



# Enhancing Immunisation Programme Planning, Service Delivery, and Monitoring through the Effective use of Sub-national Data and DHI interventions

A practical guide developed for Extended Program Immunisation Managers and Data Managers at National, District (sub-national), and Service Delivery Levels (Facility and Community) as part of Gavi, the Vaccine Alliance's Digital Health Information Strategy

November 2022

Facilitated by Michal Waga and Patricia Mechael, HealthEnabled

health.enabled



# Acknowledgements

Health Enabled and Gavi, the Vaccine Alliance would like to thank the following individuals for their inputs and valuable contributions serving as members of the Technical Working Group, technical contributors and reviewers, and key informants.

NAME	ORGANISATION
Vichet Am	CHAI
Joseph Nsiari-Muzeyi Biey	WHO-AFRO
Sarah Bryer	CHAI
Elain Byrne	University of Oslo
Vittoria Crispino	University of Oslo
Maria Carolina Danovaro	World HO-HQ
Carine Gachen	GAVI Secretariat
Fahmy Kamal	WHO-EMRO
Reggis Katsande	WHO-AFRO
Lan Mao	CHAI
Srikant Mohan	CHAI
Donadel Morgane	US CDC
Maria Muniz	UNICEF-ESARO
Dramane Gnourfateon Palenfo	AMP Afrique
Heidi Reynolds	GAVI Secretariat
Louie Rosencrans	US CDC
Solienne Scotney	CHAI
Anne Asmyr Thorsen	University of Oslo
Martha Velandia	PAHO

Cover photo credit: Gavi

As part of Gavi, The Vaccine Alliance's efforts to monitor the use of our digital health information resources and to gather recommendations to improve them in future versions, we have set up a dedicated e-mail [DHI@Gavi.org](mailto:DHI@Gavi.org). Please let us know what you have found useful and what we can do better in the next iteration. Thank you!

# List of Acronyms

<b>Acronym</b>	<b>Name</b>
<b>AEFI</b>	Adverse Events Following Immunization
<b>AMP Afrique</b>	Agence de Medecine Preventive Afrique
<b>EPI</b>	Essential Programme for Immunization
<b>DHIS</b>	District Health Information Software
<b>DHI</b>	Digital Health Information
<b>CDC</b>	Centers for Disease Control and Prevention
<b>CGH</b>	Center for Global Health
<b>CHAI</b>	Clinton Health Access Initiative
<b>DDPHSIS</b>	Deputy Director for Public Health Service and Implementation Science
<b>GID</b>	Global Immunization Division
<b>GIS</b>	Geographic Information Systems
<b>HMIS</b>	Health Management Information Systems
<b>NGO</b>	Non-Government Organisation(s)
<b>PAHO</b>	Pan American Health Organisation
<b>WHO-AFRO</b>	World Health Organisation – Regional Office for Africa
<b>WHO-HQ</b>	World Health Organisation – Headquarters
<b>UNICEF-ESARO</b>	United Nations Children’s Fund-Regional Office for Eastern and Southern Africa
<b>WHO-EMRO</b>	World Health Organisation-Regional office for the Eastern Mediterranean

# Glossary of Terms

---

<b>Data</b>	Measurement inputs that need to be processed into actionable information before action can be taken or decisions can be made
<b>Data Availability</b>	Degree to which data relevant for decision-making can be reliably accessed by relevant persons
<b>Data quality</b>	Data that are accurate and precise, relevant, complete, and timely enough for intended purpose (or "fit-for-purpose").
<b>Data Use</b>	Degree to which data are used for a defined purpose, e.g., programme management, planning, decision-making.
<b>Culture of data use</b>	The customs, dispositions, and behaviours of a particular group or organization to support and encourage the use of evidence, including facts, figures, and statistics, to inform their decision-making
<b>Data triangulation</b>	Refers to the synthesis of two or more existing data sources to address relevant questions for programme planning and decision-making. It includes assembling the data together in one graph or stitching information from several graphs together with a narrative thread.
<b>Vaccination Coverage</b>	Percentage of target population who have received a specific vaccine
<b>Epidemiological surveillance</b>	Detecting and responding to diseases to reduce morbidity and mortality
<b>Vaccine Preventable Diseases (VPD) Surveillance</b>	A type of disease surveillance that helps immunisation programs to understand the burden of diseases that are preventable by vaccination and assesses vaccine impact to inform program policy and strategy. There are 3 types of surveillance namely, passive notification of VPDs from healthcare providers, active surveillance from public health experts after hospital reviews and sentinel site surveillance in specialised hospitals with high clinical and laboratory capacity.
<b>Numerator</b>	Number of people who receive an intervention such as vaccination
<b>Denominator</b>	Target population that should receive an intervention such as vaccination

---

# Table of contents

Acknowledgements	2
List of Acronyms	3
Glossary of Terms	4
Background: Effective Sub-national Data Use for Immunisation	7
Health Management Information Systems (HMIS)	9
HMIS & Immunisation	10
District Health Information Software 2 (DHIS2) for Immunisation	11
EPI Roles and Responsibilities Related to Data	12
Data Use at National Level – EPI Directors and Managers	13
National EPI Programme Priority Decisions, Data Needs, and Sources of Information	13
Data Use at Sub-national (District) Level – EPI District Managers	16
Sub-national (District) EPI Priority Decisions, Data Needs, and Sources of Information	16
Data Use at Facility Level – Health Workers & Managers	18
Specific actions to effective data use at health facility level	19
Digital Social Listening: A New Source of Immunisation Data	21
Barriers to Effective Sub-national Data Use	22
Feedback for Action	23
Steps to giving feedback at national and sub-national level	23
Making Data More Accessible and Useful Through Dashboards	24
Analyses and visualisations for sub-national level data sharing and use	25
Data Triangulation	26
Ethiopia Data Triangulation Case study	28
Conclusion	30
Annex A: Resources	31
Annex B: References	32

# List of figures and tables

## Figures

Figure 1: IA2030 Immunisation Data Theory of Change	8
Figure 2: Proposed data use actions based on available data and collection format	9
Figure 3: HMIS & Immunisation Theory of Change	10
Figure 4: Pyramid of data quality and data use	12
Figure 5: Decisions, data required for planning and monitoring and sources of information at the National level	13
Figure 6: Recommended actions for effective data use at the national level	15
Figure 7: Decisions, data required for planning and monitoring and sources of information at the district level	16
Figure 8: Cycle of activities shown to increase availability, quality and use of data	17
Figure 9: Sources of information, data required and decisions made by health workers and administrators	18
Figure 10: Digital Social Listening for Immunisation Data - Listening, Understanding, and Engagement	21
Figure 11: Framework summarising the 8 root causes that lower participants ability and motivation to utilise data for decision-making	22
Figure 12: Dashboard for systematically increasing use of sub-national data.	24
Figure 13: Triangulation of different data sources to make informed decisions	26
Figure 14: The four-step process for data triangulation	27
Figure 15: Data triangulation recommendations based on experiences in Ethiopia	29

## Tables

Table 1: DHIS2 Immunisation Modules	11
Table 2: Common Data Use Challenges & Solutions faced by National EPI	14
Table 3: Problems, possible reasons and solutions at the sub-national level	17
Table 4: Problems, possible reasons and solutions at facility level	19
Table 5: Analyses and visualisations for sub-national level data sharing and use	25
Table 6: Case study for data triangulation in Ethiopia	28

# Background: Effective Sub-national Data Use for Immunisation

Gavi's 5.0 Strategic vision of "leaving no one behind with immunisation" hinges on the global [Immunisation Agenda 2030 \(IA2030\)](#) ratified in the 73rd World Health Assembly (WHA) in 2020 (IA2030 Core Team 2020), which includes the Data-Guided Core Principle that "high quality, 'fit-for-purpose' data will be used to track progress, improve immunization programme performance, and form the basis of decision-making at all levels."

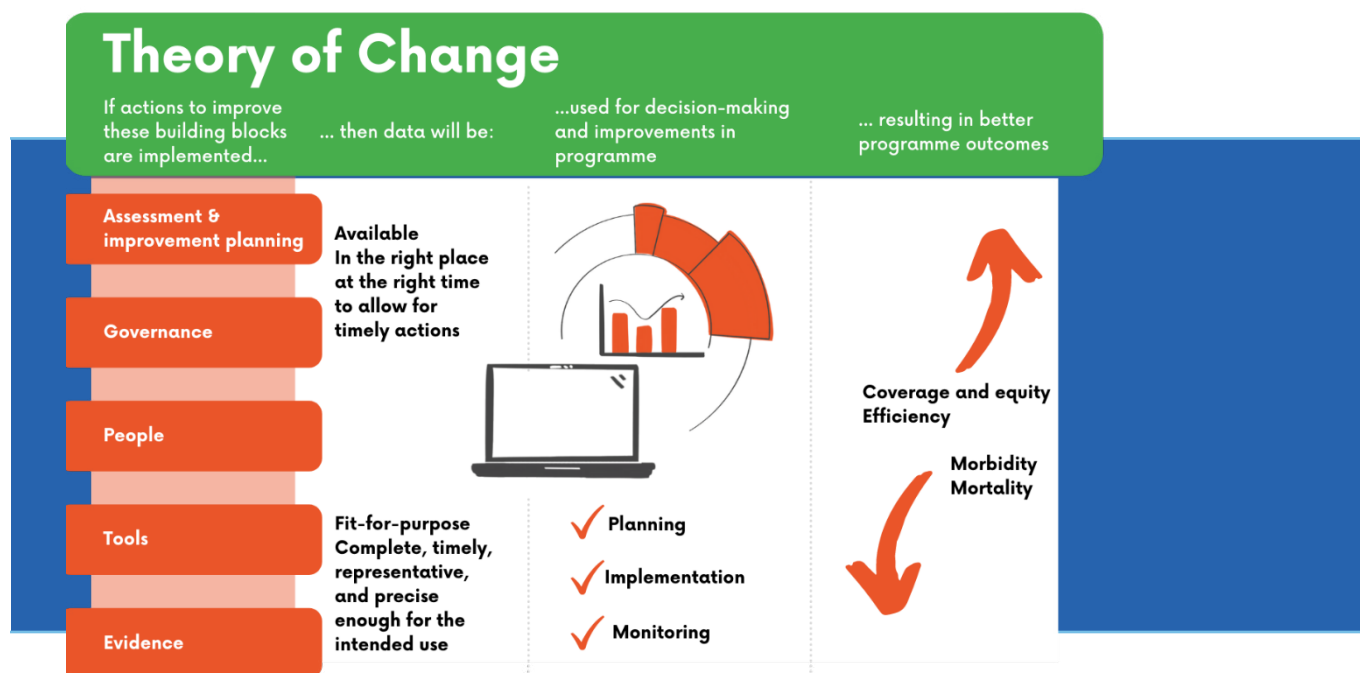
In support of this principle, [Gavi's Digital Health Information \(DHI\) Strategy](#) includes "Effective sub-national data use with improved data triangulation, dashboards, visualisation, mechanisms to aid decision-making and systems interoperability" as one of six inter-related digital health information strategies that will contribute to the successful achievement of Gavi's 5.0 strategic goals. This draws from the recommendations documented in the [Gavi Digital Health Information Strategy Technical Brief Series: Sub-national multi-source data for immunisation programme decision-making \(March 2022\)](#), namely to:

1. Prioritise initiatives targeted at multi-source (e.g., National Health Management Information Systems (NHMIS), Geographical Information System (GIS), Survey, Surveillance...) quality data reporting, triangulation, visualisation, and use at subnational levels
2. Prioritise data quality improvement through harmonisation and validation of accurate population

- estimates at subnational levels
3. Prioritise evaluation of supported multi-source data interventions to extract lessons to apply in other domains
4. Improve capacity for data-enabled and evidence-based decision-making such as the ability to monitor and analyse data completeness, accuracy, integrity, and timeliness to identify data process bottlenecks, communicate rapidly with different levels of the immunisation programme and present findings and needs to supervisors

The [Global Vaccine Action Plan \(GVAP\) 2011–2020](#) established the first global monitoring and evaluation framework for immunisation and raised awareness of the need for quality data. However, a review of GVAP concluded that data were not sufficiently tied to the actions of programmes or other stakeholders. Drawing lessons from GVAP and the work of the [Strategic Advisory Group of Experts \(SAGE\) Working Group on the Quality and Use of Global Immunization and Surveillance Data](#), the [Data Action Framework](#) provides a road map for the immunisation ecosystem to synchronise around actions necessary to maximise the use of data to meet immunisation goals. As a core principle, data are required to not only monitor progress towards the goals of the IA2030, but they are also a critical component in the design, deployment, and monitoring of immunisation programmes that will contribute to impact at every level: global, regional, national, and subnational. IA2030 data-guided work clarifies roles

Figure 1: IA2030 Immunisation Data Theory of Change



and responsibilities so that the agenda can be implemented nationally, regionally, and globally. It promotes the use of data to prompt action to ensure accountability while effectively responding to emerging challenges.

This resource was developed by HealthEnabled in support of Gavi, the Vaccine Alliance’s Digital Health Information Strategy and aligns with IA2030 Data Action Framework and Theory of Change. **It aims to provide a practical guide for Essential Programme for Immunisation Managers to improve immunisation planning, service delivery, and monitoring through effective data use at national, district (sub-national), and facility levels with facilities as a key point of engagement with communities through outreach activities.**

This resource was developed through a semi-systematic desk review, key informant interviews, and consultations with data use professionals alongside engagement with a technical working group and aligned to the IA2030 Immunisation Data Theory of Change. It draws and builds on a multitude of data use resources (See Annex A) to provide a high-level quick reference overview of the decision-making needs, data needed for those decisions, and data sources as well as how to make the data more accessible and useful at each level.

While the resource has been developed with immunisation as a primary use case, it can be applied more broadly to other health programmes.

At present most data that are collected are rarely used. They often flow to national programmes for reporting purposes only and/or can only be accessed through static reports. Digitalisation of health information systems provides an opportunity to improve access to data and its effective use at all levels; creating dashboards, visualisations, and alerts that promote more active use of data for planning, service delivery, and monitoring; and bringing data from multiple sources together for a more holistic view through data triangulation. The priority for national and sub-national partners is to successfully manage the process of transforming data into knowledge, knowledge into informed policy and plans, and plans into improved programmes, service delivery, and monitoring.

This practical guide provides an overview of the decisions that are made by key EPI stakeholders, the data that are needed for those decisions, the sources of those data, and insights on how to increase feedback, develop useful dashboards and data visualisations, and triangulate data for a more holistic picture of EPI performance.

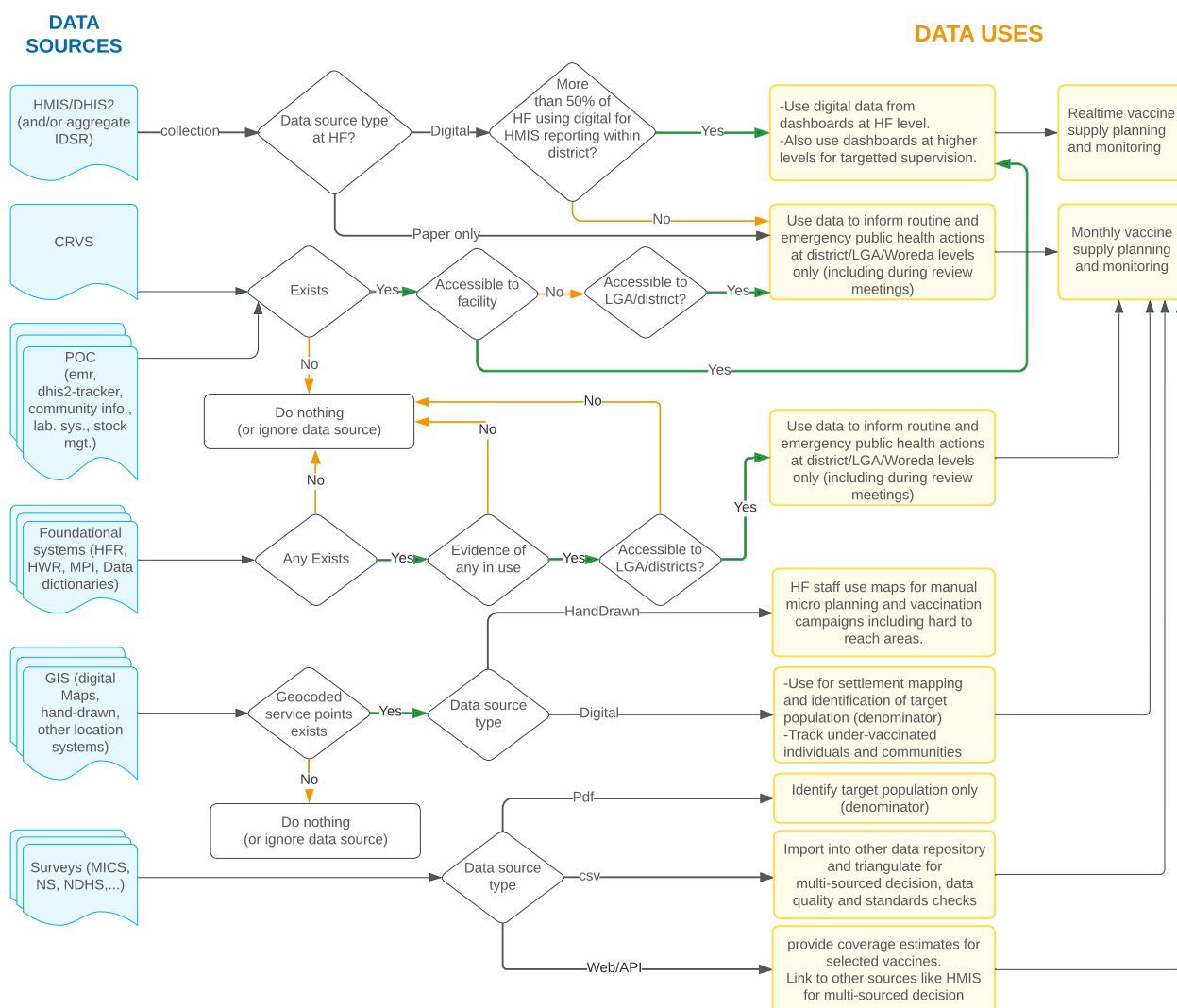


# Health Management Information Systems (HMIS)

Health Management Information System (HMIS) refers to a system whereby health data are recorded, stored, retrieved, and processed to improve decision making. Increasingly these systems are digital. It serves four key functions: 1) data generation, 2) data compilation, 3) data analysis and synthesis, and 4) communication and data use. A robust and well-functioning HMIS is essential for collection and generation of quality data to inform all relevant stakeholders in time for planning, review, program monitoring and a general quality assurance and improvement of all aspects of a health system. In many countries, the quality of data gathered at health facilities and the capacity to analyse and

use this data remain inadequate to support decision-making. At health facility and district levels, routine immunisation data is collected using different means including paper-only, hand drawn/digital maps, paper, geospatial information system (GIS), surveys, and through electronic systems like HMIS or related applications. HMIS helps to ensure that accurate data are available to assess the quality and coverage of interventions. Figure 2 summarises the proposed immunisation programme data actions and uses based on available data and collection format for effective data use through HMIS.

Figure 2: Proposed data use actions based on available data and collection format



# HMIS & Immunisation

Data use for health systems performance and interventions monitoring and planning leads to improved functioning of the health system. Sub national health teams use health data for planning and identification of targets for case interventions such as EPI programs. Decision makers across national and sub-national levels use data from the National Health Management Information Systems (NHMIS), including various platforms that support mapping of coverage and to facilitate real-time monitoring of immunisation campaigns.

The following theory of change shows how inter-related the different types and sources of data are and how they align to various immunisation outcomes, including outbreak management through improved VPD surveillance and improved safety of vaccines through better monitoring of Adverse Events Following Immunisation (AEFI). It also highlights that the increased availability and use of data from HMIS can inform decision making to set targets, plan, advocate for resources, and monitor performance.

Figure 3: HMIS & Immunisation Theory of Change

Health Impact	To save lives and protect people's health by increasing equitable and sustainable use of vaccines				
Immunisation Impact	All children fully immunised in all districts with equitable coverage across population subgroups based on geographic, socio-economic and cultural differences				
Goal	Strengthen health systems to increase equity in immunisation				
Outcome	Sustainably reach zero-dose children, under-immunised, and their communities with immunisation and PHC				
Immunisation Outputs/ Outcomes	Support improved outbreak detection and response and connection to routine immunisation	Increased capacity to identify, reach, monitor, measure and advocate for zero-dose children and their communities	Increased quality, timeliness, & delivery of immunisation services	Increased immunisation coverage and equity	Improved safety of vaccines
HIS Outcomes Immunisation	Improved <b>disease surveillance</b> through better tracking & reporting of VPDs and new outbreaks	Improved <b>identification &amp; immunisation of under-immunised children</b> through improved denominators/ targets, tracking of children & immunisation reminders to defaulters	Improved <b>service delivery and real-time monitoring</b> through better planning, monitoring, coverage tracking, stock visibility; & supportive supervision	Reduced <b>service and equity gap</b> through increased triangulation and use of sub-national data to plan and monitor immunisation	Improved capture, reporting, response, and mitigation of <b>vaccine-related adverse events</b>
HIS Outputs (data availability, quality and use)	Informed decision making to set targets, plan and advocate for resources, monitor performance and equity, optimise service delivery quality and efficiency, identify adjustment needs, and inform policies and strategies				
	Strengthened data, systems, and use to advance equitable immunisation through increased availability, accessibility, quality, completeness, timely and effective use of data				
	Data Quality App, Process, and Review Meetings				
HIS Inputs (Immunisation Data & Platforms)	Aggregated data from facilities, VPD surveillance data & dashboard, Case-based surveillance data & dashboard	Electronic Immunisation Registry, Alerts & Reminders, Birth Notification; Sub-national population target triangulation	Aggregated data from facilities, Immunisation coverage data dashboards; Immunisation data analysis tools; stock visibility & eLMIS interoperability; Supportive supervision tools	Gaps analysis tools; Smart dashboard to facilitate data triangulation and use of GIS data (with link to Master Facility Lists-mapping immunisation services and cold chain equipment)	Adverse events following immunisation (AEFI) reporting tool and dashboard
HIS & Immunisation Foundations	Master facility registry/ list Geospatial data/ facility and community maps Up-to-date data standardised immunisation data and data collection tools (HMIS registers) Standard Operating Procedures Availability of tablets and computers at point of data entry and/or care Training and refresher training for health workers Training and reference materials Onsite support supervision Data quality systems and data review meetings				
Enablers	Government leadership and commitment Data governance strategy and policy, including data use, data quality and data sharing Responsible data policies and practices Dedicated human resources with appropriate capacity to support both technology and data use activities Change management and data use culture Interoperability with other systems- including birth registries, eLMIS, community case management systems, and electronic medical record systems Sustained funding ICT Infrastructure and connectivity				

## District Health Information Software 2 (DHIS2) for Immunisation

There are a number of HMIS that can provide more real-time data. A commonly used platform in low and middle-income countries is District Health Information Software or DHIS2,

which includes a suite of immunisation modules developed in collaboration with WHO, CDC, and other Gavi Alliance Members. The following DHIS2 immunisation modules and applications facilitate availability and use of data for important immunisation-related activities in alignment with overarching achievement of immunisation outcomes such as coverage and equity.

Table 1: DHIS2 Immunisation Modules

DHIS2 immunisation packages and apps	
<b>WHO Data Quality App</b>	A custom web app in DHIS2 used to improve the quality of data used for analysis and decision making by identifying potential errors and gaps (designed according to <a href="#">WHO Data Quality Review Framework</a> )
<b>WHO EPI Module</b>	Standardized data elements, data sets, indicators, and dashboards for routine reporting and analysis of immunisation data, with a focus on facility-level data. This module includes vaccines administered, coverage rates, facility stock reporting, cold chain monitoring and wastage.
<b>WHO Immunisation Analysis App</b>	A custom web app in DHIS2 to support enhanced analyses and data visualisation for EPI program monitoring and planning
<b>Bottleneck Analysis (BNA) App</b>	An open source DHIS2 compatible application for performing bottleneck analyses on programmes to identify, analyse, and resolve immunisation programme bottlenecks.
<b>Scorecard App</b>	An open source DHIS2 compatible application for creating scorecards for immunisation programmes or other health interventions.
<b>Action Tracker</b>	An open source DHIS2 compatible application (used as stand alone or in tandem with the BNA app) that supports immunisation and other programme managers to record actions to resolve bottlenecks, assess progress in implementing actions and determine whether actions are reducing bottlenecks based on indicator tracking over time.
<b>Child Immunization Registry (not funded by Gavi)</b>	An extension for DHIS2 that allows the collection, management, and analysis of transactional, case-based data. Using DHIS2 tracker data as the model for longitudinal individual level data, this module is designed for clinicians and staff at health facilities. It enables tracking of a child's immunisation history with built-in reminders to track and follow-up with defaulters. The module supports WHO-recommended immunisation schedule and can be adapted according to national policies / schedules. It includes indicators that are autogenerated and pre-mapped to monthly facility reporting indicators included in the aggregate EPI package.
<b>Integrated Disease Surveillance &amp; Response (IDSR)</b>	Supports weekly IDSR reporting for notifiable diseases, dashboards, and alerts. Many countries in Africa use DHIS2 for IDSR reporting. This module supports standardization of definitions, alert thresholds, etc. according to WHO guidance.
<b>Vaccine-preventable disease (VPD) Case-based Surveillance</b>	Enables longitudinal capture of case data, linking clinical, laboratory, and case outcome data to a case. The tracker currently supports nine diseases and can be expanded to capture additional diseases.
<b>Adverse Effects Following Immunisation (AEFI)</b>	Case-based module to enable the notification, investigation, reporting, and analysis of adverse events following immunisation and provides mechanism for case-based surveillance of AEFI.

For more information, visit: <https://dhis2.org/immunization/>

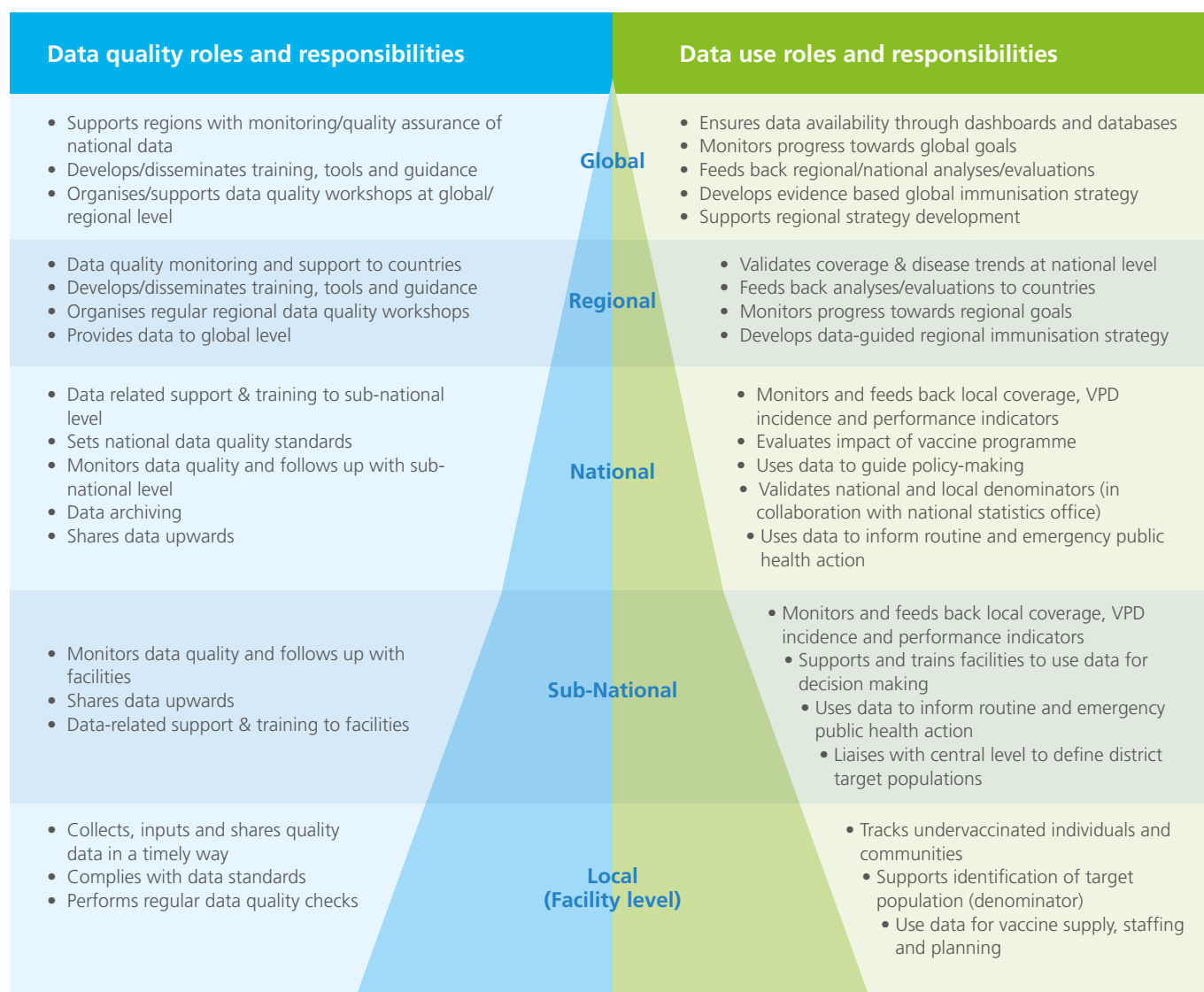
# EPI Roles and Responsibilities Related to Data

To attain optimal data quality and use, a skilled workforce is required. There have been widely documented issues around health worker competencies as relates to immunisation data management tasks. Lack of clarity on the roles and responsibilities in the workforce contributes to ineffective data use. The WHO developed an immunisation competency framework as part of their Standard Immunisation Competencies project (Fig. 4). This competency framework defines the roles and responsibilities of workers at all levels including monitoring and evaluation. It can assist immunisation programmes to develop and revise policies

relating to workforce including staff development. Interventions focused on addressing issues around data quality and insufficient skill sets as regards data quality should be focused on elements of these competency frameworks at national, district or sub-national level and health facility levels as will be discussed further in this guide.

The following sections highlight the key decisions made at the national, district and facility levels of the health system that can be supported through a more systematic and holistic approach to data availability, quality, and use.

Figure 4: Framework of immunisation data roles and responsibilities developed by the SAGE Data Working Group



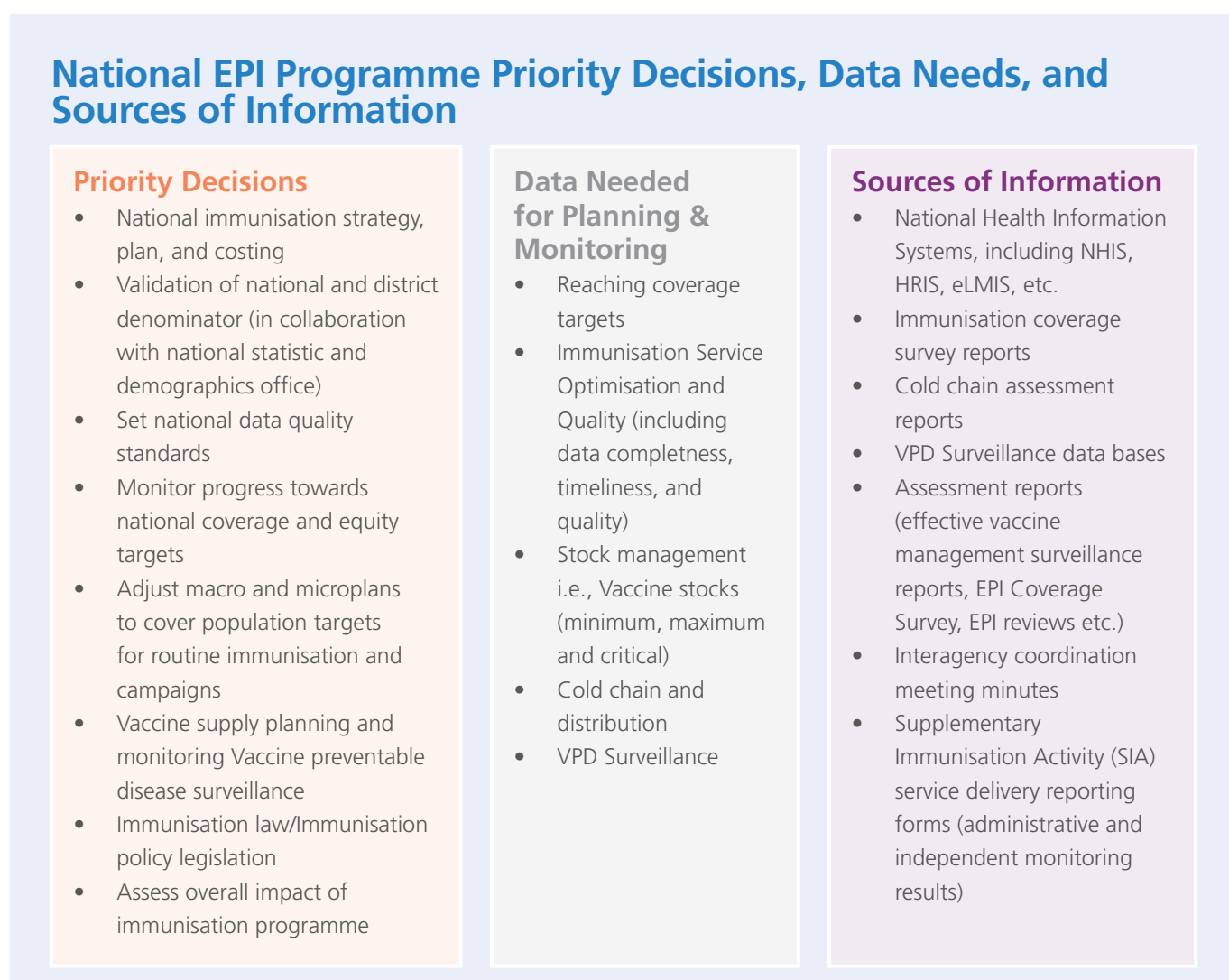
# Data Use at National Level – EPI Directors and Managers

In most countries, the national level of the EPI within the Ministry of Health is the main driver of planning activities with responsibility for the vaccine supply chain and service delivery optimisation as well as monitoring EPI performance. The figure below summarises decisions made, data required for planning and monitoring and the sources of information at national level. Countries can have national integrated health information systems, dedicated programme-specific systems, or integrated and dedicated systems at the same time. Integrated systems are often referred to as Health Management Information Systems (HMIS). Greater integration allows for the pooling of resources, both financial

and human, and potentially decreases the workload placed on health workers. At national level there are specific data that if used together can provide a holistic comprehensive view of the immunisation programme. This includes immunisation coverage data for real-time monitoring of routine immunisation and campaigns as well as VPD surveillance data to identify and respond to outbreaks, indicating overall effectiveness of immunisation programmes.

There are also common data use challenges at the national level. Table 2 highlights some of these challenges and provides possible reasons and potential solutions.

Figure 5: Decisions, data required for planning and monitoring and sources of information at the National level



There are also common data use challenges at the national level. Table 2 highlights some of these challenges and provides possible reasons and potential solutions.

In addition, there are recommended actions for effective data

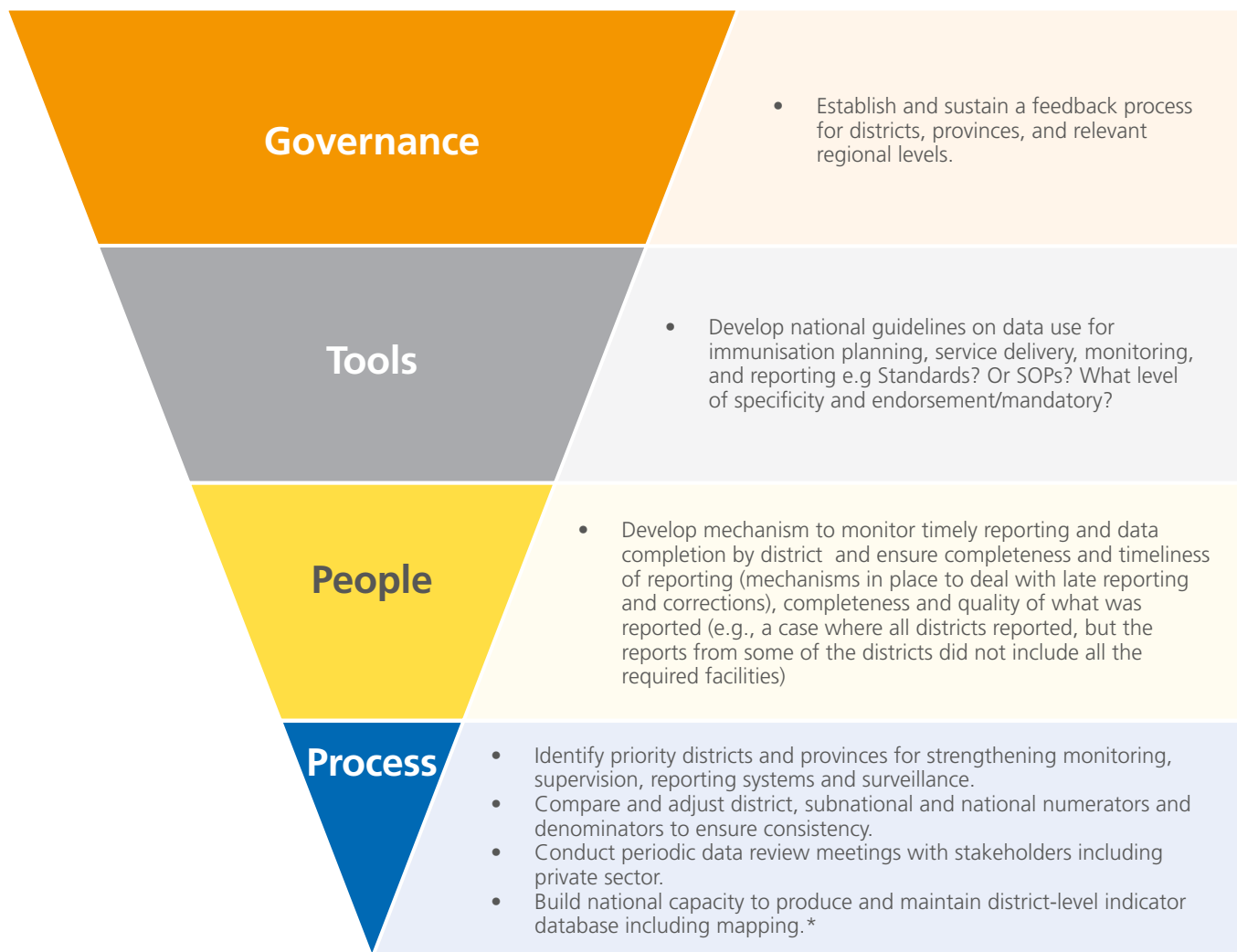
use at national level that are suitable for governments as well as private sector, NGOs, and other development partners operating in support of or alongside the national EPI as illustrated in Figure 6.

**Table 2: Common Data Use Challenges & Solutions faced by National EPI**

Diagnosed problem	Possible reason	Potential solutions
<b>Duplicate systems exist. This leads to contradictory data and unnecessary workload.</b>	Integrated HMIS do not meet the main needs of programmes. Therefore, parallel systems are in place.	Strengthen adequate governance systems and co-design reporting systems to fulfil program needs and reduce workload.
<b>Data collection forms, including home-based records (HBR), are poorly designed. Space to write on recording forms and registers is inadequate. Different forms and tools are no longer compatible. Outdated forms continue to circulate.</b>	Forms were adjusted organically, some data elements were added at times, and no one has evaluated their usefulness.	Have a designated committee (EPI/HMIS) review all the forms, make sure that tools are streamlined, that is all data on tally sheets is also included in reports, etc. Use Human Centred Design to create forms. * Make sure that all data that is collected has a clear purpose and the burden to collect it is justified. Develop and disseminate standard operating procedures (SOPs) for data collection and transmission.
<b>Electronic systems are poorly designed.</b>	Electronic tools were developed without considering country priorities, needs, or context. Generic systems are not well adapted to local data requirements, paper forms, etc.	Review and redesign electronic systems to make sure that data are only entered once digitally; make sure that data entry sheets exactly reflect the paper forms that are used to collect the data, and that they include the visualizations and other analytical tools that are adapted to local needs.

\* Adapted from PHISICC: <https://paperbased.info/>

Figure 6: Recommended actions for effective data use at the national level



For further guidance, refer to the document listed below: Data competencies for health people in SAGE Data report 2019:

<https://www.dropbox.com/sh/y7ksmbrua0k85xa/AADEXA2dn9PZ647-oT6i9wVTa?dl=0>

\*See data competencies for health people in SAGE Data report 2019: <https://www.dropbox.com/sh/y7ksmbrua0k85xa/AADEXA2dn9PZ647-oT6i9wVTa?dl=0>



# Data Use at Sub-national (District) Level – EPI District Managers

The district level oversees the health facilities to a large extent. Most district level data is in an electronic format in the HMIS. The figure below summarises the kind of decisions made at this level, the data required for planning and monitoring and the sources of information from where the information is collected and analysed.

There are also common data use challenges at the sub-national level. Table 3 highlights some of these challenges and provides possible reasons and potential solutions.

The cycle of activities shown in Figure 8 when applied systematically has been shown to increase the availability, quality, and use of data at the sub-national or district level.

Figure 7: Decisions, data required for planning and monitoring and sources of information at the district level

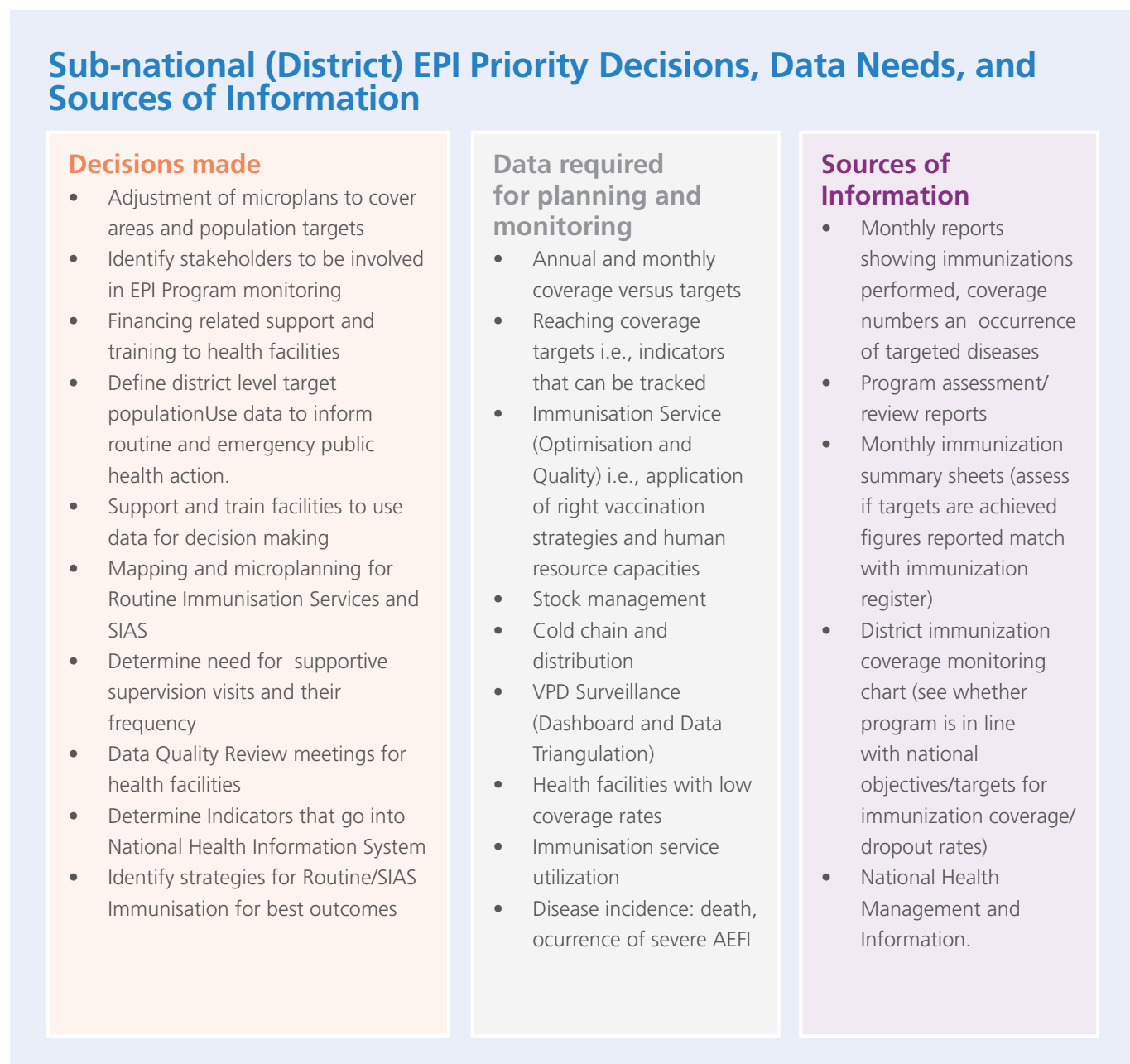
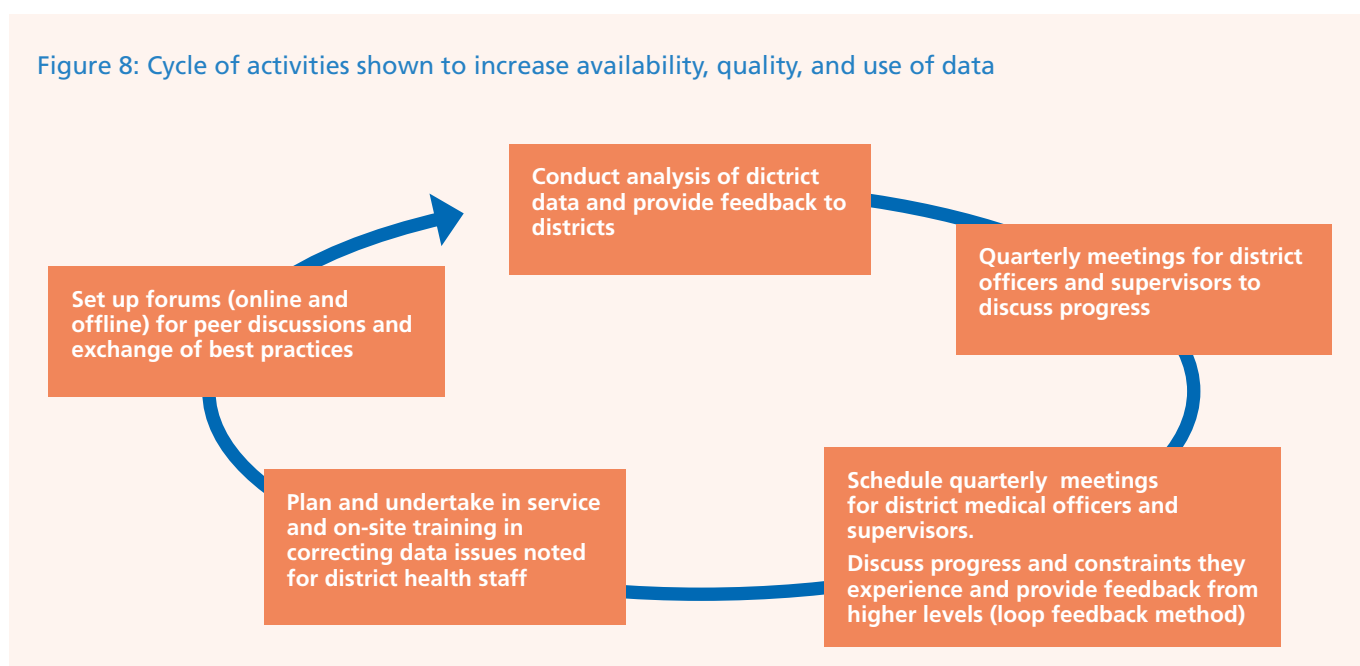




Table 3: Problems, possible reasons, and solutions at the sub-national level

Diagnosed problem	Possible reason	Potential solutions
<b>Poor or incomplete registration practices (as seen through the data verification exercise)</b>	<p>Children from outside the service area are not registered.</p> <p>Outreach activity is not registered in immunization registers.</p> <p>Registry books are not user friendly, for example do not allow for the easy retrieval of child records.</p>	<p>Change policy to clarify that all children who frequently visit the health facility should be registered and tracked.</p> <p>Design immunization registers that can easily be taken to outreach activities.</p> <p>Make sure that monitoring tools are systematically included in new vaccine introduction planning and use introductions to make sure all tools are updated with the best design possible.</p> <p>Promote the removal of outdated data collection tools</p>
<b>Data not used</b>	<p>Limited decision power</p> <p>Decisions are made based on what historically has been done</p> <p>The right analytical tools are not available or known.</p> <p>The data are of poor quality and cannot be used in a meaningful way.</p> <p>People lack the skills to use data in a meaningful way.</p>	<p>Consider analytical skills and the capacity to make decisions based on data as part of the job requirements for key positions.</p> <p>Build standard immunization dashboards with the information that is most relevant for each level, and make these available in the used electronic systems, or through other ways of dissemination.</p>
<b>Lack of availability of standardized, current formats</b>	<p>Lack of funding for reproduction</p> <p>Poor planning, for example when vaccines are introduced</p>	<p>Monitor availability of forms through the logistics management information system.</p>

Figure 8: Cycle of activities shown to increase availability, quality, and use of data



# Data Use at Facility Level – Health Workers & Managers

The health facility/community level is the basic level of primary health care. The figure below summarises the decisions made at health facility level, data required for

planning and monitoring and sources of information and highlights the major sources of data.

Figure 9: Sources of information, data required, and decisions made by health workers and administrators

## Sources of information, data required, and decisions made by health workers and administrators

### Decisions made

- Plan for vaccine and related supply and staffing
- Identify target areas/ population
- Data quality and standards checks and compliance
- Frequency of vaccine supply
- Population maps: hard to reach populations
- Track under-vaccinated individuals and communities.
- Effectiveness of Health information systems reports i.e. (completeness of reports submitted and their timeliness.
- Plan for vaccination strategies and session.

### Data required for planning and monitoring

- Occurrence of vaccine stockouts
- Historical vaccine use and persons vaccinated
- Annual and monthly coverage targets
- Annual and monthly numbers of people vaccinated
- VPD surveillance data
- Stock levels/cold-chain management
- Birth cohort of that specific period for the catchment area
- Monthly number of vaccination session conducted versus number planned.

### Sources of Information

- Immunisation tally sheets/registers that help to collect tally and to ensure that they match with reported figures. (Provides information on the number of doses of a specific vaccine administered during a particular time and date of immunization session to a particular age group.)
- Child immunization cards that show actual immunisation dates, validity of the immunisation and card retention that is useful for EPI program evaluation through activities such as census and conducting of coverage surveys
- Cold chain inventory register that compares what is available and equipment conditions.
- Vaccine stocks management registry to ensure proper vaccine management.
- Supervisory reports from health facility visits
- Cold chain temperature monitoring charts for consistency of daily monitoring.
- Census data provides target population and can be used to calculate program performance
- SIA (Supplementary Immunisation activities) service delivery reporting forms (administrative and independent monitoring results)
- Facility based Health Information System

## Specific actions to effective data use at health facility level

- Monitor and adjust district micro plans and summarise results
- Provide immediate support to health facilities falling behind the set targets which is an indication that they may need more support from district level
- Continuous Quality Improvement through feedback reports giving an overview of the situation and reflecting each health facility vaccination activities and encouraging improvement where targets are not met
- Escalate the major problems identified to the district, provincial and central level to seek collaborative solutions
- Present regular program status and extent of target achievement to district development committee to seek for political and financial support for the programs
- Compile information at health facility level for monthly reporting to provincial or national levels
- Involve district stakeholders and partners in program monitoring and enrol their support to help to facilitate access and reach with vaccination

There are also common data use challenges at the facility level. Table 4 highlights some of these challenges and provides possible reasons and potential solutions.

Table 4: Problems, possible reasons, and solutions at facility level

Diagnosed problem	Possible reason	Potential solutions
<b>Poor or incomplete registration practices (as seen through the data verification exercise)</b>	<p>Children from outside the service area are not registered.</p> <p>Outreach activity is not registered in immunization registers.</p> <p>Registry books are not user friendly, for example do not allow for the easy retrieval of child records.</p>	<p>Change policy to clarify that all children who frequently visit the health facility should be registered and tracked.</p> <p>Design immunization registers that can easily be taken to outreach activities.</p> <p>Explore the use of tracking bags, tickler files, etc. as opposed to registry books that are not organized in a manner that facilitates individual follow-up</p>
<b>Inconsistent data between different sources (register, tally sheets, reports)</b>	<p>Inaccurate aggregation or transcription errors (tally sheets, monthly report, electronic systems)</p> <p>Workload issues lead health workers to take shortcuts: for example, by tallying the immunized doses before or long after the session, based on a so-called guesstimate or the number of vaccine vials used. Misrepresentation to increase the apparent performance. Issues with management of delayed reports that may lead to non-inclusion or duplication</p>	<p><b>Knowledge gaps:</b> Provide clear standard operating procedures and adequate training and incentives, to avoid perverse incentives</p> <p><b>Skills gap:</b> Train people effectively in the collection, management, and use of data.</p> <p>Train people in the use of electronic tools.</p> <p>Make sure that data management and analytical skills are clearly spelled out in job descriptions, not only for data managers but also for managers and decision-makers.</p> <p><b>Environmental gaps:</b> Make sure that systems are in place that allow for the accurate handling of incomplete reporting.</p> <p><b>Communication gaps:</b> Put in place mechanisms, such as spot checks with data verification during regular supervision.</p> <p><b>Motivation gaps:</b> Review incentives for reporting and make sure that these focus on accurate reporting rather than reports of high performance.</p>

Table 4 continues on next page

Table 4 continued from previous page

Diagnosed problem	Possible reason	Potential solutions
<p><b>Poor understanding of catchment areas, overlapping, uncertainties in the number of target population</b></p>	<p>Outdated census or other data that does not accurately account for where people live</p>	<p>District staff to support health facility to determine catchment areas and target population.                      Display data using maps and tables showing boundaries and population figures for each target groups.                      Discuss appropriate means to collect denominator information from community (e.g., birth register).                      **Where possible consider the use of geospatial data and technology for more accurate population estimates and geographic distribution.</p>
<p><b>Data not used</b></p>	<p>The right analytical tools are not available or known.                      The data are of poor quality and cannot be used in a meaningful way.                      People lack the skills to use data in a meaningful way.</p>	<p>Consider analytical skills and the capacity to make decisions based on data as part of the job requirements for key positions.                      Build standard immunization dashboards with the information that is most relevant for each level, and make these available in the used electronic systems, or through other ways of dissemination.                      Consider providing basic Public Health training to all people working on data so they can appreciate the use of the data they are managing.</p>



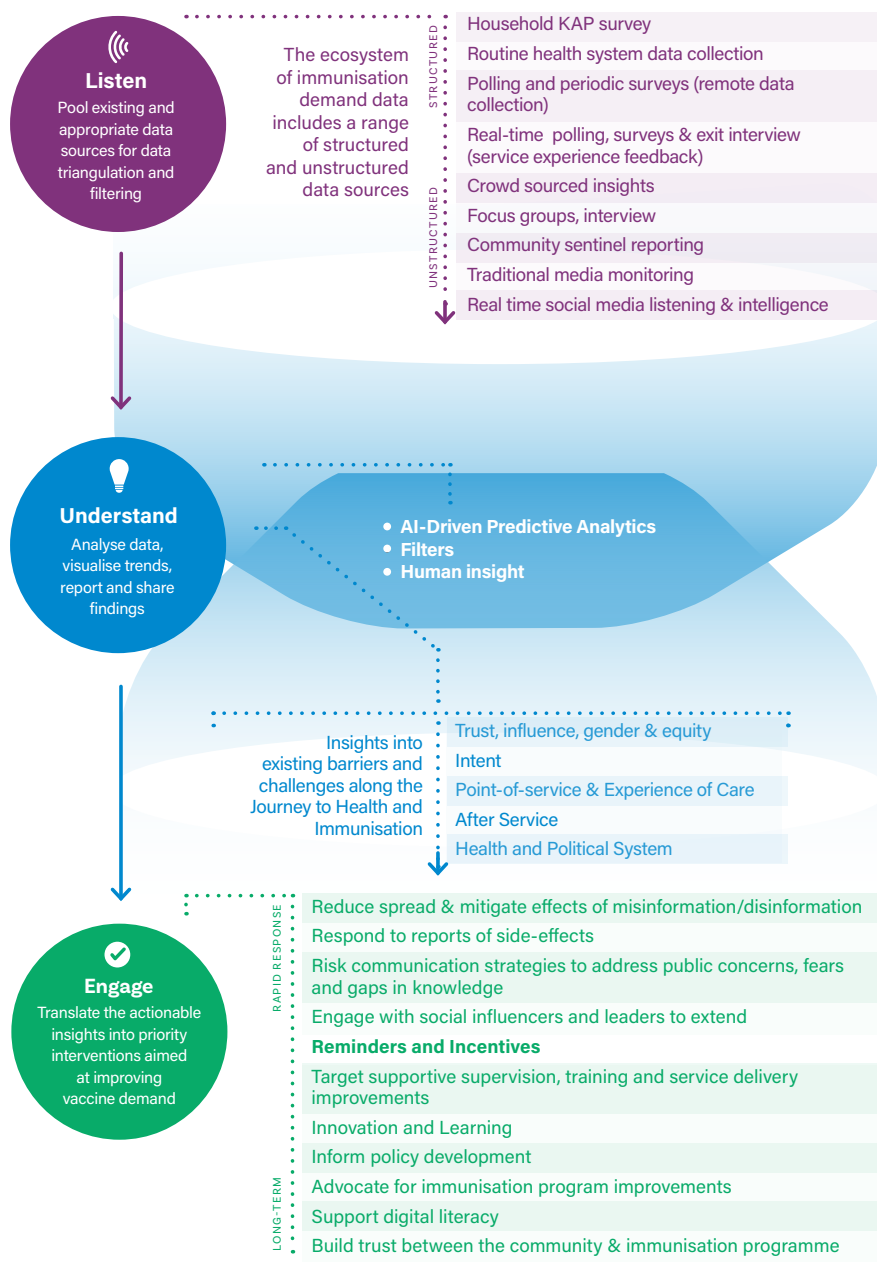
Himanshu Singh Gurjar photo

# Digital Social Listening: A New Source of Immunisation Data

A complement to routine data collection that tracks the delivery and uptake of immunisation services along with immunisation coverage and equity through national health information systems is digital social listening which captures immunisation demand information. The following graphic illustrates the broad range of data sources as well as the data

uses. This information is often captured at an individual and/or a community level through surveys, media (traditional and social) monitoring, and community sentinel reporting. It can then be used to inform more targeted engagement and trust-building with caregivers and communities as well as risk communications in the case of vaccine hesitancy.

Figure 10: Digital Social Listening for Immunisation Data - Listening, Understanding, and Engagement



Source: [HealthEnabled \(2021\). Finding the Signal Through the Noise: A landscape review and framework to enhance the effective use of digital social listening for immunisation demand generation. Geneva: Gavi, The Vaccine Alliance.](#)



# Barriers to Effective Sub-national Data Use

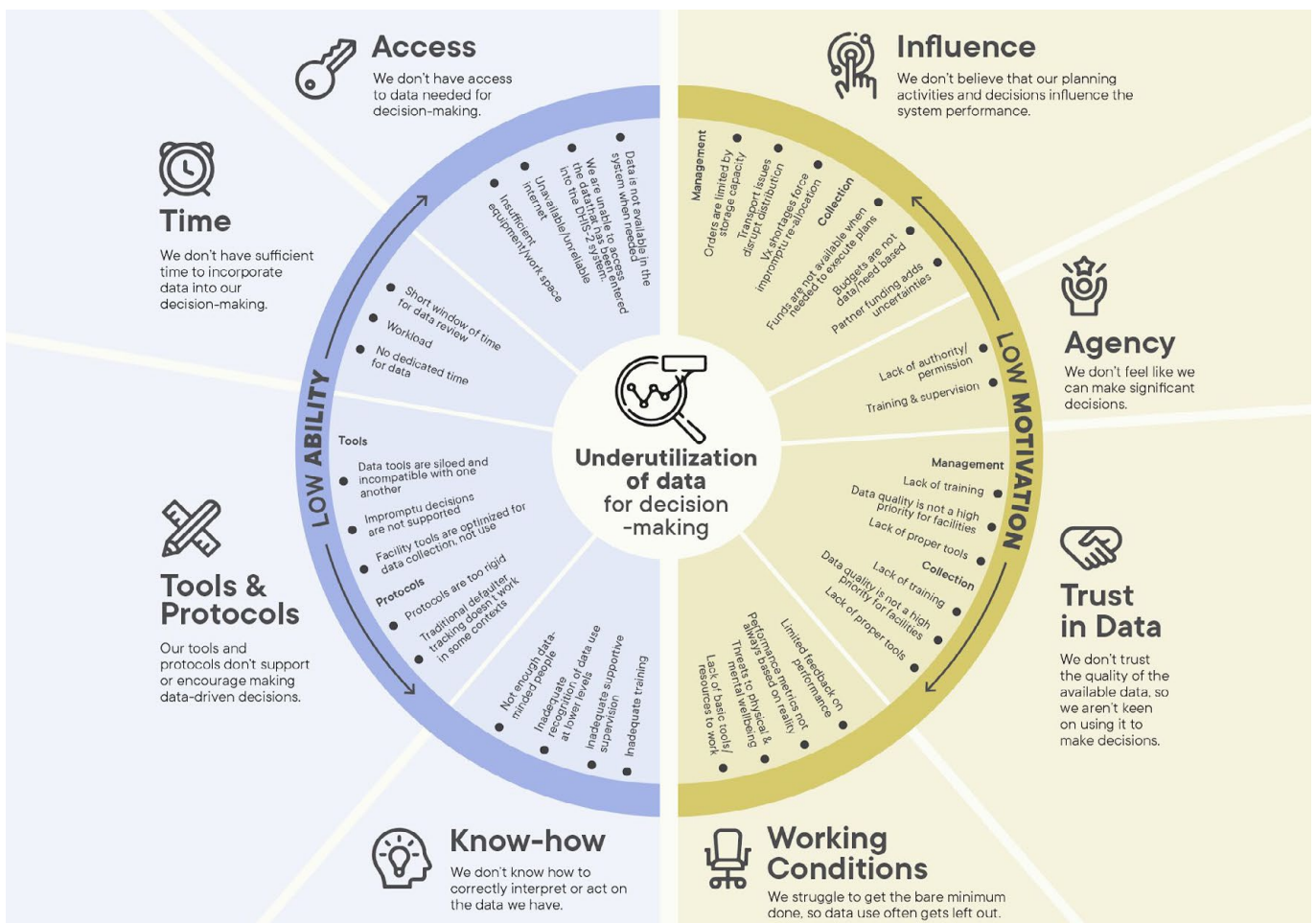
Factors leading to underutilisation of data for decision making can be subdivided into: 1) factors driven by low ability and 2) factors driven by low motivation. It is important to take these into consideration as part of overall HMIS system design and implementation as well as in the on-going tracking and monitoring of data availability and use.

**Low ability driven factors that lead to data underutilisation** refers to when the ability to include or successfully utilise data in the decision-making process is limited by external factors as well as knowledge gaps e.g., not having access to data, insufficient time to incorporate data into decision making, having tools and protocols that

don't support data driven decision making and lack of know-how to correctly interpret the data collected.

**Low motivation-related factors that lead to data underutilisation** refers to the ability to successfully utilise data in the decision-making process is limited by perceptions of data and role of health workers within the system, as well as external demotivating factors e.g., the working conditions, low trust in data, agency (health workers don't feel they can make significant decisions) and influence (belief that planning activities and decisions don't influence the larger system performance).

Figure 11: Framework summarising the 8 root causes that lower participants ability and motivation to utilise data for decision-making



Source : <https://www.jsi.com/project/vaccine-data-discovery-research-vxdel/>

## Feedback for Action

One approach that has been proven to overcome barriers to effective data use is the provision of feedback for action. Providing feedback to reporting sites such as district health staff, health facilities and to mid-level managers in charge fosters collaboration and creates an open environment that acknowledges the hard work done by providers of data. It gives them assurance that the data collected is analysed and made actionable. Feedback can be provided through avenues such as reports, seminars, Data Review sessions, monthly newsletters, bulletins, or circular letters. Mid-level managers can also organise for quarterly meetings to have face to face discussions with staff and other interested partners. Meetings are most effective if conducted when relevant data are analysed and prepared in advance in the form of graphs and illustrations, etc.

### Steps to giving feedback at national and sub-national level

- Consolidate report of provincial and district priority indicators for the 5 components of immunisation system
- Show overall progress made in last quarter
- Show a detailed analysis of location and problem areas
- Include information on the following: 1) Coverage (look at numerators separately) and dropout rates 2) Timeliness/completeness of reports and of the info 3) Cases of vaccine-preventable diseases 4) Results of AEFI investigations following immunisation 5) Stock

availability and Stockout information 6) Summarised underlying problems and contributing factors (root-cause analysis) 7) Acknowledge effort put into the job and encourages staff to keep doing better 8) Number of sessions conducted versus planned.

- Include clear data visualisation data to make the document reader friendly
- Include accounts of personal experiences/successes to enable staff to recognise themselves in the stories (positive stories)
- Use a feedback checklist if appropriate

Providing feedback in this manner contributes to the following:

- Places local data in regional data context and enable for accurate comparisons of data, performance and allow for visualisation of rates of coverage and drop-out
- Improves reports, accuracy, and promptness
- Facilitates efficient data use through provision of in-depth data analysis than can be peripherally achieved for instance, in case there is lack of computerisation of peripheral level, the central level might provide the computerised tables and maps to allow for local analysis (e.g., data triangulation)
- Provides community with vital indicators information such as drop-out rates and coverage rates for better planning and implementation of immunisation services
- Leads to improved performance by showing national progress towards public health priority areas and compares performances between regions, districts, and health facilities

# Making Data More Accessible and Useful Through Dashboards

Dashboards bring data from different sources together and help visualise them in a way that can generate automated alerts. They can be used to support reviews and planning at national level on the following: 1) Resource distribution such as finances, staff, vaccines, and cold chain equipment across districts; 2) Annual planning and reviews- including EPI macroplanning aligned to microplanning at sub-national level; and 3) Support identification of high performing districts for recognition and poor performing districts for corrective action.

The three main types of national dashboards needed are:

- **Annual Review Dashboard** This shows annual trends, quarterly or monthly trends for the most recent year and sub-national (district) comparisons.
- **Quarterly Review Dashboard** Indicates quarterly based analyses of mortality and morbidity trends, service utilisation, district performance against quarterly and/or annual targets and sub-national (district) comparisons for selected indicators.
- **Monthly or weekly trends** for selected diseases/ conditions of public health importance as observed and/ or reported by District Managers by monitoring monthly trends of vaccinated persons.

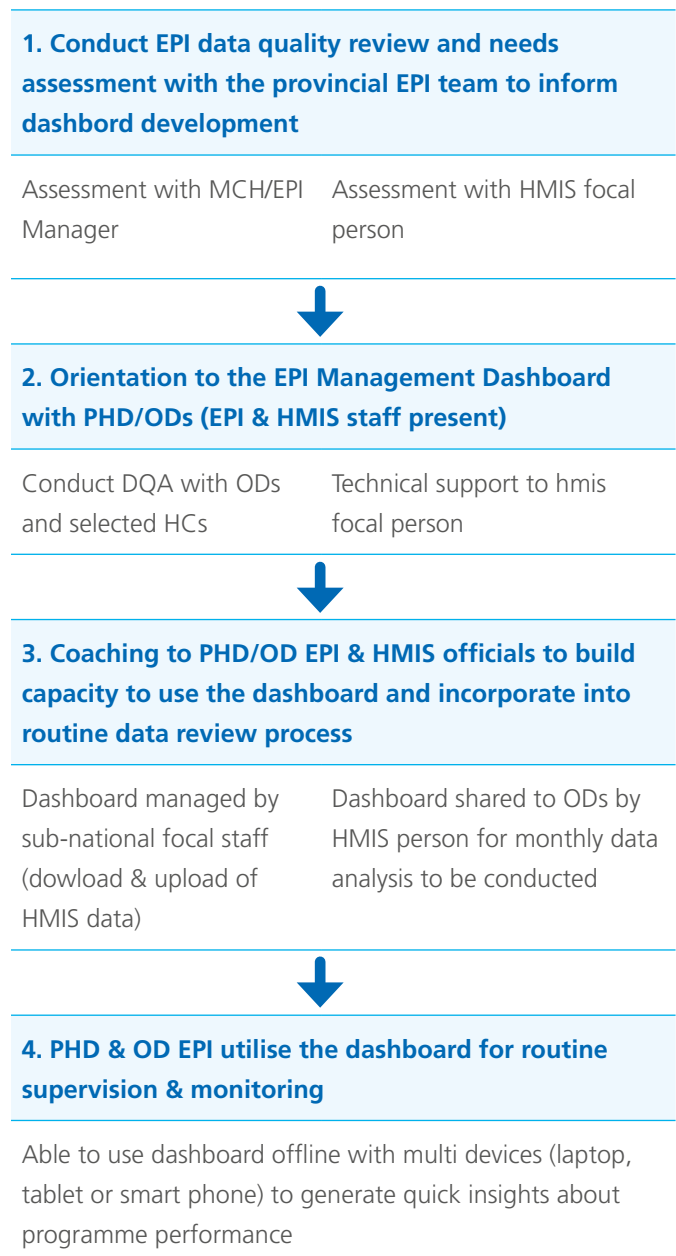
**It is very important to ensure that qualitative data components are integrated in dashboards and that the information is used to inform the decision-making process.**

Figure 12 has been included courtesy of the CHAI Cambodia, which has been working with the National Immunisation Programme to design, develop, implement, and monitor the use of dashboards as part of an effort to systematically increase sub-national data use.

Some of the lessons learned from the experience in Cambodia include:

- Limited time and capacity to engage in the dashboard development process
- Limited funding at sub-national level to conduct trainings in quality data collection and review

Figure 12: Dashboard for systematically increasing use of sub-national data



- Challenges in creating a culture of data use for decision-making rather than only when responding to requests for information
- Data reviews are across health areas, giving little time dedicated to immunisation data review and action



## Analyses and visualisations for sub-national level data sharing and use

At sub-national levels there are specific types of data analyses and visualisations that have been shown to improve EPI performance. These are outlined in Table 5.

### Special Considerations for Data Analyses and Visualisation

*a) Age and gender disaggregation proportions may only need to be presented annually, unless there are identified reasons for more frequent monitoring. If more frequent monitoring is needed, stacked bar*

*charts may be a more useful way to present the data, to enable easy comparison with the previous quarter or month.)*

*b) It is recommended to use stacked bar charts for monthly monitoring of proportional mortality and morbidity.*

*c) It is recommended to display numerator trends in cases where reliable catchment population estimates are not available to be used as denominator. For further guidance, refer to the EURO'S guide on data visualisation for immunisation: [https://www.euro.who.int/data/assets/pdf\\_file/0017/422630/WHO\\_Handbook\\_ENG\\_final-Web.pdf](https://www.euro.who.int/data/assets/pdf_file/0017/422630/WHO_Handbook_ENG_final-Web.pdf)*

Table 5: Analyses and visualisations for sub-national level data sharing and use

Type of analysis	Indicator Summary	Time Trends	Geographical Comparisons	Proportion Distributions
<b>Type of visualisation</b>	Table	Line Chart	Bar Chart on Map	Pie Chart
<b>District Dashboards</b>				
<b>Annual Review and Planning Dashboard</b>	Annual data, last 5 years Annual data, last one year, all facilities.	Annual data last 5 years. Quarterly or monthly data, last one year.	Annual data, last one year.	Annual data, one last year.
<b>Monitoring dashboard for current year:</b>	Quarterly data	Quarterly Data Compare with same quarter of previous year Weekly/monthly trends for defined indicators e.g. surveillance, how often facilities have reported.	Last quarter data	Last quarter data for proportional mortality and morbidity.
<b>Health Facility dashboards</b>				
<b>Annual review and planning dashboard</b>	Annual data, last 5 years	Annual, last 5 years Monthly, last 1 year.	Among hospital wards (selected indicators)	Annual data, last 1 year
<b>Monitoring dashboard for current year:</b>	Quarterly progress against facility targets	Monthly (or quarterly for some programs) Weekly or monthly for defined surveillance indicators	Among hospital wards (selected indicators)	

# Data Triangulation

Along with dashboards, data triangulation has been highlighted as an important strategy for a more holistic and comprehensive approach to planning, service delivery and monitoring of immunisation programmes. It refers to synthesising data from two or more sources e.g., coverage and surveillance data. It is important to closely monitor immunisation data to identify unvaccinated and under-vaccinated children for improvement of program performance. It is recommended to examine coverage and surveillance data alongside each other to assess immunisation programme effectiveness.

Triangulation refers to the synthesis of two or more existing data sources to address important questions or programme planning decision making. TechNet – 21 The Technical Network for Strengthening Immunisation Services has developed the following key considerations and 4-step process to guide triangulation.

## Key Data Triangulation Considerations

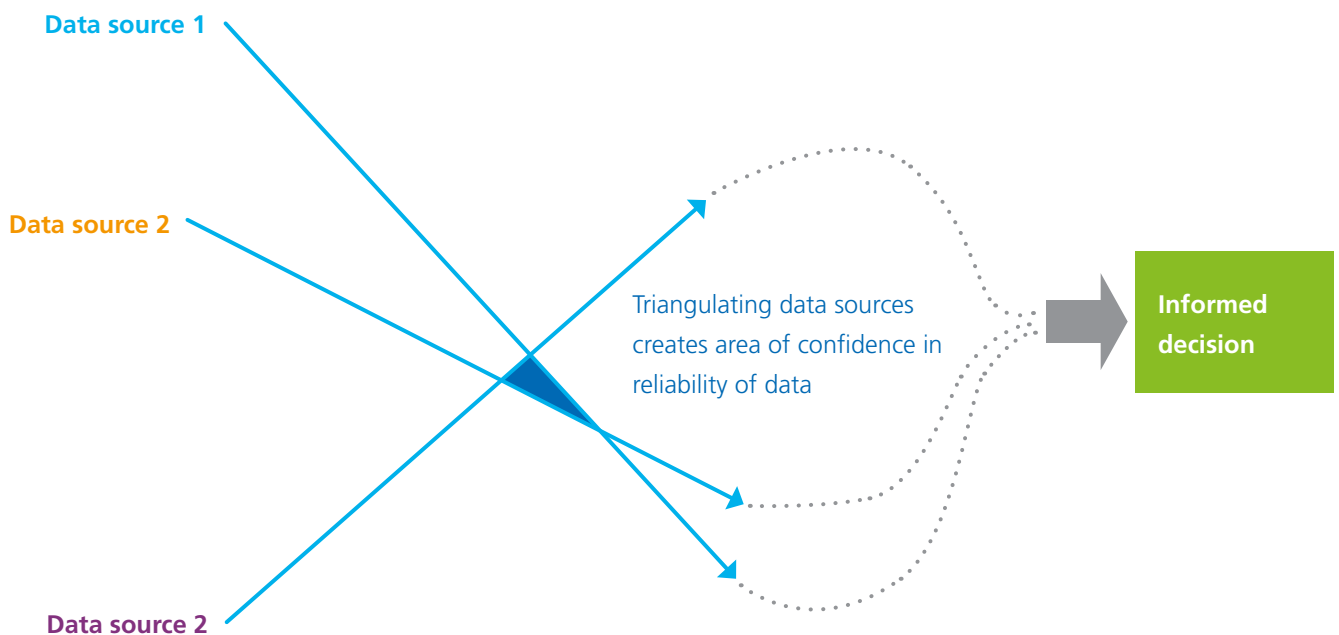
### Principals of data triangulation

- i) Develop important program objectives*
- ii) Use existing data-no new data are collected*
- iii) Include diverse data sets-data describing trends are useful*
- iv.) Integrate local knowledge and contextual information to make sense of the data*
- v.) Communicate results so action can be taken*

### Key stakeholders to engage in data triangulation process at subnational levels

- i) Immunisation and VPD surveillance focal points at subnational levels*
- ii) Partner organisations providing support to subnational immunisation or VPD Surveillance.*

Figure 13: Triangulation of different data sources to make informed decisions



iii) Program staff at the national, regional, and subnational levels

v) Scope of the triangulation exercise that could greatly impact the set timelines

For more information visit: <https://www.technet-21.org/en/topics/triangulation>.

### Time and resource considerations for data triangulation process

i) Understand the complexity of the issue you intend to examine

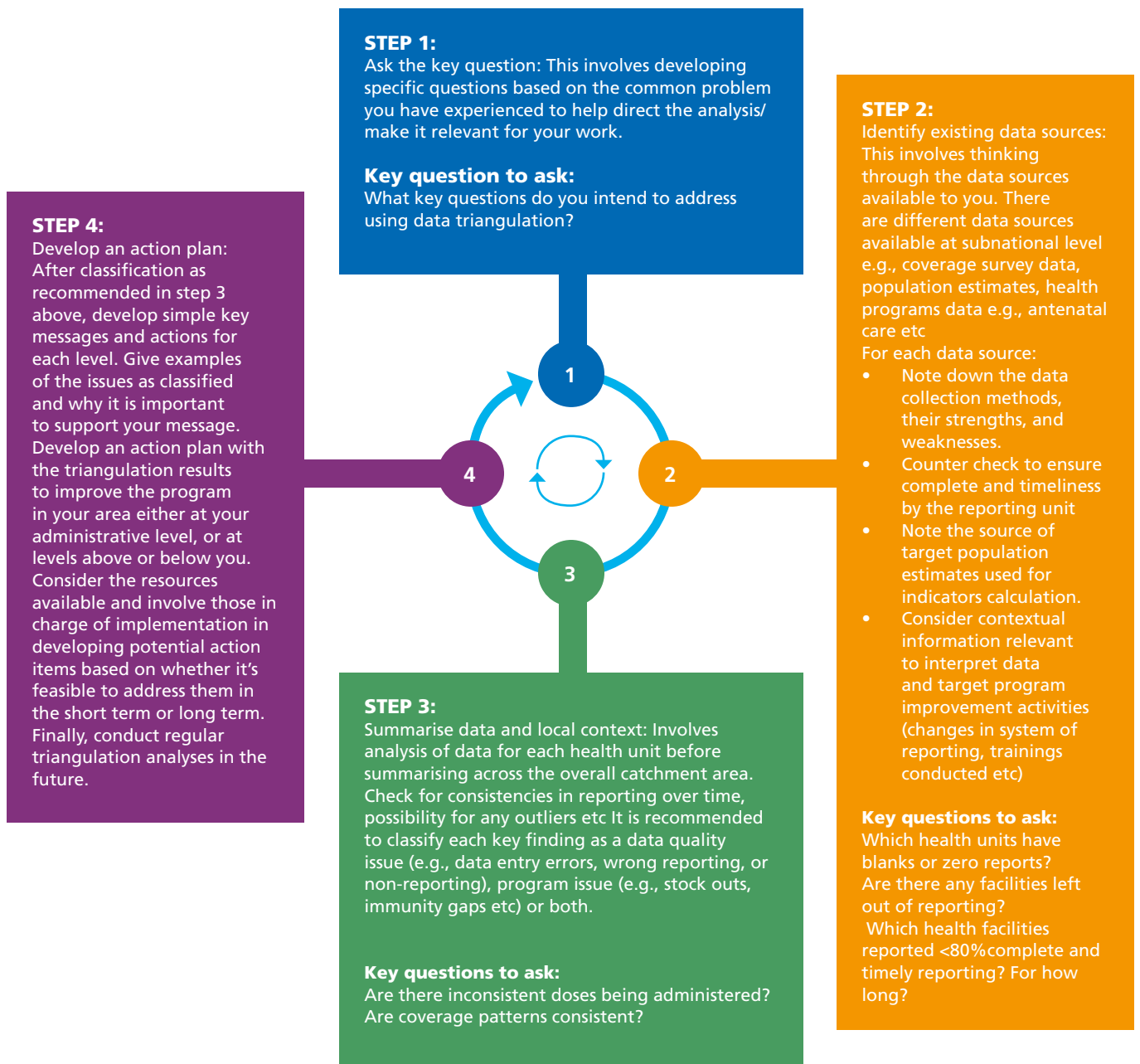
ii) Availability and quality of the data

iii) Number of stakeholders you intend to involve in the process

iv) Ability and availability of analysts to participate in the process. (If required)

Subnational programme managers play a key role in data monitoring, including routine validation and correction of data errors, on-the-job training of staff and improvement planning. Triangulation can help to identify health units that should be prioritized for follow-up. Figure 14 below shows the 4 key steps to conducting a data triangulation process.

Figure 14: The four-step process for data triangulation



# Ethiopia Data Triangulation Case study

The following were the lessons learned from Ethiopia's data triangulation efforts:

1. **Triangulation can foster better coordination among health staff with different professional roles:** This is important to analyse data from different perspectives and encourage group problem solving.
2. **Regular availability of data is important to fully leverage the benefits of triangulation:** To optimally triangulate data, it is essential to ensure regular reporting of data to the data systems that will be used for triangulation analysis; otherwise, the indicator measures could fall short of achieving desired objectives. Efforts to improve and sustain data availability/ completeness should be prioritized.
3. **Subnational managers could use data triangulation to monitor issues at the district level:** Given that data triangulation can be complex, having subnational managers use data triangulation as a management tool at the regional level to address problems happening at the district level showed some success. This takes ongoing practice and support.

Table 6: Case study for data triangulation in Ethiopia

Name of project	Data Triangulation Implementation Process
<p><b>UI-FHS (Universal Immunisation through improving family health services)</b></p> <p>Source: Project Details: <a href="https://youtu.be/xR6vlif6GqY">https://youtu.be/xR6vlif6GqY</a></p>	<p>From 2011-2021, JSI Research &amp; Training Institute, Inc. (JSI) implemented the Universal Immunization through Improving Family Health Services (UI-FHS) project in Ethiopia. In over 100 districts, UI-FHS applied quality improvement methods and tools to the national Reaching Every District (RED) strategy to strengthen the routine immunization system. This approach, known as RED-QI, focuses on improving equity in immunization service delivery to ensure that all children are reached with high-quality vaccination services.</p> <p><b>Phase 1: Learning Grant</b></p> <p>From 2011-2014, the project implemented in three districts with varying context, examining what it would take to strengthen routine immunization (RI) in each. Coverage and serology surveys were conducted at baseline and endline that demonstrated improved levels of protection and coverage, improved timeliness, and reduced missed opportunities for vaccination (MOV).</p> <p><b>Phase 2: Scaling RED-QI</b></p> <p>From 2014-2018, the project scaled RED-QI to over 100 districts (two-thirds of which were in weak-infrastructure settings). UI-FHS implemented tailored strategies to strengthen implementation based on context and produced lessons on what it takes to scale.</p> <p><b>Phase 3: Institutionalization</b></p> <p>From 2018-2021, the project shifted focus to capacity building at Regional Health Bureau (RHB) and Zonal Health Department (ZHD) levels to institutionalize RED-QI. UI-FHS also piloted new innovations such as integrated planning and service delivery with other health services and data triangulation activities, and it conducted an urban immunization assessment.</p>

Figure 15 captures the main recommendations from the Ethiopia data triangulation experience. It highlights the need to design with and for users, change management, getting

started with imperfect data, and not letting the perfect be the enemy of the good.

Figure 15: Data triangulation recommendations based on experiences in Ethiopia





# Conclusion

Before embarking on the journey to enhance immunisation programmes through effective sub-national data use, it is important to have a basic understanding of the main decisions that are made by each level of the EPI. This guide begins with an overview of HMIS and then highlights the key decisions, maps them to the data and the sources of the data to inform those decisions, provided key actions to overcome common challenges, and pushes this work forward through

key considerations for dashboards and data analyses and visualisation as well as data triangulation. The ultimate goal is to improve EPI by giving the most critical input of data to better plan, deliver services and monitor performance at national, sub-national, and facility levels so that no one is left behind with immunisation. Effective sub-national data use serves as a foundation for a well performing immunisation programme.



GAVI/2017/Frédérique Tissandier photo

# Annex A: Resources

PATH and Pan American Health Organization. (January 2019). Immunisation Data: Evidence for Action. A Realist Review of What Works to Improve Data Use for Immunization, Evidence from Low- and Middle-Income Countries. Available: [LINK](#)

Triangulation for Improved Decision-making in Immunisation Programs: Draft Guidance (July 2020) [LINK](#) (English, French)

Gavi Analysis Guidelines: [LINK](#)

Global Vaccine Action Plan 2011-2020 [LINK](#)

WHO Effective Communication of Immunization Data (2019) [LINK](#)

Ethiopia (see the immunisation data triangulation tool): [Tools & Guidelines \(jsi.com\)](#)

RAPID regular Appraisal of Program Implementation in a District (Nigeria, and elsewhere): [LINK](#)

How engaging non-health stakeholders strengthens immunisation performance by John Snow Inc. [LINK](#)

VX Data Insights study (Kenya, DRC and Mozambique): A country Brief. [LINK](#)

Data Triangulation Process: [LINK](#)

Data Triangulation Case Study in Ethiopia: [LINK](#)

Gavi Digital Health Information Strategy: Technical brief series -Subnational multi-source data for immunisation programme decision making. [LINK](#)

Strategizing for health sub-national levels by WHO: [LINK](#)

SAGE working Group on quality and use of global immunisation and surveillance data (August 2017-October 2019) : [LINK](#)

Core Principle Annex-Data Guided: [LINK](#)

Assessment of immunisation data management practices, facilitators, and barriers to immunisation data quality in the health facilities of Tach Gayint district, Northwest Ethiopia. [LINK](#)

Improving the quality and use of immunisation and surveillance data: summary report of the working group of the strategic advisory group of experts on immunisation. [LINK](#)

Finding the Signal Through the Noise: A landscape review and framework to enhance the effective use of digital social listening for immunisation demand generation [LINK](#).

# Annex B: References

Scobie HM, Edelstein M, Nicol E, Morice A, Rahimi N, MacDonald NE, Danovaro-Holliday CM, Jawad J; SAGE Working Group on Immunization and Surveillance Data Quality and Use. Improving the quality and use of immunisation and surveillance data: Summary report of the Working Group of the Strategic Advisory Group of Experts on Immunization. *Vaccine*. 2020 Oct 27;38(46):7183-7197. [LINK](#)

Campbell JD, Pasetti MF, Oot L, Adam Z, Tefera M, Beyane B, Mulholland N, Steinglass R, Krey R, Chen WH, Blackwelder WC, Levine MM. Linked vaccination coverage surveys plus serosurveys among Ethiopian toddlers undertaken three years apart to compare coverage and serologic evidence of protection in districts implementing the RED-QI approach. *Vaccine*. 2021 Sep 24;39(40):5802-5813. [LINK](#)

Improving the generation, quality, and use of data for routine immunisation systems through the use of process indicators and other strategies. Summary poster (multi-country) by John Snow Inc.: [LINK](#)

Travassos MA, Beyene B, Adam Z, Campbell JD, Mulholland N, Diarra SS, et al. (2016) Immunisation Coverage Surveys and Linked Biomarker Serosurveys in Three Regions in Ethiopia. [LINK](#)