

# Evaluating the Feasibility of Using IIS as a Sample Frame for the National Immunization Survey

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The findings and conclusions in this paper are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention.



1. Background
  - National Immunization Survey (NIS-Child)
  - Immunization Information Systems (IIS)
2. Objectives
3. Methods
4. Results
5. Two Methods for Joint Use of IIS and RDD Sampling Frames
6. Conclusions and Limitations

# 1. Background: NIS-Child

- Sponsored by the Centers for Disease Control and Prevention (CDC)
- Monitors vaccination coverage rates for children 19-35 months
- Nationwide dual-frame landline and cell-phone random-digit-dial (RDD) survey
- National, state, and selected local area and U.S. territory estimates of vaccination coverage using a standard methodology
- Sustaining high response rates and coverage of NIS-Child age-eligible children has led to increases in data collection costs

# 1. Background: IIS

- State or local confidential, computerized, population-based data systems that collect and consolidate vaccination doses administered to individuals by participating vaccination providers
- Functional standards established in the 1990s
- Varying levels of completeness of the population of children 19-35 months
- Varying levels of completeness of child vaccination histories for children included in the IIS

# 1. Background: Benefits for Immunization Programs

- Benefit for NIS/IIS engagement
  - Facilitate updating of contact information in the IIS
  - Increase NIS-Child sample size for participating states, allowing for increased precision of the estimates
  - Provide ongoing evaluation of completeness of IIS vaccination histories
  - Other benefits to the immunization community
    - Preserve or potentially improve NIS-Child survey data quality
    - Contribute to the ongoing assessment of provider under-reporting error in the NIS-Child estimates

## 2. Objectives of Project

- A. Assess the feasibility of using IIS as a sampling frame for age-eligible children for NIS-Child
- B. Assess the cost implications of using IIS as a sampling frame
- C. Assess the data quality implications of using IIS as a sampling frame
- D. Develop metrics that would help us evaluate when an IIS has met established criteria to be used as a sampling frame

### 3. Methods

- Design and test an IIS sampling frame in each of 5 states
- Select samples of children from the IIS sampling frame
  - One state could not participate because of data sharing limitations
  - Four states participated in the pilot study
- States update telephone numbers on the IIS database
- Implement standard data collection process for NIS-Child
  - Conduct telephone interview and gain consent to contact immunization providers
  - Collect provider vaccination information through mailed questionnaire
  - Determine estimates of vaccination coverage rates based on provider-reported data
- Data collection efforts spanned Q2/2013 through Q1/2015

## 4. Results

### A. Feasibility

- Access and Timing
- Sampling Frame Coverage
- Locating Information

### B. Cost Implications

- CDC
- State IIS
- NIS-Child Household Survey

### C. Data Quality Implications

- Frame Coverage
- Comparison of Vaccination Coverage Rates

### D. Readiness Metrics



## A. Feasibility – Access and Timing

- Each state had unique requirements for what data could be accessed and how data could be accessed
- Institutional Review Board (IRB) and Data Use Agreement (DUA) documents required review at multiple levels
  - NORC IRB, CDC Research Ethics Review Board (ERB), and state IIS IRB all had to review and approve
  - Time to approve ranged from 2 months up to 10 months
- Varying levels of effort for state, NORC, and CDC
  - Completeness of contact information to conduct phone interviews
  - Preparation of data file for use in pilot study
- Differing amount of time from initial contact with state until initiation of data collection, ranging from 3 to 23 months

## A. Feasibility – Sampling Frame Coverage

- Child enrollment in each IIS differs
  - Challenge to determine due to varying methods for populating IISs
- Population not covered by IIS likely includes, but not limited to, children who have recently moved to state
- Estimated coverage of IIS frame using American Community Survey migration estimates of movers into the state during the last 12 months

IIS State	Likely Coverage of IIS Frame	Likely Not Covered in IIS Frame (Recent Movers into State)
A	95.0%	5.0%
B	96.9%	3.1%
C	95.9%	4.1%
D	95.8%	4.2%

## A. Feasibility – Locating Information

- States sought updated contact information for eligible children
- State determined level of effort, ranging from 20 total hours to over 400 total hours
- Different locating resources used in different states
- Large variation in potentially reachable households across states

IIS State	Missing Phone Number	Phone Number is Found to be Disconnected/Modem/ Non-Residential	Potential Reachable Households via Telephone
A	22%	19%	58%
B	58%	8%	34%
C	9%	15%	76%
D	5%	18%	77%

## B. Cost Implications – CDC and State IIS

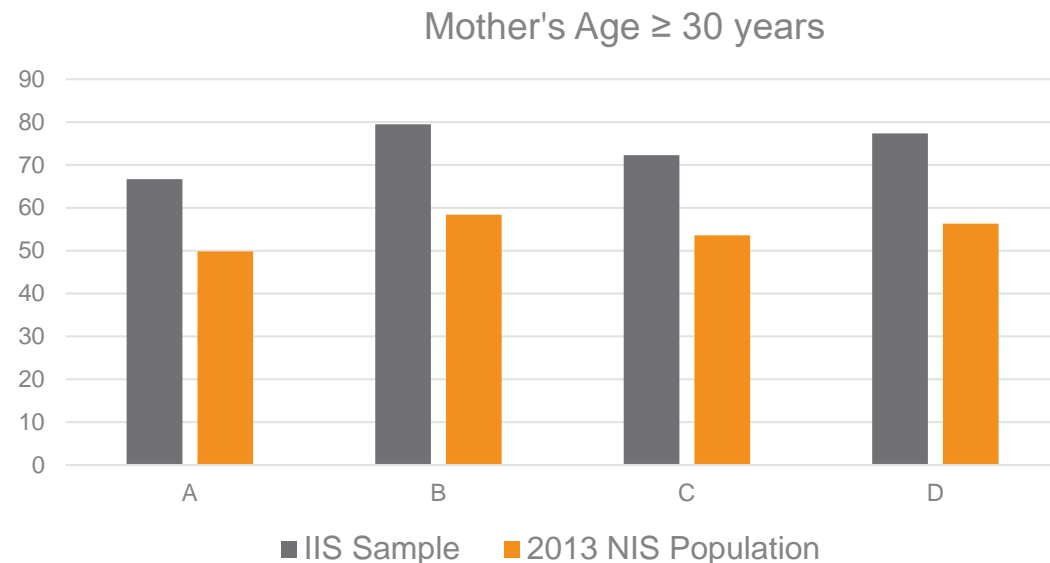
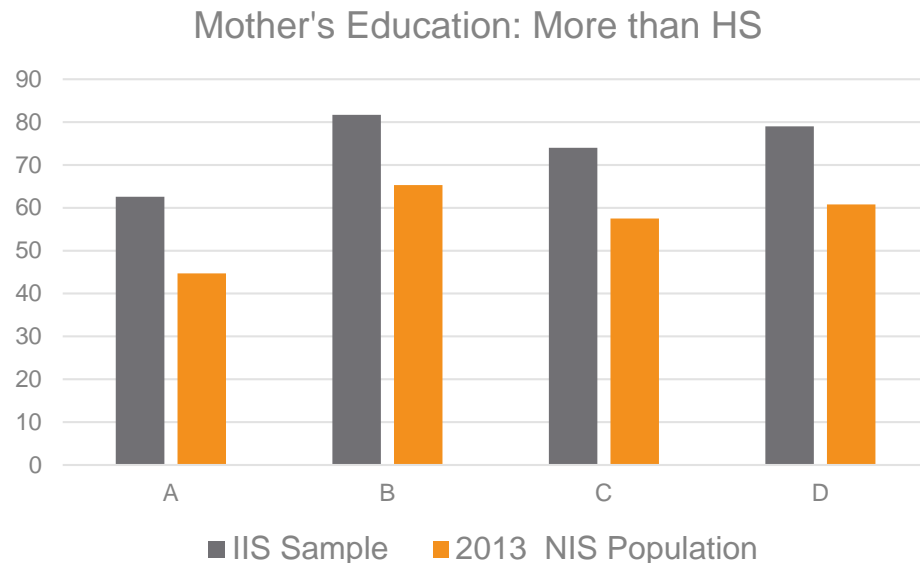
- Cost to CDC
  - Management and assistance with state engagement
    - May vary from state to state
  - Length of time from initial contact with IIS to start of telephone interviews impacts cost associated with CDC's involvement
- Cost to IIS organization
  - Management and assistance with project
  - Updating contact information – phone number, address
  - Quality control could result in varied levels of effort per state, e.g., deduplication of records
- Some costs may be one-time or non-yearly (e.g., setting up multi-year DUAs)

## B. Cost Implications – NIS-Child Household Survey

- Cost of telephone interview
  - Ratio of hours-per-case (cell-phone RDD case to IIS case) was around 13:1
- Yield rates varied by states
  - IIS eligibility rates ranged from 53.7% to 75.6%
    - Eligibility rate = household with  $\geq 1$  child / total number of households
  - For comparison, the 2013 NIS-Child cell-phone RDD sample eligibility rate at the national level was 3.3% and the landline RDD sample eligibility rate was 1.8%

## C. Data Quality Implications – Frame Coverage

- Based on all IIS sampled children with completed NIS-Child household interviews, the four IIS pilot states showed some sample-frame coverage disparities relative to population benchmarks
  - Higher proportion of mothers with more than high school degree
  - Higher proportion of mothers' age greater than or equal to 30
  - Higher percentage of children ages 30-35 months
  - Higher proportion of children living in cell-phone-only households



## C. Data Quality Implications – Comparison of Vaccination Coverage Rates

- Comparison of alternative estimates of vaccination coverage rates for State A based on provider-reported data
  - Results for other states were similar
  - Most differences were not statistically significant

Vaccine <sup>1</sup>	Vaccination Coverage Rates and Confidence Intervals (in %)						Difference		
	Dual- Frame IIS+Cell-Phone RDD Estimate			2013 NIS-Child Dual-Frame Landline+Cell-Phone RDD Estimate					
DTaP ≥ 4 doses	83.2	±	4.8	81.1	±	5.0	2.1	±	6.9
Pol ≥ 3 doses	94.1	±	2.9	92.0	±	3.4	2.1	±	4.5
MMR ≥ 1 dose	91.2	±	3.9	90.4	±	3.5	0.8	±	5.2
Rotavirus	72.0	±	5.3	62.1	±	6.5	9.9	±	8.4
HepA ≥ 1 dose	90.2	±	3.9	89.9	±	3.7	0.3	±	5.4
HepA ≥ 2 doses	62.7	±	5.7	61.1	±	6.4	1.6	±	8.6
4:3:1 <sup>2</sup>	81.6	±	4.8	79.9	±	5.1	1.7	±	7.0
4:3:1:3:3:1 <sup>3</sup>	70.2	±	6.1	72.2	±	5.8	-2.0	±	8.4

## D. Readiness Metrics

- NORC worked with CDC to identify initial measures that can be used to determine when an IIS is suitable for use as an NIS-Child sample frame
- Created list of preliminary metrics to assess level of IIS readiness across a variety of dimensions
  - No single metric is effective for determining registry readiness
  - Metrics are still being discussed and developed
- Readiness metrics depend on how IIS data would be used in building a sample frame



## D. Readiness Metrics

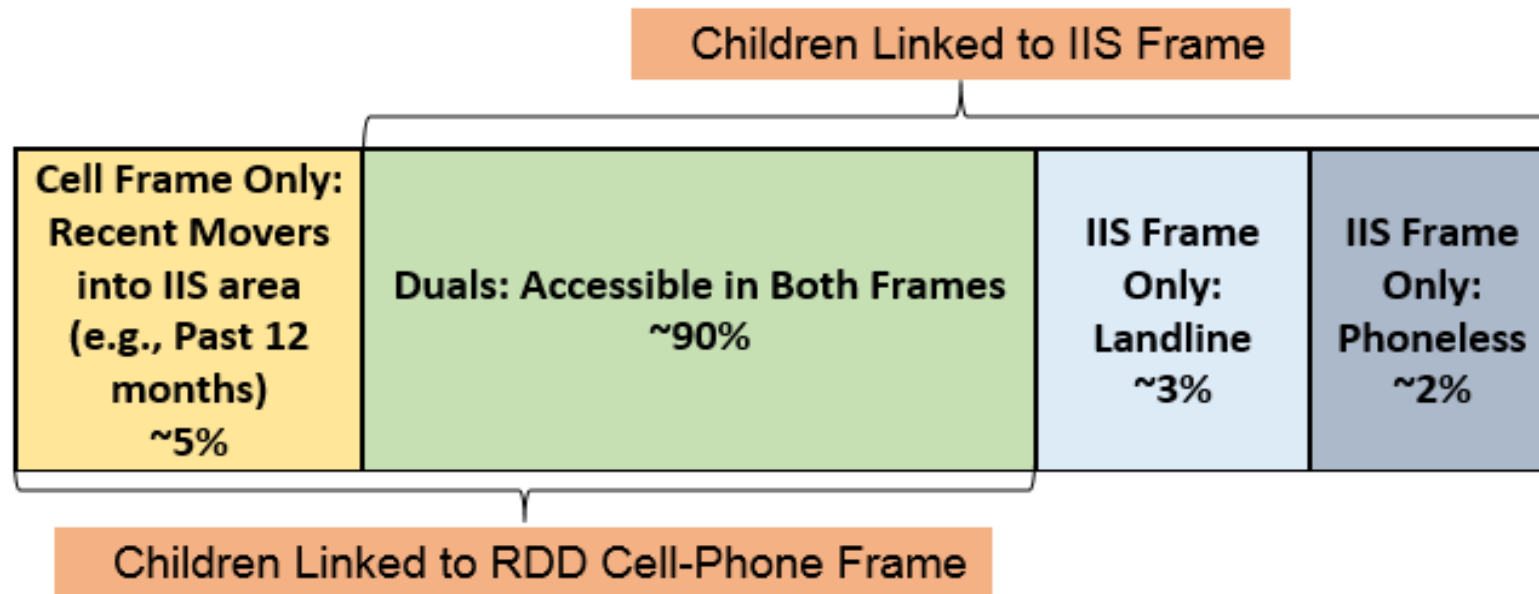
Description	Readiness Metrics
Indicator of ability to share IIS contact information to select an IIS sample for the NIS-Child	Ability to share IIS contact information with CDC operationally and legally
Percent of IIS child records with up-to-date telephone numbers	Telephone locate rate: IIS
Age-eligible children 19-35 months in the IIS area with 2+ vaccinations recorded in the IIS as a percent of all age-eligible children in the IIS area	Child Participation rate

## D. Readiness Metrics

- To use the IIS as a sampling frame in a dual-frame sampling design along with an RDD frame, the critical metric is the ability to share IIS contact information with CDC operationally and legally
  - Coupled with the ability to draw a timely IIS sample and obtain accurate contact information for that sample from the IIS
    - Drawing a timely IIS sample is critical to ensure no disruption in NIS-Child data collection, and annual reporting of vaccination coverage
    - The level of coverage and completeness of contact information impacts the percent of sample that would be selected from the IIS
- Sharing contact information is central to use of an IIS as a sampling frame in a dual-frame design

## 5. Two Methods for Joint Use of IIS and RDD Sampling Frames: Dual-Frame Design

- Based on pilot states, and given a fixed budget, a dual-frame IIS+Cell RDD sample design would allow for an increase in NIS-Child sample size by approximately 40-48%
- Potential dual-frame sampling design
  - IIS frame, covering ~95% of targeted population
  - Cell-phone RDD frame, covering ~95% of targeted population
  - IIS+Cell RDD, covering almost the entire targeted population



## 5. Two Methods for Joint Use of IIS and RDD Sampling Frames: Dual-Frame Design

- We need to know which children are dually accessible in both IIS and RDD frames to create survey weights
  - May require additional questions during the telephone interview and/or provider immunization history questionnaire
  - In the household interview, ask IIS-sample respondents questions to determine their household telephone status (e.g., do they have a cell-phone, landline, both)
  - Cell-phone RDD sample
    - Need to match RDD sample children to the IIS to determine if covered under both frames
    - Would include current NIS question asking for parental consent to contact their local IIS about their child's vaccination status

## 5. Two Methods for Joint Use of IIS and RDD Sampling Frames: Dual-Frame Implementation

- State by state approach, rolling implementation
  - When deemed suitable based on readiness metrics, a state would move forward for implementation of the dual-frame sampling design
- Maintaining comparability
  - Dual-frame allows state-to-state comparability during the transition period
  - Achieve comparable population coverage across states, even though IIS coverage varies across states

## 5. Two Methods for Joint Use of IIS and RDD Sampling Frames: Dual-Frame Implementation

- IIS considerations
  - Need to ensure comparable survey design methods implemented across states
  - Start collaboration between state and CDC well in advance to ensure data collection timelines can be met
  - Create long-term DUAs to allow for efficiency with data sharing process (potentially multi-year DUAs)
  - Would require consistent, timely sampling frame submissions from IIS to mitigate degradation of contact information

## 5. Two Methods for Joint Use of IIS and RDD Sampling Frames: Single-Frame Design

- Currently researching a single-frame stratified RDD design
  - NIS contractor would select a sample from RDD frame and work with IIS to determine which numbers are associated with age-eligible children in the IIS database
- Requires minimal sharing of information
  - No child-specific IIS data would need to be shared with the NIS contractor
  - No child-specific NIS-Child data would be shared with IIS

## 6. Limitations

- Small number of pilot states involved in analysis
  - Only four states involved in data collection efforts
  - Findings may not be generalizable to other states
  - Additional issues that are currently unknown may arise with other states
- Impact on NIS-Teen and NIS-Flu unknown
  - Both surveys piggy-back on the NIS-Child sample
  - This study did not assess readiness of IISs for sampling children other than 19-35 months



## 6. Conclusions

- IIS offers opportunity for increasing the annual state sample size in the NIS-Child
- Quality remained equivalent with most UTD vaccination coverage rate differences not statistically significant
- Cost savings in data collection may help offset additional costs incurred by IIS
  - Potentially time consuming to integrate IIS into NIS-Child processes (e.g., need for ongoing contact with IIS)
  - Costs associated with updating contact information in the IIS database
  - IIS participation rates for target population and accessibility of state information varies widely by state

## 6. Conclusions

- Advantages for participating states
  - Increased sample sizes allow for more precise estimates and better monitoring of trends across time
  - Less expensive to oversample local areas of interest
  - CDC could provide support for cleaning and updating contact information
  - Could provide ongoing evaluation of IIS vaccination history completeness
  - Could provide ongoing evaluation of NIS-Child provider under-reporting

## 6. Conclusions

- Future steps
  - Assess willingness of states to participate
    - Identify resource needs to facilitate state participation
  - Identify legal and policy barriers to data sharing
  - Further refine readiness metrics
  - Quantify impact on NIS-Teen and NIS-Flu

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