Data Triangulation for Improved Decision-making in Immunization Programmes

BID Learning Network Webinar Panel
May 28, 2020

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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

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...
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)

WHO, UNICEF, CDC collaboration (Gavi support)
**Triangulation for Improved Decision-making in Immunization Programs: Draft Guidance (May 2020)**

Available at: [https://tinyurl.com/triangulation-May2020](https://tinyurl.com/triangulation-May2020)

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<td><strong>All</strong></td>
<td><a href="#">Cover &amp; Orientation to Guide</a></td>
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<td><strong>National</strong></td>
<td><strong>1. General Triangulation Guidance</strong></td>
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<td><strong>2. Immunity gaps</strong></td>
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<td><strong>3. Programme performance</strong></td>
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<td><strong>4. Programme targets (denominators)</strong></td>
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<td><strong>8. Programme targets (denominators)</strong></td>
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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

Subnational level
Repeated outbreaks in same area with high administrative coverage
• Vaccine quality issue?
• Data quality issue?
• Other factors?

Figure 2: DTP3 coverage¹, diphtheria and pertussis cases², 1980-2017

http://www.searo.who.int/immunization/data/fact_sheets/en/
Example 2: Verification of Measles, Rubella, & Congenital Rubella Syndrome Elimination in the Americas

Triangulation!

Triangulation Process (Level 1)

1. Ask the key question
2. Identify existing data sources
3. Summarize data & local context
4. Develop an action plan

Triangulation Process
(Level 1)
Triangulation Process & Phases (Level 2)

1. Identify key question/issue
2. Identify data sources
3. Refine analysis question
4. Gather & prepare data
5. Examine reliability of data
6. Compare trends across data sets
7. Consider explanatory causes
8. If necessary, identify additional data
9. Summarize results & conclusions
10. Communicate results & discuss plan of action

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

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Important</td>
<td>• Important and timely based on country priorities?</td>
</tr>
<tr>
<td>Answerable</td>
<td>• Data available to address question?</td>
</tr>
<tr>
<td></td>
<td>• Adequate time elapsed for process to lead to measurable outcome?</td>
</tr>
<tr>
<td>Actionable</td>
<td>• Answer leads to initiation of public health action?</td>
</tr>
<tr>
<td></td>
<td>• Issues identified able to be changed through interventions?</td>
</tr>
<tr>
<td>Appropriate</td>
<td>• Best addressed by triangulation vs. research, or single data set?</td>
</tr>
<tr>
<td>Feasible</td>
<td>• Sufficient time and resources to finish task?</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Expected</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative coverage &amp; survey coverage</td>
<td></td>
<td>• Quality of reported data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Population movement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Role of private sector</td>
</tr>
<tr>
<td>Doses administered &amp; vials used/shipped</td>
<td><img src="#" alt="Upwards" /> <img src="#" alt="Upwards" /></td>
<td>• Vaccine presentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wasted/sacrificed doses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Buffer stock practices</td>
</tr>
<tr>
<td>Vaccination coverage &amp; cases of disease</td>
<td><img src="#" alt="Upwards" /> <img src="#" alt="Downwards" /></td>
<td>• Program history (vaccine intro., supplementary immunization)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disease epidemiology (age of cases, herd immunity threshold)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Surveillance performance</td>
</tr>
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</table>
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

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

http://www.searo.who.int/immunization/data/fact_sheets/en/
Immunity Gaps: Confirmed measles cases by age vs. vaccination coverage, sect district, 2018-2019

Most cases are in birth cohorts not targeted by SIA or with recent low coverage.
### Example Key Questions, Sub-National Level

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

Good agreement between doses given & doses used

Supplied below required in 2018

Immunization Medical Officer presented this data to the district EPI office and was able to improve supply chain.

Source: DHIS2
Program Performance (2): Comparison of different sources of surveillance data

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

- Aggregate > case-based – incomplete case investigation?
- Smaller difference since 2017
Immunity Gaps Health Facility Example (1): Measles Administrative Coverage

Coverage is now 100% for both MR1 & MR2

Could this be data error? Fabrication?

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

- **<9 m**: 2 cases
- **9m-1 y**: 4 cases
- **1-4 y**: 3 cases
- **5-9 y**: 1 case
- **10-14 y**: 1 case

- **Zero dose**
- **1 dose**
- **≥ 2 doses**
## Immunity Gaps Health Facility Example (3): Measles line-list

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

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

Who are the Scholars?
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](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](https://www.learning.foundation/vpd-triangulation-draft)

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

**Gavi Analysis Guide:**

**WHO Handbook on the use, collection, and improvement of immunization data (2020 draft):**
[https://www.dropbox.com/s/vtkm2m1utl3p9e5/Immunization%20Data%202005%20March%202020.docx?dl=0](https://www.dropbox.com/s/vtkm2m1utl3p9e5/Immunization%20Data%202005%20March%202020.docx?dl=0)

**Webinar resources Scholar course (slides, recordings, background)**
[www.tinyurl.com/2020-triangulation](www.tinyurl.com/2020-triangulation) (English)
[www.tinyurl.com/triangulation-2020](www.tinyurl.com/triangulation-2020) (Français)
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