Exploring Synergy: Using Survey and Administrative Data Systems to Monitor Local, State, and National Immunization Programs

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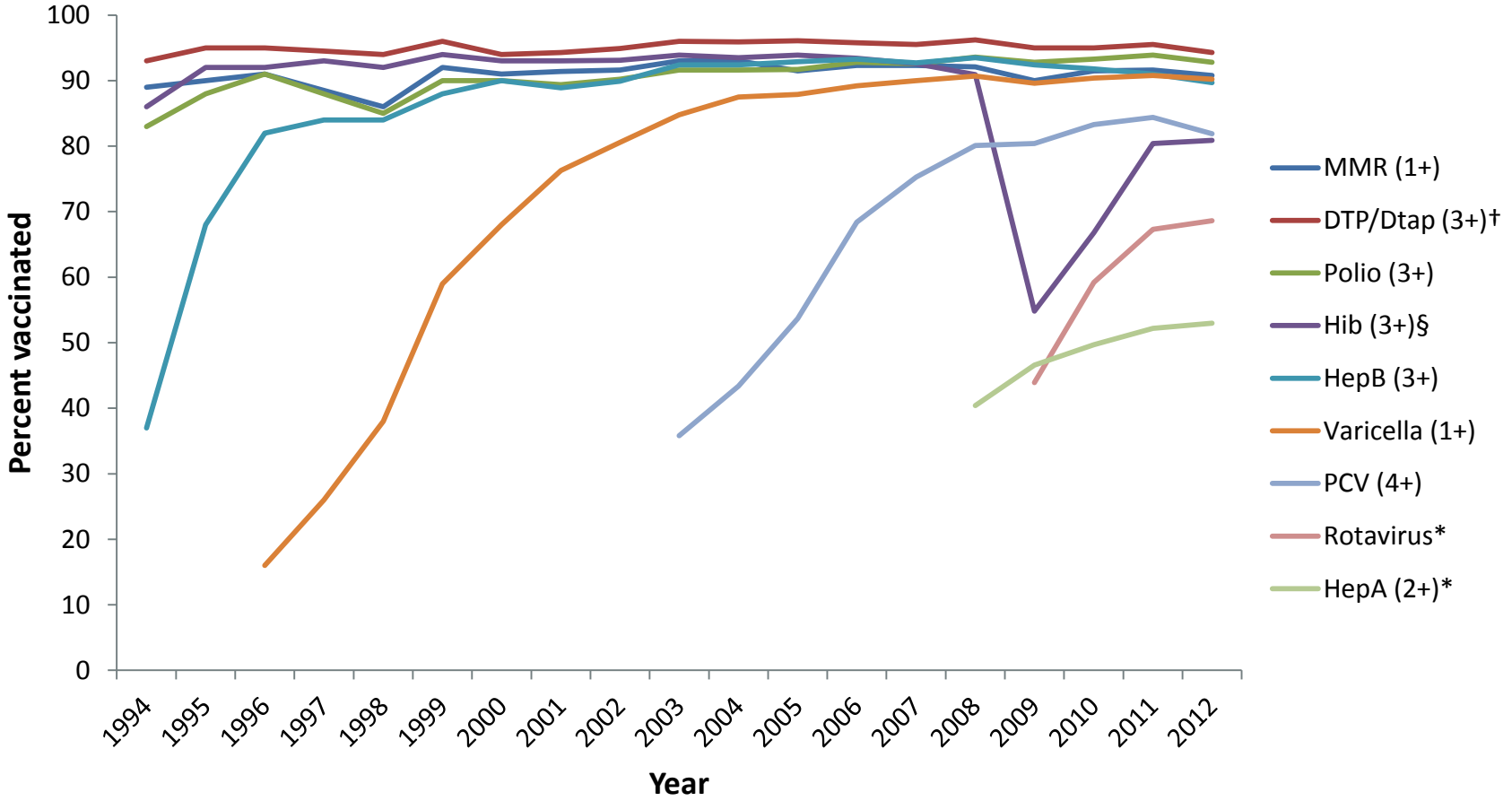
Outline

- **Background**
  - Immunization Program
  - National Immunization Surveys
  - Immunization Information Systems (IIS)
- **Challenges and Needs**
- **Projects**
  - Sample frame projects
  - Match projects
  - Local area projects
- **Next steps**
  - Local data for local action
  - Two systems/synergy issues
  - IIS “readiness”
  - Strategic planning

National Center for Immunization and Respiratory Diseases (NCIRD) Program

- **Objective**
  - Committed to the prevention of disease, disability, and death through immunization and by control of respiratory and related diseases.
    - Added benefit
      - Cost saving
        - Vaccination of each U.S. birth cohort with the current childhood immunization schedule
          - Prevents approximately 42,000 deaths and 20 million cases of disease
          - Net savings of nearly $14 billion in direct costs and $69 billion in total societal costs.

Vaccine-specific coverage* among children 19-35 months, National Immunization Survey (NIS), United States, 1994-2012



* The *Healthy People 2020* target for coverage is 90% for all vaccines with the exception of rotavirus (80%) and HepA (85%).

† DTP (3+) is not a Healthy People 2020 objective. DTaP (4+) is used to assess Healthy People 2020 objectives.

§ Reflects 3+ doses through 2008, and Full Series (3 or 4 doses depending on type of vaccine received) 2009 and later.

Comparison of 20th Century Annual Morbidity and Current Morbidity: Vaccine-Preventable Diseases

Disease	20th Century Annual Morbidity†	2012 Reported Cases ††	Percent Decrease
Smallpox	29,005	0	100%
Diphtheria	21,053	1	> 99%
Measles	530,217	55	> 99%
Mumps	162,344	199	> 99%
Pertussis	200,752	41,880	79%
Polio (paralytic)	16,316	0	100%
Rubella	47,745	8	> 99%
Congenital Rubella Syndrome	152	2	99%
Tetanus	580	36	94%
Haemophilus influenzae	20,000	21*	> 99%

†Source: JAMA. 2007;298(18):2155-2163

†† Source: CDC. MMWR January 4, 2013;61(52);ND-719-ND-731. (provisional week 52 data)

* *Haemophilus influenzae* type b (Hib) < 5 years of age. An additional 14 cases of Hib are estimated to have occurred among the 227 reports of Hi (< 5 years of age) with unknown serotype.

National Immunization Surveys

- **A probability-based random-digit-dial (RDD) dual-frame landline telephone and cell telephone survey with a follow-up provider record check**
- **Family of surveys**
  - NIS - children 19-35 months (1994)
  - NIS-Teen – adolescents 13-17 years (2006)
  - NIS-Flu – children 6-18 months and 36 months-12 years (2009)
  - NIS-Kindergarten (pilot) – children entering/recently entered kindergarten (2013-14 school year)
  - National Adult Immunization Survey (NAIS) (pilot) – adults 18 years and older (Summer 2007)
  - National 2009 H1N1 Flu Survey (emergency response) - respondents 18 years and older and their children (2009-10)
- **Strength**
  - National, state, and (limited) local area estimates of vaccination coverage using a standard methodology

IIS

- **State/local confidential, computerized, population-based, data systems that collect and consolidate vaccination doses administered by participating vaccination providers**
  - Functional IIS in 49 states, five large cities, the District of Columbia, and 8 islands/territories
- **Started in the 1970s**
  - Common functional standards and core data elements were established in 2001 (and are evolving)
- **Strengths**
  - Clinical care - Provide a consolidated vaccination record and can forecast when recommended vaccinations are due
  - Population level - Provide aggregate information on vaccination coverage within a state/local area
  - Contains functionalities that assist the immunization program and its stakeholders
  - IIS have high levels of completeness for children and kindergarteners

Challenges

- **Pockets of under-vaccination**
  - Impoverished communities (socioeconomic barriers)
  - Vaccination acceptance concerns cluster (religious, cultural)
  - Increased risk of low vaccination coverage and vaccine preventable disease transmission
- **Changing survey environment**
  - Decrease in landline telephones/increase use of cell telephones
  - Decrease in response rates
  - Increase in costs
- **Varied IIS environment**
  - May be variation in legislation, methods of populating the dataset, or administration of system
- **Perception**
  - Two systems funded to measure vaccination coverage
    - Varying objectives, perspectives, and stakeholder interests
- **Data sharing and confidentiality**
  - NIS CIPSEA
  - IIS legislation, regulations, charters

Needs

- **Assess local vaccination coverage (State and Local Health Departments)**
  - Identify options to ensure accurate vaccination coverage can be affordably monitored at the local level.
- **Assess national and state level coverage (CDC)**
  - Valid and comparable estimates over time and across states
- **Enhance synergy**
  - Leverage the National Immunization Surveys and IIS
    - Minimize survey costs
    - Reduce survey respondent burden
    - Improve IIS completeness
    - Improve survey data validity
    - Manage funds entrusted to NCIRD to assess and evaluate the Immunization Program
- **Manage national, state, and local data security issues**

NIS-IIS

- **Common element**
  - Provider reported vaccination
    - NIS – Immunization History Questionnaire (IHQ)
    - IIS – both mandatory (via state legislation) and voluntary reporting (in some cases required to administer government funded vaccines)
- **Data sets**
  - NIS and NIS-Teen
  - IIS

NIS-IIS Projects

- **Sample Frame**
  - Assessing the feasibility of using the IIS as a sample frame for the NIS sampling methodology
    - IIS assists NIS
- **Match**
  - Comparing children and their vaccination history as collected by NIS and reported to IIS
    - NIS assists IIS
- **Local Area**
  - Using NIS methodology to assist IIS in determining local area vaccination coverage rates and in identifying pockets of need
    - NIS assists IIS

NIS-IIS SAMPLE FRAME PROJECT

2008 NIS-IIS Sample Frame

- **Objective**
  - Assess potential to use IIS as an NIS sample frame
- **Methods**
  - Two mature IIS
  - Separate, independent samples from each IIS
  - NIS data collection process, including the household telephone interview and the provider survey
    - NIS updated IIS member contact information
  - Immunization data obtained from the IIS

2008 NIS-IIS Sample Frame

- **Results**
  - Large proportion of non-locatable cases, non-working/out-of-scope phone numbers, and ineligible households

2008 NIS-IIS Sample Frame Disposition

IIS	Non-locatable	Non-working/ Out-of-scope	Ineligible households
A	29%	16%	20%
B	14%	26%	18%

- **Action**
  - IIS could gather and maintain individual member contact information
    - Not the primary function of IIS

2013/2014 NIS-IIS Sample Frame

- **Objectives**
  - Assess potential to use IIS as an NIS sample frame
  - Determine the costs of using an IIS sample frame on both the IIS and NIS
  - Identify factors that could indicate when an IIS could be used to provide support as a possible sample frame for the NIS ("IIS readiness")
- **Methods**
  - Five IIS with varying maturity
    - External funding provided to IIS to update member contact information through external sources
  - Separate, independent samples from each IIS
  - NIS data collection process, including the household telephone interview and the provider survey
    - Immunization data obtained from the IIS

2013/2014 NIS-IIS Sample Frame Results from a work in progress

- **Two IIS sample frames fielded**
  - Data collection has gone smoothly
  - There is still variation in IIS

2013/2014 NIS-IIS Sample Frame Disposition

IIS	Non-locatable	Non-working/ Out-of-scope	Ineligible households
A	29%	23%	11%
B	56%	18%	7%

2013/2014 NIS-IIS Sample Frame Results from a work in progress

- **Lessons learned from 308(d), CIPSEA, and data sharing**
  - 308(d) and CIPSEA
    - The NIS sample frame is protected information
      - NIS can use an over sample of children in the IIS or the entire IIS population to prevent the IIS from knowing with certainty which children were in the sample
  - Data sharing
    - IIS restrictions on what data may be shared due to legislation, regulation, or charter
      - One IIS could not participate
      - One IIS was able to draw an oversample of potential participants
      - Other IISs closely reviewed ethical and legal options

NIS-IIS MATCH PROJECT

NIS-IIS Match

- **Objective**
  - Compare the completeness of IIS and NIS data
    - Participation in the project is at the option of each IIS
- **Participation**
  - 2008 9 areas for child sample
  - 2009 2 areas for child sample
  - 2010 6 areas for child sample and 7 for teen sample
  - 2011 2 areas for child sample and 2 for teen sample
  - 2013 1 area for child sample and 1 for teen sample
  - 2014 1 area for child sample and 1 for teen sample

NIS-IIS Match Methods

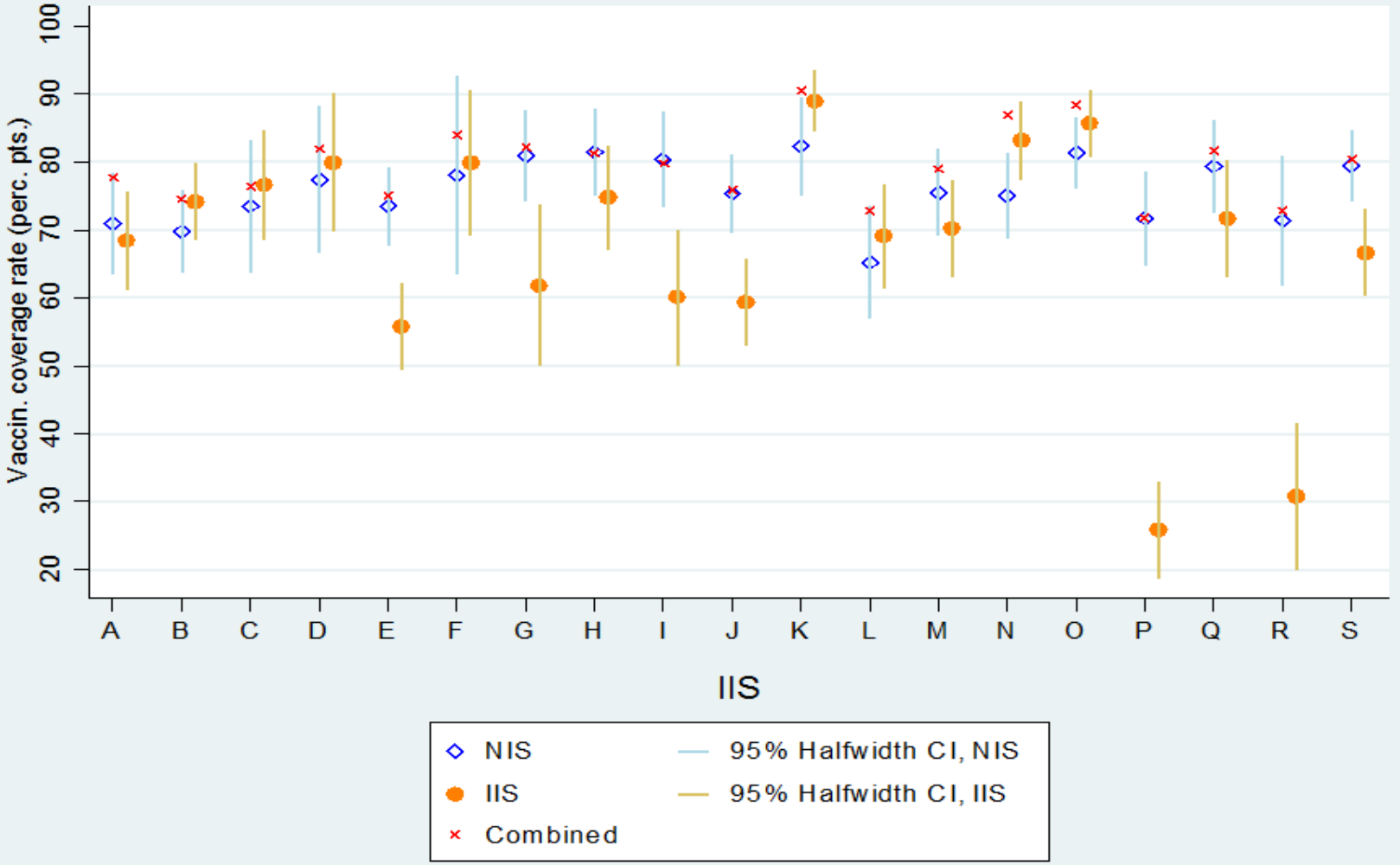
- **Methods**
  - NIS respondents are asked for consent to contact the child(ren)'s vaccination providers and consent to contact the local/state IIS
  - The consented NIS or NIS-Teen children are matched to IIS records to obtain the IIS immunization history
    - Option A - IIS extracting a subset of IIS data that are then shared with NIS (via an SFTP site). The extracted data are used to conduct the match with NIS records.
    - Option B - An NIS staff member travels to the IIS with a secure laptop loaded with linking software to conduct the match on the laptop using an extract of IIS data

NIS-IIS Match Process

- **Process**
  - Determine adequate NIS Provider Data and adequate IIS data
  - Calculate up-to-date (UTD) rates for each vaccine and series based on data source
  - Combine the NIS and IIS Data by treating the IIS as ‘another provider’ and conducting standard NIS data processing procedure.
  - The difference between the combined data and NIS (or IIS) on UTD rates indicates the ‘gain’ in reporting vaccinations if IIS (or NIS) data are incorporated.

NIS-IIS Match Ongoing Results

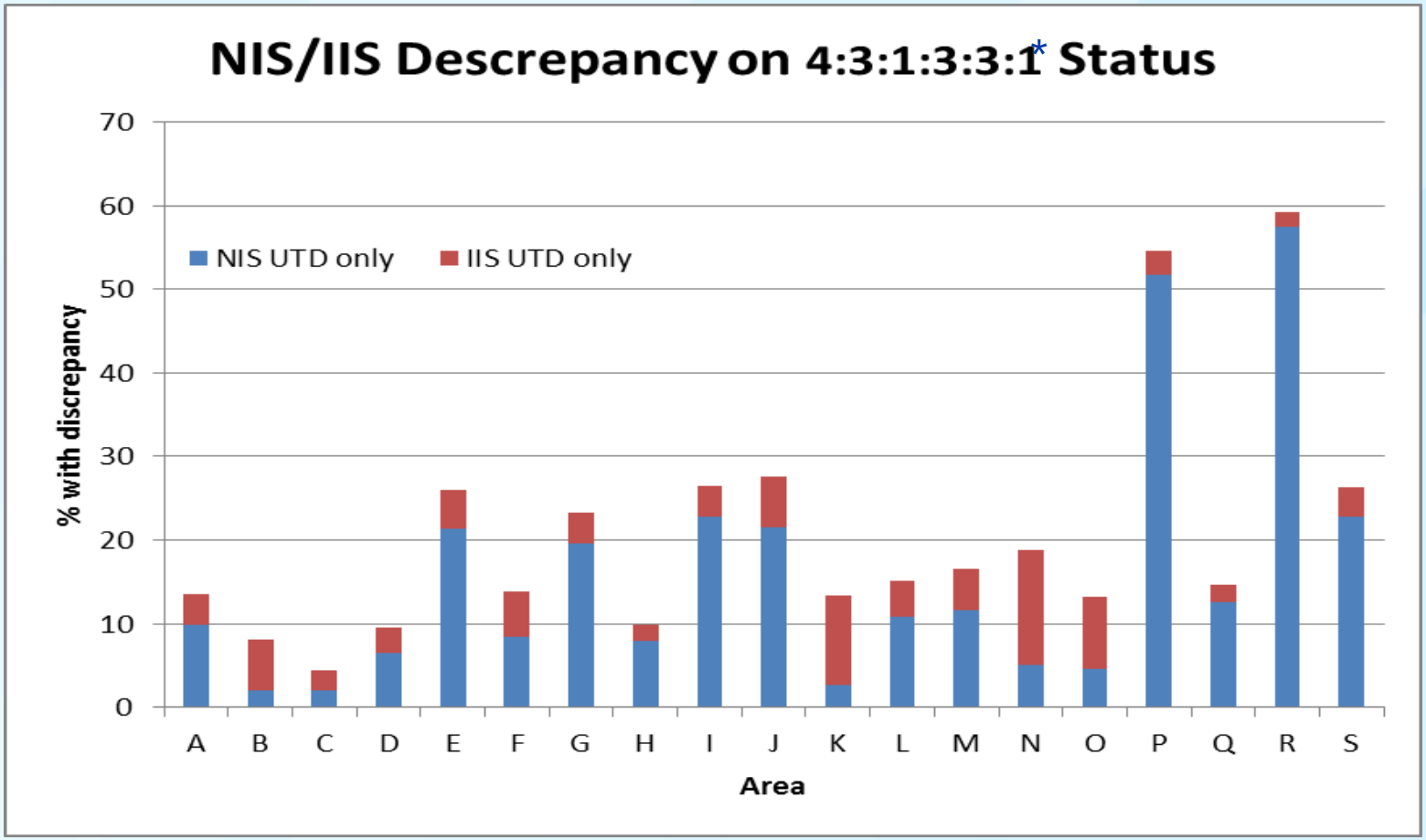
Weighted Vaccination Coverage Estimates for 4:3:1:3:3:1 Vaccine Series* Based on the NIS, the IIS, and the Combined Data: NIS-IIS Match, 2008-2011



- 4:3:1:3:3:1 series includes ≥4 doses of diphtheria and tetanus toxoids and acellular pertussis vaccine , ≥3 doses of poliovirus vaccine, ≥1 doses of measles vaccine, ≥3 doses of *Haemophilus influenzae* type B vaccine', ≥3 doses of Hepatitis B vaccine, and ≥1 doses of varicella vaccine.

NIS-IIS Match Ongoing Results

- NIS and IIS generally agree in majority of cases
- Discrepancies generally due to only NIS indicating UTD



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NIS-IIS Match Ongoing Results

- **NIS vs. IIS UTD Status Disagrees by Child/Household Characteristics**
  - Based on 15 delivered reports (13 areas) from 2008 to 2010
  - More discrepancies are found among children who:
    - moved from another area
    - had 2+ providers
  - Fewer discrepancies are found among children who:
    - lived in poverty
    - had only public providers

NIS-IIS Match Ongoing Findings

- **IIS**
  - Results show diversity of vaccination data completeness across IISs
  - Vaccination coverage estimates determined by IISs could be more accurate if NIS data were added
    - However, federal restrictions on sharing data from the NIS prevent data sharing
  - Data sharing
    - One IIS had to withdraw from the match
      - In some jurisdictions, IIS legislation prohibits access to data by researchers or other entities
- **NIS**
  - The NIS would benefit from adding additional vaccination data from the IISs.
    - However , comparability of NIS estimates across states may be affected
- **Next steps**
  - Continue as an option for interested IIS

NIS-IIS LOCAL AREA PROJECT

2013-2014 NIS-IIS Local Area

- **Objectives**
  - Develop a sustainable methodology to be used by IIS to produce estimates of vaccination coverage at the local level
  - Assist Immunization Programs in differentiating pockets of undervaccination
  - Identify characteristics associated with areas with low vaccination coverage in order to target intervention
  - Develop metrics that can be used to evaluate when an IIS is viable to produce accurate local area vaccination estimates (“IIS readiness”)

NIS-IIS Local Area Methods

- **Four mature IIS**
- **Selected four local geographic areas within each state for inclusion in the study**
  - Areas chosen had low IIS vaccination coverage
- **Funding provided to IIS to update member contact information and conduct a medical records abstraction**
- **Vaccination data were collected from three data sources**
  - NIS: NIS Household Data, provider survey data
    - Each IIS selected an oversample of children from the IIS database who reside in the selected local geographic area
    - NIS data collection process, including the household telephone interview and the provider survey
  - IIS: IIS vaccination data
    - Vaccination data obtained from the IIS where allowed and consented
  - Medical records abstraction (from vaccination provider)
    - Each IIS will collect data directly from providers using a medical record abstraction approach for a subset of the IIS sample

NIS-IIS Local Area
Results from a work in progress

- **Compile data from the NIS household interview, NIS provider survey, IIS, and medical record abstractions**
  - Calculate vaccination coverage estimates
    - Adjust estimates for children who have moved or gone elsewhere (MOGE)
  - Compare vaccination coverage estimates to determine if local areas have true low coverage or artificial coverage due to variation in IIS reporting
  - Provide summary information about providers not participating in the IIS or participating but not submitting data on the sampled child
  - Develop a “total error” simulation
- **Similar concerns with 308(d), CIPSEA, and data sharing**
- **Results soon …**

NIS IIS Moving Toward Synergy

- **Local data for local action**
  - Continue to explore methods where CDC can assist state and local health departments estimate local vaccination coverage, allowing Immunization Programs to guide action with data
- **Challenges in having two systems work together**
  - Data privacy, participant confidentiality, and data quality
  - Concern about non-comparability if National Immunization Surveys use IIS data
- **"IIS readiness"**
  - Identify potential IIS performance measures to indicate ability to
    - Serve as an sample frame for National Immunization Surveys
    - Serve as provider for National Immunization Surveys
    - Provide sufficiently accurate estimates of local vaccination coverage fit for this purpose
- **Develop strategic plan for IIS and NIS synergy**
  - Conduct Fit for Purpose Evaluations of IIS and NIS
    - Assess the impact of the use of supplemental IIS data on current NIS methodology
  - Clarify and communicate the complimentary roles of IIS and NIS

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