%	63.4%	1.4%	64.8%
DuPage	IL	75.9%	82.7%	8.9%	79.8%
Grundy	IL	57.6%	70.9%	23.3%	67.0%
Kane	IL	67.6%	75.1%	11.1%	71.7%
Kankakee	IL	67.6%	73.5%	8.8%	73.7%
Kendall	IL	69.8%	76.4%	9.5%	75.7%
La Salle	IL	57.9%	79.3%	37.0%	67.1%
Lake	IL	78.5%	83.2%	6.0%	81.4%
Madison	IL	78.7%	77.6%	-1.4%	79.2%
McHenry	IL	74.8%	79.0%	5.6%	77.3%
McLean	IL	*	89.6%	*	*
Sangamon	IL	68.2%	80.0%	17.3%	76.5%
Will	IL	64.4%	77.5%	20.3%	72.4%
Winnebago	IL	73.4%	78.2%	6.5%	76.1%
Allen	IN	53.3%	71.8%	34.6%	64.4%
Bartholomew	IN	66.9%	86.6%	29.5%	77.2%
Boone	IN	76.9%	78.1%	1.6%	79.0%
Elkhart	IN	62.4%	69.5%	11.4%	66.6%
Hamilton	IN	75.5%	79.7%	5.4%	77.6%
Hancock	IN	74.0%	78.2%	5.6%	75.4%
Hendricks	IN	71.0%	65.2%	-8.1%	70.9%
Johnson	IN	73.6%	80.3%	9.1%	78.1%

**Seven-vaccine Series Vaccination Rates by County** (continued)

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
La Porte	IN	41.5%	58.6%	41.2%	51.1%
Lake	IN	63.9%	71.0%	11.0%	66.8%
Marion	IN	72.3%	78.4%	8.4%	74.1%
Monroe	IN	*	79.3%	*	*
Porter	IN	56.1%	75.1%	33.8%	69.3%
St Joseph	IN	57.4%	68.2%	18.7%	63.0%
Tippecanoe	IN	70.3%	85.3%	21.3%	77.0%
Vanderburgh	IN	74.7%	85.7%	14.7%	81.2%
Johnson	KS	*	85.7%	*	*
Sedgwick	KS	52.4%	75.5%	44.0%	69.1%
Shawnee	KS	*	87.2%	*	*
Boone	KY	80.9%	91.5%	13.1%	84.7%
Fayette	KY	82.3%	71.4%	-13.2%	77.1%
Jefferson	KY	76.9%	81.9%	6.5%	79.2%
Caddo	LA	69.4%	69.3%	-0.2%	*
Calcasieu	LA	*	67.5%	*	*
East Baton Rouge	LA	67.3%	83.3%	23.6%	*
Jefferson	LA	72.4%	78.7%	8.7%	*
Lafayette	LA	71.0%	82.4%	16.1%	*
Saint Tammany	LA	65.2%	82.1%	26.0%	*
Bristol	MA	71.2%	83.0%	16.6%	77.4%
Essex	MA	53.2%	72.7%	36.5%	62.3%
Hampden	MA	66.5%	75.4%	13.4%	70.4%
Middlesex	MA	68.0%	77.6%	14.1%	72.5%
Norfolk	MA	69.2%	79.3%	14.7%	76.1%
Plymouth	MA	72.0%	77.1%	7.0%	76.9%
Suffolk	MA	67.8%	62.8%	-7.5%	68.0%
Worcester	MA	70.0%	83.2%	18.8%	77.8%
Anne Arundel	MD	79.7%	80.4%	0.8%	78.4%
Montgomery	MD	68.9%	76.6%	11.0%	75.0%
Cumberland	ME	75.4%	65.3%	-13.4%	70.1%
York	ME	76.5%	73.8%	-3.5%	74.9%
Berrien	MI	57.9%	80.4%	38.9%	70.6%
Calhoun	MI	68.2%	78.5%	15.1%	75.0%
Genesee	MI	57.2%	72.8%	27.2%	67.9%



**Seven-vaccine Series Vaccination Rates by County** (continued)

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
Ingham	MI	67.5%	75.3%	11.5%	65.7%
Kalamazoo	MI	64.2%	81.7%	27.2%	75.6%
Kent	MI	*	86.2%	*	*
Livingston	MI	59.5%	69.4%	16.7%	66.8%
Macomb	MI	46.5%	70.5%	51.7%	60.3%
Monroe	MI	54.8%	72.3%	31.9%	66.4%
Oakland	MI	58.7%	74.0%	26.0%	68.9%
Ottawa	MI	74.6%	87.6%	17.4%	80.0%
Saginaw	MI	*	70.9%	*	*
Washtenaw	MI	64.3%	74.2%	15.4%	70.3%
Wayne	MI	58.1%	68.3%	17.6%	63.9%
Anoka	MN	81.0%	85.6%	5.6%	85.6%
Dakota	MN	81.4%	87.6%	7.5%	84.9%
Hennepin	MN	76.2%	84.0%	10.3%	82.2%
Ramsey	MN	75.4%	80.7%	7.0%	79.4%
Saint Louis	MN	72.2%	80.2%	11.1%	74.8%
Scott	MN	70.5%	83.3%	18.1%	80.6%
Stearns	MN	82.3%	85.2%	3.5%	84.4%
Washington	MN	74.5%	86.5%	16.1%	81.2%
Wright	MN	76.7%	80.1%	4.4%	80.8%
Clay	MO	*	78.0%	*	*
Greene	MO	75.4%	77.3%	2.5%	77.1%
Jackson	MO	*	72.1%	*	*
Jasper	MO	58.1%	69.4%	19.5%	65.7%
Jefferson	MO	71.8%	76.5%	6.5%	78.3%
Platte	MO	*	73.2%	*	*
Saint Charles	MO	82.2%	84.2%	2.5%	82.1%
Saint Louis	MO	77.0%	83.9%	9.1%	80.9%
Guilford	NC	81.8%	80.9%	-1.1%	81.1%
Mecklenburg	NC	72.0%	84.1%	16.8%	80.7%
Wake	NC	76.2%	84.0%	10.3%	81.6%
Burleigh	ND	84.8%	85.9%	1.4%	85.5%
Cass	ND	86.2%	91.8%	6.5%	83.9%
Grand Forks	ND	84.1%	88.7%	5.4%	87.1%
Ward	ND	91.1%	85.1%	-6.6%	88.2%

**Seven-vaccine Series Vaccination Rates by County** (continued)

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
Douglas	NE	84.8%	88.0%	3.8%	86.9%
Lancaster	NE	77.2%	83.6%	8.3%	79.6%
Sarpy	NE	80.0%	89.0%	11.3%	85.6%
Hillsborough	NH	74.4%	79.6%	7.0%	76.9%
Rockingham	NH	64.5%	74.0%	14.7%	69.3%
Bergen	NJ	67.2%	69.8%	3.8%	67.9%
Burlington	NJ	79.5%	86.7%	9.1%	84.3%
Camden	NJ	82.0%	85.5%	4.2%	85.8%
Essex	NJ	58.5%	66.0%	12.9%	63.3%
Gloucester	NJ	84.1%	86.8%	3.3%	87.6%
Hudson	NJ	63.2%	68.6%	8.6%	66.4%
Middlesex	NJ	62.9%	62.4%	-0.8%	62.3%
Monmouth	NJ	60.3%	64.0%	6.0%	63.3%
Morris	NJ	68.2%	65.6%	-3.8%	68.5%
Union	NJ	62.5%	68.1%	9.0%	66.2%
Bernalillo	NM	69.5%	70.3%	1.2%	70.7%
Clark	NV	48.2%	63.5%	31.8%	57.4%
Washoe	NV	*	51.7%	*	*
Albany	NY	57.8%	60.5%	4.7%	58.8%
Bronx	NY	43.2%	48.4%	12.1%	45.5%
Dutchess	NY	54.6%	74.6%	36.7%	64.9%
Erie	NY	81.3%	84.5%	3.9%	82.7%
Kings	NY	53.7%	62.9%	17.1%	57.9%
Monroe	NY	66.3%	89.6%	35.1%	86.8%
Nassau	NY	57.9%	58.4%	0.9%	57.1%
New York	NY	64.5%	68.1%	5.6%	66.5%
Niagara	NY	77.6%	82.6%	6.4%	81.1%
Onondaga	NY	78.8%	85.5%	8.5%	84.2%
Orange	NY	53.6%	63.9%	19.4%	58.2%
Queens	NY	55.4%	60.9%	10.0%	57.3%
Richmond	NY	50.3%	49.8%	-1.0%	47.4%
Rockland	NY	55.0%	59.5%	8.1%	60.5%
Saratoga	NY	45.4%	49.5%	9.0%	48.1%
Suffolk	NY	60.8%	62.0%	2.1%	61.4%
Westchester	NY	60.3%	66.5%	10.3%	64.2%

**Seven-vaccine Series Vaccination Rates by County** (continued)

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
Butler	OH	69.9%	75.6%	8.1%	71.7%
Clermont	OH	74.9%	78.3%	4.5%	75.6%
Cuyahoga	OH	66.9%	77.4%	15.6%	72.5%
Delaware	OH	78.2%	80.7%	3.2%	79.6%
Franklin	OH	72.4%	77.8%	7.6%	76.9%
Greene	OH	72.5%	76.6%	5.6%	74.0%
Hamilton	OH	77.5%	77.5%	0.1%	78.3%
Lorain	OH	68.0%	63.0%	-7.3%	67.7%
Lucas	OH	64.9%	76.0%	17.2%	71.0%
Mahoning	OH	69.0%	65.0%	-5.8%	64.8%
Medina	OH	76.9%	74.8%	-2.8%	71.5%
Miami	OH	60.6%	73.5%	21.3%	69.9%
Montgomery	OH	79.4%	79.5%	0.1%	78.9%
Stark	OH	70.6%	68.9%	-2.4%	68.3%
Summit	OH	80.3%	78.2%	-2.6%	78.9%
Trumbull	OH	61.5%	65.0%	5.7%	61.4%
Warren	OH	69.1%	75.2%	8.7%	73.9%
Cleveland	OK	81.3%	88.4%	8.8%	83.0%
Oklahoma	OK	77.3%	78.7%	1.8%	78.1%
Tulsa	OK	72.1%	77.0%	6.9%	73.9%
Multnomah	OR	70.2%	69.6%	-1.0%	70.5%
Washington	OR	70.4%	75.2%	6.8%	72.5%
Allegheny	PA	84.0%	85.8%	2.1%	84.7%
Beaver	PA	81.9%	84.6%	3.3%	83.4%
Berks	PA	83.8%	85.8%	2.3%	84.7%
Blair	PA	81.5%	88.7%	8.8%	86.7%
Bucks	PA	81.4%	88.3%	8.5%	85.9%
Butler	PA	79.5%	82.4%	3.7%	79.8%
Cambria	PA	86.7%	90.2%	4.0%	86.3%
Centre	PA	80.2%	84.9%	5.9%	85.2%
Chester	PA	83.0%	85.0%	2.4%	83.9%
Cumberland	PA	87.1%	89.6%	2.8%	87.4%
Dauphin	PA	77.0%	86.4%	12.2%	83.9%
Delaware	PA	83.0%	88.3%	6.3%	86.6%
Erie	PA	78.8%	82.3%	4.4%	78.4%

**Seven-vaccine Series Vaccination Rates by County** (continued)

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
Fayette	PA	65.0%	73.4%	12.8%	68.9%
Franklin	PA	78.4%	80.2%	2.3%	81.1%
Indiana	PA	76.8%	81.7%	6.5%	80.7%
Lancaster	PA	79.1%	83.8%	6.0%	81.6%
Lebanon	PA	78.0%	82.6%	6.0%	81.3%
Lehigh	PA	84.1%	85.5%	1.6%	84.8%
Montgomery	PA	84.1%	86.5%	2.8%	85.5%
Northampton	PA	80.0%	80.4%	0.5%	81.3%
Philadelphia	PA	82.9%	86.2%	3.9%	84.9%
Schuylkill	PA	86.3%	86.1%	-0.2%	86.7%
Washington	PA	84.0%	87.7%	4.4%	85.3%
Westmoreland	PA	79.8%	86.6%	8.5%	82.2%
York	PA	84.1%	87.1%	3.6%	86.5%
Kent	RI	80.4%	83.7%	4.2%	83.9%
Providence	RI	75.5%	81.1%	7.4%	79.0%
Washington	RI	73.5%	82.1%	11.7%	77.3%
Berkeley	SC	74.8%	79.8%	6.6%	78.6%
Charleston	SC	70.9%	81.2%	14.5%	79.8%
Dorchester	SC	84.1%	80.6%	-4.2%	80.8%
Greenville	SC	67.3%	85.0%	26.3%	77.2%
Horry	SC	74.3%	80.6%	8.5%	77.3%
Lexington	SC	78.0%	77.9%	-0.2%	77.0%
Richland	SC	80.2%	79.2%	-1.2%	79.6%
Spartanburg	SC	79.5%	82.0%	3.1%	80.7%
York	SC	73.1%	76.4%	4.5%	74.4%
Davidson	TN	77.3%	84.4%	9.3%	82.3%
Hamilton	TN	63.0%	80.8%	28.3%	76.1%
Knox	TN	67.8%	77.9%	15.0%	76.8%
Rutherford	TN	76.7%	79.5%	3.6%	78.0%
Shelby	TN	78.7%	81.8%	4.0%	79.3%
Sumner	TN	81.7%	75.8%	-7.2%	79.4%
Williamson	TN	80.3%	83.5%	4.0%	81.7%
Bexar	TX	81.2%	83.2%	2.4%	82.1%
Brazoria	TX	81.8%	88.9%	8.7%	84.1%
Brazos	TX	80.4%	88.2%	9.6%	83.4%

**Seven-vaccine Series Vaccination Rates by County** (continued)

Percent of Infants Born in Given Year and Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months					
County	State	Born 2010	Born 2013	Percent Change Between 2010 to 2013	Total Vaccination Rate for All Infants in Study
Collin	TX	83.6%	83.4%	-0.2%	84.0%
Dallas	TX	80.4%	83.7%	4.1%	82.3%
Denton	TX	80.1%	82.1%	2.6%	81.2%
El Paso	TX	68.9%	78.7%	14.2%	73.9%
Fort Bend	TX	80.7%	89.1%	10.4%	85.3%
Galveston	TX	71.8%	81.0%	12.8%	80.5%
Harris	TX	81.9%	85.6%	4.5%	84.4%
Hidalgo	TX	65.3%	69.9%	7.1%	71.1%
Lubbock	TX	85.8%	84.3%	-1.7%	82.0%
Midland	TX	76.1%	79.3%	4.2%	79.4%
Montgomery	TX	84.8%	78.2%	-7.7%	81.2%
Tarrant	TX	79.3%	77.8%	-1.9%	79.2%
Travis	TX	71.1%	76.0%	6.8%	73.7%
Webb	TX	53.1%	72.4%	36.4%	67.3%
Williamson	TX	77.6%	76.2%	-1.8%	77.6%
Davis	UT	72.9%	79.4%	8.9%	73.0%
Salt Lake	UT	71.5%	74.3%	3.9%	72.7%
Chesapeake City	VA	68.7%	80.4%	17.1%	76.1%
Chesterfield	VA	72.4%	77.5%	7.0%	75.6%
Fairfax	VA	75.7%	79.6%	5.1%	77.1%
Hampton City	VA	67.4%	73.8%	9.5%	72.0%
Hanover	VA	79.1%	86.9%	10.0%	83.0%
Henrico	VA	76.1%	82.1%	7.9%	80.3%
James City	VA	76.4%	77.6%	1.6%	74.3%
Loudoun	VA	71.9%	77.6%	7.9%	74.9%
Montgomery	VA	66.1%	77.6%	17.5%	77.3%
Newport News City	VA	63.9%	75.7%	18.4%	69.8%
Prince William	VA	69.5%	75.7%	8.9%	74.4%
Richmond City	VA	67.7%	72.4%	6.9%	72.2%
Spotsylvania	VA	59.7%	66.2%	10.8%	63.6%
<b>National</b>		<b>69.2%</b>	<b>77.2%</b>	<b>11.6%</b>	<b>73.5%</b>

\* Insufficient data

## Appendix E-4: Vaccination Rates by Vaccine and State

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months							
State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
AL	83.7%	86.6%	88.3%	90.6%	88.5%	83.2%	90.6%
AR	75.1%	84.0%	83.7%	85.8%	82.5%	75.2%	86.0%
AZ	80.4%	84.7%	83.8%	88.1%	84.5%	78.1%	87.5%
CA	79.5%	84.0%	88.7%	89.1%	84.8%	76.9%	88.1%
CO	83.4%	84.7%	85.1%	90.0%	86.6%	81.8%	88.0%
CT	86.1%	88.3%	87.4%	93.0%	89.0%	88.0%	92.2%
DE	85.8%	88.4%	91.6%	93.5%	89.7%	85.7%	93.0%
FL	79.0%	85.6%	84.1%	86.4%	83.5%	77.3%	87.3%
GA	86.8%	90.3%	87.6%	92.2%	90.1%	86.0%	92.6%
IA	79.1%	87.5%	82.9%	89.0%	85.2%	78.9%	88.1%
ID	80.1%	89.0%	84.4%	88.2%	87.1%	78.0%	86.9%
IL	81.9%	85.0%	87.4%	89.0%	86.0%	80.8%	87.9%
IN	78.9%	83.9%	78.7%	87.8%	84.7%	78.5%	87.1%
KS	74.1%	81.1%	79.5%	90.1%	79.3%	73.5%	89.1%
KY	87.6%	90.6%	85.9%	92.3%	91.3%	87.1%	91.7%
LA	52.4%	60.4%	59.1%	82.7%	57.3%	51.4%	82.1%
MA	74.7%	84.3%	83.9%	91.7%	82.3%	72.5%	90.3%
MD	86.9%	89.8%	89.6%	93.4%	90.6%	85.7%	92.5%
ME	87.0%	86.9%	84.2%	91.6%	89.4%	84.8%	90.7%
MI	71.8%	80.1%	78.2%	84.6%	77.8%	69.9%	84.0%
MN	84.1%	88.9%	90.8%	91.5%	88.8%	83.2%	89.7%
MO	79.2%	84.4%	82.3%	90.2%	83.0%	78.9%	89.3%
MS	77.2%	87.1%	80.7%	88.0%	85.2%	77.0%	88.2%
NC	86.9%	90.2%	89.6%	93.2%	90.9%	86.6%	92.9%
ND	85.7%	88.2%	92.1%	92.3%	91.6%	85.8%	91.4%
NE	82.1%	86.8%	89.6%	91.4%	87.9%	82.3%	90.6%
NH	83.0%	85.6%	85.8%	89.2%	85.6%	80.3%	88.3%
NJ	82.9%	88.7%	85.1%	89.2%	86.4%	81.5%	89.5%
NM	73.0%	84.5%	83.9%	88.4%	81.5%	71.1%	86.9%
NV	77.8%	85.9%	70.5%	87.9%	83.3%	75.6%	88.0%
NY	80.1%	85.8%	81.0%	87.4%	84.7%	71.9%	87.0%

**Vaccination Rates by Vaccine and State** (continued)

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months							
State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
OH	82.6%	86.1%	83.3%	89.2%	87.0%	81.7%	88.0%
OK	79.3%	87.9%	86.1%	88.2%	85.3%	77.3%	88.4%
OR	83.9%	82.5%	86.0%	87.8%	85.7%	81.3%	85.6%
PA	88.0%	90.6%	93.5%	93.2%	91.7%	87.4%	92.9%
RI	87.6%	95.3%	90.5%	94.4%	90.6%	87.0%	94.5%
SC	82.2%	89.6%	86.0%	91.4%	87.0%	82.0%	91.2%
TN	82.2%	88.7%	88.3%	89.6%	87.4%	82.2%	89.6%
TX	83.6%	88.1%	90.1%	92.1%	87.8%	82.9%	91.7%
UT	78.0%	87.3%	82.7%	89.3%	85.5%	76.1%	88.3%
VA	86.3%	88.4%	85.6%	91.8%	89.9%	84.9%	91.5%
VT	86.6%	90.3%	95.9%	94.6%	87.3%	86.2%	90.9%
WA	83.9%	87.8%	89.8%	92.2%	87.7%	81.7%	90.4%
WI	80.0%	83.5%	81.9%	87.3%	83.0%	78.8%	85.8%
WV	81.0%	87.1%	87.9%	89.0%	85.6%	79.1%	89.5%
<b>National</b>	<b>80.1%</b>	<b>85.6%</b>	<b>84.4%</b>	<b>89.3%</b>	<b>85.1%</b>	<b>78.8%</b>	<b>88.6%</b>



**Appendix E-5: Vaccination Rates by Vaccine and MSA**

MSA	Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months						
	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
AKRON, OH	89.2%	90.8%	87.9%	94.0%	92.1%	88.6%	92.3%
ALBANY-SCHENECTADY-TROY, NY	88.0%	91.8%	85.3%	93.9%	91.9%	61.5%	92.1%
ALBUQUERQUE, NM	76.4%	85.7%	85.6%	89.8%	83.8%	75.4%	89.1%
ALLENTOWN-BETHLEHEM-EASTON, PA	87.4%	89.8%	93.7%	94.0%	92.0%	86.3%	93.5%
ALTOONA, PA	89.7%	93.4%	94.2%	94.4%	93.6%	89.4%	92.7%
ANN ARBOR, MI	74.6%	81.3%	80.8%	86.2%	80.2%	71.7%	84.9%
APPLETON-OSHKOSH-NEENAH, WI	85.2%	88.1%	89.1%	90.3%	89.3%	84.5%	89.3%
ATLANTA, GA	87.0%	90.3%	87.9%	91.8%	90.2%	86.0%	92.3%
AUGUSTA-AIKEN, GA-SC	83.6%	89.7%	88.2%	92.7%	89.2%	86.0%	93.4%
AUSTIN-SAN MARCOS, TX	83.9%	84.1%	88.9%	90.3%	85.7%	81.6%	89.6%
BALTIMORE, MD	89.2%	90.4%	91.5%	94.4%	92.5%	86.7%	93.5%
BATON ROUGE, LA	53.8%	62.9%	61.7%	87.4%	58.7%	54.3%	87.0%
BEAUMONT-PORT ARTHUR, TX	77.5%	84.6%	85.2%	90.3%	82.4%	78.4%	90.4%
BENTON HARBOR, MI	74.6%	83.4%	79.3%	86.9%	80.3%	73.1%	86.4%
BERGEN-PASSAIC, NJ	82.3%	87.6%	82.2%	88.0%	84.6%	81.6%	88.0%
BIRMINGHAM, AL	82.6%	83.4%	87.5%	89.6%	86.8%	82.3%	89.5%
BISMARCK, ND	86.8%	90.0%	93.1%	92.3%	92.5%	86.6%	91.5%
BLOOMINGTON, IN	87.4%	90.8%	69.1%	90.4%	89.4%	87.0%	90.4%
BLOOMINGTON-NORMAL, IL	88.1%	85.1%	90.1%	92.1%	91.5%	88.3%	91.6%
BOISE CITY, ID	83.6%	89.4%	88.4%	91.5%	88.4%	81.2%	88.9%
BOSTON-CAMBRIDGE-QUINCY, MA*	73.0%	83.3%	82.5%	91.0%	81.1%	69.9%	89.3%
BRAZORIA, TX	86.3%	90.6%	91.7%	94.1%	89.6%	85.4%	94.0%
BRYAN-COLLEGE STATION, TX	84.5%	89.4%	93.4%	92.9%	88.2%	84.6%	92.9%
BUFFALO-NIAGARA FALLS, NY	89.5%	93.2%	94.5%	93.7%	93.2%	*	93.1%
CANTON-MASSILLON, OH	81.0%	85.5%	81.9%	86.5%	85.7%	80.9%	85.1%
CHARLESTON, WV	84.4%	88.8%	91.9%	91.2%	88.0%	84.3%	91.9%
CHARLESTON-NORTH CHARLESTON, SC	83.7%	91.4%	86.8%	91.8%	88.3%	83.9%	91.6%
CHARLOTTE-GASTONIA-ROCK HILL, NC-SC	86.5%	90.5%	88.2%	92.8%	90.8%	85.9%	92.4%
CHARLOTTESVILLE, VA	79.7%	79.4%	82.7%	85.7%	81.0%	81.2%	83.3%
CHATTANOOGA, TN-GA	79.9%	84.0%	85.5%	88.4%	84.6%	79.1%	87.1%
CHICAGO, IL	82.9%	85.8%	88.2%	89.5%	86.6%	81.7%	88.4%
CINCINNATI, OH-KY-IN	87.6%	88.7%	88.1%	92.1%	91.1%	87.3%	91.4%

\* The Boston-Cambridge-Quincy MSA includes the counties of Middlesex, Essex, Suffolk, Norfolk and Plymouth, Massachusetts.

**Vaccination Rates by Vaccine and MSA** (continued)

MSA	Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months						
	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
CLEVELAND-LORAIN-ELYRIA, OH	82.5%	85.2%	84.1%	90.8%	87.7%	82.5%	89.2%
COLORADO SPRINGS, CO	81.2%	82.6%	80.4%	87.5%	86.6%	80.8%	85.7%
COLUMBIA, SC	82.5%	87.7%	87.2%	91.8%	86.5%	82.7%	91.4%
COLUMBUS, GA-AL	90.8%	92.8%	89.1%	96.3%	92.1%	88.9%	96.1%
COLUMBUS, OH	87.9%	89.3%	88.4%	92.5%	91.4%	87.3%	92.1%
DALLAS, TX	86.4%	88.9%	90.9%	91.9%	89.5%	85.4%	91.6%
DAVENPORT-ROCK ISLAND-MOLINE, IA-IL	77.5%	85.7%	86.0%	88.7%	84.4%	77.0%	87.3%
DAYTON-SPRINGFIELD, OH	85.6%	89.1%	85.3%	90.9%	89.8%	84.4%	89.6%
DENVER, CO	86.1%	87.2%	87.5%	92.0%	88.8%	84.4%	90.7%
DETROIT, MI	70.4%	77.8%	76.8%	81.9%	76.3%	68.5%	81.8%
DOVER, DE	82.9%	87.9%	87.4%	93.2%	87.9%	83.6%	93.1%
DULUTH-SUPERIOR, MN-WI	82.2%	88.9%	85.4%	89.1%	86.3%	79.1%	86.4%
DUTCHESS COUNTY, NY	76.1%	85.0%	75.3%	83.9%	80.8%	75.1%	83.4%
EL PASO, TX	75.5%	88.8%	83.6%	91.8%	82.2%	78.4%	92.2%
ELKHART-GOSHEN, IN	74.9%	85.4%	78.7%	86.9%	86.1%	75.5%	84.8%
ERIE, PA	80.7%	87.2%	89.3%	91.0%	86.5%	79.6%	90.1%
EVANSVILLE-HENDERSON, IN-KY	86.8%	90.4%	87.2%	92.3%	90.6%	86.4%	91.7%
FARGO-MOORHEAD, ND-MN	90.3%	86.2%	95.1%	95.2%	94.8%	91.3%	94.2%
FAYETTEVILLE-SPRINGDALE-ROGERS, AR	78.9%	88.0%	87.2%	87.9%	86.5%	79.1%	88.2%
FLINT, MI	73.1%	80.3%	81.0%	86.6%	78.7%	69.7%	85.9%
FORT COLLINS-LOVELAND, CO	84.0%	83.8%	85.3%	87.7%	85.9%	82.6%	84.6%
FORT LAUDERDALE, FL	81.9%	89.0%	89.5%	88.5%	85.1%	80.5%	90.8%
FORT WAYNE, IN	72.3%	79.5%	72.0%	82.3%	79.4%	71.0%	80.8%
FORT WORTH-ARLINGTON, TX	84.6%	86.7%	91.3%	91.6%	88.8%	83.4%	91.2%
GALVESTON-TEXAS CITY, TX	84.9%	91.7%	90.6%	92.7%	89.9%	83.0%	92.3%
GARY, IN	73.0%	79.1%	78.2%	84.6%	80.3%	72.7%	84.3%
GLENS FALLS, NY	89.3%	90.6%	76.3%	92.1%	91.1%	61.1%	90.9%
GRAND FORKS, ND-MN	86.6%	89.6%	93.5%	93.1%	92.5%	84.8%	92.2%
GRAND RAPIDS-MUSKEGON-HOLLAND, MI	80.8%	86.5%	84.7%	89.8%	85.2%	79.1%	89.0%
GREELEY, CO	82.0%	76.2%	81.0%	89.2%	82.0%	78.6%	83.3%
GREENSBORO--WINSTON-SALEM--HIGH POINT, NC	87.6%	91.5%	89.2%	93.4%	91.2%	88.0%	93.7%
GREENVILLE-SPARTANBURG-ANDERSON, SC	82.2%	90.0%	85.6%	90.4%	86.7%	82.1%	90.3%

**Vaccination Rates by Vaccine and MSA** (continued)

MSA	Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months						
	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
HAMILTON-MIDDLETOWN, OH	84.2%	86.4%	83.3%	89.8%	88.3%	83.8%	89.5%
HARRISBURG-LEBANON-CARLISLE, PA	88.1%	92.4%	94.1%	93.7%	92.1%	88.4%	92.5%
HOUMA, LA	48.1%	56.9%	55.0%	80.1%	55.9%	48.9%	80.4%
HOUSTON, TX	85.6%	90.2%	91.4%	93.5%	89.4%	85.3%	93.1%
HUNTINGTON-ASHLAND, WV-KY-OH	76.5%	88.0%	76.8%	86.9%	82.5%	75.4%	87.5%
HUNTSVILLE, AL	85.2%	90.7%	89.8%	91.7%	90.1%	83.3%	91.4%
INDIANAPOLIS, IN	85.8%	88.0%	84.7%	91.7%	90.2%	85.1%	91.2%
JACKSONVILLE, FL	76.4%	82.8%	81.4%	84.7%	81.0%	74.8%	83.8%
JERSEY CITY, NJ	79.2%	87.9%	82.7%	88.5%	84.4%	78.2%	90.1%
JOHNSON CITY-KINGSPORT-BRISTOL, TN-VA	83.4%	91.6%	86.9%	90.4%	87.9%	79.9%	89.9%
JOHNSTOWN, PA	85.3%	89.5%	92.7%	92.7%	91.3%	87.2%	93.6%
JONESBORO, AR	78.0%	89.4%	88.2%	89.5%	87.6%	78.2%	88.7%
JOPLIN, MO	70.2%	78.2%	74.4%	77.4%	75.6%	72.3%	77.2%
KALAMAZOO-BATTLE CREEK, MI	76.9%	84.0%	82.4%	88.1%	82.7%	74.8%	87.4%
KANKAKEE, IL	77.8%	84.6%	86.3%	83.2%	85.8%	76.9%	83.7%
KANSAS CITY, MO-KS	73.1%	79.3%	77.5%	90.8%	77.0%	72.9%	89.9%
KNOXVILLE, TN	82.7%	90.3%	88.7%	90.8%	87.9%	82.5%	90.1%
LAFAYETTE, IN	80.9%	84.9%	81.4%	90.3%	84.8%	82.1%	89.0%
LAFAYETTE, LA	54.4%	64.2%	61.6%	82.1%	58.3%	51.9%	80.3%
LAKE CHARLES, LA	48.2%	53.5%	51.5%	72.2%	54.2%	44.1%	72.4%
LAKELAND-WINTER HAVEN, FL	78.2%	88.8%	84.8%	87.9%	85.7%	77.5%	88.1%
LANCASTER, PA	87.0%	90.5%	92.0%	92.6%	91.1%	85.5%	91.0%
LANSING-EAST LANSING, MI	66.4%	78.3%	74.0%	85.2%	73.4%	66.3%	83.6%
LAREDO, TX	71.4%	80.7%	83.0%	88.5%	81.5%	75.7%	88.0%
LAS VEGAS, NV-AZ	74.9%	83.4%	71.0%	86.2%	81.5%	71.5%	86.6%
LEXINGTON, KY	90.2%	93.9%	87.4%	93.8%	92.6%	88.9%	90.8%
LINCOLN, NE	84.7%	87.3%	91.2%	92.8%	89.5%	83.5%	91.7%
LITTLE ROCK-NORTH LITTLE ROCK, AR	84.7%	91.0%	91.2%	92.8%	89.9%	85.4%	93.4%
LOS ANGELES-LONG BEACH, CA	78.2%	84.1%	88.8%	89.9%	84.0%	75.8%	88.1%
LOUISVILLE, KY-IN	88.0%	88.8%	87.4%	92.1%	91.4%	87.3%	92.1%
LUBBOCK, TX	83.6%	88.9%	91.9%	92.8%	89.1%	85.5%	92.0%
LYNCHBURG, VA	82.4%	83.5%	82.5%	86.3%	88.2%	80.7%	85.0%
MADISON, WI	73.5%	66.5%	73.8%	80.2%	64.9%	72.4%	77.5%
MCALLEN-EDINBURG-MISSION, TX	74.6%	86.6%	85.3%	92.6%	82.4%	74.6%	91.0%

**Vaccination Rates by Vaccine and MSA** (continued)

MSA	Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months						
	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
MEMPHIS, TN-AR-MS	79.9%	89.9%	88.4%	88.7%	87.2%	81.0%	89.8%
MIAMI, FL	78.0%	88.1%	83.1%	85.8%	82.9%	76.3%	88.4%
MIDDLESEX-SOMERSET-HUNTERDON, N	80.8%	89.2%	81.9%	88.8%	85.4%	79.8%	89.5%
MILWAUKEE-WAUKESHA, WI	81.6%	84.9%	83.5%	88.2%	85.4%	80.9%	86.5%
MINNEAPOLIS-ST. PAUL, MN-WI	85.1%	90.0%	91.4%	92.0%	89.0%	84.0%	90.4%
MONMOUTH-OCEAN, NJ	80.0%	88.6%	82.8%	85.5%	83.7%	79.2%	85.3%
MYRTLE BEACH, SC	80.7%	88.0%	86.6%	90.5%	86.6%	79.8%	90.0%
NASHVILLE, TN	84.6%	89.1%	89.2%	90.2%	88.6%	85.1%	90.6%
NASSAU-SUFFOLK, NY	77.5%	84.8%	76.9%	83.6%	82.4%	75.1%	84.5%
NEW ORLEANS, LA	55.9%	59.1%	62.8%	85.0%	59.3%	53.8%	83.6%
NEW YORK-NEWARK, NY-NJ-PA	74.4%	80.9%	74.5%	84.2%	79.7%	71.3%	83.6%
NEWARK, NJ	80.2%	86.3%	81.8%	87.5%	83.9%	77.1%	87.5%
NEWBURGH, NY-PA	74.8%	81.5%	71.6%	84.0%	79.7%	74.2%	83.7%
NORFOLK-VIRGINIA BEACH-NEWPORT NEWS, VA-NC	87.0%	88.3%	85.3%	92.9%	90.8%	85.6%	92.4%
OAKLAND, CA	83.4%	87.3%	90.4%	91.3%	88.1%	81.9%	90.7%
ODESSA-MIDLAND, TX	78.5%	86.7%	87.4%	89.6%	83.9%	79.1%	89.1%
OKLAHOMA CITY, OK	83.2%	89.6%	88.5%	89.5%	87.9%	81.6%	89.8%
OMAHA, NE-IA	86.3%	89.8%	92.8%	93.7%	91.1%	86.0%	93.0%
ORANGE COUNTY, CA	82.6%	83.9%	91.2%	89.4%	87.2%	77.8%	89.3%
ORLANDO, FL	77.9%	83.3%	83.1%	85.9%	83.1%	76.6%	86.5%
PEORIA-PEKIN, IL	76.6%	68.9%	80.8%	85.1%	82.3%	76.2%	83.0%
PHILADELPHIA, PA-NJ	89.4%	90.8%	95.0%	94.6%	92.6%	88.5%	94.5%
PHOENIX-MESA, AZ	81.0%	84.8%	84.8%	88.3%	84.9%	79.3%	87.8%
PITTSBURGH, PA	87.9%	90.3%	92.4%	91.0%	90.7%	87.5%	91.3%
PORTLAND-VANCOUVER,OR-WA	84.4%	81.8%	86.5%	87.8%	86.0%	82.0%	86.0%
RALEIGH-DURHAM-CHAPEL HILL, NC	87.4%	90.7%	90.0%	94.1%	91.5%	87.7%	93.8%
READING, PA	89.8%	93.7%	93.8%	94.5%	93.1%	88.5%	93.9%
RENO, NV	82.1%	89.5%	67.5%	89.7%	86.5%	82.5%	89.1%
RICHLAND-KENNEWICK-PASCO, WA	80.6%	86.8%	84.8%	92.6%	85.6%	77.0%	90.6%
RICHMOND-PETERSBURG, VA	88.0%	90.4%	88.2%	92.8%	90.2%	86.4%	93.2%
RIVERSIDE-SAN BERNADINO, CA	72.3%	81.6%	83.6%	86.0%	79.6%	70.8%	85.1%
ROANOKE, VA	88.8%	86.3%	88.6%	92.4%	91.6%	87.4%	91.9%
ROCHESTER, NY	91.1%	94.0%	96.0%	95.5%	93.9%	86.1%	94.6%
ROCKFORD, IL	79.8%	85.3%	85.5%	87.4%	85.3%	78.3%	87.4%
SAGINAW-BAY CITY-MIDLAND, MI	65.6%	77.5%	74.8%	83.2%	72.6%	63.0%	82.7%

**Vaccination Rates by Vaccine and MSA** (continued)

MSA	Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months						
	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
SALT LAKE CITY-OGDEN, UT	78.9%	87.8%	82.2%	90.1%	85.8%	77.4%	89.2%
SAN ANTONIO, TX	84.6%	90.0%	91.2%	93.9%	89.0%	83.4%	93.2%
SAN DIEGO, CA	81.4%	82.6%	88.6%	89.4%	84.1%	78.4%	88.6%
SAN FRANCISCO, CA	84.4%	83.8%	91.7%	89.2%	88.7%	83.2%	89.0%
SCRANTON-WILKES-BARRE-HAZLETON, PA	83.1%	87.6%	88.9%	90.5%	88.3%	82.7%	90.4%
SEATTLE-BELLEVUE-EVERETT, WA	86.1%	89.2%	91.5%	93.4%	89.3%	84.1%	91.8%
SHARON, PA	85.4%	88.9%	91.0%	90.4%	89.7%	84.8%	89.0%
SHREVEPORT-BOSSIER CITY, LA	50.3%	59.4%	52.7%	78.9%	55.5%	50.6%	79.2%
SIoux FALLS, SD	76.4%	89.5%	70.3%	83.5%	89.4%	89.5%	82.4%
SOUTH BEND, IN	76.0%	87.0%	77.0%	87.2%	84.6%	78.5%	86.4%
SPOKANE, WA	79.5%	85.8%	85.7%	88.9%	83.9%	76.3%	84.8%
SPRINGFIELD, IL	83.5%	83.4%	90.7%	90.1%	89.9%	83.8%	90.7%
SPRINGFIELD, MO	82.6%	87.1%	85.4%	89.9%	85.4%	82.0%	89.3%
ST. CLOUD, MN	84.6%	89.0%	91.2%	90.6%	89.6%	85.3%	87.3%
ST. LOUIS, MO-IL	87.5%	90.3%	89.3%	92.7%	91.0%	87.4%	91.8%
STATE COLLEGE, PA	85.0%	91.2%	94.0%	94.2%	91.5%	90.6%	93.8%
SYRACUSE, NY	89.3%	92.1%	94.1%	95.0%	94.1%	87.5%	94.7%
TACOMA, WA	79.1%	84.7%	85.9%	89.3%	84.5%	77.8%	86.9%
TAMPA-ST. PETERSBURG-CLEARWATER, FL	84.8%	89.8%	87.9%	90.9%	88.4%	84.0%	91.6%
TOLEDO, OH	78.2%	84.9%	79.4%	85.5%	83.7%	79.1%	84.9%
TOPEKA, KS	72.6%	76.3%	75.8%	89.3%	76.9%	69.6%	88.6%
TULSA, OK	80.5%	89.4%	86.9%	89.2%	86.3%	76.4%	89.3%
WASHINGTON, DC-MD-VA-WV	85.4%	88.7%	85.4%	91.9%	89.9%	84.3%	91.3%
WEST PALM BEACH-BOCA RATON, FL	80.9%	86.9%	84.2%	88.5%	85.2%	79.1%	88.2%
WICHITA, KS	72.4%	82.7%	77.4%	86.1%	79.1%	72.6%	85.6%
WILMINGTON-NEWARK, DE-MD	85.9%	87.9%	92.4%	93.2%	89.6%	85.5%	92.6%
YORK, PA	89.2%	92.1%	93.8%	94.0%	93.3%	89.1%	93.7%
YOUNGSTOWN-WARREN, OH	74.9%	80.5%	77.7%	82.6%	79.8%	73.9%	80.6%
<b>National</b>	<b>80.1%</b>	<b>85.6%</b>	<b>84.4%</b>	<b>89.3%</b>	<b>85.1%</b>	<b>78.8%</b>	<b>88.6%</b>

## Appendix E-6: Vaccination Rates by Vaccine and County

		Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months						
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Jefferson	AL	81.8%	82.4%	86.5%	88.6%	85.9%	81.9%	88.5%
Madison	AL	86.4%	91.9%	91.2%	93.2%	91.6%	84.4%	92.6%
Benton	AR	78.9%	88.1%	86.1%	88.1%	86.0%	78.2%	87.9%
Craighead	AR	78.0%	89.4%	88.2%	89.5%	87.6%	78.2%	88.7%
Faulkner	AR	84.1%	92.2%	90.5%	91.3%	91.5%	85.1%	90.9%
Pulaski	AR	86.2%	90.7%	91.7%	93.2%	90.2%	86.2%	94.4%
Washington	AR	78.8%	88.0%	89.5%	87.4%	87.5%	80.7%	88.9%
Maricopa	AZ	81.6%	85.0%	85.2%	88.7%	85.3%	79.7%	88.1%
Los Angeles	CA	80.2%	84.8%	89.9%	90.3%	85.0%	77.0%	88.2%
Orange	CA	82.6%	83.9%	91.2%	89.4%	87.2%	77.8%	89.3%
Riverside	CA	70.7%	79.7%	82.8%	85.3%	78.8%	69.7%	84.9%
San Diego	CA	81.4%	82.6%	88.6%	89.4%	84.1%	78.4%	88.6%
Santa Clara	CA	83.9%	84.4%	91.1%	88.3%	88.4%	82.9%	88.7%
Adams	CO	82.7%	88.3%	85.6%	91.5%	87.7%	82.1%	90.6%
Arapahoe	CO	86.9%	89.0%	88.4%	92.6%	90.4%	87.2%	92.0%
Boulder	CO	82.0%	76.2%	81.0%	89.2%	82.0%	78.6%	83.3%
Denver	CO	88.2%	85.7%	89.2%	93.1%	89.8%	87.0%	91.9%
Douglas	CO	87.3%	87.5%	88.5%	91.3%	89.4%	85.2%	90.7%
El Paso	CO	81.2%	82.6%	80.4%	87.5%	86.6%	80.8%	85.7%
Jefferson	CO	87.3%	85.5%	86.7%	92.3%	86.8%	83.7%	89.5%
Larimer	CO	84.0%	83.8%	85.3%	87.7%	85.9%	82.6%	84.6%
Weld	CO	83.0%	87.6%	85.8%	91.4%	88.5%	80.0%	89.4%
Fairfield	CT	85.6%	88.8%	86.2%	91.6%	88.6%	84.6%	90.2%
Hartford	CT	86.3%	89.4%	88.0%	93.9%	89.8%	89.4%	93.7%
New Haven	CT	88.0%	88.3%	89.2%	93.4%	90.4%	89.2%	92.1%
New London	CT	88.5%	91.4%	90.0%	95.1%	91.1%	88.7%	94.2%
Kent	DE	82.9%	87.9%	87.4%	93.2%	87.9%	83.6%	93.1%
New Castle	DE	86.0%	87.7%	92.3%	93.3%	89.6%	85.6%	92.5%
Sussex	DE	88.3%	91.8%	93.8%	94.8%	92.2%	88.5%	94.9%
Broward	FL	81.9%	89.0%	89.5%	88.5%	85.1%	80.5%	90.8%
Duval	FL	71.6%	79.5%	77.0%	82.5%	76.9%	71.3%	81.5%
Hillsborough	FL	86.3%	90.2%	89.9%	92.7%	89.5%	84.9%	93.0%
Miami-Dade	FL	78.0%	88.1%	83.1%	85.8%	82.9%	76.3%	88.4%
Orange	FL	76.2%	80.6%	80.0%	84.6%	80.8%	74.3%	85.4%
Palm Beach	FL	80.9%	86.9%	84.2%	88.5%	85.2%	79.1%	88.2%



**Vaccination Rates by Vaccine and County** (continued)

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months								
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Polk	FL	78.2%	88.8%	84.8%	87.9%	85.7%	77.5%	88.1%
Cherokee	GA	85.0%	87.4%	84.9%	88.1%	88.3%	84.2%	88.7%
Cobb	GA	88.0%	90.0%	89.1%	93.2%	90.9%	88.1%	93.1%
DeKalb	GA	88.0%	89.8%	89.1%	93.1%	90.9%	86.1%	94.1%
Forsyth	GA	90.9%	92.4%	92.3%	92.0%	93.5%	90.2%	93.3%
Fulton	GA	88.4%	90.8%	89.6%	92.5%	90.5%	86.8%	92.8%
Gwinnett	GA	87.4%	91.9%	89.7%	92.6%	90.7%	87.3%	93.3%
Muscogee	GA	90.6%	92.9%	88.9%	96.1%	92.2%	88.9%	95.8%
Ada	ID	84.5%	89.2%	88.8%	92.0%	88.7%	83.1%	89.2%
Canyon	ID	80.9%	90.0%	87.4%	89.8%	87.6%	75.7%	88.0%
Cook	IL	81.7%	84.1%	87.9%	89.2%	85.3%	81.0%	88.0%
DeKalb	IL	78.7%	82.1%	83.8%	85.2%	84.0%	73.8%	81.2%
DuPage	IL	86.6%	88.2%	91.0%	91.3%	89.9%	84.9%	90.3%
Grundy	IL	76.4%	85.0%	81.5%	86.8%	81.6%	74.2%	85.9%
Kane	IL	82.0%	86.6%	84.5%	89.0%	86.3%	80.8%	87.6%
Kankakee	IL	77.8%	84.6%	86.3%	83.2%	85.8%	76.9%	83.7%
Kendall	IL	82.7%	85.9%	87.2%	88.1%	86.7%	80.8%	87.3%
La Salle	IL	72.3%	82.3%	82.7%	83.7%	80.1%	69.0%	82.5%
Lake	IL	88.3%	88.7%	92.8%	92.1%	90.1%	86.7%	90.9%
Madison	IL	83.3%	87.1%	89.8%	92.4%	90.0%	84.6%	91.9%
McHenry	IL	84.7%	89.3%	88.6%	89.8%	88.1%	82.1%	88.9%
McLean	IL	88.1%	85.1%	90.1%	92.1%	91.5%	88.3%	91.6%
Sangamon	IL	83.5%	83.4%	90.7%	90.1%	89.9%	83.8%	90.7%
Will	IL	80.1%	86.4%	85.8%	88.4%	85.7%	79.0%	87.4%
Winnebago	IL	81.5%	86.2%	86.8%	88.5%	86.5%	81.0%	88.4%
Allen	IN	72.8%	79.7%	73.0%	82.9%	80.0%	71.0%	81.1%
Bartholomew	IN	86.9%	89.1%	86.4%	92.2%	92.2%	85.8%	91.7%
Boone	IN	89.1%	89.7%	88.8%	93.5%	93.4%	89.1%	92.9%
Elkhart	IN	74.9%	85.4%	78.7%	86.9%	86.1%	75.5%	84.8%
Hamilton	IN	87.4%	89.3%	88.1%	92.0%	91.7%	86.9%	90.9%
Hancock	IN	85.3%	86.8%	84.7%	92.3%	87.5%	84.9%	93.3%
Hendricks	IN	88.8%	89.4%	79.8%	93.4%	91.9%	86.6%	92.8%
Johnson	IN	87.1%	90.6%	87.3%	93.7%	92.2%	85.7%	93.3%
La Porte	IN	64.9%	72.6%	66.8%	82.9%	72.8%	64.4%	80.3%
Lake	IN	72.7%	79.1%	79.3%	84.7%	81.0%	72.6%	84.5%
Marion	IN	84.9%	86.8%	85.3%	91.4%	89.4%	84.5%	91.3%



**Vaccination Rates by Vaccine and County** (continued)

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months								
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Monroe	IN	87.4%	90.8%	69.1%	90.4%	89.4%	87.0%	90.4%
Porter	IN	73.5%	79.0%	76.1%	84.6%	79.0%	72.9%	84.1%
St Joseph	IN	76.0%	87.0%	77.0%	87.2%	84.6%	78.5%	86.4%
Tippecanoe	IN	84.0%	87.1%	84.6%	91.8%	87.9%	85.3%	90.5%
Vanderburgh	IN	87.4%	90.6%	88.0%	92.6%	91.1%	86.9%	92.2%
Johnson	KS	77.3%	81.5%	81.2%	93.3%	80.7%	77.4%	92.7%
Sedgwick	KS	73.0%	82.6%	77.4%	85.7%	78.9%	73.0%	85.8%
Shawnee	KS	72.6%	76.3%	75.8%	89.3%	76.9%	69.6%	88.6%
Boone	KY	91.3%	92.2%	91.9%	92.9%	94.3%	90.5%	93.4%
Fayette	KY	89.9%	94.0%	87.2%	94.4%	92.3%	89.2%	91.1%
Jefferson	KY	88.3%	88.3%	88.2%	92.6%	91.4%	87.1%	92.1%
Caddo	LA	49.3%	58.6%	51.0%	79.4%	53.8%	49.8%	80.2%
Calcasieu	LA	48.2%	53.5%	51.5%	72.2%	54.2%	44.1%	72.4%
East Baton Rouge	LA	50.1%	59.6%	58.1%	86.7%	55.5%	51.2%	85.4%
Jefferson	LA	54.4%	54.6%	61.2%	85.3%	57.7%	52.0%	84.4%
Lafayette	LA	55.9%	64.5%	62.9%	83.0%	58.8%	53.4%	81.5%
Saint Tammany	LA	59.8%	63.4%	64.8%	83.3%	63.7%	58.4%	82.1%
Bristol	MA	83.4%	88.8%	90.0%	94.3%	89.2%	78.7%	93.9%
Essex	MA	72.8%	82.1%	81.5%	93.6%	79.5%	71.0%	89.3%
Hampden	MA	64.1%	84.4%	76.3%	91.4%	76.6%	75.2%	91.7%
Middlesex	MA	71.3%	82.5%	80.2%	88.7%	79.6%	70.5%	88.0%
Norfolk	MA	76.2%	84.5%	85.2%	92.7%	84.3%	68.5%	91.5%
Plymouth	MA	78.6%	87.5%	90.1%	94.2%	86.4%	75.6%	91.7%
Suffolk	MA	65.0%	80.7%	78.3%	88.5%	76.5%	58.9%	86.6%
Worcester	MA	82.8%	87.1%	89.7%	94.0%	88.3%	80.6%	92.6%
Anne Arundel	MD	90.9%	89.3%	91.5%	94.7%	92.7%	86.7%	93.6%
Montgomery	MD	83.8%	88.6%	84.7%	93.5%	87.1%	84.3%	91.4%
Cumberland	ME	87.4%	86.7%	83.3%	93.2%	89.1%	86.9%	91.7%
York	ME	87.3%	86.0%	85.0%	89.5%	89.6%	82.9%	89.2%
Berrien	MI	74.6%	83.4%	79.3%	86.9%	80.3%	73.1%	86.4%
Calhoun	MI	74.9%	82.6%	83.2%	87.4%	81.3%	73.3%	86.7%
Genesee	MI	73.1%	80.3%	81.0%	86.6%	78.7%	69.7%	85.9%
Ingham	MI	65.9%	78.8%	73.3%	86.0%	72.6%	65.6%	84.1%
Kalamazoo	MI	78.2%	84.6%	82.1%	88.3%	83.5%	75.9%	87.5%
Kent	MI	79.2%	86.0%	83.3%	89.3%	84.3%	77.8%	88.8%
Livingston	MI	73.2%	78.3%	78.3%	83.9%	77.5%	69.9%	82.8%

**Vaccination Rates by Vaccine and County** (continued)

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months								
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Macomb	MI	65.9%	72.5%	71.6%	75.8%	71.1%	63.9%	75.9%
Monroe	MI	70.5%	81.6%	78.1%	83.8%	77.4%	70.7%	84.5%
Oakland	MI	75.1%	80.9%	80.8%	84.6%	80.0%	72.9%	84.5%
Ottawa	MI	83.9%	87.8%	86.9%	90.5%	86.9%	81.8%	89.5%
Saginaw	MI	65.7%	78.3%	74.8%	83.3%	72.7%	61.3%	82.9%
Washtenaw	MI	75.2%	82.8%	81.4%	87.7%	81.1%	73.1%	86.3%
Wayne	MI	69.0%	78.6%	76.2%	83.5%	76.1%	67.7%	83.5%
Anoka	MN	87.1%	92.0%	92.7%	92.8%	91.2%	87.1%	91.7%
Dakota	MN	87.3%	90.8%	92.4%	93.1%	89.8%	86.3%	91.7%
Hennepin	MN	86.0%	89.7%	91.3%	92.8%	89.2%	84.5%	91.4%
Ramsey	MN	82.3%	89.5%	89.3%	90.6%	86.6%	82.7%	88.4%
Saint Louis	MN	82.2%	88.9%	85.4%	89.1%	86.3%	79.1%	86.4%
Scott	MN	83.5%	88.6%	90.8%	89.9%	88.3%	81.7%	88.1%
Stearns	MN	86.2%	89.4%	92.6%	91.2%	91.0%	86.6%	88.1%
Washington	MN	84.7%	91.4%	92.7%	91.1%	89.7%	83.2%	89.5%
Wright	MN	81.4%	88.2%	89.8%	90.4%	87.8%	80.6%	88.2%
Clay	MO	70.0%	79.1%	73.4%	90.2%	73.9%	69.2%	89.0%
Greene	MO	84.0%	88.2%	86.3%	91.4%	86.1%	83.1%	90.6%
Jackson	MO	70.1%	76.0%	74.1%	88.5%	74.1%	70.2%	87.9%
Jasper	MO	70.2%	78.2%	74.4%	77.4%	75.6%	72.3%	77.2%
Jefferson	MO	87.3%	89.0%	87.9%	92.3%	91.5%	87.0%	91.2%
Platte	MO	73.8%	80.7%	75.4%	90.2%	74.7%	71.3%	89.1%
Saint Charles	MO	87.9%	92.0%	89.5%	93.2%	91.4%	88.3%	92.3%
Saint Louis	MO	89.1%	90.7%	89.6%	92.9%	91.1%	88.4%	91.7%
Guilford	NC	90.5%	93.0%	90.0%	94.6%	93.4%	90.2%	94.7%
Mecklenburg	NC	88.3%	91.1%	90.8%	94.1%	91.2%	87.0%	93.5%
Wake	NC	87.8%	91.1%	90.3%	94.0%	91.4%	88.0%	93.8%
Burleigh	ND	86.8%	89.4%	92.9%	91.8%	92.5%	86.4%	91.1%
Cass	ND	90.2%	86.1%	95.0%	95.1%	94.8%	91.2%	94.2%
Grand Forks	ND	87.9%	90.5%	94.1%	93.3%	92.9%	86.9%	92.3%
Ward	ND	85.6%	90.6%	93.2%	91.2%	91.9%	86.2%	90.6%
Douglas	NE	87.1%	90.2%	93.2%	94.1%	91.5%	86.4%	93.4%
Lancaster	NE	84.7%	87.3%	91.2%	92.8%	89.5%	83.5%	91.7%
Sarpy	NE	85.5%	88.9%	91.7%	93.0%	90.2%	85.9%	92.3%
Hillsborough	NH	81.7%	85.2%	85.5%	88.0%	84.7%	78.2%	87.1%
Rockingham	NH	78.4%	80.2%	81.0%	86.4%	81.8%	76.4%	85.5%

**Vaccination Rates by Vaccine and County** (continued)

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months								
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Bergen	NJ	82.9%	87.8%	83.2%	87.9%	85.1%	82.1%	88.1%
Burlington	NJ	87.5%	90.7%	92.3%	92.9%	90.5%	86.2%	93.6%
Camden	NJ	90.6%	91.2%	94.2%	94.1%	92.1%	89.0%	93.7%
Essex	NJ	78.4%	84.9%	80.3%	85.5%	82.4%	74.0%	85.8%
Gloucester	NJ	89.1%	93.4%	94.9%	93.4%	92.4%	89.7%	94.5%
Hudson	NJ	79.2%	87.9%	82.7%	88.5%	84.4%	78.2%	90.1%
Middlesex	NJ	78.9%	88.8%	80.1%	87.2%	84.1%	78.7%	89.6%
Monmouth	NJ	80.4%	88.5%	82.3%	84.9%	83.6%	79.8%	85.5%
Morris	NJ	82.5%	87.8%	84.3%	88.5%	85.1%	79.6%	88.3%
Union	NJ	79.2%	86.4%	80.5%	88.4%	84.1%	77.2%	88.1%
Bernalillo	NM	75.4%	85.6%	85.2%	89.6%	83.4%	74.4%	88.5%
Clark	NV	74.7%	83.3%	70.7%	86.1%	81.2%	71.2%	86.5%
Washoe	NV	82.1%	89.5%	67.5%	89.7%	86.5%	82.5%	89.1%
Albany	NY	86.0%	90.3%	88.0%	92.9%	90.6%	64.0%	92.0%
Bronx	NY	58.3%	70.5%	60.4%	77.5%	67.3%	57.3%	76.5%
Dutchess	NY	76.1%	85.0%	75.3%	83.9%	80.8%	75.1%	83.4%
Erie	NY	89.7%	93.1%	94.4%	94.0%	93.3%	*	93.5%
Kings	NY	72.2%	80.0%	71.4%	82.1%	77.5%	67.6%	82.0%
Monroe	NY	92.0%	94.1%	96.0%	95.8%	94.6%	89.2%	95.1%
Nassau	NY	78.2%	85.0%	76.2%	85.5%	82.0%	73.5%	85.5%
New York	NY	78.9%	81.7%	79.5%	88.2%	82.7%	76.5%	86.5%
Niagara	NY	88.4%	93.7%	94.7%	91.8%	92.7%	*	91.4%
Onondaga	NY	89.3%	92.0%	94.2%	94.7%	94.8%	87.3%	94.3%
Orange	NY	74.8%	81.5%	71.6%	84.0%	79.7%	74.2%	83.7%
Queens	NY	73.5%	80.2%	73.6%	84.1%	79.3%	69.8%	83.5%
Richmond	NY	72.5%	82.3%	72.1%	74.3%	77.2%	63.9%	77.0%
Rockland	NY	72.0%	81.6%	72.2%	81.2%	80.0%	73.2%	80.8%
Saratoga	NY	89.4%	91.5%	79.9%	94.4%	92.8%	61.4%	91.7%
Suffolk	NY	77.0%	84.7%	77.5%	82.0%	82.7%	76.4%	83.7%
Westchester	NY	79.8%	84.7%	80.0%	88.3%	84.9%	78.2%	87.4%
Butler	OH	84.2%	86.4%	83.3%	89.8%	88.3%	83.8%	89.5%
Clermont	OH	86.5%	87.0%	88.4%	90.6%	89.7%	85.9%	91.4%
Cuyahoga	OH	84.3%	86.5%	86.6%	92.3%	89.6%	84.5%	90.9%
Delaware	OH	91.0%	89.5%	90.6%	92.6%	93.1%	89.9%	93.0%
Franklin	OH	87.7%	89.7%	88.3%	92.8%	91.4%	87.3%	92.3%
Greene	OH	87.5%	87.5%	85.9%	90.9%	89.8%	85.5%	88.2%

**Vaccination Rates by Vaccine and County** (continued)

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months								
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Hamilton	OH	88.0%	89.6%	88.2%	93.0%	91.6%	88.3%	91.9%
Lorain	OH	78.6%	86.6%	82.6%	91.7%	86.9%	80.7%	88.8%
Lucas	OH	78.2%	85.3%	80.0%	85.8%	83.8%	79.3%	85.0%
Mahoning	OH	74.3%	78.4%	76.5%	80.3%	78.1%	72.5%	77.1%
Medina	OH	83.1%	85.2%	82.5%	90.7%	87.9%	81.2%	89.2%
Miami	OH	80.2%	86.7%	80.7%	87.7%	86.4%	77.0%	86.0%
Montgomery	OH	86.9%	90.1%	87.0%	92.0%	90.9%	87.1%	90.7%
Stark	OH	81.0%	85.5%	81.9%	86.5%	85.7%	80.9%	85.1%
Summit	OH	89.2%	90.8%	87.9%	94.0%	92.1%	88.6%	92.3%
Trumbull	OH	70.7%	76.9%	74.8%	78.3%	75.4%	69.3%	75.7%
Warren	OH	84.9%	86.5%	85.6%	90.1%	88.9%	84.0%	88.7%
Cleveland	OK	85.5%	89.5%	91.3%	91.8%	90.1%	84.7%	90.8%
Oklahoma	OK	84.2%	89.9%	89.2%	88.9%	88.6%	82.0%	90.2%
Tulsa	OK	81.9%	90.0%	87.3%	89.6%	87.1%	77.5%	89.7%
Multnomah	OR	83.6%	82.3%	85.7%	87.4%	86.0%	80.3%	84.1%
Washington	OR	87.0%	81.4%	87.4%	86.6%	87.3%	85.0%	84.9%
Allegheny	PA	89.0%	91.4%	93.1%	92.0%	91.3%	88.8%	91.8%
Beaver	PA	89.7%	91.4%	93.6%	93.0%	93.1%	90.9%	93.3%
Berks	PA	89.8%	93.7%	93.8%	94.5%	93.1%	88.5%	93.9%
Blair	PA	89.7%	93.4%	94.2%	94.4%	93.6%	89.4%	92.7%
Bucks	PA	90.1%	91.5%	94.8%	93.6%	93.4%	89.3%	94.1%
Butler	PA	86.6%	89.6%	91.2%	88.4%	89.9%	86.2%	88.8%
Cambria	PA	85.9%	90.3%	93.2%	93.2%	91.4%	87.1%	93.8%
Centre	PA	85.0%	91.2%	94.0%	94.2%	91.5%	90.6%	93.8%
Chester	PA	89.5%	89.4%	94.2%	94.5%	92.2%	88.8%	93.9%
Cumberland	PA	89.9%	93.8%	95.2%	94.0%	93.3%	89.4%	93.4%
Dauphin	PA	86.3%	90.8%	93.6%	93.0%	90.7%	87.0%	91.6%
Delaware	PA	90.9%	92.2%	95.7%	95.4%	93.3%	89.7%	95.1%
Erie	PA	80.7%	87.2%	89.3%	91.0%	86.5%	79.6%	90.1%
Fayette	PA	78.8%	81.6%	86.3%	87.2%	83.8%	77.4%	87.4%
Franklin	PA	86.4%	90.6%	92.6%	90.0%	92.1%	86.0%	90.4%
Indiana	PA	85.9%	88.4%	92.5%	89.6%	90.7%	88.5%	91.1%
Lancaster	PA	87.0%	90.5%	92.0%	92.6%	91.1%	85.5%	91.0%
Lebanon	PA	85.7%	91.2%	91.7%	93.3%	90.9%	87.0%	90.4%
Lehigh	PA	88.1%	89.8%	94.1%	94.3%	92.9%	87.9%	93.9%
Montgomery	PA	90.3%	91.3%	95.9%	94.8%	93.6%	89.2%	94.6%

**Vaccination Rates by Vaccine and County** (continued)

Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months								
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Northampton	PA	87.0%	90.0%	93.3%	93.9%	91.3%	84.8%	93.3%
Philadelphia	PA	87.1%	89.6%	94.5%	94.9%	91.2%	86.4%	94.7%
Schuylkill	PA	88.2%	93.5%	93.6%	94.3%	93.7%	89.6%	93.9%
Washington	PA	89.5%	91.2%	93.5%	92.6%	91.8%	88.6%	92.6%
Westmoreland	PA	87.5%	90.1%	92.4%	89.6%	90.8%	86.6%	91.4%
York	PA	89.2%	92.1%	93.8%	94.0%	93.3%	89.1%	93.7%
Kent	RI	90.3%	96.7%	92.8%	96.6%	92.9%	89.2%	96.3%
Providence	RI	86.8%	95.4%	89.8%	93.8%	89.8%	86.0%	94.1%
Washington	RI	85.8%	93.8%	88.6%	92.8%	89.2%	86.3%	93.4%
Berkeley	SC	83.2%	90.8%	86.4%	92.2%	87.9%	83.7%	91.6%
Charleston	SC	84.4%	91.8%	86.6%	91.6%	88.0%	84.0%	91.0%
Dorchester	SC	83.2%	91.1%	87.7%	91.9%	89.2%	83.8%	92.6%
Greenville	SC	83.1%	88.6%	85.5%	90.2%	86.9%	83.2%	90.5%
Horry	SC	80.7%	88.0%	86.6%	90.5%	86.6%	79.8%	90.0%
Lexington	SC	81.5%	87.6%	86.5%	91.3%	85.3%	80.6%	90.7%
Richland	SC	83.5%	87.9%	87.9%	92.4%	87.8%	84.7%	92.1%
Spartanburg	SC	81.4%	91.2%	87.7%	89.3%	87.1%	81.8%	89.5%
York	SC	86.2%	92.6%	82.2%	93.1%	91.6%	86.2%	92.6%
Davidson	TN	84.7%	88.7%	89.2%	90.9%	88.2%	84.1%	90.7%
Hamilton	TN	80.2%	83.9%	85.5%	88.1%	84.7%	79.6%	86.9%
Knox	TN	83.6%	90.7%	88.1%	90.9%	87.7%	82.5%	90.1%
Rutherford	TN	85.0%	90.4%	89.7%	89.5%	90.1%	86.0%	91.7%
Shelby	TN	80.8%	90.2%	88.6%	89.1%	87.7%	81.8%	90.0%
Sumner	TN	81.3%	88.5%	84.9%	87.6%	85.2%	83.5%	87.3%
Williamson	TN	85.5%	87.6%	89.9%	90.9%	88.4%	86.0%	90.9%
Bexar	TX	85.0%	89.9%	91.0%	94.1%	89.0%	83.8%	93.2%
Brazoria	TX	86.3%	90.6%	91.7%	94.1%	89.6%	85.4%	94.0%
Brazos	TX	84.5%	89.4%	93.4%	92.9%	88.2%	84.6%	92.9%
Collin	TX	87.7%	90.2%	91.2%	92.2%	90.4%	87.4%	91.8%
Dallas	TX	86.0%	88.6%	90.7%	92.5%	89.4%	85.3%	92.3%
Denton	TX	86.8%	88.1%	91.0%	90.5%	89.3%	84.9%	90.4%
El Paso	TX	75.5%	88.8%	83.6%	91.8%	82.2%	78.4%	92.2%
Fort Bend	TX	87.3%	90.8%	93.2%	94.4%	90.2%	87.4%	93.8%
Galveston	TX	84.9%	91.7%	90.6%	92.7%	89.9%	83.0%	92.3%
Harris	TX	85.7%	90.3%	91.4%	93.8%	89.4%	85.5%	93.5%
Hidalgo	TX	74.6%	86.6%	85.3%	92.6%	82.4%	74.6%	91.0%

**Vaccination Rates by Vaccine and County** (continued)

		Percent of Infants in All Years in Study Fully Vaccinated with the Seven-Vaccine Series by Age 2 Years, 3 Months						
County	State	DTaP	Hep B	Hib	MMR	Polio	Pneumococcal	Varicella
Lubbock	TX	83.6%	88.9%	91.9%	92.8%	89.1%	85.5%	92.0%
Midland	TX	80.6%	88.9%	88.4%	88.3%	86.3%	80.9%	87.8%
Montgomery	TX	83.2%	89.0%	88.8%	90.5%	88.2%	82.3%	90.2%
Tarrant	TX	84.8%	86.5%	91.0%	91.4%	88.8%	83.2%	90.9%
Travis	TX	84.9%	82.9%	89.5%	90.4%	85.6%	81.9%	89.4%
Webb	TX	71.4%	80.7%	83.0%	88.5%	81.5%	75.7%	88.0%
Williamson	TX	82.8%	86.8%	88.1%	90.2%	86.3%	81.7%	90.4%
Davis	UT	80.2%	88.6%	84.6%	90.6%	86.6%	76.2%	89.3%
Salt Lake	UT	78.7%	87.8%	81.5%	89.9%	85.6%	77.9%	89.3%
Chesapeake City	VA	85.9%	86.3%	85.0%	92.3%	89.6%	85.0%	91.8%
Chesterfield	VA	87.9%	90.6%	88.7%	93.4%	90.2%	86.4%	93.4%
Fairfax	VA	86.8%	89.3%	87.8%	92.3%	91.0%	86.0%	91.3%
Hampton City	VA	86.0%	87.7%	84.3%	94.6%	90.7%	83.6%	92.9%
Hanover	VA	91.7%	92.1%	91.2%	93.8%	93.3%	89.9%	94.1%
Henrico	VA	89.2%	91.8%	90.1%	93.6%	91.3%	88.7%	94.4%
James City	VA	88.5%	88.2%	84.9%	93.3%	90.6%	86.0%	92.5%
Loudoun	VA	87.4%	88.3%	86.4%	91.5%	91.4%	84.8%	92.0%
Montgomery	VA	86.4%	91.4%	86.5%	93.0%	89.4%	86.1%	92.3%
Newport News City	VA	86.1%	87.9%	83.0%	92.4%	89.0%	83.8%	91.9%
Prince William	VA	87.1%	90.9%	86.0%	93.7%	91.6%	86.2%	93.0%
Richmond City	VA	86.2%	86.8%	85.8%	91.5%	87.7%	83.8%	90.6%
Spotsylvania	VA	82.4%	86.2%	83.5%	88.9%	87.5%	77.5%	88.9%
Virginia Beach City	VA	86.3%	89.0%	86.4%	92.2%	90.5%	86.5%	92.0%
Benton	WA	82.5%	87.8%	85.0%	92.9%	87.0%	78.7%	91.2%
Clark	WA	80.4%	81.1%	86.1%	88.6%	84.4%	78.7%	88.0%
King	WA	86.8%	90.0%	92.2%	94.0%	90.2%	85.2%	92.8%
Pierce	WA	79.1%	84.7%	85.9%	89.3%	84.5%	77.8%	86.9%
Snohomish	WA	84.5%	87.2%	90.0%	91.9%	87.0%	81.2%	89.2%
Spokane	WA	79.5%	85.8%	85.7%	88.9%	83.9%	76.3%	84.8%
Dane	WI	73.5%	66.5%	73.8%	80.2%	64.9%	72.4%	77.5%
Milwaukee	WI	81.2%	85.4%	82.8%	88.7%	85.0%	80.3%	86.5%
Outagamie	WI	85.0%	88.4%	89.0%	90.2%	89.4%	85.2%	89.5%
Waukesha	WI	83.8%	87.1%	86.8%	89.3%	88.4%	82.6%	88.6%
Kanawha	WV	84.2%	87.2%	93.4%	91.8%	88.3%	84.2%	92.5%
<b>National</b>		<b>80.1%</b>	<b>85.6%</b>	<b>84.4%</b>	<b>89.3%</b>	<b>85.1%</b>	<b>78.4%</b>	<b>88.6%</b>



### Appendix E-7: Rate of Vaccine Refusal by State\*

State	Percent of infants in all years in study with at least one parental vaccination refusal	State	Percent of infants in all years in study with at least one parental vaccination refusal
AL	0.9%	NC	3.4%
AR	1.4%	ND	1.5%
AZ	6.4%	NE	1.5%
CA	2.3%	NH	2.2%
CO	5.7%	NJ	6.5%
CT	1.7%	NM	3.1%
DE	2.7%	NV	2.3%
FL	4.8%	NY	8.4%
GA	2.9%	OH	2.2%
IA	1.1%	OK	1.8%
ID	2.5%	OR	6.8%
IL	3.2%	PA	3.2%
IN	1.7%	RI	2.4%
KS	3.5%	SC	1.2%
KY	1.7%	TN	2.3%
LA	0.8%	TX	2.9%
MA	3.5%	UT	2.6%
MD	2.0%	VA	2.4%
ME	3.7%	VT	2.7%
MI	5.4%	WA	7.0%
MN	2.7%	WI	3.5%
MO	2.6%	WV	1.2%
MS	1.2%	<b>National</b>	<b>3.3%</b>

\* Documented refusal rates are based on all ten CDC-recommended vaccines for early childhood.



## Appendix E-8: Rate of Vaccine Refusal by MSA

MSA	Percent of infants in all years in study with at least one parental vaccination refusal	MSA	Percent of infants in all years in study with at least one parental vaccination refusal
AKRON, OH	1.5%	CHICAGO, IL	3.6%
ALBANY-SCHENECTADY-TROY, NY	1.0%	CINCINNATI, OH-KY-IN	2.9%
ALBUQUERQUE, NM	4.7%	CLEVELAND-LORAIN-ELYRIA, OH	1.5%
ALLENTOWN-BETHLEHEM-EASTON, PA	4.2%	COLORADO SPRINGS, CO	5.9%
ALTOONA, PA	1.7%	COLUMBIA, SC	1.1%
ANN ARBOR, MI	3.3%	COLUMBUS, GA-AL	0.7%
APPLETON-OSHKOSH-NEENAH, WI	4.8%	COLUMBUS, OH	3.3%
ATLANTA, GA	3.8%	DALLAS, TX	3.1%
AUGUSTA-AIKEN, GA-SC	1.3%	DAVENPORT-ROCK ISLAND-MOLINE, IA-IL	0.8%
AUSTIN-SAN MARCOS, TX	9.8%	DAYTON-SPRINGFIELD, OH	2.7%
BALTIMORE, MD	1.9%	DENVER, CO	6.0%
BATON ROUGE, LA	1.3%	DETROIT, MI	9.3%
BEAUMONT-PORT ARTHUR, TX	0.4%	DOVER, DE	2.1%
BENTON HARBOR, MI	1.3%	DULUTH-SUPERIOR, MN-WI	1.2%
BERGEN-PASSAIC, NJ	8.9%	DUTCHESS COUNTY, NY	10.3%
BIRMINGHAM, AL	1.4%	EL PASO, TX	0.7%
BISMARCK, ND	1.1%	ELKHART-GOSHEN, IN	1.1%
BLOOMINGTON, IN	6.7%	ERIE, PA	4.6%
BLOOMINGTON-NORMAL, IL	5.3%	EVANSVILLE-HENDERSON, IN-KY	0.8%
BOISE CITY, ID	2.6%	FARGO-MOORHEAD, ND-MN	1.0%
BOSTON-CAMBRIDGE-QUINCY, MA*	3.6%	FAYETTEVILLE-SPRINGDALE-ROGERS, AR	3.0%
BRAZORIA, TX	2.5%	FLINT, MI	3.7%
BRYAN-COLLEGE STATION, TX	1.3%	FORT COLLINS-LOVELAND, CO	9.7%
BUFFALO-NIAGARA FALLS, NY	7.9%	FORT LAUDERDALE, FL	6.0%
CANTON-MASSILLON, OH	3.7%	FORT WAYNE, IN	1.0%
CHARLESTON, WV	0.8%	FORT WORTH-ARLINGTON, TX	3.2%
CHARLESTON-NORTH CHARLESTON, SC	1.0%	GALVESTON-TEXAS CITY, TX	3.2%
CHARLOTTE-GASTONIA-ROCK HILL, NC-SC	3.0%	GARY, IN	2.1%
CHARLOTTESVILLE, VA	2.1%	GLENS FALLS, NY	3.0%
CHATTANOOGA, TN-GA	1.4%	GRAND FORKS, ND-MN	1.1%
		GRAND RAPIDS-MUSKEGON-HOLLAND, MI	2.3%

\* The Boston-Cambridge-Quincy MSA includes the counties of Middlesex, Essex, Suffolk, Norfolk and Plymouth, Massachusetts.

**Rate of Vaccine Refusal by MSA** (continued)

<b>MSA</b>	<b>Percent of infants in all years in study with at least one parental vaccination refusal</b>
GREELEY, CO	4.1%
GREENSBORO--WINSTON-SALEM--HIGH POINT, NC	3.3%
GREENVILLE-SPARTANBURG-ANDERSON, SC	1.5%
HAMILTON-MIDDLETOWN, OH	2.3%
HARRISBURG-LEBANON-CARLISLE, PA	2.8%
HOUMA, LA	0.1%
HOUSTON, TX	2.3%
HUNTINGTON-ASHLAND, WV-KY-OH	0.9%
HUNTSVILLE, AL	0.9%
INDIANAPOLIS, IN	1.6%
JACKSONVILLE, FL	5.6%
JERSEY CITY, NJ	6.5%
JOHNSON CITY-KINGSPORT-BRISTOL, TN-VA	4.0%
JOHNSTOWN, PA	0.8%
JONESBORO, AR	0.6%
JOPLIN, MO	4.3%
KALAMAZOO-BATTLE CREEK, MI	1.5%
KANKAKEE, IL	1.4%
KANSAS CITY, MO-KS	5.4%
KNOXVILLE, TN	0.8%
LAFAYETTE, IN	1.7%
LAFAYETTE, LA	0.7%
LAKE CHARLES, LA	0.1%
LAKELAND-WINTER HAVEN, FL	6.3%
LANCASTER, PA	4.0%
LANSING-EAST LANSING, MI	1.7%
LAREDO, TX	0.0%
LAS VEGAS, NV-AZ	2.1%
LEXINGTON, KY	1.8%
LINCOLN, NE	1.4%
LITTLE ROCK-NORTH LITTLE ROCK, AR	0.8%

<b>MSA</b>	<b>Percent of infants in all years in study with at least one parental vaccination refusal</b>
LOS ANGELES-LONG BEACH, CA	1.5%
LOUISVILLE, KY-IN	3.1%
LUBBOCK, TX	4.2%
LYNCHBURG, VA	3.8%
MADISON, WI	4.3%
MCALLEN-EDINBURG-MISSION, TX	0.8%
MEMPHIS, TN-AR-MS	1.1%
MIAMI, FL	3.8%
MIDDLESEX-SOMERSET-HUNTERDON, N	4.0%
MILWAUKEE-WAUKESHA, WI	2.6%
MINNEAPOLIS-ST. PAUL, MN-WI	3.5%
MONMOUTH-OCEAN, NJ	6.3%
MYRTLE BEACH, SC	0.6%
NASHVILLE, TN	3.9%
NASSAU-SUFFOLK, NY	14.2%
NEW ORLEANS, LA	1.1%
NEW YORK-NEWARK, NY-NJ-PA	10.1%
NEWARK, NJ	9.3%
NEWBURGH, NY-PA	5.3%
NORFOLK-VIRGINIA BEACH-NEWPORT NEWS, VA-NC	2.1%
OAKLAND, CA	1.7%
ODESSA-MIDLAND, TX	1.3%
OKLAHOMA CITY, OK	2.0%
OMAHA, NE-IA	2.0%
ORANGE COUNTY, CA	3.9%
ORLANDO, FL	4.7%
PEORIA-PEKIN, IL	5.0%
PHILADELPHIA, PA-NJ	3.8%
PHOENIX-MESA, AZ	7.5%
PITTSBURGH, PA	2.4%
PORTLAND-VANCOUVER, OR-WA	6.5%
RALEIGH-DURHAM-CHAPEL HILL, NC	4.2%
READING, PA	1.6%

**Rate of Vaccine Refusal by MSA** (continued)

<b>MSA</b>	<b>Percent of infants in all years in study with at least one parental vaccination refusal</b>
RENO, NV	2.3%
RICHLAND-KENNEWICK-PASCO, WA	2.7%
RICHMOND-PETERSBURG, VA	2.6%
RIVERSIDE-SAN BERNADINO, CA	2.1%
ROANOKE, VA	1.5%
ROCHESTER, NY	2.7%
ROCKFORD, IL	2.1%
SAGINAW-BAY CITY-MIDLAND, MI	0.8%
SALT LAKE CITY-OGDEN, UT	2.3%
SAN ANTONIO, TX	1.8%
SAN DIEGO, CA	4.9%
SAN FRANCISCO, CA	2.9%
SCRANTON-WILKES-BARRE-HAZLETON, PA	4.0%
SEATTLE-BELLEVUE-EVERETT, WA	7.9%
SHARON, PA	0.4%
SHREVEPORT-BOSSIER CITY, LA	0.3%
SIoux FALLS, SD	1.5%
SOUTH BEND, IN	1.3%

<b>MSA</b>	<b>Percent of infants in all years in study with at least one parental vaccination refusal</b>
SPOKANE, WA	3.9%
SPRINGFIELD, IL	1.9%
SPRINGFIELD, MO	3.1%
ST. CLOUD, MN	2.2%
ST. LOUIS, MO-IL	2.3%
STATE COLLEGE, PA	4.7%
SYRACUSE, NY	2.7%
TACOMA, WA	7.5%
TAMPA-ST. PETERSBURG-CLEARWATER, FL	4.8%
TOLEDO, OH	0.4%
TOPEKA, KS	1.5%
TULSA, OK	2.4%
WASHINGTON, DC-MD-VA-WV	2.6%
WEST PALM BEACH-BOCA RATON, FL	4.0%
WICHITA, KS	1.5%
WILMINGTON-NEWARK, DE-MD	3.0%
YORK, PA	4.2%
YOUNGSTOWN-WARREN, OH	0.9%
<b>National</b>	<b>3.3%</b>

## Appendix E-9: Rate of Vaccine Refusal by County

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Jefferson	AL	1.4%
Madison	AL	0.9%
Benton	AR	3.5%
Craighead	AR	0.6%
Faulkner	AR	0.5%
Pulaski	AR	1.0%
Washington	AR	2.1%
Maricopa	AZ	7.6%
Los Angeles	CA	1.6%
Orange	CA	3.9%
Riverside	CA	2.8%
San Diego	CA	4.9%
Santa Clara	CA	2.6%
Adams	CO	6.9%
Arapahoe	CO	4.9%
Boulder	CO	4.1%
Denver	CO	7.7%
Douglas	CO	6.2%
El Paso	CO	5.9%
Jefferson	CO	5.4%
Larimer	CO	9.7%
Weld	CO	5.5%
Fairfield	CT	3.5%
Hartford	CT	0.9%
New Haven	CT	0.7%
New London	CT	1.0%
Kent	DE	2.1%
New Castle	DE	2.8%
Sussex	DE	2.9%
Broward	FL	6.0%
Duval	FL	6.7%
Hillsborough	FL	4.6%
Miami-Dade	FL	3.8%
Orange	FL	4.2%

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Palm Beach	FL	4.0%
Polk	FL	6.3%
Cherokee	GA	5.8%
Cobb	GA	4.2%
DeKalb	GA	2.5%
Forsyth	GA	4.0%
Fulton	GA	3.3%
Gwinnett	GA	4.1%
Muscogee	GA	0.7%
Ada	ID	3.0%
Canyon	ID	1.7%
Cook	IL	3.3%
DeKalb	IL	4.5%
DuPage	IL	5.5%
Grundy	IL	2.7%
Kane	IL	4.3%
Kankakee	IL	1.4%
Kendall	IL	4.9%
Lake	IL	2.6%
Madison	IL	2.8%
McHenry	IL	2.4%
McLean	IL	5.3%
Sangamon	IL	1.8%
Will	IL	2.9%
Winnebago	IL	2.1%
Allen	IN	1.0%
Bartholomew	IN	0.7%
Boone	IN	1.7%
Elkhart	IN	1.1%
Hamilton	IN	2.0%
Hancock	IN	0.6%
Hendricks	IN	1.2%
Johnson	IN	1.8%
Lake	IN	1.9%

**Rate of Vaccine Refusal by County** (continued)

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Marion	IN	1.6%
Monroe	IN	6.7%
Porter	IN	2.6%
Tippecanoe	IN	1.6%
Vanderburgh	IN	0.7%
Johnson	KS	7.7%
Sedgwick	KS	1.2%
Shawnee	KS	1.5%
Boone	KY	2.5%
Fayette	KY	2.0%
Jefferson	KY	2.8%
Bristol	MA	3.0%
Essex	MA	4.0%
Hampden	MA	3.7%
Middlesex	MA	2.5%
Norfolk	MA	3.5%
Plymouth	MA	7.4%
Suffolk	MA	2.2%
Worcester	MA	3.6%
Anne Arundel	MD	3.7%
Montgomery	MD	1.1%
Cumberland	ME	5.5%
York	ME	1.8%
Berrien	MI	1.3%
Calhoun	MI	3.1%
Genesee	MI	3.7%
Ingham	MI	1.5%
Kalamazoo	MI	0.8%
Kent	MI	2.0%
Livingston	MI	5.6%
Macomb	MI	12.7%
Monroe	MI	2.0%
Oakland	MI	11.2%
Ottawa	MI	1.7%
Saginaw	MI	1.0%
Washtenaw	MI	2.2%

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Wayne	MI	5.3%
Anoka	MN	4.5%
Dakota	MN	2.7%
Hennepin	MN	4.0%
Ramsey	MN	3.9%
Scott	MN	1.9%
Stearns	MN	1.0%
Washington	MN	2.6%
Wright	MN	4.8%
Clay	MO	3.0%
Greene	MO	2.8%
Jackson	MO	4.2%
Jasper	MO	5.2%
Jefferson	MO	2.2%
Platte	MO	5.3%
Guilford	NC	4.2%
Mecklenburg	NC	3.6%
Wake	NC	4.7%
Burleigh	ND	1.2%
Cass	ND	1.2%
Grand Forks	ND	1.3%
Ward	ND	3.8%
Douglas	NE	2.3%
Lancaster	NE	1.4%
Sarpy	NE	1.7%
Hillsborough	NH	2.3%
Rockingham	NH	2.2%
Bergen	NJ	8.9%
Burlington	NJ	7.5%
Camden	NJ	2.3%
Essex	NJ	9.3%
Gloucester	NJ	2.6%
Hudson	NJ	6.5%
Middlesex	NJ	3.5%
Monmouth	NJ	6.6%
Morris	NJ	9.0%

**Rate of Vaccine Refusal by County** (continued)

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Union	NJ	8.6%
Bernalillo	NM	4.6%
Clark	NV	2.2%
Washoe	NV	2.3%
Albany	NY	0.6%
Bronx	NY	5.7%
Dutchess	NY	10.3%
Erie	NY	8.3%
Kings	NY	8.9%
Monroe	NY	3.0%
Nassau	NY	13.7%
New York	NY	14.5%
Niagara	NY	5.8%
Onondaga	NY	2.3%
Orange	NY	5.4%
Queens	NY	9.8%
Richmond	NY	25.6%
Rockland	NY	8.2%
Saratoga	NY	1.8%
Suffolk	NY	14.6%
Westchester	NY	5.9%
Butler	OH	2.3%
Clermont	OH	4.3%
Cuyahoga	OH	1.5%
Delaware	OH	3.6%
Franklin	OH	3.1%
Greene	OH	3.2%
Hamilton	OH	2.7%
Lorain	OH	2.2%
Lucas	OH	0.4%
Mahoning	OH	1.1%
Medina	OH	2.3%
Miami	OH	3.1%
Montgomery	OH	2.5%
Stark	OH	3.5%
Summit	OH	1.5%

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Trumbull	OH	0.9%
Warren	OH	2.2%
Cleveland	OK	1.9%
Oklahoma	OK	2.5%
Tulsa	OK	2.4%
Multnomah	OR	6.4%
Washington	OR	6.6%
Allegheny	PA	2.2%
Beaver	PA	0.9%
Berks	PA	1.6%
Blair	PA	1.7%
Bucks	PA	5.3%
Butler	PA	2.9%
Cambria	PA	0.6%
Centre	PA	4.7%
Chester	PA	4.9%
Cumberland	PA	3.0%
Dauphin	PA	2.5%
Delaware	PA	5.2%
Erie	PA	4.6%
Fayette	PA	1.2%
Franklin	PA	5.9%
Indiana	PA	5.4%
Lancaster	PA	4.0%
Lebanon	PA	2.9%
Lehigh	PA	4.7%
Montgomery	PA	2.8%
Northampton	PA	4.0%
Philadelphia	PA	2.6%
Schuylkill	PA	1.0%
Washington	PA	2.0%
Westmoreland	PA	3.1%
York	PA	4.2%
Kent	RI	1.6%
Providence	RI	1.6%
Washington	RI	4.7%

**Rate of Vaccine Refusal by County** (continued)

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Berkeley	SC	0.9%
Charleston	SC	1.2%
Dorchester	SC	0.8%
Greenville	SC	1.9%
Horry	SC	0.6%
Lexington	SC	1.2%
Richland	SC	1.0%
Spartanburg	SC	1.1%
York	SC	1.7%
Davidson	TN	4.6%
Hamilton	TN	1.5%
Knox	TN	0.6%
Rutherford	TN	2.9%
Shelby	TN	1.2%
Sumner	TN	2.4%
Williamson	TN	3.3%
Bexar	TX	1.8%
Brazoria	TX	2.5%
Brazos	TX	1.4%
Collin	TX	3.4%
Dallas	TX	2.5%
Denton	TX	4.5%
El Paso	TX	0.7%
Fort Bend	TX	1.9%
Galveston	TX	3.2%
Harris	TX	2.5%
Hidalgo	TX	0.8%
Lubbock	TX	4.2%
Midland	TX	1.6%
Montgomery	TX	2.0%
Tarrant	TX	3.4%

County	State	Percent of infants in all years in study with at least one parental vaccination refusal
Travis	TX	12.6%
Webb	TX	0.0%
Williamson	TX	6.1%
Davis	UT	2.4%
Salt Lake	UT	2.4%
Chesapeake City	VA	1.8%
Chesterfield	VA	2.3%
Fairfax	VA	2.8%
Hampton City	VA	1.4%
Hanover	VA	3.0%
Henrico	VA	3.2%
James City	VA	2.6%
Loudoun	VA	2.4%
Montgomery	VA	2.1%
Newport News City	VA	1.6%
Prince William	VA	1.7%
Richmond City	VA	2.7%
Spotsylvania	VA	4.4%
Virginia Beach City	VA	3.0%
Benton	WA	2.8%
Clark	WA	6.7%
King	WA	7.4%
Pierce	WA	7.5%
Snohomish	WA	9.5%
Spokane	WA	3.9%
Dane	WI	4.3%
Milwaukee	WI	3.1%
Outagamie	WI	4.9%
Waukesha	WI	2.1%
Kanawha	WV	0.5%
<b>National</b>		<b>3.3%</b>