

Are We There Yet?

Assessing IIS Readiness for Research & Surveillance

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Immunization Surveillance- Background

Immunization questions traditionally were answered using:

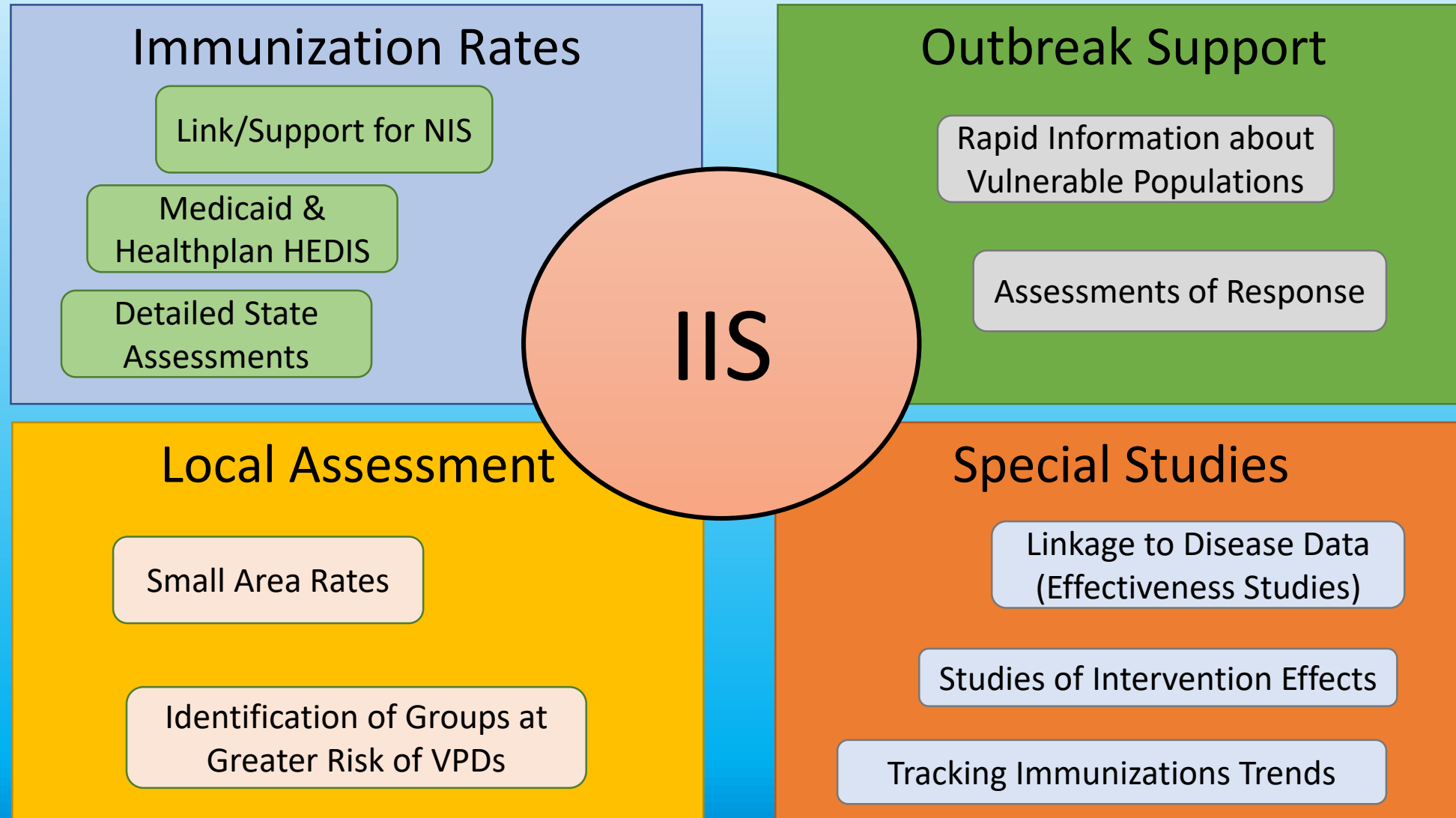
- 1) Surveys
- 2) Large clinic datasets

Immunization information systems are late-comers to the research game

IIS Research/Surveillance Background

- IIS originally started for clinic support (1960's-1970's)
- Dual use perspective was developed by the CDC in the late 1980's
 - IIS could also be used for rate surveillance and hunting for pockets of need.
 - 1990's- early registry validation studies
 - Late 1990's- recognized need for immunization measures that combine records across providers, rely on provider reports and not parent recall.
 - Early-Mid 2000's – IIS begin to develop rates & look for PONs.

IIS Research & Surveillance Usage



IIS Challenges

Many challenges to having perfect data:

- Unmerged records
- Mismatched records
- Unreported mobility
- Errors in reporting
- Duplicate reporting
- Errors in IIS processing
- Fragmentary reporting
- & etc.

The Road to IIS Data Completeness



The Myth of Data Completeness

A Perspective on IIS Research/Surveillance:

- “someday our data will be complete enough to do that”

Reality:

- ‘Completeness’ is an abstract term;
- Our data will never be truly perfect;
- What we have is typically good enough

Dimensions of Mature IIS Data

A small proposal- IIS completeness depends on at least three dimensions:

- Stability of reporting
- Accuracy of data
- Population representation

Of these three, stability is the key issue for surveillance.

Stability of Reporting

- This was covered in another AIRA talk.
- Partial population capture and lack of accuracy will lead to biases in rates (both numerator and denominator issues).
- However if data is stable, then use of ratios will cancel out most or all of these biases
- Reporting then is for the likelihood of one group being immunized compared to another.

Stability Example- Adult Influenza by Race

- Biased set of Oregon ALERT rates- (too high)

2017-18 Influenza Immunization Rates for Oregon Adults Age 19-64 with Any Immunizations Reported to ALERT in Last 5 Years	
categories	adult19-64
All	47%
White only, non-Latino	54%
White only, ethnicity unknown	37%
Latino, any race*	42%
AF-AM, any race*	42%
Asian, any race*	53%
NHPI, any race*	47%
AIAN, any race*	45%
Other only, non-Latino	53%
Unknown	37%

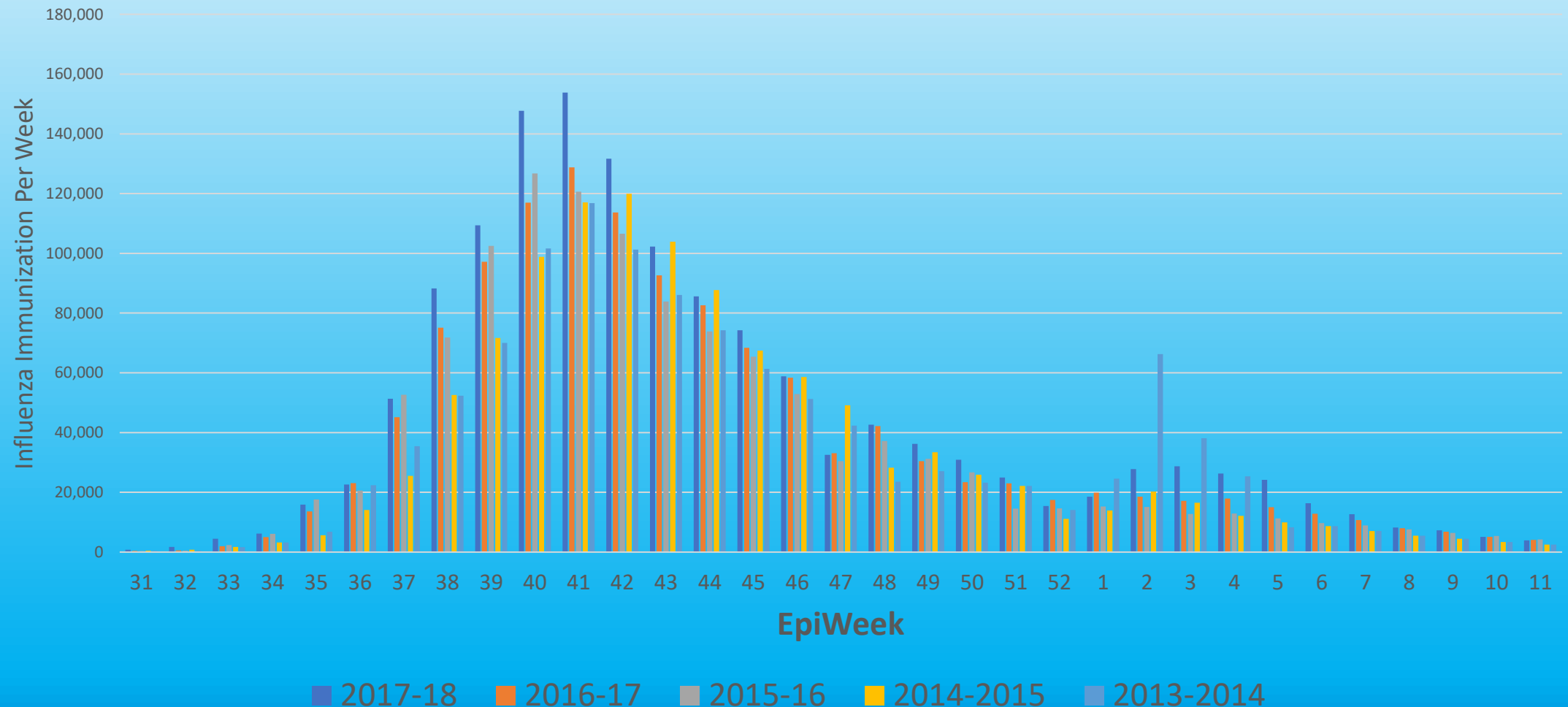
- Likelihood format- much lower bias

2017-18 Likelihood of Influenza Immunization for Oregon Adults Age 19-64 By Race Compared to White-Alone Population	
categories	adult19-64
All	0.88
White only, non-Latino	1.00
White only, ethnicity unknown	0.69
Latino, any race*	0.79
AF-AM, any race*	0.78
Asian, any race*	0.99
NHPI, any race*	0.87
AIAN, any race*	0.84
Other only, non-Latino	0.99
Unknown	0.70

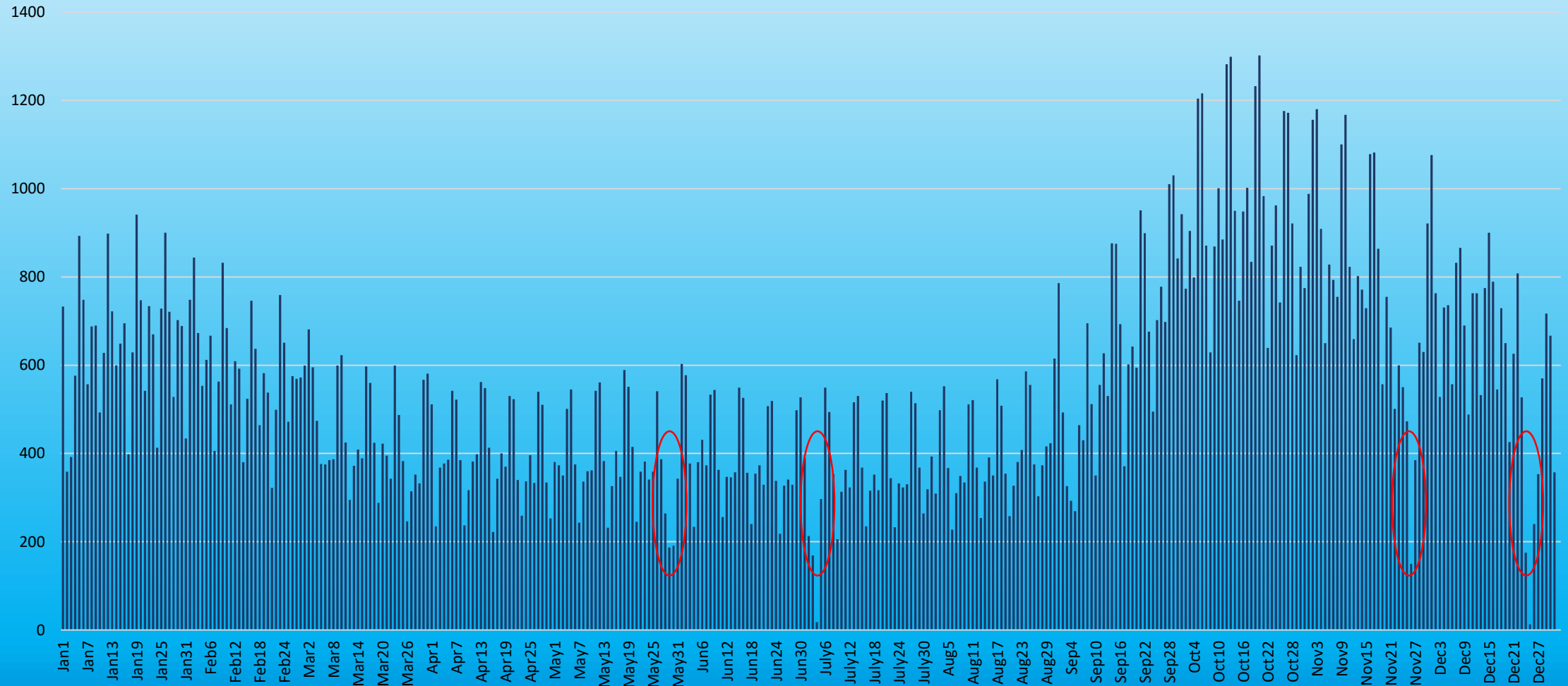
So How Stable is IIS Data?

- In a mature registry, day to day and season to season patterns of immunization are remarkably stable.
- External events, whether planned (as interventions) or unplanned (such as media reporting) can change this.
- Unstable data reporting is reflected in unexplainable changes in the pattern of immunizations.

Oregon ALERT Reported Influenza Immunizations by EpiWeek and Season



Pneumococcal Conjugate Vaccine (PCV) Receipt at Age 65, by Administration Date, (2013-2017)



Measuring Stability

Premise (a simple concept):

- the sum of unanticipated changes in immunization patterns is a measure of stability.

Implementation:

- The magnitude and frequency of perturbations in IIS data that are not related to real-world events are used here to illustrate data stability measurement

How to Implement Stability Measurement

Specific Details:

For any age group and vaccine:

- Compare week to week changes in immunizations, against the change for the same weeks in the prior year.
- For assumed stability, this is tested as an Odds Ratio (OR).
- There are 51 week to week comparisons possible in a year.
- A Mantel-Haenszel method will produce a pooled OR from the 51 tests.
- The pooled Odds Ratio is the proposed stability measure here.

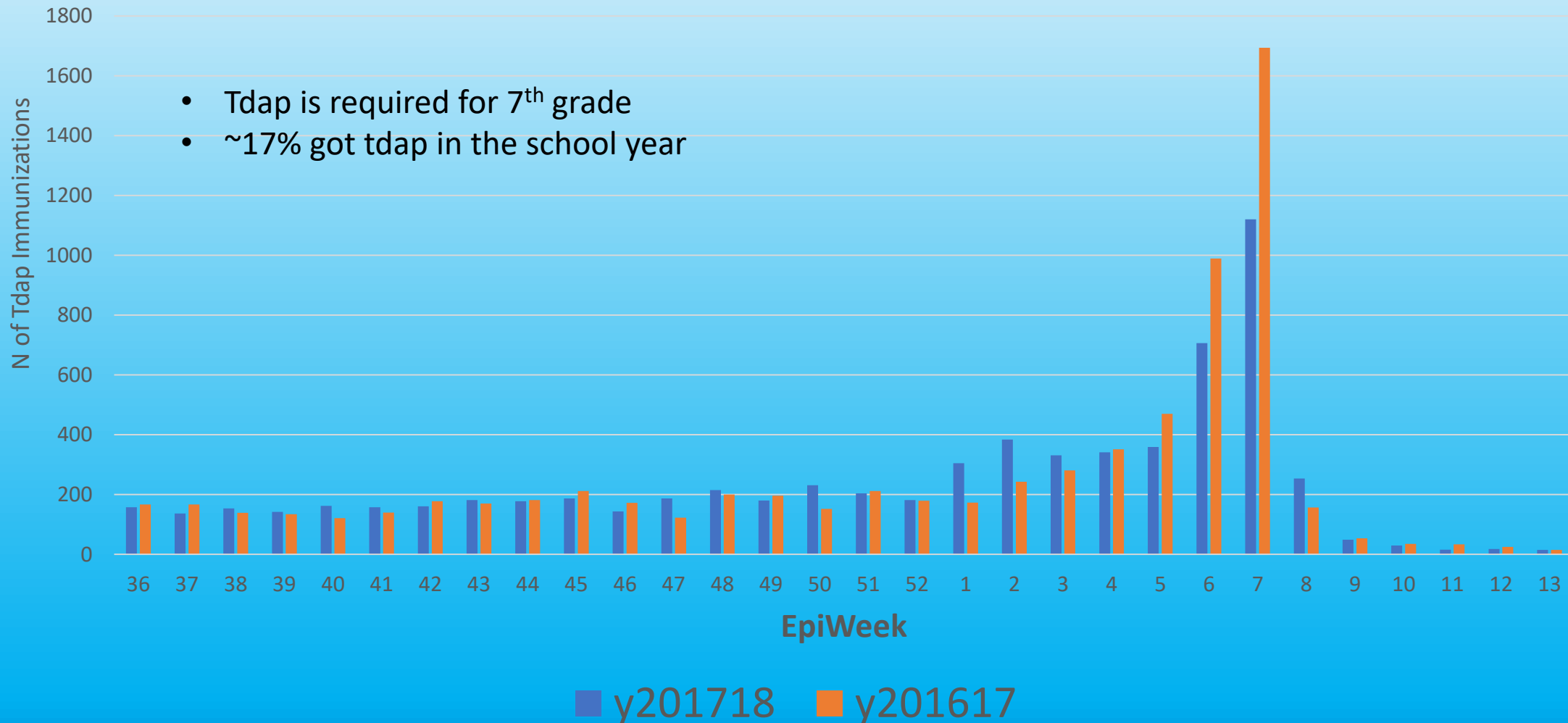
Math

- Assuming stability, then OR is based on the 2x2 table:

Immunization Totals per Week & Year			
		<u>Year</u>	
		One	Two
<u>Week</u>	One	a	b
	Two	c	d

- Where the OR is $(d/b) / (c/a) = (a*d) / (b*c)$
- If stability exists, the OR will be close to 1.
- A pooled OR can also be calculated across a series of weeks & tables

Oregon School Year Tdap Receipt Among 13 Year Olds, 2017-18 Compared to 2016-17, by EpiWeek



7th Grade Tdap Stability

- Test- if data is stable, then pooled OR ~ 1.0 .
- Process:
 - Calculate week to week vs year to year 2x2 tables
 - Exclude weeks with known external artifacts
 - Calculated pooled OR.
- Result- here the pooled OR was 1.01 (95%ci .97 to 1.09)
- Interpretation- the data is stable enough to analyze late-seeking of tdap in response to 7th grade school requirements

Next Steps

Note that this is a work in progress that needs broader community involvement:

Questions to answer:

- What immunizations and ages to assess?
- How does this stability measure look across different IIS?
- What is a reasonable threshold for saying an IIS is ready for research and surveillance?