

# Data Triangulation for Improved Decision-making in Immunization Programmes

**BID Learning Network Webinar Panel  
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Presented by:

Mrs. Angela Montesanti Porter, U.S. Centers for Disease Control & Prevention,  
Dr. Michelle Morales, U.S. Centers for Disease Control & Prevention, &  
Mr. Jan Grevendonk, World Health Organization

# Which of the following best matches your idea of data triangulation?



7

Validating data  
quality



4

Visualizing data on  
dashboards



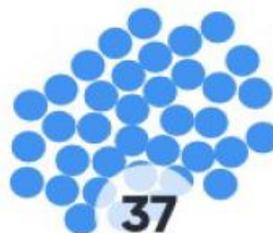
7

Harmonizing data



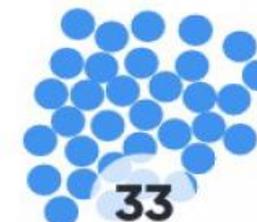
4

Predictive modeling  
of data



37

Comparing at least  
2 data sources



33

Comparing at least  
3 data sources

 92

Data from interactive survey responses (n=92) during first webinar of WHO Scholar Level 2 Certification Course on EPI Data Triangulation, March 2020.

# What is Data Triangulation?

***Definition:*** Synthesis of existing data from two or more sources to address relevant questions for program planning and decision-making

Identifies and aims to address limitations of any one data source and/or data collection methodology

Encourages deeper insight through making sense of complementary information and broader context



# Triangulation is like...

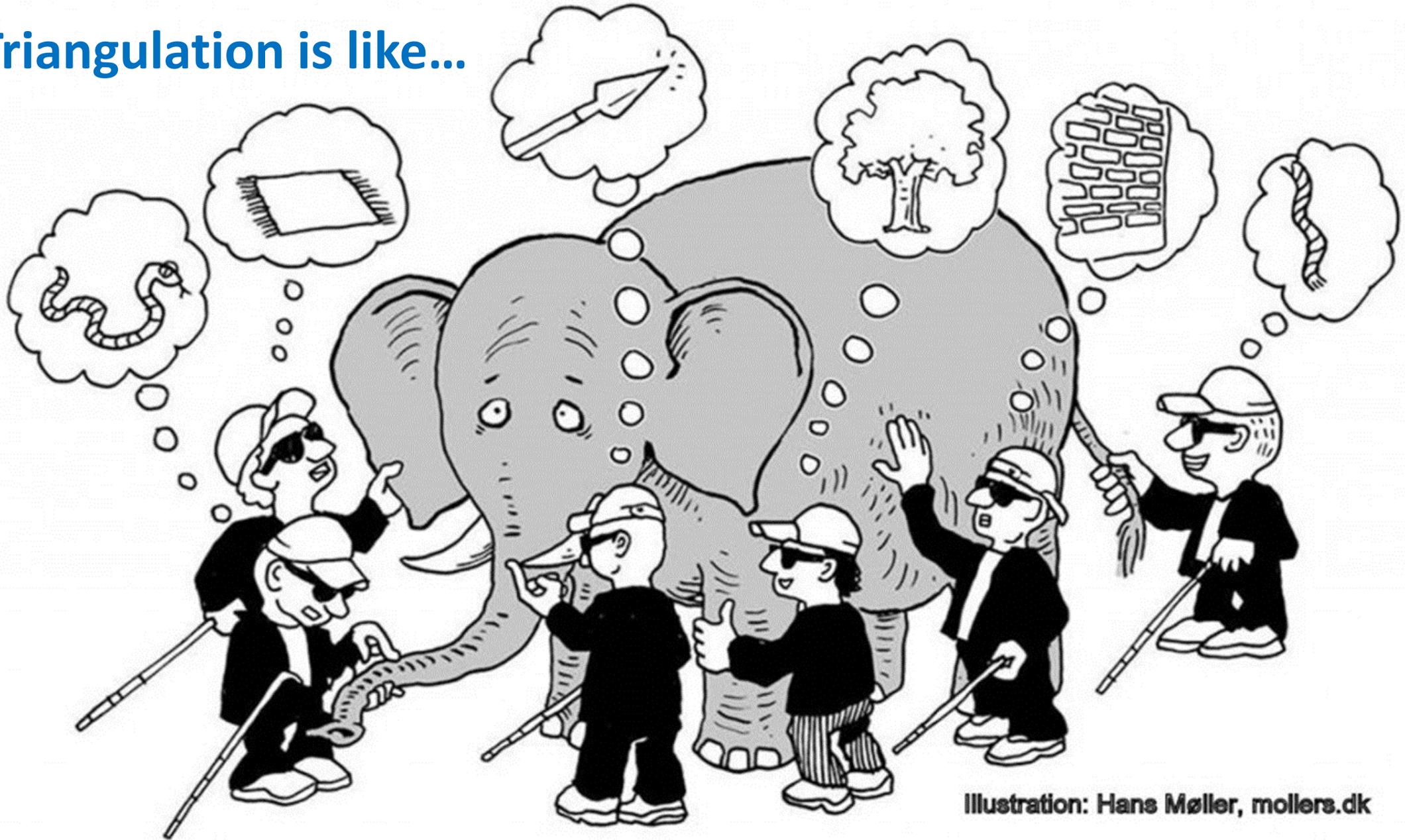
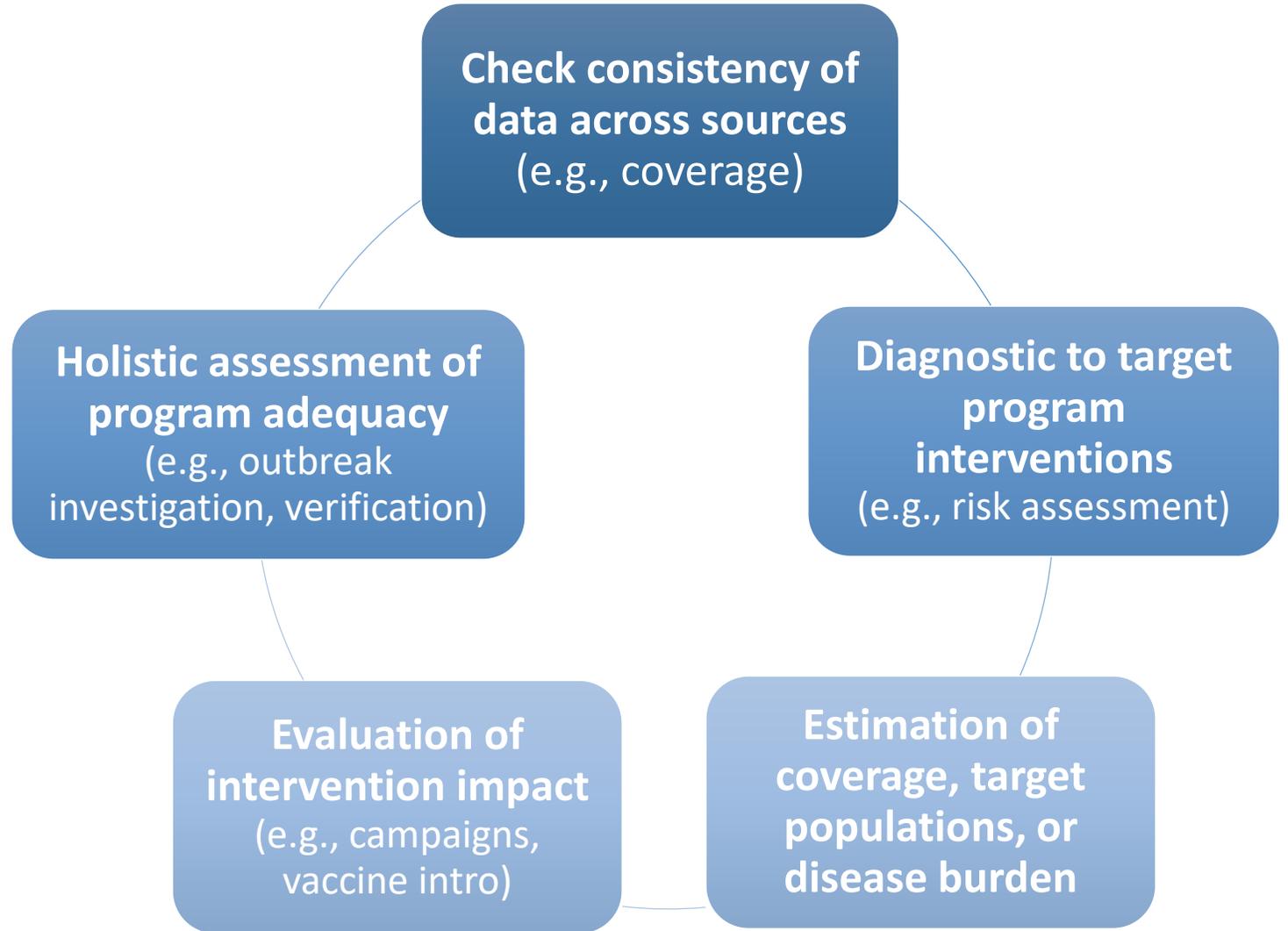


Illustration: Hans Møller, mollers.dk

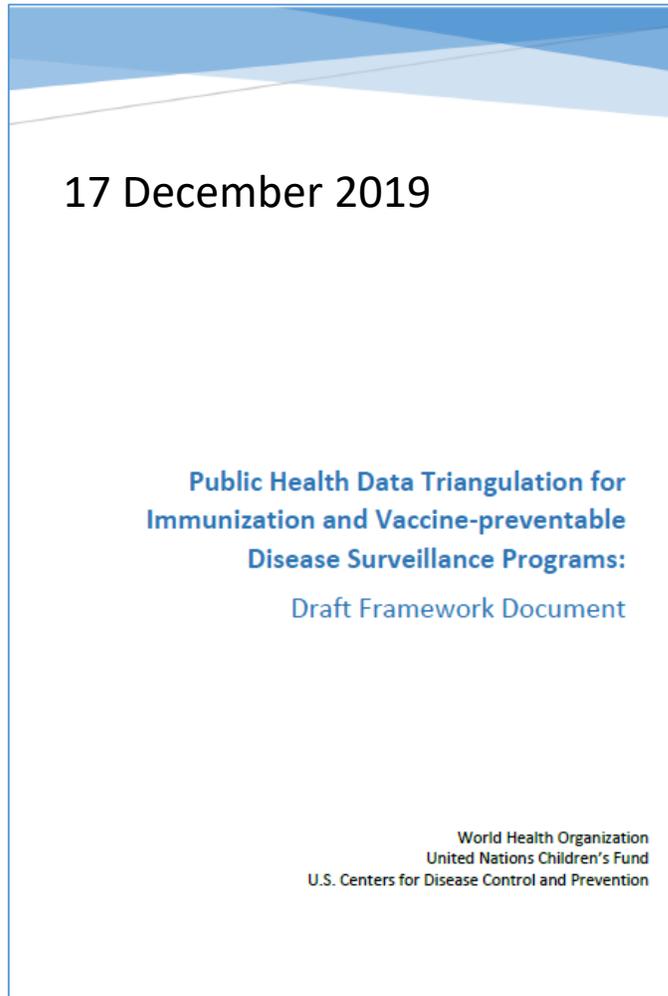
# Triangulation Use by EPI

Landscape analysis:  
**5 types of triangulation**  
used by EPI

Not just data validation!



# Public Health Data Triangulation for Immunization and VPD Surveillance Programs: Draft Framework



## Data Triangulation Framework

What it is & how to use

What the added value is

## Country triangulation exercises

Bangladesh

Cote d'Ivoire

## Global guidance draft, May 2020

Level 1 (Subnational level)

Level 2 (National level)

# Triangulation for Improved Decision-making in Immunization Programs: Draft Guidance (May 2020)

Available at:

<https://tinyurl.com/triangulation-May2020>

Audience	Document	
All	0.  Cover & Orientation to Guide	
National 	1.  General Triangulation Guidance	
	Topic Specific Annexes	
	2.  Immunity gaps	
	3.  Programme performance	
	4.  Programme targets (denominators)	
Sub-national 	5.  General Triangulation Guidance	
	Topic Specific Annexes	
	6.  Immunity gaps	
	7.  Programme performance	
	8.  Programme targets (denominators)	

# Benefits of data triangulation

- ✓ Encourages collaboration across programmes units and potential for greater data sharing and access
- ✓ Aids deeper understanding of data through synthesis with contextual information & consideration of data limitations
- ✓ Identifies areas for program improvement, including data quality, that might not be apparent from use of individual data sources
- ✓ Improves confidence in conclusions & quality of recommendations for planning & policy/strategy decision-making
- ✓ Strengthens health system by building capacity for critical thinking, data analysis & use within an increasingly data-rich environment

# Minimal Criteria for Triangulation

- 1) Access to two or more data sources, and
- 2) Data management/analysis capacity, and
- 3) Willingness to take action on results

Format will vary based on

- level (national vs. subnational)
- frequency (routine vs. ad-hoc)



# Triangulation Principles



Driven by important program objectives



Use existing data, no new data are collected



Include diverse data sets (e.g. coverage, stock, surveillance)



Engage a multidisciplinary team, if possible



Basic analysis that includes local knowledge in interpretation

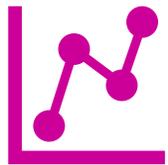


Results communicated for use in improved decision-making

# Two Ways to Triangulation Data



1) Combine data in one analysis (e.g., graph) from start



+



+



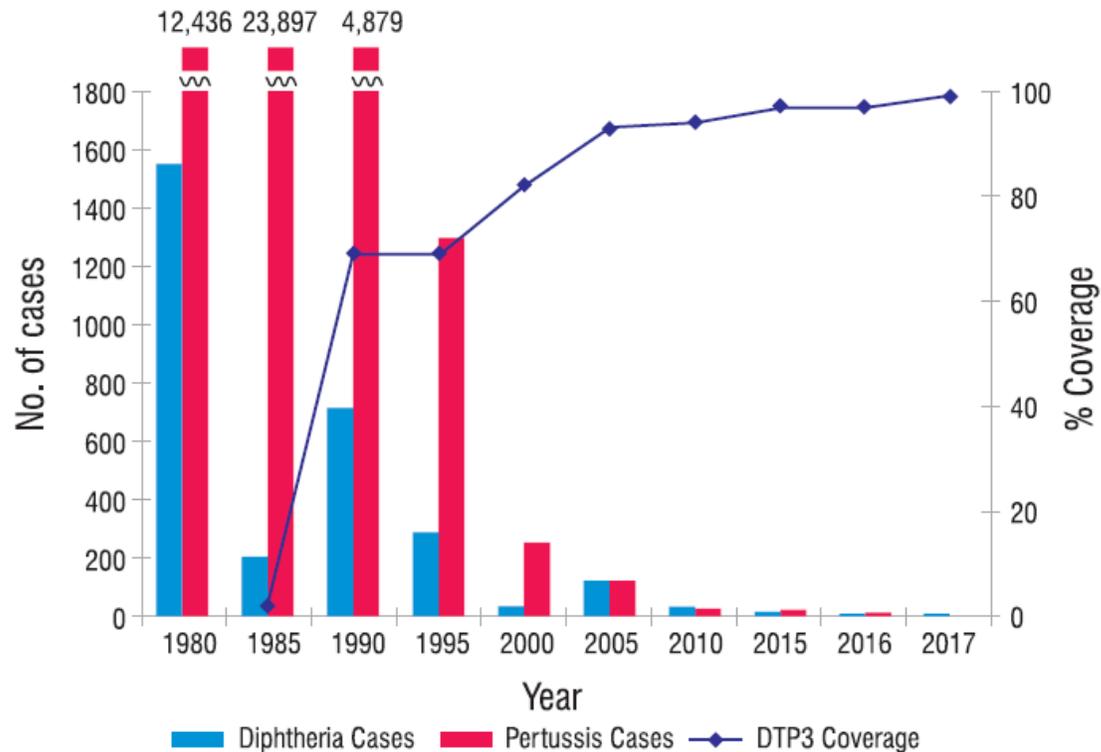
2) Separate analyses & combine through interpretation at end



**Either way:** Critical thinking required to turn data into information for action

# Example 1: Immunization program impact on diphtheria & pertussis burden

Figure 2: DTP3 coverage<sup>1</sup>, diphtheria and pertussis cases<sup>2</sup>, 1980-2017



## Subnational level

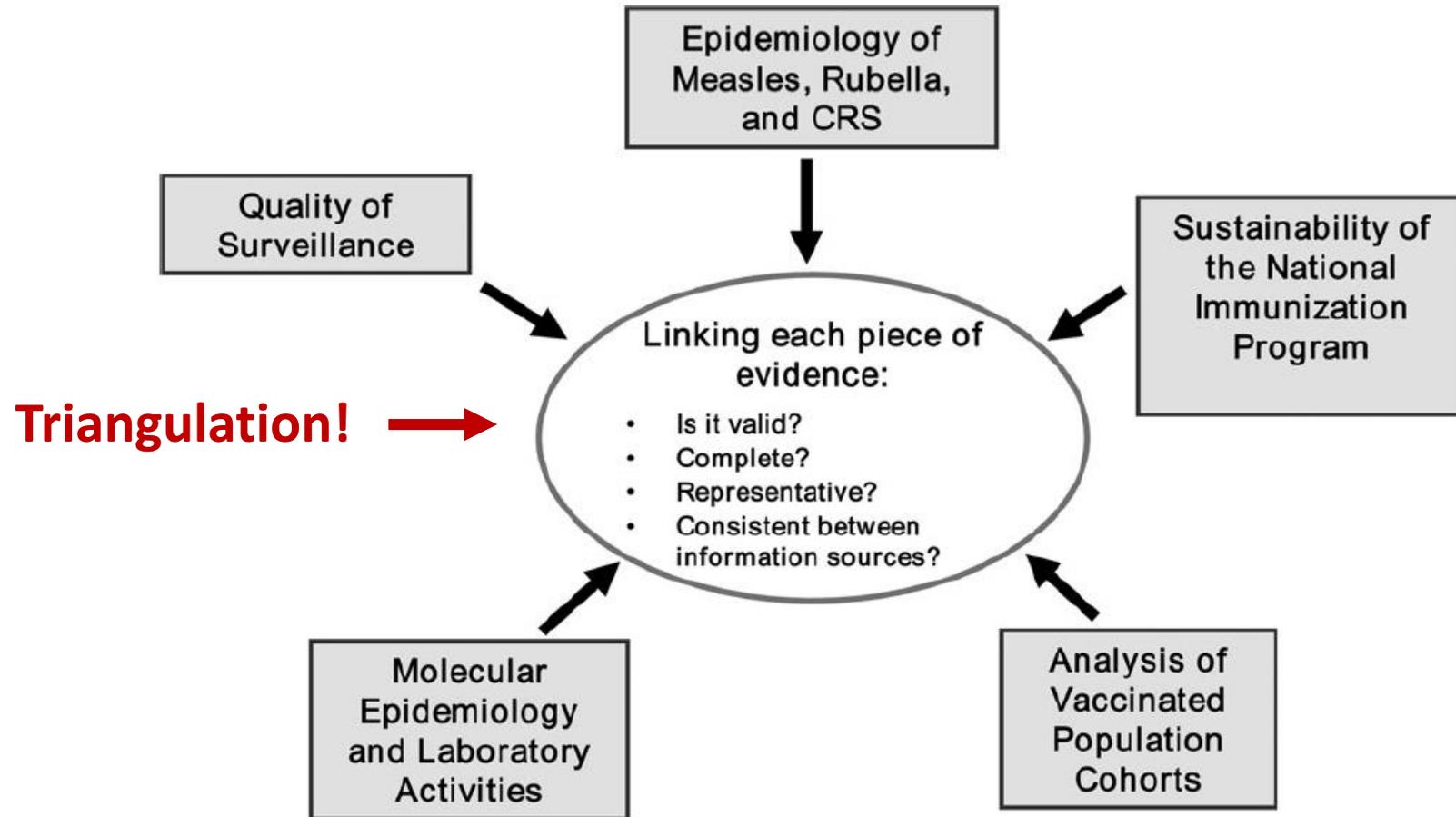
Repeated outbreaks in same area with high administrative coverage

- Vaccine quality issue?
- Data quality issue?
- Other factors?

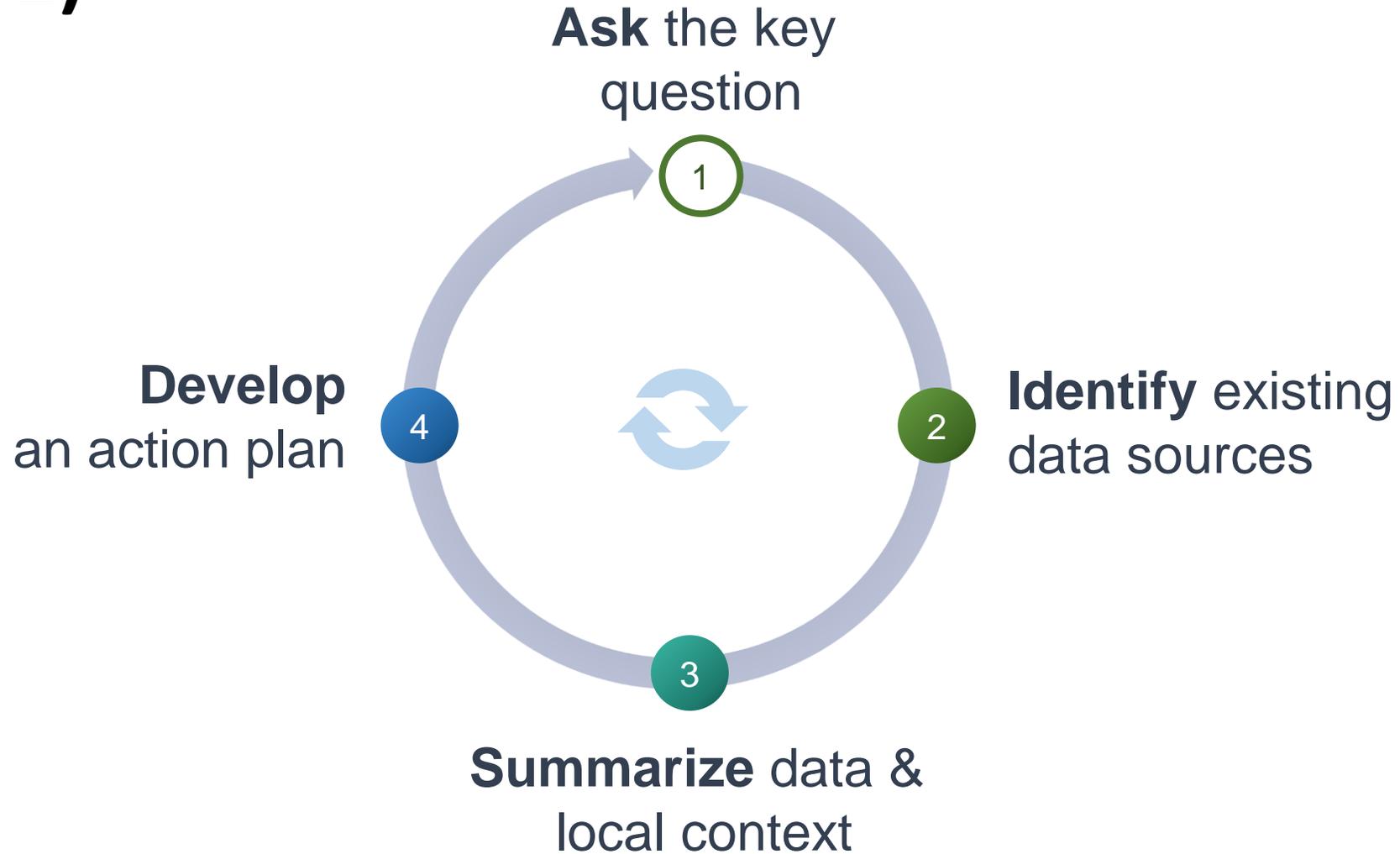
<sup>1</sup> WHO and UNICEF estimates of national immunization coverage, July 2018

<sup>2</sup> WHO vaccine-preventable diseases: monitoring system 2018

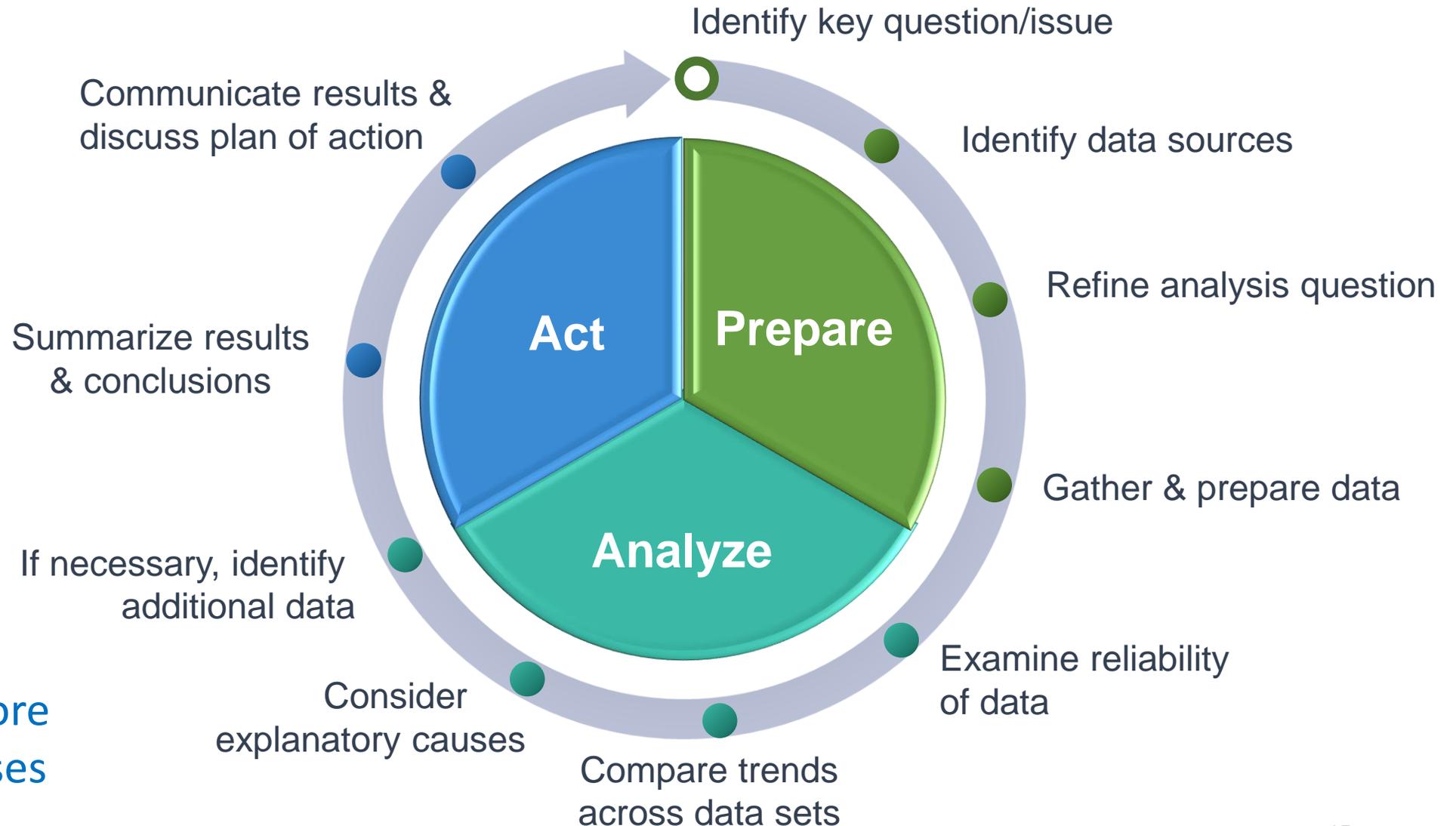
# Example 2: Verification of Measles, Rubella, & Congenital Rubella Syndrome Elimination in the Americas



# Triangulation Process (Level 1)



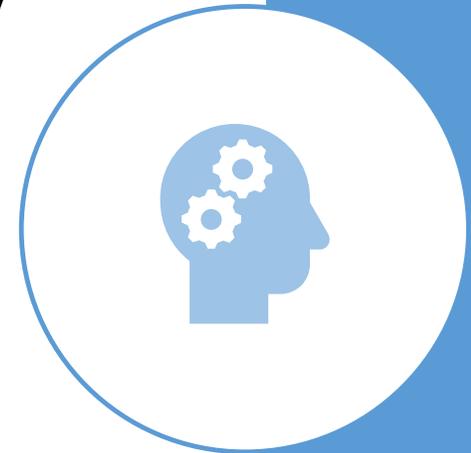
# Triangulation Process & Phases (Level 2)



10-steps for more  
in-depth analyses

# Triangulation Use for Monitoring & Evaluation

- Can use to answer a program question taking many months to investigate, or
- Principles can be used in day-to-day monitoring & decision-making, e.g.,
  - Same questions each month
  - Data sources pre-determined
  - Analysis automated (e.g., dashboard)
- Both cases – analysis has purpose & **critical thinking** required to process data into usable information



# 1. ASK the key question



Start by identifying key program problem & related questions

- How do hope to use data for action at end?



Question must be answerable & actionable



Action may inform local program planning, or where an policy change from higher level needed



Engage variety of relevant staff from beginning

- Review examples, brainstorm, facilitate group discussion

# Criteria for Identifying a Data Triangulation Question

Criteria	Description
<b>Important</b>	<ul style="list-style-type: none"><li>• Important and timely based on country priorities?</li></ul>
<b>Answerable</b>	<ul style="list-style-type: none"><li>• Data available to address question?</li><li>• Adequate time elapsed for process to lead to measurable outcome?</li></ul>
<b>Actionable</b>	<ul style="list-style-type: none"><li>• Answer leads to initiation of public health action?</li><li>• Issues identified able to be changed through interventions?</li></ul>
<b>Appropriate</b>	<ul style="list-style-type: none"><li>• Best addressed by triangulation vs. research, or single data set?</li></ul>
<b>Feasible</b>	<ul style="list-style-type: none"><li>• Sufficient time and resources to finish task?</li></ul>

Specify/limit scope based on what can be answered and acted upon

(Adapted from Rutherford et al. 2010)

# Why questions are important

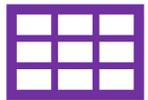
- Making a question is a critical-thinking activity — practice 😊
- Question helps direct & limit scope of analysis
- Asking important questions engages audience (decision-makers) when telling your triangulation story at end

What's your initial theory of **why** the problem exists?

**Hypothesis** — explanation made based on limited evidence as a starting point for investigation



## 2. IDENTIFY existing data sources



Identify all relevant data sources, including those not in routine use

- Talk with staff /partners within & outside program



Access & effort required to compile data in usable format



Invaluable – creating list of all data sources & well organized archive

- Aid more regular use in the future



Consider strengths & limitations of each source

# What data sources to include in triangulation

- **Diverse** — gain more complete understanding of programme issue
- ***Independent*** in terms of collection method — more helpful for assessing & addressing limitations of individual data sources
  - e.g., poor data entry exists in both coverage & vaccine stock reports?
- **Describing trends in process & outcome indicators** — useful
  - Coverage & VPD incidence
  - Program data (e.g., stock-outs, vaccine sessions) & coverage
- **Match in terms of geography and/or time period**

## Example data sources include:

- Administrative coverage
- Vaccine supply and use
- Service delivery
- Adverse Event Following Immunization (AEF) surveillance
- Vaccine Preventable Disease (VPD) surveillance
- Coverage surveys
- Population estimates

## 3. SUMMARIZE data & local context



Assess data quality: completeness, internal consistency\*



Evaluate trends across data sources (place/time)



Incorporate contextual information & local knowledge



Brainstorm multiple hypotheses to explain findings



Be honest about data limitations, e.g., missing data, errors

\*Handbook on Use, Collection and Improvement of Immunization Data

<https://www.dropbox.com/s/8ivdiu0g5xvnlbc/handbook.pdf?dl=1>

# Analysis Guidance

- Best graph & disaggregation to see patterns related to question
  - Try several options & compare
- Annotate with important context to aid interpretation
  - Circles, arrows, text, benchmark lines
- Do trends across data sets match expectation?
  - Areas of agreement & disagreement
  - Critical view of silence (zero or missing)
  - Requires knowledge of how data fit together & data limitations



# Examples: Interpreting comparisons of different data

Comparison	Expected	Considerations
<b>Administrative coverage &amp; survey coverage</b>		<ul style="list-style-type: none"><li>• Quality of reported data</li><li>• Population movement</li><li>• Role of private sector</li><li>• Robustness of survey methods</li></ul>
<b>Doses administered &amp; vials used/shipped</b>		<ul style="list-style-type: none"><li>• Vaccine presentation</li><li>• Wasted/sacrificed doses</li><li>• Buffer stock practices</li><li>• Informal exchange networks</li></ul>
<b>Vaccination coverage &amp; cases of disease</b>		<ul style="list-style-type: none"><li>• Program history (vaccine intro., supplementary immunization)</li><li>• Disease epidemiology (age of cases, herd immunity threshold)</li><li>• Surveillance performance</li></ul>

## 4. DEVELOP an action plan



Simple key messages tailored to your target audience



Tell a story with your data!

- Visual information processed faster than words
- Logical flow, supported with explanatory details
- Case studies, if relevant



Recommend actions based on triangulation results

# Making an action plan



Action may be at your administrative level, or other levels



Obtain input from people tasked with implementing plan



Think creatively about solutions if resources are limited



Prioritize based on what's feasible for short & long-term

## Examples of recommended actions

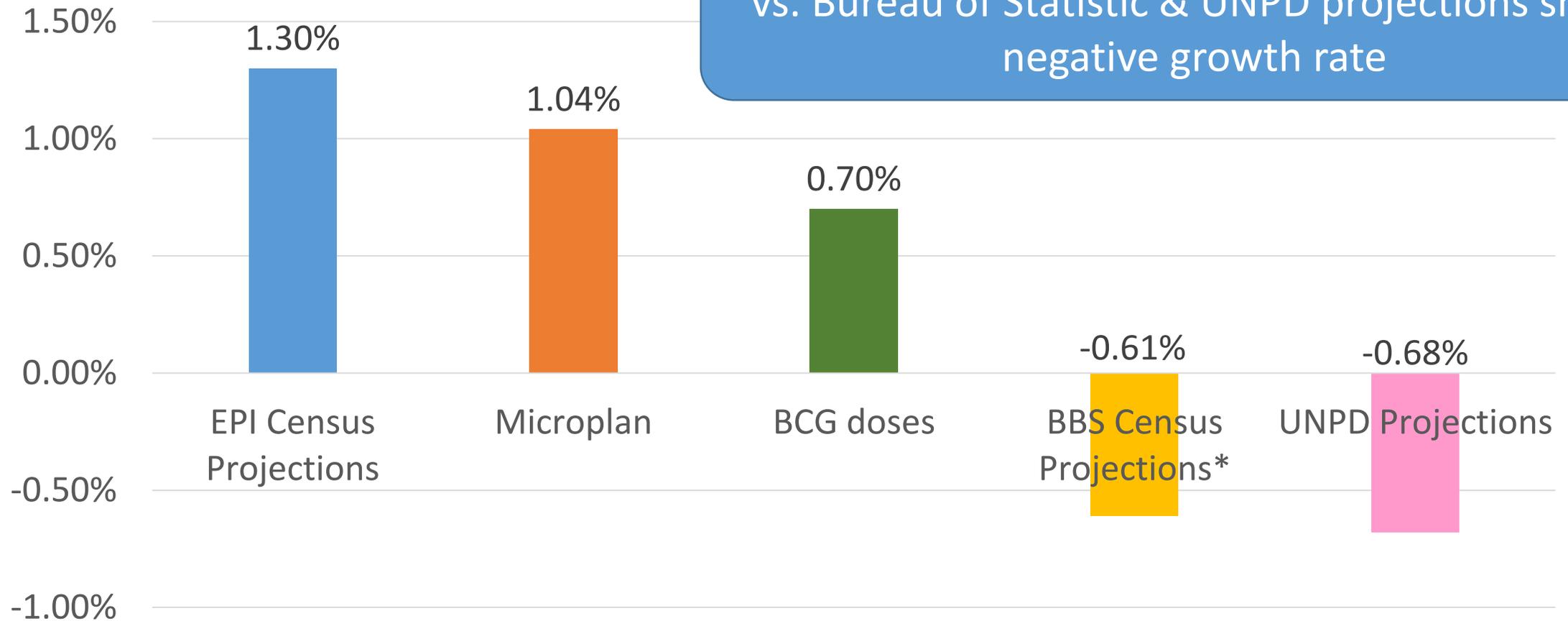
- Supportive supervision on improving data quality
- Revise microplan guidance to use local growth rates
- Catch-up vaccination in areas with coverage gaps

# Example Key Questions, National-level

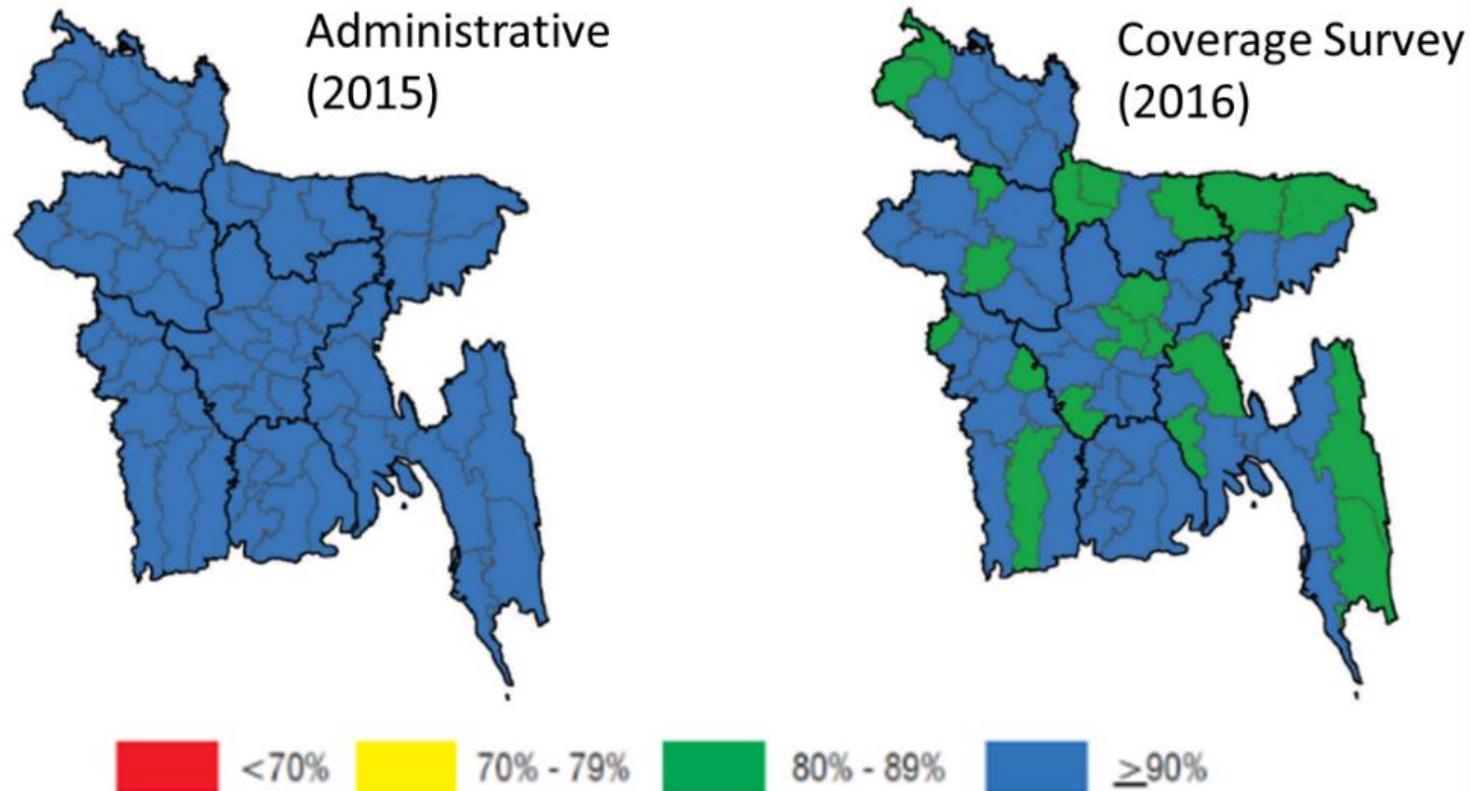
Identified Program Issue	Key Question for Data Triangulation Analysis
Inaccurate target population estimates	Does the target population estimate for national immunization program align with known demographic trends?
Assess program performance/data quality	Which districts with low performance and/or inconsistencies in data quality requiring follow-up?
Unidentified immunity gaps	Does surveillance data suggest there are immunization coverage gaps?

# Target Estimates: Growth rates for 2017-2018 across data sources, Country X

EPI data sources show positive growth rate vs. Bureau of Statistic & UNPD projections show negative growth rate

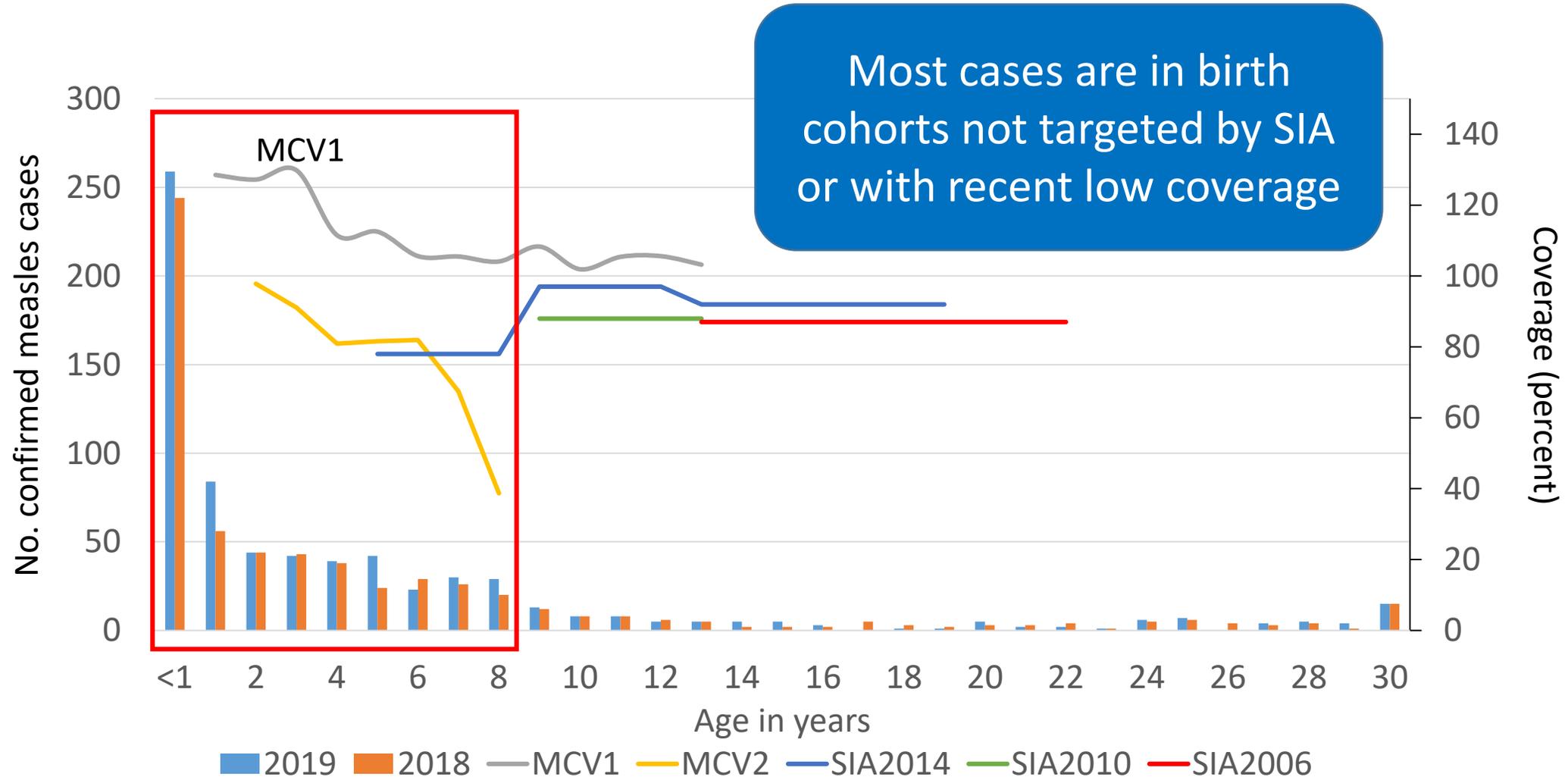


# Program Performance: Map of district Penta3 administrative coverage vs coverage survey, 2016



Administrative coverage data is overestimated — hides subnational coverage gaps

# Immunity Gaps: Confirmed measles cases by age vs. vaccination coverage, sect district, 2018-2019



# Example Key Questions, Sub-National Level

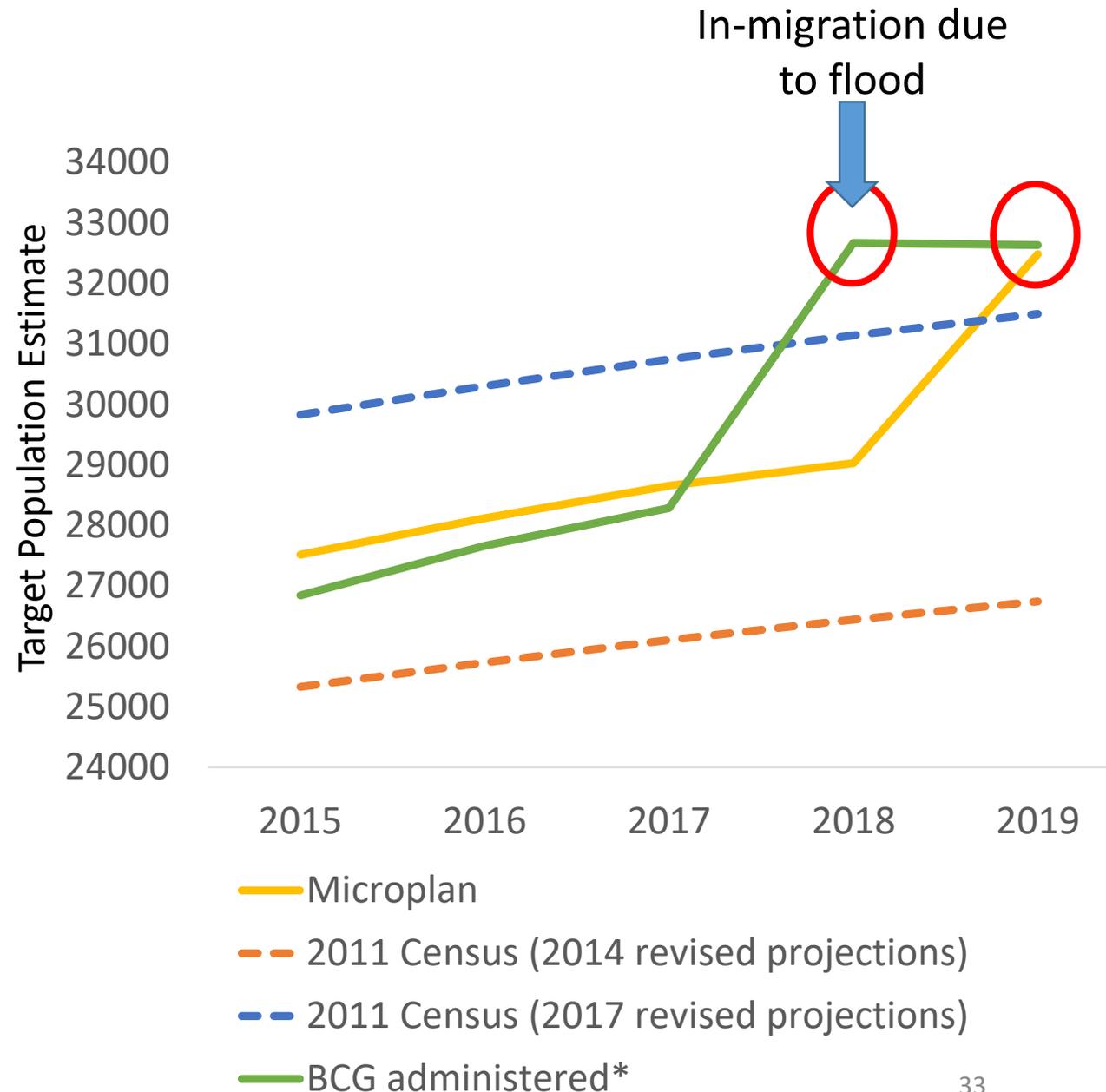
Identified Program Issue	Key Question for Data Triangulation Analysis
Inaccurate target population estimates	Do the current target population values capture everyone in a catchment area?
Assess program performance/data quality	Which health units under my supervision should be prioritized for visits or follow-up?
Unidentified immunity gaps	Does administrative coverage in my district/health facility appear to be accurate?

# Compare Target Estimates Across Data Sources

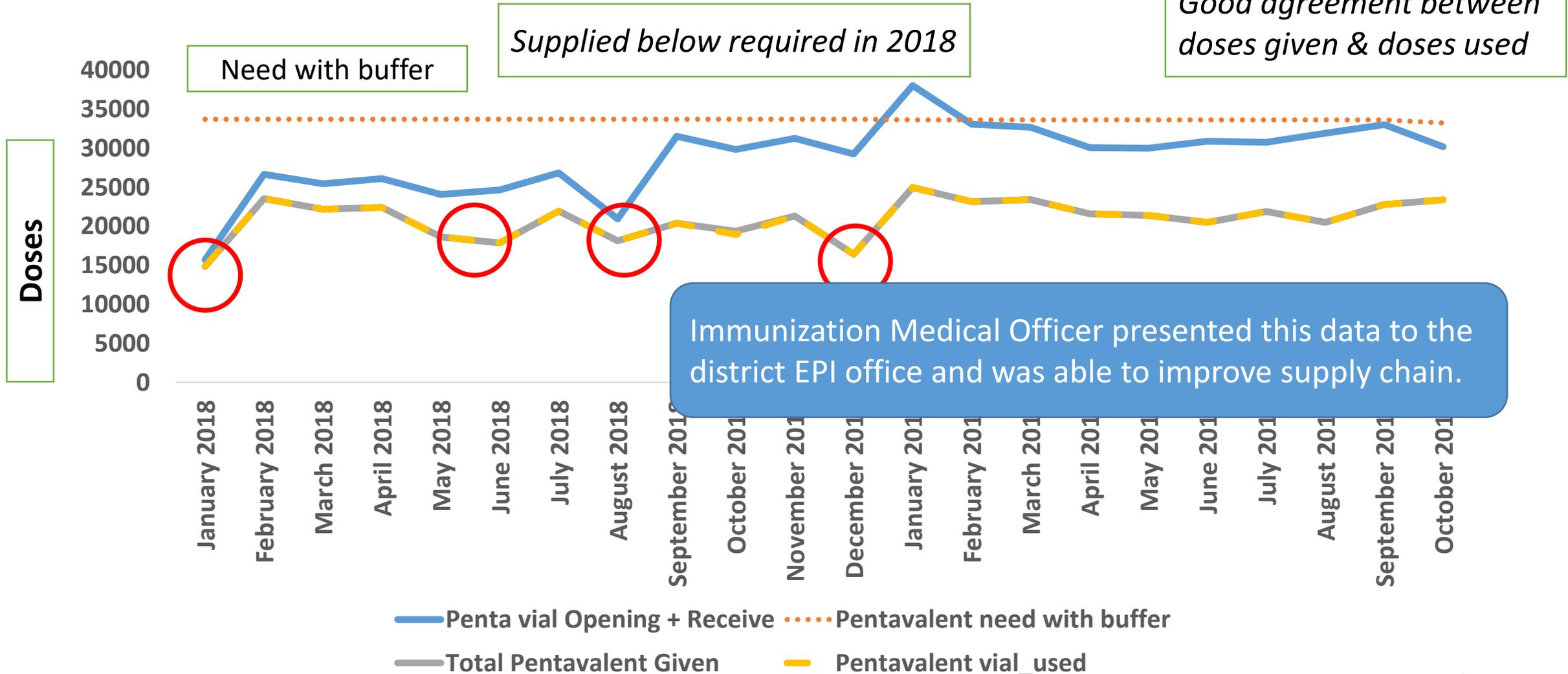
## Example 1: Health Facility X

- 2019 microplan target: 32,484
- Large ↑ BCG in doses given Sep 2018- July 2019 (DHIS2)

Calculated own growth rate & made change in microplan

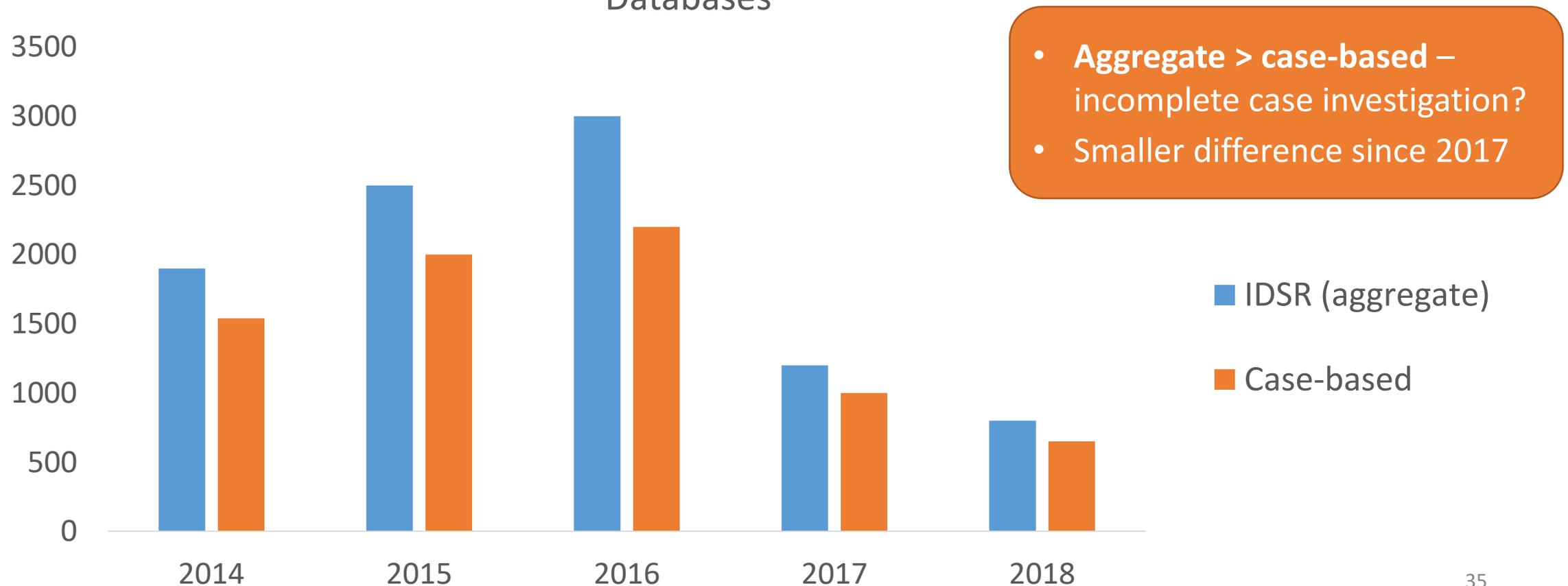


# Program Performance (1): Penta doses available & used vs. doses administered, City Corporation X, 2018- 2019 (Oct)



# Program Performance (2): Comparison of different sources of surveillance data

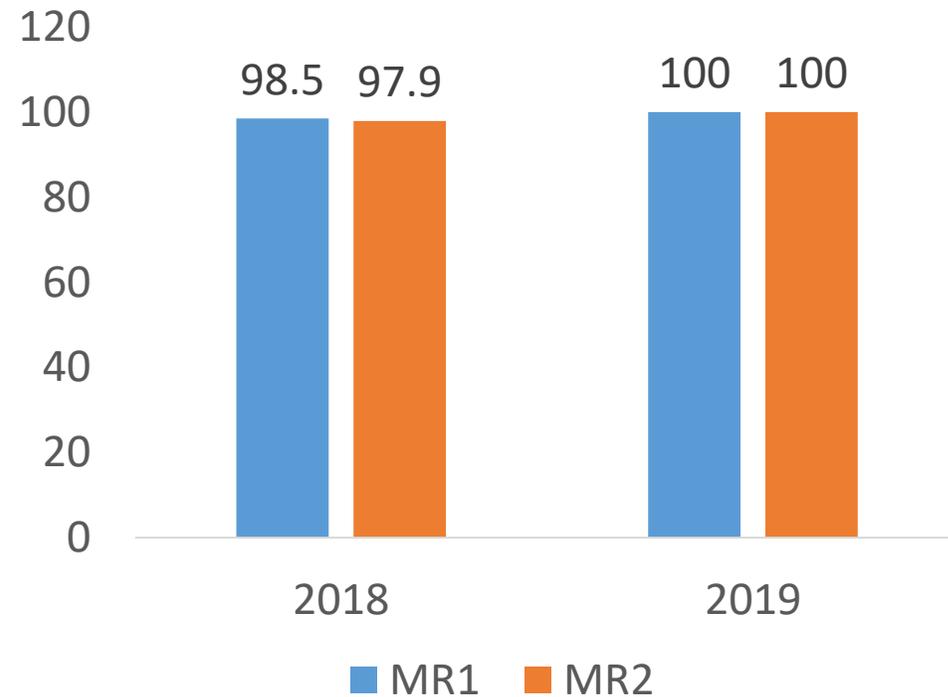
Reporting of Suspected Measles Cases: Aggregate and Case-Based Databases



# Immunity Gaps Health Facility Example (1): Measles Administrative Coverage

Coverage is now 100% for  
both MR1 & MR2

Could this be data error?  
Fabrication?



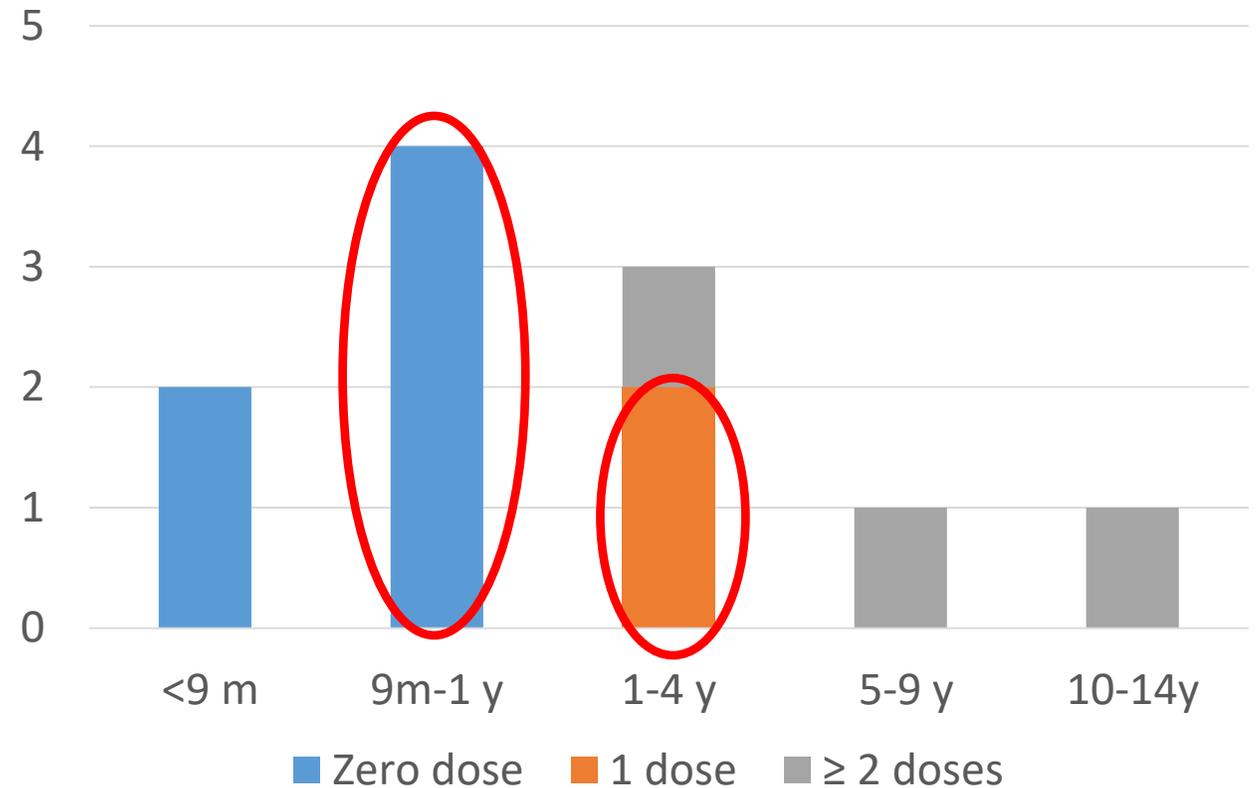
# Immunity Gaps Health Facility Example (2): Age and Vaccination Status

Generally doing well  
with few cases

Evidence of delayed  
vaccination

Field investigation  
found not vaccinating  
sick children

Confirmed Measles Cases



# Immunity Gaps Health Facility Example (3): Measles line-list

Village	Sub-district	Date of Onset
Yellow town	Sub-district-B	1-Dec-19
Yalluw town	Sub-B	28-Nov-19
Green town	River Union	20-Aug-19
Blue town	Lake	17-Sep-19
Yellow town	Yellow town	3-Dec-19
Red town	Mountain	1-Jan-19
Yellow	B	1-Dec-19
Purple town	Ocean WARD-2	15-Mar-19
Orange	WARD-3	8-Jul-19
Brown town	WARD-1	7-Nov-19
Yellow	B	4-Dec-19
Yellow town	Yellow	11-Dec-19
Pink town	Delta	23-Jan-19

Focus on time & space. Are we missing outbreaks?

# Opportunities for integrating triangulation with existing activities

- Routine analysis
  - Feedback on reported data
  - EPI data review meetings (monthly, quarterly)
  - Annual desk reviews
  - Periodic in-depth assessments
- Ad-hoc evaluations of intervention impact or program implementation
- Outbreak investigations
- Part of Data Quality Reviews, EPI/VPD Surveillance Reviews
- Trainings of Mid-level managers & supportive supervision
- Dashboard design

# Scholar course DIP Level 2

Using Data Triangulation to improve immunization programmes

# What are Scholar courses?

- Remote learning
  - Immunization strategies (GRISP)
  - Coverage Surveys
  - Equity
  - Data Quality and Use
- 6/8 week “sprints”, with up to 200-400 learners per cohort
- Massive interest and energy for data:
  - 4000+ applications
  - 1800 onboarded
  - 1000 finishers Level 1

*Collaboration between WHO and the Geneva Learning Foundation*



<https://learning.foundation/who-scholar-en/>



# Scholar course format

- Weekly discussion groups
- Weekly webinars (so far 17 x 2)
- 3 community assignments
- 1 creator project per learner
  
- 3 “secret ingredients”
  - Learning by doing
  - Peer review and learning
  - Community

## Some questions for next steps

- Balance between repeats and new topics?
- One size fits all or specific courses targeting different groups?
- Regional and/or country level scholars?

# Resources

**Triangulation for Improved Decision-making in Immunization Programs: Draft Guidance (March 2020)**

<https://tinyurl.com/triangulation-May2020>

**Public Health Data Triangulation for Immunization & VPD Surveillance Programs: Draft Framework (Dec 2019)**

<https://www.learning.foundation/vpd-triangulation-draft>

**WHO Effective Communication of Immunization Data (2019)**

<http://www.euro.who.int/en/health-topics/disease-prevention/vaccines-and-immunization/publications/2019/effective-communication-of-immunization-data-2019>

**Gavi Analysis Guide:**

<https://www.gavi.org/sites/default/files/document/guidelines/Analysis-Guidance-2020.pdf>

**WHO Handbook on the use, collection, and improvement of immunization data (2020 draft):**

<https://www.dropbox.com/s/vtkm2m1utl3p9e5/Immunization%20Data%2005march2020.docx?dl=0>

**Webinar resources Scholar course (slides, recordings, background)**

[www.tinyurl.com/2020-triangulation](http://www.tinyurl.com/2020-triangulation) (English)

[www.tinyurl.com/triangulation-2020](http://www.tinyurl.com/triangulation-2020) (Français)

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- Many colleagues who provided feedback through SurveyMonkey®, EPI Partners' Meeting (2018), WHO-EMRO Monitoring Workshop, WHO Scholar course on Triangulation for Immunization Programme Improvement, and country workshops

**THANK YOU**