

Comparing National Immunization Survey (NIS) and Immunization Information System (IIS) Vaccination Coverage Estimates

Laura Pabst, MPH
Evaluation Team Lead
IIS Support Branch, CDC

2015 AIRA Annual Meeting
April 21, 2015



Outline

- ❑ **Background**
 - Immunization Information Systems (IIS)
 - National Immunization Survey (NIS)
 - Reasons for comparing results
- ❑ **Methods for comparing coverage estimates**
- ❑ **Preliminary results**
- ❑ **Discussion and Next steps**

Immunization Information System (IIS)

- ❑ State or local confidential, computerized, population-based, data systems that collect and consolidate vaccination doses administered by participating vaccination providers
- ❑ All IIS includes children, almost all include adolescents and adult
- ❑ **Strengths**
 - Includes provider-verified vaccinations
 - IIS exist in almost all immunization program jurisdictions
 - Data are immediately available to immunization programs
 - Most IIS are population-based
- ❑ **Limitations**
 - Estimates of vaccination coverage use varying methodologies
 - Data quality concerns in some jurisdictions (e.g. unidentified MOGE, under-ascertainment, etc.)

National Immunization Survey (NIS)

- ❑ A probability-based random-digit-dial (RDD) dual-frame landline telephone and cell telephone survey with a provider record check (PRC) mailed to vaccination providers
- ❑ Includes children 19-35 months (since 1994)
- ❑ **Strengths**
 - Includes provider-verified vaccinations
 - Survey is administered in all immunization program jurisdictions
 - Estimates of vaccination coverage using a standard methodology across programs
- ❑ **Limitations**
 - Results can take approximately one year to produce/publish
 - Challenge to interpret changes in coverage over time at the awardee level
 - NIS sample size per state limited (~400 per estimation area for most areas)
 - NIS provides limited estimates for local areas

Comparing NIS and IIS coverage estimates

❑ Why compare?

- Respond to inquiries from stakeholders (e.g. state/local leadership)
- Proxy for completeness of IIS data
- Justify investments in IIS

❑ Challenges to comparing

- Differences in coverage might result from
 - Differences in data collection or analysis methodologies
 - Biases in one or both systems
 - Both
- Distinguishing between these makes interpretation of comparison results difficult

NIS-IIS Match Project

- ❑ Compares vaccination histories in the IIS to those collected during the NIS provider record check for children in the NIS sample
- ❑ **Strengths**
 - Available to any immunization program
 - Offered annually for NIS and NIS-Teen
 - Robust methodology with child-level (1-to-1) comparisons
- ❑ **Limitations**
 - Some IIS cannot participate due to data sharing restrictions
 - Cost ~\$40-50,000 per Match
 - Results available 2-3 years after the year of assessment
 - Only includes children in the NIS who had adequate provider data

NIS vs. IIS coverage estimates

- ❑ CDC receives multiple requests for technical assistance for comparing NIS and IIS coverage estimates each year
- ❑ CDC's ability to provide evidence-based guidance has been limited
- ❑ Individual awardees have developed multiple different approaches to comparing estimates

Project Objectives

- ❑ **Develop and test methods for generating IIS-based coverages estimates that are comparable to NIS**
 - Minimize data collection/analysis differences, wherever possible

- ❑ **Provide evidence-based guidance to all immunization programs using tested methodologies**
 - Allow programs to generate comparable estimates in a timely manner at reduced cost

Methods

1. Analyze IISentinel Site data to “replicate” NIS methodology for 19-35 month olds
2. Analyze NIS data to “replicate” IIS-based coverage methodology for 19-35 month olds
3. Analyze IISentinel Site data using “traditional” population-based methods
4. Compare results from approaches #1 - #3

Methods

1. **Analyze IISentinel Site data to “replicate” NIS methodology for 19-35 month olds**
 - Will present preliminary data from one “replication” approach in this presentation
 - Other “replication” approaches will be explored in the future
2. **Analyze NIS data to “replicate” IIS-based coverage methodology for 19-35 month olds**
 - Will explore this method in the future
3. **Analyze IISentinel Site data using “traditional” population-based methods**
4. **Compare results from approaches #1 - #3**

NIS Methodology

1. Identify the sample frame for Quarter 1 (i.e. a batch of phone numbers for RDD)

2. Divide the sample frame for the Quarter into 26 replicates (i.e. sub-sample frames)

3. Initiate phone calls for the 1st/next replicate

4. Determine if identified child is age-eligible (i.e. 19-35 months of age at any time during the Quarter); exclude all other respondents

5. Complete household interview with family of eligible child
Date of interview = Reference Date

6. Conduct provider record check (PRC) for each enrolled child

7a. For each child with adequate PRC data, count number of vaccinations by vaccine group received from:

- Birth to 19 months of age for children aged <19 months at the Reference Date
- Birth to the Reference Date for children 19-35 months at the Reference Date
- Birth through age 35 months for children aged >35 months at the Reference Date

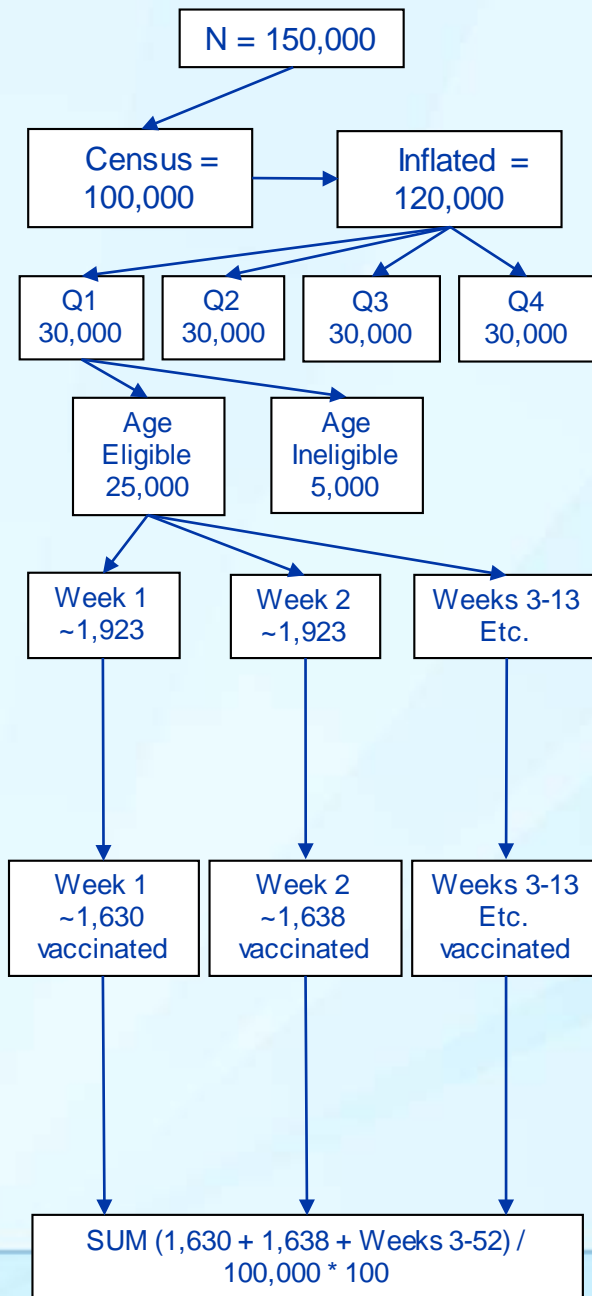
7b. Determine if additional sample is needed.

8. Calculate coverage for each vaccine group
(# children vaccinated / total sample *100; population weights applied)

1st: Repeat for 2nd through 26th replicate.

2nd: Repeat for Quarter 2 through Quarter 4 until sufficient n is achieved.

IIS Analysis to Replicate NIS Methodology



1. Select children in IIS* consistent with published NIS birth cohort (Jan 2010-May 2012)

2. Sample from the IIS the total number of 19-35 month olds in the jurisdiction according to Census, inflating for quarterly ineligibility

3. Randomly assign each sampled child to Quarter 1 – Quarter 4

4. Determine if identified child is age-eligible (i.e. 19-35 months of age at any time during the Quarter); exclude all other respondents

5. For each child within an assigned quarter, randomly assign a “week of household interview” (week 1-13)

6. For each child in the sample, set the Reference Date as the Wednesday of the assigned week/quarter.

7. For each child in the sample, count number of vaccinations by vaccine group received from:

- Birth to 19 months of age for children aged <19 months at the Reference Date
- Birth to the Reference Date for children 19-35 months at the Reference Date
- Birth through age 35 months for children aged >36 months at the Reference Date

8. Calculate coverage for each vaccine group (# children vaccinated / total sample * 100)

Repeat 100 times to obtain 95% interval estimate

* Excludes MOGE documented and deceased children

“Traditional” Population-Based IIS Analysis

1. Select children in IIS* aged 19-35 months as of December 31, 2013 (Jan 1, 2011-May, 31 2011)

2. For each child in the sample, count number of vaccinations by vaccine group received from:

- Birth to December 31, 2013

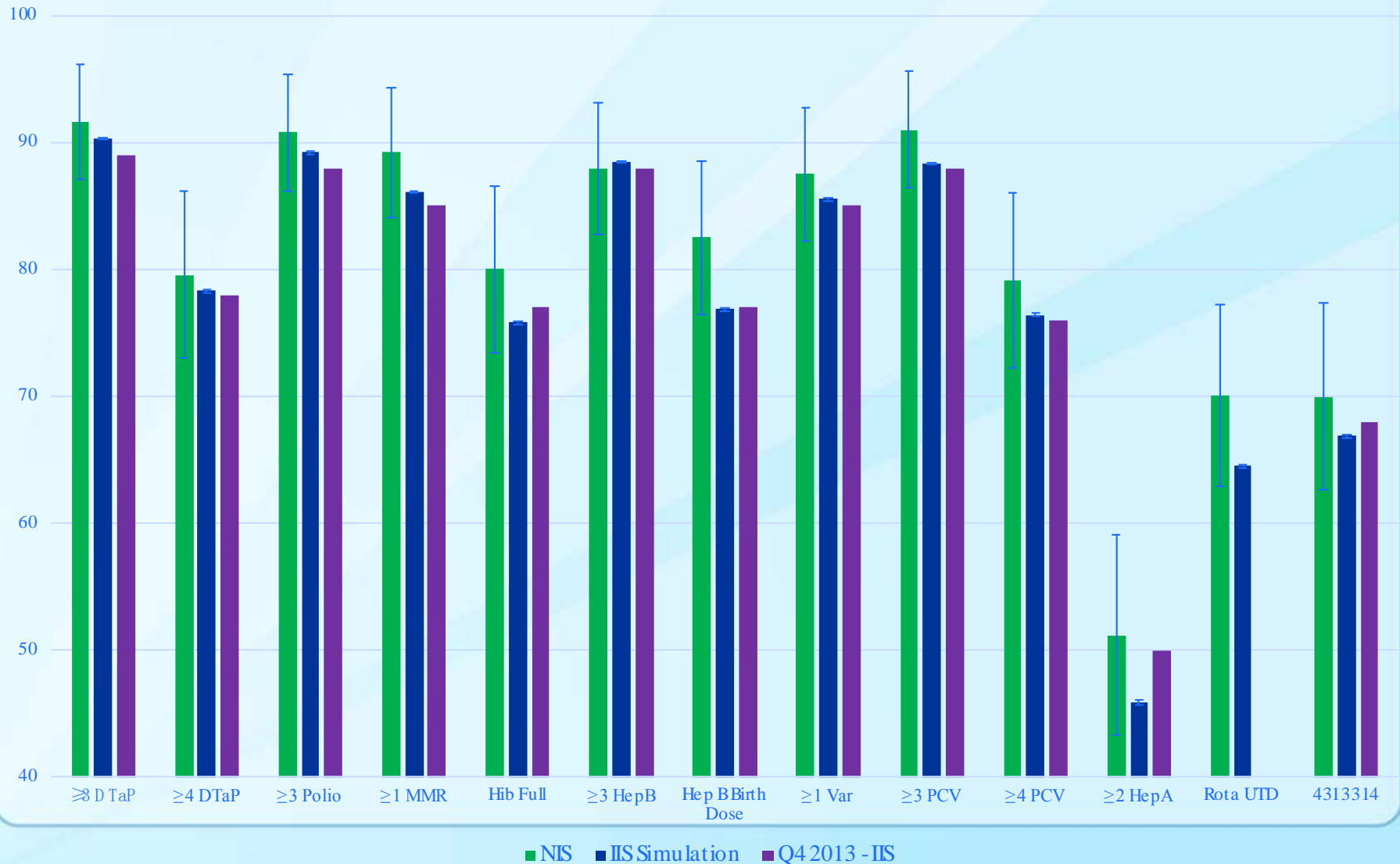
3. Calculate coverage for each vaccine group
(# children vaccinated / Census estimate for 19-35 month olds *100)

Vaccination Definitions

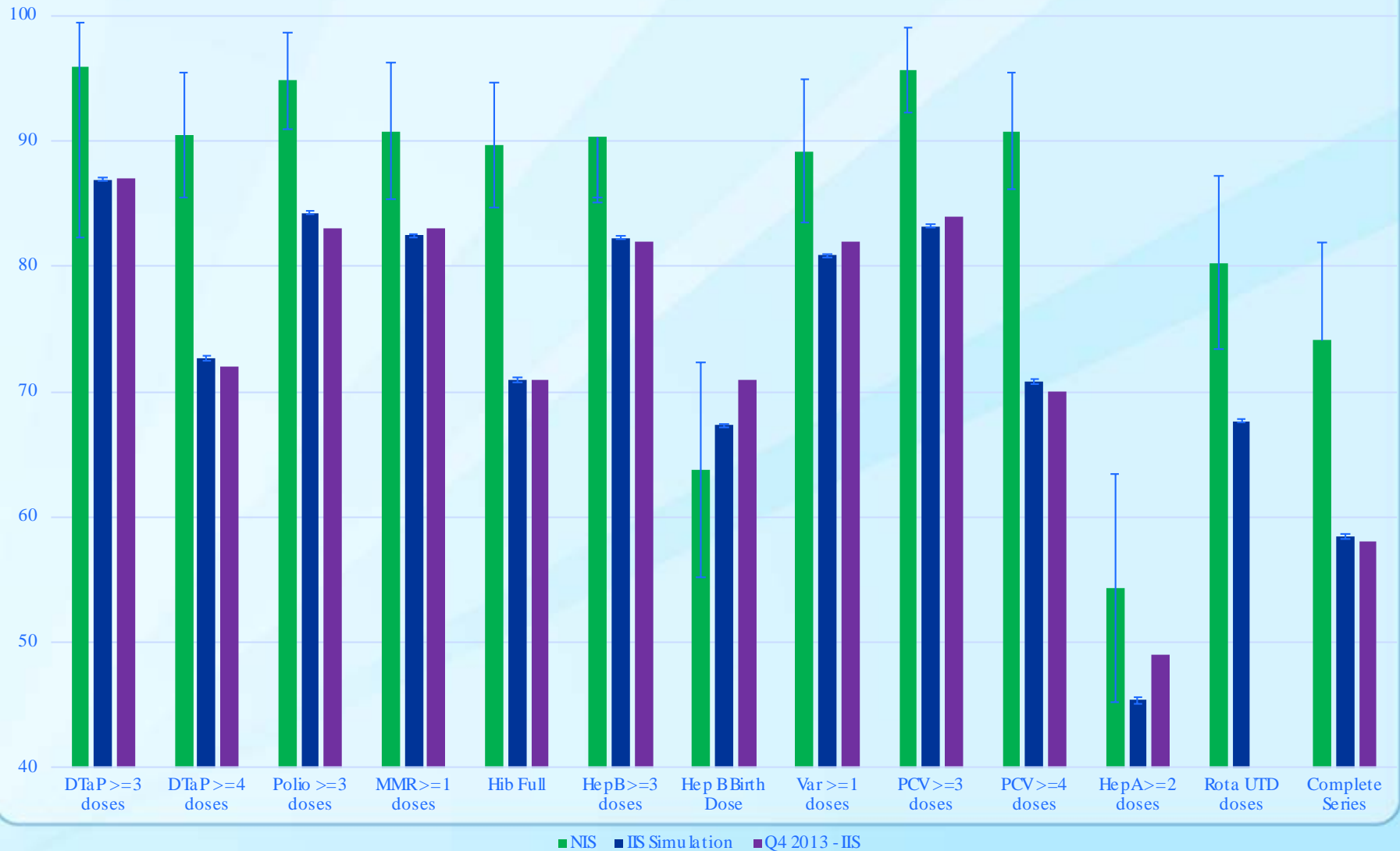
Label	Vaccination Definitions from NISTables*
≥3 DTaP	≥3 doses of any diphtheria and tetanus toxoids and pertussis vaccine including diphtheria and tetanus toxoids and any acellular pertussis vaccine (DTaP/DTP/DT).
≥4 DTaP	** ≥4 doses of diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine.
≥3 Polio	†† ≥3 doses of any poliovirus (Polio) vaccine.
≥1 MMR	≥1 doses of measles-mumps-rubella (MMR) vaccine.
Hib Full	Full series Haemophilus influenzae type b (Hib) vaccine: ≥3 or ≥4 doses of Haemophilus influenzae type b (Hib-FS) vaccine depending on product type received (includes primary series plus the booster dose).
≥3 HepB	≥3 doses of hepatitis B (HepB) vaccine.
HepB Birth Dose	≥1 dose of hepatitis B (HepB) vaccine administered between birth and age 3 days.
≥1 Var	≥1 dose of varicella (Var) vaccine at or after child's first birthday, unadjusted for history of varicella disease
≥3 PCV	≥3 doses of pneumococcal conjugate vaccine (PCV).
≥4 PCV	≥4 doses of pneumococcal conjugate vaccine (PCV).
≥2 HepA	≥2 doses of hepatitis A (HepA) vaccine.
Rota UTD	≥2 or ≥3 doses of Rotavirus vaccine, depending on product type received (≥2 doses for Rotarix® or ≥3 doses for RotaTeq®)
4313314	≥4 doses of DTaP vaccine, ≥3 doses of Polio vaccine, ≥1 dose of any MMR vaccine, full series Haemophilus influenzae (Hib-FS) vaccine, ≥3 doses of HepB vaccine, ≥1 dose of Var vaccine, and ≥4 doses of PCV.

*<http://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/data/tables-2013.html>

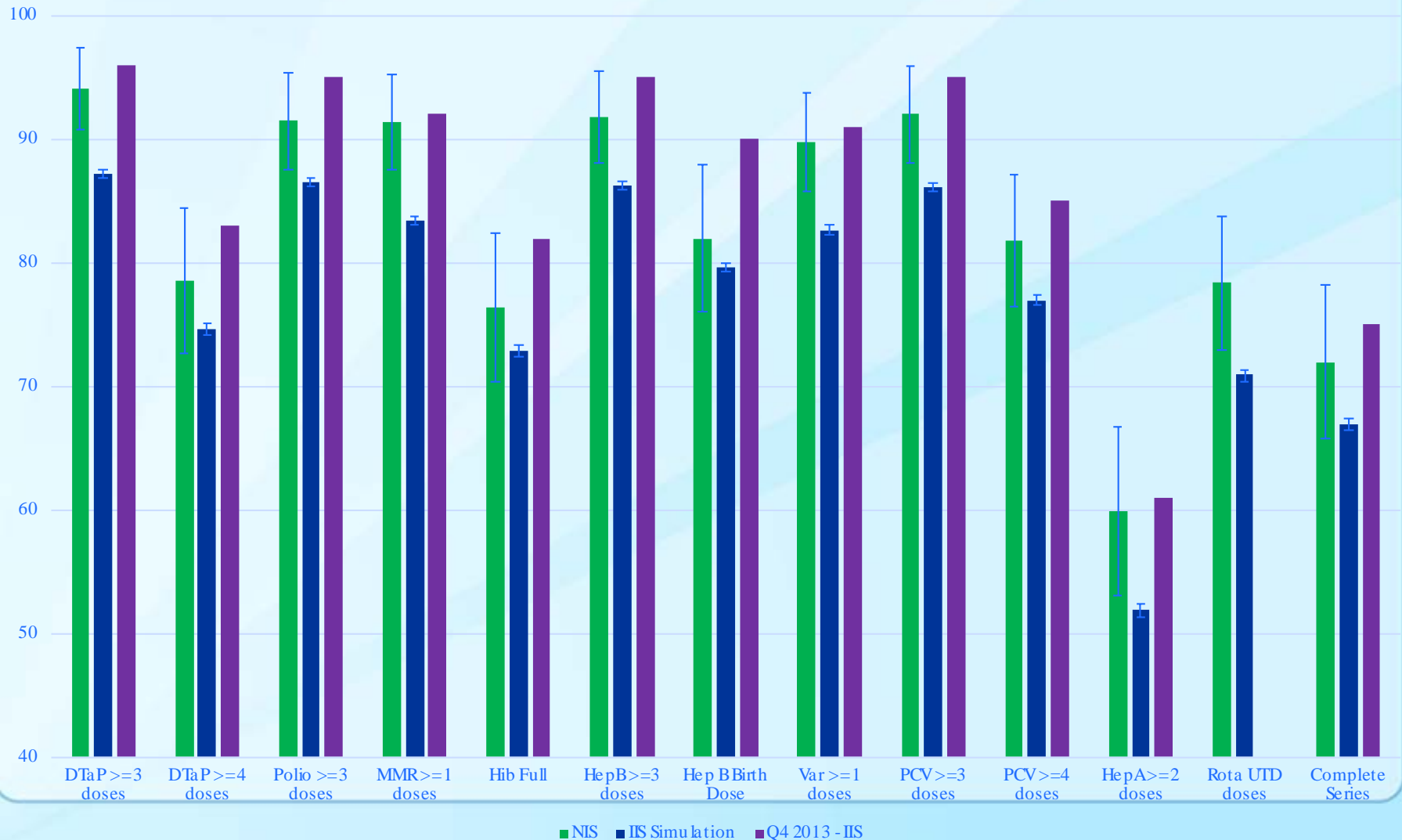
Preliminary Results – Sentinel Site A



Preliminary Results – Sentinel Site B



Preliminary Results – Sentinel Site C



Discussion

- ❑ Variable results across sites and coverage estimates
- ❑ Unknown if results reflect
 - Remaining methodological issues to be addressed in analysis
 - Underreporting to IIS
 - Biases in the NIS
 - Combination of these
- ❑ Methods and results are preliminary!

Discussion and Next Steps

- ❑ Refine methods based on other known considerations and stakeholder feedback
- ❑ Analyze NIS data to “replicate” IIS-based coverage methodology for 19-35 month olds
- ❑ Pilot IIS methods with other IIS
- ❑ Determine “best method(s)” and circulate guidance to awardees
- ❑ Develop methods for adolescent coverage comparing IIS and the NIS-Teen

Acknowledgements

Assessment Branch

- Jim Singleton
- Laurie Elam-Evans
- Stacie Greby

IISupport Branch

- Elizabeth Zell
- Lauren Shaw

Thank you!

Laura Pabst

lnw9@cdc.gov

404-639-6082

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

NIS Methodology

1. Identify the sample frame for Quarter 1 (i.e. a batch of phone numbers for RDD)

2. Divide the sample frame for the Quarter into 26 replicates (i.e. sub-sample frames)

3. Initiate phone calls for the 1st/next replicate

4. Determine if identified child is age-eligible (i.e. 19-35 months of age at any time during the Quarter); exclude all other respondents

5. Complete household interview with family of eligible child
Date of interview = Reference Date

6. Conduct provider record check (PRC) for each enrolled child

2nd: Repeat for Quarter 2 through Quarter 4 until sufficient n is achieved.

1st: Repeat for 2nd through 26th replicate.

7a. For each child with adequate PRC data, count number of vaccinations by vaccine group received from:

- Birth to 19 months of age for children aged <19 months at the Reference Date
- Birth to the Reference Date for children 19-35 months at the Reference Date
- Birth through age 35 months for children aged >35 months at the Reference Date

7b. Determine if additional sample is needed.

8. Calculate coverage for each vaccine group
(# children vaccinated / total sample * 100;
population weights applied)

IIS Analysis to Replicate NIS Methodology

1. Select children in IIS consistent with published NIS birth cohort (Jan 2010-May 2012)

2. Sample from the IIS the total number of 19-35 month olds in the jurisdiction according to Census, inflating for quarterly ineligibility

3. Randomly assign each sampled child to Quarter 1 – Quarter 4

4. Determine if identified child is age-eligible (i.e. 19-35 months of age at any time during the Quarter); exclude all other respondents

5. For each child within an assigned quarter, randomly assign a "week of household interview" (week 1-13)

6. For each child in the sample, set the Reference Date as the Wednesday of the assigned week/quarter.

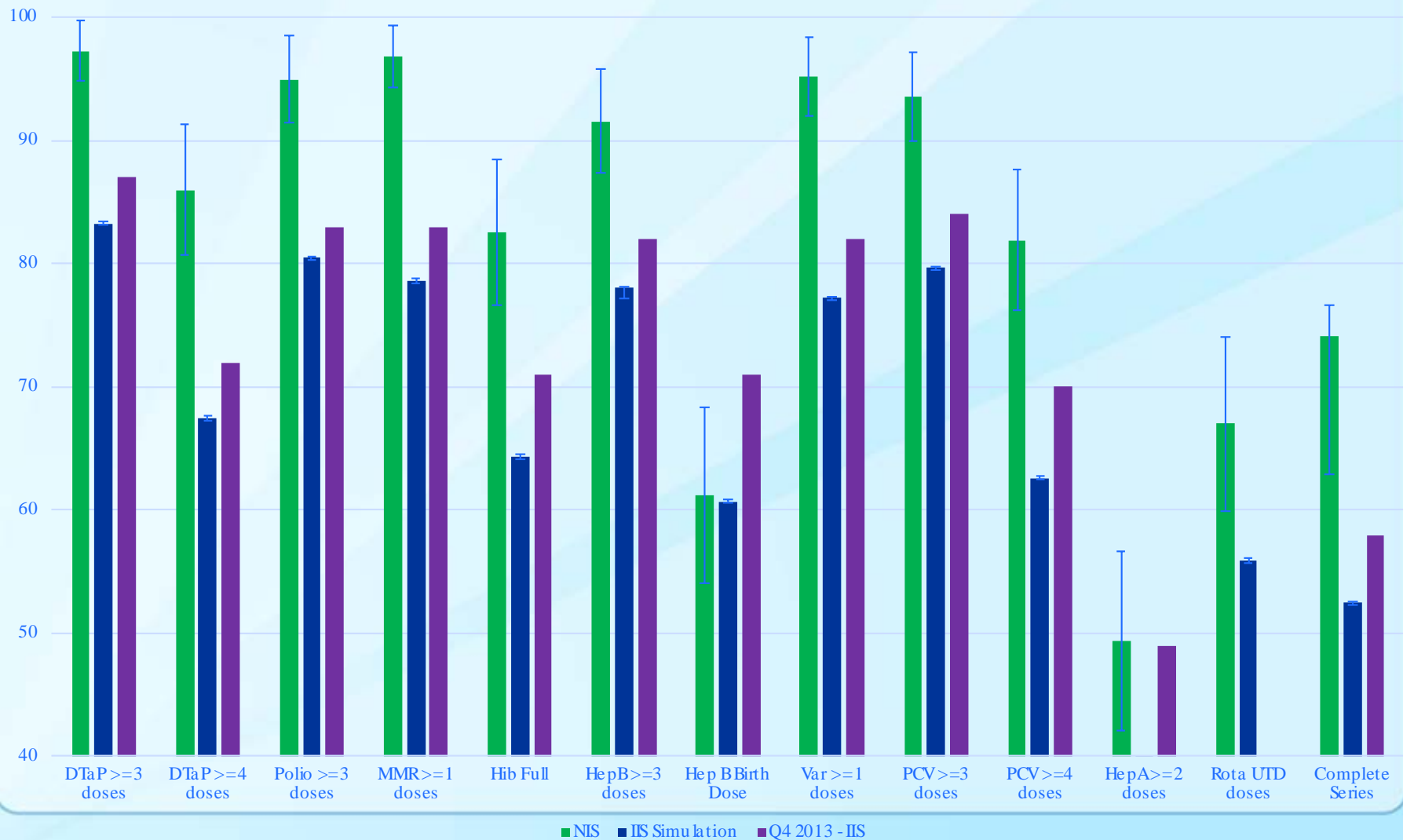
7. For each child in the sample, count number of vaccinations by vaccine group received from:

- Birth to 19 months of age for children aged <19 months at the Reference Date
- Birth to the Reference Date for children 19-35 months at the Reference Date
- Birth through age 35 months for children aged >35 months at the Reference Date

8. Calculate coverage for each vaccine group
(# children vaccinated / total sample * 100)

Repeat 100 times to obtain CI

Preliminary Results – Sentinel Site D



Preliminary Results – Sentinel Site E

