OVERVIEW OF THE DESIGN AND PRELIMINARY RESULTS FROM THE TOPICAL MODULES OF THE NATIONAL IMMUNIZATION SURVEY

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Background

The National Immunization Survey (NIS) was initiated in April 1994 to monitor vaccination coverage rates on an ongoing basis. The NIS covers 78 Immunization Action Plan (IAP) areas that include the 50 states and 28 metropolitan areas, including the District of Columbia. Each IAP area represents a stratum of the sampling design within which the NIS samples independently. Within each IAP area, the design of the NIS includes 2 phases of sampling: a random digit dialing (RDD) phase of households with children between the ages of 19 and 35 months of age, followed by a mail survey of vaccination providers of these "age-eligible" children in sampled households. Smith et al.[1] and Zell et al.[2] give a more detailed description of the design of the NIS.

One of the primary functions of the NIS has been to provide surveillance to monitor progress toward achieving vaccination goals defined by the Childhood Immunization Initiative [3] and to assist the CDC in directing resources to states for the purposes of improving vaccination coverage rates in IAP areas.

In addition to providing estimated coverage rates for IAP areas, there has been recognition that additional information is required to assist the National Immunization Program at the Centers for Disease Control and Prevention in improving vaccination coverage rates. Specific topics that have been identified where additional information is required include parents' ability to pay for vaccinations; (in parents) knowledge and experiences about immunization; and (in) day care arrangements/breastfeeding practices/WIC participation. All of these are important topics in which data will be collected and analyzed to improve our understanding of vaccination in the U.S. This information could lead to new or improved programs that are designed to increase vaccination rates further.

[1]Smith, P.J., Battaglia, M.P., Huggins, V., Ezzati-Rice, T., Rodén, A.-S., Khare, M., Wright, R.A. Overview of the sampling design and The statistical methods used in The national immunization survey. American Journal of Preventive Medicine, to appear.
[2] Smith, P.J., Rao, J.N.K., Daniels, D., Battaglia, M.P., Ezzati-Rice, T.M., Khare, M. Compensating for nonresponse bias in the national immunization survey using response propensities. NCHS Series 2 Report. Hyattsville, MD. To appear.
[3]Zell ER, Ezzati-Rice TM, Battaglia MP, and Wright RA. "National Immunization Survey: The Methodology of a Vaccination Surveillance System", Public Health Reports, Oxford University Press, Cary,NC, vol 115, pp 65-77, January/February 2000.
[4] Centers for Disease Control and Prevention. Reported vaccine-preventable diseases -United States, 1993, and the Childhood Immunization Initiative. MMWR Morb Mortal Wkly Rep. 1994;43:57-60.

The Design of the First NIS Topical Modules

The need to collect information on these topics has been carefully balanced with the burden that respondents bear in participating in the NIS RDD interview. Approximately 85% of all NIS respondents in the RDD phase of the survey are known to be mothers with at least 1 child between 19 and 35 months of age. Also, the current average interview length for the NIS household interview conducted over the telephone is approximately 24 minutes for households with an age eligible child. While the need for information on additional topics is great, if all respondents were asked additional questions, the length of the NIS interview would become considerably longer and would place even greater burden upon respondents.

To control respondent burden, a split sampling design has been used. In this design, each respondent with an age eligible child will be randomly assigned to receive questions pertaining to only one of the three topics. We refer to the questions that pertain to a single topic as a "topical module." The overall goal of the split sampling design is to control respondent burden, yet to enhance the NIS interview to collect additional analytically important information. Smith et al.[5] provider more details about the design of the NIS topical modules.

[5] Smith, Philip J., Simpson, Diane, Battaglia, Michael P., Huggins, Vicki, Rodewald, Lance, Klevens, Monina, Wilkinson, Marilyn, Rodén, Ann-Sofi, Khare, Meena, and Wright, Robert A. 2000. Split sampling design for topical modules in the National Immunization Survey. *2000 Proceedings of the Section on Survey Research Methods*. Alexandria, VA: American Statistical Association, pp. 653-658.

The Analytic Objectives of the First NIS Health Insurance Topical Module

Costs to parents and providers are a known barrier to vaccination. Specifically, administration of vaccines by private providers depends on insurance reimbursement rates, the availability of publicly purchased vaccines, and other possible costs to providers. Referral of children needing vaccinations away from a child's "medical home" to a health department clinic also depends on insurance coverage and out-of-pocket costs to parents. These referrals cause missed opportunities and delays in timely vaccinations. Data from this topical module will provide information on these economic barriers to vaccination and their impact on vaccination coverage levels.

The Vaccines for Children (VFC) program is a federal entitlement program that provides publicly purchased vaccine for five groups of children: uninsured children; underinsured children if they go to a federally qualified health center; Medicaid-enrolled children; and American Indian or Alaska Native children. Nationally, approximately 32% of preschool children are eligible for VFC. In order to correctly distribute the VFC funds to the states, CDC needs to know the proportion of a state's preschool children that are entitled to VFC vaccine. This module will provide state-by-state estimates of this proportion, and these estimates will be combined with state program information to distribute funds. Although VFC is a federal entitlement program, it is operated at the state level. Each state enrolls providers into the VFC program, and these providers administer VFC vaccine to eligible children. Since the NIS provider record check asks whether the provider is enrolled in VFC, this module will allow each state to determine the proportion of VFC-eligible children who receive their vaccines from VFC enrolled providers. This information will help guide states' provider enrollment efforts. States purchase vaccine using one of three different policies: universal purchase (15 states), in which all vaccine is purchased by the state; augmented VFC (16 states), in which state funding is used to purchase vaccine for children whose commercial insurance does not cover the cost of vaccination so they can be vaccinated in their medical home; and standard purchase (17 states), in which vaccine for underinsured children is purchased only for health departments. This module will be used to determine whether the likelihood of referral to health department clinics is associated with vaccine purchase policy.

Results from the Health Insurance Module

State Vaccine for Children Eligibility Rates

The Vaccines for Children (VFC) program is a federal entitlement program that provides publicly purchased vaccine for five groups of children: uninsured children; underinsured children if they go to a federally qualified health center; Medicaid-enrolled children; and American Indian or Alaska Native children. Nationally, approximately 32% of preschool children are eligible for VFC. In order to correctly distribute the VFC funds to the states, CDC needs to know the proportion of a state's preschool children that are entitled to VFC vaccine. This module will provide state-by-state estimates of this proportion, and these estimates will be combined with state program information to distribute funds.

VFC eligibility is defined as

- reporting living in a household with total annual income less than 133% of poverty,
- reporting being on Medicaid,
- reporting being without medical insurance,
- reporting having medical insurance that does not cover at least some of the cost of vaccinations, and
- reporting being American Native / Alaskan Native.

The following table provides VFC eligibility rates and rates associated with factors that define VFC eligibility for each State and the District of Columbia.

VFC Eligibility Rates and Rates Associated with VFC Eligibility

State	Percent < 133% of Poverty % (95 %CI)	Percent Reporting Being on Medicaid % (95 %CI)	Percent in Household Reporting No Medical Insurance % (95 %CI)	Percent Uninsured % (95 %CI)	Percent Reporting Insurance Coverage Not for Although Some Shots % (95 %CI)	Percent Reporting Insurance Coverage Neither Although Nor Shots % (95 %CI)	Percent Eligible to Receive VFC % (95 %CI)
U.S. Total	36.0 (2.4)	29.0 (2.1)	28.1 (2.4)	7.7 (0.1)	4.7 (0.2)	1.3 (0.1)	32.9 (2.2)
Alabama	38.4 (12.8)	44.3 (12.1)	45.4 (11.8)	4.1 (0.4)	7.4 (7.1)	0.2 (0.4)	38.8 (11.8)
Alaska	43.9 (14.7)	35.3 (14.9)	38.5 (14.4)	7.5 (1.5)	5.0 (3.6)	30.9 (10.8)	75.6 (11.1)
Arizona	40.8 (11.1)	34.0 (8.1)	40.4 (8.1)	7.9 (1.4)	2.1 (1.7)	0.0 (0.0)	42.5 (10.8)
Arkansas	41.1 (12.6)	45.6 (12.7)	46.6 (12.8)	12.7 (3.1)	7.9 (7.8)	1.8 (1.4)	49.7 (11.8)
California	41.7 (10.4)	35.3 (10.5)	48.7 (10.1)	7.9 (0.4)	4.7 (4.1)	0.0 (0.0)	38.9 (10.6)
Colorado	28.0 (10.7)	19.2 (11.8)	23.3 (10.1)	10.4 (1.4)	1.3 (0.5)	1.9 (1.0)	40.5 (13.5)
Connecticut	29.8 (13.9)	30.0 (14.9)	35.3 (14.8)	9.0 (0.6)	1.2 (0.4)	0.0 (0.0)	33.9 (13.5)
Delaware	33.8 (14.7)	27.6 (13.5)	33.9 (14.9)	7.1 (1.1)	2.2 (1.4)	0.0 (0.0)	49.9 (15.8)
Dist. of Columbia	31.7 (10.8)	37.9 (14.7)	44.3 (14.8)	5.7 (0.8)	0.0 (0.0)	0.0 (0.0)	52.3 (15.0)
Florida	27.2 (11.4)	30.9 (11.2)	40.2 (11.0)	17.9 (0.6)	5.9 (4.7)	5.1 (3.3)	59.5 (11.9)
Georgia	34.9 (13.1)	29.8 (11.9)	39.7 (12.7)	13.3 (0.7)	2.9 (1.5)	0.0 (0.0)	53.4 (13.1)
Hawaii	41.1 (14.7)	39.8 (14.8)	52.6 (14.1)	3.5 (4.8)	0.0 (0.0)	3.5 (4.8)	55.2 (14.1)
Idaho	38.2 (14.8)	39.8 (13.1)	52.0 (13.6)	4.8 (4.8)	5.1 (7.1)	5.2 (7.3)	66.7 (13.3)
Illinois	28.1 (9.2)	33.9 (12.4)	36.4 (10.9)	8.8 (0.2)	11.4 (5.7)	0.0 (0.0)	47.1 (12.3)
Indiana	22.9 (14.1)	36.4 (14.6)	37.3 (14.6)	2.2 (1.8)	11.1 (7.6)	0.2 (0.4)	52.9 (14.0)
Iowa	24.9 (12.0)	18.9 (11.5)	27.6 (12.4)	7.5 (7.1)	10.7 (9.6)	4.3 (3.8)	39.5 (12.4)
Kansas	25.1 (12.8)	17.3 (12.1)	25.1 (12.8)	8.9 (4.2)	3.9 (4.5)	4.2 (7.7)	37.8 (13.8)
Kentucky	26.3 (13.1)	32.7 (13.7)	39.5 (13.8)	3.7 (1.6)	5.1 (4.1)	1.4 (2.8)	44.7 (14.8)
Louisiana	53.1 (15.8)	43.4 (13.8)	53.0 (14.4)	5.7 (4.2)	7.3 (4.1)	2.0 (2.8)	70.5 (12.7)
Maine	26.9 (12.8)	36.6 (14.8)	41.1 (14.1)	5.7 (4.4)	3.1 (4.1)	0.0 (0.0)	46.7 (14.4)
Maryland	13.3 (8.7)	28.5 (11.8)	29.1 (12.2)	8.4 (4.5)	2.4 (4.6)	0.0 (0.0)	40.5 (13.8)
Massachusetts	17.6 (10.7)	30.8 (14.8)	35.5 (15.7)	2.3 (1.6)	1.8 (1.1)	0.0 (0.0)	35.0 (14.7)
Michigan	26.3 (11.4)	24.2 (10.8)	31.4 (11.3)	3.8 (1.6)	11.9 (8.6)	0.0 (0.0)	45.2 (13.4)
Minnesota	16.1 (10.7)	21.7 (10.2)	27.8 (10.3)	1.2 (1.3)	0.0 (0.0)	3.4 (4.7)	30.9 (10.4)
Mississippi	46.8 (16.8)	47.4 (15.4)	52.9 (15.8)	4.3 (4.8)	11.8 (10.8)	0.0 (0.0)	68.9 (14.8)
Missouri	35.1 (10.8)	30.4 (12.7)	32.0 (12.8)	6.7 (4.1)	5.7 (7.5)	5.3 (7.3)	47.7 (10.8)
Montana	40.0 (16.1)	26.2 (14.8)	38.3 (15.3)	11.2 (8.8)	0.0 (0.0)	3.8 (1.1)	60.7 (10.5)
Nebraska	32.2 (17.2)	34.8 (16.8)	40.3 (16.8)	1.9 (1.8)	4.2 (6.3)	0.0 (0.0)	45.2 (17.5)
Nevada	24.2 (15.8)	18.5 (12.3)	40.1 (15.5)	9.6 (4.6)	10.7 (10.8)	4.4 (4.2)	56.7 (17.3)
New Hampshire	7.3 (8.1)	12.8 (4.8)	17.3 (10.3)	11.5 (4.8)	2.8 (4.5)	3.7 (5.4)	31.2 (13.1)
New Jersey	16.8 (11.7)	12.5 (9.8)	20.8 (11.7)	8.3 (4.2)	1.9 (1.7)	0.0 (0.1)	24.8 (13.8)
New Mexico	38.1 (13.5)	50.5 (12.7)	57.9 (13.3)	4.3 (1.1)	4.1 (4.8)	12.0 (11.4)	67.9 (12.2)
New York	30.3 (10.7)	29.6 (10.6)	40.2 (10.8)	3.5 (2.8)	1.4 (2.4)	0.0 (0.0)	47.2 (11.2)
North Carolina	26.7 (14.6)	34.9 (14.8)	42.9 (14.6)	4.7 (3.6)	2.5 (3.5)	2.1 (3.0)	50.2 (14.6)
North Dakota	32.2 (13.5)	24.5 (11.2)	37.6 (13.6)	2.7 (3.8)	6.0 (5.8)	10.4 (10)	46.0 (14.9)
Ohio	27.8 (10.3)	41.2 (11.9)	45.3 (11.5)	1.1 (1.4)	5.5 (4.8)	0.3 (0.4)	53.4 (11.5)
Oklahoma	27.0 (13.0)	37.9 (12.7)	46.8 (12.9)	14.3 (4.8)	11.2 (9.8)	18.1 (10.8)	71.5 (12.3)
Oregon	35.2 (13.0)	15.8 (12.1)	29.7 (14.4)	11.7 (10.1)	2.6 (3.1)	0.0 (0.0)	41.1 (15.3)
Pennsylvania	22.0 (14.8)	9.1 (4.1)	23.4 (13.8)	7.3 (7.6)	0.4 (0.6)	0.2 (0.4)	35.8 (15.6)
Rhode Island	34.7 (13.1)	30.9 (12.2)	35.6 (12.6)	0.0 (0.0)	0.0 (0.0)	4.8 (5.7)	41.3 (13.8)
South Carolina	28.4 (14.7)	37.1 (14.2)	38.1 (14.5)	5.8 (4.2)	5.2 (4.5)	0.0 (0.0)	56.7 (16.8)
South Dakota	17.4 (12.5)	27.9 (14.3)	33.2 (14.6)	13.4 (11.3)	13.5 (11.8)	7.3 (7.4)	53.3 (16.5)
Tennessee	42.2 (11.5)	42.7 (11.4)	52.2 (11.1)	11.5 (0.6)	3.5 (4.2)	1.1 (2.1)	58.3 (9.8)
Texas	38.4 (12.0)	23.1 (9.8)	43.6 (10.5)	17.9 (0.6)	3.7 (3.4)	0.2 (0.5)	55.0 (10.6)
Utah	30.0 (13.0)	34.4 (13.4)	35.9 (13.6)	17.9 (11.0)	12.1 (9.8)	3.0 (3.8)	56.9 (10.9)
Vermont	24.9 (9.1)	40.7 (10.5)	41.3 (10.5)	4.5 (0.1)	3.1 (4.1)	0.0 (0.0)	49.0 (14.4)
Virginia	14.8 (12.4)	22.5 (10.5)	26.2 (10.7)	1.3 (0.1)	0.0 (0.0)	0.0 (0.0)	30.4 (17.0)
Washington	26.0 (10.8)	31.4 (10.8)	40.4 (11.6)	1.4 (1.8)	3.4 (4.1)	2.3 (1.8)	45.8 (11.9)
West Virginia	46.1 (14.6)	27.7 (12.8)	47.7 (14.1)	8.7 (4.2)	0.0 (0.0)	1.5 (1.9)	57.5 (14.3)
Wisconsin	12.5 (7.7)	18.3 (9.5)	21.8 (10.5)	1.1 (1.9)	7.5 (7.2)	0.3 (0.6)	31.5 (11.9)
Wyoming	13.8 (11.1)	25.8 (10.6)	28.6 (10.7)	12.2 (3.1)	5.8 (6.5)	14.2 (13.2)	57.5 (16.2)

Estimates of 4:3:1:3 vaccination coverage, by federal entitlement program.

STATE	Estimated 4:3:1:3 Vaccination Coverage Non-participants % (95% CI)	Estimated 4:3:1:3 Vaccination Coverage Participants % (95% CI)	Estimated 4:3:1:3 Vaccination Coverage Medicaid % (95% CI)	Estimated 4:3:1:3 Vaccination Coverage Uninsured % (95% CI)
U.S. Total	74.9 (±1)	80.4 (±0.5)	80.3 (±0.6)	68.2 (±0.6)
Alabama	65.9 (±8.9)	77.3 (±12.9)	75.6 (±14.7)	76.0 (±15.6)
Alaska	77.3 (±8.6)	73.9 (±15.9)	69.5 (±20.5)	77.9 (±16.8)
Arizona	77.5 (±8.1)	59.6 (±12.7)	61.7 (±16.3)	60.0 (±14.2)
Arkansas	63.8 (±15.5)	73.9 (±11.3)	73.0 (±18.3)	73.4 (±14.2)
California	65.6 (±13.8)	84.0 (±10.8)	84.5 (±15.6)	75.0 (±14.1)
Colorado	68.9 (±8.6)	87.0 (±12.8)	89.9 (±10.9)	78.9 (±15.4)
Connecticut	81.5 (±15.3)	70.8 (±15.7)	76.1 (±24.3)	73.8 (±23.8)
Delaware	85.3 (±13.5)	92.3 (±10.8)	81.1 (±17.4)	86.8 (±15.1)
Dist. of Columbia	85.7 (±10.1)	83.6 (±15.3)	75.1 (±21.9)	77.4 (±26.3)
Florida	63.0 (±9.1)	74.1 (±17.1)	69.4 (±16.6)	69.1 (±16.2)
Georgia	69.8 (±11.5)	80.7 (±12.5)	80.9 (±15.4)	81.9 (±13.1)
Hawaii	67.1 (±10.3)	73.8 (±17.8)	76.3 (±18.9)	77.1 (±16.4)
Idaho	73.3 (±15.3)	80.6 (±16.8)	86.4 (±18.5)	85.0 (±16.7)
Illinois	79.4 (±13.2)	82.3 (±10.3)	57.5 (±14.2)	57.2 (±11.3)
Indiana	74.5 (±18.8)	75.2 (±15.8)	75.5 (±22.8)	74.3 (±18.5)
Iowa	67.0 (±13.8)	76.5 (±10.1)	76.1 (±16.4)	69.1 (±17.1)
Kansas	84.0 (±14.8)	63.0 (±15.3)	72.1 (±32.1)	78.9 (±26.5)
Kentucky	84.3 (±14.7)	86.4 (±7.6)	100.0 (±0.0)	87.8 (±4.1)
Louisiana	46.9 (±22.5)	75.4 (±16.5)	74.2 (±18.8)	69.3 (±17.8)
Maine	68.9 (±18.1)	85.5 (±10.6)	88.4 (±12.3)	81.2 (±16.1)
Maryland	89.7 (±12.3)	79.7 (±15.2)	82.3 (±17.4)	78.4 (±16.8)
Massachusetts	75.2 (±15.4)	68.5 (±34.5)	77.2 (±22.5)	79.3 (±35.3)
Michigan	77.1 (±16.2)	48.9 (±16.1)	52.0 (±20.4)	57.3 (±18.1)
Minnesota	67.0 (±18.8)	70.2 (±20.5)	74.5 (±25.4)	74.5 (±25.4)
Mississippi	69.6 (±25.6)	92.4 (±8.2)	94.6 (±10.3)	95.2 (±8.2)
Missouri	70.6 (±20.3)	52.0 (±16.8)	54.1 (±18.9)	54.7 (±16.6)
Montana	85.4 (±18.1)	79.8 (±15.8)	79.9 (±20.8)	75.2 (±18.3)
Nebraska	89.8 (±11.3)	94.3 (±18.2)	84.6 (±30.7)	63.0 (±28.6)
Nevada	40.0 (±27.7)	83.7 (±14.5)	74.1 (±18.2)	79.2 (±15.2)
New Hampshire	77.9 (±13.1)	84.4 (±17.4)	74.9 (±28.6)	76.6 (±31.3)
New Jersey	75.5 (±16.6)	74.6 (±15.4)	76.5 (±26.4)	75.5 (±26.8)
New Mexico	66.0 (±22.2)	72.8 (±14.4)	72.3 (±18.3)	68.0 (±15.7)
New York	71.8 (±13.3)	66.8 (±10.6)	63.7 (±16.6)	64.5 (±16.4)
North Carolina	80.0 (±12.1)	80.5 (±14.3)	83.6 (±16.2)	77.9 (±17.3)
North Dakota	73.7 (±36.3)	81.4 (±10.8)	81.7 (±16.3)	80.6 (±15.2)
Ohio	74.7 (±14.8)	49.4 (±18.8)	44.3 (±17.8)	47.5 (±17.3)
Oklahoma	100.0 (±0.0)	75.1 (±14.5)	74.4 (±18.1)	75.0 (±14.4)
Oregon	94.8 (±10.8)	76.6 (±20.3)	62.9 (±28.5)	58.6 (±25.2)
Pennsylvania	75.7 (±18.6)	78.9 (±15.7)	85.5 (±14.5)	71.4 (±20.4)
Rhode Island	82.9 (±12.8)	82.1 (±16.0)	74.1 (±19.6)	74.1 (±19.6)
South Carolina	95.1 (±8.4)	73.6 (±16.4)	78.0 (±21.4)	69.1 (±21.8)
South Dakota	86.8 (±14.4)	76.7 (±17.2)	77.5 (±23.8)	81.8 (±17.2)
Tennessee	96.7 (±5.1)	78.6 (±12.5)	75.4 (±13.8)	73.5 (±12.8)
Texas	81.2 (±10.3)	84.1 (±12.8)	80.9 (±15.8)	54.8 (±15.1)
Utah	74.7 (±16.4)	66.0 (±15.6)	53.1 (±25.3)	68.7 (±18.1)
Vermont	85.4 (±10.7)	73.9 (±15.2)	66.2 (±20.4)	69.9 (±19.5)
Virginia	72.9 (±16.9)	62.1 (±30.4)	44.4 (±37.3)	47.1 (±36.2)
Washington	75.2 (±12.3)	71.2 (±15.2)	69.8 (±17.7)	69.9 (±16.1)
West Virginia	76.9 (±18.5)	87.3 (±10.9)	87.5 (±12.4)	83.7 (±14.1)
Wisconsin	81.5 (±13.7)	62.5 (±18.3)	61.2 (±24.3)	72.1 (±18.6)
Wyoming	96.7 (±10.5)	80.5 (±16.8)	75.0 (±34.6)	78.7 (±35.8)

Federal Entitlement Programs Participation and Vaccination Coverage: State Estimates

Among the goals of the VFC program is to raise vaccination coverage rates by removing financial barriers to vaccinations among people living in poverty. The Women, Infants, And Children (WIC) Program is an entitlement program run by the U.S. Department of Agriculture. The mission of the WIC Program is to safeguard the health of low-income women, infants, & children up to age 5 who are at nutritional risk by providing nutritious foods to supplement diets, information on healthy eating, and referrals to health care. Generally, families living below 185% of the federally established poverty level are eligible to participate in WIC. Also, WIC is mandated to program increase vaccination coverage among children participating in the program. Medicaid is a jointly-funded, Federal-State health insurance program for certain low-income and needy people. It covers approximately 36 million individuals including children, the aged, blind, and/or disabled, and people who are eligible to receive federally assisted income maintenance payments. Medicaid often serves to cover the costs of childhood vaccinations for participating families.

The following table uses data available from 1 quarter of the NIS Health Insurance Module, and provides 4:3:1:3:3[6] vaccination rates among children who have ever participated in WIC, eligible for VFC, and insured by Medicaid. Although the sample size used to estimate these rates is insufficiently large to yield precise estimates after 1 quarter of data collection, these preliminary estimates indicate that rates may vary widely from state to state and from program to program.

[6] 4 or more doses of diphtheria and tetanus toxoids and pertussis vaccine [DTP], 3 or more doses of Polio, 1 or more doses of measles mumps and rubella vaccine [MMR], and 3 or more doses of Hib [7]

Health Insurance and Vaccination Coverage

Among all children 19-35 months of age in the U.S., 7.8% (±1.3%) are not covered by any type of health insurance. Among children covered by health insurance, the 4:3:1:3 coverage rate is 77.0% (±2.3%) compared to 59.9% (±0.0%) for children who are not covered by insurance. These percentages are significantly different (p<0.05). Among children covered by health insurance, the odds of being 4:3:1:3 UTD is 2.2 times greater among children who are covered by health insurance, compared to children that are not covered by health insurance.

INSURED	n	Percent in Each Category % (95% CI)	Percent 4:3:1:3[7] UTD % (95%)	Odds Ratio: 4:3:1:3 UTD OR (95% CI)
Yes	4046	92.2 (±1.3)	77.0 (±2.3)	2.2 (1.5, 3.3)
No	326	7.8 (±1.3)	59.9 (±9.0)	1.0 (1.0, 1.0)

[7] 4 or more doses of diphtheria and tetanus toxoids and pertussis vaccine [DTP], 3 or more doses of Polio, 1 or more doses of measles mumps and rubella vaccine [MMR], and 3 or

Association of Demographic and Socioeconomic Factors with Health Insurance and Vaccination Coverage

These results show that 19-35 month old children that have both low rates of insurance coverage and vaccination rates are more likely
To be living in a household that has an annual income that is below the Federally established poverty level,

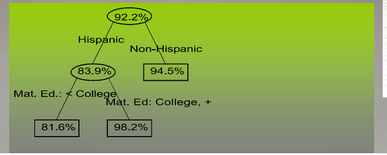
- To have a mother who is 19 years of age or younger,
- To be living in a household where the mother is not married,
- To have a mother that has less than a high school education,
- To be living in a household with 4 or more children 18 years or younger, or
- To have moved from a different state since the birth of the 19-35 month old child in the household.

Association of Demographic and Socioeconomic Factors with Health Insurance and Vaccination Coverage

	n	Percent in Each Category % (95% CI)	Percent 4:3:1:3 UTD % (95% CI)	Odds Ratio: 4:3:1:3 UTD OR (95% CI)	Percent Uninsured % (95% CI)	Odds Ratio: Uninsured OR (95% CI)
HOUSEHOLD'S INCOME						
Above +$75K	759	18.1 (±1.6)	81.8 (±3)	1.0 (1.0, 1.0)	3.6 (±1.7)	1.0 (1.0, 1.0)
Above +$20K	1464	32.5 (±2.2)	78.8 (±3.7)	0.9 (0.7, 1.2)	5.9 (±1.5)	1.7 (1.1, 2.7)
Below	755	28.3 (±2.1)	70.9 (±5)	0.6 (0.4, 1.0)	8.5 (±1.4)	2.6 (1.6, 4.2)
Unknown	614	14.3 (±2.1)	71.7 (±7.6)	0.6 (0.4, 1.7)	8.9 (±1.1)	1.4 (0.8, 2.7)
CHILD'S RACE/ETHNICITY						
Hispanic	862	21.9 (±2.0)	77.8 (±5.1)	1.0 (0.7, 1.4)	14.0 (±4)	3.1 (1.2, 8.4)
White, non-Hispanic	2611	57.2 (±2.2)	77.2 (±2.7)	1.0 (1.0, 1.0)	3.4 (±1.1)	1.0 (1.0, 1.0)
Black, non-Hispanic	691	15.1 (±1.6)	68.1 (±6.1)	0.4 (0.3, 0.6)	5.1 (±1.6)	1.7 (0.8, 3.3)
American Indian, non-Hispanic	30	1.1 (±0.3)	62.7 (±18.7)	0.3 (0.7, 0.1)	10.9 (±16.3)	3.6 (0.6, 21.8)
Asian, non-Hispanic	175	3.7 (±0.8)	71.4 (±11.2)	0.7 (0.4, 1.3)	16.9 (±12)	1.7 (0.6, 5.1)
Other, non-Hispanic	0	0.0 (±0.1)	(0 , 0)	1.0 (1.0, 1.0)	(0 , 0)	1.0 (1.0, 1.0)
GENDER						
Male	2290	51.8 (±2.4)	74.8 (±3.1)	1.0 (1.0, 1.0)	9.7 (±2.0)	1.0 (1.0, 1.0)
Female	2136	48.1 (±2.4)	79.8 (±3.1)	1.1 (0.9, 1.4)	10.8 (±1.8)	1.1 (0.8, 1.7)
CHILD'S AGE (MONTHS)						
19 - 24	1588	35.9 (±2.0)	72.3 (±4)	1.0 (1.0, 1.0)	13.1 (±2.1)	1.0 (1.0, 1.0)
25 - 30	1450	33.4 (±2.2)	79.8 (±3.2)	1.5 (1.1, 2.0)	10.8 (±2.0)	0.7 (0.5, 1.0)
31 - 35	1404	34.5 (±2.2)	77.8 (±4.2)	1.3 (1.0, 1.8)	6.1 (±1.2)	0.3 (0.2, 0.5)
MOTHER'S AGE (YEARS)						
<=19	138	3.4 (±0.6)	72.4 (±16.7)	1.0 (1.0, 1.0)	26.9 (±16.7)	1.0 (1.0, 1.0)
20 - 29	1906	46.4 (±2.6)	73.8 (±3.7)	1.0 (0.6, 1.6)	10.8 (±2.1)	1.6 (0.6, 3.9)
30+	2539	50.0 (±2.4)	79.7 (±2.6)	1.4 (0.8, 2.5)	9.4 (±1.7)	2.0 (0.5, 8.8)
MOTHER'S MARITAL STATUS						
Widowed/Divorced/Separated	356	8.3 (±1.4)	72.5 (±8.1)	0.6 (0.5, 1.2)	26.8 (±8.6)	3.5 (0.9, 1.1)
Never Married	622	19.9 (±2.0)	70.7 (±4.5)	0.6 (0.6, 1.1)	18.1 (±3)	3.6 (1.6, 9.9)
Married	3235	71.8 (±2.2)	79.5 (±2.6)	1.0 (1.0, 1.0)	6.5 (±1.4)	1.0 (1.0, 1.0)
MOTHER'S EDUCATIONAL ATTAINMENT						
<12 years	588	16.5 (±1.8)	70.6 (±6)	1.0 (1.0, 1.0)	34.4 (±4.5)	1.0 (1.0, 1.0)
12 years	1183	27.1 (±2.4)	72.4 (±4.2)	1.1 (0.8, 1.6)	16.8 (±2.8)	1.7 (1.0, 2.7)
>12, non-college graduate	740	13.3 (±1.6)	79.3 (±5.1)	1.6 (1.0, 2.6)	15.4 (±2.1)	2.6 (1.5, 4.5)
College graduate	1730	32.8 (±2.1)	86.2 (±3.9)	1.7 (1.1, 2.4)	3.6 (±0.8)	0.1 (0.04, 0.8)
NUMBER CHILDREN IN HOUSEHOLD: 4+ YEARS OF AGE OR LESS						
1 Child	1189	27.4 (±2.1)	80.8 (±3.7)	1.0 (1.0, 1.0)	15.1 (±2.6)	1.0 (1.0, 1.0)
2-3 Children	2636	61.0 (±2.4)	74.9 (±2.9)	0.7 (0.5, 0.8)	9.0 (±1.1)	1.1 (1.0, 2.2)
4+ Children	477	12.0 (±1.7)	67.9 (±7.1)	0.5 (0.3, 0.7)	26.4 (±3.1)	5.6 (3.5, 1.2)
Unknown	3	0.0 (±0.0)	(0 , 0)	1.0 (1.0, 1.0)	(0 , 0)	1.0 (1.0, 1.0)
CHILD MOVED FROM DIFFERENT STATE SINCE BIRTH						
Moved, Diff State	256	5.9 (±1.7)	66.4 (±8)	1.0 (1.0, 1.0)	35.7 (±8)	1.0 (1.0, 1.0)
Did Not Move from Diff State	4036	92.1 (±1.7)	76.9 (±2.1)	1.7 (1.1, 2.8)	10.9 (±1.3)	3.0 (1.1, 3.7)
METROPOLITAN STATISTICAL AREA (MSA)						
MSA, Central City	1695	34.4 (±2.2)	73.5 (±3.8)	0.6 (0.7, 1.0)	16.4 (±3.1)	0.9 (0.8, 1.4)
MSA, not Central City	2310	46.8 (±2.1)	79.8 (±3.4)	1.0 (1.0, 1.0)	9.7 (±2.1)	1.0 (1.0, 1.0)
FOREIGN BORN						
Yes	39	1.5 (±0.1)	66.9 (±36.3)	0.6 (0.2, 2.1)	77.2 (±35.3)	0.3 (0.1, 0.9)
No	4333	98.5 (±0.1)	76.8 (±2)	1.0 (1.0, 1.0)	9.5 (±1.5)	1.0 (1.0, 1.0)
LANGUAGE MS RDD INTERVIEW						
English	3810	87.9 (±1.4)	76.5 (±2.1)	1.0 (1.0, 1.0)	9.4 (±1.2)	1.0 (1.0, 1.0)
Spanish	415	11.1 (±1.7)	77.2 (±7.5)	1.1 (0.7, 1.7)	17.9 (±7.2)	3.2 (0.1, 0.4)
Other	31	1.0 (±0.1)	72.1 (±24.9)	0.6 (0.2, 2.8)	37.2 (±14.2)	3.1 (0.5, 12.4)

A Tree-Based Analysis of Vaccination Coverage, Insurance Coverage, and Demographic And Socioeconomic Factors

Defining Subgroups of Children with Comparable Rates of Insurance Coverage



Insurance Rates, 4:3:1:3 Coverage, Attributable Risk, and Excess Cases by Subgroup

Children Living in Households that Have a Written Record of Their Child's Vaccination History

| Subgroup | Sample Size | Percent in the Subgroup % (95% CI)[8] | Percent of Children Covered by Insurance % (95% CI) | Percent 4:3:1:3 Vaccination Coverage % (95% CI) | Difference, With Insurance vs. Without Ins