

# General Triangulation Guidance

Subnational Level

5

Fundamental introduction to  
triangulation principles and the 4-Step  
process for district and facility levels

World Health Organization, UNICEF, & U.S.  
Centers for Disease Control and Prevention

**TRIANGULATION FOR IMPROVED DECISION-  
MAKING IN IMMUNIZATION PROGRAMMES**

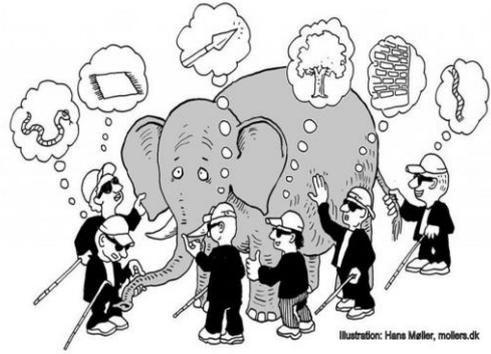
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## Introduction

**Data triangulation** is the synthesis of data from two or more existing data sources to address relevant questions for programme planning and decision making.

Triangulation can include putting different data together in one graph, or stitching information from several graphs together with a story. Triangulation requires critical thinking and basic analysis skills but goes beyond making graphs — it's about turning data into reliable information for action.

Triangulation of two or more data sources helps identify and potentially address limitations related to the use of a single data source or data collection method. Incorporating local contextual information and knowledge, including variations in data quality, can provide a deeper and more complete view of a programme issue (Fig 1).



**Fig 1.** Triangulation is like the [parable of the blind men and the elephant](#)

### Why do we do triangulation?

- At all levels, many data sources exist. However, analysis and use of all existing data is lacking.
- The data triangulation process can be used to:
  - Provide a deeper and more comprehensive view of programme issues of interest
  - Optimize immunization and surveillance programme activities such as programme planning (e.g. microplanning, forecasting), routine analyses, and training
  - Identify and potentially address data quality issues with each data source

### Use of this guide

This triangulation guide is an orientation to the fundamental data triangulation process for staff who support immunization programmes and vaccine-preventable disease (VPD) surveillance systems. Guidance on specific programme topics is included in the Annex documents. This guidance will help build or strengthen skills relevant for use in your daily job activities. For more information, a Triangulation Guide for the national and regional/provincial level is also available.

### Who can use the triangulation guidelines at the subnational level?

- Immunization and VPD surveillance focal points at all subnational levels
- Partner organizations providing support to subnational immunization or VPD surveillance programmes

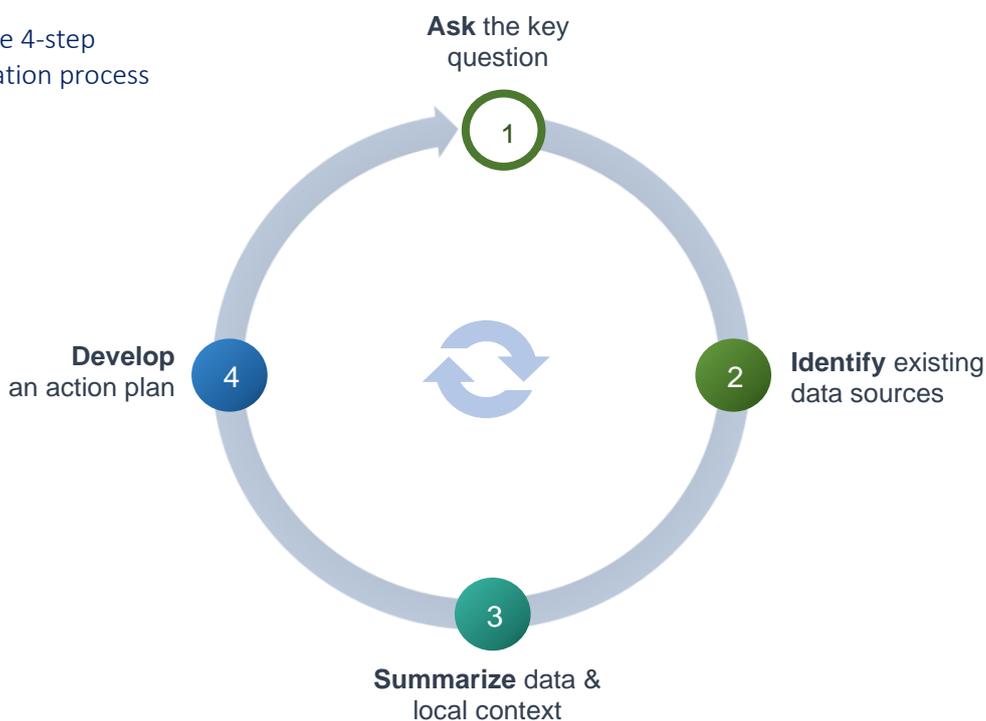
### Triangulation principles

- Develop important programme objectives
- Use existing data — no new data are collected
- Include diverse data sets
  - Data describing trends in indicators are especially useful
  - Integrating local knowledge and contextual information helps make sense of data
- Communicate results so action can be taken

### Process

The 4-step triangulation process is to ask a key question, identify existing data sources, summarize data and local knowledge, and develop an action plan (Fig 2). The goal of triangulation is to provide valid information useful for programme planning and decision making. The frequency with which the triangulation is conducted will vary by key question/issue and local context.

**Fig 2.** The 4-step triangulation process



### ASK the key question

- *Start by identifying an important programme problem and developing a related key question.*
- The question must be answerable and actionable (See Table 2 for sample questions).
- The resulting action may be at your administrative level, the level above or below, or multiple administrative levels.
- Triangulation outputs can feed into local programme planning, highlight where assistance from a higher administrative level is needed, or identify where a change in immunization policy or strategy is needed.
- Triangulation can be very useful for identifying data issues/gaps that can inform new or improved data collection efforts. It can identify the need for additional data, or explanations, to target solutions.

### IDENTIFY existing data sources

- Potential immunization and surveillance data sources are listed in the box below and in Table 1.
- To start, no new data are collected in the field. Existing data are used to answer an actionable question, or to generate a hypothesis that eventually needs to be confirmed through in-depth examination as a next step.
- Explore the use of additional existing data sources outside the immunization and VPD surveillance programme.
- Strengths and limitations of each data source should be considered and noted.
- Different data sources need to cover the same time periods and geographic locations.
- Integrate local knowledge about the datasets to provide context in the interpretation of the results.

#### **Examples of Subnational Immunization Data Sources (Note, this list should align and be similarly ordered as the list in Table 1)**

- Administrative vaccination coverage: doses administered, programme target, dropout rates
- Vaccine stock and supplies
- Programme management: frequency of vaccination sessions, vaccine available on premises; use of open-vial policy
- VPD surveillance: case-based or aggregate
- Serosurveys
- Population estimates (census projections)
- Civil registration and vital statistics (CRVS) systems, including sample registration systems
- Health and Demographic Surveillance Sites (Add to table 1 below too)
- Subnational coverage surveys (e.g., DHS, MICS, EPI, etc.)
- Evaluations: EPI reviews, post-vaccine introduction evaluations (PIEs), data quality assessments (DQAs)
- Special studies
- Other program data: e.g. deliveries attended by skilled birth attendants (SBA) for HepB-BD; surveys from Statistics Office

## Data triangulation at health facilities

Health facilities have many different recording and reporting tools to report the same immunization data (e.g. child register, vaccination session tally sheet, home-based immunization record, stock inventory ledgers monthly wall chart). Triangulation of these data could be informative for determining gaps in data recording and reporting practices. For example, the total number of vaccinated children from name-based registers could be compared with the number in the aggregate report, or vaccine doses administered could be compared with doses used (stock). [Data Triangulation: Use of Health Facility Immunization Reporting Tools](#) (2017) from John Snow Inc. (JSI) is a helpful reference.

**Table 1: Potential data sources with strengths & weaknesses**

Data sources	Example	Strengths	Weaknesses
<b>Administrative immunization data</b>	Doses administered; coverage	<ul style="list-style-type: none"> <li>Potentially includes all vaccinated children</li> </ul>	<ul style="list-style-type: none"> <li>Missing anyone not included in reporting (e.g., private providers)</li> <li>Data quality issues from recording and reporting errors</li> <li>Coverage impacted by inaccuracies in both numerator &amp; denominator</li> </ul>
<b>Vaccine stock data</b>	Total doses used	<ul style="list-style-type: none"> <li>Potentially includes all doses given</li> </ul>	<ul style="list-style-type: none"> <li>Missing vaccine doses not included in reporting (e.g., private providers)</li> <li>Data quality issues from recording and reporting errors</li> <li>May not be maintained on timely basis</li> </ul>
<b>Case-based surveillance data</b>	Individual case data	<ul style="list-style-type: none"> <li>Includes individual data on age &amp; vaccination status</li> <li>Vaccination status of cases may be helpful comparison with coverage</li> </ul>	<ul style="list-style-type: none"> <li>Limited to suspected cases only (thus, may create biases)</li> <li>Issues with suboptimal surveillance performance may limit usefulness</li> </ul>
<b>Aggregate surveillance data</b>	Number of cases reported by week	<ul style="list-style-type: none"> <li>May include reporting from all facilities</li> </ul>	<ul style="list-style-type: none"> <li>Aggregate No. of cases without age and vaccination status likely of limited relevance, except to compare to No. of suspect cases reported to case-based surveillance</li> <li>Data quality may be an issue</li> </ul>
<b>Coverage surveys</b>	Estimated vaccination coverage	<ul style="list-style-type: none"> <li>Usually considered more reliable than administrative coverage</li> </ul>	<ul style="list-style-type: none"> <li>May not be available for level of interest</li> <li>May have small sample size</li> <li>Conducted periodically</li> </ul>
<b>Census projections</b>	Target population for sub-national level	<ul style="list-style-type: none"> <li>Census-based</li> </ul>	<ul style="list-style-type: none"> <li>Time from when census conducted impacts accuracy</li> <li>May not reflect actual target population because age and district-specific growth rates not applied</li> <li>May not be available at lowest level</li> </ul>
<b>Immunization microplan</b>	Target population for sub-national level	<ul style="list-style-type: none"> <li>Used in routine immunization and SIA planning</li> <li>Completed at the sub-national level (e.g. district &amp; health facility)</li> <li>Guidance &amp; training available</li> </ul>	<ul style="list-style-type: none"> <li>Calculation done at lowest level &amp; aggregated through unclear process</li> <li>May not reflect true population</li> </ul>
<b>Registries</b>	Civil registration & Vital Statistics (CVRS); Birth registration; Electronic immunization registries	<ul style="list-style-type: none"> <li>May include No. live births/surviving infants; Infant mortality rates; No. vaccine doses administered</li> <li>May include information on migration status</li> </ul>	<ul style="list-style-type: none"> <li>Varies in terms of completeness by area</li> </ul>
<b>Local enumeration</b>	Head counts in catchment area by EPI	<ul style="list-style-type: none"> <li>Regular house-to-house counts of target groups</li> </ul>	<ul style="list-style-type: none"> <li>May not be widely available</li> <li>Policy and implementation may vary</li> </ul>
<b>Surveys</b>	Demographic Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), EPI	<ul style="list-style-type: none"> <li>Includes crude birth rates and infant mortality rates</li> </ul>	<ul style="list-style-type: none"> <li>Limitations vary based on methods</li> <li>May be infrequent</li> <li>May not include subnational level</li> </ul>

## SUMMARIZE data & local context

- Analyses should be focused on the key issue/question
- Two types of analyses should be conducted:
  - 1) Check the data quality of each data source
    - Make note of the data quality issues in each data source
    - These data quality issues should be addressed immediately and/or as part of the action plan
  - 2) Compare trends across different data sources (e.g. coverage vs. surveillance data)
- Use basic analysis and produce visualizations (e.g. graphs and tables) to explore patterns and associations in the data. This can be done on a computer or with pen and paper.
- Ensure that contextual and local knowledge is integrated during the interpretation of the results.
- Be honest about data limitations, like missing data, or errors in the data recording and entry process.
- EPI and surveillance colleagues should discuss multiple possible explanations for the findings.
  - Explore if more than one factor may result in the findings.
  - Consult with implementation level staff to make sure the conclusions are valid.
- Outline the key findings: classify as a data quality issue, program issue, policy issue or a combination.
- Visualizing data from multiple sources in an effective manner will help communicate complex information clearly to help your audience act.
  1. What story am I trying to tell? Who is my target audience?
  2. What data are important to tell my story? What points do I need to emphasize?
  3. What options do I have for displaying this data? Which option is most effective in communicating?

## Hints for good data visualization

- Determine the story, you want to tell, and your target audience; this is the starting point of the data visualization.
- Keep the data visualization as simple as possible to tell the story (e.g., no 3D graphs).
- Use best graph and disaggregation to address objective, number of data points and:
  - Comparisons — Bar chart (cluster), lines graph
  - Composition — Pie chart, donut chart, tree chart, stacked columns
  - Distribution — Bar chart, histogram, box and whisker plots
  - Relationship — Line graph, Venn diagram, bubble charts, scatter plots
  - Trends — Line graph, bar graph, map
- Annotate with important context to aid interpretation
  - Circles, arrows, lines with expected benchmarks, text labels

**Note:** A helpful resource is “Effective communication of immunization data” at [http://www.euro.who.int/\\_data/assets/pdf\\_file/0017/422630/WHO\\_Handbook\\_ENG\\_final-Web.pdf?ua=1](http://www.euro.who.int/_data/assets/pdf_file/0017/422630/WHO_Handbook_ENG_final-Web.pdf?ua=1)

## Develop an action plan

- To prepare for meetings and/or presentations to discuss findings, determine the story you want to tell and your target audience as a starting point.
  - Develop simple key messages and use your data to tell the story.
  - Include a title that clearly states the key message of the graph.
  - Include bullets with 1-2 key interpretations per graph to make your point.
  - Provide specific examples of issues and related explanations to make your message clearer.

- Develop recommended actions for each level on how to use your triangulation results to improve the program in your area.
- The resulting actions may be at your administrative level, the administrative level below, the administrative level above, or at multiple administrative levels.
- Obtain collaborative input from people being tasked with implementation of proposed action plan. Involve local administrative authorities in developing the action plan, where possible.
- Think creatively of solutions to the problem, especially if resources are limited. Consider how to integrate solutions into existing mechanisms or processes to ensure implementation at the operational level.
- Multiple approaches may be able to be taken to address the programme issue.
- Actions can be prioritized based on what is feasible for the short-term versus what is feasible for long-term or will take more time or resources to address.

### Implementation of data triangulation process

- Data triangulation can occur at multiple levels. The administrative level at which the exercise is conducted depends on the question being asked.
- Key findings should be shared within and across administrative levels and geographic areas.
- Reflect upon the usefulness and impact of the actions that were implemented.
- Triangulation may be an iterative process, or repeated cycle where you learn and improve from past experience.
  - Revisit whether your issue has been resolved or if a new programme issue has been identified.
  - The frequency of the exercise may be monthly, quarterly, or annually and depends on the question being asked.
  - It is helpful to continue to focus on one key question at a time, the question of interest may change over time.
- Make an effort to incorporate triangulation into routine and periodic processes, e.g., data monitoring, programme planning, etc.

The annexes contain three case studies asking questions about issues that are likely to be important at the sub-national level (See Table 2). The draft triangulation guidance documents are available online at <https://www.technet-21.org/en/topics/triangulation>.

**Table 2: Summary of Annexes**

Annex	Key issue/question	Emphasis on specific data sources	Topics to be addressed	Why it is important
6 	Are there immunity gaps in your area?	Administrative data, surveillance	Equity	Reach every child and achieve disease elimination goals
7 	Which areas or facilities have performance issues in need of remediation?	Administrative data, vaccine stock data, program data	Identification of program issues and data inconsistencies	Targeted feedback and supervision to achieve improvement in program
8 	Do the current target population values accurately capture everyone in your catchment area?	Microplan, official census, local health census, birth/death registries, registration of pregnant women, migrant surveys	How to compare different local target population estimates and growth rates for programme use	Improve program planning to achieve equity in service delivery

## Putting it into practice: an example of a subnational data triangulation process

In Country W, there has been a call for a “data revolution”, to strengthen data systems – from collection to reporting to analysis. Thus, to improve data quality and use for immunization program improvement, at the end of 2019, teams at the regional level conducted the initial steps to introduce a data triangulation process.

### *1. Ask the key question*

The immunization program wanted to answer a couple key questions: 1) How do we know if the administrative immunization data we have is of good quality? 2) How can we review available data holistically to understand where program improvements are needed to drive decision-making?

### *2. Identify existing data sources*

The first step was to develop a triangulation team, including the regional immunization program officer, the maternal and child health regional director, a regional pharmaceutical and supply expert, the regional planning and program director, and a logistician. As a group, they looked at which data were available, which decisions needed to be made, and which areas of the immunization program needed to be improved. They identified indicators that could be triangulated against each other on a routine basis. The group then determined a process for regular data gathering and review.

### *3. Summarize data and local context*

Next, the relevant data from various databases were assembled into an Excel tool that organized and classified the data, including a basic scoring system for indicators that should look comparable to one another.

### *4. Develop an action plan*

The triangulation team committed to meeting regularly to review the triangulated data from the tool and discuss next steps and action points for program improvement. Through data triangulation and strong collaboration, these teams can institute better data use and drive decision-making for improved performance.

(Source: John Snow Institute)

## References

Analysis and use of health facility data: Guidance for Programme Managers (February 2018 working document) Available at: [https://www.who.int/healthinfo/tools\\_data\\_analysis\\_routine\\_facility/en/](https://www.who.int/healthinfo/tools_data_analysis_routine_facility/en/)

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Measles Rubella SAGE Working group. “Guidance to Increasing Population Level Immunity” available at: [https://www.who.int/immunization/sage/meetings/2018/october/3\\_Country\\_classification\\_Guidance\\_measles\\_session\\_yellow\\_book\\_doc.pdf?ua=1](https://www.who.int/immunization/sage/meetings/2018/october/3_Country_classification_Guidance_measles_session_yellow_book_doc.pdf?ua=1)

WHO VPD surveillance standards: [www.who.int/immunization/monitoring\\_surveillance/burden/vpd/standards/en/](http://www.who.int/immunization/monitoring_surveillance/burden/vpd/standards/en/)

WHO vaccine position papers: [www.who.int/immunization/documents/positionpapers/en/](http://www.who.int/immunization/documents/positionpapers/en/)

“Reaching every district” (RED) strategy: [https://www.who.int/immunization/programmes\\_systems/service\\_delivery/red/en/](https://www.who.int/immunization/programmes_systems/service_delivery/red/en/)

WHO. Training for Mid-Level Managers (MLM): <https://www.who.int/immunization/documents/mlm/en/>

WHO. Immunization in Practice: A practical guide for health staff: <https://www.who.int/immunization/documents/mlm/en/>

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