

Moving towards convergence: The National Immunization Survey (NIS) and Immunization Information Systems (IIS)

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BACKGROUND

Federal Immunization Program

□ Approximately \$3.4 billion per year

- Vaccine purchase
 - Vaccine for Children (VFC)
- Support national and state immunization programs
 - Administrative systems
 - Immunization Information Systems (IIS)
 - VTrckS – vaccine purchase and tracking
 - AFIX – provider vaccination assessment
- <1% is spent on direct evaluations of the program
 - Surveys
 - National Immunization Survey (NIS) family (NIS, NIS-Teen, NIS-Flu)
 - School Vaccination Assessment
 - National Health Interview Survey (NHIS) – selected questions
 - Behavioral Risk Factor Surveillance System (BRFSS) – selected questions and modules

NIS

□ Purpose

- Provide national and state vaccination coverage for evaluation of immunization programs and policies.

□ Description

- A family of surveys that monitors national- and state-level vaccination coverage estimates for children and teens in the United States.
- Consistent methodology creates comparable estimates across states.

□ Methods

- List-assisted random digit dial (RDD) dual landline and cell telephone survey
- Provider reported vaccination administration to determine vaccination status (Provider Record Check – PRC)

IIS

□ Purpose

- Collect and consolidate vaccination data from vaccine providers and provide tools for designing and sustaining effective immunization strategies at the provider and program levels.

□ Description

- Population-based databases that record vaccinations administered by participating providers to persons residing within a given area.
- Systems vary across states.
- Able to identify vaccination patterns at the local level (below state) in a timely manner.
 - Most vaccinations are reported within 30 days of administration

□ Methods

- Provider reported receipt of vaccination to determine vaccination status.
- Use date of vaccination to assess dose validity

NIS and IIS Moving Towards Convergence

❑ Commonalities

- Provider reported vaccine administration or receipt of vaccination
- Vaccination coverage data for decision making
- Populations overlap

❑ Differences

- Scope
 - NIS – National and State levels
 - IIS – State and Local levels

❑ Opportunities created by convergence/cooperation

- Decrease program evaluation costs
- Minimize reporting burden on providers
- Improve methods to calculate vaccination coverage at the local level to identify pockets of low or lagging vaccination and risks for outbreaks of vaccine preventable disease

Operational Research Strategy

□ Focus

- Improved measures of vaccination coverage.
 - Exploit the strengths of each system
 - Improve validity
 - Optimize costs

□ Projects

- Completed
 - NIS-IIS sample frame
- Ongoing
 - NIS-IIS match
- Future
 - NIS-IIS sample frame
 - Incorporate IIS into NIS provider record check
 - IIS local area analysis

PAST AND CURRENT PROJECTS

NIS-IIS Sample Frame

□ Purpose

- Examine IIS potential to provide an adjunct sample frame to increase the efficiency of NIS.
- Examine sampling strategies to address potential representativeness of the sample and nonresponse bias concerns.

□ Sample

- 2008 NIS
 - NIS – 19-35 month old children
- IIS
 - $n = 2$ (Grantee A & B)

□ Analysis

- Representativeness of the sample
- Data reporting
- Nonresponse analysis

NIS-IIS Sample Frame Methods

❑ Sample Preparation

- A random sample of children 19-35 months was drawn from grantee A & B IIS (1st and 2nd quarters of 2008)
- Contact information was updated (street address and telephone numbers)

❑ Data collection

- Telephone survey (usual NIS household interview)
 - Eligibility confirmed
 - Consent obtained for PRC and IIS check
- PRC

❑ IIS Check

- Compare to PRC
- Nonresponse/non-consent

NIS-IIS Sample Frame Results

- ❑ **A “large” proportion of IIS cases were not locatable.**
 - 13.9% in A, 28.6% in B
- ❑ **Representativeness of the sample**
 - The NIS sample and IIS population differ by selected sociodemographic characteristics (unweighted).
 - The weighted estimates of the NIS compared to the IIS were comparable.
- ❑ **Data Reporting**
 - Use of IIS data to replace PRC data would result in no change in one state and lower rates in the other state.
 - IIS data completeness affects vaccination coverage rates.
- ❑ **Nonresponse analysis**
 - Some or all of the differences may reflect the correlation between incomplete data from NIS and incomplete data reported to IIS
 - IIS cases with an incomplete NIS household interview may have lower vaccination coverage rates than those with a complete PRC.
 - IIS cases with adequate NIS PRC data may have higher vaccination coverage rates than those without PRC data.

NIS-IIS Match

□ History

- Piloted in 2002 and 2004 with 8 grantees
- Implementation started in 2008
 - NIS (child) and NIS-Teen

□ Purpose

- How vaccination rates computed from the IIS compare to rates computed from the NIS.
- How complete the vaccination histories are for each series in the IIS as compared to the NIS.
- How much NIS coverage estimates would increase if IIS data were added to the NIS
- How complete the vaccination histories are from the NIS for children who are up-to-date based on IIS information.
- Whether there are characteristics of providers or children/families associated with completeness of IIS vaccination records.

NIS-IIS Match Methods

❑ NIS household interview

- Requested permission for the PRC
- Requested permission to contact the IIS

❑ Query the IIS

- Criteria for matching records were chosen by each office.
- All vaccinations included in the IIS were included.

❑ NIS-IIS Match Child-Level Information

- Comparison of Vaccination Rates Based on Provider vs. IIS Data
 - Up-to-date (UTD) rates for each vaccine and series based on data source
 - Adequate NIS Provider Data
 - Adequate IIS Data
 - Child had 2 or more immunizations in their IIS records
 - Adequate NIS Provider Data and Adequate IIS Data
 - Synthesized NIS and IIS Data

Summary of NIS-IIS Match Results

- ❑ IIS match rates (68%-100%) and adequate data rates relative to matches (78%-99%) vary across localities
- ❑ Adequate IIS data increases NIS adequate provider data (APD) by 5-20 percentage points

Locality	NIS APD Rate (Given Provider Consent)	IIS Match Rate	Adequate IIS Data Rate (relative to consents)	Adequate IIS Data Rate (relative to matches)	Percentage Increase in APD Resulting from IIS
2008 Data					
1	88.9%	81.0%	63.5%	78.4%	5.3%
2	81.0%	68.2%	61.4%	90.0%	10.0%
3	85.2%	96.7%	84.6%	87.5%	8.7%
4	87.1%	73.1%	72.3%	98.9%	6.7%
5	90.6%	100.0%	96.3%	96.3%	9.0%
6	79.5%	95.9%	89.3%	93.1%	20.6%
7	87.0%	92.4%	89.9%	97.3%	10.4%
8	90.0%	96.1%	92.3%	96.0%	6.5%
9	89.7%	78.8%	65.1%	82.6%	6.5%
2009 Data					
11	85.7%	93.8%	83.6%	89.1%	10.3%
12	81.4%	90.5%	75.4%	83.4%	16.9%

Sample size for combined NIS/IIS data records range from 175 - 466

Comparison of 4:3:1:3:3:1 UTD Rates

- ❑ NIS UTD rates higher than IIS UTD rates for 8 of 11 localities across 2008 and 2009
- ❑ Synthesized NIS/IIS UTD rates generally close to NIS, but as much as 11.9 percentage points higher than NIS
- ❑ Magnitude of differences vary by locality
- ❑ Rates of child and provider participation, listing of vaccination names affect IIS UTD rates, and thus NIS/IIS differences

	4:3:1:3:3:1		
Locality	NIS- IIS	Synthesized - NIS	Synthesized - IIS
2008 Data			
1	7.7	2.2	9.9
2	12.8	0.9	13.7
3	20.3	-0.5	19.8
4	5.3	3.5	8.8
5	2.6	6.8	9.4
6	16.0	0.5	16.4
7	17.7	1.6	19.3
8	-4.4	4.7	0.4
9	45.9	0.1	46.0
2009 Data			
10	-3.9	7.5	3.7
11	-8.2	11.9	3.7
Max	45.9	11.9	46.0
Min	-8.2	-0.5	0.4
Median	7.7	2.2	9.9

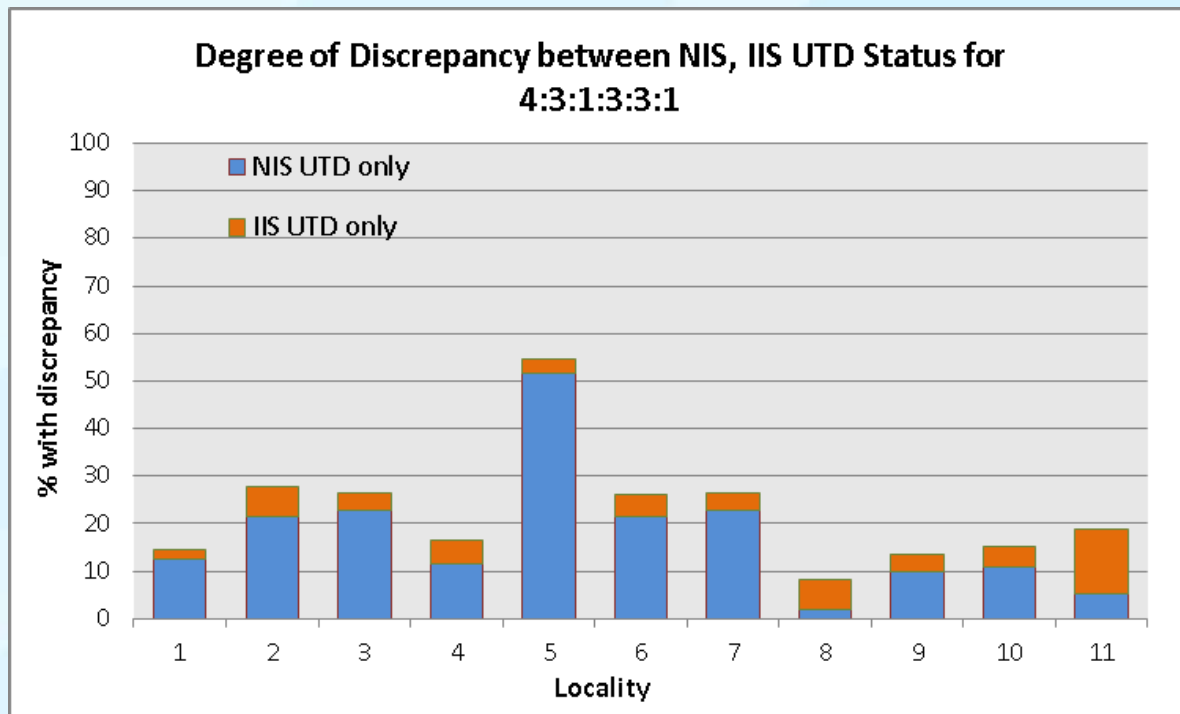
Difference in Selected UTD Rates

- Gains from synthesized NIS/IIS appear greater in
 - vaccine series than single vaccines
 - vaccine types that require more doses

	4:3:1:3:3:1			3+ DTP			4+ DTP		
Locality	NIS- IIS	Synthesized - NIS	Synthesized - IIS	NIS- IIS	Synthesized - NIS	Synthesized - IIS	NIS- IIS	Synthesized - NIS	Synthesized - IIS
2008 Data									
1	7.7	2.2	9.9	2.3	1.1	3.4	5.6	1.7	7.3
2	12.8	0.9	13.7	8.4	-2.0	6.4	13.8	-1.0	12.8
3	20.3	-0.5	19.8	10.8	-2.5	8.4	20.6	-2.6	18.0
4	5.3	3.5	8.8	0.1	1.1	3.4	5.6	1.7	7.3
5	2.6	6.8	9.4	4.3	2.7	7.0	4.4	3.3	7.7
6	16.0	0.5	16.4	0.0	0.0	0.0	0.0	0.0	0.0
7	17.7	1.6	19.3	1.1	0.2	1.3	1.7	1.4	3.0
8	-4.4	4.7	0.4	-2.0	0.6	-1.4	-3.1	2.8	-0.4
9	45.9	0.1	46.0	5.6	0.9	6.5	5.0	5.1	8.6
2009 Data									
10	-3.9	7.5	3.7	0.3	3.2	3.4	0.4	4.7	5.1
11	-8.2	11.9	3.7	-2.1	-3.5	1.4	-6.4	8.8	2.4
Max	45.9	11.9	46.0	10.8	3.2	8.4	20.6	8.8	18.0
Min	-8.2	-0.5	0.4	-2.1	-3.5	-1.4	-6.4	-2.6	-0.4
Median	7.7	2.2	9.9	1.1	0.6	3.4	4.4	1.7	7.3

NIS/IIS UTD Status Discrepancies

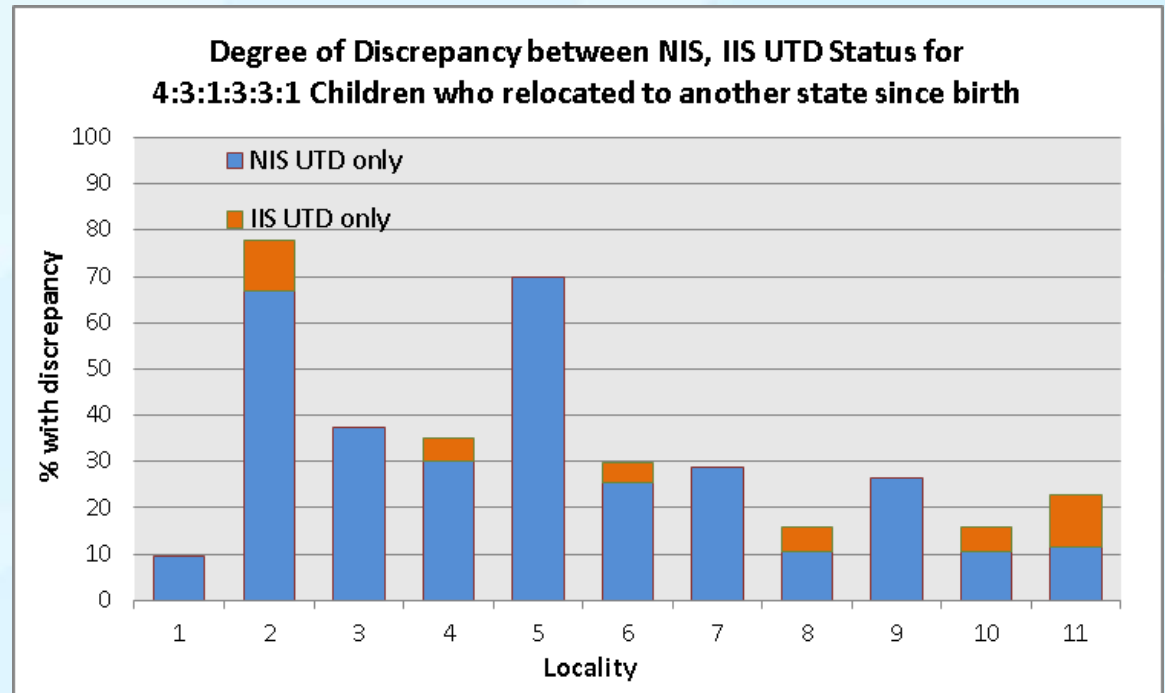
- ❑ NIS, IIS generally agree on UTD status in majority of cases
- ❑ Discrepancies generally due to only NIS indicating UTD
- ❑ Magnitude of results vary by state



	NIS UTD only	IIS UTD only	Total Disagree
Max	51.7%	13.7%	54.6%
Min	2.0%	2.0%	8.1%
Median	12.6%	4.3%	18.8%

NIS/IIS UTD Status Discrepancies: Relocations

- ❑ Discrepancy rate higher for children relocated to another state
- ❑ Discrepancies always due to only NIS showing UTD for approximately half of localities



	NIS UTD only	IIS UTD only	Total Disagree
Max	70.0%	11.4%	77.8%
Min	9.5%	0.0%	9.5%
Median	26.3%	4.3%	28.6%

FUTURE PROJECTS

NIS-IIS Sample Frame

□ 2008

■ Purpose

- Examine IIS potential to provide an adjunct sample frame to increase the efficiency of NIS.
- Examine sampling strategies to address potential representativeness of the sample and nonresponse bias concerns.

■ Samples

- 2008 NIS
 - NIS – 19-35 month old children
- IIS
 - n = 2 (Grantee A & B)

■ Analysis

- Representativeness of the sample
- Data reporting
- Nonresponse analysis

□ 2012

■ Notable changes in IIS maturity and completeness since 2008

- Investment (e.g., funds, technology, training)
- Lessons learned (e.g., updating contact information)

NIS-IIS Sample Frame

□ Purpose

- Determine the feasibility and impact of an IIS sample frame, without introducing unnecessary bias, if such an approach offers cost-savings to CDC.

□ Sample

- 5 IIS with a range of maturity and participation rates to determine factors that would guide use of an IIS as part of an NIS sample frame.

□ Analysis

- Assess potential biases in vaccination coverage estimates calculated using an IIS sample frame or a multi-sample frame.
- Determine measures of adequacy of IIS data that will guide decisions to incorporate an IIS into an NIS sample frame.
- Evaluate potential cost savings and effects on bias using an IIS sample frame or a multi-sample frame.

Incorporate IIS into NIS PRC

□ Purpose

- Supplementing NIS with IIS data to streamline the NIS PRC.
 - Some providers are already forwarding their data collection requests to their state IIS.

□ Benefits

- Streamline NIS data collection requests to one location
 - Reduce burden on IIS
 - Reduce burden on provider (possibly)
- Encourage participation by providers in and use of IIS
- More providers adopting HL7 messaging standards into workflow

□ Tradeoffs

- Non-comparability across states
- Increase PRC complexity, cost, and time

□ Methods

- To be determined

NIS-IIS Local Area Analysis

□ Purpose

- Improve strategies used by IIS to accurately conduct local area analysis of vaccination coverage.
 - Compare local area analysis results from IIS and NIS.

□ Sample

- 2 grantees with mature IIS and varied local vaccination coverage

□ Analysis

- Follow-up with state and local immunization programs to determine if low rates in an area reflect inadequacies of the IIS, actual lower vaccination rates, or some combination.
- Develop a “total error” simulation model for vaccination coverage estimates from an IIS.
- Assess potential biases in vaccination coverage estimates calculated using an IIS sample frame.

For more information please contact Centers for Disease Control and Prevention

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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.

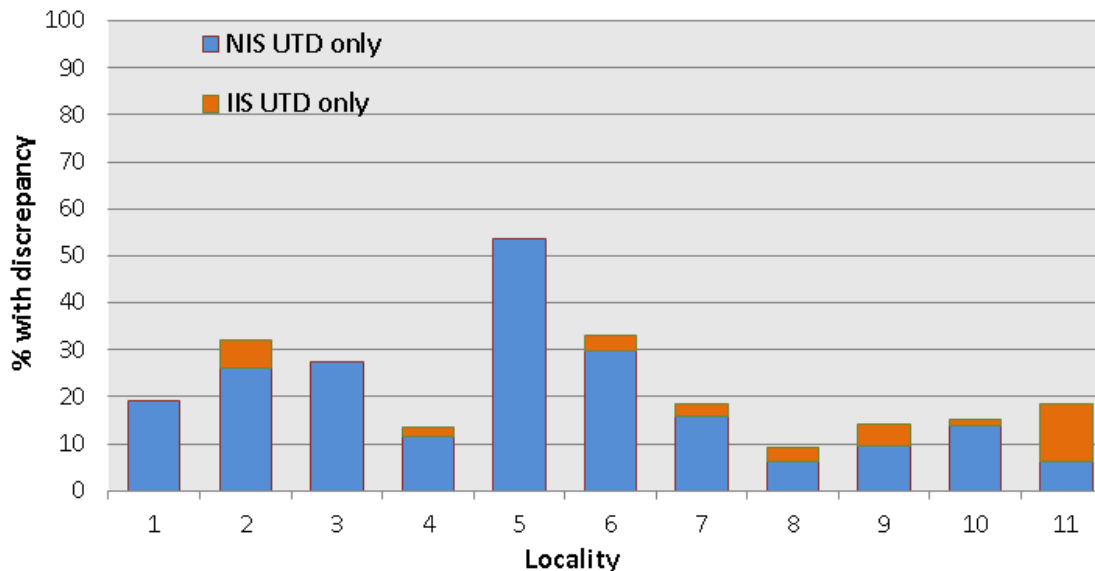




NIS/IIS UTD Status Discrepancies: # of Providers

- Discrepancy rate similar to overall for children with multiple providers
- Discrepancies due to only NIS showing UTD for approximately 1/4 of localities

Degree of Discrepancy between NIS, IIS UTD Status for 4:3:1:3:3:1 Children with multiple provider

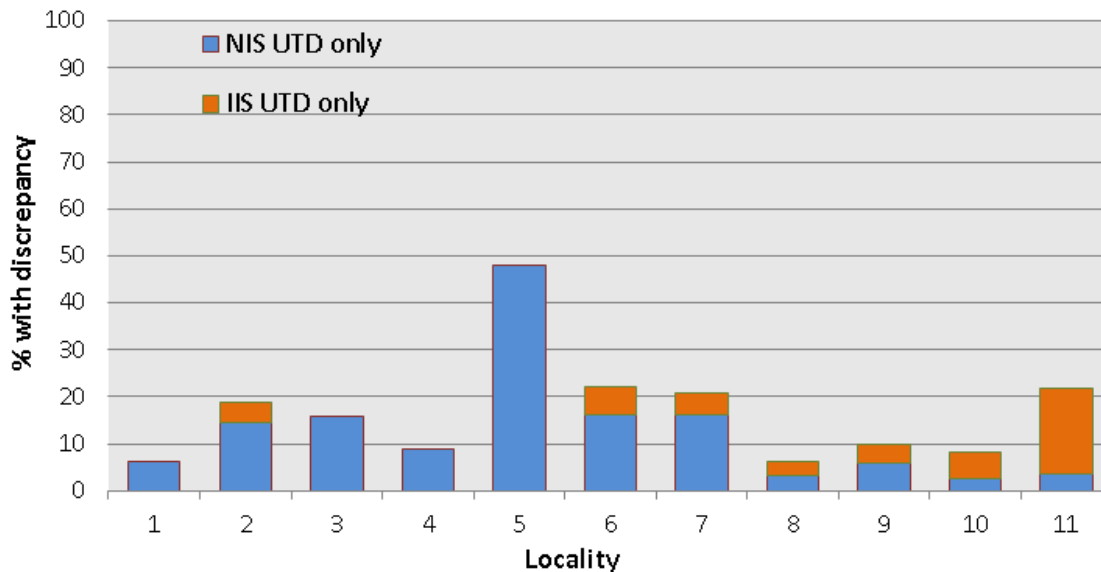


	NIS UTD only	IIS UTD only	Total Disagree
Max	53.5%	12.3%	53.5%
Min	6.2%	0.0%	9.3%
Median	15.8%	2.6%	18.5%

NIS/IIS UTD Status Discrepancies: HH Income

- Discrepancy rate lower for children in poverty
- Discrepancies due to only NIS showing UTD for approximately 1/2 of localities

Degree of Discrepancy between NIS, IIS UTD Status for 4:3:1:3:3:1 Children in household with income below poverty level

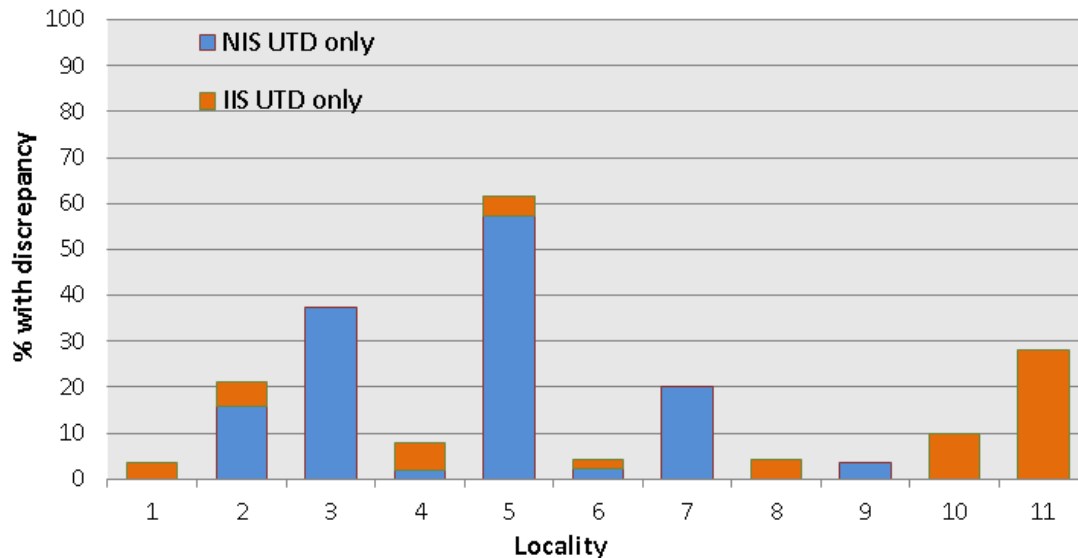


	NIS UTD only	IIS UTD only	Total Disagree
Max	47.9%	18.2%	47.9%
Min	2.7%	0.0%	6.1%
Median	8.9%	3.9%	15.8%

NIS/IIS UTD Status Discrepancies: Facility Type

- Discrepancy rate generally lower for children with public provider
- Discrepancies due to only NIS showing UTD for 3 of 9 localities in 2008; due to only IIS showing UTD for 2 of 9 localities in 2008 (and predominant in another 2 localities in 2009).

Degree of Discrepancy between NIS, IIS UTD Status for 4:3:1:3:3:1 Children with public provider



	NIS UTD only	IIS UTD only	Total Disagree
Max	57.4%	28.0%	61.7%
Min	0.0%	0.0%	3.4%
Median	2.1%	4.3%	10.0%