Results of the 2008 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. **Hep B: hepatitis B vaccine**
    d. **Hib: *Haemophilus influenzae,* type B vaccine**
    e. **MMR: measles, mumps, rubella**
    f. **Var: varicella (chickenpox) vaccine**
    g. **PCV7: heptavalent pneumococcal conjugate vaccine**
    h. **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 2008 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®) and influenza vaccine (Flu) are assessed and reported individually, but are not included in the combined series measures. This 2008 survey reports the proportion of children receiving at least 2 doses of Flu and four doses of PCV7.

The 2008 sample population:
The 2008 statewide sample consisted of 1589 children born in the first quarter of 2006 (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 2005 in that region. The oversampled children (n=16 of the 1589) were included only in state-level analysis of black-white disparities. Of the 1589, 102 were excluded from the analysis because parents refused to participate (n=13) or had moved out of state (n=89); 1487 children remained in the sample (including the 16 oversampled records).

Of the 1487, no documentation of vaccination could be found for 20 children. Parents for 14 of these 20 children cited a religious (n=8), medical (n=1) or philosophical (n=5) reason for not vaccinating their children; the remaining 6 unvaccinated children could not be located by health department staff. Parents of three additional children stopped vaccinating their children after at least one dose of vaccine had been administered: two for religious reasons and one for other personal reasons. Partial vaccination records were available in the Tennessee Immunization Registry for 8 children who could not be located by health department staff. By protocol, all of these children are included in the analysis.

Important 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 sub-strata smaller than that level. For example, it is not possible to assess immunization coverage levels of individual counties 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 2006 who received every routinely recommended vaccine on time could have received 3 doses of influenza vaccine. The fall of 2005 was the first season that routine immunization of children 6-23 months was recommended by CDC. Because the number of children who received 3 doses was extremely low and considered less useful, this survey reports the percentage of children who received at least 2 doses of influenza vaccine.

Hib
Two formulations of Hib vaccine are available, one requires 3 doses before 25 months and the other requires four. Because brand names are not captured, three doses of Hib vaccine are considered complete, although that definition may include some children who received only three doses of the 4-dose product. This results in an overestimation of on-time completion.

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 make comparison to past survey results less meaningful.

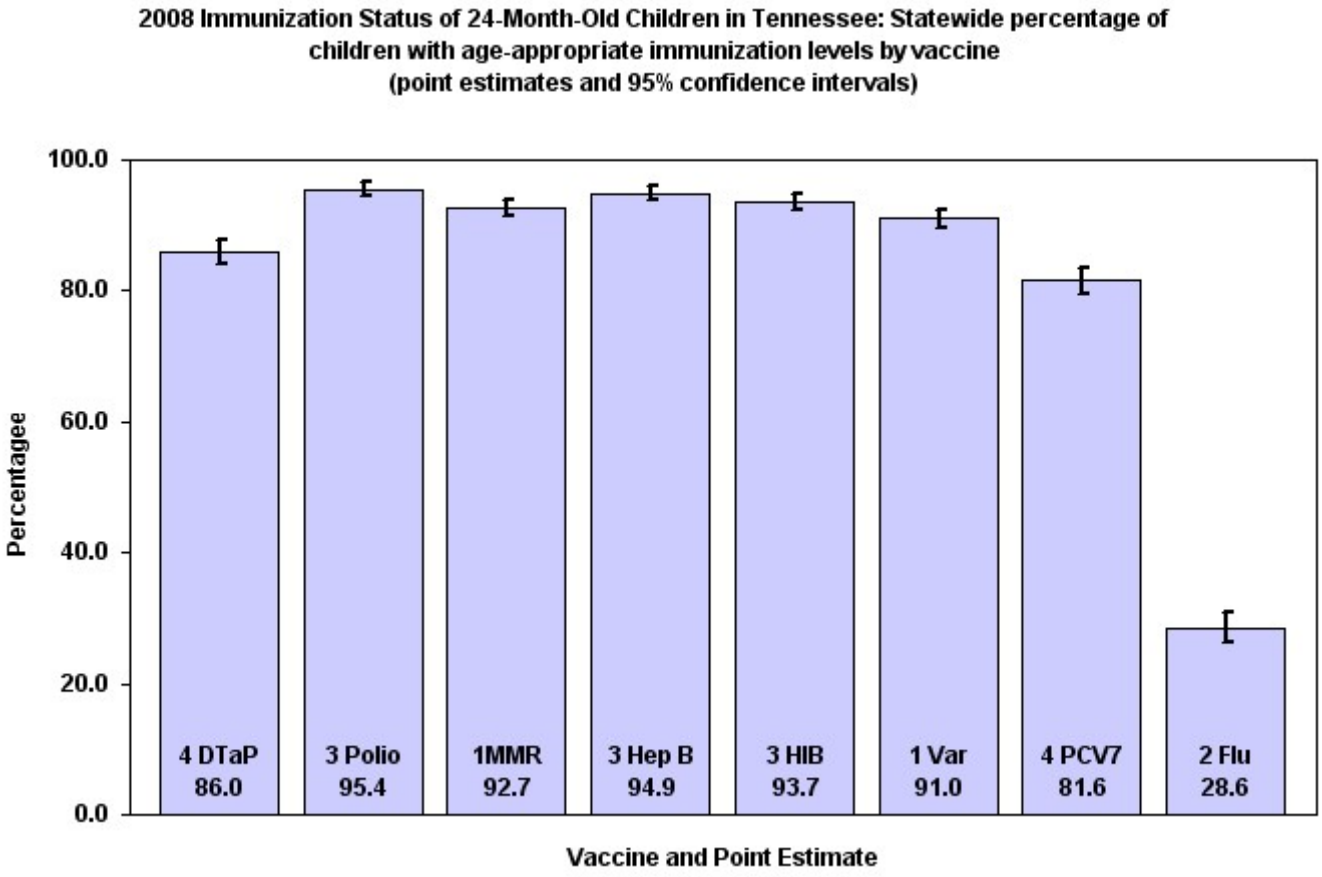
Statewide Results and Trend Analysis:

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. As in 2007, the percentage of children with on-time immunization documented for each vaccine in the target vaccine series was over 90%, with the exception of the fourth dose of DTaP. A statistically significant increase in the coverage rates from 2007 to 2008 were seen with influenza vaccine (see Appendix 3 for comparison).

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.

Figure 1

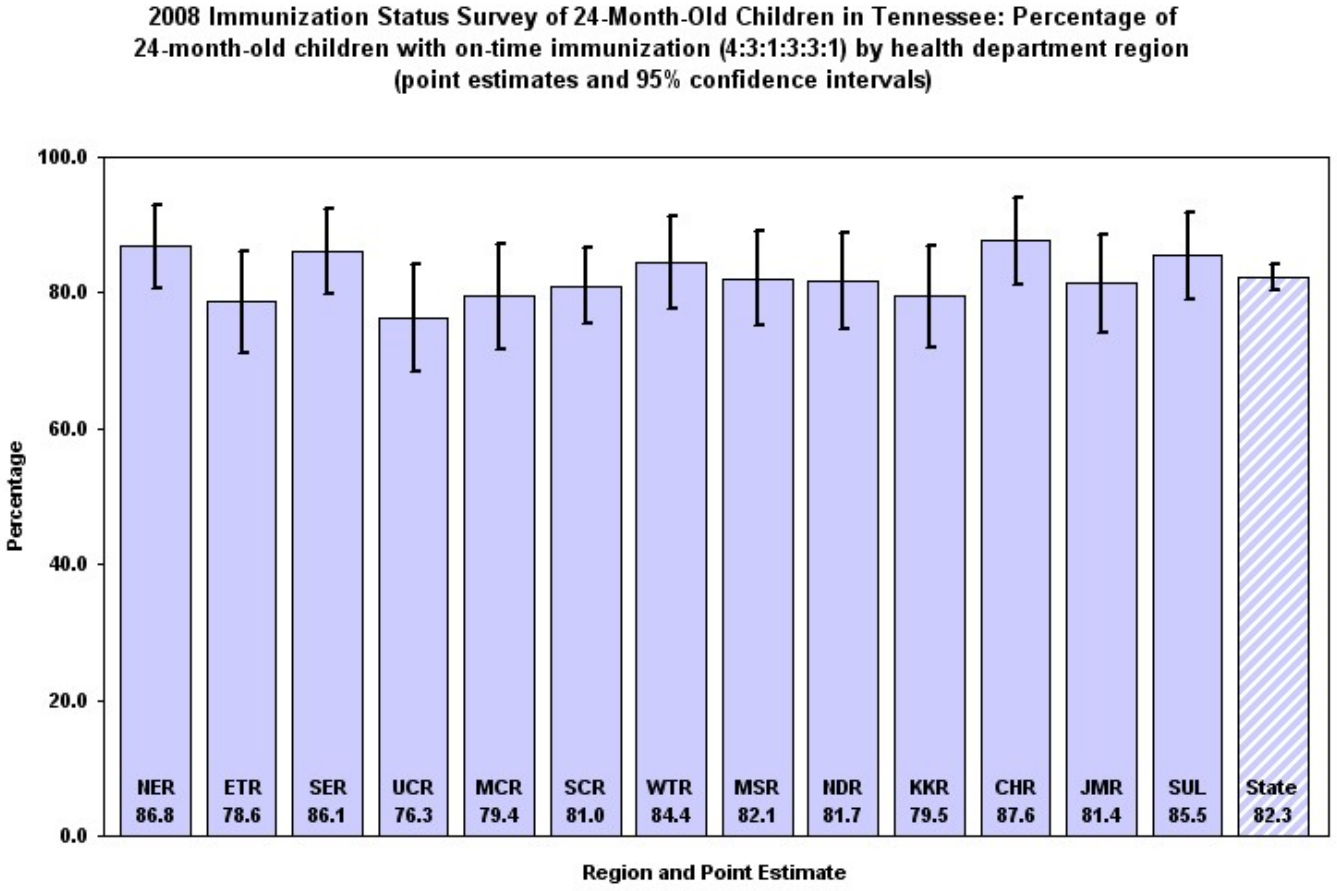


Complete 4:3:1:3:3:1 immunization levels statewide and by public health region

The percentage of children with on-time immunization for all vaccines in the 4:3:1:3:3:1 series, both statewide and in each public health region are presented in figure 2 below. In 2008, the point estimates for regions ranged from 76.3% (95% CI: 68.5-84.1) in the Upper Cumberland Region to 87.6% (95% CI: 81.3-93.9) in the Chattanooga-Hamilton County Region; however, this year no regional result was statistically significantly higher or lower than the statewide coverage level of 82.3% (95% CI: 80.4-84.3).

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 4:3:1:3:3:1 aggregate series.

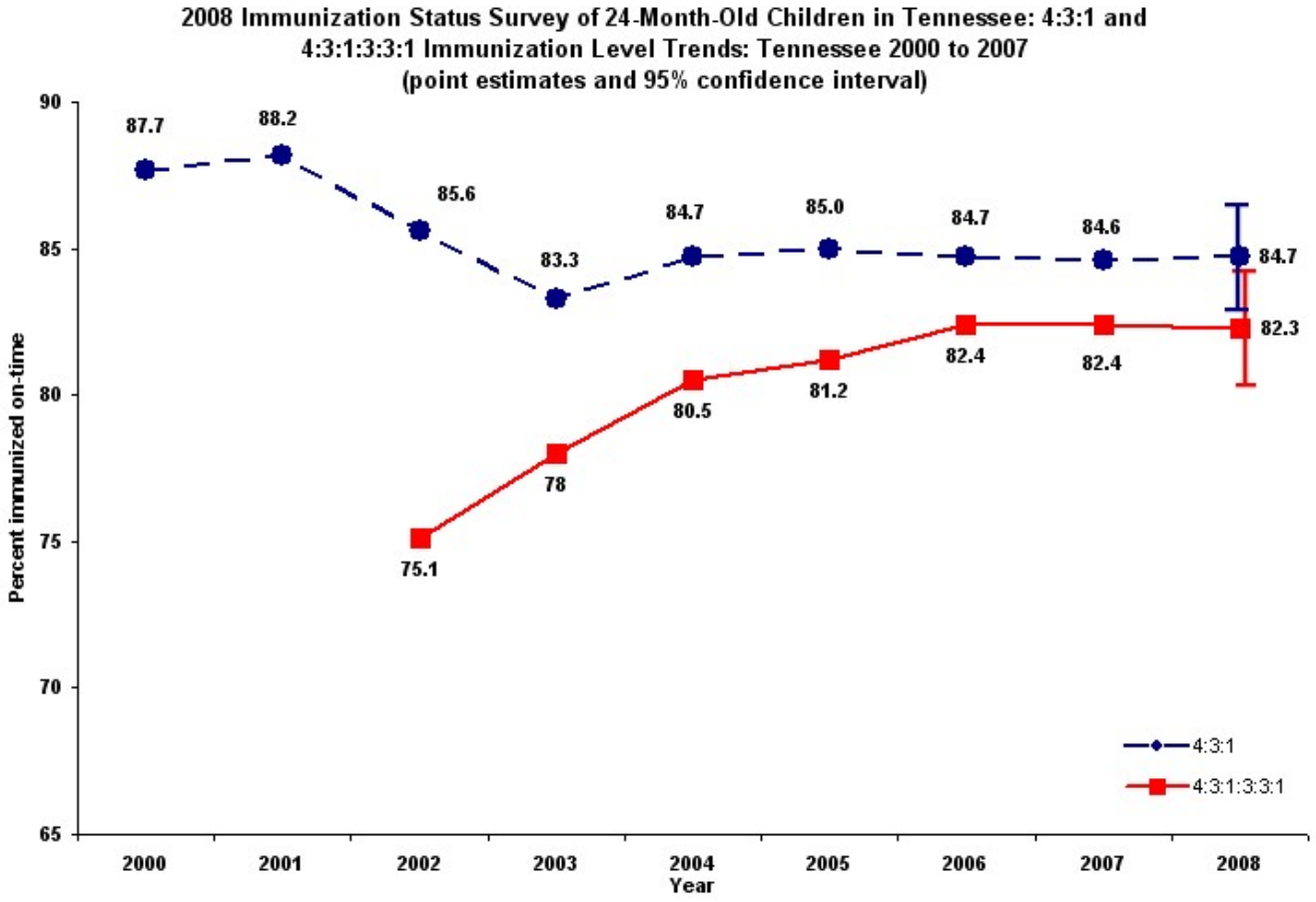
Figure 2



State coverage trends over time

Figure 3 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. Over time, these two lines have converged; the overlapping 95% confidence intervals show that the differences in the point estimates are not statistically significant. This trend indicates that children who receive DTaP, IPV and MMR on time almost always receive Hib, Hep B and varicella vaccines on time, as well.

Figure 3



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. After showing a statistically significant difference of 8.3 percentage points (83.9% for whites vs. 75.6% for blacks) in 2007, the gap measured in the 2008 survey had decreased to 4.9 percentage points (83.3% vs. 78.4%) in 2008: the difference was not statistically significant. 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 4 shows the differences in the 4:3:1:3:3:1 series over time beginning in 2004.

Figure 4

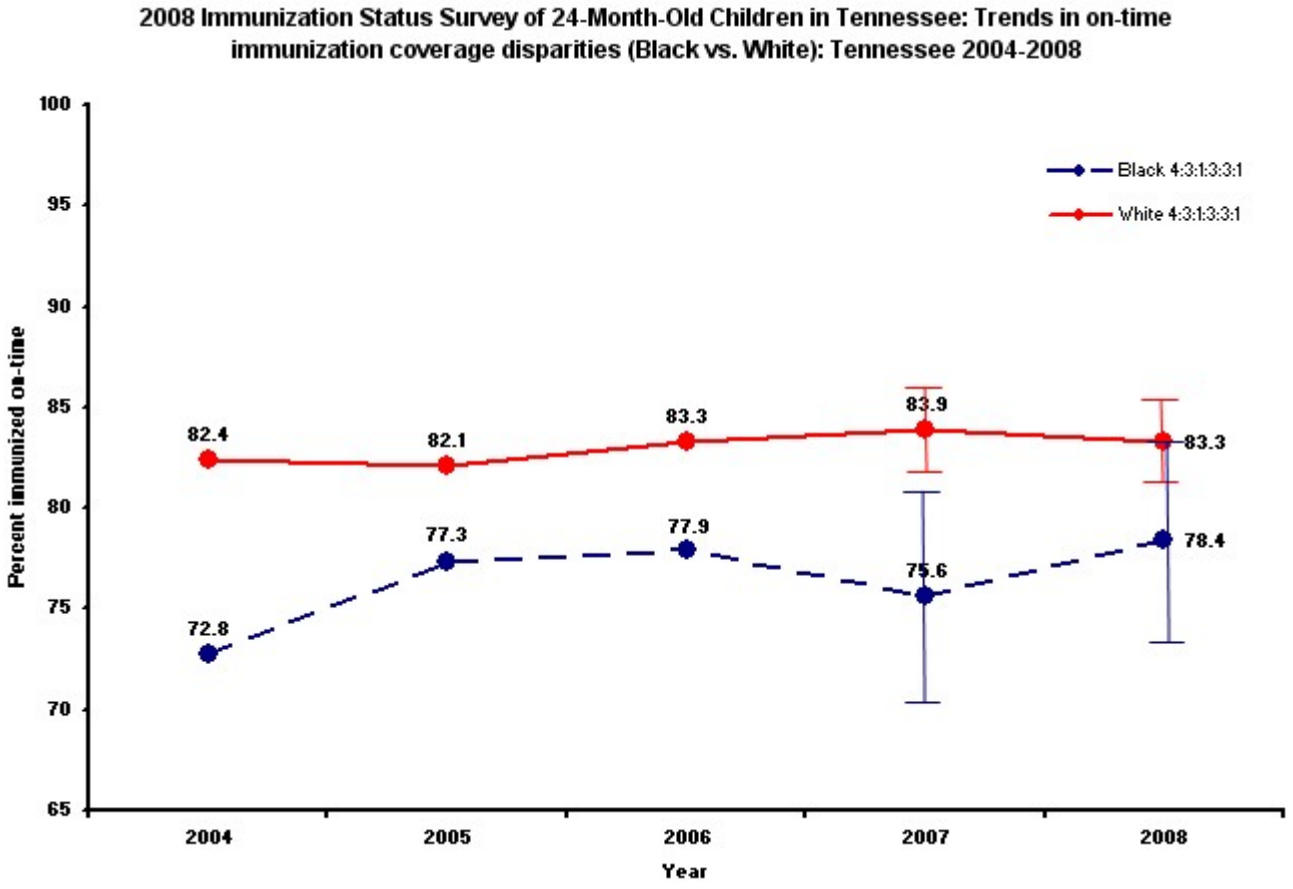
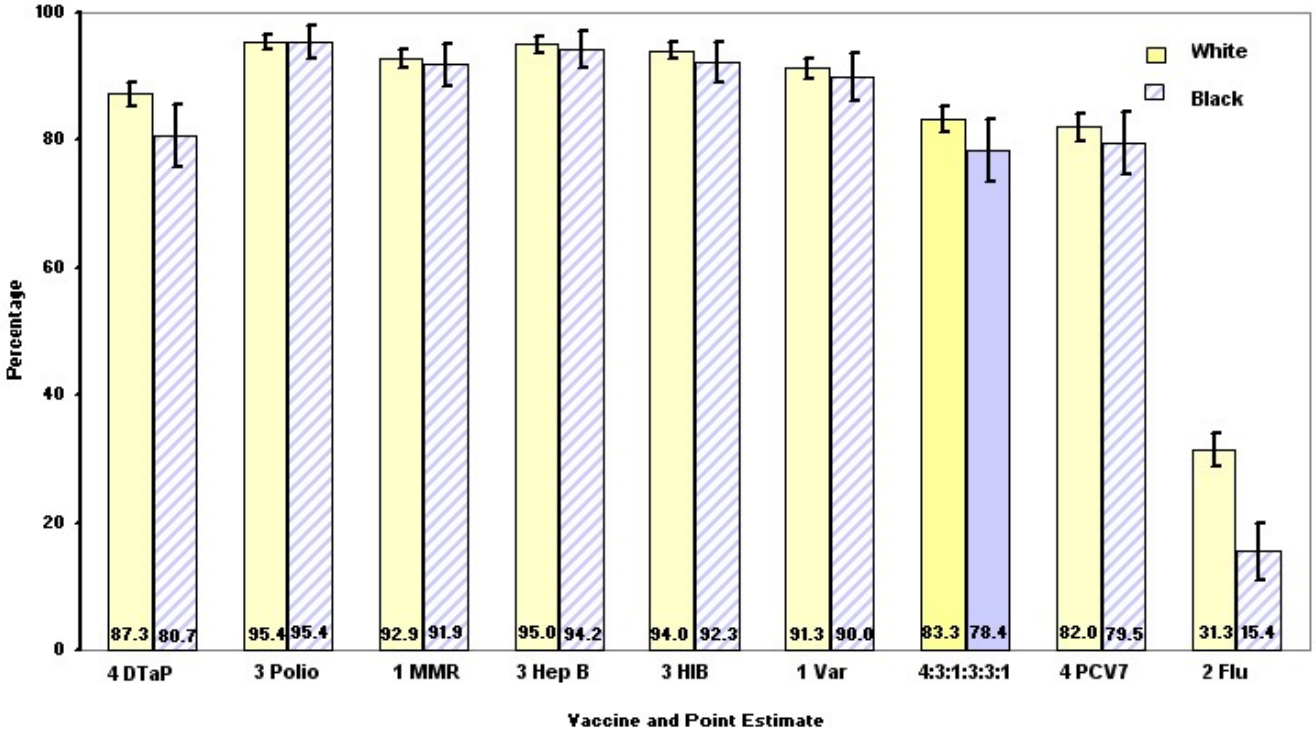


Figure 5 shows the percentages of children, categorized by race, with on-time immunization for each vaccine measured. Among individual vaccines included in the 4:3:1:3:3:1 series, no statistically significant differences between blacks and whites were seen, although the largest difference in the point estimates was for the 4th DTaP, which is consistent with the findings of the 2007 survey. The statistically significant gap in PCV7 coverage seen in 2007 narrowed to the point of statistical insignificance in the 2008 survey population. The 2008 survey shows that the wide racial disparity in immunization against influenza persists (the point estimate for white children is double that for black children). State requirements for child care attendance include all vaccines measured except PCV7 or flu vaccine.

Figure 5

2008 Immunization Status of 24-Month-Old Children in Tennessee: Statewide percentage of children with age-appropriate immunization levels by vaccine and race (point estimates and 95% confidence intervals)



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 2008 survey, children with just one sibling were also significantly less likely to complete immunization on time, compared to children with no siblings.

Although point estimates for on-time immunization (using the aggregate 4:3:1:3:3:1 measure) were lower in public clinic settings, among TennCare enrollees and WIC participants when compared to private clinic settings or children not enrolled in TennCare or WIC, the differences did not quite reach statistical significance. Table 1 below summarizes the 2008 on-time completion rates for 4:3:1:3:3:1 in these groups.

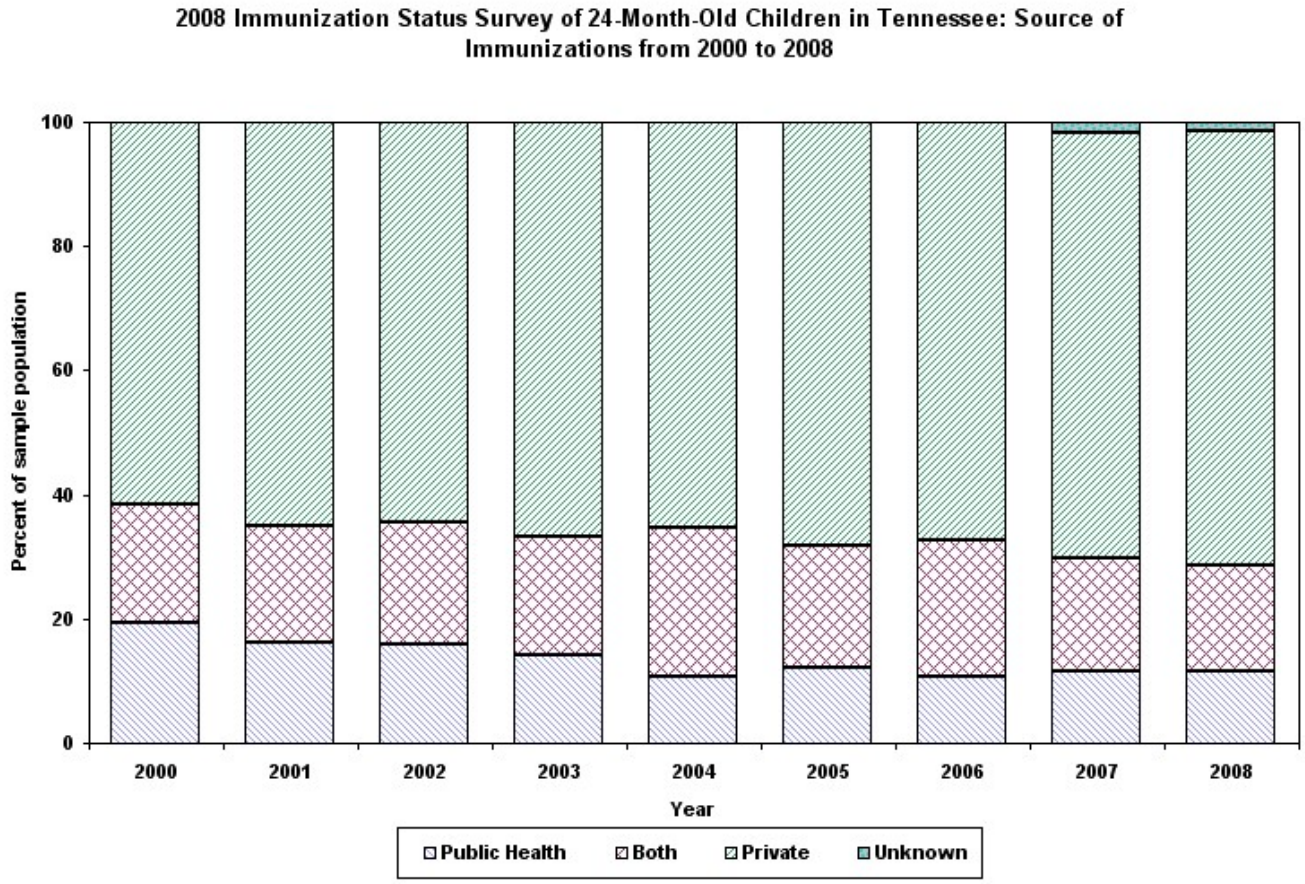
Table 1

4:3:1:3:3:1 Completion Levels in the 2008 Survey of 24-Month-Old Children: Selected Characteristics			
Provider Type	Public n=137/172	Private n=877/1030	Both n=197/249
	79.7% ± 6.02	**85.1% ± 2.17**	**79.1% ± 5.05**
TennCare Enrollment	Enrolled n=659/819	Not Enrolled n=552/652	
	80.5% ± 2.72	**84.7% ± 2.77**	
WIC Enrollment	Enrolled n=744/921	Not Enrolled n=467/550	
	80.8% ± 2.54	**84.9% ± 2.99**	
Other Siblings	None n=536/596	One n=382/469	Two or more n=281/389
	89.9% ± 2.42	**81.4% ± 3.52**	**72.2% ± 4.45**
Age at First Immunization	≤120 days n=1199/1429	120 days n=12/22	
	83.9% ± 1.91	**54.5% ± 20.81%**	

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 leveled off in recent years. In 2008, 11.7% of children surveyed received their immunizations exclusively at a public health facility. The percentage of children who were vaccinated exclusively in private settings was 70.0% (68.4% in 2007). Figure 6 below shows the trend over time.

Figure 6



Although the difference measured in on-time coverage rates between public and private clinic patients in the survey did not reach statistical significance, the prevalence of risk factors for delayed immunization was higher among the public health patient population. The table 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	**30.2% (52/172)**	**22.1% (55/249)**	**13.1% (135/1030)**
2 or more siblings	**36.3% (62/171)**	**32.8% (81/247)**	**23.1% (235/1017)**
Age at first dose >120 days	**2.9% (5/172)**	**2.8% (7/249)**	**1.0% (10/1030)**
Any of above risk factors	**54.7% (94/172)**	**45.0% (112/249)**	**33.4% (344/1030)**

Summary of key findings from the 2008 Survey:

1. The point estimate of on-time administration of all vaccines in the 4:3:1:3:3:1 series has remained level for the last 3 survey years: 82.3% in 2008, compared to 82.4% in both 2007 and 2008.
2. The Department of Health's goal of reaching at least 90% on-time coverage with each vaccine that is included in the 4:3:1:3:3:1 series was achieved for all vaccines except DTaP (86%), which 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 should focus on this target.
3. The percentage of children with 4 doses of PCV7 was estimated at 81.6%; however, 94.6% of children in the survey had received at least 3 doses by 24 months of age.
4. The percentage of children who had received at least 2 doses of influenza vaccine by 24 months showed a 55% increase in one year, from 18.4% in 2007 to 28.6% in 2008. Extreme regional disparities in coverage with this vaccine were measured, ranging from 52.1% coverage in Sullivan County to just 9.2% coverage in West Tennessee Region (see Appendix 1 for influenza charts). A pronounced racial disparity persists, with coverage among black children less than half that among white children.
5. The disparity measured between black and white children in on-time immunization for the 4:3:1:3:3:1 series, which has fluctuated over the last decade, narrowed from 8.3 percentage points in 2007 to 4.9 percentage points in 2008, and was no longer statistically significant. Among the individual vaccines in the series, the greatest difference measured was in completion of the 4th DTaP, consistent with 2007 results; however the difference in 2008 fell short of statistical significance.
6. Analyses of TennCare and WIC enrolled children compared to those not enrolled are presented in Appendix 3. Although both TennCare and WIC children surveyed were less likely to be immunized on time than counterparts who were never enrolled, these estimates did not reach statistical significance. A large and significant difference was 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 as a result of the findings of this survey of 24-month-old children.

1. 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.
2. 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 DTaP 4.
3. TIP will share survey findings with WIC and TennCare leadership to inform their strategies to improve on-time immunization of their patient populations. In the summer of 2008, the practice of providing only one month of WIC vouchers (instead of three) to parents of children behind on immunizations until they were caught up was discontinued; new strategies, including telephone reminders through the TENNderCare program have replaced this approach. Subsequent survey results may demonstrate the effect of these changes.
4. 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, having multiple siblings, and delayed start to immunization.
5. TIP is in the process of a regulation change that would require PCV7 for child care enrollment among children <5 years.
6. The TIP epidemiologist will resume providing regular reports of children who start immunizations at >120 days and children who have two or more siblings (those at high risk of not completing immunizations) to the regional health department offices for their use.
7. 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

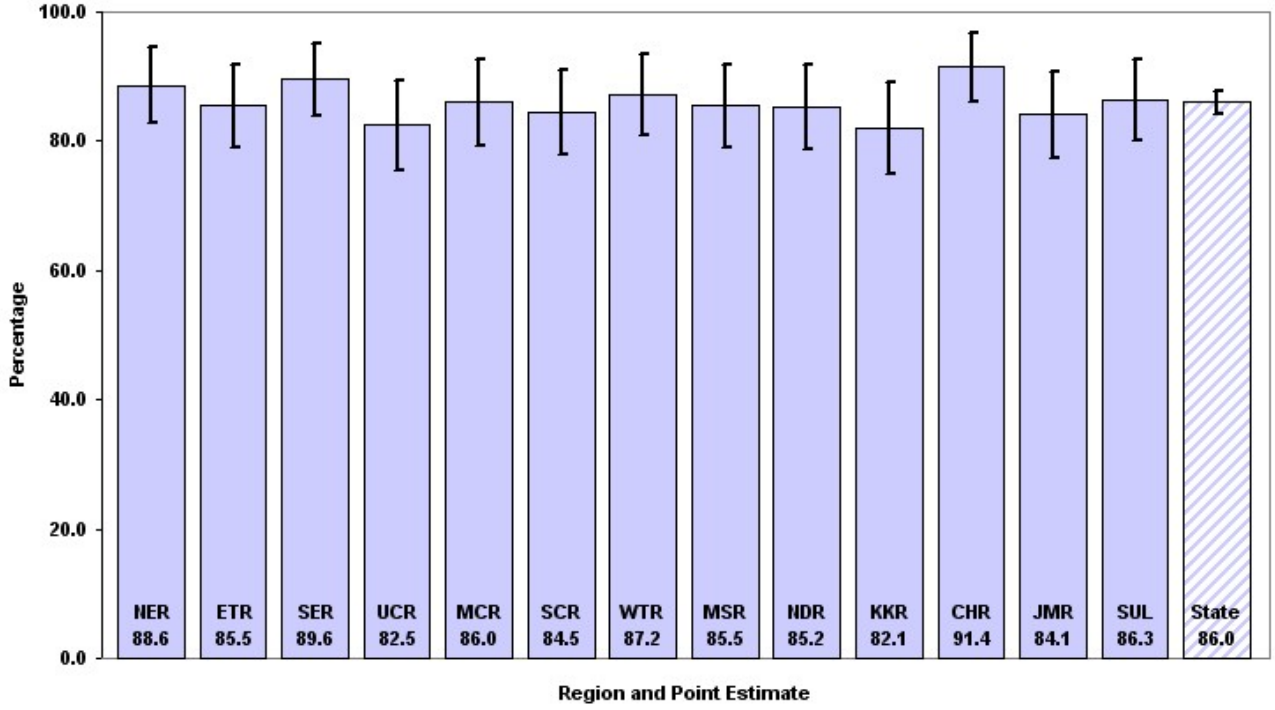
on-time immunization documented in medical records; site visitors help staff address areas for improvement in immunization service delivery.

8. The 2009 survey will continue to report on the 4:3:1:3:3:1 vaccines, PCV7 and influenza, and will add assessments of the use of hepatitis A vaccine, recommended in 2006 for all children between 12 and 24 months of age.

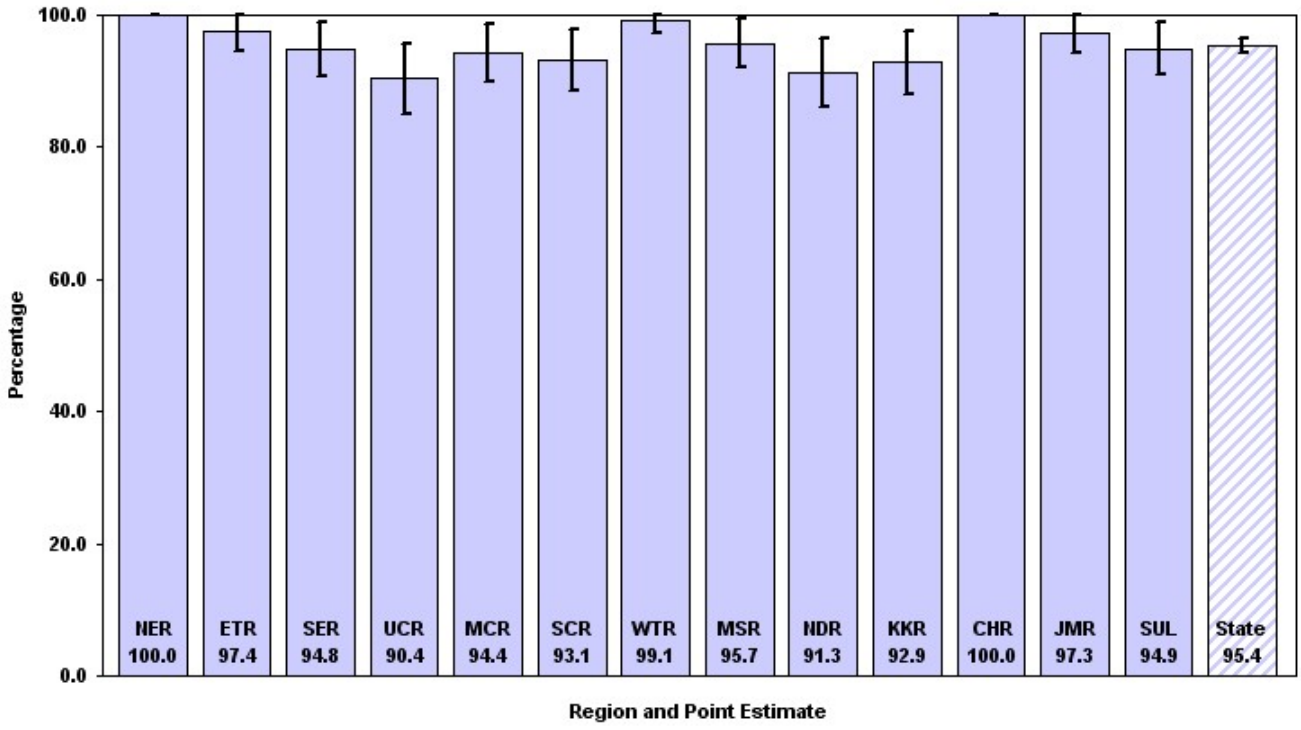
Appendix 1
2008 Immunization Status Survey
Of 24-Month-Old Children in Tennessee

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

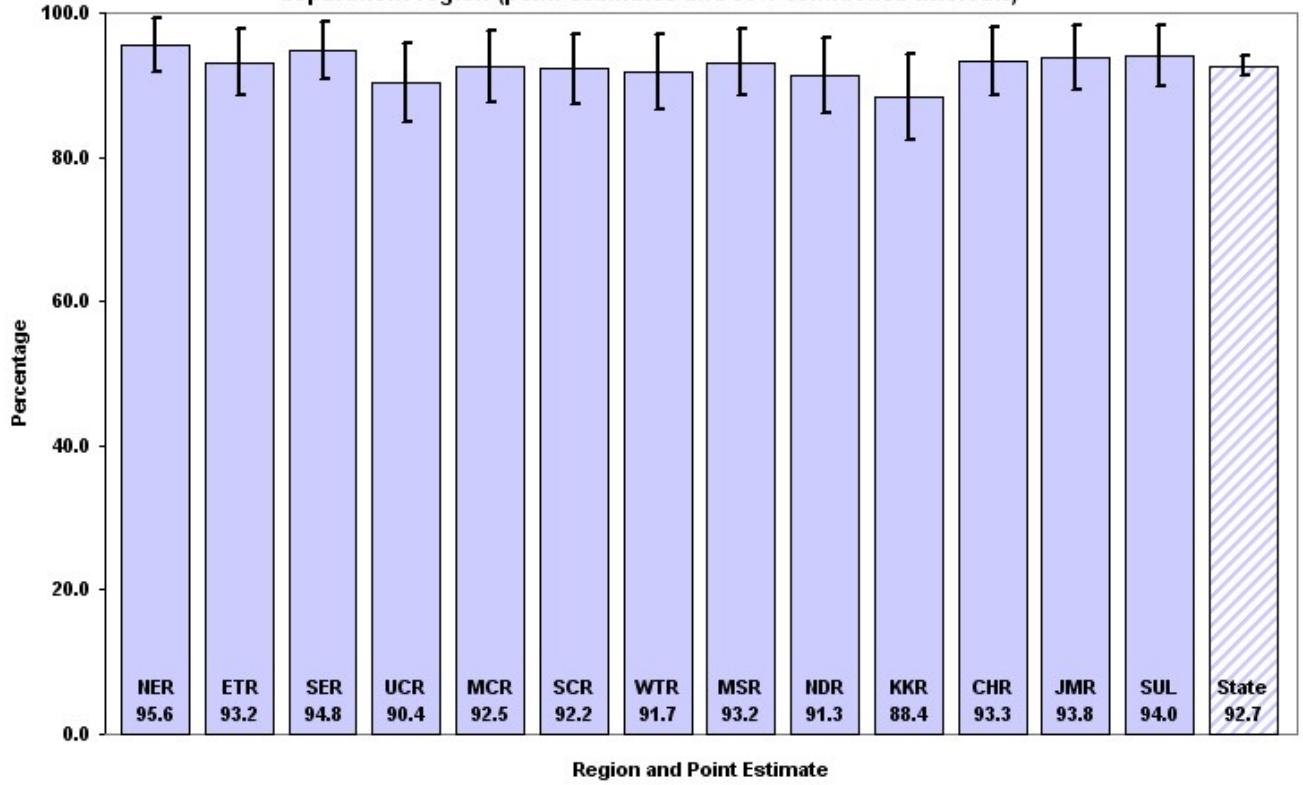
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete diptheria, tetanus and acellular pertussis (DTaP) series (4 doses) by health department region (point estimates and 95% confidence intervals)



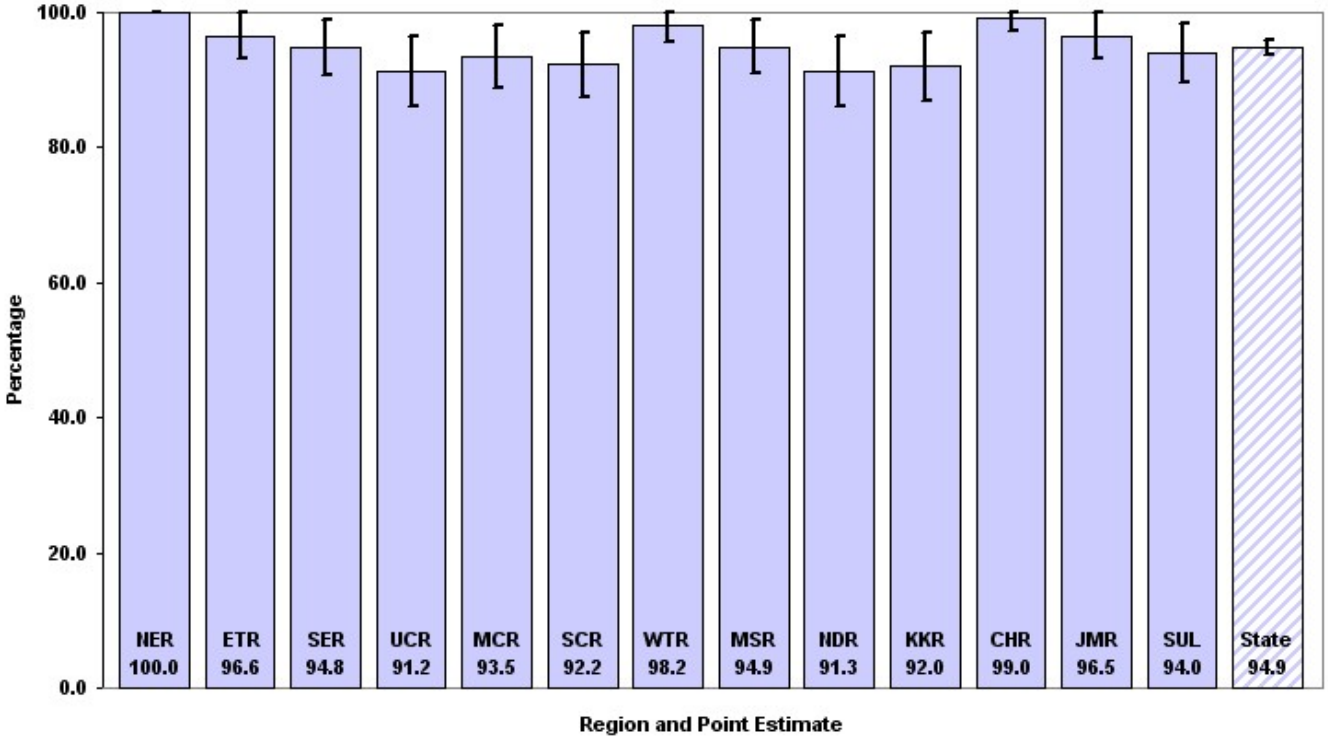
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete polio (IPV) series (3 doses) by health department region (point estimates and 95% confidence intervals)



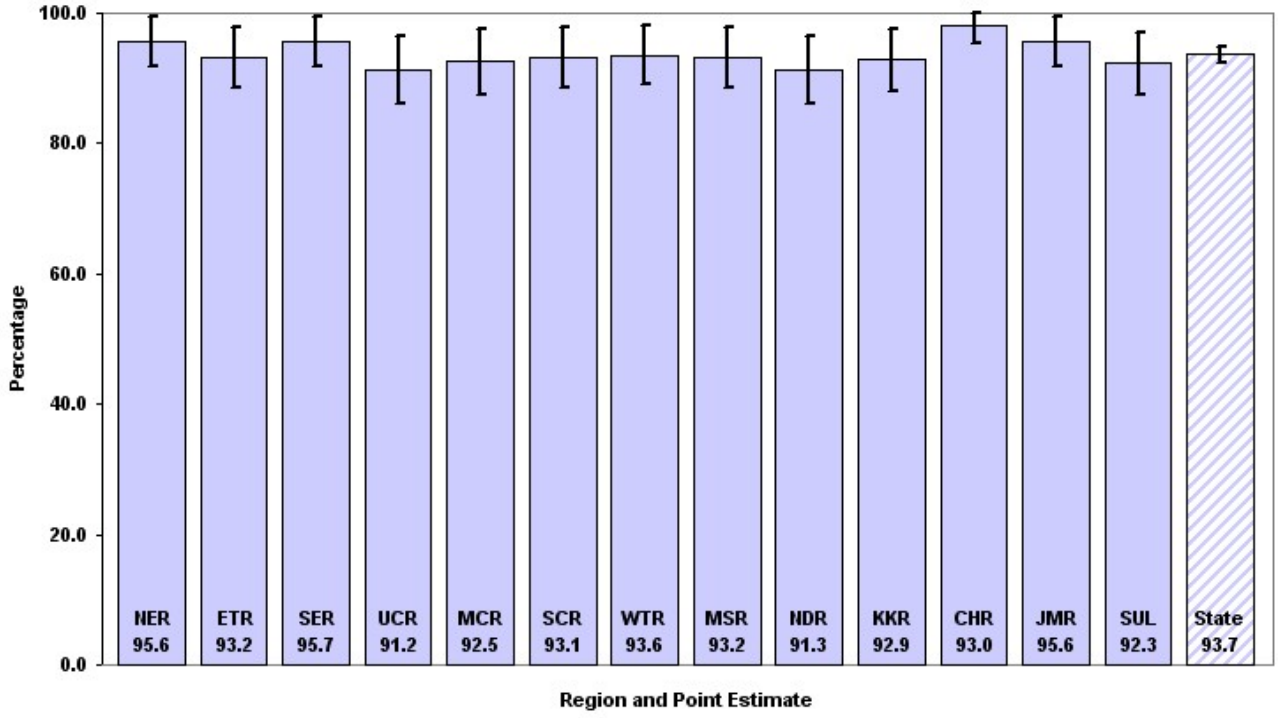
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete measles, mumps, and rubella (MMR) series (1 dose) by health department region (point estimates and 95% confidence intervals)



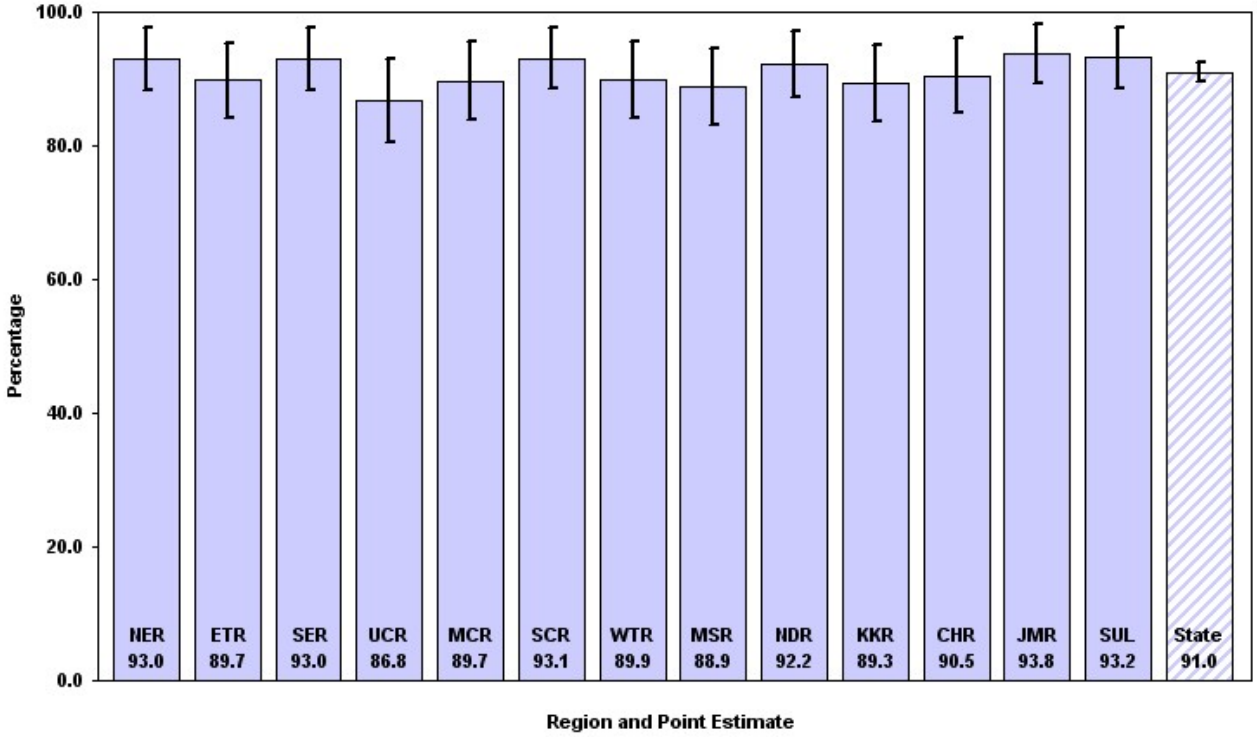
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete Hepatitis B (HBV) series (≥3 doses) by health department region (point estimates and 95% confidence intervals)



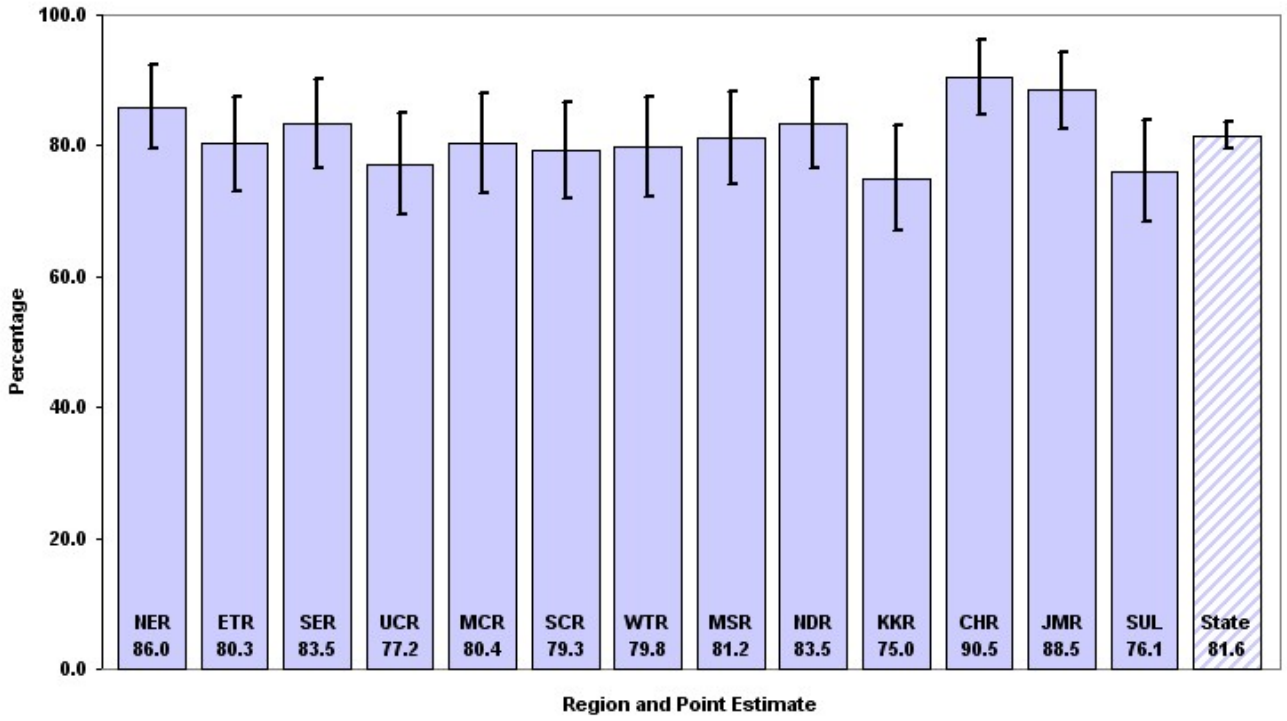
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete *Haemophilus influenzae* type B (Hib) series (3 or 4 doses) by health department region (point estimates and 95% confidence intervals)



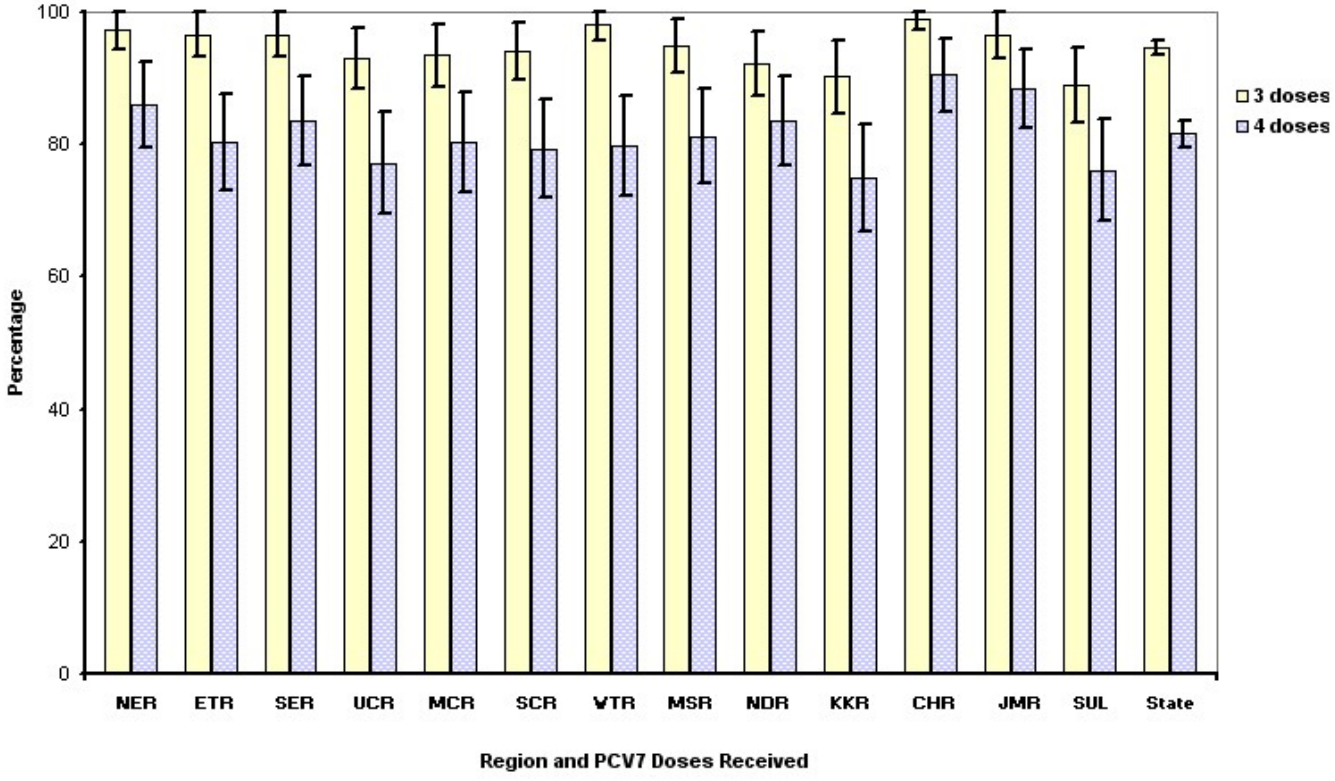
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete varicella series (1 dose) by health department region (point estimates and 95% confidence intervals)



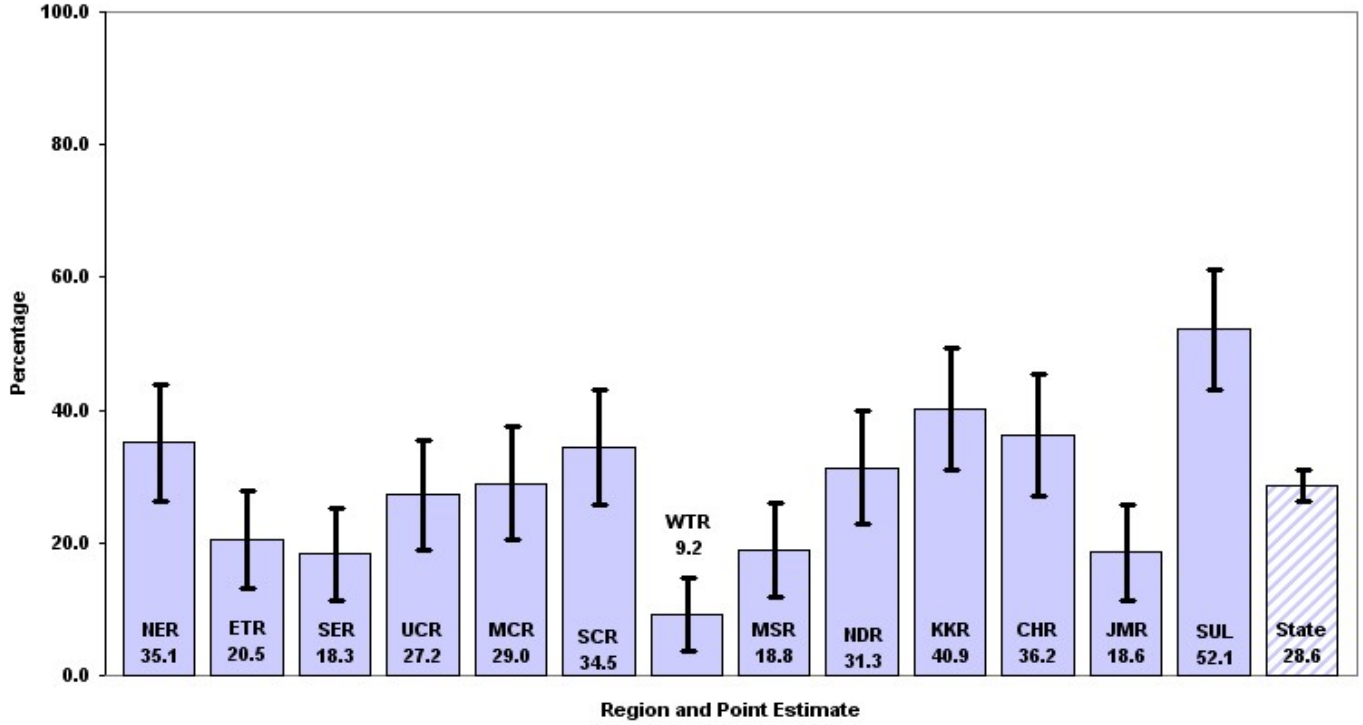
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with complete PCV7 series (4 doses) by health department region (point estimates and 95% confidence intervals)



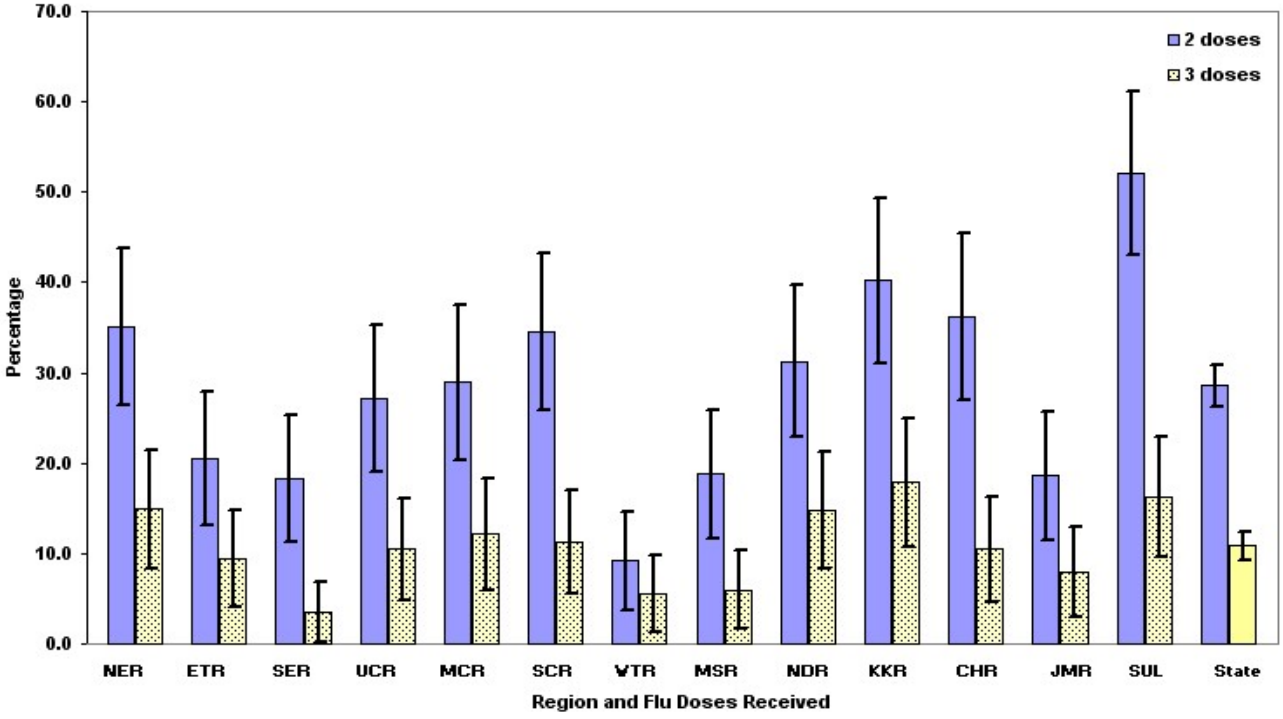
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with 3 or 4 doses of PCV7 by health department region



2008 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)



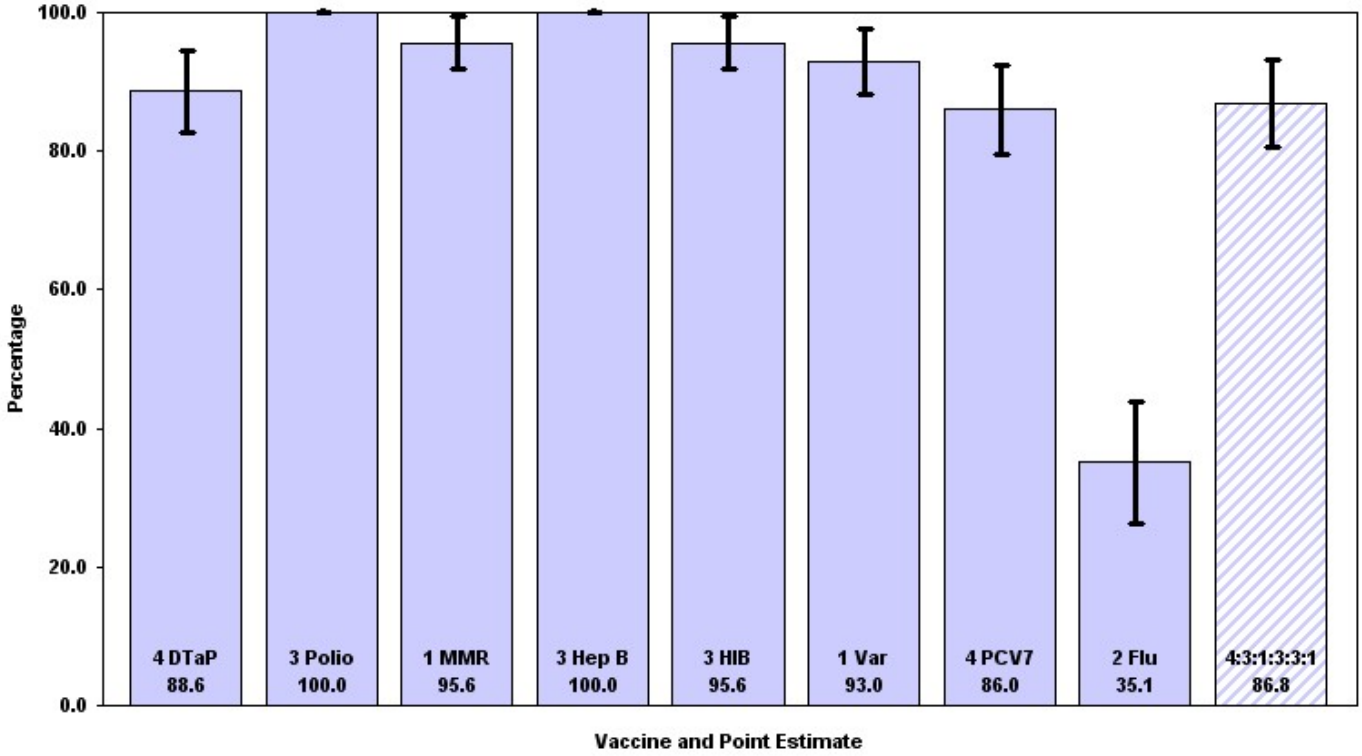
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children with 2 or 3 doses of Influenza vaccine by health department region (point estimates and 95% confidence intervals)



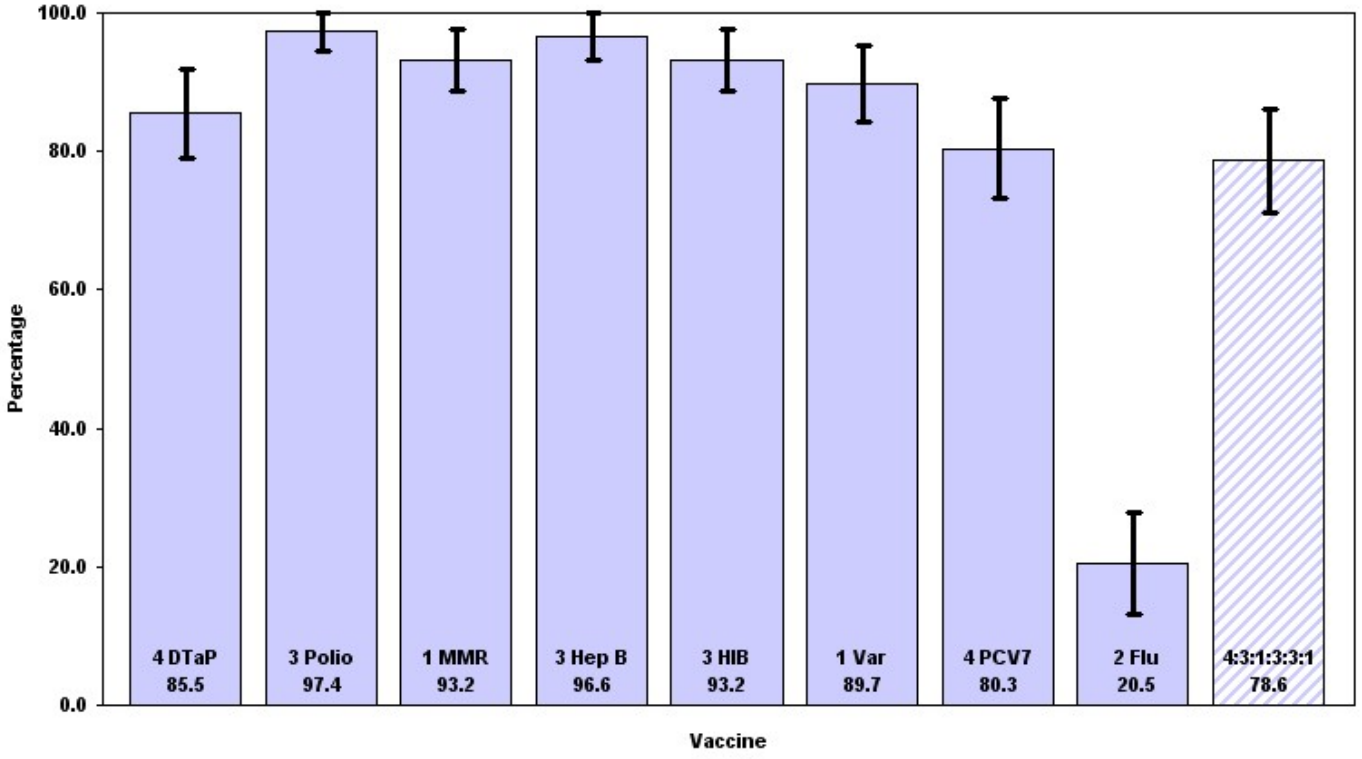
Appendix 2
2008 Immunization Status Survey
Of 24-Month-Old Children in Tennessee

Immunization coverage measured in each Public Health Region

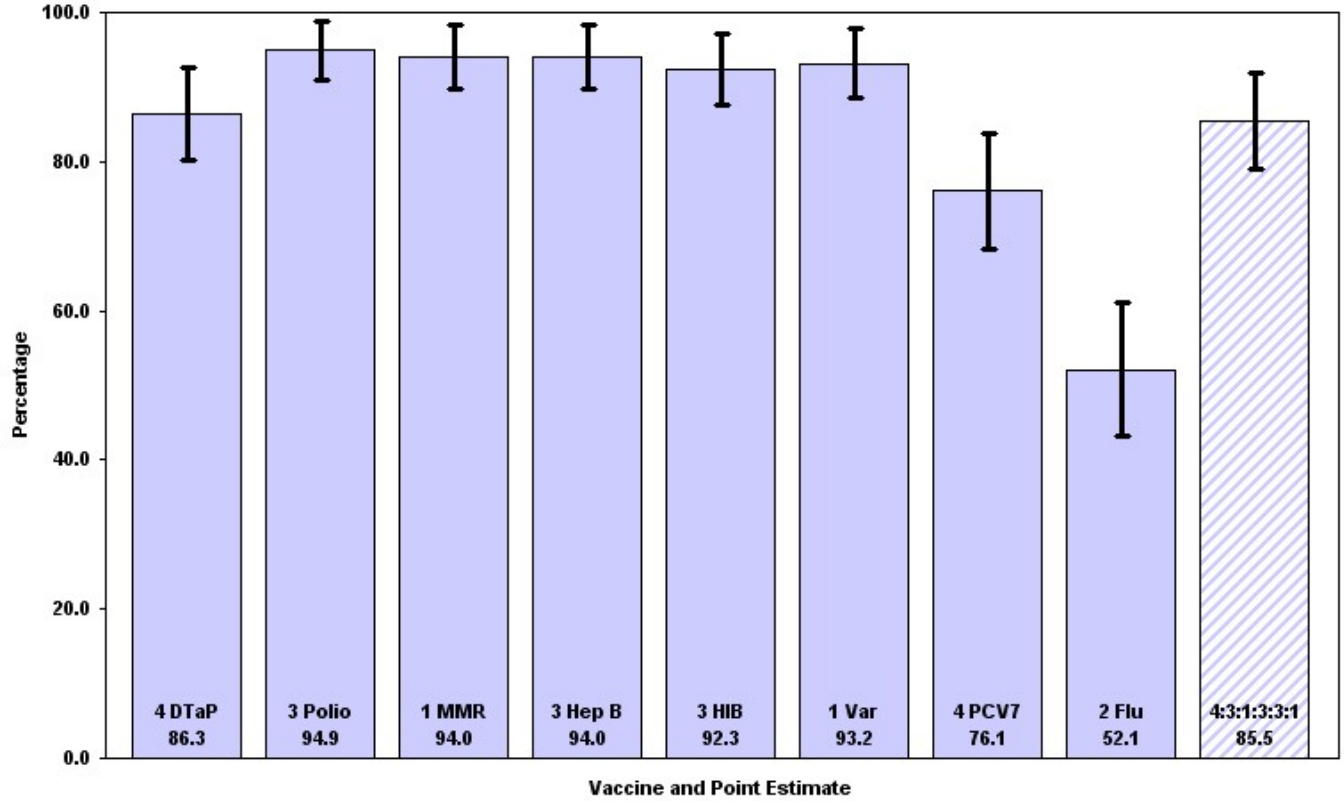
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Northeast Region (NER) by vaccine (point estmates and 95% confidence intervals) of 24-Month-Old Children in



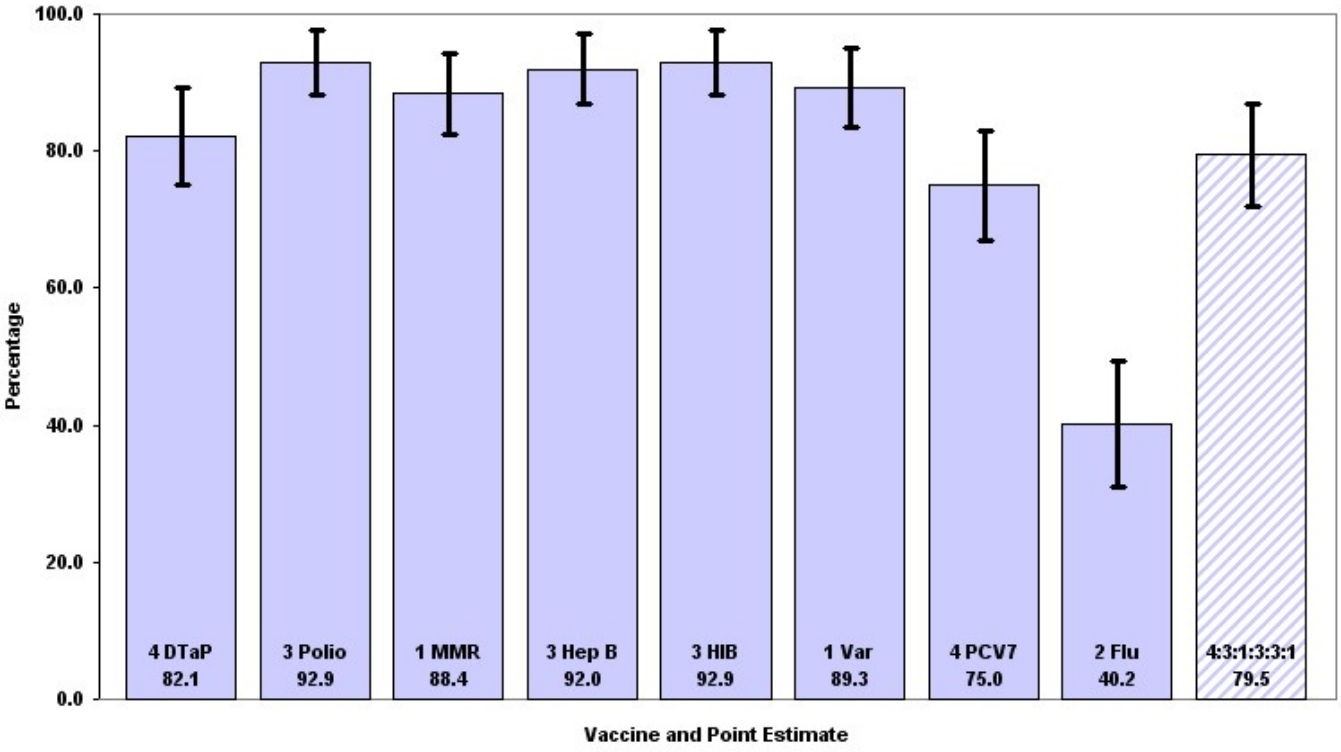
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in East Tennessee Region (ETR) by vaccine (point estmates and 95% confidence intervals)



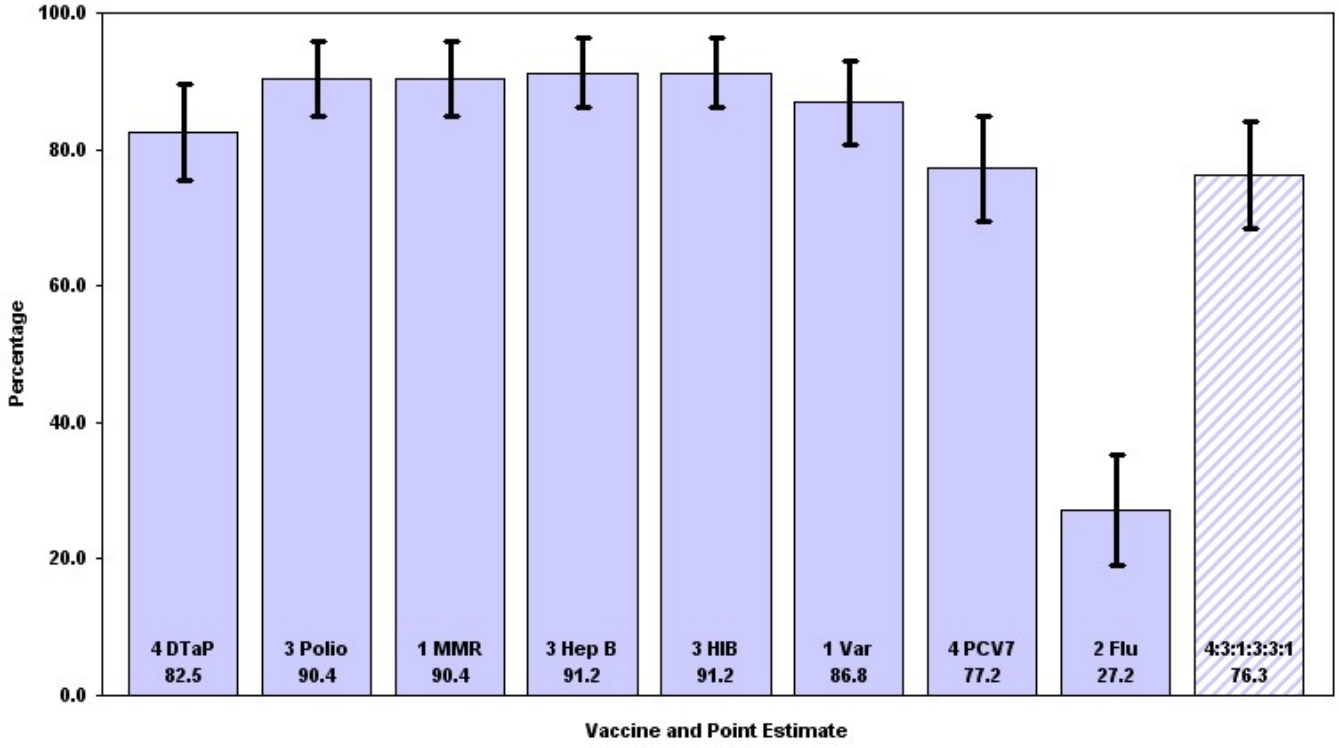
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Sullivan Region (SUL) by vaccine (point estimates and 95% confidence intervals)



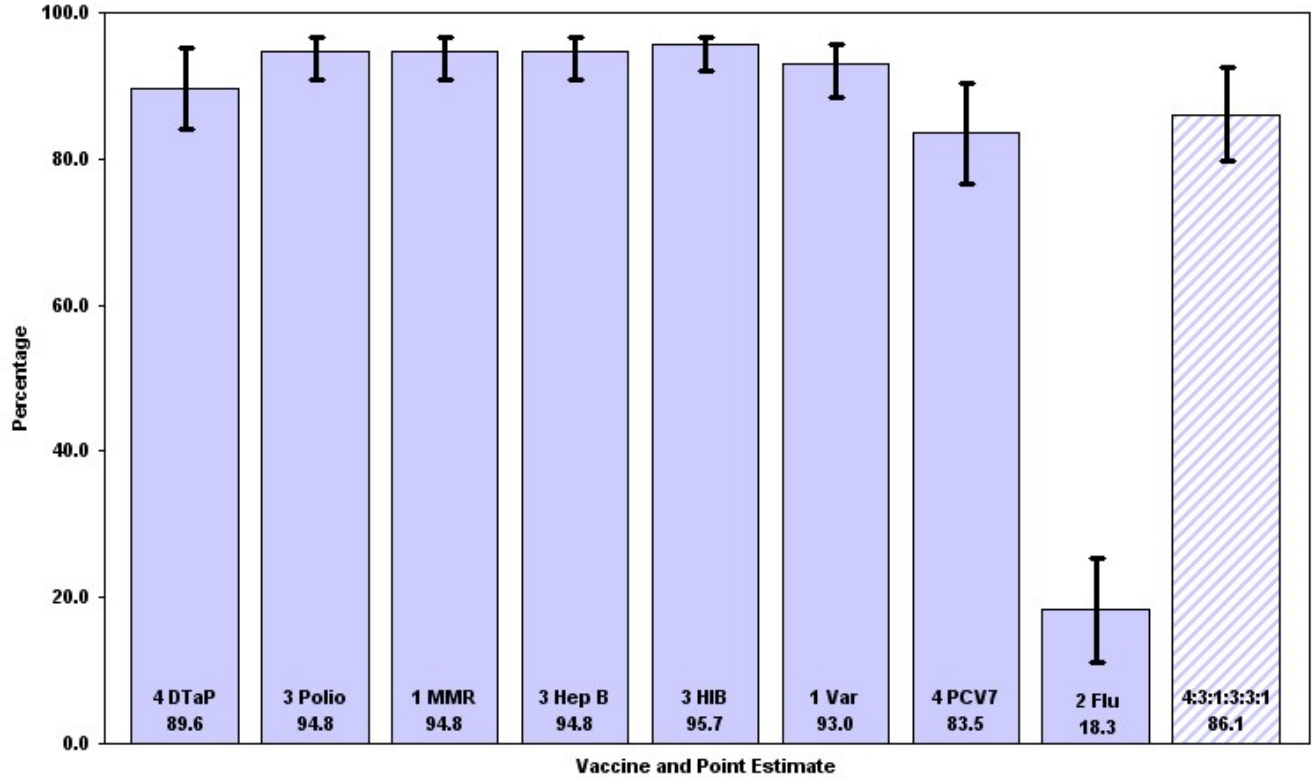
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Knoxville Region (KKR) by vaccine (point estmates and 95% confidence intervals)



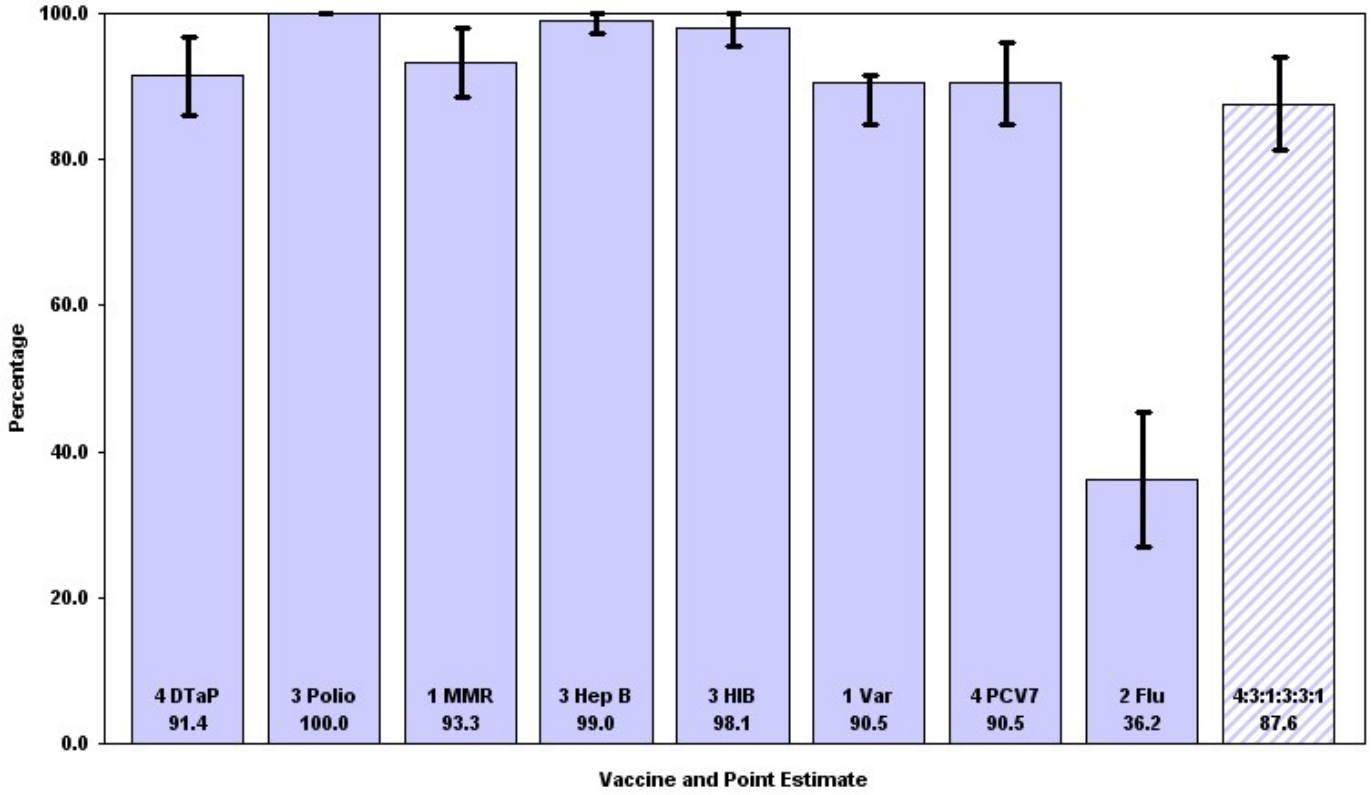
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Upper Cumberland Region (UCR) by vaccine (point estimates and 95% confidence intervals)



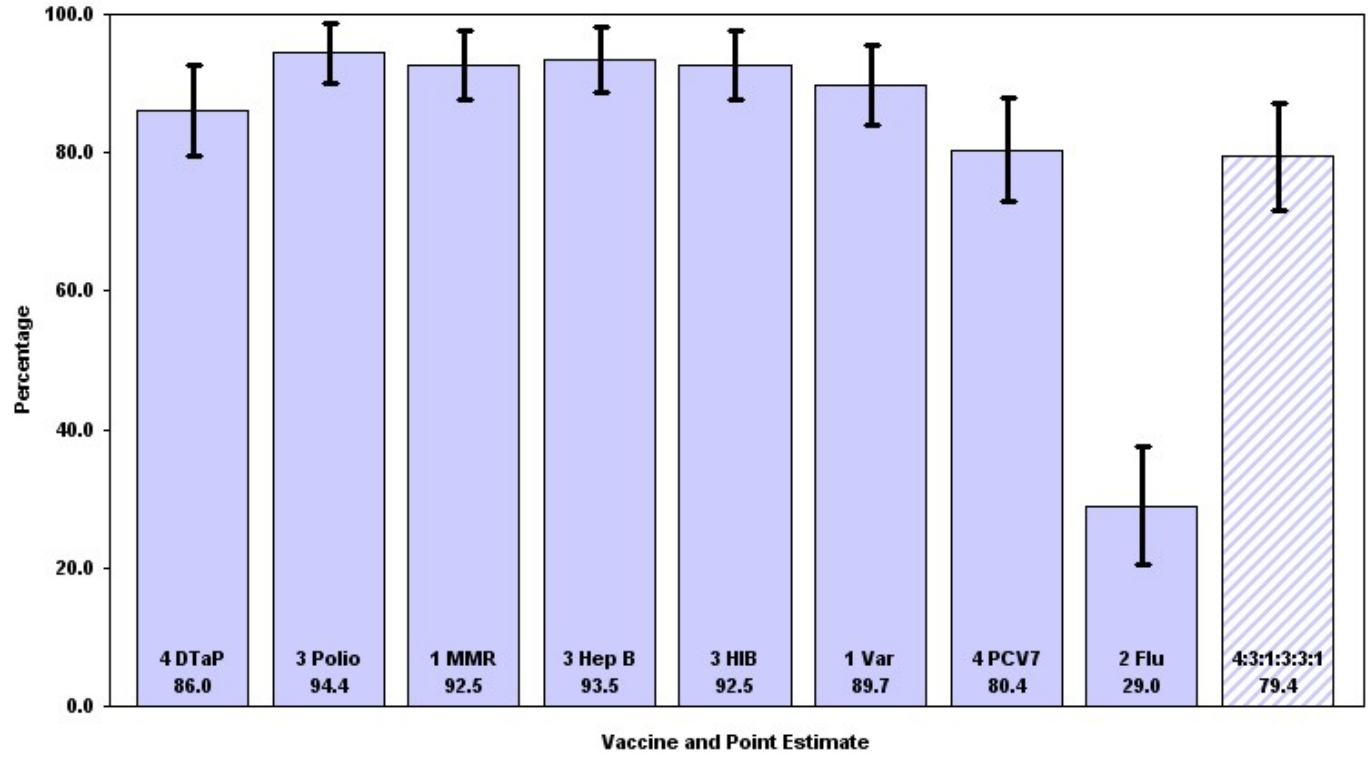
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Southeast Region (SER) by vaccine (point estmates and 95% confidence intervals)



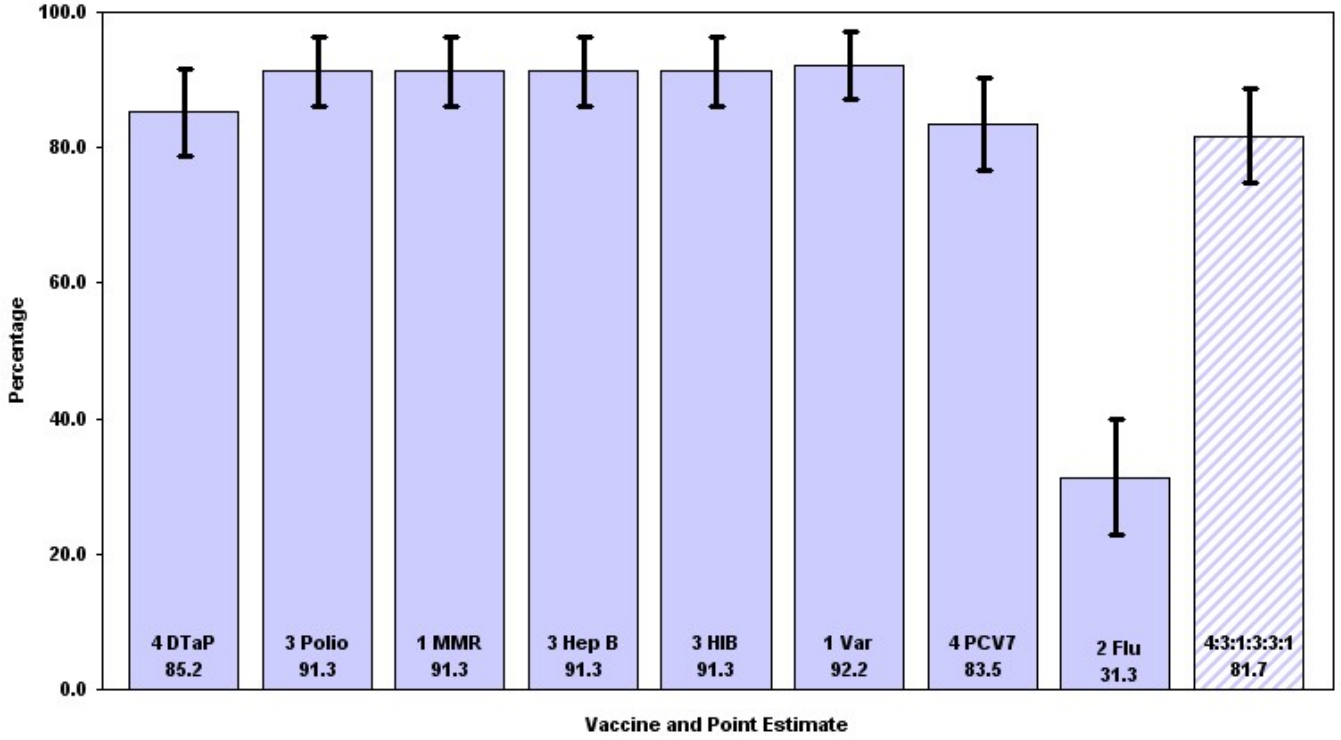
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Chattanooga Hamilton Region (CHR) by vaccine (point estmates and 95% confidence intervals)



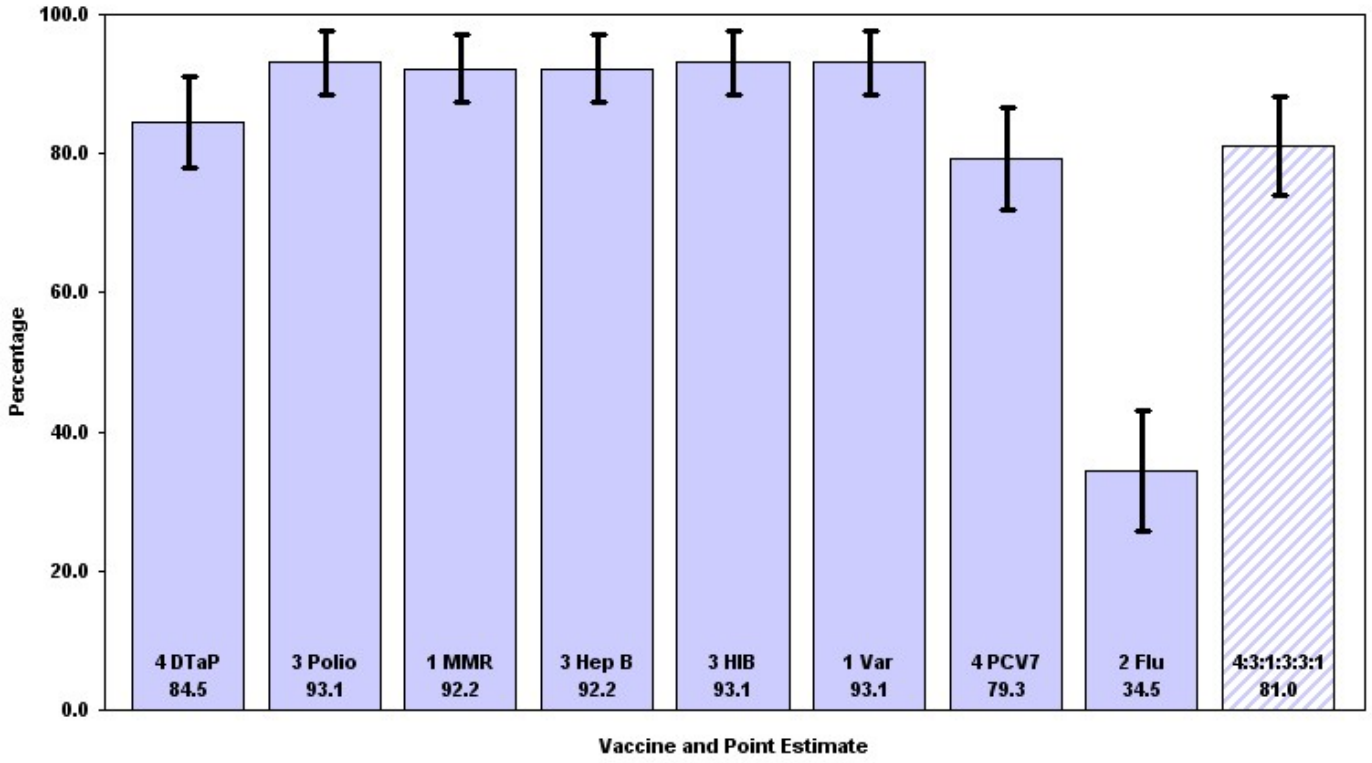
2007 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Mid-Cumberland Region (MCR) by vaccine (point estmates and 95% confidence intervals)



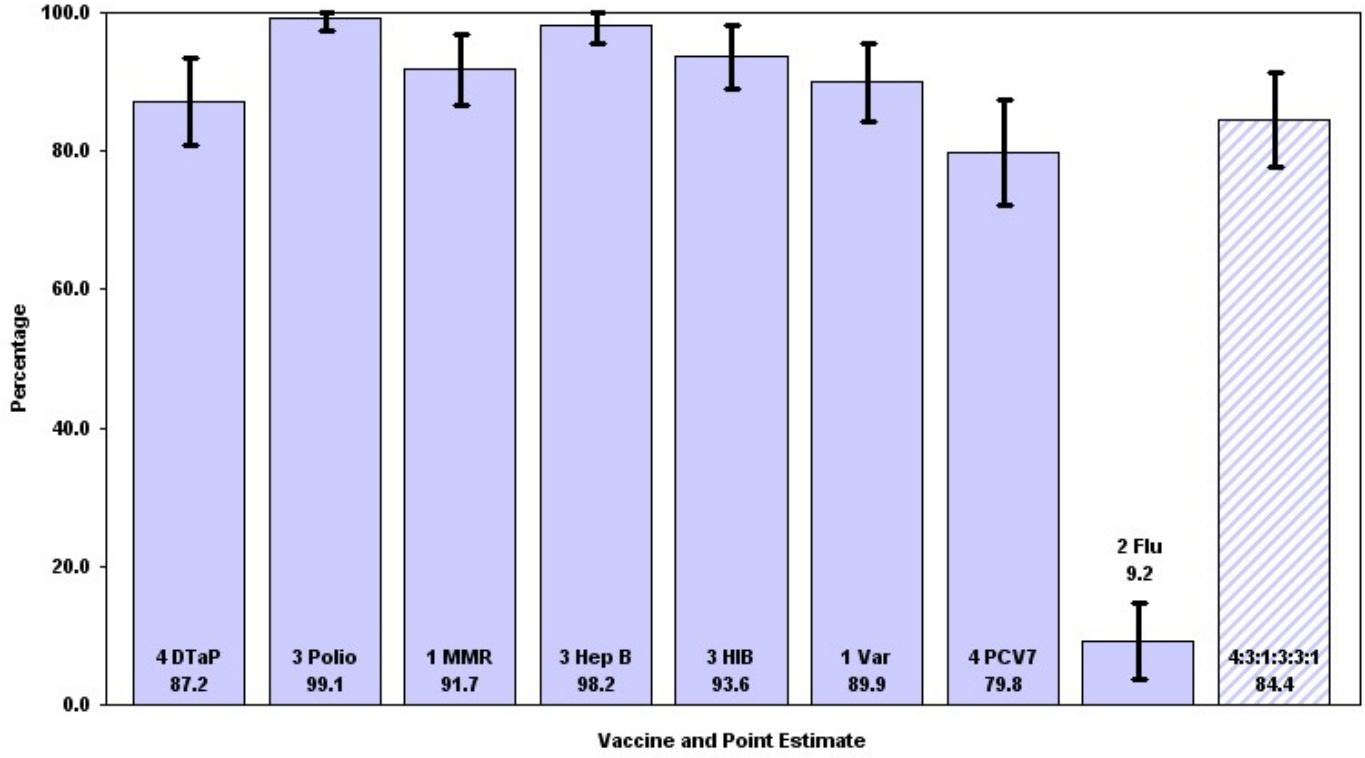
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Nashville Davidson Region (NDR) by vaccine (point estmates and 95% confidence intervals)



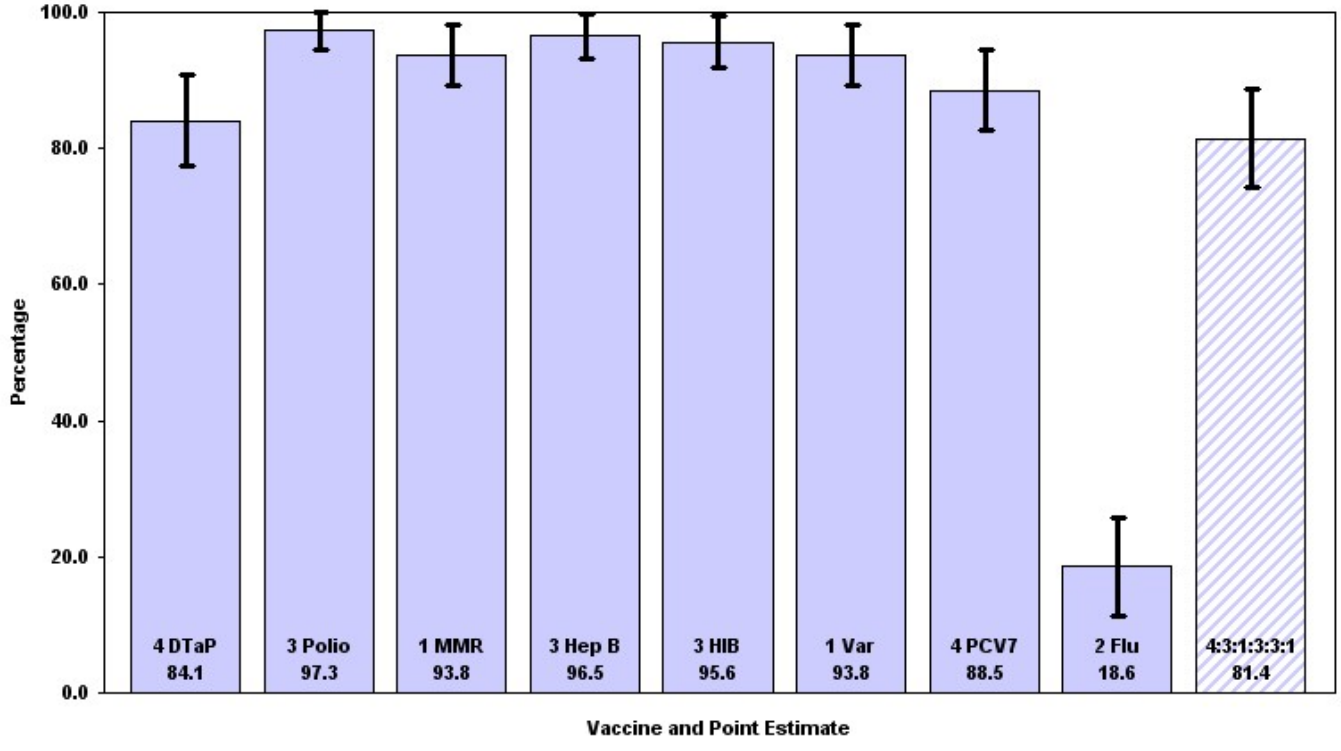
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in South Central Region (SCR) by vaccine (point estimates and 95% confidence intervals)



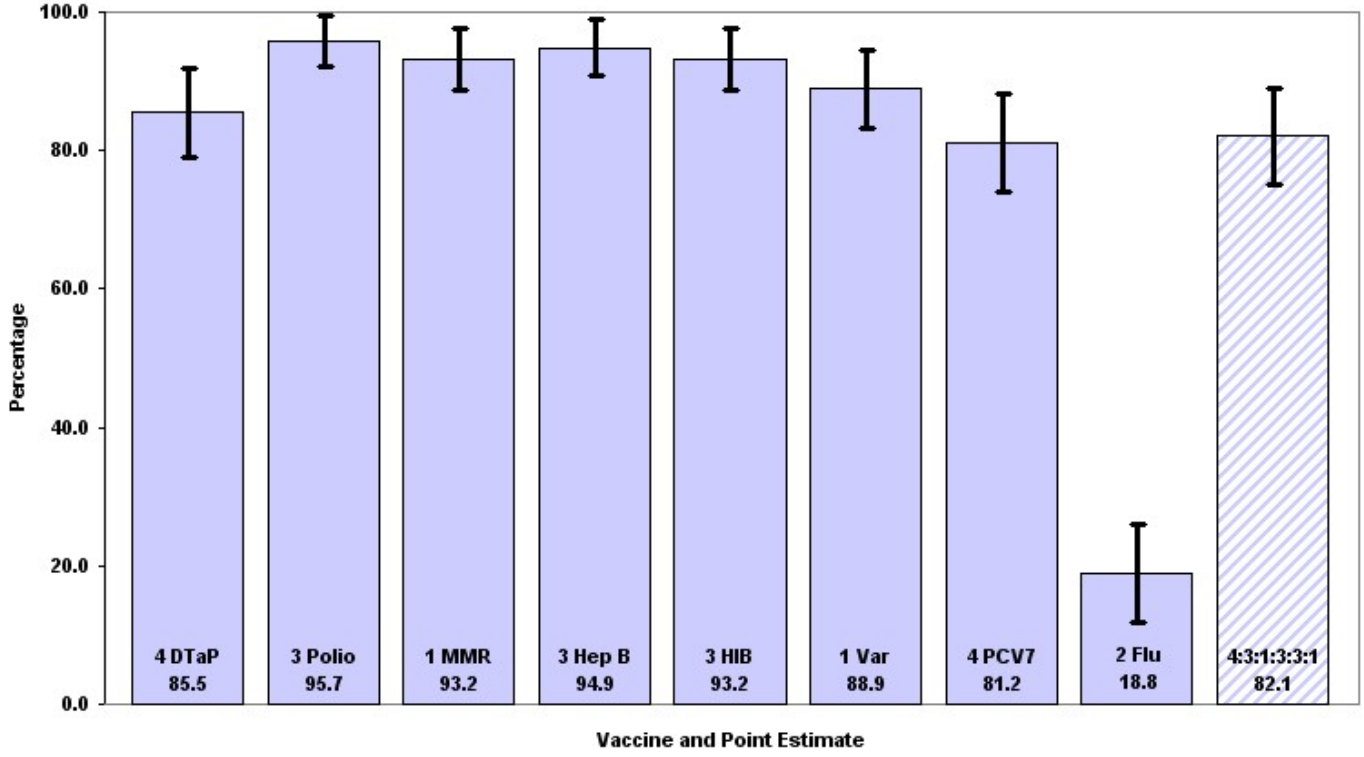
2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in West Tennessee Region (WTR) by vaccine (point estmates and 95% confidence intervals)



2007 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)

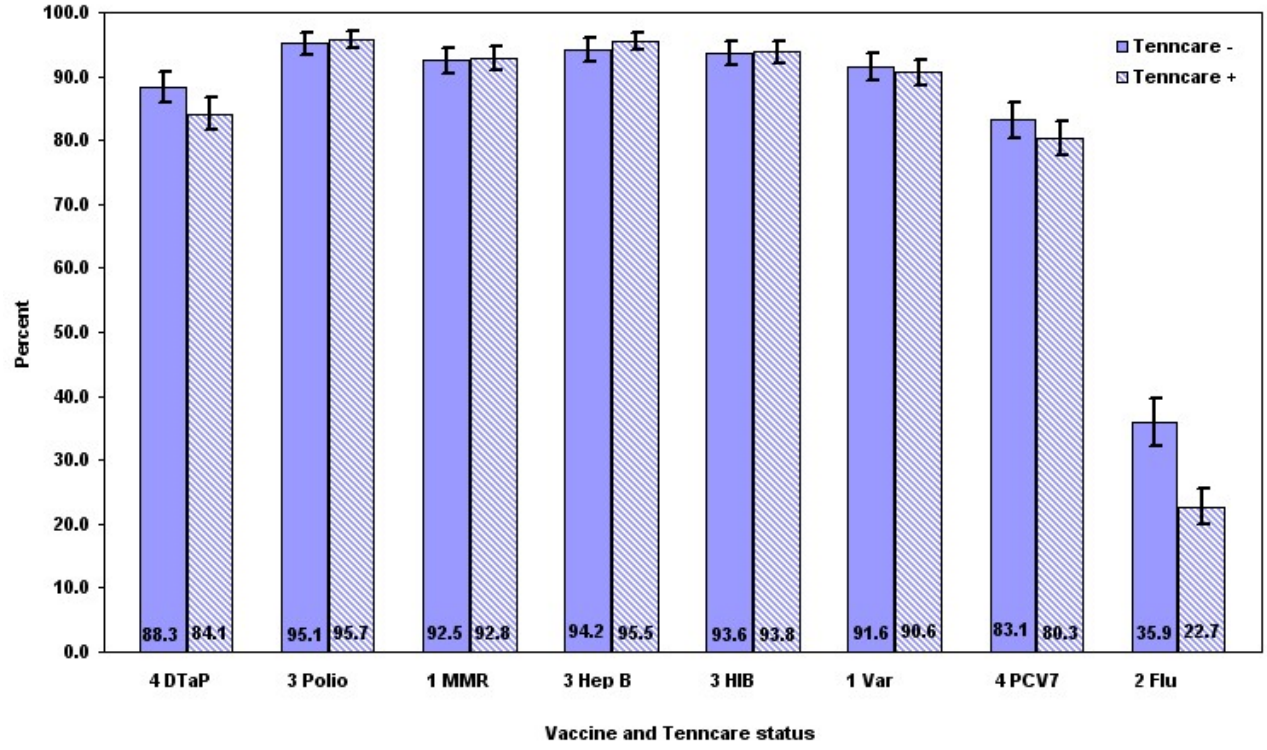


2008 Immunization Status Survey of 24-Month-Old Children in Tennessee: Percentage of children complete in Memphis Shelby Region (MSR) by vaccine (point estmates and 95% confidence intervals)

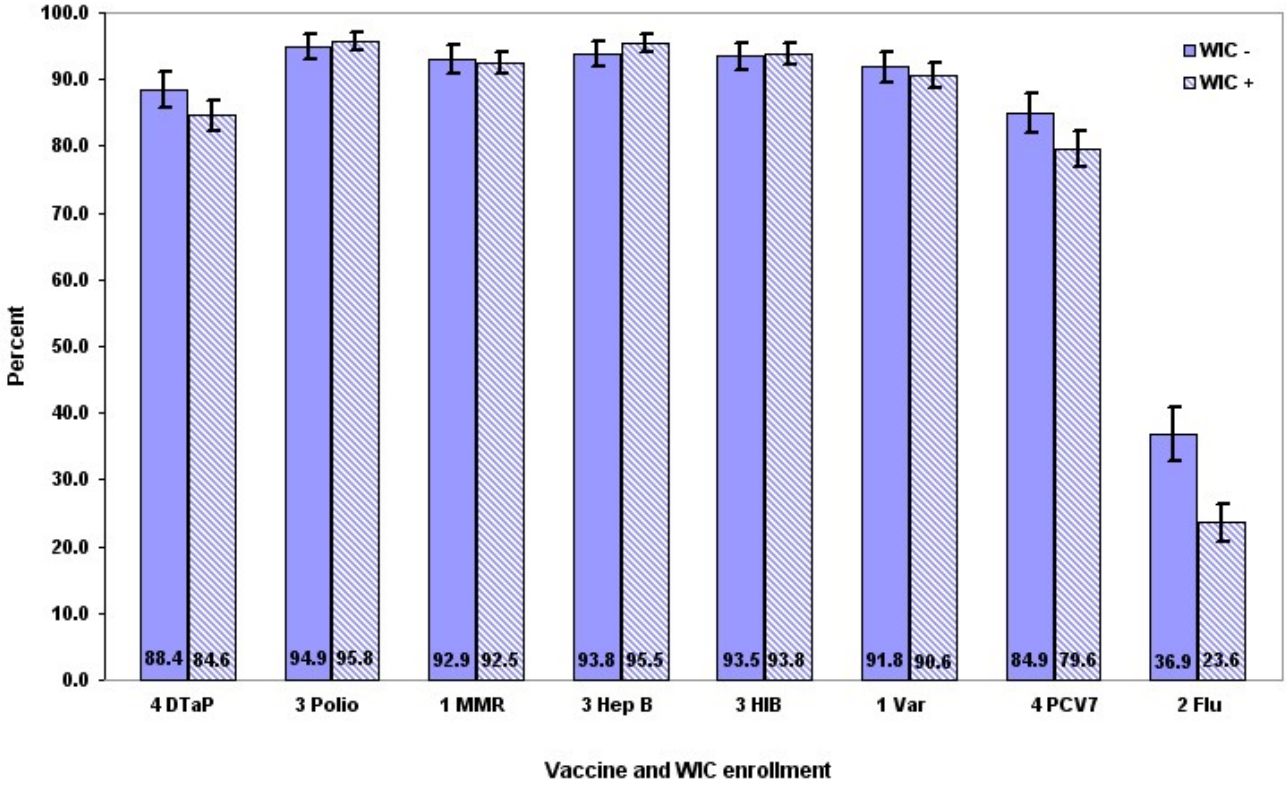


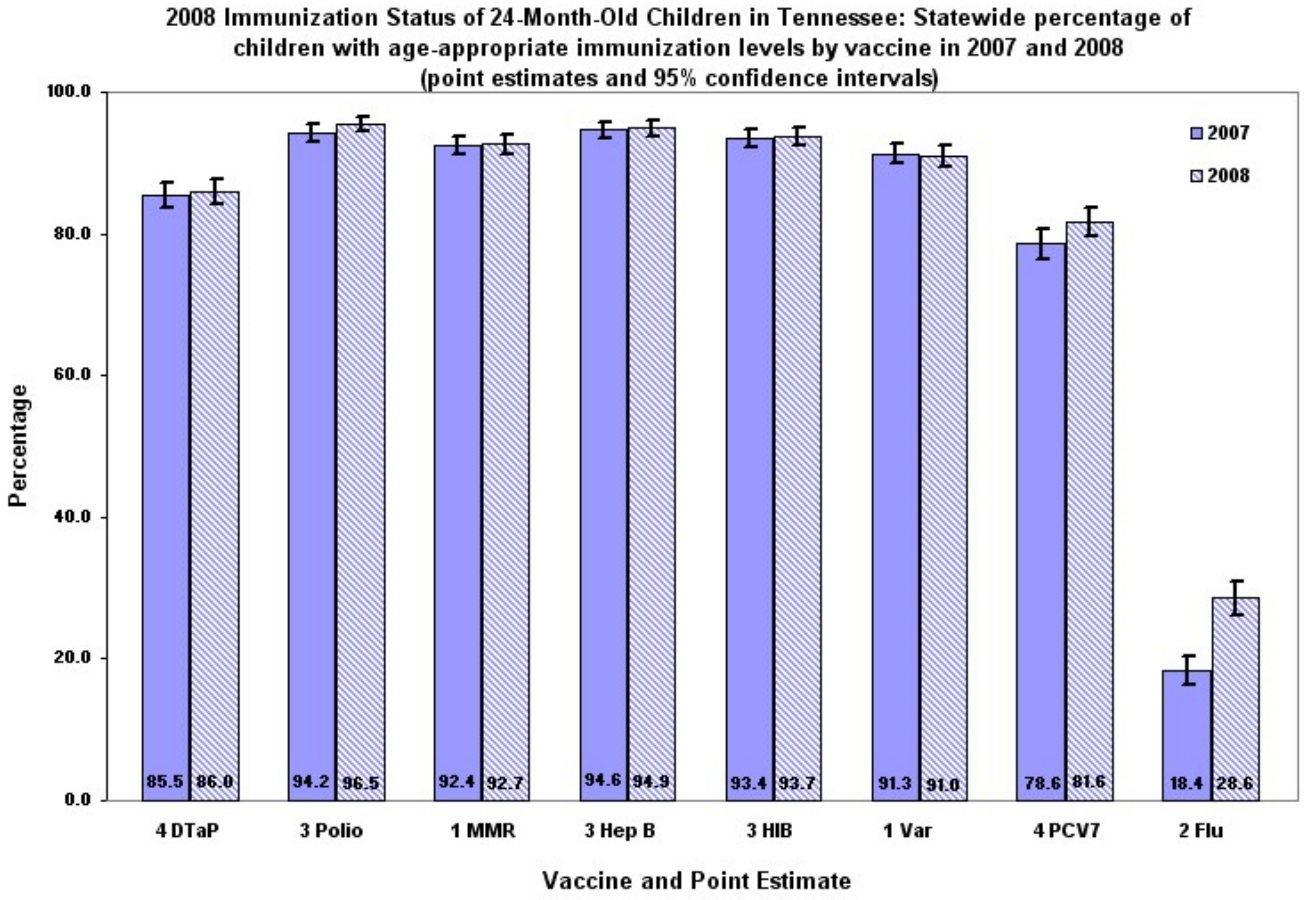
Appendix 3
2008 Immunization Status Survey
Of 24-Month-Old Children in Tennessee

2008 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)



2008 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)




2008 Immunization Status of 24-Month-Old Children in Tennessee: Statewide percentage of children with age-appropriate immunization levels by vaccine in 2007 and 2008 (point estimates and 95% confidence intervals)
Percentage
100.0
80.0
60.0
40.0
20.0
0.0
2007
2008
85.5
86.0
94.2
96.5
92.4
92.7
94.6
94.9
93.4
93.7
91.3
91.0
78.6
81.6
18.4
28.6
4 DTaP
3 Polio
1 MMR
3 Hep B
3 HIB
1 Var
4 PCV7
2 Flu
Vaccine and Point Estimate

Appendix 4
2008 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	99	86.8%	15	13.2%	114
East TN	92	78.6%	25	21.4%	117
Southeast TN	99	86.1%	16	13.9%	115
Upper Cumberland	87	76.3%	27	23.7%	114
Mid-Cumberland	85	79.4%	22	20.6%	107
South Central	94	81.0%	22	19.0%	116
West TN	92	84.4%	17	15.6%	109
Shelby County	96	82.1%	21	17.9%	117
Davidson County	94	81.7%	21	18.3%	115
Knox County	89	79.5%	23	20.5%	112
Hamilton County	92	87.6%	13	12.4%	105
Madison County	92	81.4%	21	18.6%	113
Sullivan County	100	85.5%	17	14.5%	117
Total	1211	82.3%	260	17.7%	1471

Series Complete (4:3:1)

Region	Yes		No		Total
	n=	%	n=	%	n=
Northeast TN	101	88.6%	13	11.4%	114
East TN	98	83.8%	19	16.2%	117
Southeast TN	101	87.8%	14	12.2%	115
Upper Cumberland	92	80.7%	22	19.3%	114
Mid-Cumberland	89	83.2%	18	16.8%	107
South Central	96	82.8%	20	17.2%	116
West TN	93	85.3%	16	14.7%	109
Shelby County	100	85.5%	17	14.5%	117
Davidson County	96	83.5%	19	16.5%	115
Knox County	91	81.2%	21	18.8%	112
Hamilton County	96	91.4%	9	8.6%	105
Madison County	92	81.4%	21	18.6%	113
Sullivan County	101	86.3%	16	13.7%	117
Total	1246	84.7%	225	15.3%	1471

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

Region	Public			Private			Both		
	Yes	Total	%	Yes	Total	%	Yes	Total	%
Northeast TN	14	14	100.0%	72	83	86.7%	13	17	76.5%
East TN	5	6	83.3%	71	89	79.8%	16	21	76.2%
Southeast TN	10	12	83.3%	74	82	90.2%	15	17	88.2%
Upper Cumberland	13	15	86.7%	58	77	75.3%	16	21	76.2%
Mid-Cumberland	3	3	100.0%	70	83	84.3%	12	18	66.7%
South Central	9	11	81.8%	57	68	83.8%	28	33	84.8%
West TN	34	37	91.9%	43	55	78.2%	15	17	88.2%
Shelby County	8	13	61.5%	67	76	88.2%	21	27	77.8%
Davidson County	0	2	0.0%	87	99	87.9%	7	11	63.6%
Knox County	5	11	45.5%	74	89	83.1%	10	12	83.3%
Hamilton County	1	2	50.0%	80	90	88.9%	11	13	84.6%
Madison County	28	37	75.7%	43	49	87.8%	21	27	77.8%
Sullivan County	7	9	77.8%	81	90	90.0%	12	15	80.0%
Total	137	172	79.7%	877	1030	85.1%	197	249	79.1%

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

Region	White			Black			Other		
	Yes	Total	%	Yes	Total	%	Yes	Total	%
Northeast TN	96	111	86.5%	3	3	100.0%	0	0	0.0%
East TN	89	113	78.8%	0	1	0.0%	3	3	100.0%
Southeast TN	98	113	86.7%	1	2	50.0%	0	0	0.0%
Upper Cumberland	87	111	78.4%	0	2	0.0%	0	1	0.0%
Mid-Cumberland	76	96	79.2%	7	9	77.8%	2	2	100.0%
South Central	84	105	80.0%	6	7	85.7%	4	4	100.0%
West TN	68	80	85.0%	23	28	82.1%	1	1	100.0%
Shelby County	30	33	90.9%	62	78	79.5%	4	6	66.7%
Davidson County	74	88	84.1%	19	25	76.0%	1	2	50.0%
Knox County	77	97	79.4%	10	13	76.9%	2	2	100.0%
Hamilton County	66	74	89.2%	23	27	85.2%	3	4	75.0%
Madison County	59	67	88.1%	33	46	71.7%	0	0	0.0%
Sullivan County	98	115	85.2%	2	2	100.0%	0	0	0.0%
Total	1002	1203	83.3%	189	243	77.8%	20	25	80.0%

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

Region	0 Siblings			1 Siblings			2+Siblings		
	Yes	Total	%	Yes	Total	%	Yes	Total	%
Northeast TN	47	49	95.9%	30	36	83.3%	22	29	75.9%
East TN	43	52	82.7%	32	40	80.0%	17	25	68.0%
Southeast TN	44	46	95.7%	31	38	81.6%	23	30	76.7%
Upper Cumberland	32	40	80.0%	35	43	81.4%	20	30	66.7%
Mid-Cumberland	35	40	87.5%	29	34	85.3%	21	32	65.6%
South Central	39	45	86.7%	32	38	84.2%	22	32	68.8%
West TN	41	42	97.6%	25	34	73.5%	25	31	80.7%
Shelby County	38	43	88.4%	31	39	79.5%	26	34	76.5%
Davidson County	49	57	86.0%	25	30	83.3%	14	20	70.0%
Knox County	44	49	89.8%	23	30	76.7%	22	33	66.7%
Hamilton County	44	44	100.0%	29	37	78.4%	17	22	77.3%
Madison County	41	44	93.2%	19	24	79.2%	32	45	71.1%
Sullivan County	39	45	86.7%	41	46	89.1%	20	26	76.9%
Total	536	596	89.9%	382	469	81.5%	281	389	72.2%

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

Region	Enrolled			Not Enrolled		
	Yes	Total	%	Yes	Total	%
Northeast TN	51	63	81.0%	48	51	94.1%
East TN	52	68	76.5%	40	49	81.6%
Southeast TN	57	6	85.1%	42	48	87.5%
Upper Cumberland	56	75	74.7%	31	39	79.5%
Mid-Cumberland	40	55	72.7%	45	52	86.5%
South Central	63	76	82.9%	31	40	77.5%
West TN	58	65	89.2%	34	44	77.3%
Shelby County	66	81	81.5%	30	36	83.3%
Davidson County	47	60	78.3%	47	55	85.5%
Knox County	16	21	76.2%	73	91	80.2%
Hamilton County	37	45	82.2%	55	60	91.7%
Madison County	55	73	75.3%	37	40	92.5%
Sullivan County	61	70	87.1%	39	47	83.0%
Total	659	819	80.5%	552	652	84.7%

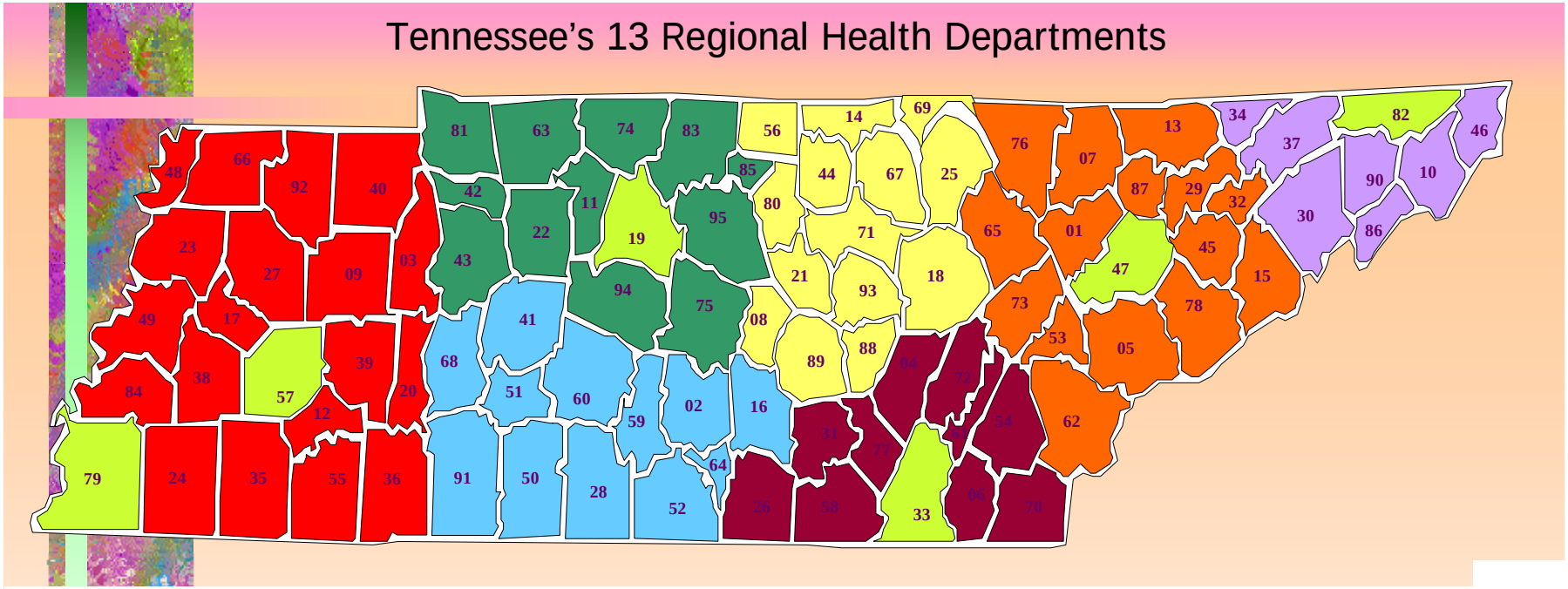
DTaP Immunizations Received by 25 Months

Region	0		1		2		3		4		Total
Northeast TN	0	0.0%	0	0.0%	0	0.0%	5	4.7%	101	95.3%	106
East TN	1	0.9%	0	0.0%	2	1.8%	7	6.4%	100	90.9%	110
Southeast TN	4	3.6%	0	0.0%	0	0.0%	3	2.7%	103	93.6%	110
Upper Cumberland	2	1.0%	2	1.8%	1	0.9%	11	10.0%	94	85.5%	110
Mid-Cumberland	3	2.8%	1	0.9%	0	0.0%	10	9.4%	92	86.8%	106
South Central	4	3.5%	1	0.9%	1	0.9%	10	8.8%	98	86.0%	114
West TN	0	0.0%	1	1.0%	0	0.0%	5	5.0%	95	94.1%	101
Shelby County	1	0.9%	1	0.9%	3	2.6%	3	7.9%	100	87.7%	114
Davidson County	4	2.0%	2	1.8%	1	0.9%	8	7.1%	98	86.7%	113
Knox County	0	0.0%	0	0.0%	5	4.7%	9	8.5%	92	86.8%	106
Hamilton County	0	0.0%	0	0.0%	0	0.0%	7	6.8%	96	93.2%	103
Madison County	0	0.0%	1	0.9%	1	0.9%	14	12.6%	95	85.6%	111
Sullivan County	3	2.6%	2	1.8%	1	0.9%	7	6.1%	101	88.6%	114
Total	22	1.6%	11	0.8%	15	1.1%	105	7.4%	1265	89.2%	1418

Note: Of the 22 children with no DTaP doses, 15 were not immunized for medical, personal or religious reasons and 7 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												