Results of the 2009 Immunization Status Survey Of 24-Month-Old Children in Tennessee

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Definitions of Abbreviations in Charts

1. **Vaccines**
    a. **DTaP: diphtheria, tetanus, acellular pertussis**
    b. **IPV: inactivated polio vaccine**
    c. **HAV: hepatitis A vaccine**
    d. **HBV: hepatitis B vaccine**
    e. **Hib: *Haemophilus influenzae,* type B vaccine**
    f. **MMR: measles, mumps, rubella**
    g. **Var: varicella (chickenpox) vaccine**
    h. **PCV7: heptavalent pneumococcal conjugate vaccine**
    i. **Flu: influenza vaccine**
2. **Public Health Regions**
    a. **Rural, multi-county regions**
        i. **NER: Northeast Region**
        ii. **ETR: East Tennessee Region**
        iii. **SER: Southeast Region**
        iv. **UCR: Upper Cumberland Region**
        v. **SCR: South Central Region**
        vi. **MCR: Mid-Cumberland Region**
        vii. **WTR: West Tennessee Region**
    b. **Metropolitan, single county regions**
        i. **SUL: Sullivan County**
        ii. **KKR: Knoxville-Knox County**
        iii. **CHR: Chattanooga-Hamilton County**
        iv. **NDR: Nashville-Davidson County**
        v. **JMR: Jackson-Madison County**
        vi. **MSR: Memphis-Shelby County**

Results of the 2009 Immunization Status Survey

Of 24-Month-Old Children in Tennessee

General:

The annual survey of the immunization status of 24-month-old children is conducted by the Tennessee Department of Health's (TDH) Immunization Program (TIP) to track progress toward achieving at least 90% on-time immunization with each routinely recommended vaccine for that population. The survey is composed of random, statistically-valid samples drawn from birth certificates of infants born in each of the 13 health department regions. The samples are aggregated to give statewide statistics on immunization coverage levels in Tennessee.

Definitions of target goals:
TIP's goal is for 90% of Tennessee's children to be completely immunized with each of 6 vaccines which protect against the following 10 diseases: diphtheria, tetanus, pertussis, (combined as DTaP); poliomyelitis (IPV); measles, mumps, rubella (combined as MMR); *Haemophilus influenzae* type B (Hib); hepatitis B (Hep B); and varicella (Var).

This survey uses the same definitions for complete immunization in this age group as the Centers for Disease Control and Prevention (CDC) National Immunization Survey (NIS). Complete immunization is defined as having received four doses of DTaP, three doses of IPV, one dose of MMR, three doses of Hib, three doses of Hep B, and one dose of varicella vaccine (abbreviated as **4:3:1:3:3:1**). Surveys conducted before 2002 defined complete immunization only using data from DTaP, polio vaccine and MMR (abbreviated as **4:3:1**) in children 24 months of age. For this reason, 4:3:1 data are provided in some charts where trends over time are analyzed, but the more comprehensive measure is otherwise used. More recently introduced routine vaccines, pneumococcal conjugate vaccine (PCV7, or Prevnar®), influenza vaccine (Flu) and hepatitis A (HAV) vaccine are assessed and reported individually, but are not included in the combined series measures. This 2009 survey reports the proportion of children receiving at least 4 doses of PCV7, 2 doses of Flu and 2 doses of HAV.

For the 2009 survey, the target goal for *Haemophilus influenzae* type B was changed from 3 doses to 2 doses because a vaccine shortage throughout 2008 led the CDC to drop the booster dose from the recommended schedule for all children who would have been aged 12-24 months during 2008. Thus, all assessments shown in this survey are **4:3:1:2:3:1 for 2009**. See the limitations section for additional information.

The 2009 sample population:
The 2009 statewide sample consisted of 1601 children born in the first quarter of 2007 (January, February and March). Oversampling for black children was done in each region where the random sample contained fewer black children than the actual proportion of black children born in the first quarter of 2007 in that region. The oversampled children (n=28 of the 1601) were included only in state-level analysis of black-white disparities. Of the 1601, 98 were excluded from the analysis for one of the following reasons: parents refused to participate (n=14) or the child had moved out of state (n=84; 83 from the original sample and 1 additional black child); 1503 children remained in the sample (including the 27 remaining oversampled records).

Of the 1503, no documentation of vaccination could be found for 26 children. Parents for 16 of these 26 children cited a religious (n=8), medical (n=1) or philosophical (n=7) reason for not vaccinating their children; the remaining 10 children could not be located by health department staff. There were no children whose parents indicated that they refused further vaccination for any reason after their child received after at least one dose of vaccine. By protocol, all of these children are included in the analysis.

Statistical notes:
The survey is designed to allow valid statistical comparisons of the populations in each of the 13 health department regions; however, sample sizes are too small to yield interpretable results at the county level within multi-county rural health department regions.

Ninety-five percent confidence intervals (CI) were calculated and are displayed as box-whisker plots on graphs in this report to permit assessment of the statistical significance of differences in point estimates. Confidence intervals that do not overlap indicate that the point-estimate differences being compared have at least a 95% chance of representing true differences in the populations being compared. CI were not calculated for surveys before 2007.

Limitations of the survey:

Influenza (Flu)
Children born in the first quarter of 2007 who received every routinely recommended vaccine on time could have received 3 doses of influenza vaccine. This survey reports the percentage of children who received at least 2 doses of influenza vaccine.

Hib
Two different Hib vaccine schedules may be used, depending upon the Hib formulation used. The Merck product requires a 2-dose primary series with a booster dose after the first birthday; the Sanofi Pasteur product requires a 3-dose primary series, with a booster dose after the first birthday. Because brand names are not captured in this survey, the standard estimate of completion has traditionally been the measure of three doses of Hib vaccine by 24 months, with the recognition that this definition may include some children who received only three doses of the 4-dose product. The result is an overestimation of on-time completion: more than 90% of children in our survey have achieved this goal for several years.

In December 2007, Merck voluntarily recalled certain lots of its Hib-containing vaccines and suspended production of Hib vaccine. In response to this shortage, the Advisory Committee on Immunization Practices (ACIP) recommended that the booster dose of Hib be deferred for all healthy children until the shortage resolved. This recommendation was not lifted until the late summer of 2009. All children in this survey cohort would have been subject to this reduced dose schedule. For this reason, **the 2009 survey uses a 2 dose measure for Hib series completeness**, which is the coverage level most comparable to the usual 3-dose measure in previous years.

In this 2009 survey, all aggregate measures of complete coverage are 4:3:1:**2**:3:1 and will be compared to past 4:3:1:3:3:1 measures.

Minimum intervals
On-time immunization may be overestimated because data analysis does not take into account whether dose intervals or age at administration meets Centers for Disease Control and Prevention (CDC) recommendations. Minimum intervals have not been assessed in previous surveys; to add these criteria would limit the ability to compare current coverage to past survey results.

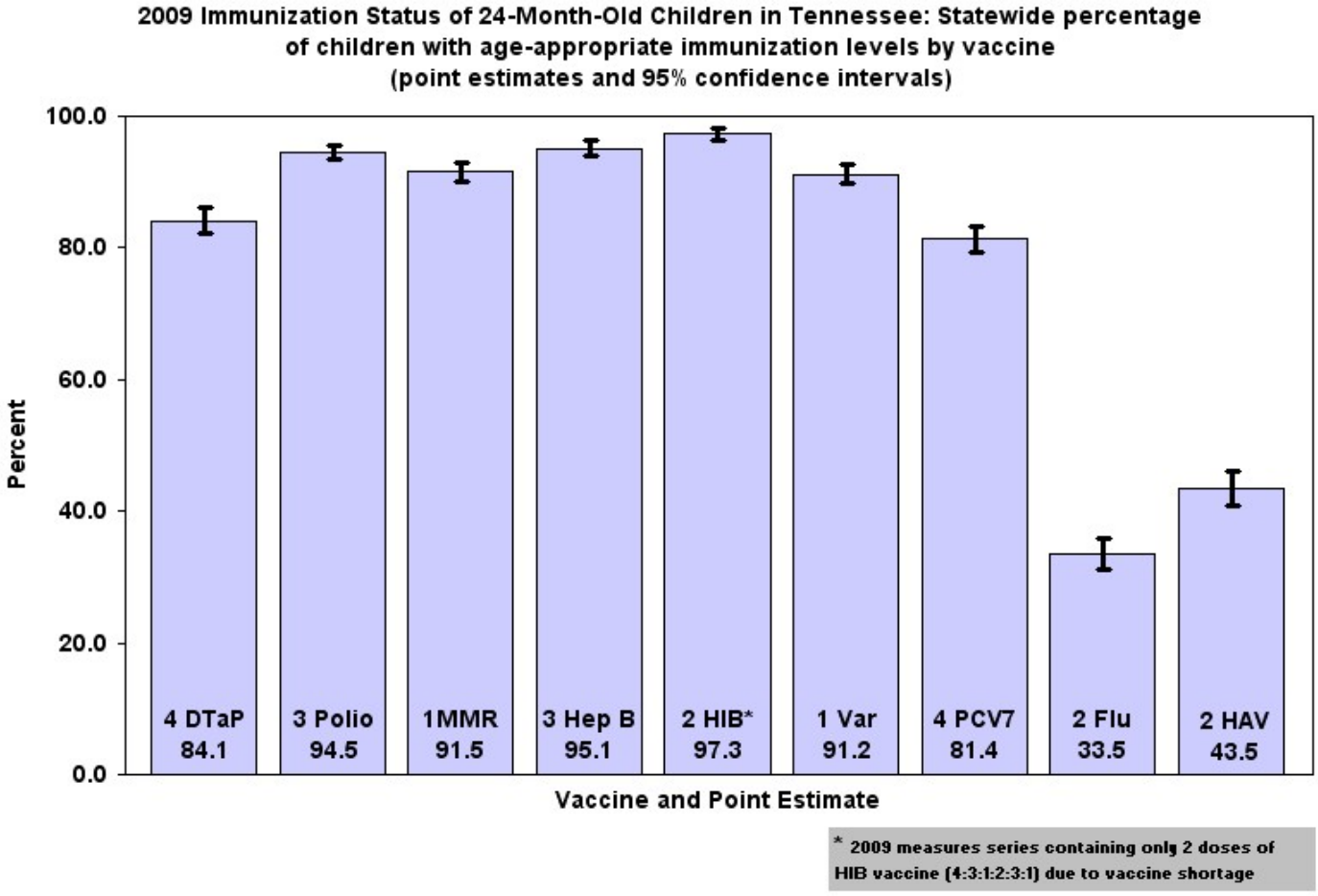
Statewide Results and Trend Analysis:

Vaccine specific on-time immunization coverage

The proportion of children sampled who had been immunized on-time, by individual vaccine, is in Figure 1, below. The percentage of children with on-time immunization documented for each vaccine in the target vaccine series was over 90% for each vaccine in the target vaccine series except for the fourth dose of DTaP. In 2009, 97.3% of children had received at least 2 doses of Hib vaccine, using the revised completeness measure that reflects the reduced schedule recommended by ACIP (70.7% of children received three doses).

Appendix 1 of this report contains charts displaying the percentages of children with documented on-time immunization for each vaccine in across all health department regions and statewide. In July 2010, a single dose of hepatitis A vaccine will be required for all children aged 18 months or older in child care facilities in Tennessee. A chart of region and statewide coverage with one dose of hepatitis A is provided in Appendix 1.

Figure 1



Complete 4:3:1:2:3:1 immunization levels statewide and by public health region

The percentage of children with on-time immunization for all vaccines in the 4:3:1:2:3:1 series, both statewide and in each public health region are presented in Figure 2 below. Statewide 4:3:1:2:3:1 coverage was 80.8% (95% CI: 78.7-82.8%) with no regional coverage rates dropping below 75% or statistically significantly different than the state rate.

Comparisons with 2008 coverage levels are shown in Figure 3. The 4:3:1:3:3:1 coverage level for 2009, not shown in the charts below for reasons explained previously, was 64.9%.

Appendix 2 of this report contains charts for each public health region displaying the percentage of children in each region who were immunized on-time for each of the vaccines and for the 4:3:1:2:3:1 aggregate series.

Figure 2

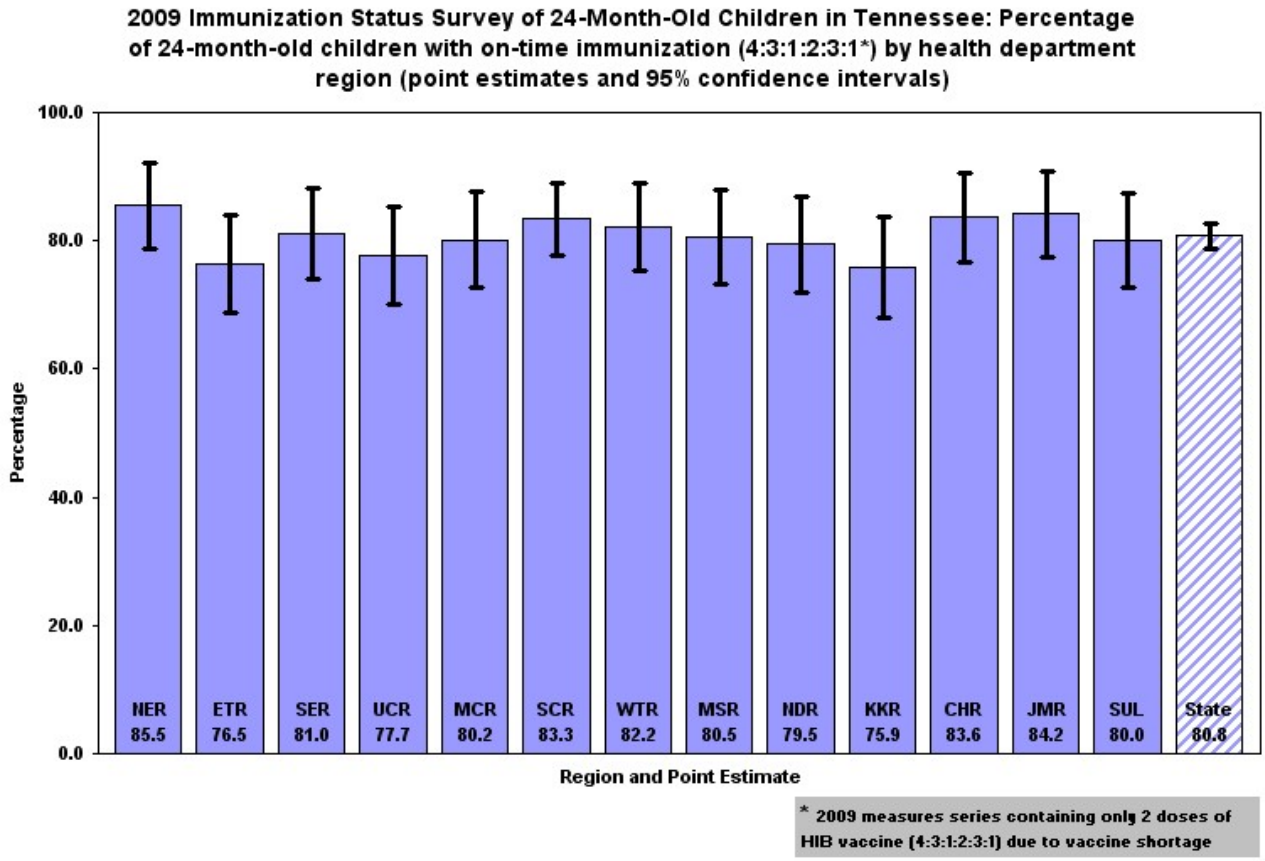
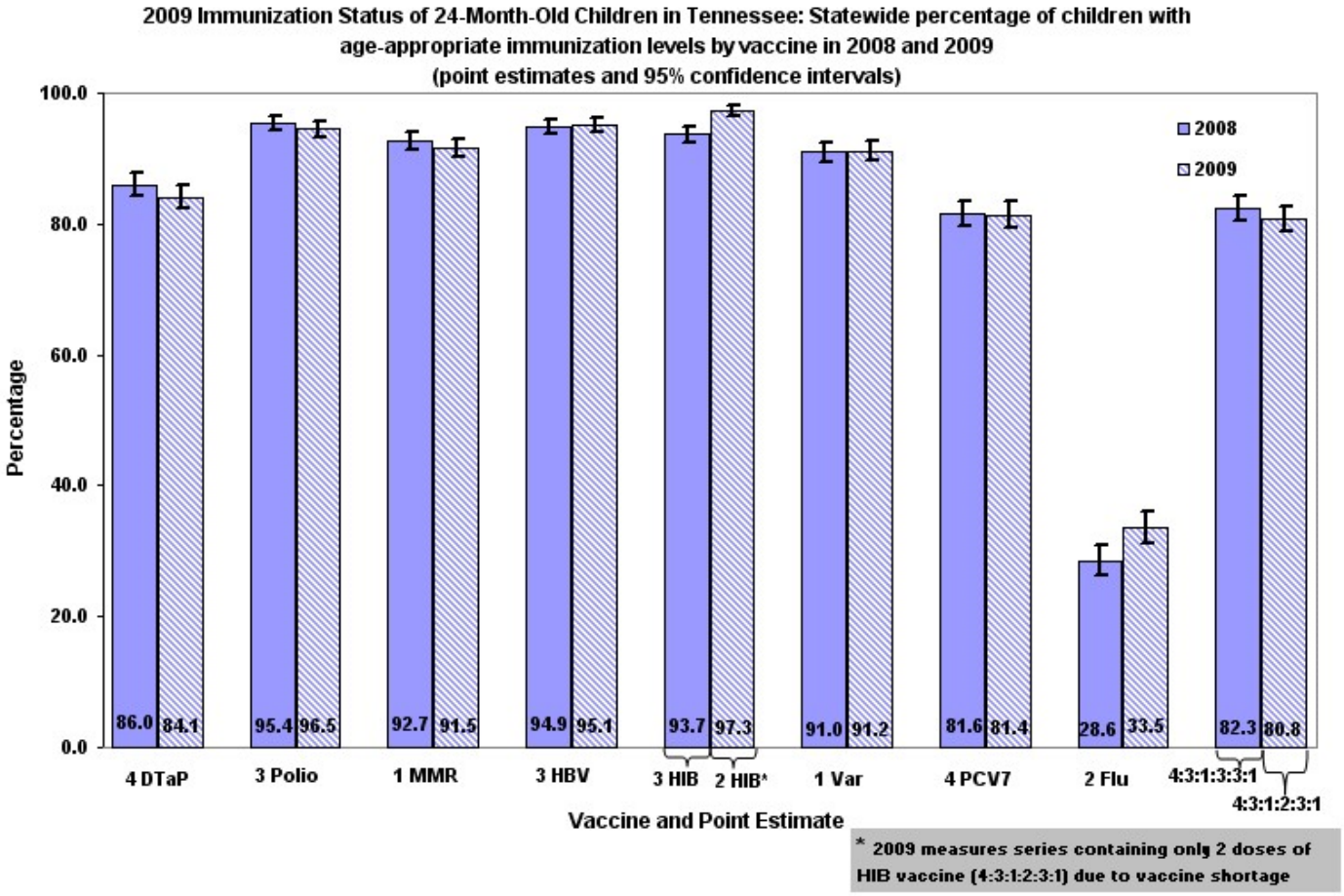


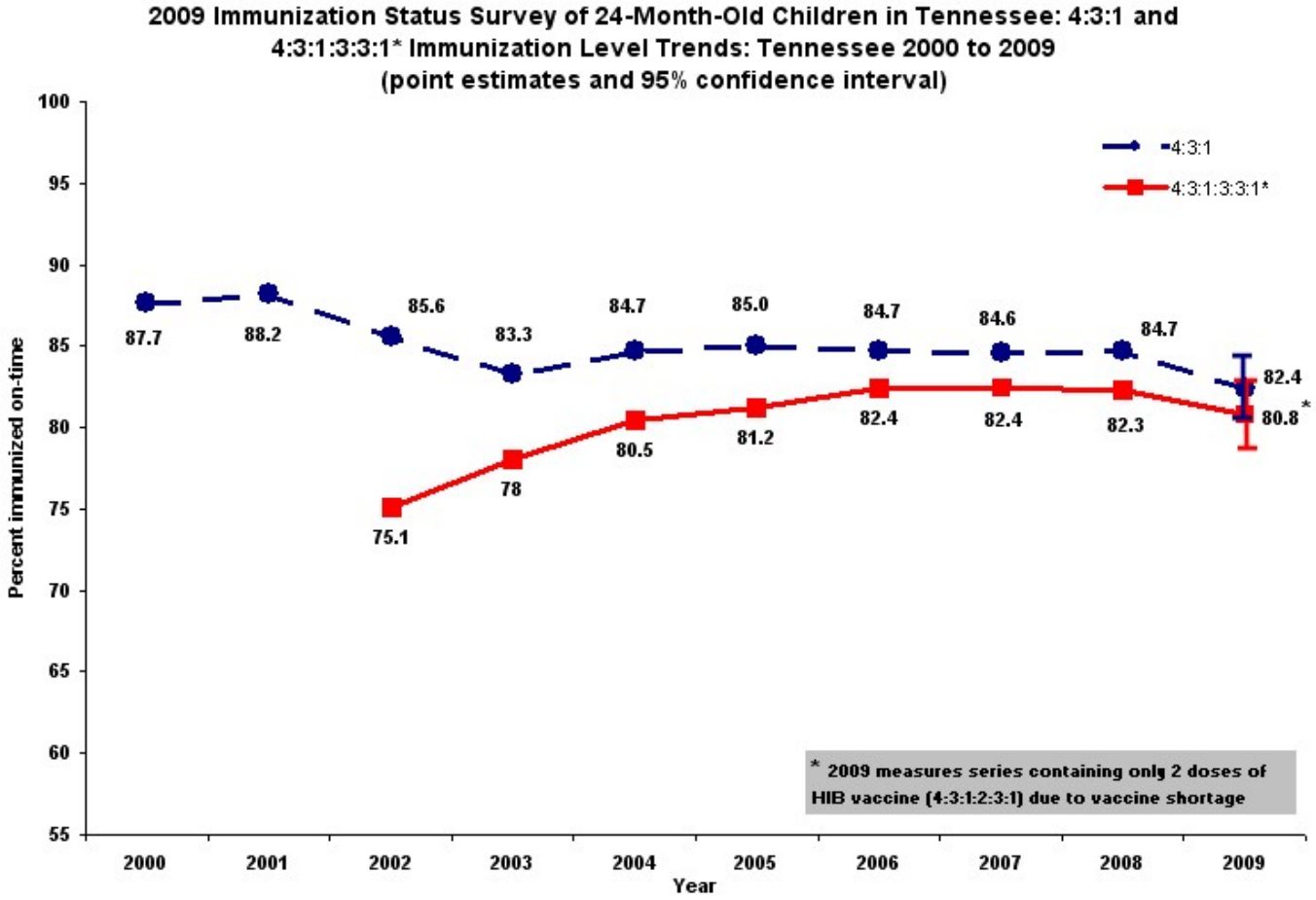
Figure 3


2009 Immunization Status of 24-Month-Old Children in Tennessee: Statewide percentage of children with age-appropriate immunization levels by vaccine in 2008 and 2009 (point estimates and 95% confidence intervals)
100.0
80.0
60.0
40.0
20.0
0.0
Percentage
2008
2009
86.0
84.1
95.4
96.5
92.7
91.5
94.9
95.1
93.7
97.3
91.0
91.2
81.6
81.4
28.6
33.5
82.3
80.8
4 DTaP
3 Polio
1 MMR
3 HBV
3 HIB
2 HIB*
1 Var
4 PCV7
2 Flu
4:3:1:3:3:1
4:3:1:2:3:1
Vaccine and Point Estimate
* 2009 measures series containing only 2 doses of HIB vaccine (4:3:1:2:3:1) due to vaccine shortage

State coverage trends over time

Figure 4 below compares the 4:3:1 and 4:3:1:3:3:1 levels of on-time immunization measured by this survey from 2000 to 2008 and the 4:3:1:2:3:1 level in 2009. Over time, these two lines have converged with point estimates that were not significantly different. This indicated that children who receive DTaP, IPV and MMR on time almost always receive other routine vaccines on time, as well. The 4:3:1:2:3:1 estimate for 2009 was 80.8%.

Figure 4



Racial disparities

The disparity between black and white children in on-time immunization improved in the second half of the 1990s with the introduction of TennCare and the Vaccines for Children (VFC) Program, as measured by state immunization surveys conducted after these programs began. In recent years, the gap in 4:3:1:3:3:1 on-time immunization measured in this survey between black and white children has fluctuated from year to year. In 2009, a statistically insignificant difference was seen with 4:3:1:2:3:1 coverage with 82.8 % (95% CI: 78.1-87.5) in black children versus 79.9% (95% CI: 77.7-82.2). The sample size of children of other races (n=25) was too small to be meaningfully interpreted; this group was excluded from the analysis. Figure 5 shows the differences in the 4:3:1:3:3:1 series over time from 2004-2008 and the 4:3:1:2:3:1 coverage in 2009

Figure 5

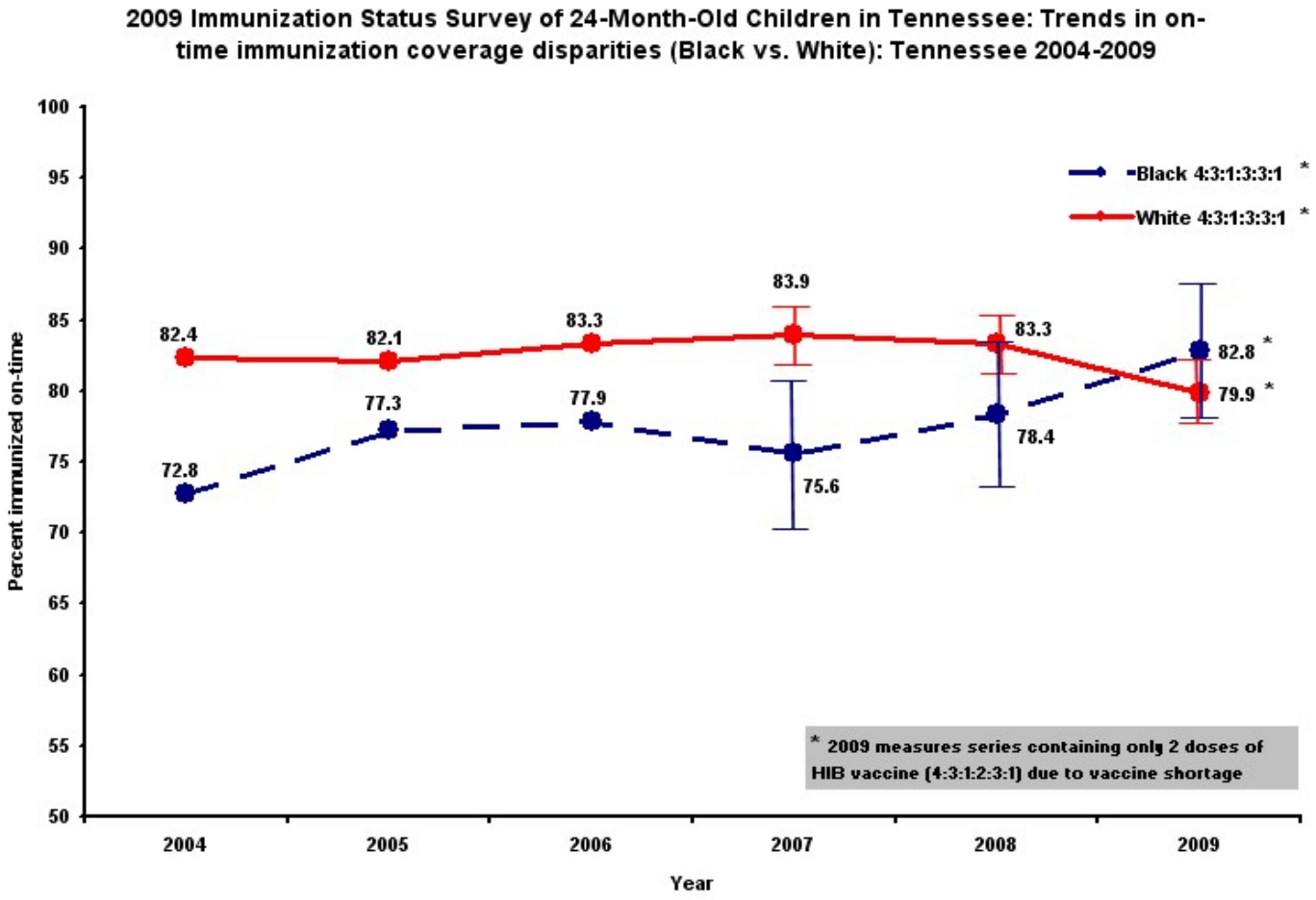
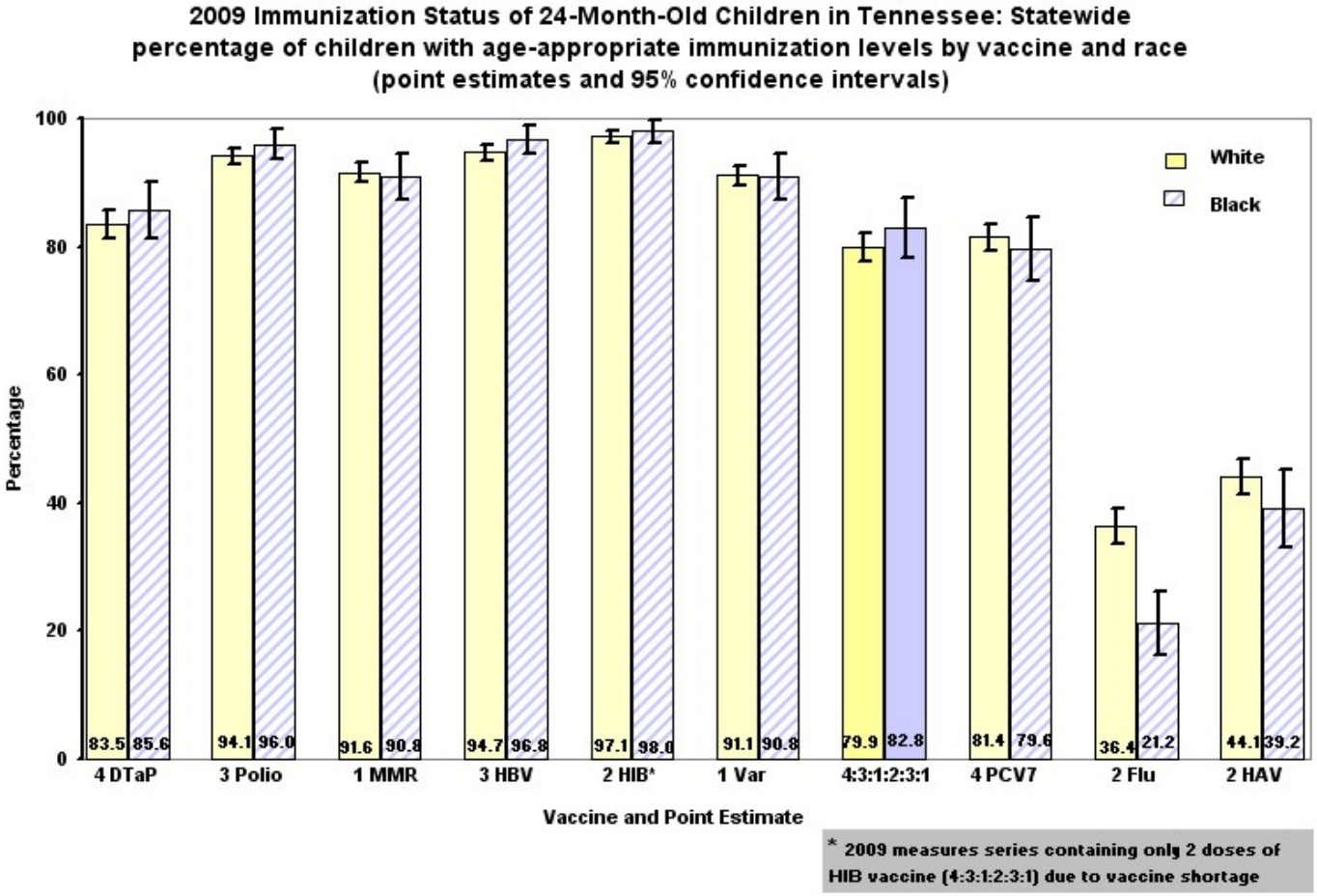


Figure 6 shows the percentages of children, categorized by race, with on-time immunization for each vaccine measured. Among vaccines included in the 4:3:1:2:3:1 series, no statistically significant differences between blacks and whites were seen. Even though some improvement is seen in the number of children of both races receiving at least 2 doses of flu vaccine, the wide racial disparity in immunization against influenza persists unchanged from 2008, at 15 percentage points.

Figure 6



Immunization among selected sub-populations

Previous surveys have identified certain characteristics associated with failure to complete the recommended series of immunizations on time: starting immunizations at greater than 120 days of life, having two or more siblings, and being black (as described above). In the 2009 survey, children with just one sibling were also significantly less likely to complete immunization on time, compared to children with no siblings. This gap in completion rates are statistically significant for the modified 4:3:1:2:3:1 series for children receiving all their vaccinations in a public health setting as compared those receiving their vaccines from a private provider.

There was no difference in coverage between TennCare enrolled and non-enrolled children, or among WIC enrolled or non-enrolled children. Children who begin their immunizations after 120 days remain the most likely to fail to be fully vaccinated by their second birthday. Table 1 below summarizes the 2009 on-time completion rates for 4:3:1:2:3:1 in these groups.

Table 1

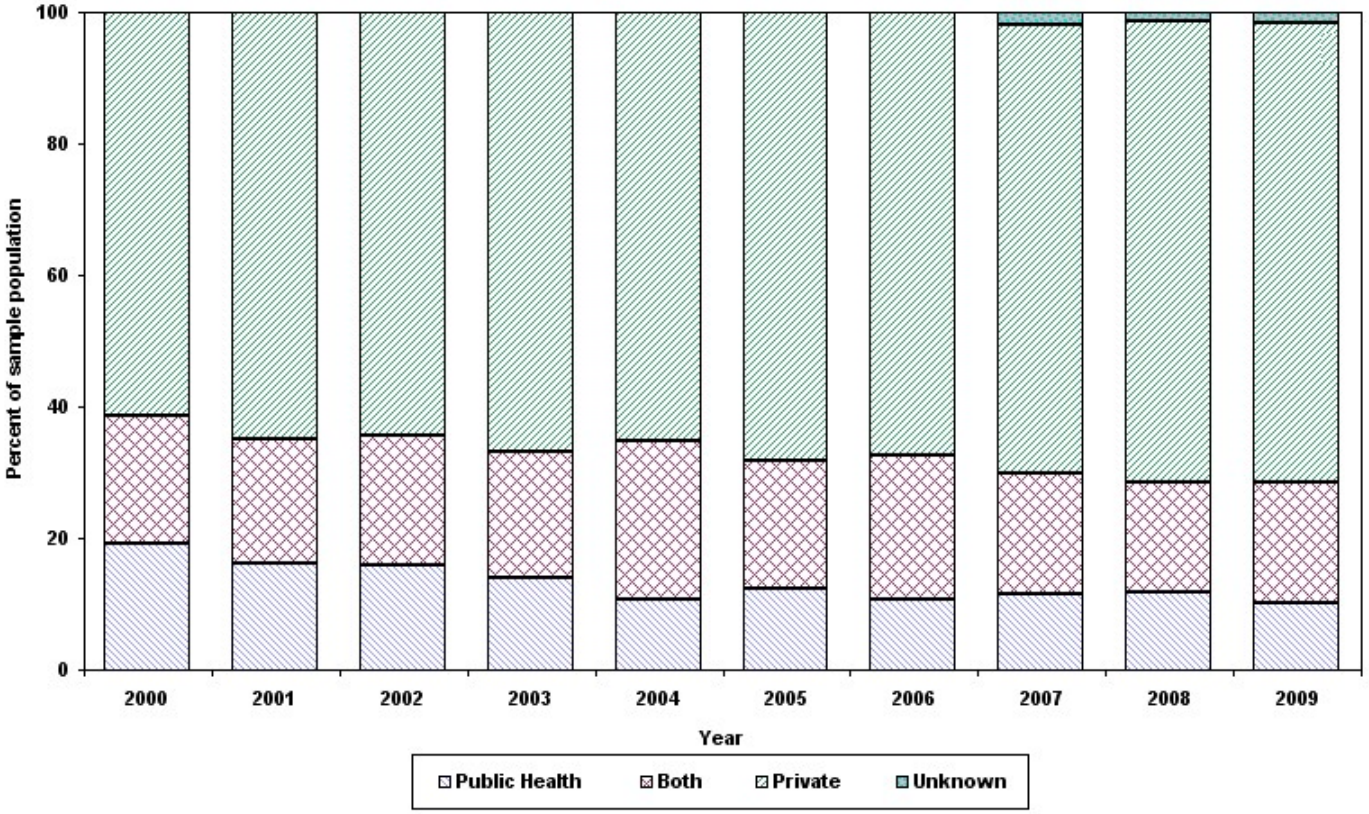
4:3:1:2:3:1 Completion Levels in the 2009 Survey of 24-Month-Old Children: Selected Characteristics			
Provider Type	Public n=108/150	Private n=855/1032	Both n=229/269
	72.0% ± 7.19	**82.9% ± 2.30**	**85.1% ± 4.25**
TennCare Enrollment	Enrolled n=682/843	Not Enrolled n=510/633	
	80.9% ± 2.65	**80.6% ± 3.08**	
WIC Enrollment	Enrolled n=751/930	Not Enrolled n=441/546	
	80.8% ± 2.53	**80.8% ± 3.31**	
Other Siblings	None n=518/600	One n=396/506	Two or more n=272/362
	86.3% ± 2.75	**78.3% ± 3.59**	**75.1% ± 4.45**
Age at First Immunization	≤120 days n=1184/1426	120 days n=8/25	
	83.0% ± 1.95	**32.0% ± 18.29**	

Immunization provider types and patient populations

The downward trend in the proportion of children immunized in a public health setting began in the second half of the 1990s when TennCare and the Vaccines for Children (VFC) Program enabled many children to receive immunizations in their medical home. That trend has been stable for several years. In 2009, 10.2% of children surveyed received their immunizations exclusively at a public health facility. The percentage of children who were vaccinated exclusively in private settings was unchanged (69.9%). Figure 6 below shows the trend over time.

Figure 7

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Source of Immunizations from 2000 to 2009



The difference measured in on-time coverage rates between public and private clinic patients in the survey reached statistical significance in 2009. This can be attributed in part to the higher prevalence of risk factors for delayed immunization among the public health patient population. Table 2 below shows the prevalence of these risk factors among patients in this survey who were immunized in health departments, private offices, and in a combination of public and private clinics.

Table 2

Prevalence of risk factors for delayed immunizations in the survey population by provider type			
Risk Factor	Health Department	Both Private and Public	Private Only
Black	**22.0% (33/150)**	**21.2% (57/269)**	**12.7% (121/1032)**
2 or more siblings	**31.3% (47/150)**	**28.6% (77/269)**	**15.5% (227/1025)**
Age at first dose >120 days	**6.0% (9/150)**	**1.5% (4/269)**	**1.2% (12/1032)**
Any of above risk factors	**50.0% (75/150)**	**43.1% (116/269)**	**32.2% (332/1032)**

Summary of key findings from the 2009 Survey:

1. The statewide point estimate of on-time administration of all vaccines in the 4:3:1:3:3:1 series was level from 2006-2008 (82.3-82.4%). Due to an extended shortage of Hib vaccine beginning December 2007, the ACIP deferred the booster dose for this birth cohort: all 2009 aggregate analyses were conducted with a modified vaccine series (a 4:3:1:**2**:3:1 series) for a statewide coverage measure of 80.8%.
2. The Department of Health's goal of reaching at least 90% on-time coverage with each vaccine that is included in the 4:3:1:2:3:1 series was achieved for all vaccines except DTaP (84.1%). DTaP vaccination remains the critical barrier to improving overall immunization coverage. The 4th DTaP is traditionally the most difficult because it requires 4 doses to be complete. Immunization improvement efforts need to focus on this target.
3. The percentage of children with 4 doses of PCV7 was estimated at 81.4%; however, 95.1% of children in the survey had received at least 3 doses by 24 months of age (see Appendix 1).
4. The percentage of children who had received at least 2 doses of influenza vaccine by 24 months increased. One third of children surveyed in 2009 (33.5%) received 2 or more doses of influenza vaccine: annual increases have been measured since this survey began tracking influenza (18.4% in 2007 and 28.6% in 2008). Despite gains in most jurisdictions, extreme regional disparities in coverage with this vaccine were measured again, ranging from 54.8% coverage in Sullivan County to just 15.3% coverage in West Tennessee Region (see Appendix 1 for influenza charts). A pronounced racial disparity persists in influenza vaccine coverage.
5. The disparity measured between black and white children in on-time immunization for the 4:3:1:3:3:1 series has fluctuated over the last decade and remained statistically insignificant in 2009.
6. Analyses of TennCare and WIC enrolled children compared to those not enrolled are presented in Appendix 3. For the second year in a row, large and significant differences were detected in immunization against influenza: children in both TennCare and WIC were less well-immunized against influenza.

Proposed actions based on survey results:

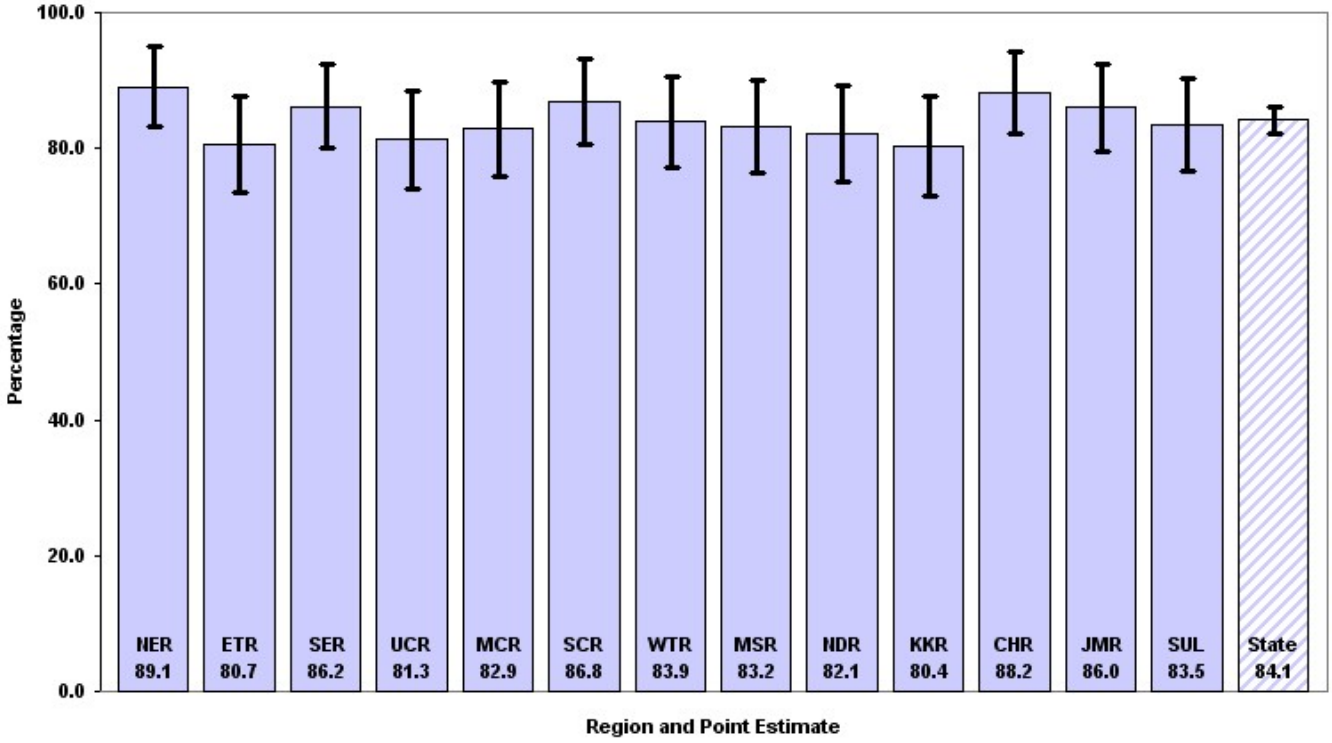
The Immunization Program (TIP) plans to take the following steps to improve on-time immunization of 24-month-old children.

1. New childcare immunization requirements, effective July 2010, will require age-appropriate immunization against pneumococcal disease and one dose of HAV.
2. TIP will continue to encourage both public and private providers to improve the DTaP 4 level by ensuring that the DTaP 3 is administered by 6 months of age so DTaP 4 may be administered by 12 months of age whenever possible.
3. TIP also will emphasize in its educational efforts the importance of having a system to recall patients who have missed doses of vaccine, such as those who are in need of DTaP4.
4. TIP will share survey findings with WIC and TennCare leadership to inform their strategies to improve on-time immunization of their patient populations, with a particular focus on improving influenza vaccine coverage.
5. TIP will continue to work through the annual Immunization Spring Review and other educational venues to increase awareness among public and private providers of risk factors for delayed immunization, including black race (for influenza), having multiple siblings, and delayed start to immunization.
6. TIP will continue to educate public and private immunization providers about their performance and opportunities to improve through assessment site visits conducted in 25-33% of health department clinics and private Vaccines for Children Program participant offices each year. These visits include reports of levels of on-time immunization documented in medical records; site visitors help staff address areas for improvement in immunization service delivery.
7. The 2011 survey will continue to report on the 4:3:1:3:3:1 vaccines, PCV7, influenza, and hepatitis A vaccines, and will add rotavirus vaccine coverage of infants for the first time.

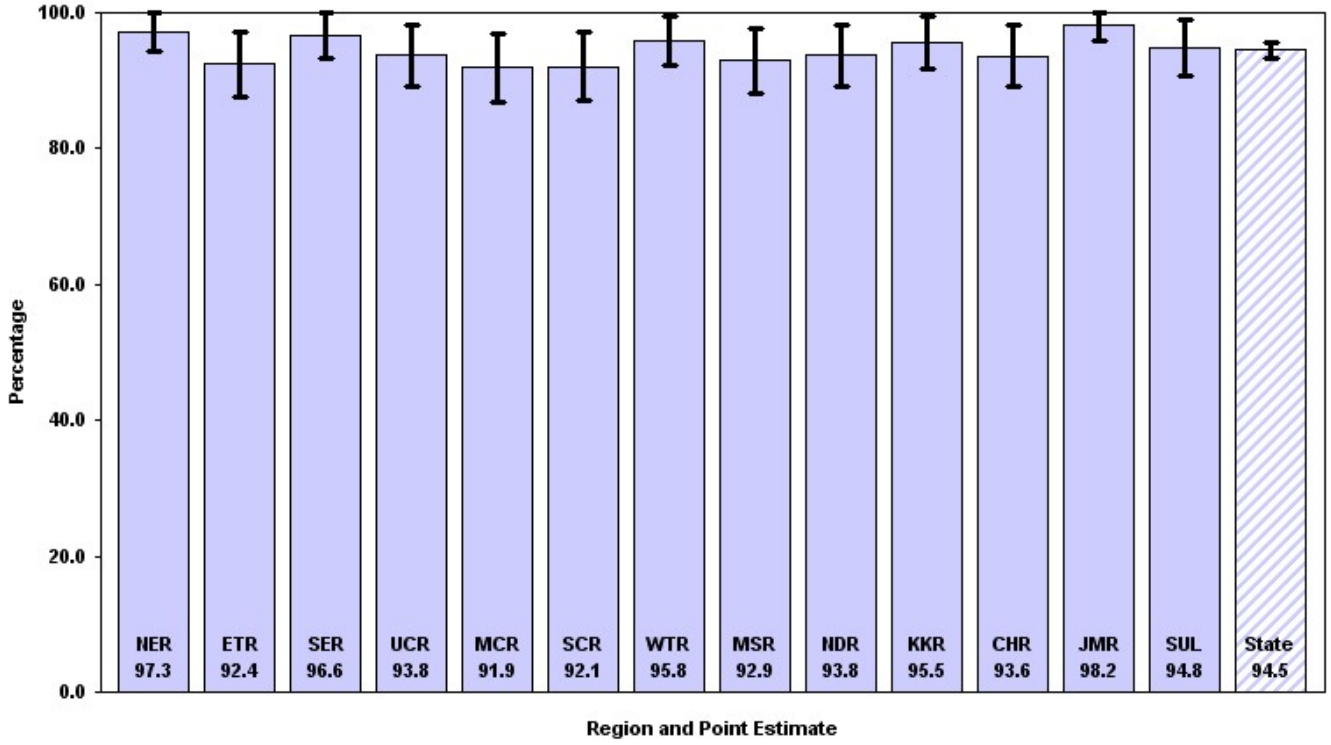
Appendix 1
2009 Immunization Status Survey
Of 24-Month-Old Children in Tennessee

Immunization coverage for each vaccine assessed across all health department regions and statewide

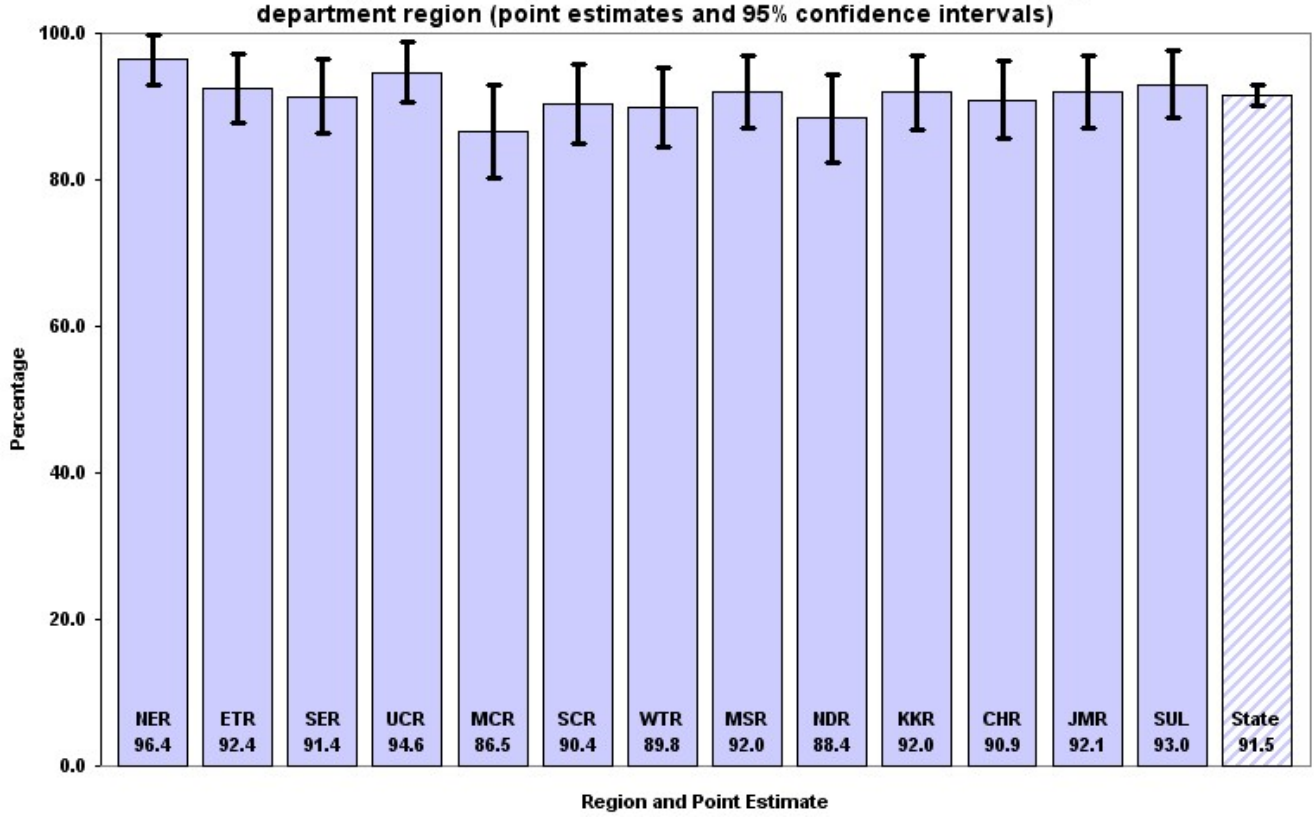
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete diptheria, tetanus and acellular pertussis (DTaP) series (4 doses) by health department region (point estimates and 95% confidence intervals)



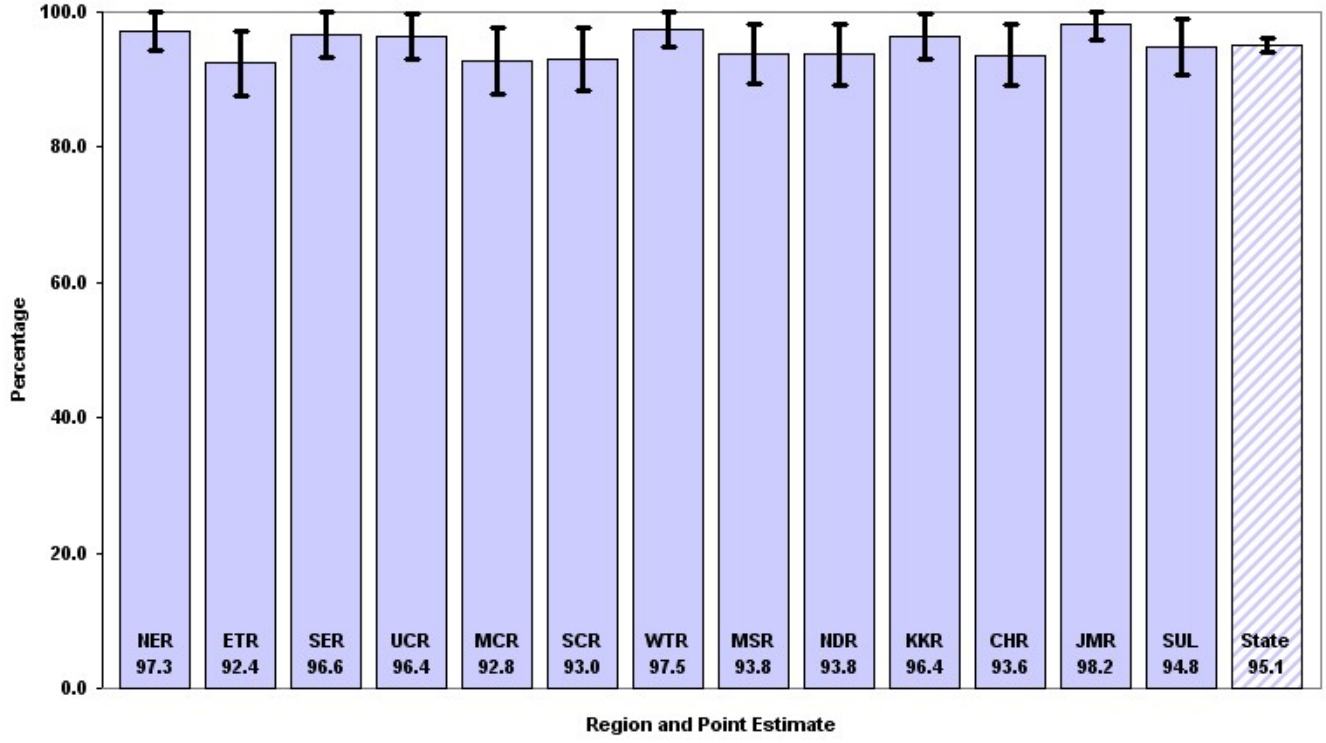
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete polio (IPV) series (3 doses) by health department region (point estimates and 95% confidence intervals)

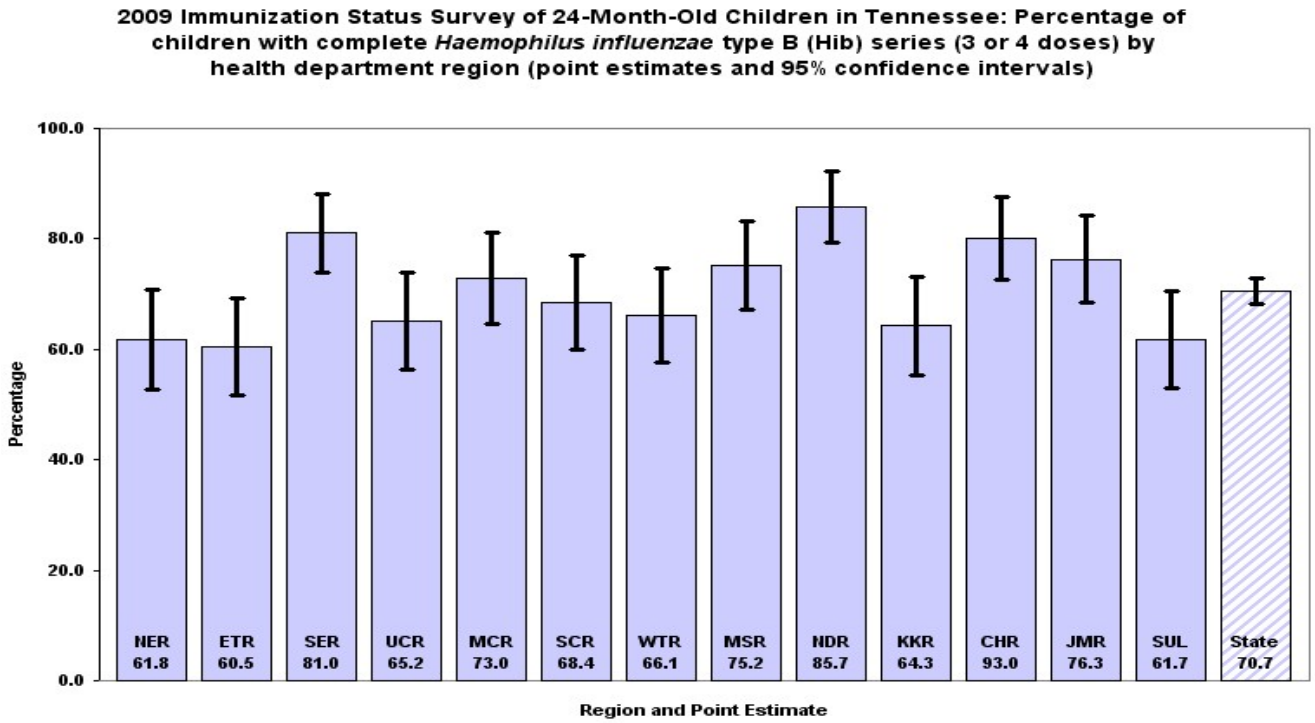


2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete measles, mumps, and rubella (MMR) series (1 dose) by health department region (point estimates and 95% confidence intervals)

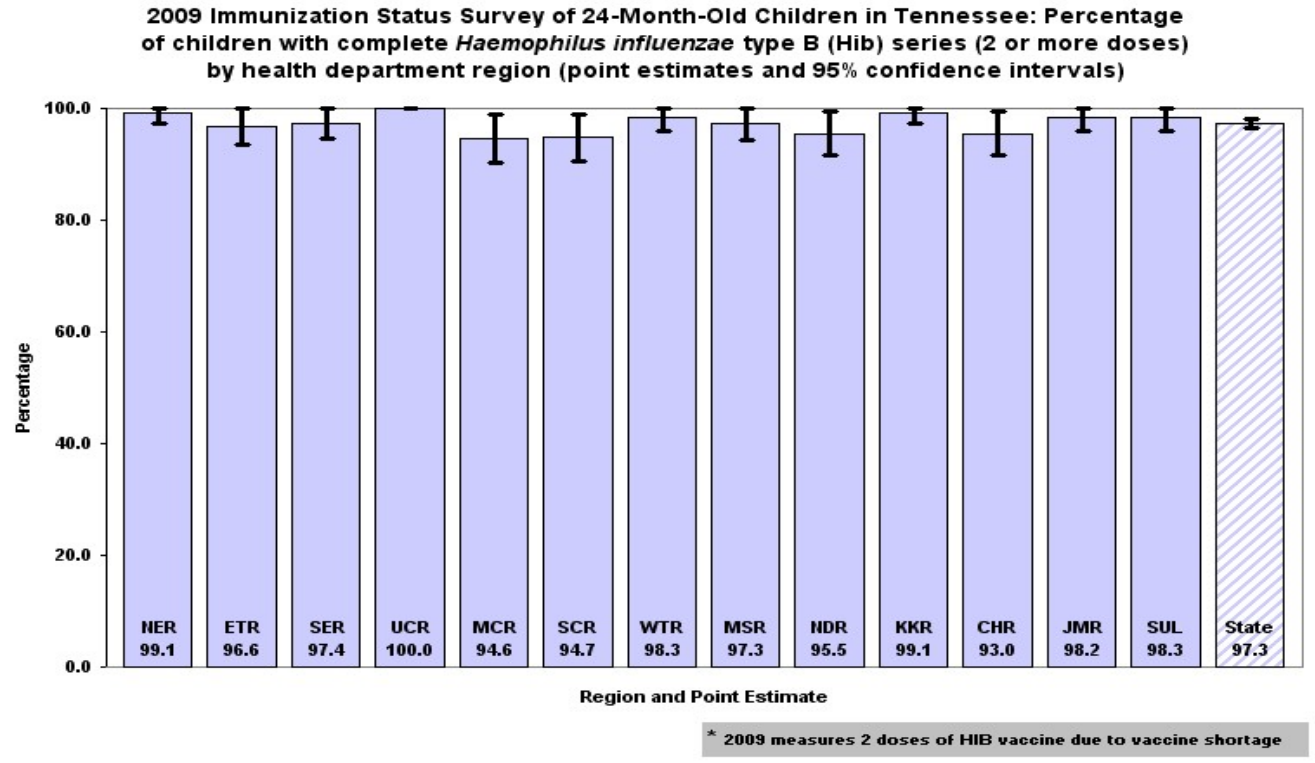


2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete Hepatitis B (HBV) series (≥3 doses) by health department region (point estimates and 95% confidence intervals)

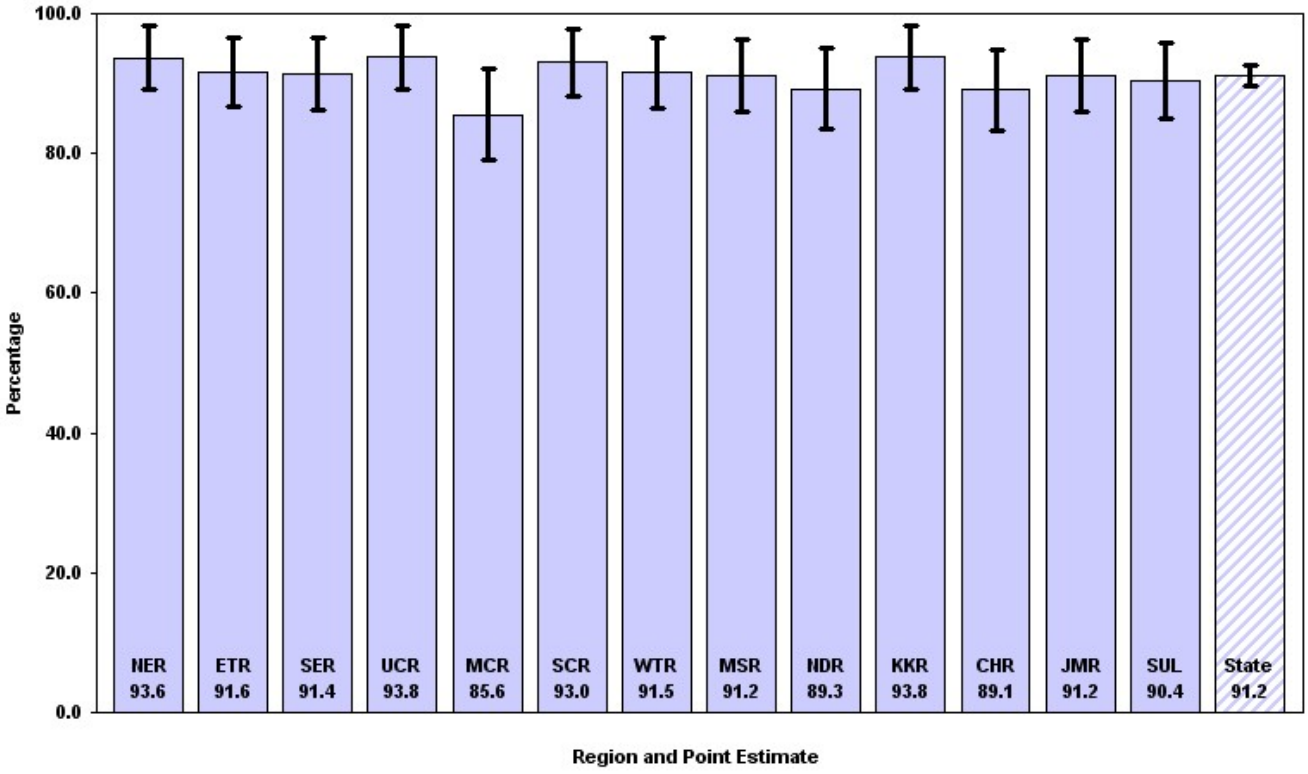




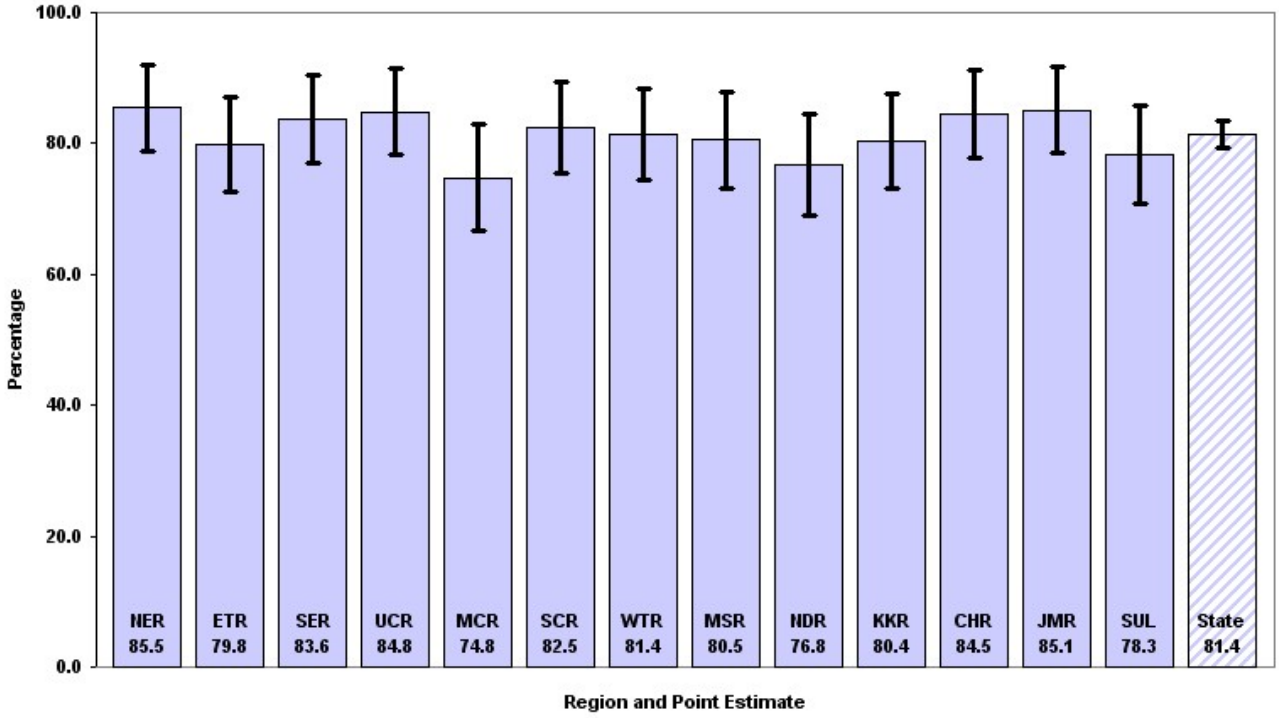
Wide disparities in coverage levels may incorporate regional differences in the prevalence of use of Merck brand products (2 dose primary series). The official ACIP schedule was reduced by 1 dose because of the deferral of the booster dose for this age cohort, thus, the valid assessment is the assessment below of 2-dose coverage with Hib vaccine.



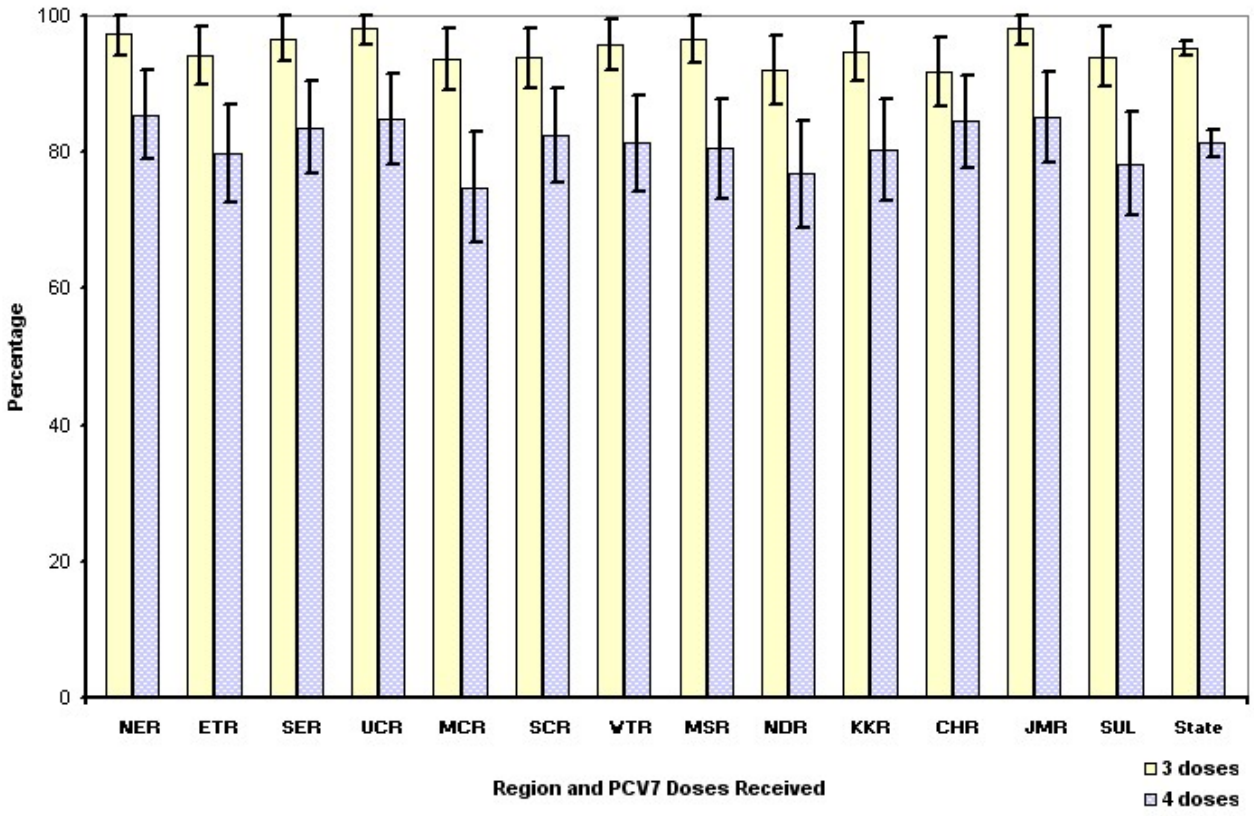
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete varicella series (1 dose) by health department region (point estimates and 95% confidence intervals)



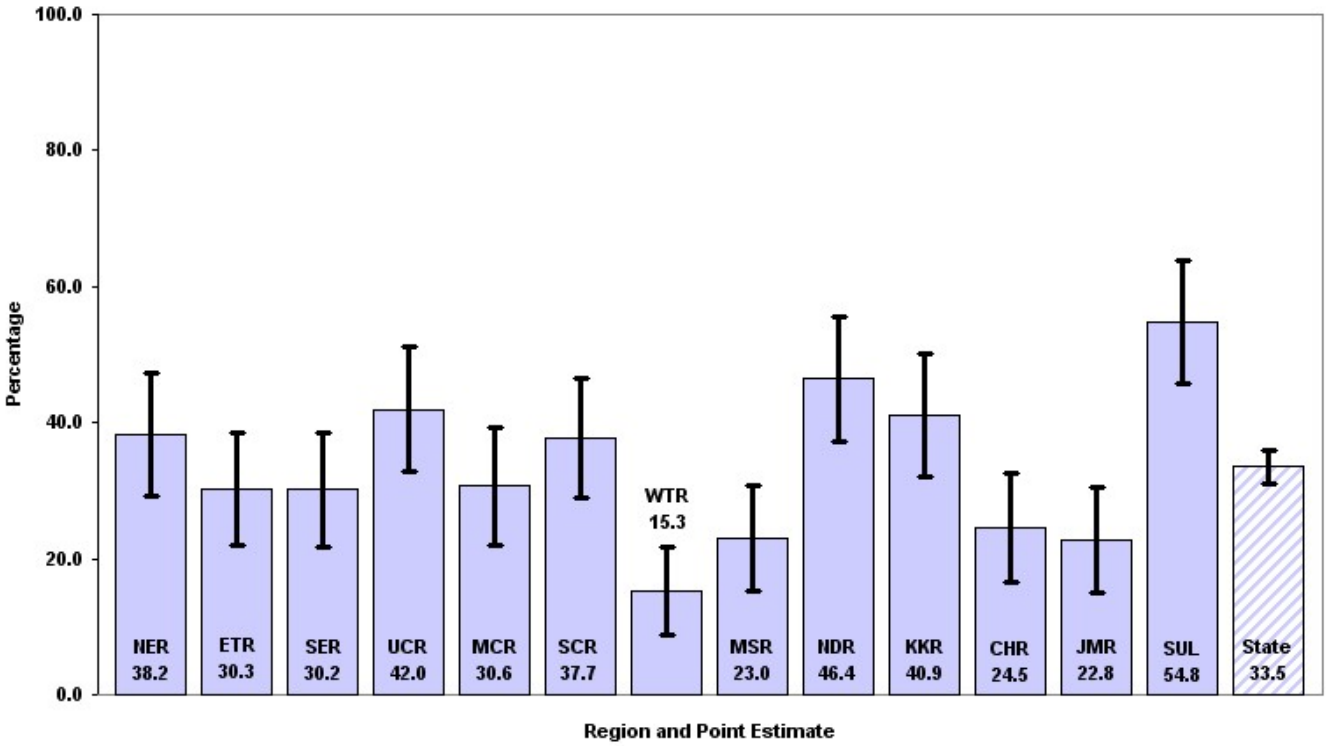
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete PCV7 series (4 doses) by health department region (point estimates and 95% confidence intervals)



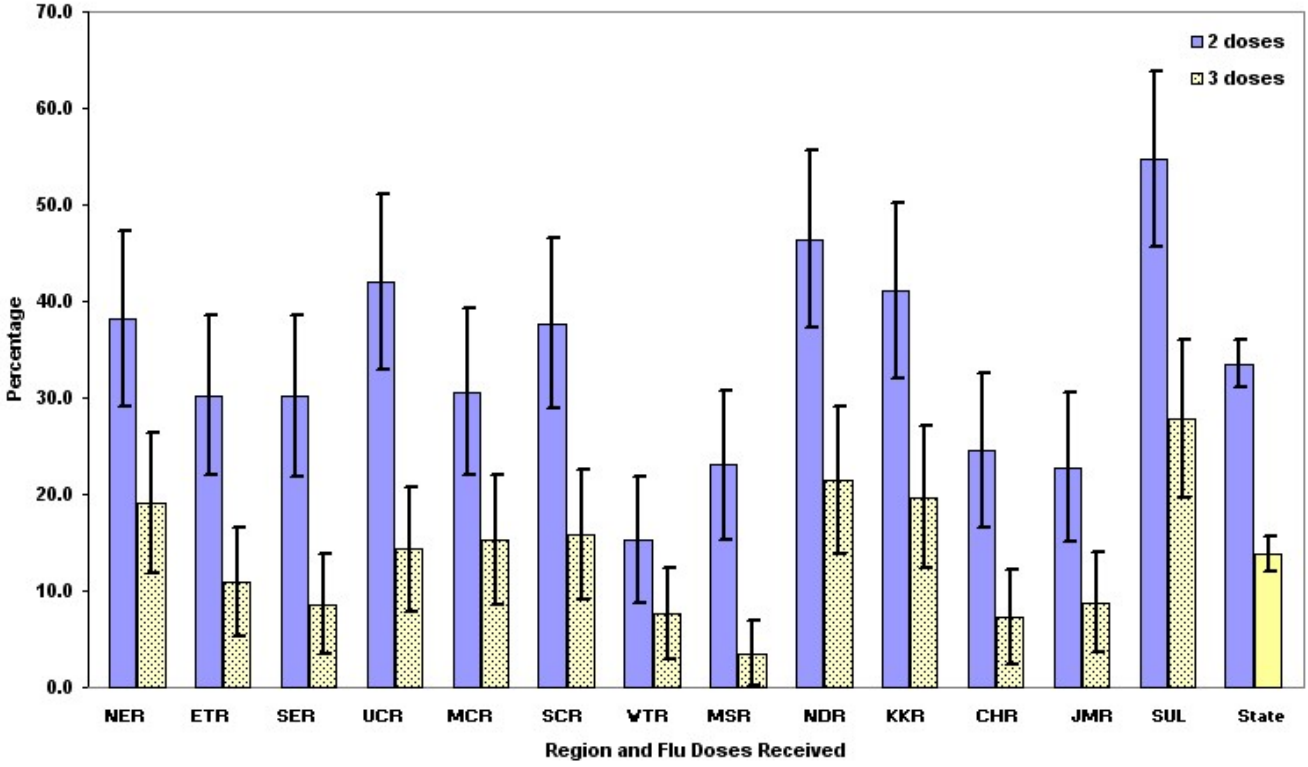
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with 3 or 4 doses of PCV7 by health department region



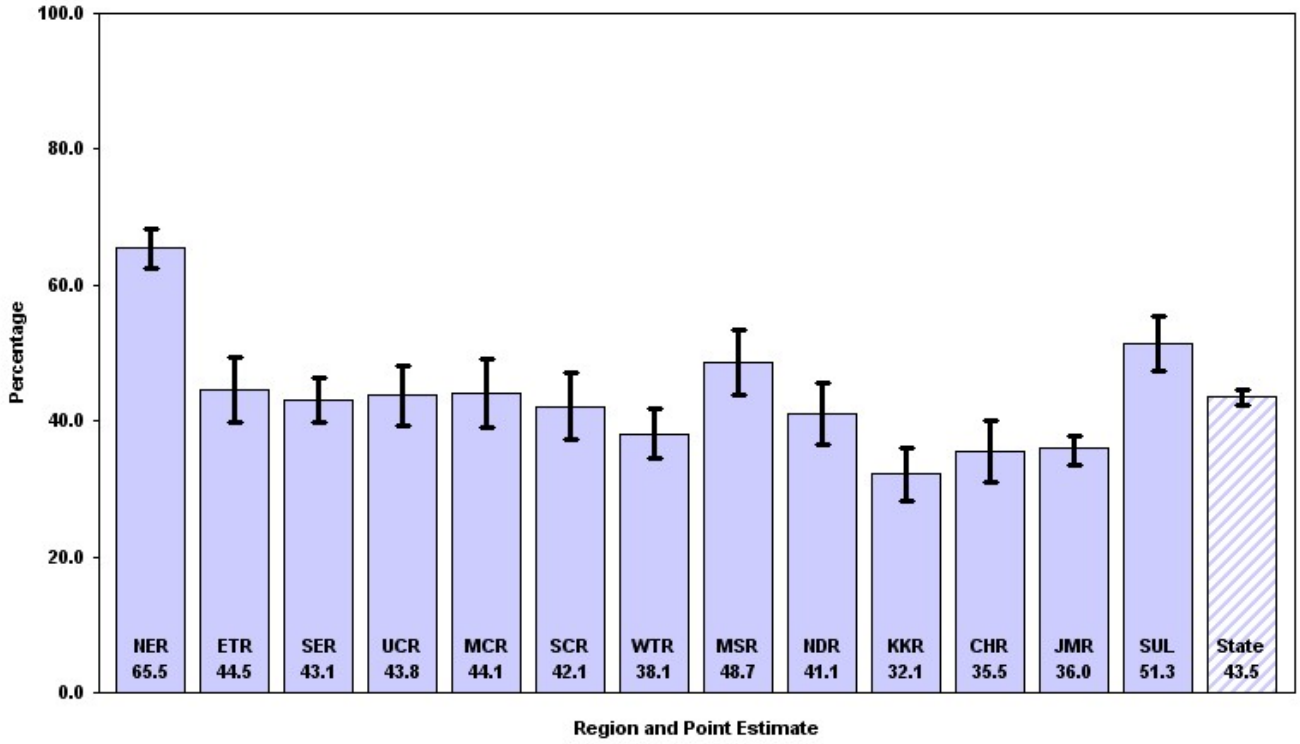
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with 2 doses of influenza vaccine by health department region (point estimates and 95% confidence intervals)



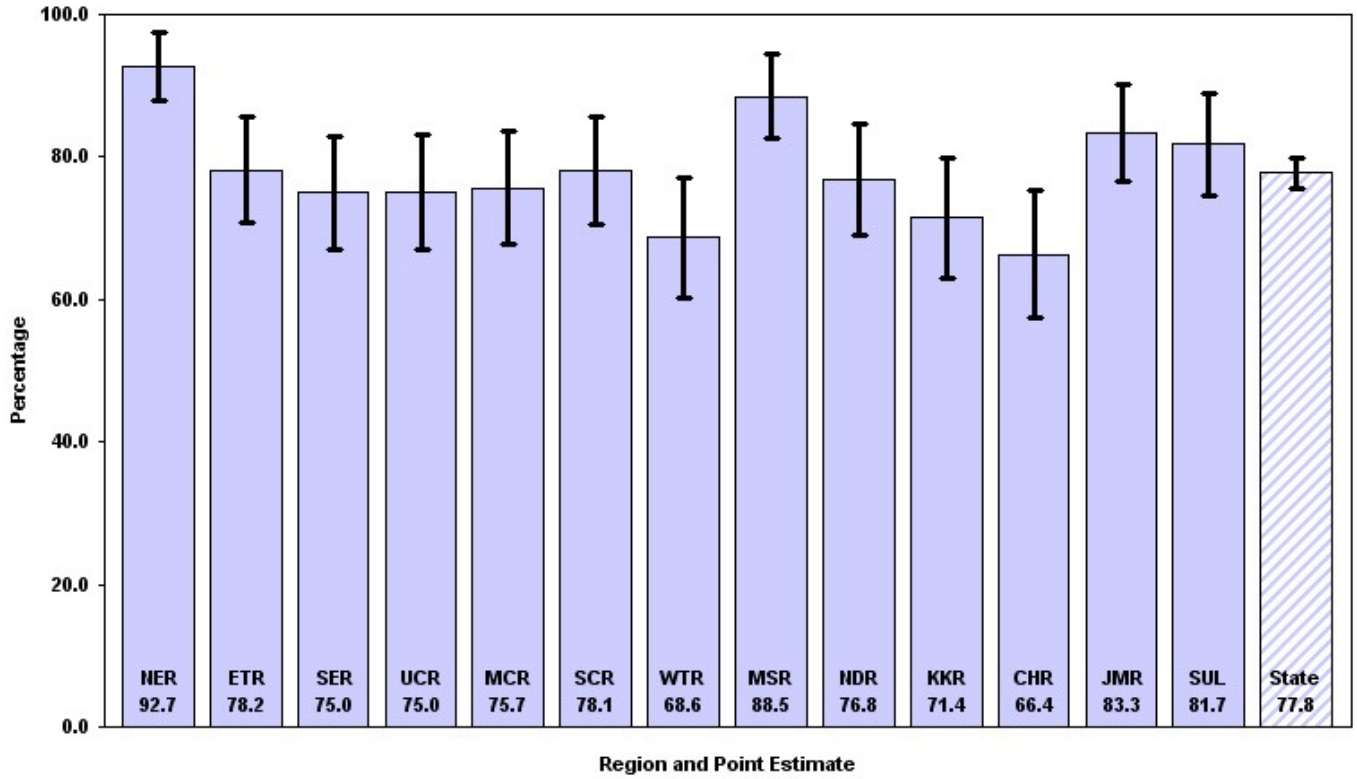
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with 2 or 3 doses of Influenza vaccine by health department region (point estimates and 95% confidence intervals)



2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete Hepatitis A (HAV) series (2 doses) by health department region (point estimates and 95% confidence intervals)



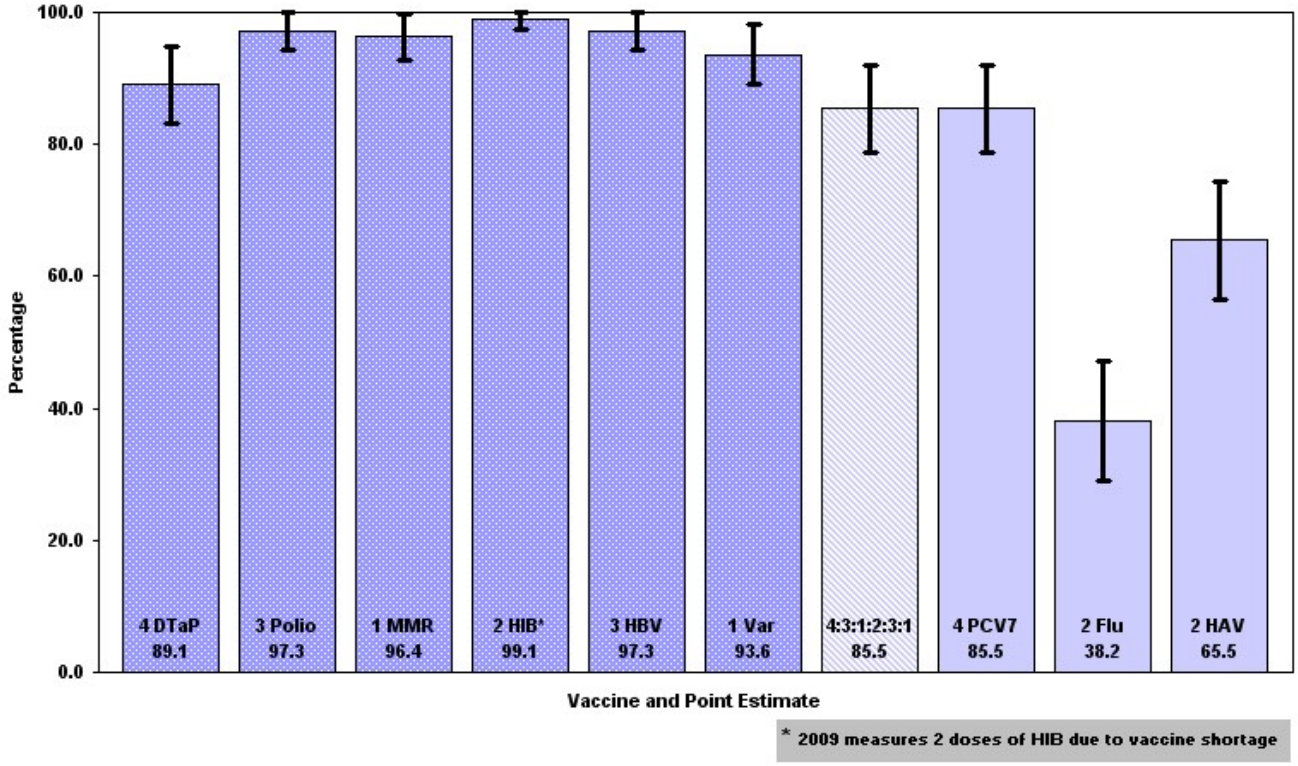
2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete Hepatitis A (HAV) series (1 dose) by health department region (point estimates and 95% confidence intervals)



Appendix 2
2009 Immunization Status Survey
Of 24-Month-Old Children in Tennessee

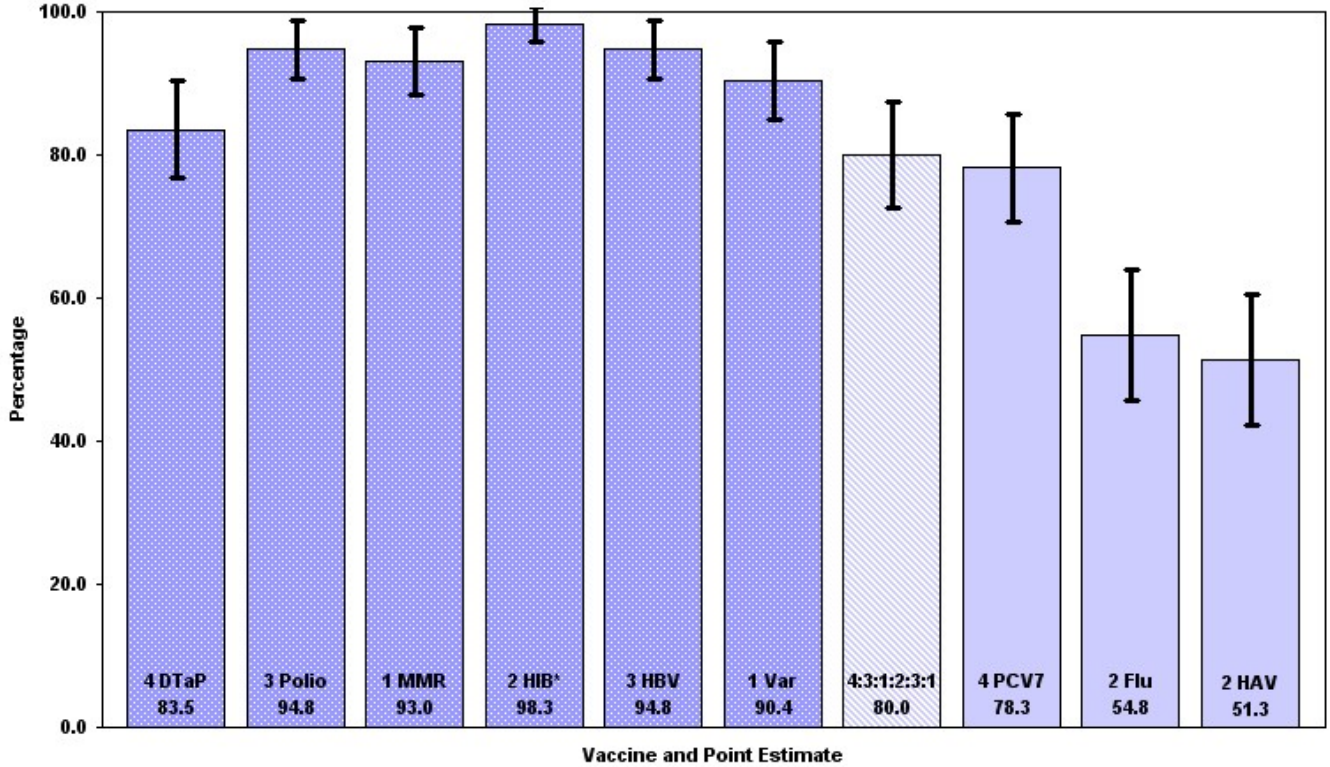
Immunization coverage measured in each Public Health Region

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Northeast Region (NER) by vaccine (point estmates and 95% confidence intervals)



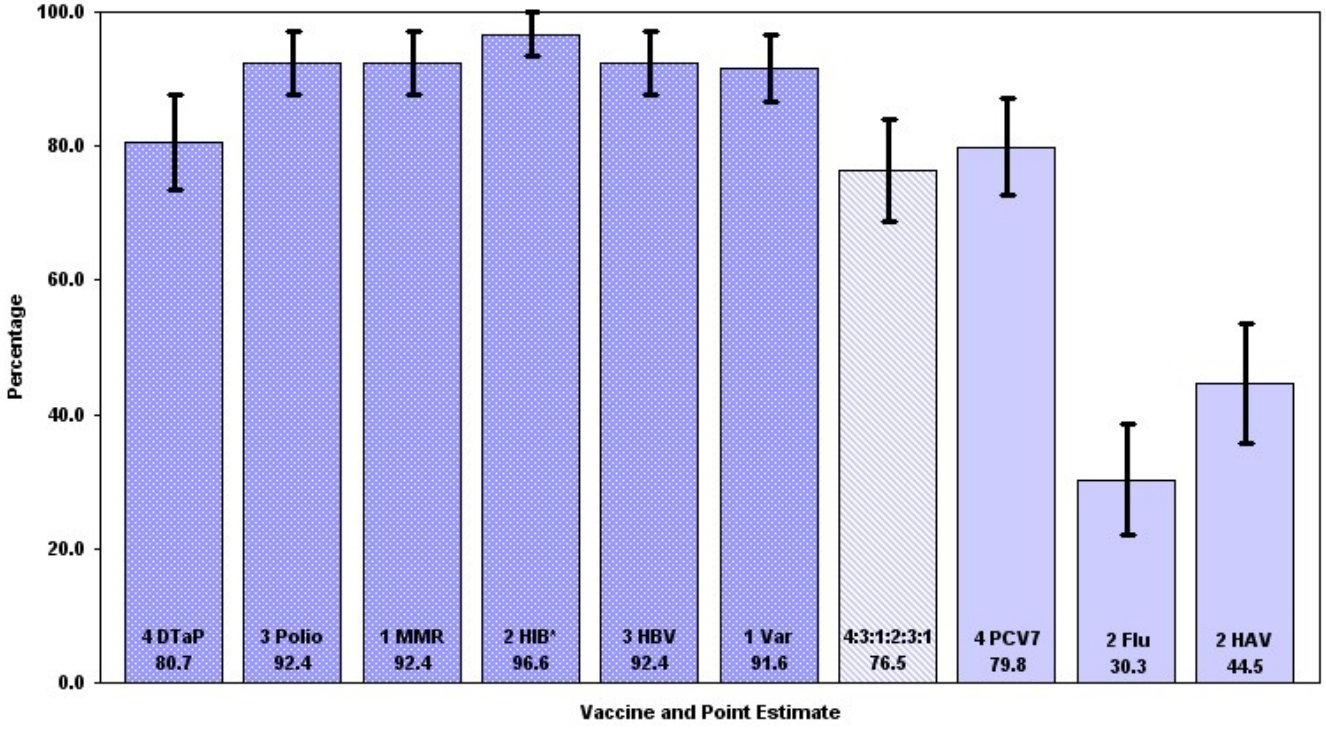
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Sullivan Region (SUL) by vaccine (point estimates and 95% confidence intervals)



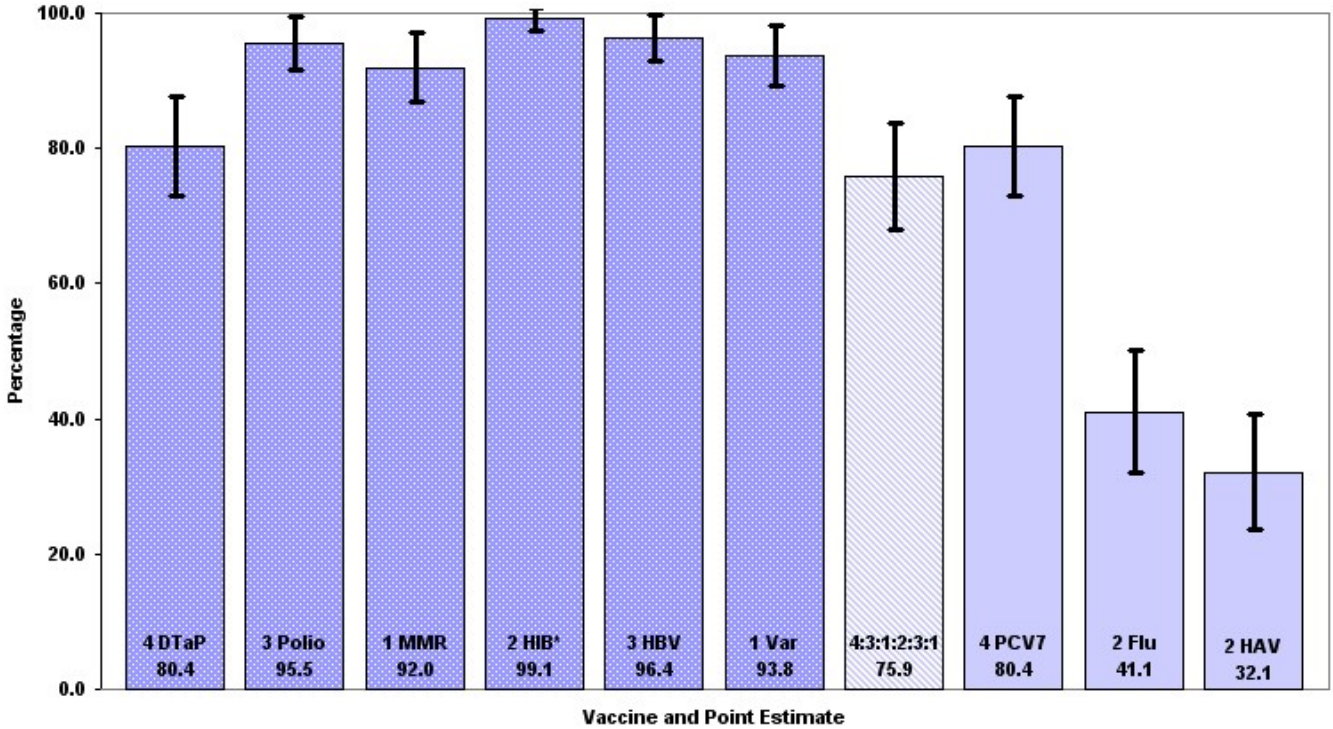
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in East Tennessee Region (ETR) by vaccine (point estmates and 95% confidence intervals)



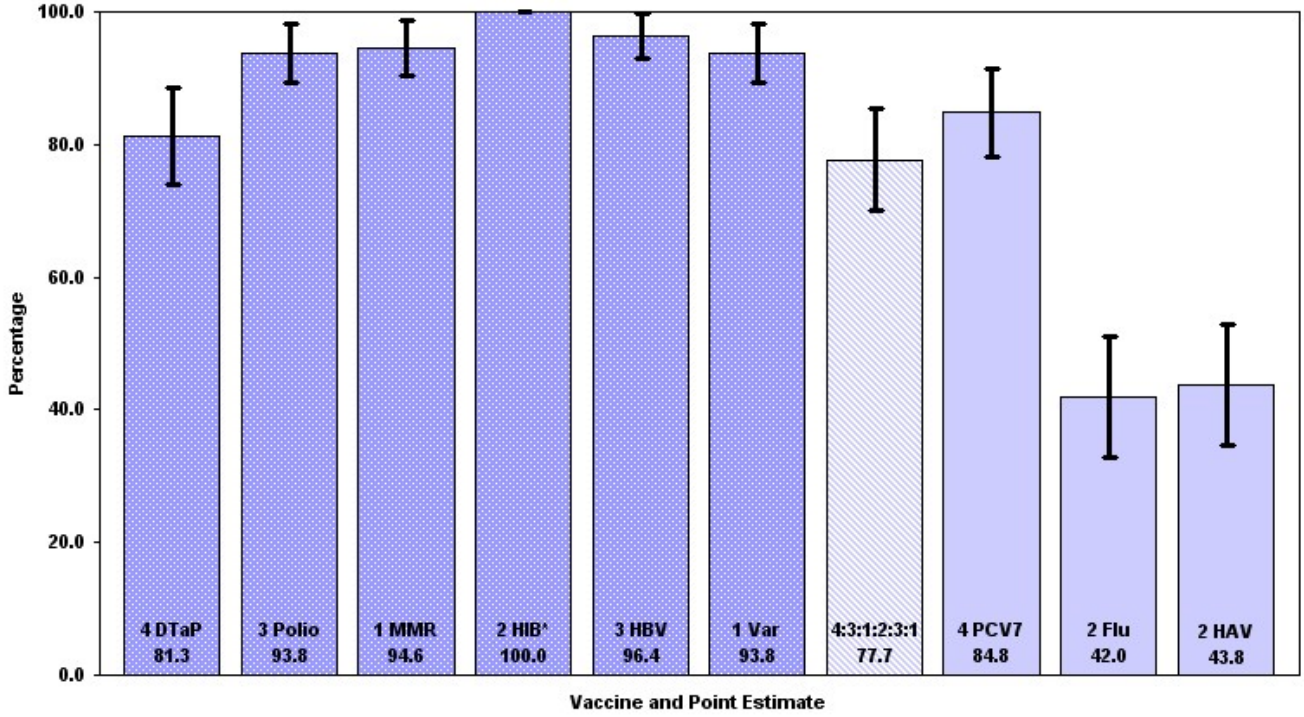
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Knoxville Region (KKR) by vaccine (point estmates and 95% confidence intervals)



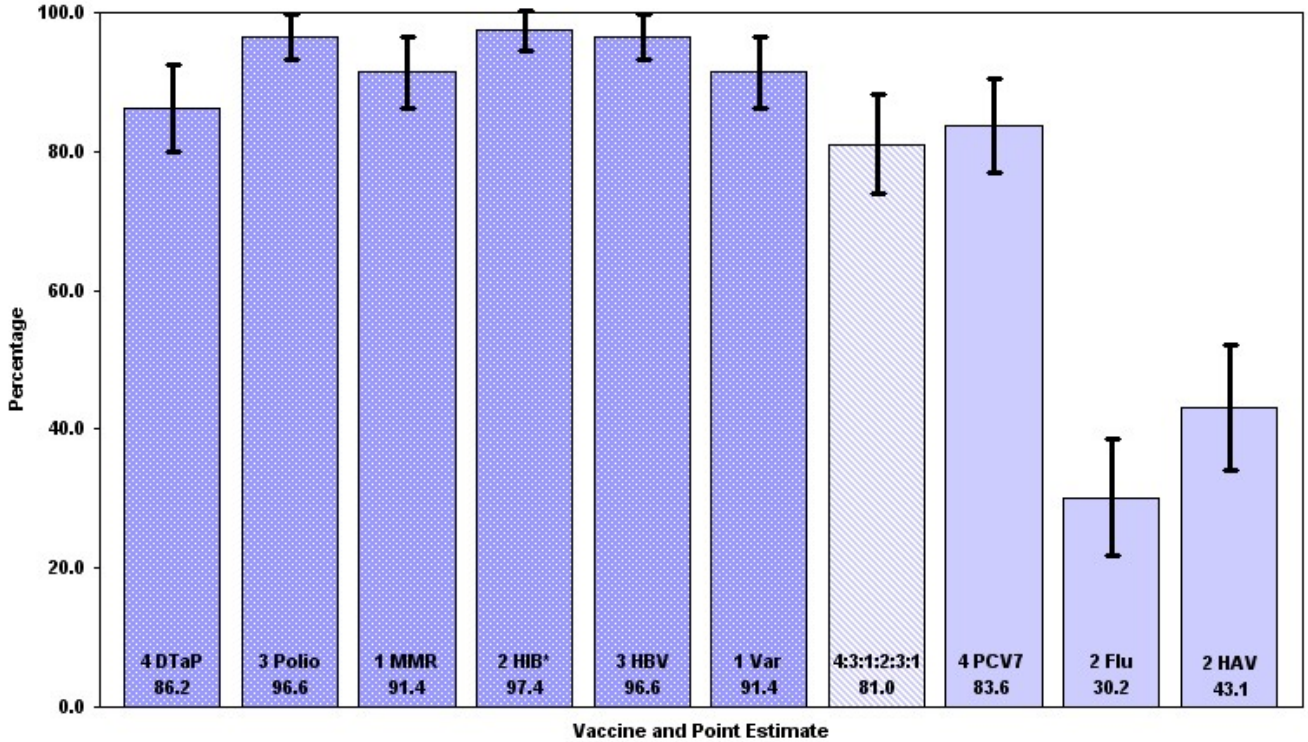
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Upper Cumberland Region (UCR) by vaccine (point estimates and 95% confidence intervals)



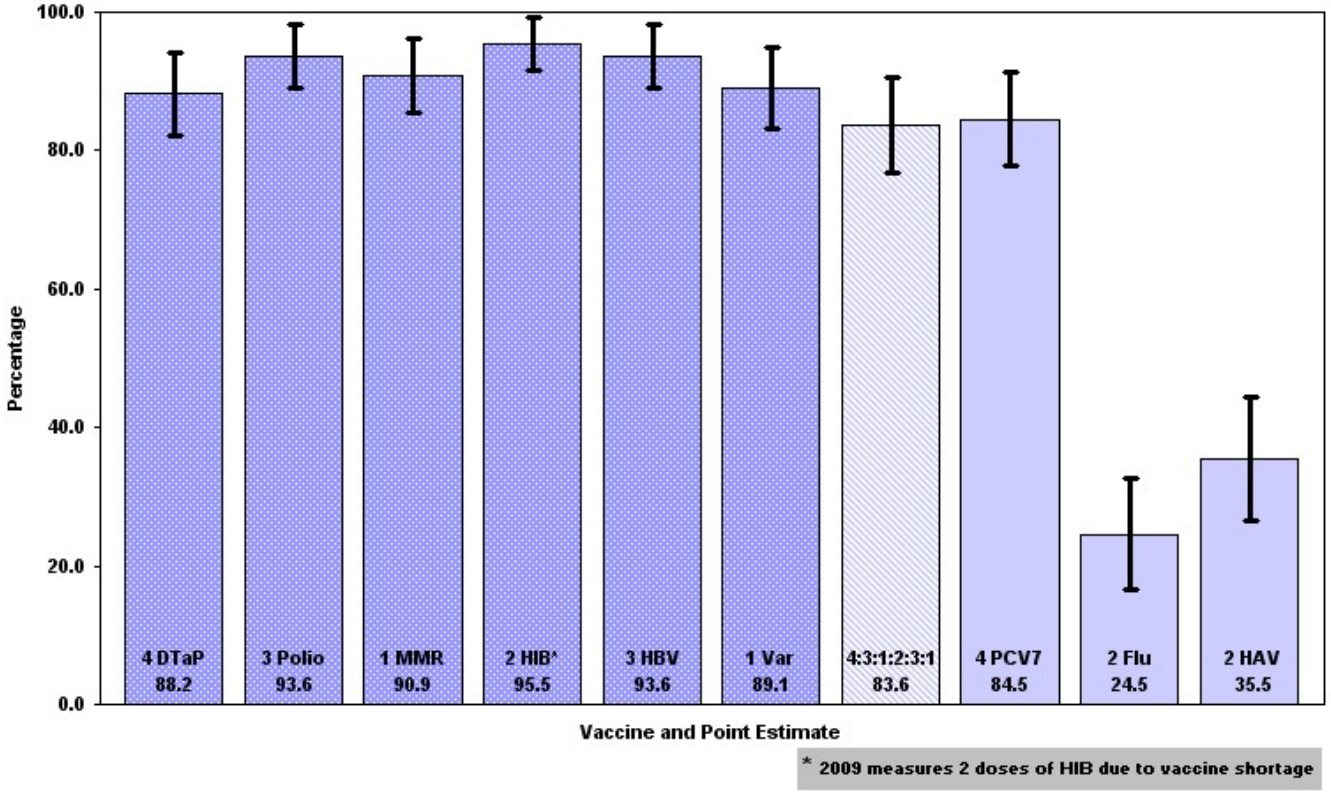
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Southeast Region (SER) by vaccine (point estmates and 95% confidence intervals)



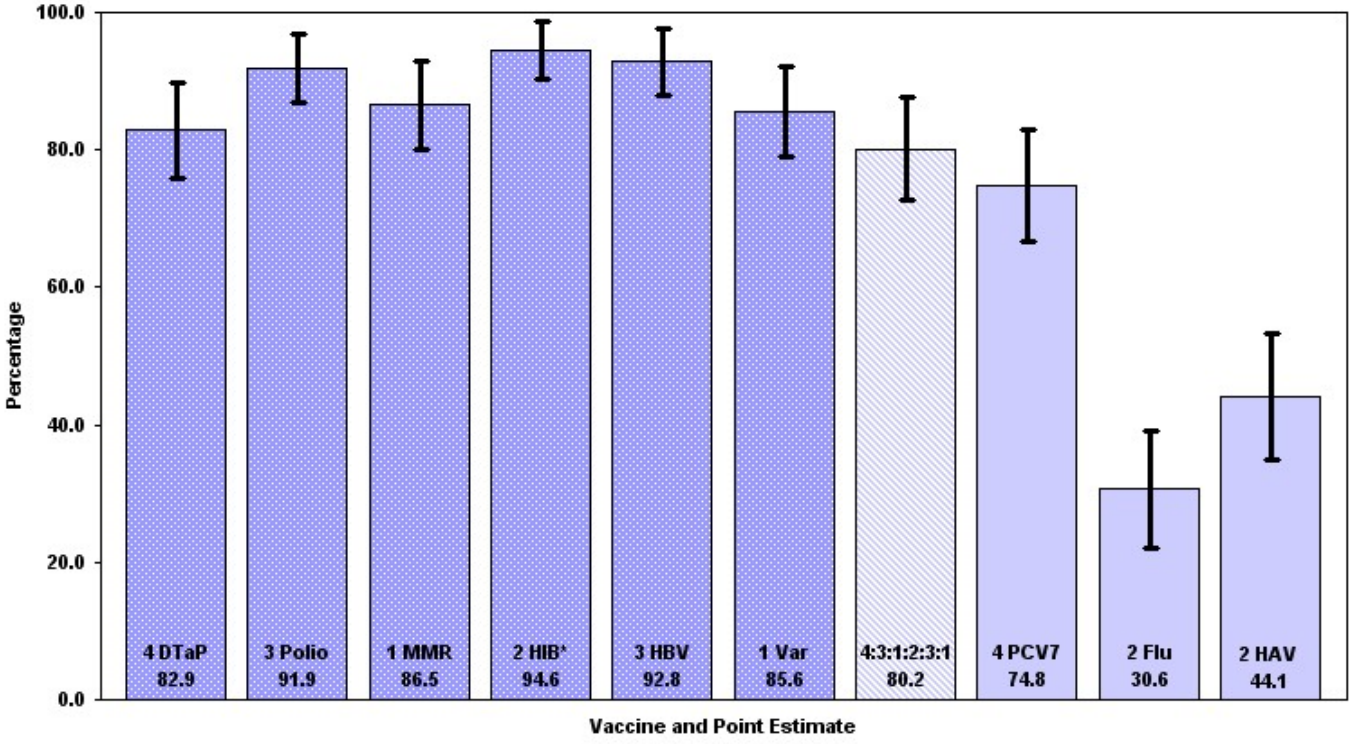
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Chattanooga Hamilton Region (CHR) by vaccine (point estmates and 95% confidence intervals)



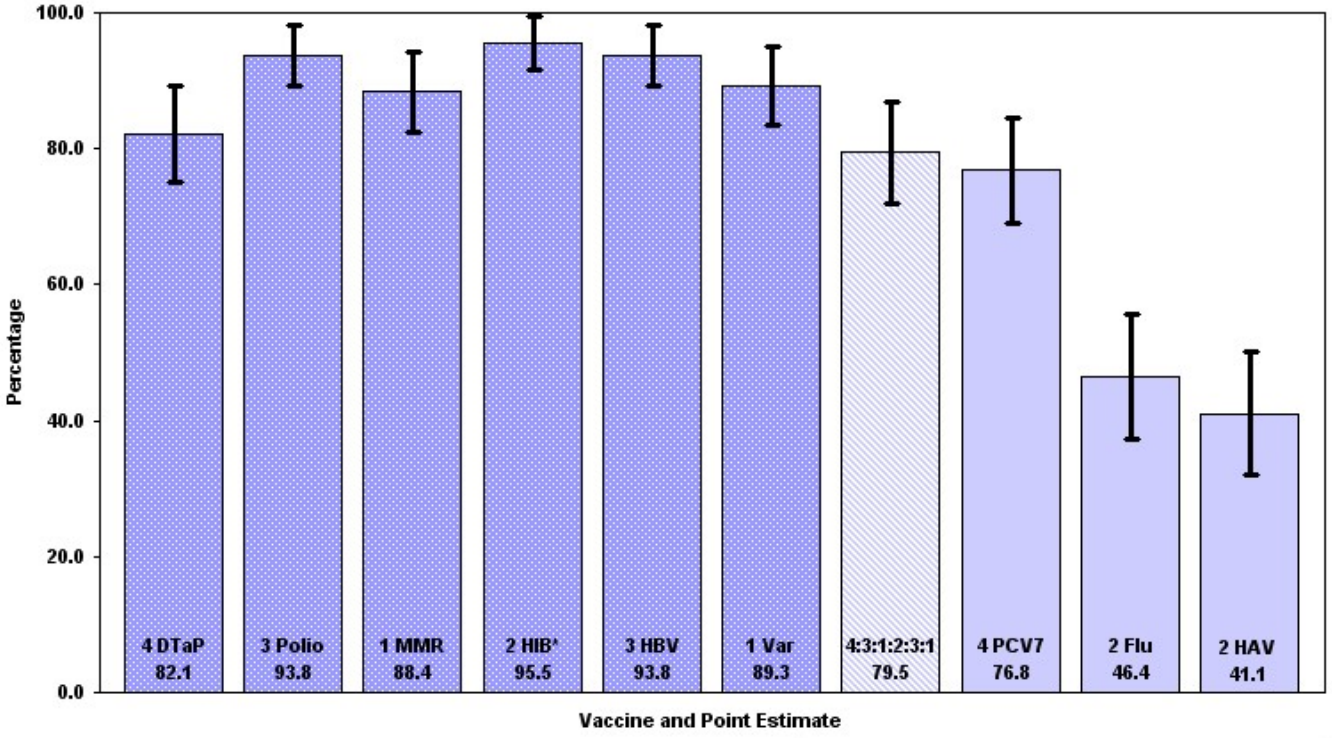
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Mid-Cumberland Region (MCR) by vaccine (point estmates and 95% confidence intervals)



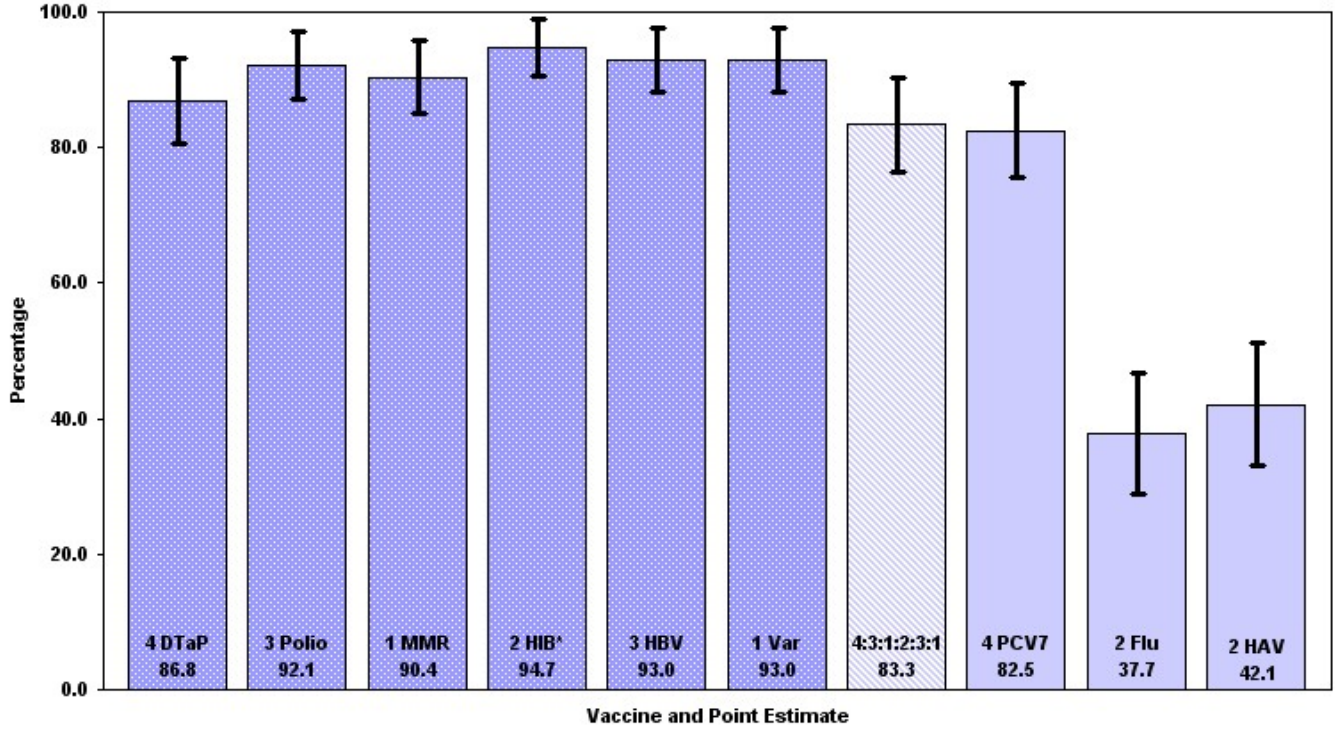
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Nashville Davidson Region (NDR) by vaccine (point estmates and 95% confidence intervals)



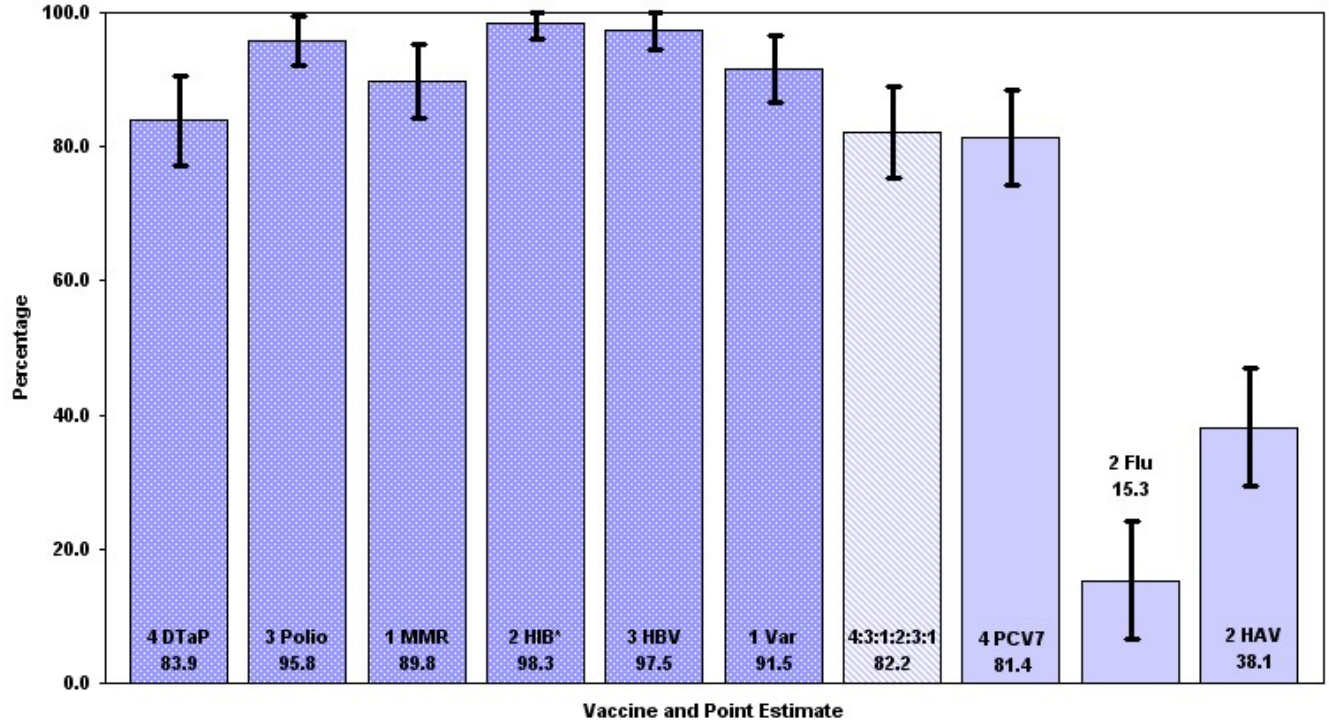
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in South Central Region (SCR) by vaccine (point estimates and 95% confidence intervals)



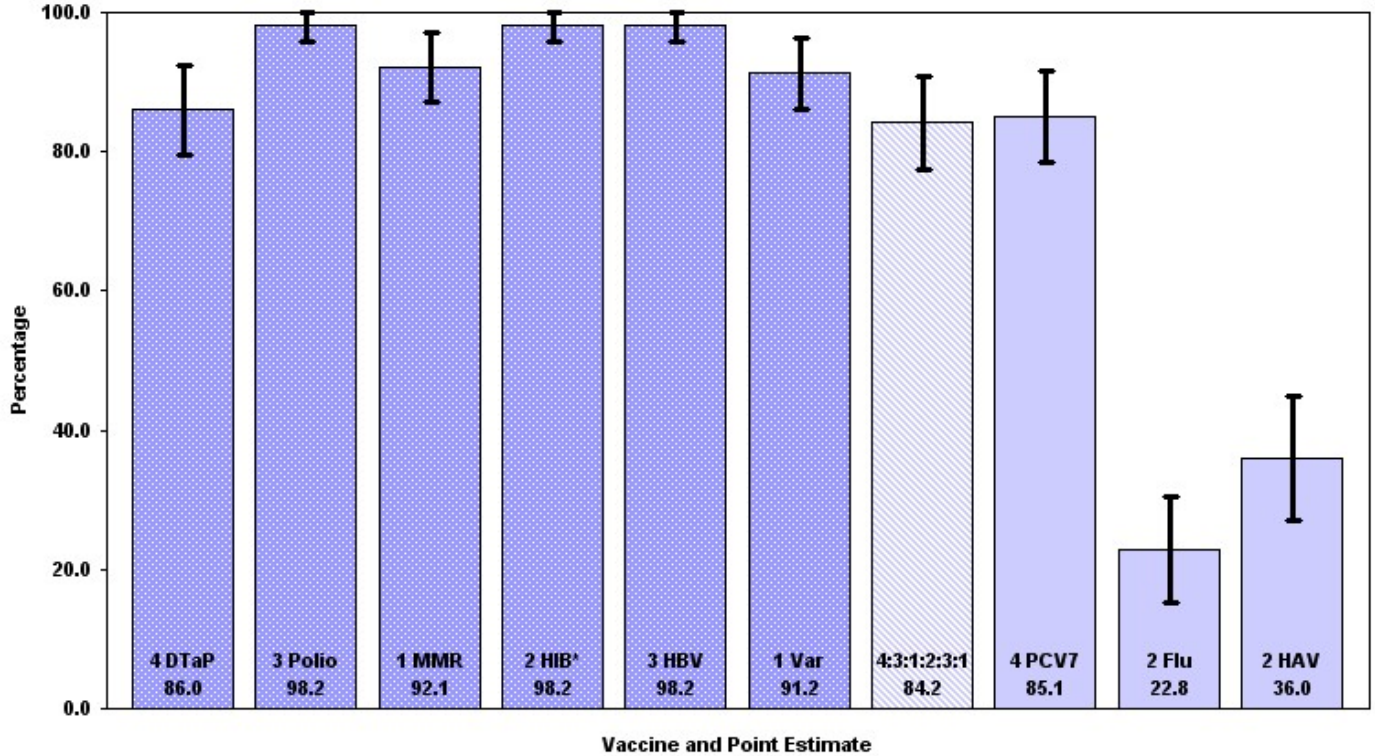
* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in West Tennessee Region (WTR) by vaccine (point estmates and 95% confidence intervals)

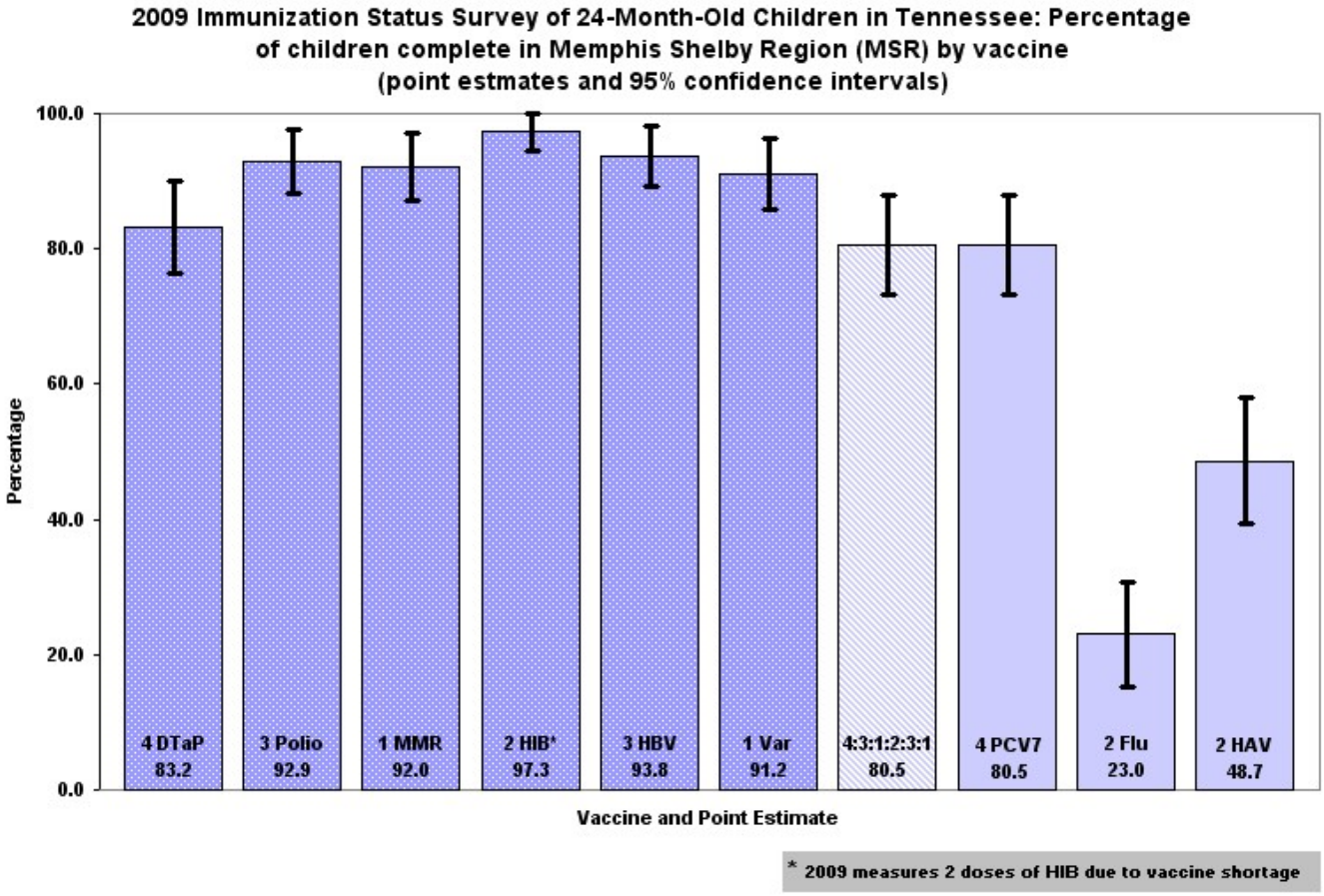


* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Jackson Madison Region (JMR) by vaccine (point estimates and 95% confidence intervals)

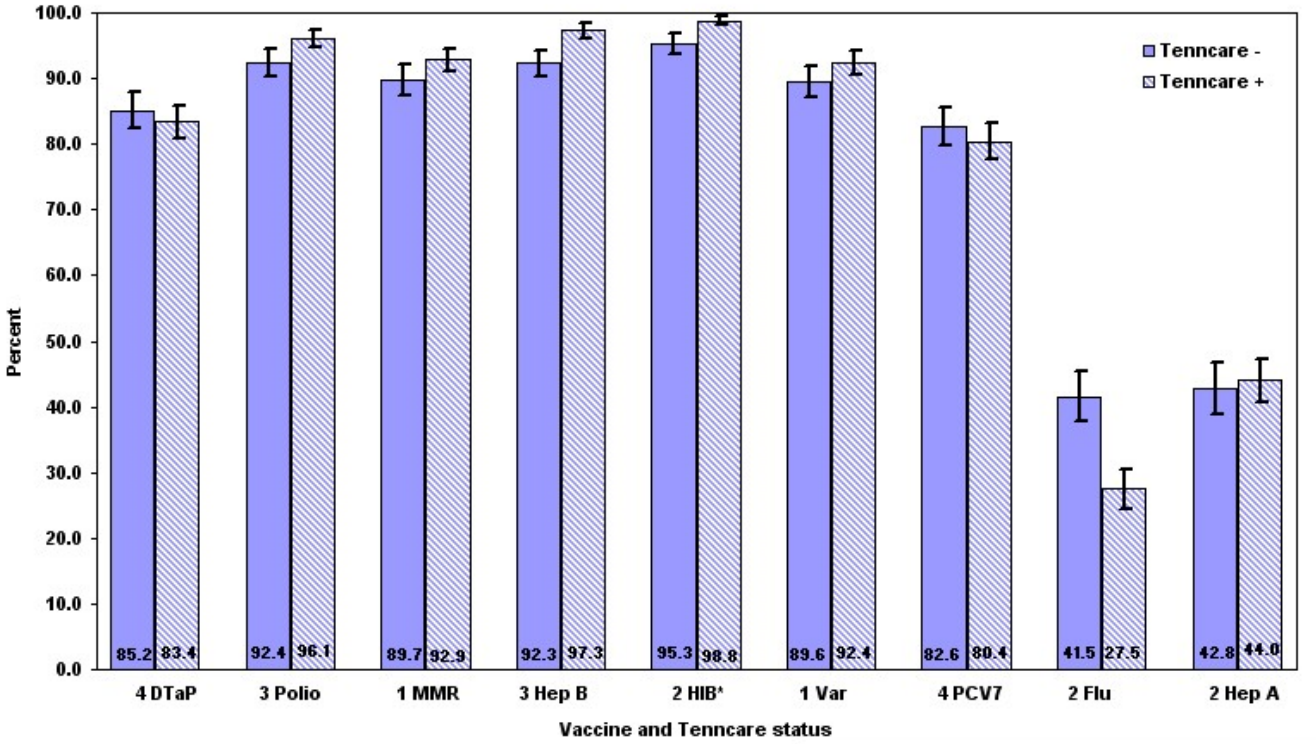


* 2009 measures 2 doses of HIB due to vaccine shortage


2009 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Memphis Shelby Region (MSR) by vaccine (point estmates and 95% confidence intervals)
Percentage
100.0
80.0
60.0
40.0
20.0
0.0
4 DTaP 83.2
3 Polio 92.9
1 MMR 92.0
2 HIB* 97.3
3 HBV 93.8
1 Var 91.2
4:3:1:2:3:1 80.5
4 PCV7 80.5
2 Flu 23.0
2 HAV 48.7
Vaccine and Point Estimate
* 2009 measures 2 doses of HIB due to vaccine shortage

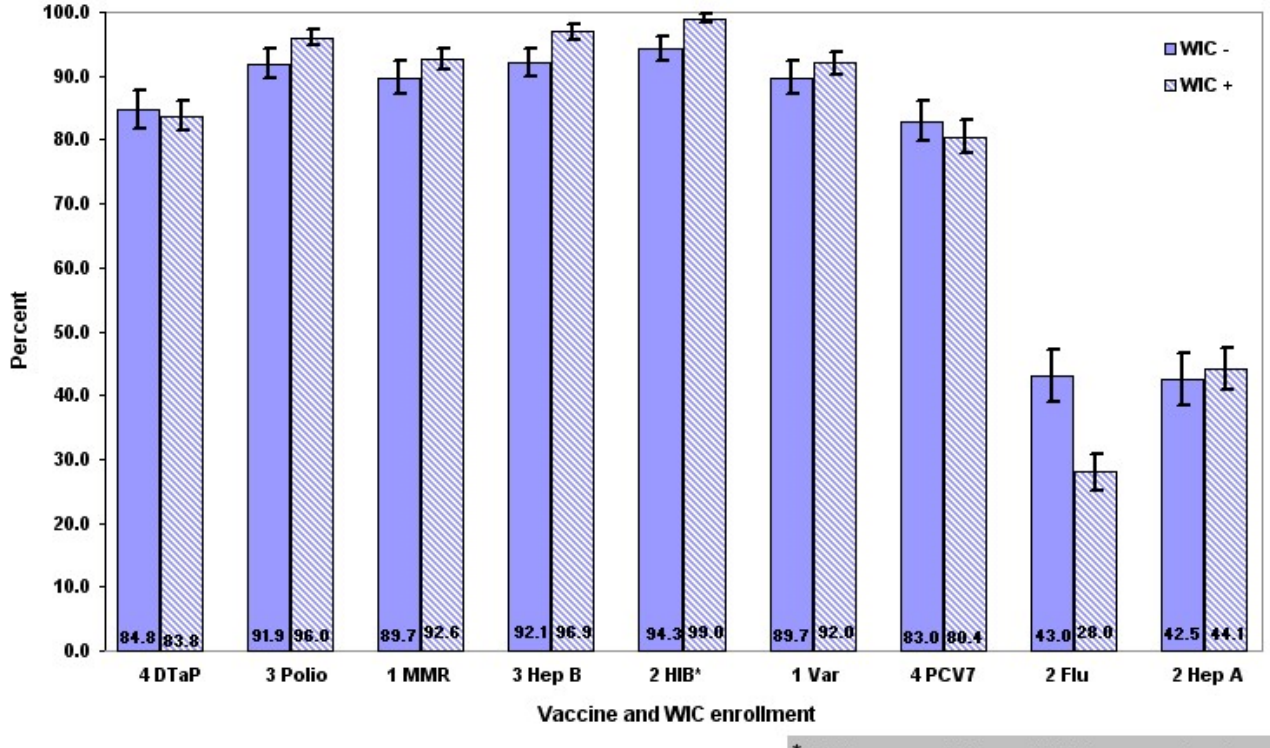
Appendix 3
2009 Immunization Status Survey
Of 24-Month-Old Children in Tennessee

2009 Immunization Status of 24-Month-Old Children in Tennessee: Statewide percentage of children with age-appropriate immunization levels by vaccine and Tenncare enrollment status (point estimates and 95% confidence intervals)



* 2009 measures 2 doses of HIB due to vaccine shortage

2009 Immunization Status of 24-Month-Old Children in Tennessee: Statewide percentage of children with age-appropriate immunization levels by vaccine and WIC enrollment status (point estimates and 95% confidence intervals)



* 2009 measures 2 doses of HIB due to vaccine shortage

Appendix 4
2009 Immunization Status Survey
Of 24-Month-Old Children in Tennessee

Data Tables for Selected Analyses

Series Complete (4:3:1:3:3:1)

Region	Yes		No		Total
	n=	%	n=	%	n=
Northeast TN	64	58.2%	46	41.8%	110
East TN	58	48.7%	61	51.3%	119
Southeast TN	82	70.7%	34	29.3%	116
Upper Cumberland	62	55.4%	50	44.6%	112
Mid-Cumberland	69	62.2%	42	37.8%	111
South Central	74	64.9%	40	35.1%	114
West TN	68	57.6%	50	42.4%	118
Shelby County	75	66.4%	38	33.6%	113
Davidson County	85	75.9%	27	24.1%	112
Knox County	61	54.5%	51	45.5%	112
Hamilton County	80	72.7%	30	27.3%	110
Madison County	81	71.1%	33	28.9%	114
Sullivan County	62	53.9%	53	46.1%	115
Total	921	62.4%	555	37.6%	1476

Series Complete (4:3:1:2:3:1)

Region	Yes		No		Total
	n=	%	n=	%	n=
Northeast TN	94	85.5%	16	14.5%	110
East TN	91	76.5%	28	23.5%	119
Southeast TN	94	81.0%	22	19.0%	116
Upper Cumberland	87	77.7%	25	22.3%	112
Mid-Cumberland	89	80.2%	22	19.8%	111
South Central	95	83.3%	19	16.7%	114
West TN	97	82.2%	21	17.8%	118
Shelby County	91	80.5%	22	19.5%	113
Davidson County	89	79.5%	23	20.5%	112
Knox County	85	75.9%	27	24.1%	112
Hamilton County	92	83.6%	18	16.4%	110
Madison County	96	84.2%	18	15.8%	114
Sullivan County	92	80.0%	23	20.0%	115
Total	1192	80.8%	284	19.2%	1476

Series Complete (4:3:1)

Region	Yes		No		Total
	n=	%	n=	%	n=
Northeast TN	98	89.1%	12	10.9%	110
East TN	93	78.2%	26	21.8%	119
Southeast TN	97	83.6%	19	16.4%	116
Upper Cumberland	89	79.5%	23	20.5%	112
Mid-Cumberland	90	81.1%	21	18.9%	111
South Central	97	85.1%	17	14.9%	114
West TN	98	83.1%	20	16.9%	118
Shelby County	93	82.3%	20	17.7%	113
Davidson County	90	80.4%	22	19.6%	112
Knox County	86	76.8%	26	23.2%	112
Hamilton County	95	86.4%	15	13.6%	110
Madison County	96	84.2%	18	15.8%	114
Sullivan County	94	81.7%	21	18.3%	115
Total	1216	82.4%	260	17.6%	1476

Series Complete (4:3:1:2:3:1) by Provider Type

Region	Public			Private			Both		
	Yes	Total	%	Yes	Total	%	Yes	Total	%
Northeast TN	11	15	73.3%	66	74	89.2%	17	21	81.0%
East TN	3	6	50.0%	71	87	81.6%	17	25	68.0%
Southeast TN	8	11	72.7%	64	76	84.2%	22	27	81.5%
Upper Cumberland	5	8	62.5%	66	87	75.9%	16	17	55.8%
Mid-Cumberland	1	2	50.0%	77	94	81.9%	11	11	100.0%
South Central	10	14	71.4%	59	66	89.4%	26	29	89.7%
West TN	24	30	80.0%	48	60	81.5%	25	26	96.2%
Shelby County	6	7	85.7%	56	69	81.2%	29	36	80.6%
Davidson County	1	2	50.0%	77	94	81.9%	11	12	91.7%
Knox County	5	11	45.5%	69	86	80.2%	11	14	78.6%
Hamilton County	4	6	66.7%	74	87	85.1%	14	16	87.5%
Madison County	24	30	80.0%	53	61	86.9%	19	21	90.5%
Sullivan County	6	8	75.0%	75	91	82.4%	11	14	78.6%
Total	108	150	72.0%	855	1032	82.8%	229	269	85.1%

Series Complete (4:3:1:2:3:1) by Race

Region	White			Black			Other		
	Yes	Total	%	Yes	Total	%	Yes	Total	%
Northeast TN	92	108	85.2%	2	2	100.0%	1	1	100.0%
East TN	89	117	76.1%	1	2	50.0%	2	2	100.0%
Southeast TN	88	110	80.0%	4	4	100.0%	4	4	100.0%
Upper Cumberland	87	112	77.7%	2	2	100.0%	0	0	N/A
Mid-Cumberland	79	100	79.0%	8	10	80.0%	4	4	100.0%
South Central	84	102	82.4%	9	10	90.0%	2	2	100.0%
West TN	77	95	81.1%	21	24	87.5%	1	1	100.0%
Shelby County	40	48	83.3%	51	67	76.1%	5	5	100.0%
Davidson County	58	75	77.3%	32	37	86.5%	3	4	75.0%
Knox County	70	96	72.9%	14	15	93.3%	1	1	100.0%
Hamilton County	68	83	81.9%	22	26	84.6%	5	5	100.0%
Madison County	56	64	87.5%	37	47	78.7%	3	3	100.0%
Sullivan County	88	111	79.3%	4	4	100.0%	0	0	N/A
Total	976	1221	79.9%	207	250	82.8%	31	32	96.9%

Series Complete (4:3:1:2:3:1) by Number of Older Siblings

Region	0 Siblings			1 Siblings			2+Siblings		
	Yes	Total	%	Yes	Total	%	Yes	Total	%
Northeast TN	38	41	92.7%	28	37	75.7%	28	32	87.5%
East TN	43	52	82.7%	27	39	69.2%	21	28	75.0%
Southeast TN	44	50	88.0%	32	40	80.0%	18	26	69.2%
Upper Cumberland	44	51	86.3%	28	42	66.7%	15	19	79.0%
Mid-Cumberland	29	37	78.4%	26	35	74.3%	30	35	85.7%
South Central	37	41	90.2%	37	46	80.4%	21	27	77.8%
West TN	44	51	86.3%	33	41	80.5%	20	26	76.9%
Shelby County	45	52	86.5%	21	27	77.8%	24	33	72.7%
Davidson County	34	42	81.0%	33	37	89.2%	22	31	71.0%
Knox County	35	42	83.3%	31	42	73.8%	19	28	67.9%
Hamilton County	40	44	90.9%	29	34	85.3%	22	31	71.0%
Madison County	41	44	93.2%	37	45	82.2.%	18	25	72.0%
Sullivan County	44	53	83.0%	34	41	82.9.%	14	21	66.7%
Total	518	600	86.3%	396	506	78.3%	272	362	75.1%

Series Complete (4:3:1:2:3:1) by TennCare Enrollment

Region	Enrolled			Not Enrolled		
	Yes	Total	%	Yes	Total	%
Northeast TN	62	74	83.8%	32	36	88.9%
East TN	54	70	77.1%	37	49	75.5%
Southeast TN	62	75	82.7%	32	41	78.1%
Upper Cumberland	52	71	73.2%	35	41	85.4%
Mid-Cumberland	40	49	81.6%	49	62	79.0%
South Central	51	64	79.7%	44	50	88.0%
West TN	68	78	87.2%	29	40	72.5%
Shelby County	63	76	82.9%	28	37	75.7%
Davidson County	44	53	83.0%	45	59	76.3%
Knox County	31	45	68.9%	54	67	80.6%
Hamilton County	44	49	89.8%	48	61	78.7%
Madison County	60	74	81.1%	36	40	90.0%
Sullivan County	51	65	78.5%	41	50	82.0%
Total	682	843	80.9%	510	633	80.6%

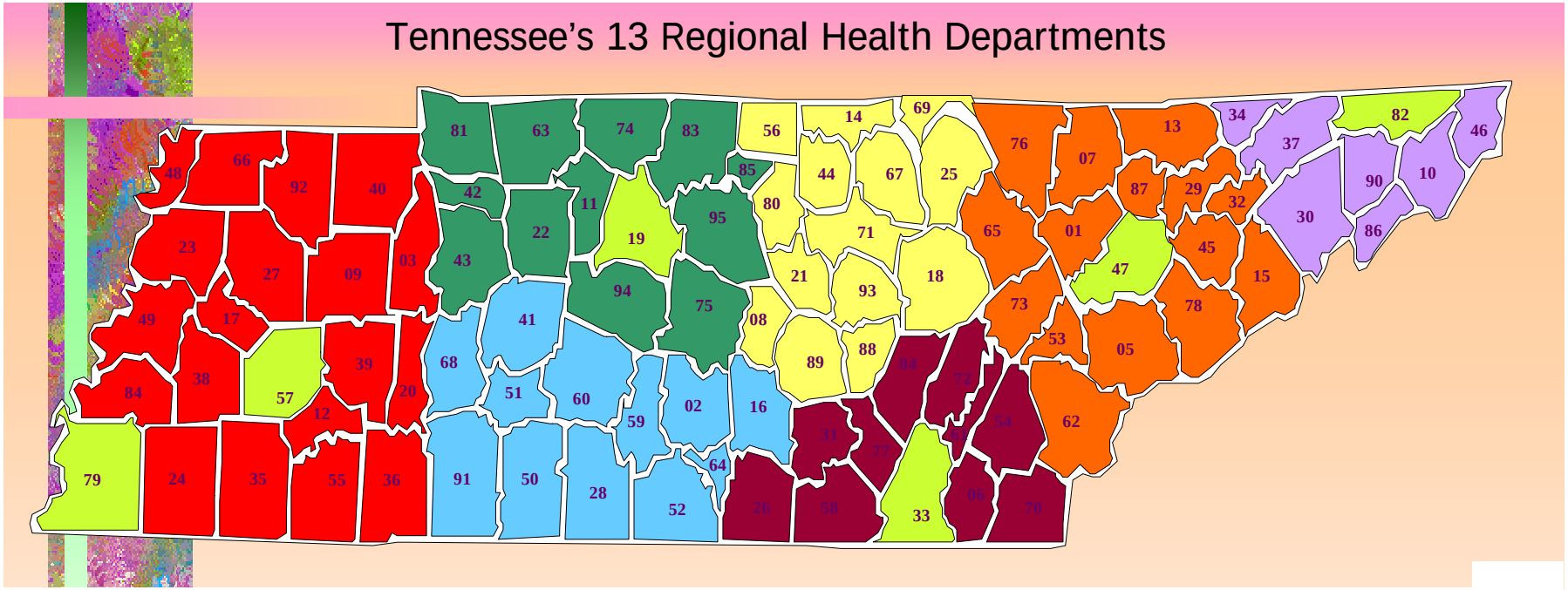
DTaP Immunizations Received by 25 Months

Region	0		1		2		3		4		Total
Northeast TN	0	0.0%	1	1.0%	0	0.0%	6	5.7%	98	93.3%	105
East TN	1	0.9%	1	0.9%	4	3.5%	12	10.5%	96	84.2%	114
Southeast TN	2	1.8%	0	0.0%	1	0.9%	7	6.4%	100	90.9%	110
Upper Cumberland	0	0.0%	0	0.0%	2	1.9%	11	10.6%	91	87.5%	104
Mid-Cumberland	4	3.7%	1	0.9%	2	1.8%	10	9.2%	92	84.4%	109
South Central	5	4.7%	0	0.0%	1	0.9%	2	1.9%	99	92.5%	107
West TN	2	1.8%	0	0.0%	0	0.0%	11	9.8%	99	88.4%	112
Shelby County	1	0.9%	0	0.0%	2	1.9%	9	8.5%	94	88.7%	106
Davidson County	4	3.7%	1	0.9%	2	1.8%	10	9.2%	92	84.4%	109
Knox County	1	1.0%	0	0.0%	2	1.9%	11	10.6%	90	86.5%	104
Hamilton County	1	0.9%	3	2.7%	1	0.9%	8	7.3%	97	88.2%	110
Madison County	2	1.8%	0	0.0%	0	0.0%	9	8.3%	98	89.9%	109
Sullivan County	2	1.8%	0	0.0%	1	0.9%	10	9.2%	96	88.1%	109
Total	25	1.8%	7	0.5%	18	1.3%	116	8.2%	1242	88.2%	1408

Note: Of the 25 children with no DTaP doses, 15 were not immunized for medical, personal or religious reasons and 10 children could not be located by health department staff.

Appendix 5

Tennessee's 13 Regional Health Departments



West		Mid Cumberland		South Central		Southeast		Upper Cumberland		East		North East	
#	County	#	County	#	County	#	County	#	County	#	County	#	County
03	Benton	11	Cheatham	02	Bedford	04	Bledsoe	08	Cannon	01	Anderson	10	Carter
09	Carroll	22	Dickson	16	Coffee	06	Bradley	14	Clay	05	Blount	30	Greene
12	Chester	42	Houston	28	Giles	26	Franklin	18	Cumberland	07	Campbell	34	Hancock
17	Crockett	43	Humphreys	41	Hickman	31	Grundy	21	DeKalb	13	Claiborne	37	Hawkins
20	Decatur	63	Montgomery	50	Lawrence	54	McMinn	25	Fentress	15	Cocke	46	Johnson
23	Dyer	74	Robertson	51	Lewis	58	Marion	44	Jackson	29	Grainger	86	Unicoi
24	Fayette	75	Rutherford	52	Lincoln	61	Meigs	56	Macon	32	Hamblen	90	Washington
27	Gibson	81	Stewart	59	Marshall	70	Polk	67	Overton	45	Jefferson		
35	Hardeman	83	Sumner	60	Maury	72	Rhea	69	Pickett	53	Loudon		
36	Hardin	85	Trousdale	64	Moore	77	Sequatchie	71	Putnam	62	Monroe		**METROS**
38	Haywood	94	Williamson	68	Perry			80	Smith	65	Morgan	#	**County**
39	Henderson	95	Wilson	91	Wayne			88	Van Buren	73	Roane	19	Davidson
40	Henry							89	Warren	76	Scott	33	Hamilton
48	Lake							93	White	78	Sevier	47	Knox
49	Lauderdale									87	Union	57	Madison
55	McNairy											79	Shelby
66	Obion											82	Sullivan
84	Tipton												
92	Weakley												