Behind the Numbers: State Variation in Childhood Immunization Coverage Rates

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ABSTRACT

Objectives
We examined state variation in childhood immunization coverage rates by comparing high and low coverage states in terms of demographics and state immunization policies and practices to better understand factors affecting state rates and to inform state policy and practice decisions made to improve vaccination.

Methods
We identified high and low coverage states based on states' 4:3:1:3:3:1* rates in the 2005, 2006, and 2007 National Immunization Surveys (NIS). We collected corresponding state-level demographic, immunization policy, and immunization practice data and tested for differences in each of the survey years using the Wilcoxon Rank Sum Test and Fisher's Exact Test.

Results
Differences between high and low coverage states were detected. High coverage states had higher proportions of children with private, employer-based insurance and births to mothers with at least four years of college and lower proportions of completely unvaccinated children and children living in low-income households. High coverage states were more likely to have insurance benefit mandates for immunization and to require all vaccines for childcare. Finally, these states served a greater proportion of their WIC participants at WIC clinic sites with immunization activities.

Conclusions
The results indicate that states with high and low childhood immunization coverage rates differ in terms of key demographic, policy, and practice measures. To improve childhood coverage rates states should: adopt insurance benefit mandates that prohibit cost-sharing, require age-appropriate vaccination for childcare facilities, implement a rigorous process for granting non-medical exemptions, and continue to link immunization and WIC services. Multivariate analysis is needed to determine the extent of the impact of various measures on state coverage rates and potential interactions among measures tested.

* 4:3:1:3:3:1: 4 or more doses of any diphtheria and tetanus toxoids and pertussis vaccines including diphtheria and tetanus toxoids, and any acellular pertussis vaccine (DTaP/DTP/DT); 3 or more doses of any poliovirus vaccine; 1 or more doses of measles-mumps-rubella vaccine; 3 or more doses of Haemophilus influenzae type b vaccine; 3 or more doses of hepatitis B vaccine; and 1 or more doses of varicella vaccine.

BACKGROUND AND OBJECTIVES

Achieving and maintaining high immunization levels in each birth cohort is essential for the continued control of vaccine preventable disease. In order to provide protection from widespread transmission of disease in the population, public health goals call for 90% coverage among children for individual vaccines and 80% coverage for the series of recommended immunizations.

The primary responsibility to assure adequate immunization levels in the population falls to the states. In order to better understand variation in state's childhood coverage rates and ultimately inform state policy and practice decisions designed to improve coverage, we compared high and low coverage states in terms of key demographic, policy, and practice measures.

METHODS

Selection of States
We identified high and low coverage states based on 4:3:1:3:3:1 rates in the 2005, 2006, and 2007 NIS. The thirteen states in the fourth quartile (Q4) are used to represent high coverage states and the thirteen in the first quartile (Q1) are used to represent low coverage states (Figure 1).

Measures of Interest
State-level demographic, immunization policy, and immunization practice measures were chosen based on a review of the literature and data availability (Tables 1 and 2). Demographic, policy, and practice measures reflect data from two years prior, when available, since the NIS measures up-to-date status among children age 19 to 35 months.

Analysis
We used SAS software to test for associations between state immunization coverage groups and selected measures. The Wilcoxon Rank Sum Test was used to test demographic and state practice measures and Fisher's Exact Test was used to test binary immunization policy measures. State coverage groups were treated as independent samples for each NIS year.

Table 1. Demographic Measures

Race/Ethnicity	Percent of children age 0-18 years by race/ethnicity:[1] • White, non-Hispanic, • Black, non-Hispanic, • Hispanic, and • Other race, non-Hispanic.
Poverty	Percent of children under age 18 year by the federal poverty level:[2] • < 125% FPL, • ≥ 125% to < 200% FPL (near poverty), and • > 200% FPL.
Insurance	Percent of children under age 18 years by type of health insurance:[3] • Uninsured, • Private insurance, • Private employer-based insurance, • Government insurance, and • Government insurance: Medicaid/State Children's Health Insurance Program.
Maternal Education	Percent of births to mothers by maternal education:[4] • < High school education and • ≥ Four-year college degree.
Completely Unvaccinated Children	Rate of completely unvaccinated children age 19-35 months per 100,000.[5]
Access to Medical Care	Percent of children age 0-5 years with:[6] • One or more preventive medical care visits during the past year and • One or more health professionals considered by parent to be a personal doctor or nurse.
Physician Distribution	Rate of primary care physicians** per 100,000 population.[7]

Table 2. State Immunization Policy and Practice Measures

Financial Coverage of Vaccines	State vaccine purchase policy:[8] • Universal Purchase • Enhanced VFC • VFC-Only
	Insurance benefit mandate for childhood immunizations:[9] • Mandate • Mandate that specifies no copayments • Mandate that specifies no deductibles • Mandate that specifies no copayments and no deductibles
Childcare Immunization Laws	Childcare immunization requirements:[10] • Vaccines in the 4:3:1:3:3:1 series required for child care Non-medical exemption availability: • Philosophical exemption
Immunization Assessment and Outreach	WIC-Immunization linkages:[11] • Percent of WIC participants age 0-5 years served at WIC clinics with immunization interventions
	Provider quality improvement:[12] • Percent of VFC-enrolled providers who received an assessment, feedback, incentives, and exchange site visit in the past year.

RESULTS

Immunization Coverage Rates
• Coverage rates differed significantly between first and fourth quartile states in all three survey years (Figure 1).

Demographics
• High and low coverage states differed significantly in all three NIS years in terms of: the percent of children with private, employer-based insurance; percent of births to mothers with four or more years of college; and rates of completely unvaccinated children (Figure 2, A-C).
• High and low coverage states differed significantly in two of the three NIS years in terms of: the percent of children living in low-income households; the percent of children receiving a preventive medical visit in the past year; and the percent of black, non-Hispanic children (Figure 2, D-F).
• No significant differences were found for the percent of children living in poverty and the percent of children with government-based insurance.

Policy Measures
• One policy measure was significantly different in two of the three survey years: presence of an insurance benefit mandate for childhood immunization. Two policies were significantly different in one of the three years: benefit mandates that prohibited cost sharing and childcare immunization requirements (Figure 3).
• No significant differences were found in terms of having universal or enhanced vaccine purchase policies or availability of philosophical exemptions.

Practice Measures
• One significant difference was found in state immunization practices. In all three survey years, high coverage states served a greater proportion of their WIC clinic participants at WIC clinic sites with immunization activities.
• No difference was found in terms of the proportion of states' Vaccines for Children-enrolled providers receiving an immunization quality improvement assessment visit in the past year.

CONCLUSIONS

There were significant demographic and immunization policy and practice differences between states with high and low childhood immunization coverage rates. Exploring the relationship between these factors and state coverage rates sheds light on variation in the annual NIS and informs state immunization program managers and policy makers intent on improving coverage. State policy makers should consider: adopting insurance benefit mandates for childhood immunizations, requiring age-appropriate vaccination for children in childcare, implementing a rigorous process for parents seeking non-medical exemptions, and establishing or continuing links between immunization and WIC services.

Continued monitoring of state immunization levels is needed as state policies and practices are adopted and federal health insurance reform efforts are initiated. Achieving and maintaining adequate vaccination levels in the preschool-age population not only protects children from acquiring deadly diseases but also protects the entire community, reduces medical costs, and saves lives.

Figure 1. High and Low Coverage States for the 4:3:1:3:3:1 Series; 2005, 2006, and 2007 NIS (*p<0.05)

Figure 2. Selected Demographic Differences Between High and Low Coverage States; Data by State Quartile Group and NIS Year (*p<0.05)

A. Percent of children under age 18 with private employer-based insurance.
B. Percent of births to mothers with four or more years of college.
C. Rate of completely unvaccinated children age 19-35 months per 100,000.
D. Percent of children under age 18 in near poverty households.
E. Percent of children age 0-5 years with preventive medical visit in the past year.
F. Rate of black non-Hispanic children age 0-18 years.
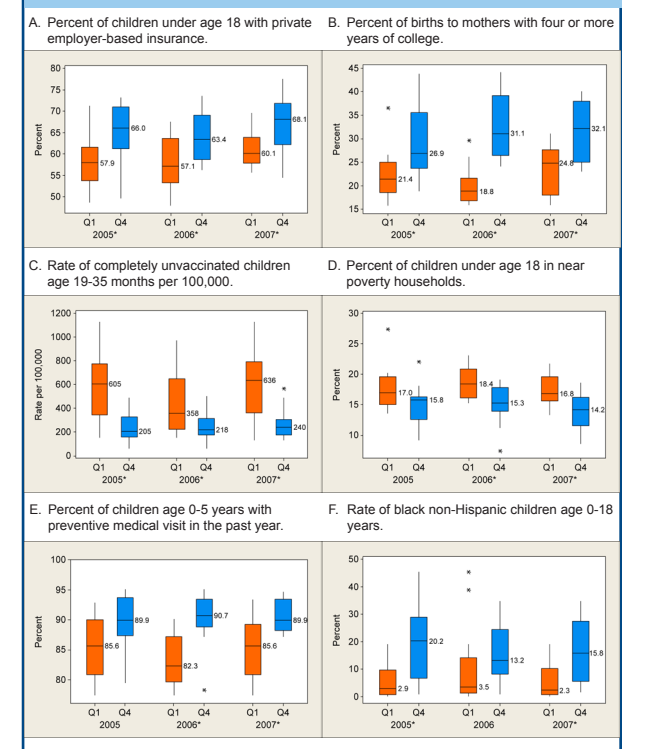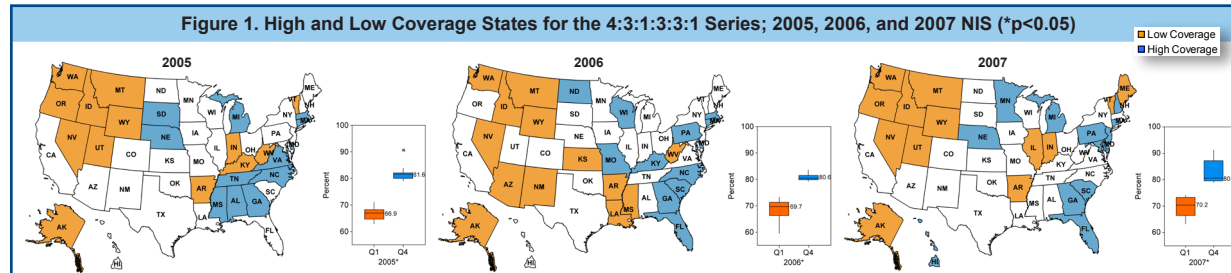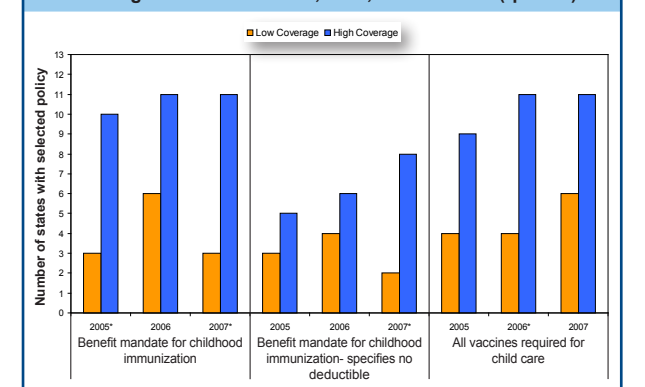
Figure 3. Selected Policy Differences Between High and Low Coverage States in the 2005, 2006, and 2007 NIS (*p<0.05)

1 Urban Institute and Kaiser Commission on Medicaid and the Uninsured. Estimates based on the Census Bureau's March 2005 and 2006 Current Population Survey. Aggregate 2004-2005 data. Other includes: Asian-Americans, Pacific Islanders, American Indians, Aleutians, Eskimos, and persons of two or more races.
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