Understanding the National Immunization Survey (NIS) and its Relationship with Immunization Information Systems (IIS) – a Budding Romance?

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AIRA National Meeting

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Overview of NIS

Let’s get to know each other first…

National Immunization Survey (NIS) Objectives

- Assess national, state and selected local area vaccination coverage
- Monitor vaccination coverage trends and progress towards *Healthy People 2020* targets
- Identify disparities in vaccination coverage by selected socio-demographic characteristics
- Evaluate ongoing strategies to improve vaccination coverage
- Monitor adherence to ACIP vaccination recommendations

NIS Overview

- A family of surveys using one telephone sample
  - Children 19-35 months anytime during sampling quarter (NIS-Child)
  - Adolescents 13-17 years (NIS-Teen)
  - Children 6 months - 17 years (NIS-Flu)
- Dual (landline and cellular) frame survey
- Stratified by state and selected local areas and territories
- Telephone interview of parents or guardians of age-eligible children

NIS Overview

- Telephone interview collects
  - Socio-demographics, health insurance status
  - Information about child's vaccination providers
  - Consent to contact the vaccination providers
- Mailed survey of vaccination providers to collect vaccination histories
- Vaccination coverage estimates are based on provider data
- Data weighted to achieve accurate representation of the target population

NIS Sample and Response Rates, 2015

- 8,379,156 telephone numbers released to survey phone center
- NIS-Child sample size 15,167 with adequate provider data
  - Household response rate 34.9%
  - Provider phase response rate 56.2%
- NIS-Teen sample size 21,875 with adequate provider data
  - Household response rate 33.0%
  - Provider phase response rate 49.8%
- Sample size with adequate provider data per estimation area
  - NIS-Child range 188 - 361
  - NIS-Teen range 259 - 444

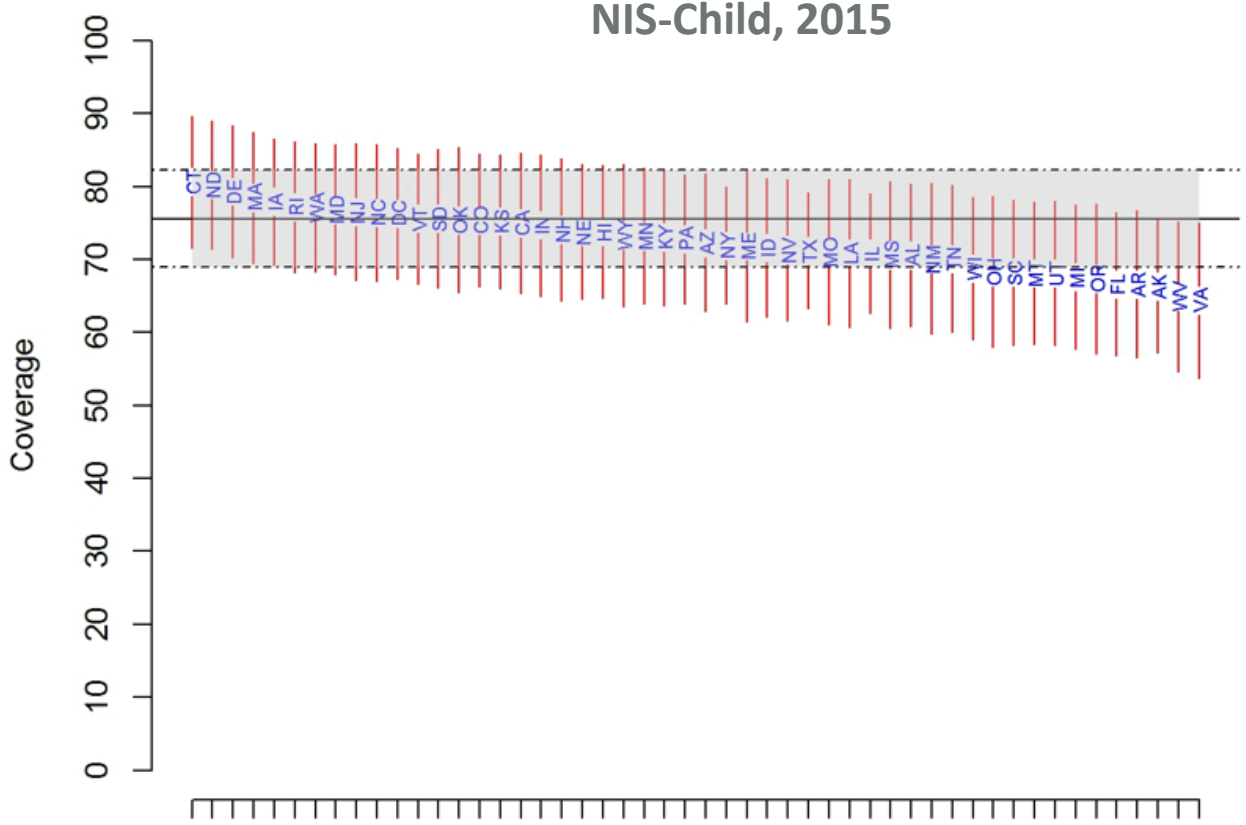
NIS Strengths

- Ongoing surveillance system providing state-level and national estimates of vaccination coverage that are comparable across areas and over time
- Provides accountability for federal investment in immunization programs, including the VFC program and funding state immunization programs
- Precise national estimates
- Identifies factors associated with vaccination coverage

NIS Limitations

- Not timely in comparison to IIS
  - HepB birth doses received 2.5-4.5 years before data reported
  - 4th dose of DTaP at age 24 months received 1.5-2.5 years before
- Random error: Wide state-level confidence intervals
  - Sample size per state or awardee limits short-term trend assessment and comparisons to other states
- Systematic error: Bias may remain after weighting
  - Excludes households without telephones
  - Low response rates creates susceptibility to selection bias
  - May miss some vaccinations

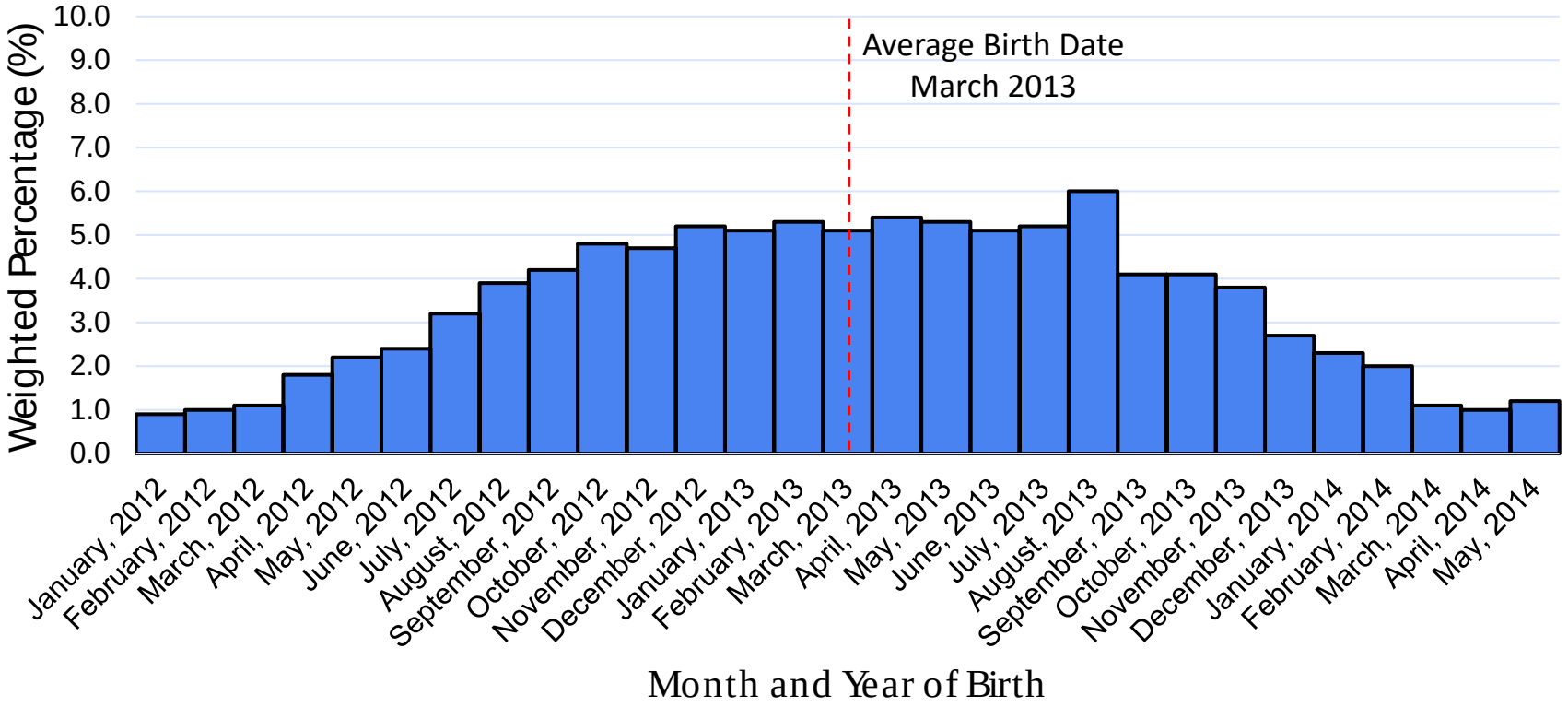
Comparison of Estimated Combined 7-Vaccine Series (4:3:1:3*:3:1:4) Coverage: Georgia vs. All Other States NIS-Child, 2015



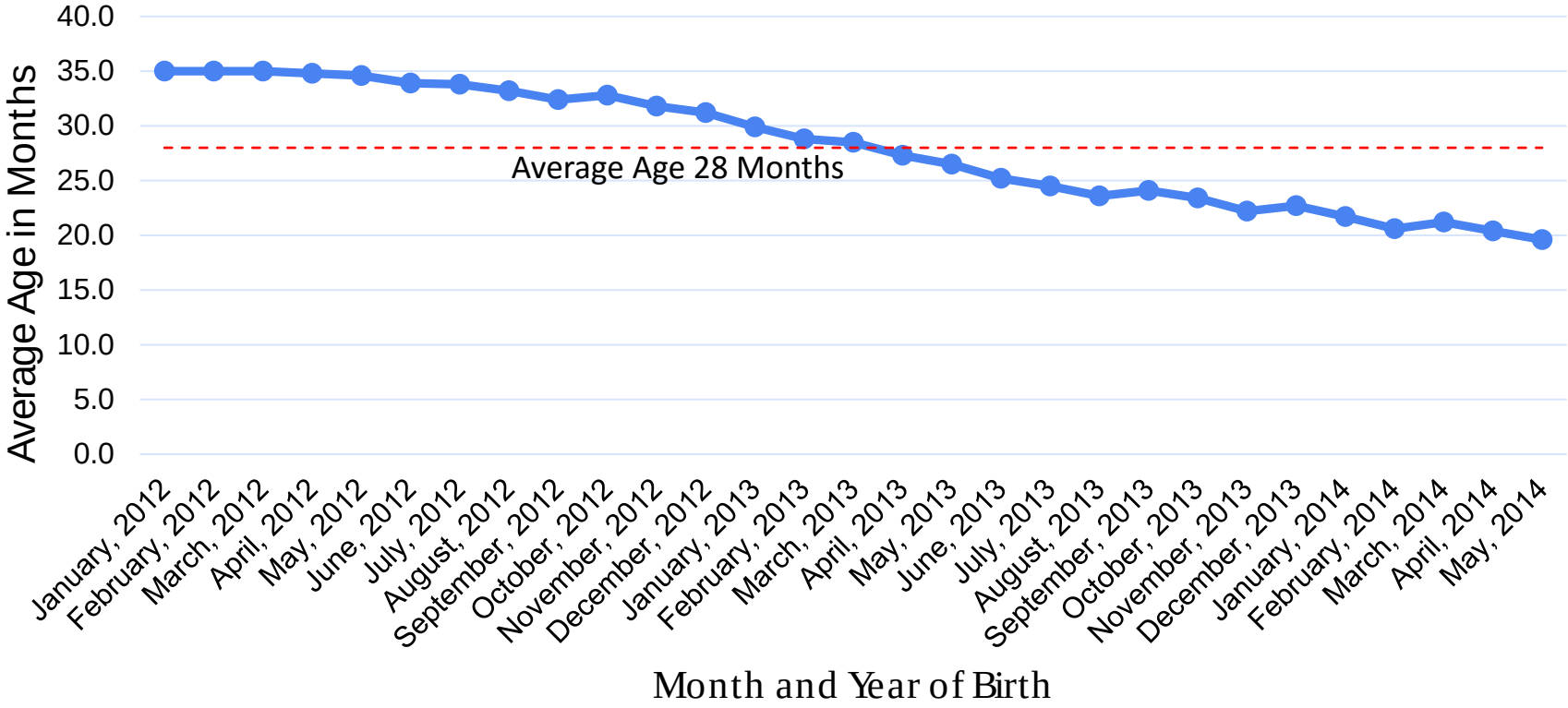
- No adjustment was made for multiple comparisons.
- Significance level for each comparison α=0.05.
- The combined 7-vaccine series (4:3:1:3*:3:1:4) includes ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, ≥1 dose of measles-containing vaccine, full series of Hib (3 or 4 doses, depending on product type), ≥3 doses of hepatitis B vaccine, ≥1 dose of varicella vaccine, and ≥4 doses of PCV.

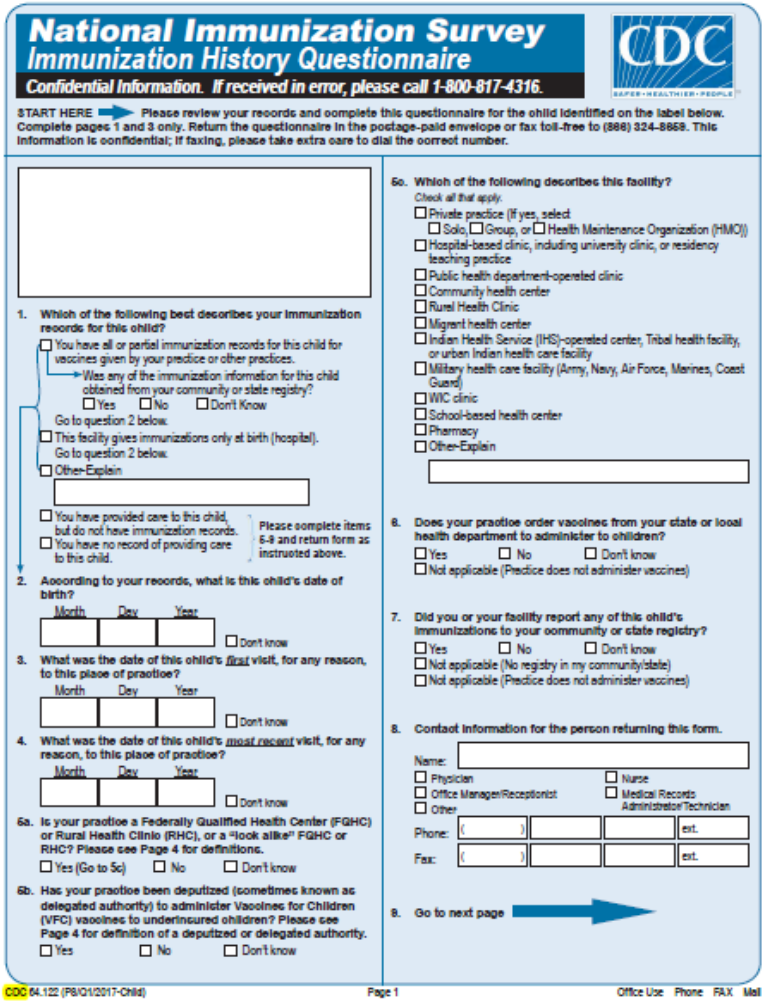
Figure prepared by Phil Smith

Weighted Distribution (%) of Sample by Birth Date, National Immunization Survey (NIS – Child) 2015



Average Age When Vaccination Status Determined, by Birth Date, National Immunization Survey (NIS – Child) 2015





National Immunization Survey
Immunization History Questionnaire

Confidential Information. If received in error, please call 1-800-817-4316.

CDC SAFER·HEALTHIER·PEOPLE™

START HERE ➡ **Please review your records and complete this questionnaire for the child identified on the label below. Complete pages 1 and 3 only. Return the questionnaire in the postage-paid envelope or fax toll-free to (888) 324-8669. This information is confidential; if faxing, please take extra care to dial the correct number.**

1. **Which of the following best describes your immunization records for this child?**
   - ☐ You have all or partial immunization records for this child for vaccines given by your practice or other practices.
     - → Was any of the immunization information for this child obtained from your community or state registry? ☐ Yes ☐ No ☐ Don't Know
     - Go to question 2 below.
   - ☐ This facility gives immunizations only at birth (hospital). Go to question 2 below.
   - ☐ Other-Explain
   - ☐ You have provided care to this child, but do not have immunization records.
   - ☐ You have no record of providing care to this child.

   Please complete items 6-9 and return form as instructed above.

2. **According to your records, what is this child's date of birth?** Month / Day / Year ☐ Don't know

3. **What was the date of this child's *first* visit, for any reason, to this place of practice?** Month / Day / Year ☐ Don't know

4. **What was the date of this child's *most recent* visit, for any reason, to this place of practice?** Month / Day / Year ☐ Don't know

6a. **Is your practice a Federally Qualified Health Center (FQHC) or Rural Health Clinic (RHC), or a "look alike" FQHC or RHC? Please see Page 4 for definitions.** ☐ Yes (Go to 5c) ☐ No ☐ Don't know

6b. **Has your practice been deputized (sometimes known as delegated authority) to administer Vaccines for Children (VFC) vaccines to underinsured children? Please see Page 4 for definition of a deputized or delegated authority.** ☐ Yes ☐ No ☐ Don't know

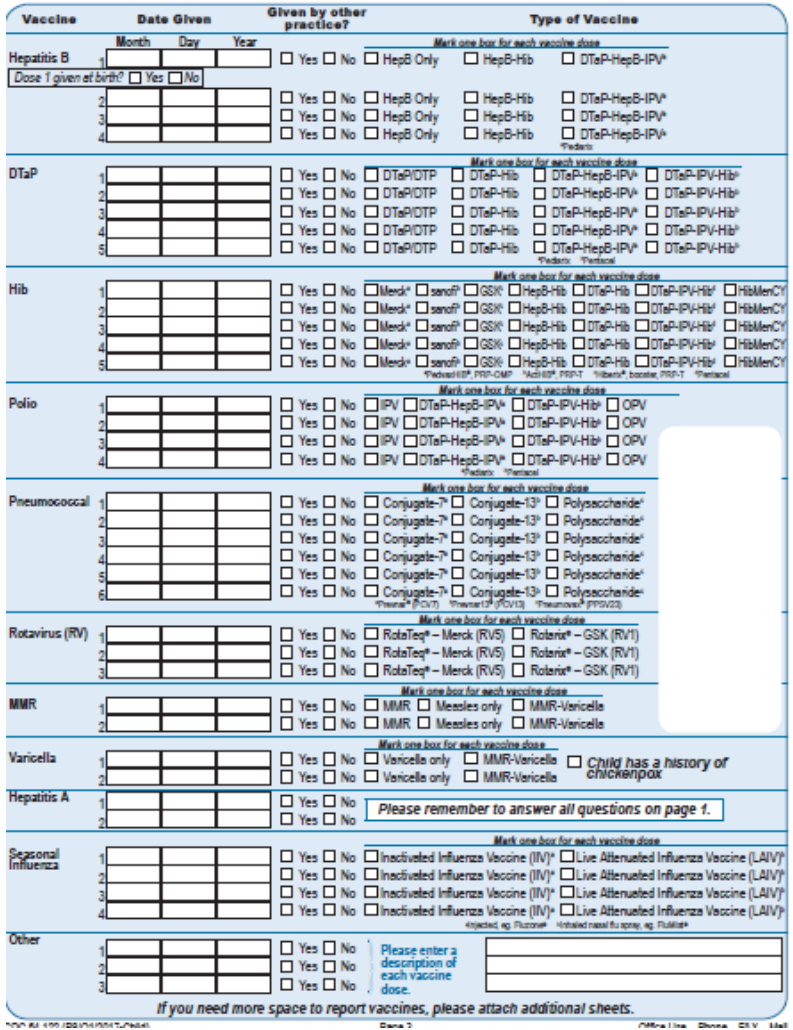
6c. **Which of the following describes this facility?** *Check all that apply.*
- ☐ Private practice (If yes, select ☐ Solo, ☐ Group, or ☐ Health Maintenance Organization (HMO))
- ☐ Hospital-based clinic, including university clinic, or residency teaching practice
- ☐ Public health department-operated clinic
- ☐ Community health center
- ☐ Rural Health Clinic
- ☐ Migrant health center
- ☐ Indian Health Service (IHS)-operated center, Tribal health facility, or urban Indian health care facility
- ☐ Military health care facility (Army, Navy, Air Force, Marines, Coast Guard)
- ☐ WIC clinic
- ☐ School-based health center
- ☐ Pharmacy
- ☐ Other-Explain

7. **Does your practice order vaccines from your state or local health department to administer to children?** ☐ Yes ☐ No ☐ Don't know ☐ Not applicable (Practice does not administer vaccines)

8. **Did you or your facility report any of this child's immunizations to your community or state registry?** ☐ Yes ☐ No ☐ Don't know ☐ Not applicable (No registry in my community/state) ☐ Not applicable (Practice does not administer vaccines)

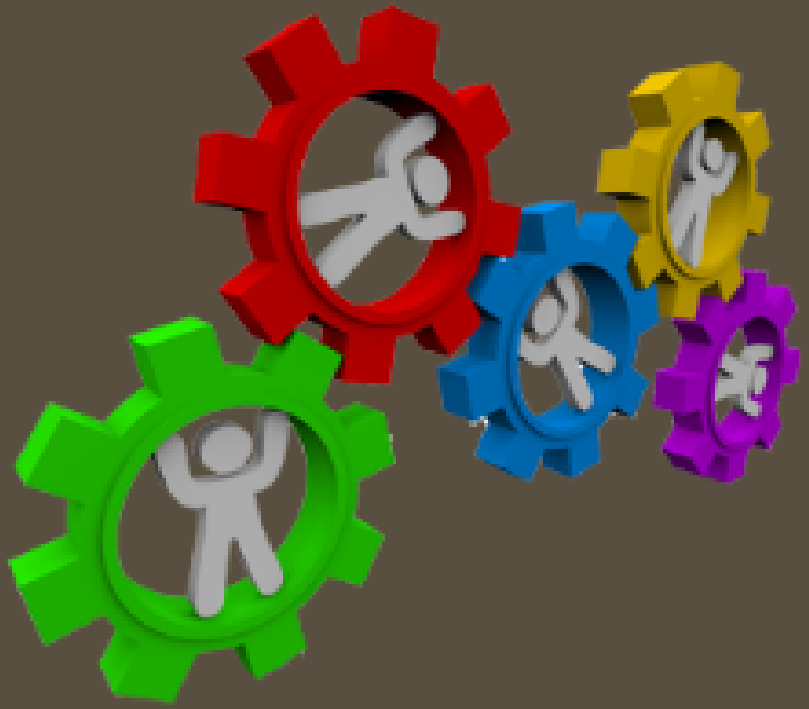
8. **Contact information for the person returning this form.**
   Name:
   ☐ Physician ☐ Nurse ☐ Office Manager/Receptionist ☐ Medical Records Administrator/Technician ☐ Other
   Phone: ( ) ext.
   Fax: ( ) ext.

9. **Go to next page** ➡



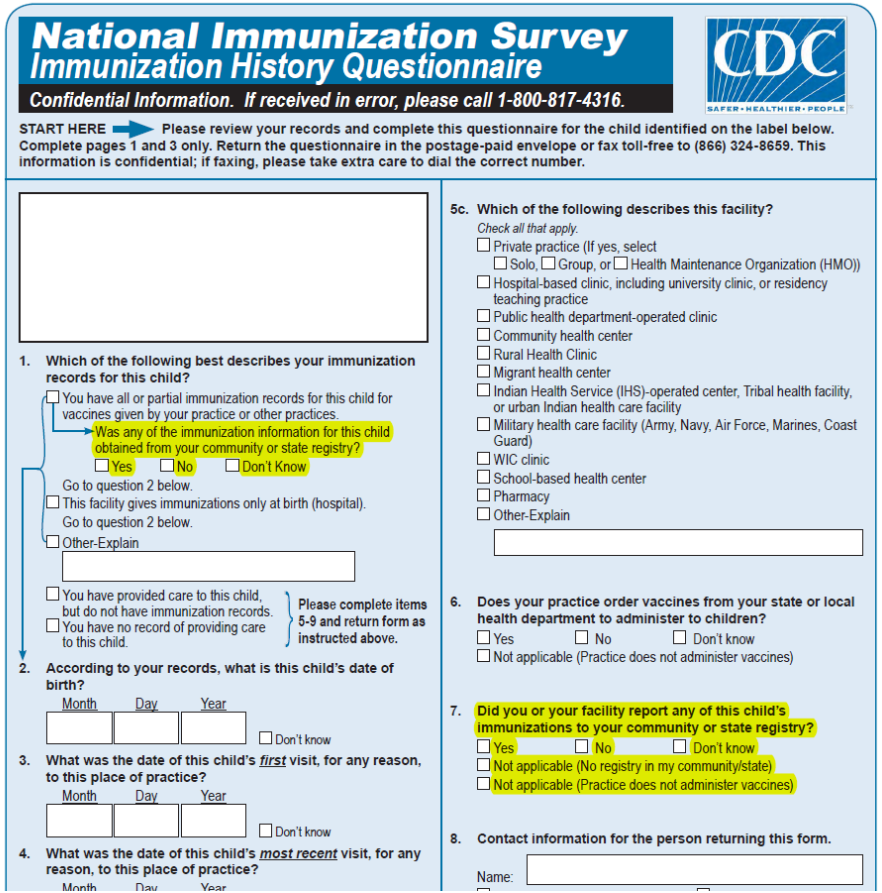
Vaccine	Date Given: Month / Day / Year	Given by other practice?	Type of Vaccine
Hepatitis B	1	☐ Yes ☐ No	☐ HepB Only ☐ HepB-Hib ☐ DTaP-HepB-IPV[a]
Dose 1 given at birth? ☐ Yes ☐ No	2	☐ Yes ☐ No	☐ HepB Only ☐ HepB-Hib ☐ DTaP-HepB-IPV[a]
	3	☐ Yes ☐ No	☐ HepB Only ☐ HepB-Hib ☐ DTaP-HepB-IPV[a]
	4	☐ Yes ☐ No	☐ HepB Only ☐ HepB-Hib ☐ DTaP-HepB-IPV[a]
DTaP	1	☐ Yes ☐ No	☐ DTaP/DTP ☐ DTaP-Hib ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b]
	2	☐ Yes ☐ No	☐ DTaP/DTP ☐ DTaP-Hib ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b]
	3	☐ Yes ☐ No	☐ DTaP/DTP ☐ DTaP-Hib ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b]
	4	☐ Yes ☐ No	☐ DTaP/DTP ☐ DTaP-Hib ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b]
	5	☐ Yes ☐ No	☐ DTaP/DTP ☐ DTaP-Hib ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b]
Hib	1	☐ Yes ☐ No	☐ Merck[a] ☐ sanofi[b] ☐ GSK[c] ☐ HepB-Hib ☐ DTaP-Hib ☐ DTaP-IPV-Hib[d] ☐ HibMenCY
	2	☐ Yes ☐ No	☐ Merck[a] ☐ sanofi[b] ☐ GSK[c] ☐ HepB-Hib ☐ DTaP-Hib ☐ DTaP-IPV-Hib[d] ☐ HibMenCY
	3	☐ Yes ☐ No	☐ Merck[a] ☐ sanofi[b] ☐ GSK[c] ☐ HepB-Hib ☐ DTaP-Hib ☐ DTaP-IPV-Hib[d] ☐ HibMenCY
	4	☐ Yes ☐ No	☐ Merck[a] ☐ sanofi[b] ☐ GSK[c] ☐ HepB-Hib ☐ DTaP-Hib ☐ DTaP-IPV-Hib[d] ☐ HibMenCY
	5	☐ Yes ☐ No	☐ Merck[a] ☐ sanofi[b] ☐ GSK[c] ☐ HepB-Hib ☐ DTaP-Hib ☐ DTaP-IPV-Hib[d] ☐ HibMenCY
Polio	1	☐ Yes ☐ No	☐ IPV ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b] ☐ OPV
	2	☐ Yes ☐ No	☐ IPV ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b] ☐ OPV
	3	☐ Yes ☐ No	☐ IPV ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b] ☐ OPV
	4	☐ Yes ☐ No	☐ IPV ☐ DTaP-HepB-IPV[a] ☐ DTaP-IPV-Hib[b] ☐ OPV
Pneumococcal	1	☐ Yes ☐ No	☐ Conjugate-7[a] ☐ Conjugate-13[b] ☐ Polysaccharide[c]
	2	☐ Yes ☐ No	☐ Conjugate-7[a] ☐ Conjugate-13[b] ☐ Polysaccharide[c]
	3	☐ Yes ☐ No	☐ Conjugate-7[a] ☐ Conjugate-13[b] ☐ Polysaccharide[c]
	4	☐ Yes ☐ No	☐ Conjugate-7[a] ☐ Conjugate-13[b] ☐ Polysaccharide[c]
	5	☐ Yes ☐ No	☐ Conjugate-7[a] ☐ Conjugate-13[b] ☐ Polysaccharide[c]
	6	☐ Yes ☐ No	☐ Conjugate-7[a] ☐ Conjugate-13[b] ☐ Polysaccharide[c]
Rotavirus (RV)	1	☐ Yes ☐ No	☐ RotaTeq® – Merck (RV5) ☐ Rotarix® – GSK (RV1)
	2	☐ Yes ☐ No	☐ RotaTeq® – Merck (RV5) ☐ Rotarix® – GSK (RV1)
	3	☐ Yes ☐ No	☐ RotaTeq® – Merck (RV5) ☐ Rotarix® – GSK (RV1)
MMR	1	☐ Yes ☐ No	☐ MMR ☐ Measles only ☐ MMR-Varicella
	2	☐ Yes ☐ No	☐ MMR ☐ Measles only ☐ MMR-Varicella
Varicella	1	☐ Yes ☐ No	☐ Varicella only ☐ MMR-Varicella ☐ *Child has a history of chickenpox*
	2	☐ Yes ☐ No	☐ Varicella only ☐ MMR-Varicella
Hepatitis A	1	☐ Yes ☐ No	*Please remember to answer all questions on page 1.*
	2	☐ Yes ☐ No	
Seasonal Influenza	1	☐ Yes ☐ No	☐ Inactivated Influenza Vaccine (IIV)[a] ☐ Live Attenuated Influenza Vaccine (LAIV)[b]
	2	☐ Yes ☐ No	☐ Inactivated Influenza Vaccine (IIV)[a] ☐ Live Attenuated Influenza Vaccine (LAIV)[b]
	3	☐ Yes ☐ No	☐ Inactivated Influenza Vaccine (IIV)[a] ☐ Live Attenuated Influenza Vaccine (LAIV)[b]
	4	☐ Yes ☐ No	☐ Inactivated Influenza Vaccine (IIV)[a] ☐ Live Attenuated Influenza Vaccine (LAIV)[b]
Other	1	☐ Yes ☐ No	Please enter a description of each vaccine dose.
	2	☐ Yes ☐ No	
	3	☐ Yes ☐ No	

If you need more space to report vaccines, please attach additional sheets.



Existing Synergy of IIS with NIS

Haven’t I met you somewhere before?



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- ☐ Other-Explain

- ☐ You have provided care to this child, but do not have immunization records.
- ☐ You have no record of providing care to this child.

Please complete items 5-9 and return form as instructed above.

2. According to your records, what is this child's date of birth?

Month ____ Day ____ Year ____ ☐ Don't know

3. What was the date of this child's *first* visit, for any reason, to this place of practice?

Month ____ Day ____ Year ____ ☐ Don't know

4. What was the date of this child's *most recent* visit, for any reason, to this place of practice?

Month Day Year

5c. Which of the following describes this facility?

Check all that apply.

- ☐ Private practice (If yes, select ☐ Solo, ☐ Group, or ☐ Health Maintenance Organization (HMO))
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6. Does your practice order vaccines from your state or local health department to administer to children?

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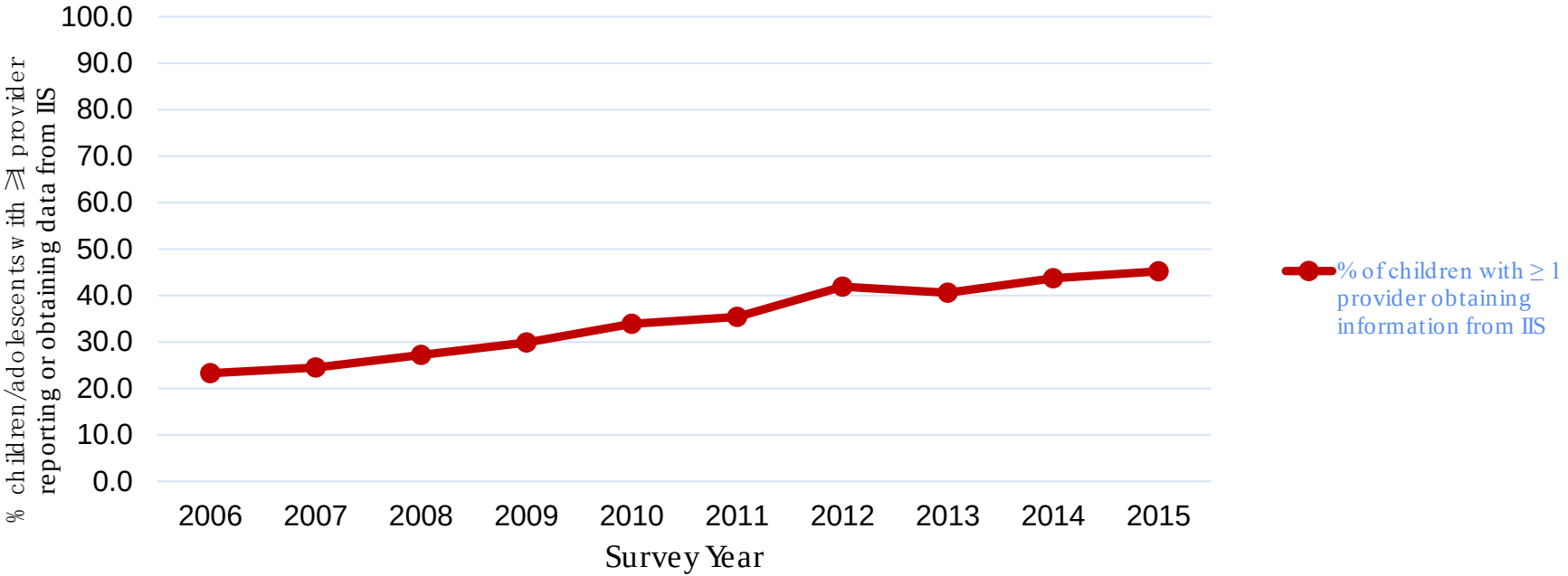
8. Contact information for the person returning this form.

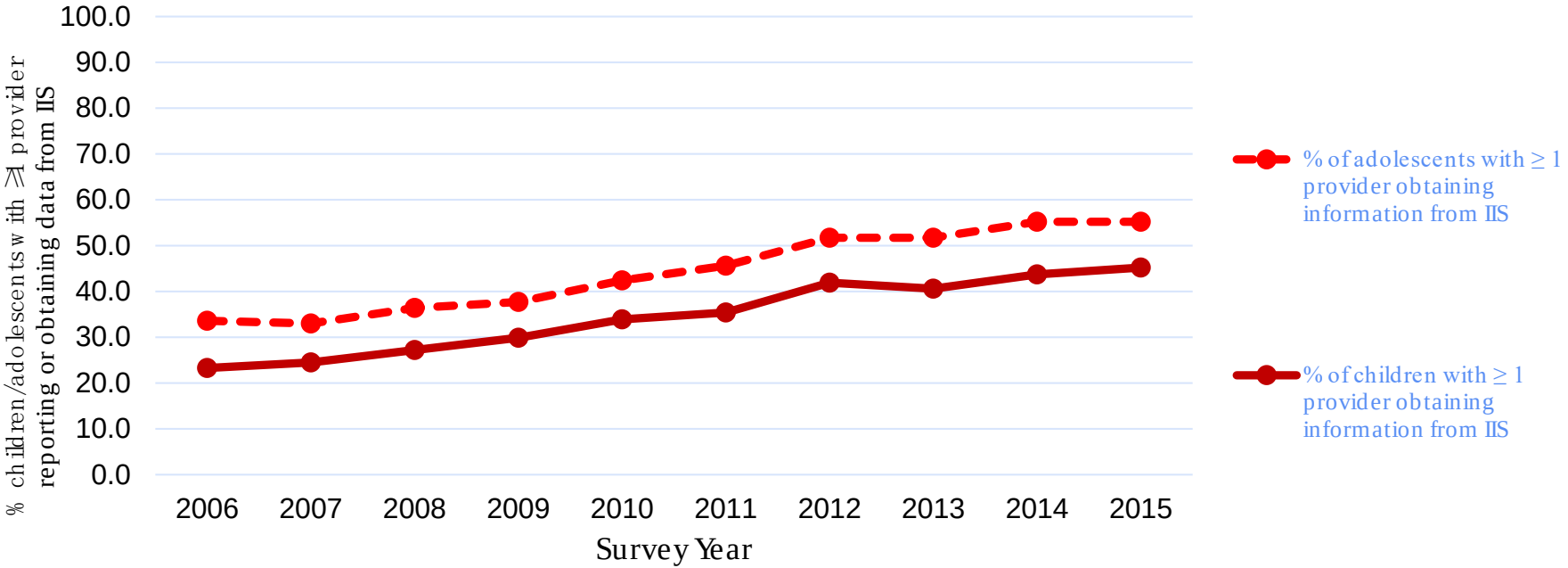
Name:

Percentage of Children 19-35 Months with ≥1 Providers Obtaining Data From IISs NIS-Child, 2006-2015



Updated from Cardemil CV et al., J Public Health Management Practice, 2016;22(3):245-254

Percentage of Children 19-35 Months & Adolescents 13-17 Years with ≥1 Providers Obtaining Data From IISs NIS-Child and NIS-Teen, 2006-2015



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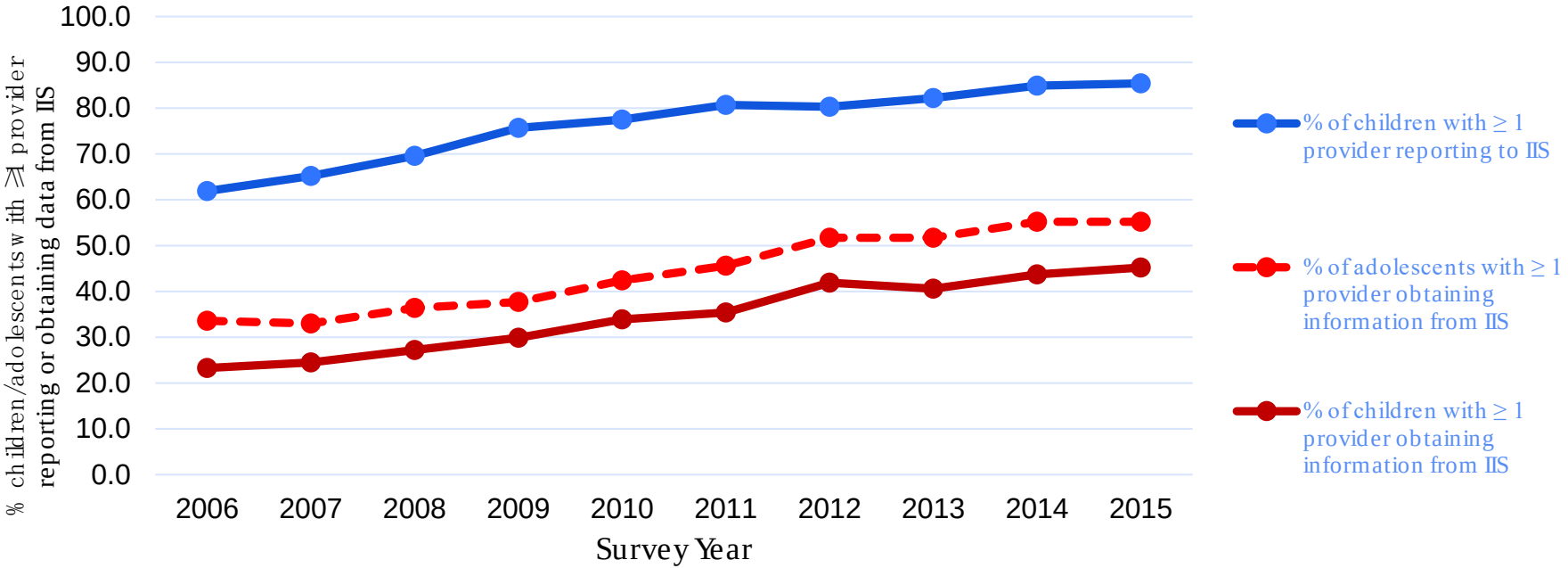
Percentage of Children 19-35 Months & Adolescents 13-17 Years with ≥1 Providers Reporting to, or Obtaining Data From IISs NIS-Child and NIS-Teen, 2006-2015



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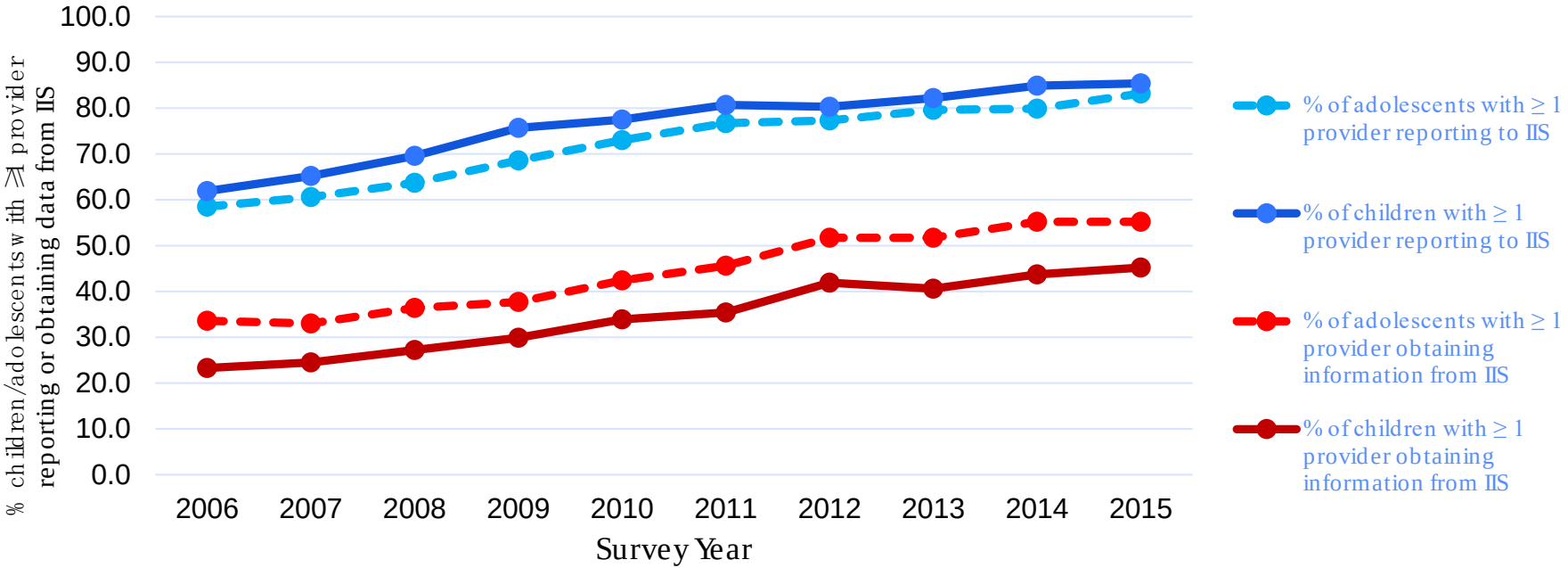


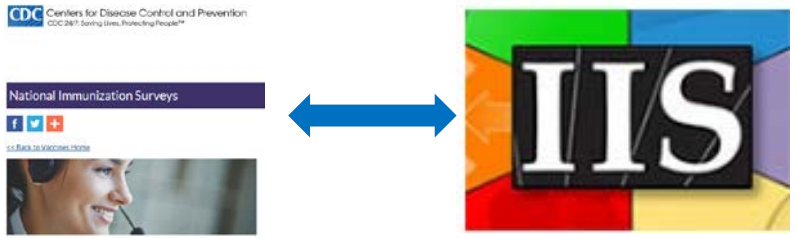
Updated from Cardemil CV et al., J Public Health Management Practice, 2016;22(3):245-254

Matching Children from NIS to IIS

Let’s see how compatible we are …

The NIS-IIS Match

Compares IIS quality and completeness with data collected through NIS (child or teen)

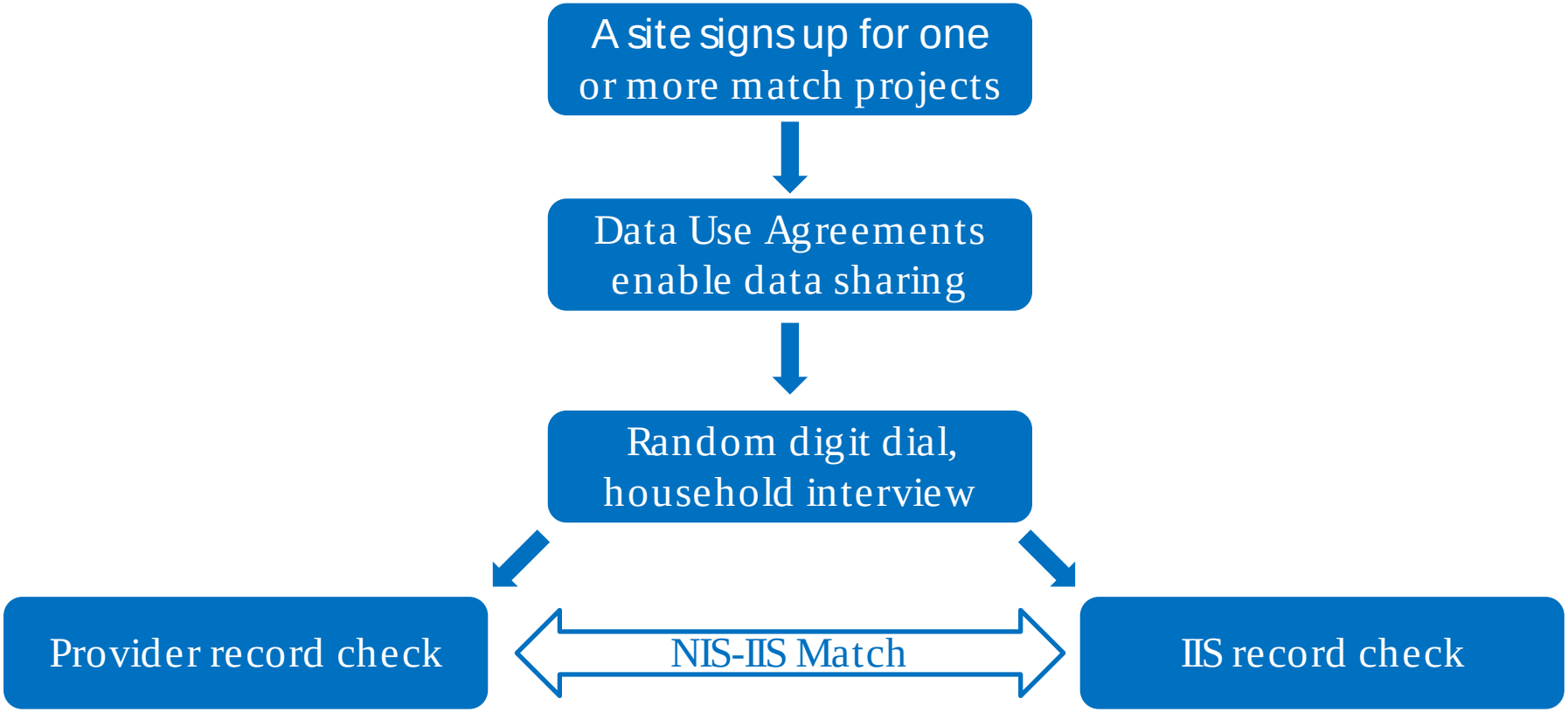


Evaluates:

- Completeness of IIS records
- Vaccination coverage calculations (IIS vs NIS)
- Characteristics of children with incomplete IIS vaccination records

Match produces data to improve NIS through Total Survey Error modeling

How the Match works

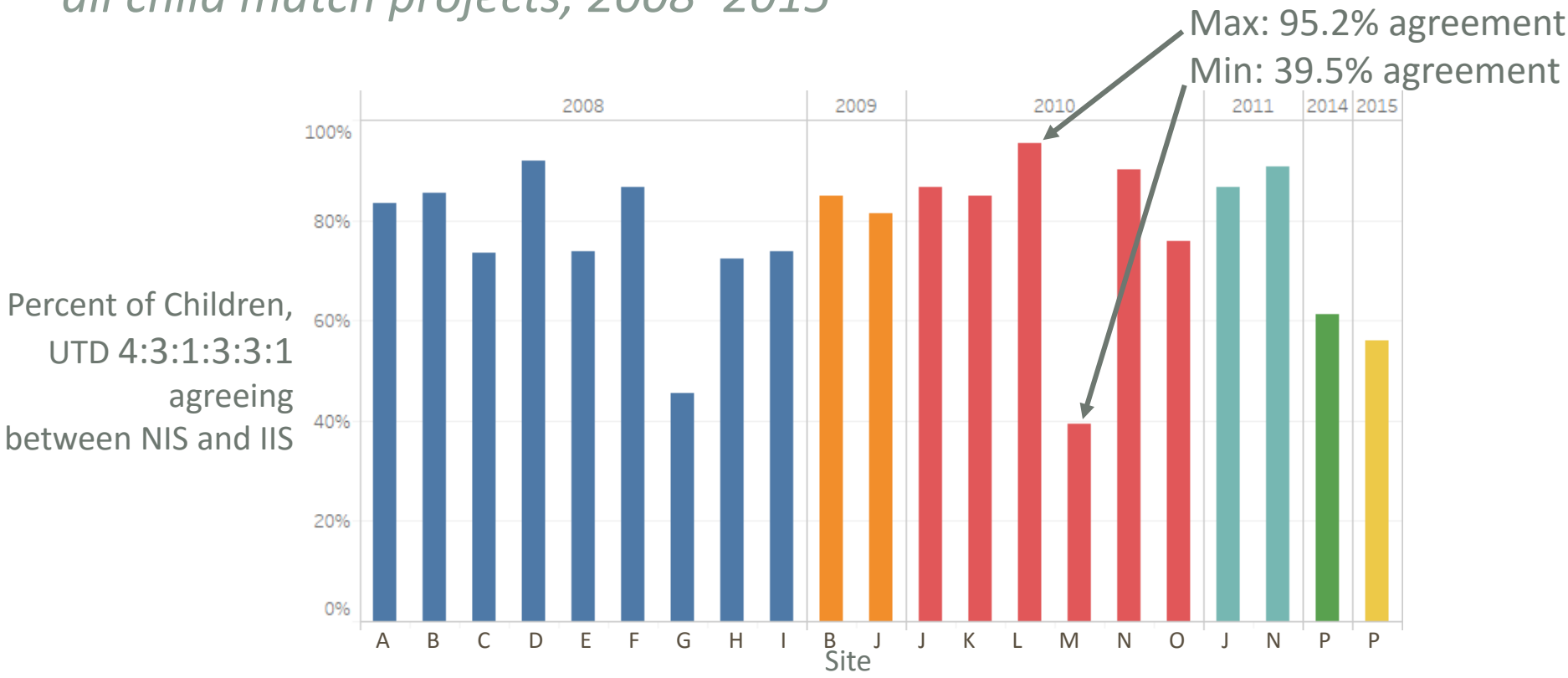


Participation in NIS-IIS Match

- 21 NIS-IIS Child match reports completed across 16 areas (2008 to early 2017)
  - Similar projects conducted 2002, 2004
- Among all child match projects, most children from NIS household interview were able to be located in IIS
  - Median match rate: 92%
  - Match rate range: 68% to 100%
- Across all NIS-IIS Child Match projects, vaccination data completeness ranged widely

NIS-IIS Agreement: 4:3:1:3:3:1 Series Completion

all child match projects, 2008–2015



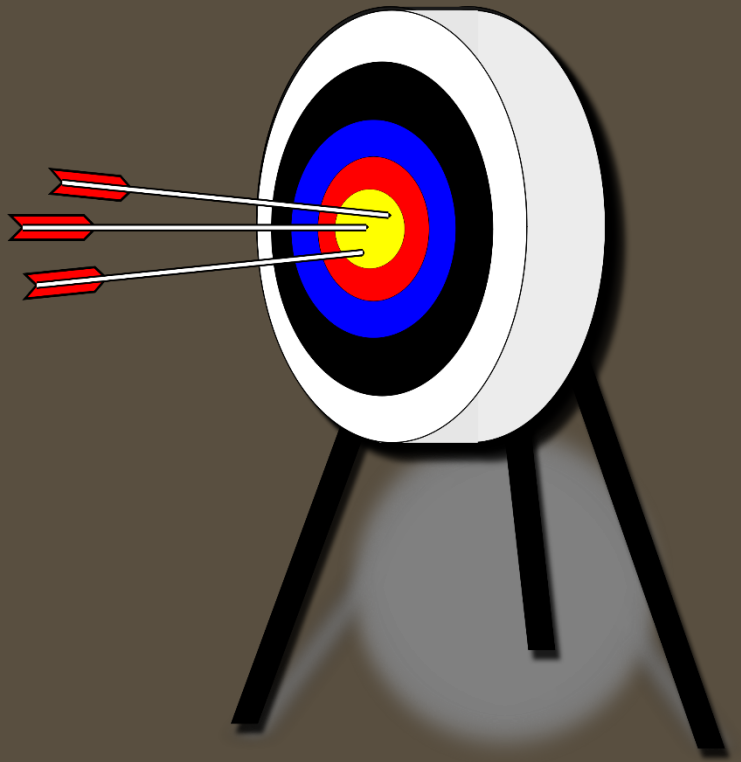
Prepared by NORC at the University of Chicago

Among children with ≥2 doses in IIS and granting permission to query IIS

Who is missing from IIS?

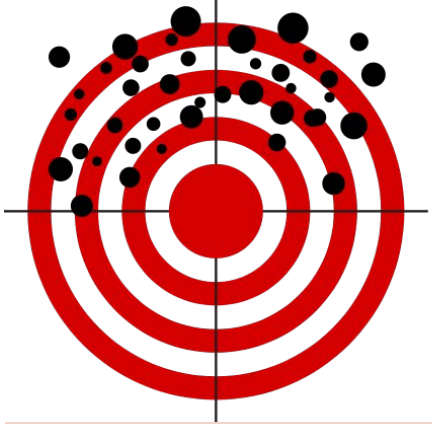
- Examined children UTD for recommended vaccines and series (e.g., 4:3:1:3:3:1) in NIS, but not UTD in IIS

- Across all match projects, children most often missing IIS records:
  - had relocated from another state since birth
  - were above poverty
  - had not been vaccinated only by public providers

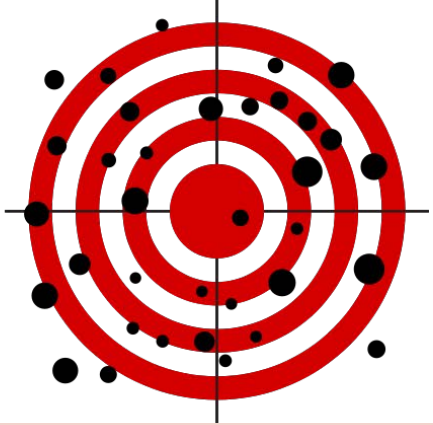


NIS Total Survey Error

Can we be honest with each other?



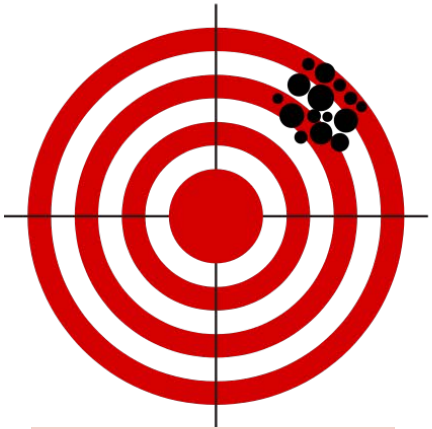
Not Precise & Biased



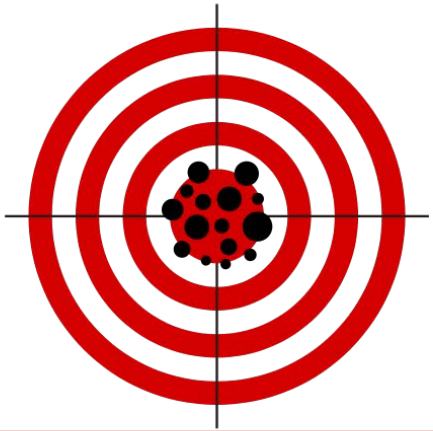
Not Precise & Not Biased

NIS

- Not Precise
- Biased?



Precise & Biased



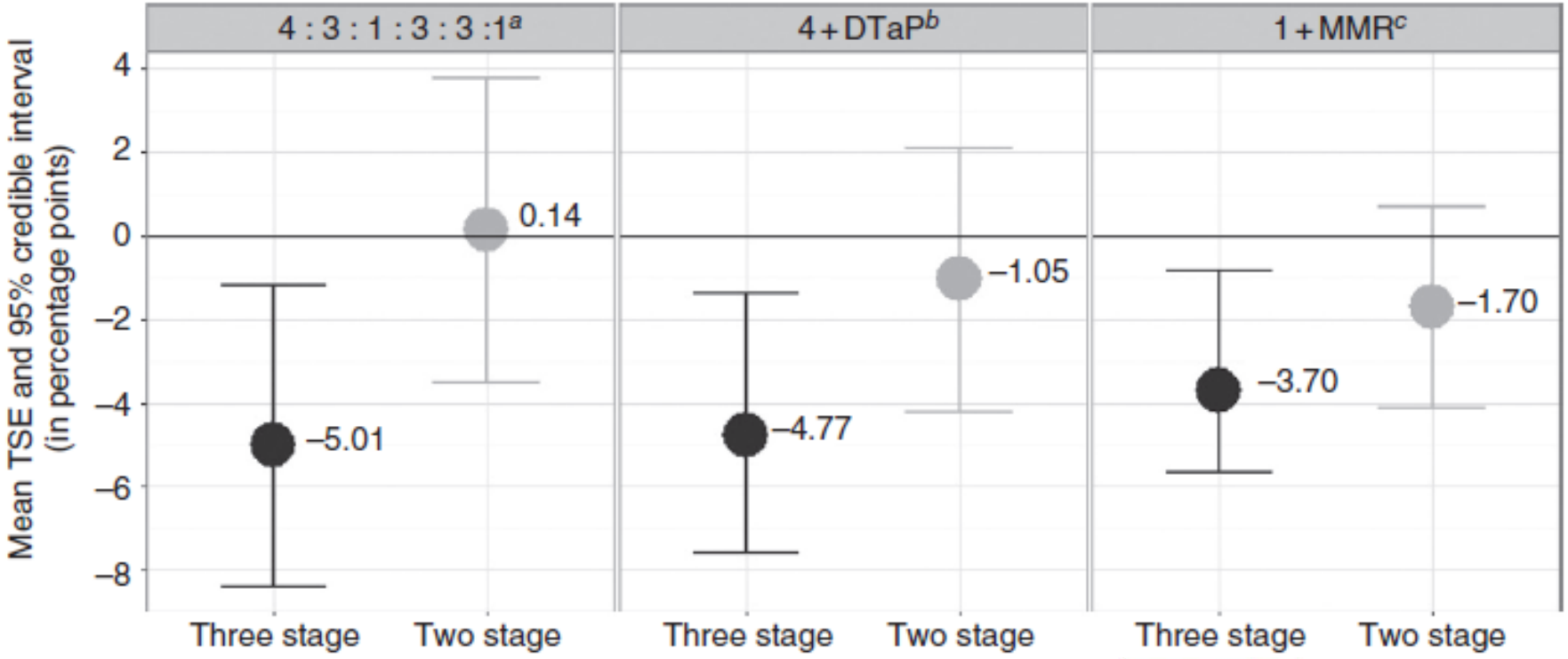
Precise & Not Biased

IIS

- Precise
- Biased?

NIS Total Survey Error Model

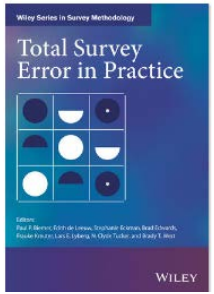
- Estimate bias in estimated vaccine coverage from systematic errors
  - Incomplete sample frame (excludes phoneless households)
  - Vaccination rates may differ in responders vs. non-responders
  - Not all vaccinations are reported by providers or not all vaccinating providers are contacted or report
- Model input
  - National Health Interview Survey, IIS-NIS match results
- Method
  - Monte Carlo replication to generate plausible range for difference in estimated vaccination coverage rate and “true” rate (bias)



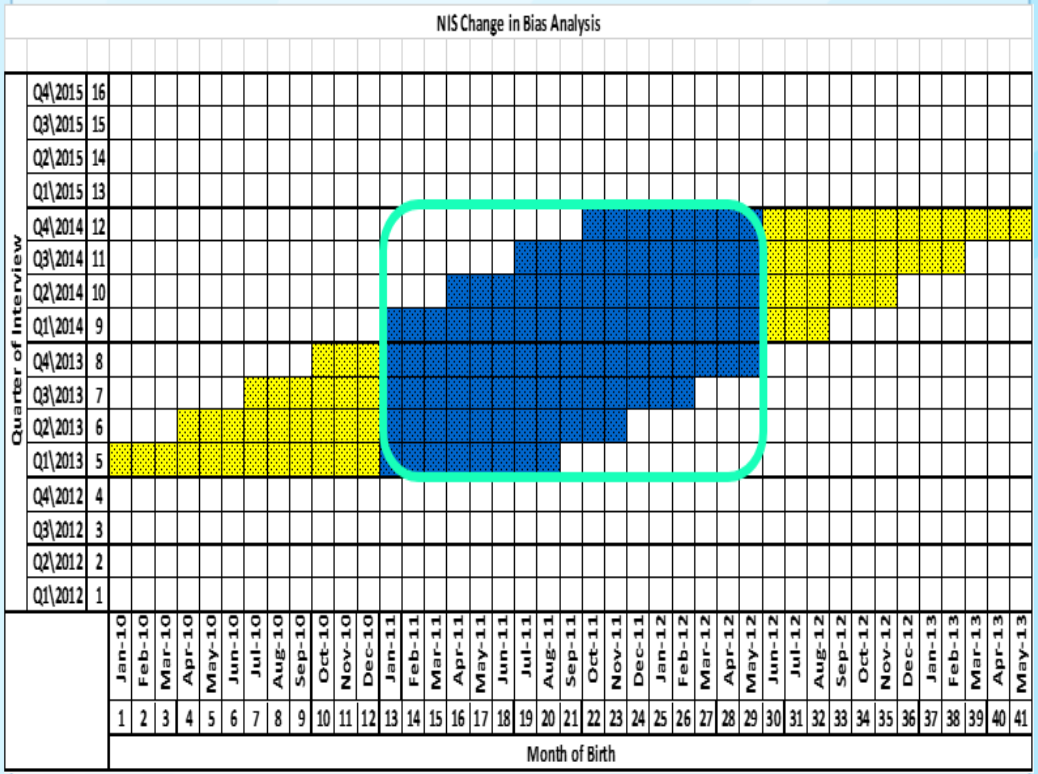
Total Survey Error Assessment for Sociodemographic Subgroups in the 2012 U.S. National Immunization Survey

Kirk M. Wolter,[1] Vicki J. Pineau,[1] Benjamin Skalland,[1] Wei Zeng,[1] James A. Singleton,[2] Meena Khare,[3] Zhen Zhao,[2] David Yankey,[2] and Philip J. Smith[2]

[1] *NORC at the University of Chicago, Chicago, IL, USA*
[2] *National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, GA, USA*
[3] *National Center for Health Statistics, Centers for Disease Control and Prevention, Hyattsville, MD, USA*

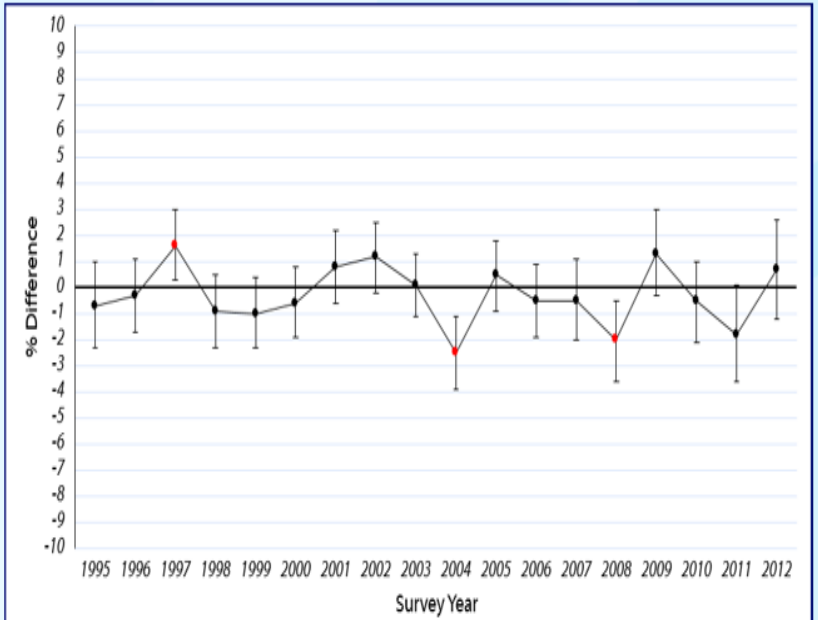


Change in Bias
Bridging Birth Cohorts



AAPOR 2015

Change in Bias
≥1 MMR by 19 months



* Indicates statistically significant difference.

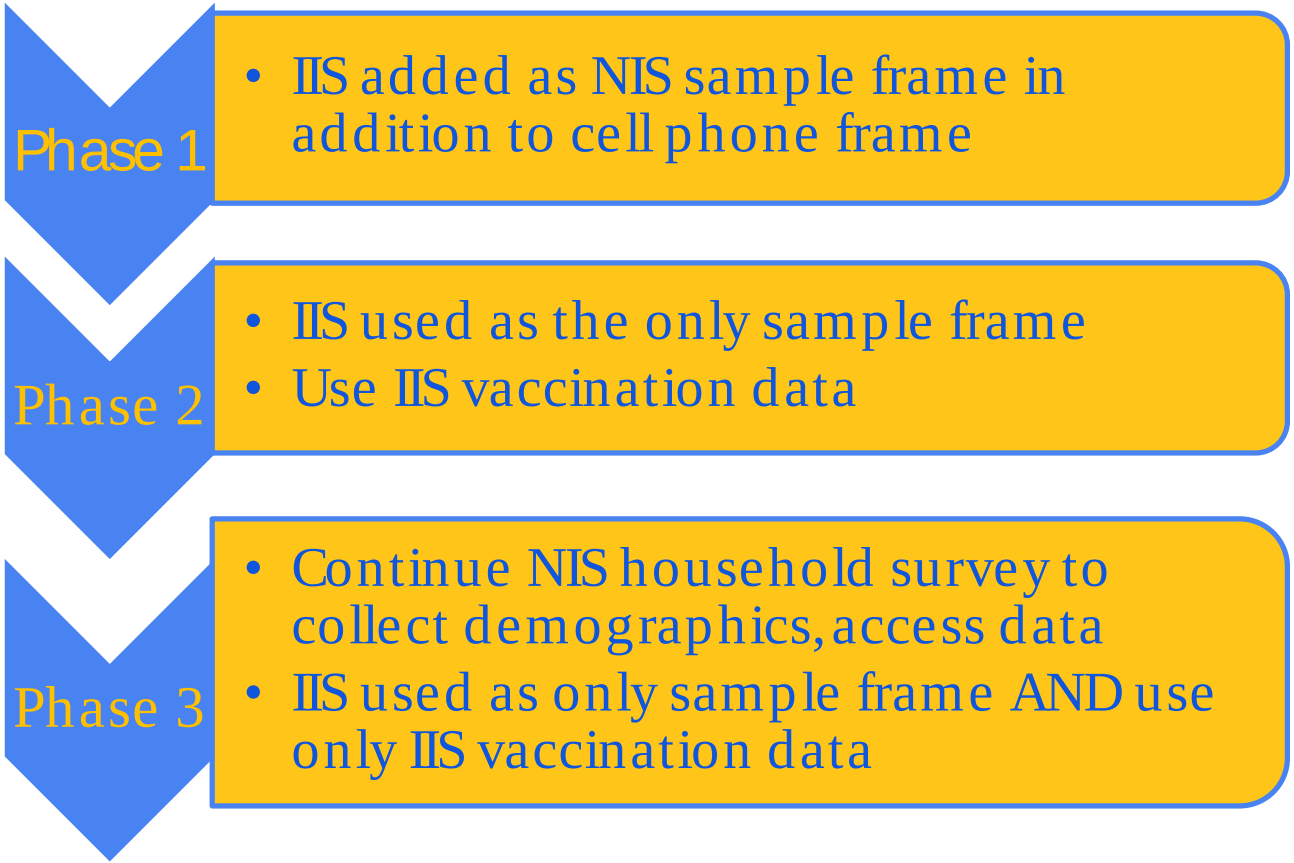
Future Synergies

Let’s get engaged…

New Directions for NIS and IIS Synergy

- AIRA Work Group developing guide to assist in interpreting and communicating results of NIS and IIS vaccination coverage assessments
- Selected county estimates of vaccination coverage from NIS-Child, NIS-Teen, and NIS-Flu
  - Will be distributed to immunization programs later this year
    - How do they compare to IIS estimates?
    - Are these estimates useful for state and local immunization programs?
- CDC proposal to integrate IIS and NIS for national and state level vaccination coverage assessment

Proposed Strategy for Integrating IIS and NIS



Benefits of Phase 1

- Increase state and local area sample size
- Address and phone number locating services could be provided for IIS to improve their use as an NIS sample frame
- Could provide annual assessment of the completeness of the IIS population and the IIS vaccination data, and facilitate AIRA's IIS assessment and certification initiative
  - Requires data sharing so vaccination data from the IIS can be compared to vaccination data from the NIS
  - CDC would use to evaluate potential bias in NIS estimates
- Reduced cost to awardees to oversample local areas of interest
- Reduced burden on the American public (fewer phone calls)

Next Step - Assess Feasibility

- Can IIS data be shared for NIS sampling under your program's current policies?
- Is your program willing to share IIS data for NIS sampling?
- How many IIS adequately represent the population of children 6 months -17 years?
- How many IIS have sufficiently complete and accurate phone number and address data for households with children 6 months -17 years?
- What resources would programs need to share IIS data for NIS sampling?
- What concerns, questions, and feedback do you have about the proposed strategy?

Thank You

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 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.