Quality and Use of Immunization and Surveillance Data

SAGE Working Group
2 April 2019

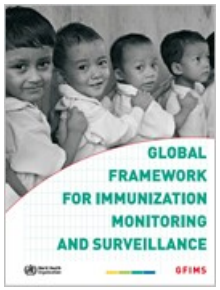
BACKGROUND

20 years of discussing immunization data quality

SAGE Meeting

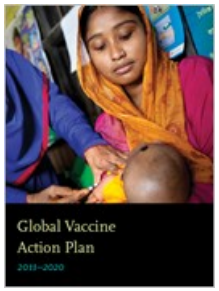
1998

GFIMS



2007

SAGE Meeting & GVAP



2011

GVAP Reports

2013–2018

Poor data quality impeding programme improvement. Data quality should be top priority.

Post-2020

June 1998 — SAGE

- Many inconsistencies in coverage data
- Recommended intensified efforts & resources to improve data quality in context of health systems strengthening
- Led to development of annual WHO/UNICEF estimates of national immunization coverage (WUENIC)

Nov. 2011 — SAGE

- Recommended to improve national/ subnational coverage & surveillance data
- Caution in interpreting coverage estimates for performance-based financing
- WHO to improve coverage survey methods, develop serosurvey guidelines, & support improved use of surveillance data

SAGE Working Group
Quality and Use of Global Immunization and Surveillance Data

Established August 2017

SAGE MEMBERS

Jaleela Jawad: Ministry of Health, Bahrain (Chair of the Working Group)

Noni MacDonald: Dalhousie University, IWK Health Centre, Canada

EXPERTS

George Bonsu: Ghana Health Service, Ghana

Michael Edelstein: Public Health England, UK

Hashim Ali Elzein Elmousaad: Independent Consultant, USA

Pradeep Haldar: Ministry of Health and Family Welfare, India

Claudio Lanata: Instituto de Investigacion Nutricional, Peru

Ana Morice: Independent Consultant, Costa Rica

Mimi Mynak: Ministry of Health, Bhutan

Edward Nicol: South African Medical Research Council; Stellenbosch University, South Africa

Nargis Rahimi: Shifo Foundation, Sweden

Heather Scobie: Centers for Disease Control and Prevention, USA

Carolina Danovaro: WHO Secretariat/focal point

Terms of Reference (TORs) — 1

1. Take stock of **data availability** and determine if there are unmet **immunization monitoring and evaluation data needs** at global and regional level, and suggest revisions for reporting processes;
2. Review existing and new draft **standards and guidance** on immunization monitoring and vaccine-preventable disease (VPD) surveillance data to identify gaps, revisions, and areas that require updates;
3. Review and assess the **current 'state' of immunization and VPD-surveillance data quality and use** at country, regional and global level;

Terms of Reference (TORs) — 2

4. Review **evidence** on:
   a. **factors** that may cause **and/or limit access to quality and use** of immunization and VPD-surveillance data for decision-making at different levels;
   b. **effectiveness** (including where possible, **cost-effectiveness**) of **interventions** for improving access to, improving quality of, or promoting the use of data at national and subnational levels;
5. Review the status of **information systems** that collect immunization and VPD-surveillance data, the availability of modern **information technologies**, and their current and potential future role in supporting the collection, management, analysis and use of immunization and surveillance data;
6. Identify **knowledge gaps** & create prioritized research agenda.

Outline of Session

Methods & Framework

Landscape (TOR1–3)

Barriers and Solutions (TOR 4a & 4b)

- Governance
- People
- Tools (also TOR5)
- Assessment & Improvement Planning (also TOR3)
  - Data use, triangulation, continuous quality improvement (CQI)

Evidence Gaps & Research Agenda (TOR6)

Recommendations

Methods & Framework

Heather Scobie, SAGE Data WG Member

Methods

- Since August 2017 — multiple teleconferences & three face-to-face meetings (including Data Partners' Meetings, 2017 & 2018)
- Data within scope: vaccine coverage, programme indicators (e.g., vaccination sessions), vaccine supply, & VPD surveillance
- Topic not amenable to GRADE methodology because TORs broad, and much of related evidence descriptive in nature
- Evidence from literature reviews & landscape analyses — published & grey literature
  - Systematic reviews used where available
  - Expert opinion & consensus, where paucity of high-quality evidence
- Recognize contributions of WHO, UNICEF, country Ministries of Health, and partner organizations

Methods: Studies & Reviews Conducted

Landscape analyses — TOR1, 2, 3 and 6

- Document reviews, survey of 22 key informants, survey of 6 Regional Offices
- Data availability/reporting; guidance/standards; data quality assessment/indicators; data triangulation; evidence gaps & research

Literature reviews — TOR4a/b and TOR5

- IDEA realist review: what works to improve data use for immunization in low- & middle-income countries (LMICs)
- Scoping review: pre- & in-service training on immunization data, LMICs
- Scoping review: factors limiting quality of immunization data, LMICs
- Barriers limiting quality & access to VPD surveillance data
- Novel approaches for immunization data
- Novel methods for polio surveillance & applicability to other VPDs

- **Data triangulation: tetanus vaccination & surveillance (TOR3)**
- **Series of country case studies (various TORs)**

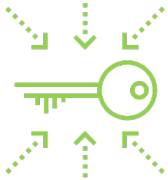
Attributes of data quality:
Defined as "fit-for-purpose" (quality & usability)

ACCURACY

Degree of agreement between a given measurement & the actual (or true) value. Proxies: concurrence, integrity.*

PRECISION

Degree of spread among a series of measurements that is independent of accuracy. Proxy: consistency.*



RELEVANCY

Degree to which the data collected & reported reflect what is most important to support decision-making & not in excess of what is needed so as to consume scarce resources.

COMPLETENESS

Degree to which all relevant data needed for decision-making are recorded & reported and therefore available for use.

TIMELINESS

Degree to which data are current & available when needed to inform decisions.

Adapted from *Bloland P, MacNeil A. In press.*

* *Proxies:* Concurrence — Degree of agreement between different methods intended to measure the same construct.
Integrity — Degree to which data, once entered into official record, are not lost, incorrectly transcribed, or otherwise altered from the original.
Consistency — Degree to which data attributes are free from contradiction and are coherent with other data in a specific context of use.

Simplified Theory of Change: How actions lead to improvements in programmes & health outcomes

If actions to improve these are implemented	then data will be	and used for	resulting in
Assessment & improvement planning **Governance** **People** **Tools** **Evidence**	**Available** **Fit-for-purpose**	**Decision-making & improvements in programme** Planning Implementation Monitoring	**INCREASED** Coverage & Equity, Efficiency **DECREASED** Morbidity & Mortality

Source: Global Framework to Strengthen Immunization and Surveillance Data for Decision-making– June 2018 draft

Landscape

Landscape: Data Availability & Reporting

Considerable variety of immunization and surveillance data available nationally, regionally and globally

- Increasing demand for disaggregated data (subnational, individual-level)
- Some gaps: equity, high-risk (e.g., migrants), private sector, life-course
- Collected data may be inaccessible to those that need them

WHO/UNICEF Joint Reporting Form (JRF) — important for global monitoring

- Revised every 2 years
- Increasing time & resources required for countries to complete it

WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) — improved reliability & comparability across countries

- Review of WUENIC and alternatives by Immunization and Vaccine-related Implementation Research Advisory Committee (IVIR-AC) is well received

Landscape: Data Quality & Use

Poor quality immunization & surveillance data

- Especially in LMICs, where data needed to target missed populations

Vaccination coverage (numerators & denominators, surveys)

- 35% of subnational areas — vaccination coverage >100% (2018)[1]
- 11% of countries with >10% annual variation in reported live births[2]
- Inconsistent estimates from closely timed coverage surveys
- Few LMICs with quality vital registration (reliable denominator source)

VPD surveillance

- Relevant data not always collected (age, vaccination, lab confirmation)
- Reporting delays cause delayed outbreak detection
- Data collected not always analyzed/used (other than polio, measles)

Efforts in countries & regions to improve data quality & use

- Guidance & standards
- Data quality assessments
- Electronic immunization registries, web-based information systems

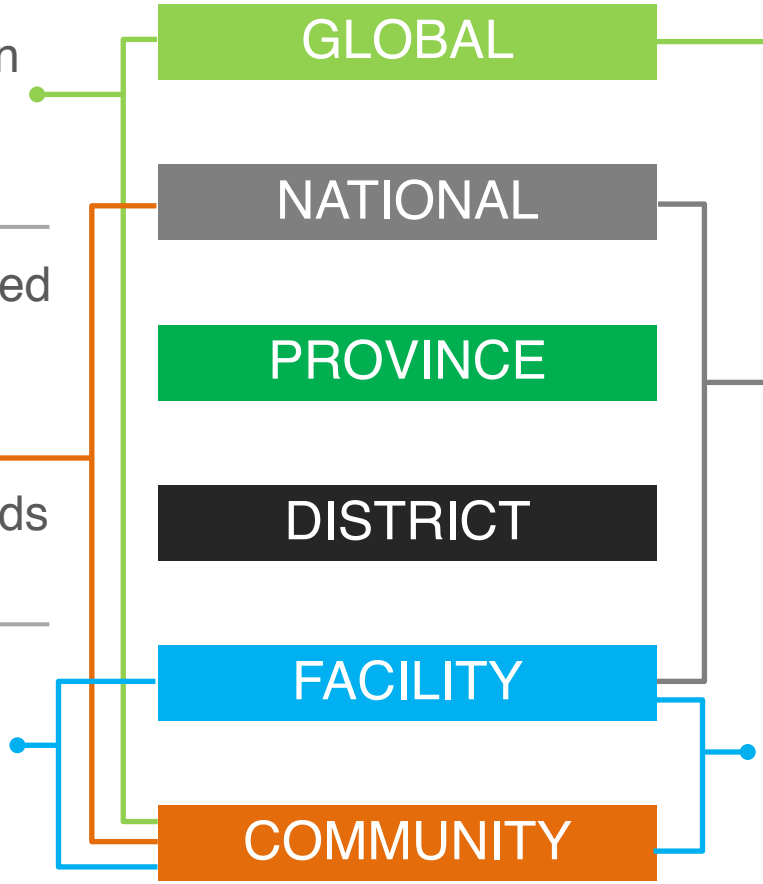
[1] https://www.who.int/immunization/monitoring_surveillance/data/limitations.pdf?ua=1
[2] Stashko et al. PLoS One. 2019.

Sources of Data Quality Loss

- Intentional falsification
- Inaccurate denominator data

- Poor/ missing/ outdated forms
- Errors in transcribing, calculation
- Loss, damaged records
- Procedural gaps

- Failure to record properly
- Private sector not included



Sources of Data Use Failure

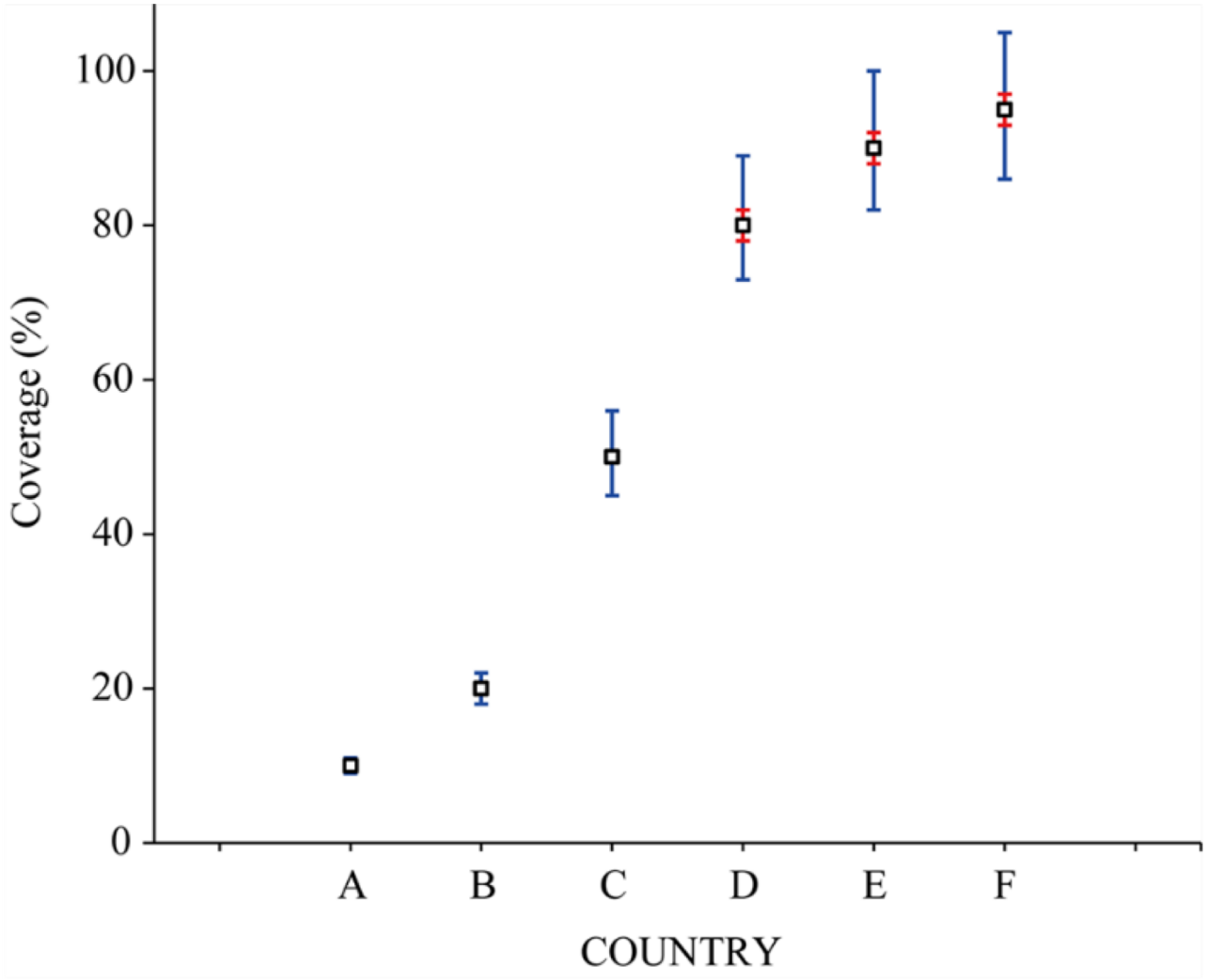
- Lack of confidence in quality of available data & information

- Lack of advanced data analysis & interpretation skills

- Lack of basic data analysis & interpretation skills
- Lack of understanding of how to use data to monitor programme

Adapted from *Bloland P, MacNeil A. Defining & assessing the quality, usability, and utilization of immunization data. In press.*

Effect of 10% error in target population estimates on immunization coverage rates



Brown et al. Avoiding the Will O' the Wisp: Challenges in Measuring High Levels of Immunization Coverage with Precision. World Journal of Vaccines. 2014;4(3):3.

Landscape: Standards & Guidance

Plenty of monitoring guidance available regionally & globally — more than 10 during 2017–2018

- Improve awareness & discoverability
- Trend towards longer (200+ page) online guidance

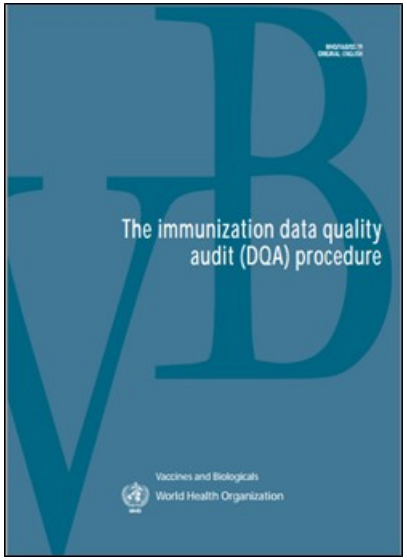
Highlights

- VPD Surveillance Standards (2018), Coverage Survey Manual (2018), EPI Review (2018), 2YL (2018), various serosurvey guides
- Continuous Improvement Plan (cIP) for vaccine supply chain (2018)
- Accompanying capacity-building: workshops, distance & e-learning
- Draft: Data Framework; Data Handbook; Immunization Competencies

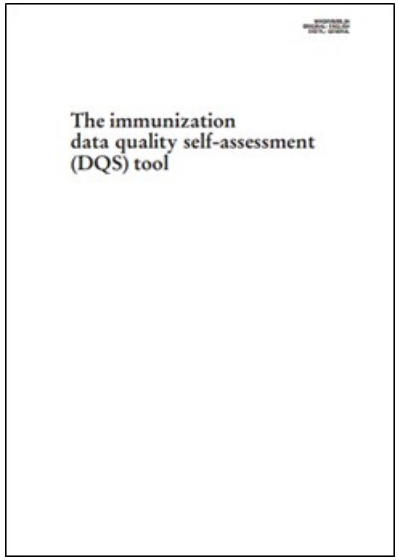
Some areas where user-friendly, practical guidance needed

- Life-course, migrants, equity, triangulation, electronic immunization registries (EIRs), capacity building (e.g., data use)
- Denominators — 2015 draft guide needs revising & finalization (e.g., include developments in GIS use)

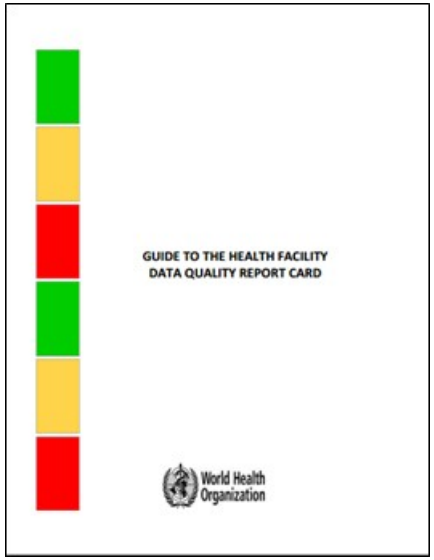
History of data quality assessment methods:
published WHO guidance



Data Quality Audit
(DQA)
2003



Data Quality Self-Assessment
(DQS)
2005

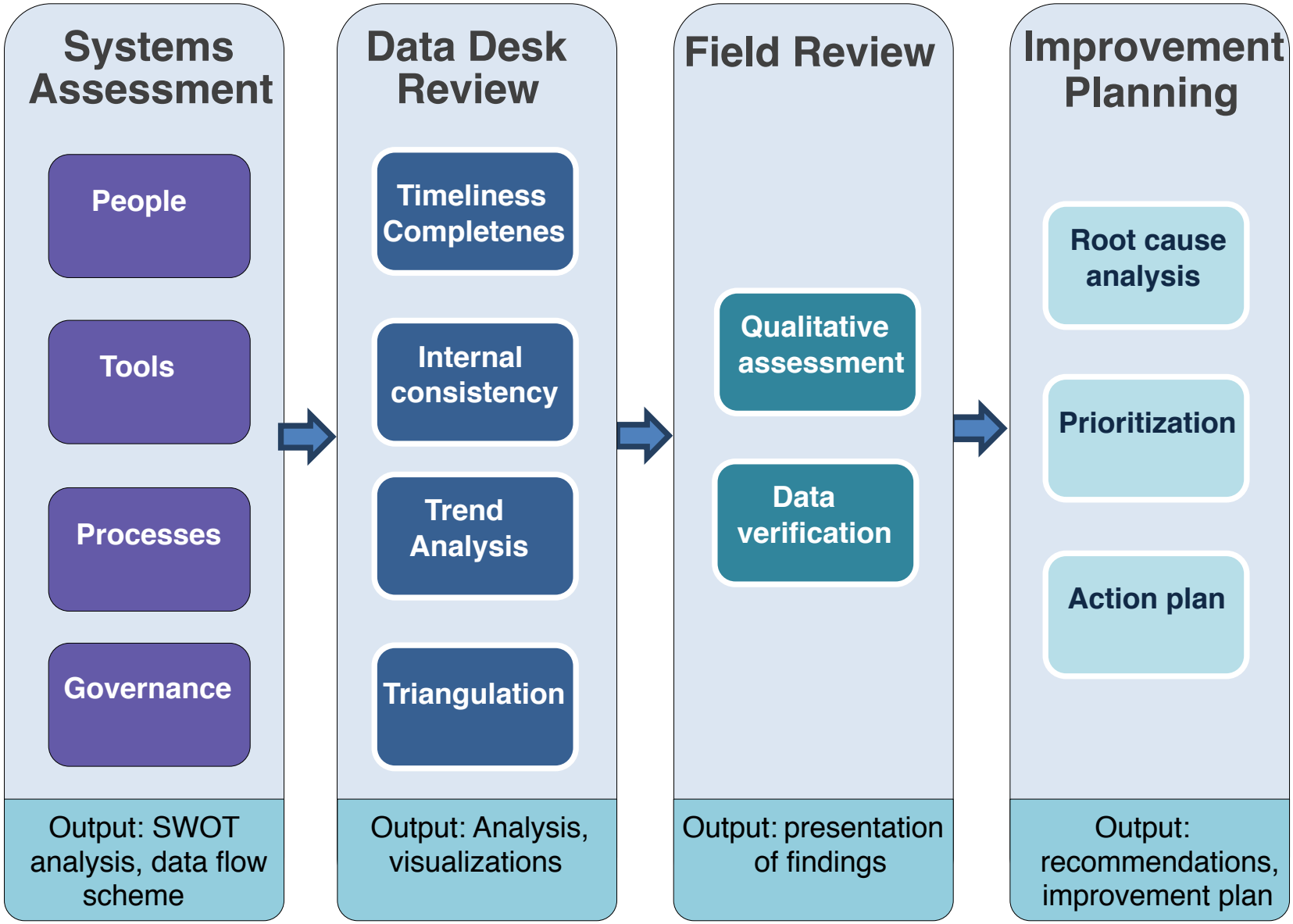


Data Quality Report Card
(DQRC)
2015

Data Quality Review
(DQR)
2018

Framework for assessing and improving data quality

part of WHO draft Data Handbook



Data Quality Indicators

Data quality attributes & measures not standardized

- Same basic analysis approaches in place since 1998

Single composite data quality indicator for immunization coverage presented to SAGE in Oct 2015 — rejected

- Completeness of reporting; internal consistency of numerator, denominator; external consistency of admin coverage & other sources
- Composite indicators of limited value because can obscure issues with individual components

In absence of global indicators, Gavi made own 7-indicator panel

WG proposes — develop panel of indicators (with 1–2 key indicators) relating to key data quality & use attributes

- For routine monitoring of data quality alongside coverage & equity
- Can use summary table of indicators from WG review as starting point
- Similar to what exists for surveillance performance monitoring

Surveillance Monitoring & Indicators

Standardized approaches to evaluating & monitoring VPD surveillance systems — since 1980s

- Integrated for different VPDs at global level in 2018 EPI Review

Data quality assessment methods less developed

- Capture-recapture, reviewing registers for “missed cases,” comparing across aggregate & case-based systems

Panels of VPD-specific surveillance performance indicators in 2018 Surveillance Standards

- Used routinely for polio since 1980s & measles since 1990s
- Completeness, timeliness, sensitivity, representativeness, adequacy of case investigation & laboratory confirmation
- Mix of system & data quality attributes (fit-for-purpose includes usability)
- Serve as basis for strong monitoring & accountability framework for global elimination & eradication programmes

Global Initiatives: New or Under Development

WHO Immunization Monitoring Academy

- Multi-month, enrollment in distance learning programme
- Online lectures, discussion sessions, and projects

WHO Immunization Information System (WIISE)

- Global data mart — JRF, subnational coverage, measles-rubella surveillance, campaigns, etc.
- Electronic JRF (eJRF) — optimize reporting
- Automated analyses/visualization — more useful

Global Comprehensive VPD Surveillance Strategy

- Include more VPDs, based on country priorities
- More individual-level & laboratory data
- Greater emphasis data visualization & use for routine programme monitoring, decision-making & response

Selected Resources for Immunization Data Quality and Use at Regional Level

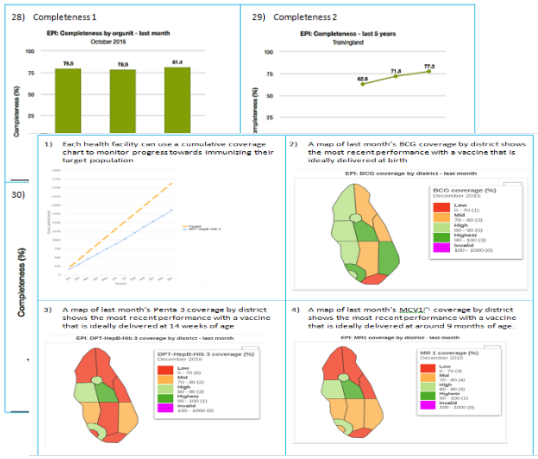
Americas Region

Coverage Monitoring: Vaccination & Deworming 2017

Electronic Immunization Registry 2018

African Region

Analysis of Health Facility Data 2018 (draft)



District Health Information System 2 (DHIS2) Dashboard

Recent country examples of data quality & use improvement efforts (last 5 years)

Country	Examples
China	• Coverage monitoring — disaggregating by residential status • Triangulating surveillance data to identify immunity gaps
India	• Subnational coverage estimation (similar to WUENIC) used to prioritize districts for intensified immunization • Case-based surveillance pilot for diphtheria, pertussis, tetanus
Nigeria	• Denominator improvement pilots, including GIS, micro-census • Data mentoring & supportive supervision by 266 Nigeria Stop Transmission of Polio (NSTOP) officers in high-risk states & local government areas

Governance

Nargis Rahimi, SAGE Data WG Member

Leadership, ownership, political will

Strengthening immunization data quality & use — long-term process requiring evidence-based decisions owned by countries down to frontline where data is collected

Success factors

- Common vision, strategies, framework for monitoring across government and international partners
- Strong leadership, political support, organisational culture
- Process independent of political cycle and changes
- Transparent and closely monitored plan, with timelines and clearly defined responsibilities

Example: National Immunization Technical Advisory Groups

- Independent group of national experts providing evidence-informed advice to programme decision-makers on immunization policy

Coordination & Collaboration

Good coordination & collaboration across areas and organisations (health systems approach) necessary to avoid:

Issue	Example
Fragmented information systems	• Country with 16 information systems caused by partners introducing duplicative systems, or systems specific to programme/ geographic area
Inefficiencies from lack of data sharing or non-interoperable systems	• Lack of private provider engagement in immunization and surveillance reporting cause poor representativeness, delayed outbreak detection
	• Poor agreement between epidemiologic & laboratory, or aggregate & case-based data caused by lack of communication between different units

Example: Health Data Collaborative

Collaboration among international agencies, governments, partners, academics to empower countries, align investments for strengthening data quality/use most efficiently & effectively

Accountability

As global health funding grows, increasingly clear that data quality and use are essential for monitoring progress, allocating resources

Results-based financing

- Challenge in LMICs where issues with coverage data quality
- Potential for perverse incentives
- SAGE in 2011, advised against use of coverage for performance-based financing

Case for broader monitoring framework

- Relative improvements, in addition to targets
- Data quality indicators
- Process indicators (e.g., service delivery)

Coupled with clear expectations for job duties & deliverables, all levels

- Feasibility of applying lessons learned from polio accountability frameworks

Resource Allocation

Need accurate estimates of resources needed for activities for immunization and VPD surveillance data & funding gaps

- Can be overlooked, underestimated

Ensure adequate human & financial resources

- Resources for data management at all levels
- IT infrastructure & tools that answer programmatic needs; maintenance
- Capacity building
- Data review meetings, communication
- Laboratories & sample transport for VPD surveillance

Example:

- England mandates to asses impact on workforce time when making changes to information system & processes

Standards, Policies, Agreements

Functional & efficient data systems require development and use of standards for all aspects of data management

- Collecting, processing, preserving, using/reusing, sharing, archiving, and disposing of data

Especially critical when being integrated or made interoperable with broader health information systems

Examples of challenges observed in countries

- Lack of standards, guidelines and other tools
- VPD information systems not collecting relevant data for use
- Poor archiving practices resulting in unavailability of historical data

Privacy & data security — emerging issue

Data sharing & archiving

Legal implications of sharing surveillance & immunization data vary by setting, but mainly relate to disaggregated data containing confidential or personal information

Systematic review defined 5 barriers to local, national & international sharing of public health surveillance data[1]

- Technical (e.g., poor archiving, restrictive format)
- Motivational (e.g., lack of trust)
- Economic (e.g., negative effects of reporting outbreak)
- Political
- Legal and ethical

Address both technical & non-technical issues to data sharing

- Guide from U.K. Chatham House[2]

Data sharing agreements can help resolve ambiguities

- Consider context, define terms, informal best in some situations

[1] van Panhuis et al. BMC Public Health. 2014; 14: 1144.
[2] https://datasharing.chathamhouse.org/

People

Importance of health workforce for data quality & use

There is no data quality without high quality data at local level

Yet, many interventions:

- Focus on national/district level, rather than health facility level
- Focus on technology (new tools), rather than people that drive information systems

Workforce capacity cited as limitation in >80% of references included in review of barriers to VPD surveillance data quality

Issue	Example
Staff shortages (*capacity*)	• Poor staff recruitment & retention • Inadequate person-time equivalents allocated for data
Skill shortages (*capability*)	• Data not included in pre-service training • Lack of in-service training, supportive supervision
Poor motivation to collect quality data	• Only reporting, rather using data • Lack of feedback • Competing priorities (clinical duties, other programmes)

Five-country study by WHO — Health workers in LMICs spend a third of time on data recording & reporting process at primary care[1]

[1] A. Siyam (WHO), *personal communication*

Other studies 25% to 40% (Whittaker et al 2015)

Competencies for data collection, analysis & use

Countries lack guidelines to help address workforce planning, management and evaluation

Use of competencies helps better allocate resources per required functions, define workforce roles & responsibilities

- Competency: combination of knowledge, skills & abilities needed to perform specific task in given context

WHO developed Immunization Competencies Framework — assess, design/revise policies, and plan workforce

- Includes monitoring evaluation at national, provincial, district and facility
- SAGE reviewed & recommended related tools in April 2017
- Guidelines under development — WG urges completion

WG attempted to define data quality & use roles and responsibilities for different levels

Data quality & use roles and responsibilities by level

Data flow	Data quality - roles and responsibilities	Data use - roles and responsibilities
Global	• Supports regions with monitoring/quality assurance of national data • Develops/disseminates training, tools and guidance • Organises /supports data quality workshops at global/regional level	• Ensures data availability through dashboards and databases • Monitors progress towards global goals • Feeds back regional & country-level evaluations and analyses • Develops evidence based global immunization strategy • Supports regional strategy development
Regional	• Data quality monitoring and support to countries • Develops/disseminates training, tools and guidance • Organises regular regional data quality workshops • Provides data to global level	• Validates coverage & disease trends at national level • Feeds back evaluations and analyses to individual countries • Monitors progress towards regional goals • Develops evidence based regional immunization strategy
National	• Data-related support & training to sub-national level • Sets national data quality standards • Monitors data quality and follows up with sub-national level • Data Archiving • Shares data upwards	• Monitors and feeds back local coverage, VPD incidence and performance indicators • Evaluates impact of vaccine programme • Uses data to guide policy making • Validates national and local denominator (collaboration with national statistic and demographic office) • Uses data to inform routine and emergency public health action
Sub-National	• Monitors data quality and follows up with facilities • Shares data upwards • Data-related support & training to facilities	• Monitors and feeds back local coverage, VPD incidence and performance indicators • Supports and trains facilities to use data for decision making • Uses data to inform routine and emergency public health action • Liaises with central level to define district target population
Local (Facility level)	• Collects, inputs and shares quality data in a timely way • Complies with data standards • Performs regular data quality checks	• Tracks undervaccinated individuals and communities • Supports identification of target population (denominator) • Use data for vaccine supply, staffing and planning

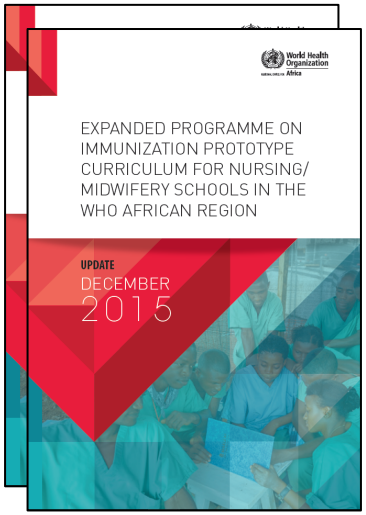
Pre-service training

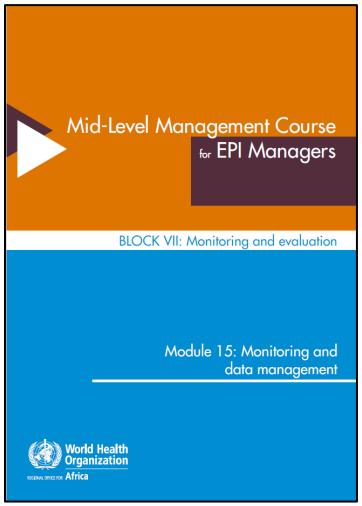
Scoping review of pre- & in-service training:

- Pre-service training often not adequate to prepare health workers with necessary skills & competencies
- Most tutors & clinical instructors at training institutions lack sufficient skills and relevant knowledge
- Programmes often fail to increase students knowledge & improve skills
- Lack of math skills among health workers involved with data collection at both facility & district levels

Examples exist for pre-service curricula & training including immunization data collection, analysis & use — further effort needed

- AFR Medical School & Nursing/Midwifery Immunization Curricula (2015)
- AFR Mid-Level Management for EPI Managers (2017)





Guidance from AFR

In-service training

Given inadequacy of pre-service training, regular in-service training necessary to refresh & update competencies

- Needs to address collection of high-quality data & use of data

Challenges observed

- Most investments in-service training — no substantial difference in skills acquisition & practice
- In some cases, increased capacity of frontline staff leads to staff attrition as seek better paying positions
- Lack of opportunities to receive qualifications on using latest health information systems

Training effectiveness can be improved by including adult-learning techniques — more interactive, than didactic

- WHO Immunization Monitoring Academy — model for how distance-learning, coupled with group discussions & mentoring on projects might increase training quality & minimize time away from posts

Supportive supervision & feedback

Supportive supervision — neglected aspect of workforce development
- Includes mentorship, joint-problem solving & communication
- Should be structured around providing hands-on support for specific deliverables or outcomes, rather than random checking
- Opportunity to identify bottlenecks & implement interventions for improving data quality & use

Supervision of front-line health workers often limited by lack of logistical & financial support
- Other: inadequate managerial skills, lack of leadership, workload

Timely feedback, preferably written, critical part of supervision
- Often observed to be lacking
- Important for enhancing data quality

Example: Data Improvement Teams in Uganda[1,2]
- Visited all districts & 90% health facilities in 3 years
- Improved data quality indicators
- Cost 0.5%–1.6% of immunization programme budget

[1] Ward et al. Emerg Infect Dis. 2017; 23(13). [2] K. Ward, Submitted.

Multi-faceted interventions

Multicomponent interventions most prevalent & often more effective for improving immunization use[1,2]

Health systems approach more likely to succeed and be sustained over long-term, e.g.,

- Data review meetings, creating national guidelines & protocols on data use, hiring data managers at all levels
- Training combined with supervision or group problem solving or certain multifaceted strategies — more effective than single strategies

No impact from technological interventions alone, without capacity building

[1] IDEA realist review 2018
[2] Rowe et al. 2018

Tools

Michael Edelstein, SAGE Data WG Member

Proliferation of tools

Tools: not a magic bullet

Most tools never go beyond pilot phase

- Developed solutions not always aligned with public health problems, user requirements, local context

Some tools improve data quality and/or use

- E.g. health information systems, dashboards
- Accuracy, completeness and timeliness

Success depends on:

- Addressing a well-defined problem
- Infrastructure (e.g., electricity, internet), integration, governance, financing, capacity

What tools are available?

- Immunization information systems
- Digitization of paper records
- Decision Support tools (e.g. dashboards)
- Logistic management information systems
- mHealth
- Media based approaches
- Geospatial based technologies
- Predictive analytics

Immunization information systems — 1

Vaccine & VPD surveillance data can be collected as part of stand-alone system (e.g. EIR), or as part of integrated health information system

	PROS	CONS
Stand alone	Developed with immunization programmes in mind	Data linkage Parallel, non-interoperable systems
Integrated	Better linkage Requirements across health programmes More resource efficient	Not developed specifically to meet the needs of immunization programmes Not used

Immunization information systems — 2

Both approaches — potential to improve data completeness, timeliness, integrity, efficiency & use especially when implemented at subnational level

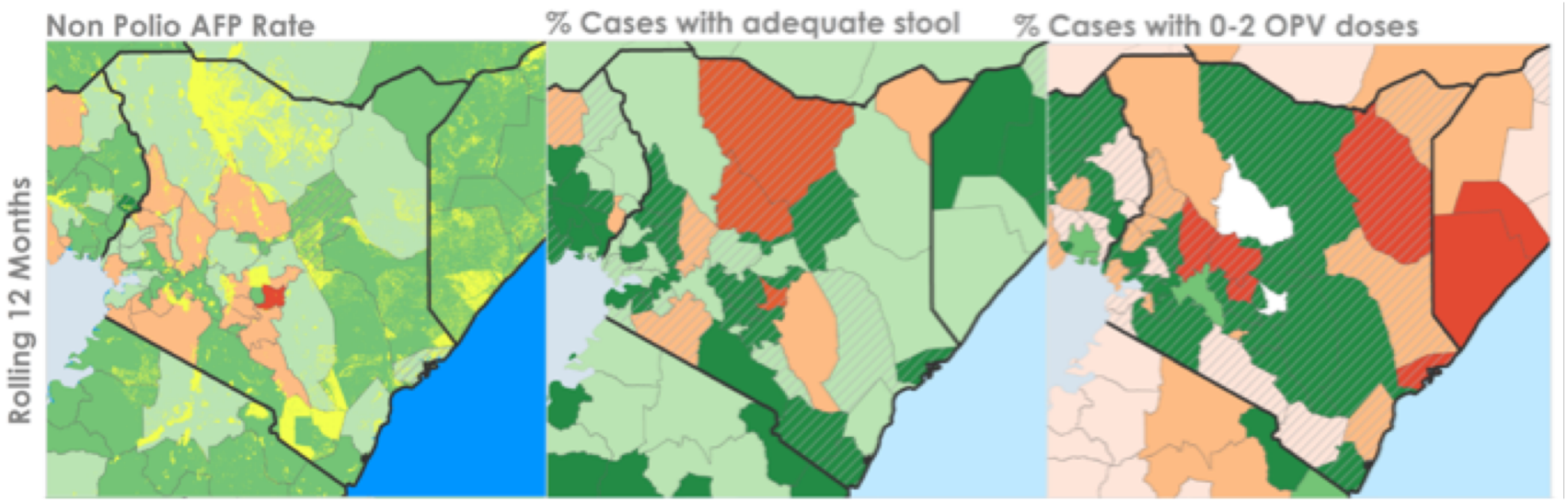
Switching from paper to electronic information systems itself does not guarantee better data quality or use

- Still dependent on quality of data collection at facility level

E.g. District Health Information System 2 (DHIS2), Africa Region

- 14 countries use EPI data integrated into DHIS2, additional 13 countries have EPI data in DHIS2 but don't use them
- Insufficient involvement of EPI staff in defining functionality required for immunization programme monitoring
- Lack of trust in the data

Decision support tools: Dashboards



Dashboards — either stand-alone or integrated, used at country, regional and global levels

- Monitor data quality, programme performance, cold chain, vaccine stock
- Improve monitoring efficiency and precision by visually bringing together data sources under a single platform
- Improve use by translating disparate data into decision-making information

Factors for success — data standardization, capacity-building

Resource implications

Geospatial based technologies

Two main uses

- Improved denominator estimates, including migrating populations
- Planning and monitoring vaccination & surveillance activities, including microplanning

Based on different technologies

- Satellite imagery, geo-positioning, mobile phone call records

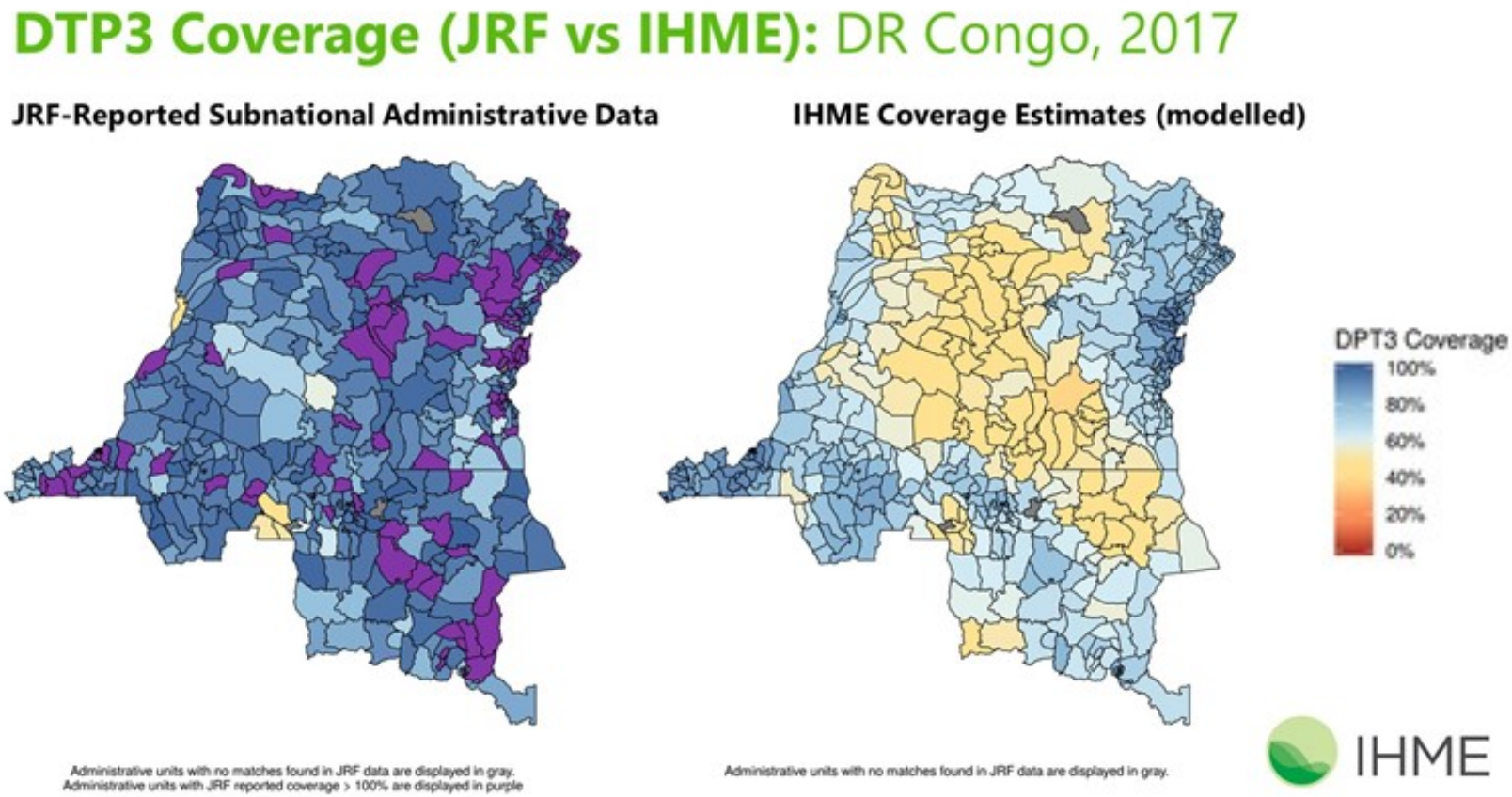
Can generate more accurate, precise population data

- Population estimates in previous “black spots”
- Combined with predictive analytics for forecasting

Processing such data requires financial resources and a trained workforce

More impact and economic studies of GIS technologies needed to determine feasibility of broader programme use

Combining geospatial approaches with predictive analytics: an example



Approach needs validation and assessment of usefulness

Do tools improve data quality and use?

Technological innovation can improve data quality & use

- BUT not all quality & use problems have a technological solution
- Beware of “solution in search of a problem”

Tools that are integrated or aligned with broader health information systems and respond to individual user requirements — more likely to achieve their aims

Innovations more likely to improve data use if combined with other interventions (e.g., a dashboard, health worker training and a feedback mechanism on data generated)

More guidance on when & how to scale up innovations needed

Assessment & Improvement Planning

New data challenges for monitoring immunization programmes

Maintaining accuracy as coverage increases

- Accuracy of population estimates
- Migrants & other high-risk groups — may be left out of population targets, require different approaches to monitor coverage

Monitoring equity

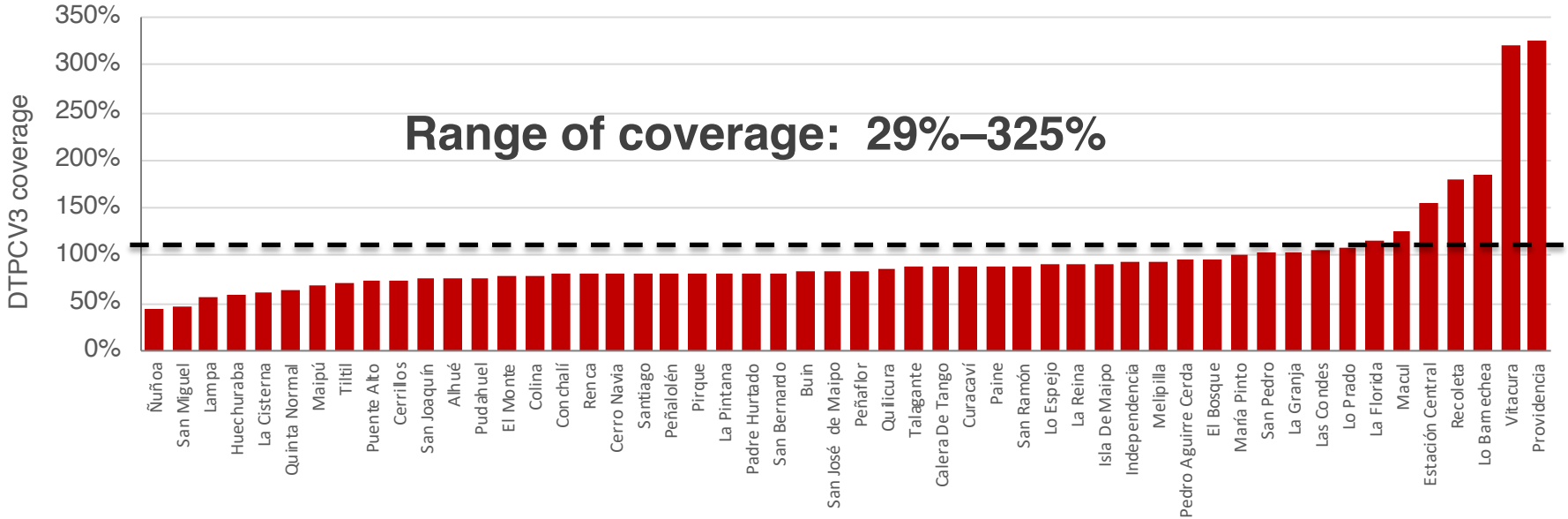
- Current monitoring strategy sub-optimal in identifying & reducing gaps in immunization coverage for vulnerable groups or minorities
- No guidance on routine monitoring of immunization equity

Measuring performance over life-course

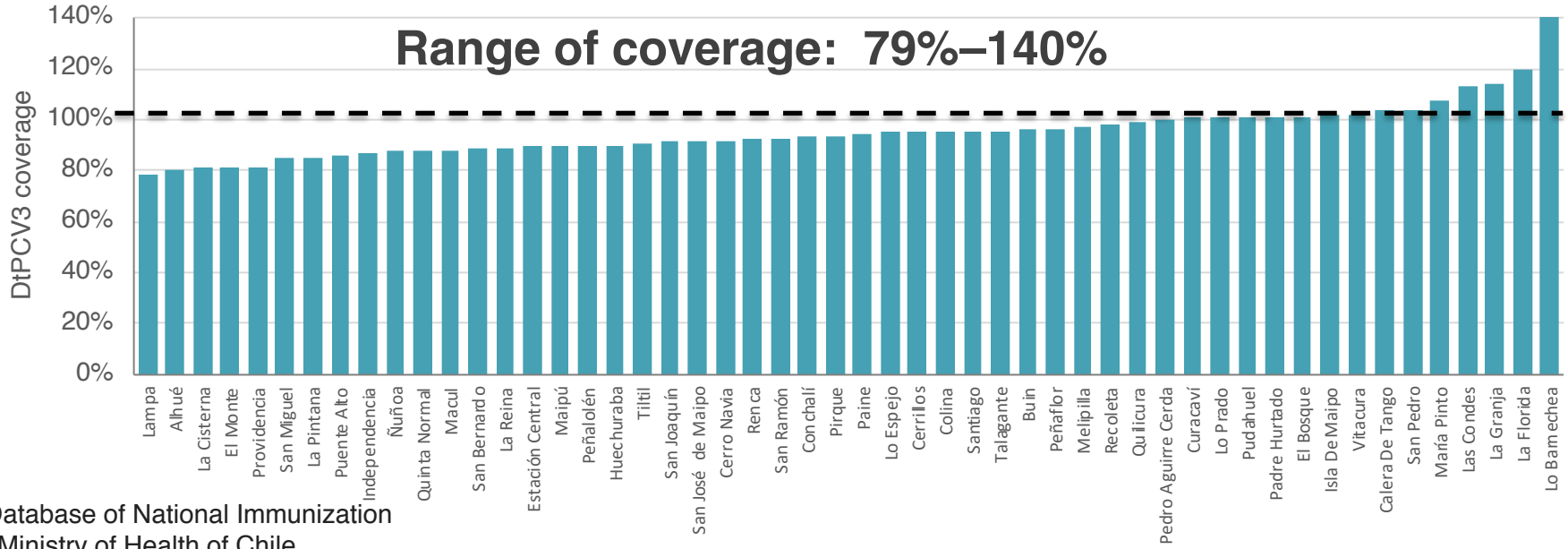
- Challenges in accurately measuring coverage beyond infancy, especially for multi-dose vaccines: MCV2, DTP4, HPV, pregnancy
- Role of serosurveillance

Comparison of DTPCV3 coverage **using two numerators: place of residence & place of vaccination**, Metropolitan Region, Chile 2017

Numerator = place of vaccination



Numerator = place of residence



Source: Database of National Immunization Registry, Ministry of Health of Chile

Routine monitoring of data quality

Case for shifting away from focusing exclusively on using targets to a focus on improvement in performance & data quality

- Perverse incentives linked to performance-based financing
- Opportunities to perform automated data validation checks and analyses to improve data quality & use

Shift from periodic to routine ongoing data quality monitoring

- Data quality alongside coverage
- Reported denominators
- Stock-outs

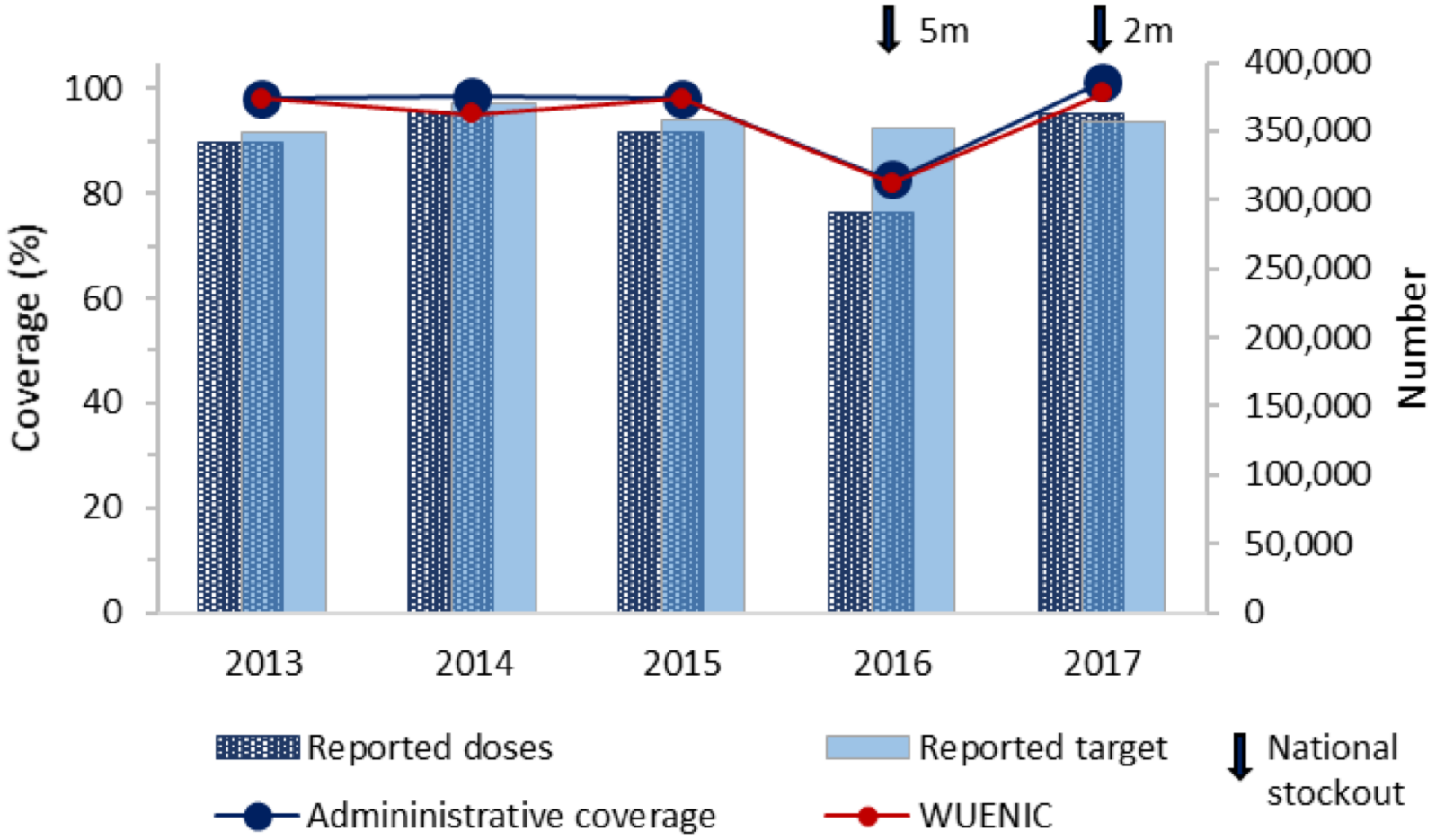
Framework/guidance for ongoing monitoring of data quality lacking

- Routine data quality monitoring done in some settings but ad-hoc

Routine publication of global immunization data quality reviews

At the regional, national and sub-national levels, incorporating data quality monitoring into feedback, monitoring bulletins, dashboards

Example: Trends in doses administered & targets, national stock-outs in DTPCV3 coverage analysis, Country A



Source: [WHO VPD Monitoring System]

Building a data-use culture

Challenging because it involves strengthening entire health system (governance, tools, people, improvement processes)

- And changing aspects of a particular culture

Evidence from IDEA review suggests improving data use — potential entry point for improving data quality

Making better use of existing data besides coverage data, including data from other programmes

- VPD surveillance
- Vaccine supply

Data Triangulation

Critical synthesis of two or more existing data sources to address relevant questions for programme planning and decision-making

- Address limitations of any one data source, methodology
- Encourage deeper insights by examining complementary data and putting them into broader context

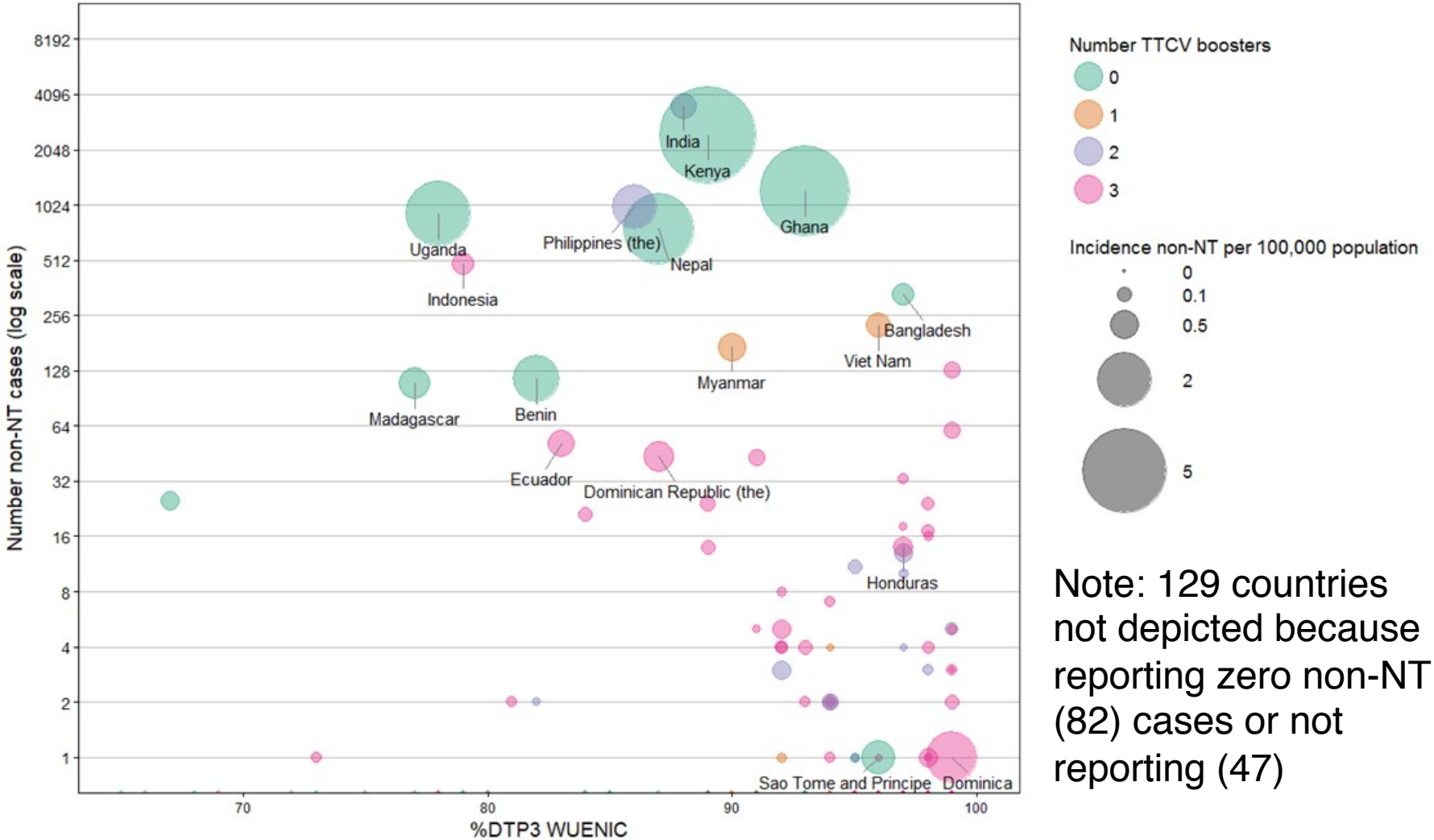
Triangulation should be default for public health analyses to make the best use of existing data

- Assessing data quality
- Examining key programme issues, e.g. immunity gaps, equity
- Evaluating intervention

Data Triangulation for Immunization & Surveillance Programmes Framework — collaboration with WG

- Online annex
- Guidance in 2020

Example: Triangulating incidence of non-neonatal tetanus by number of tetanus boosters & DTPCV3* coverage (WUENIC)



Note: 129 countries not depicted because reporting zero non-NT (82) cases or not reporting (47)

*DTPCV3: 3rd dose of diphtheria, tetanus, pertussis containing vaccine

Source: Krow-Lucal et al., unpublished (online annex)

Continuous quality improvement (CQI)

CQI encourages asking: “How are we doing?” “Can we do it better?”

CQI approaches increase data ownership & use of data for action

- Data improvement plans
- Addressing root causes
- “Measurement culture” vs “performance culture”

Process evaluation + targets

- Maturity grids to prioritize support

Continuous improvement plan guidance exists for vaccine supply

- Could translate more broadly to EPI

Whole systems approach — similar data needs throughout healthcare system

Evidence & Research Agenda

Gaps in Evidence & Research Agenda — 1

Lack of consensus definition of data quality & how to monitor it

What data quality & use interventions lead to better decision-making and better immunization programme performance, in particular at facility level

Effectiveness, cost-effectiveness, time efficiency, and sustainability of interventions which aim to improve data quality and use, and how/when to scale up — different contexts

How to improve denominators

- Local level, life-course, mobile populations, non-technical barriers

Optimal use of triangulation, including modelling

- Validating modeled subnational coverage and denominator data, evaluating relevance for program use at various levels
- Use of VPD surveillance & vaccine supply data at various levels

Gaps in Evidence & Research Agenda — 2

Evaluation approaches to VPD surveillance data quality

Workforce motivating & demotivating factors for using data and producing data of high quality

What elements of CQI improve programme performance

- Effective incentives for individual (health worker) & organizational levels
- Absolute vs. relative targets
- Whole systems approach

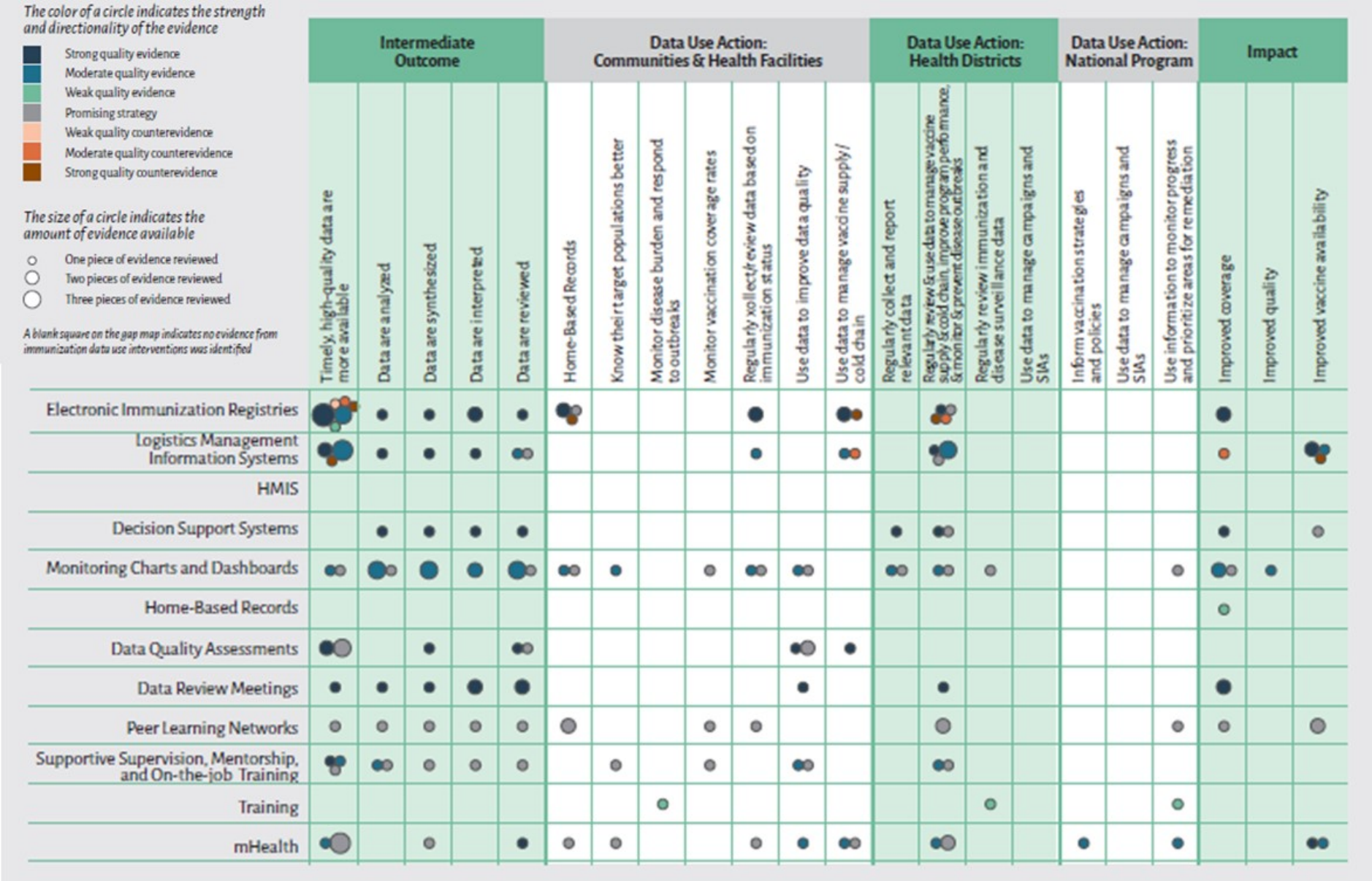
How equity best measured routinely as part of programme monitoring

- Standardized equity monitoring indicators and approaches

Utility of serosurveys by disease in different contexts

- Role in immunization programme monitoring relative to other priorities
- Use in triangulation

IDEA Report — Evidence & Gaps



https://findyourfinding.org/idea-report/

Recommendations

Considerations

- Data issues keep coming up (SAGE 1998, 2011)
- If want different results, need to try different approaches and learn from mistakes and successes
- If only focus on low-hanging fruit, won't address root causes and get sustainable change
  - No simple tech solutions
  - It's also about People, Governance…
- Solving more difficult issues require addressing systems issues and working cross-sectorally
  - i.e., holistic health systems approach and beyond
- SDGs, Universal Health Coverage and Primary Heath Care are fundamental touchpoints for many of needed changes — capacity-building, data use, CQI
- Approaches need to be context-specific, country-owned and driven from frontline up

Proposed Recommendations — 1

Embed monitoring of data quality and use into global, regional and national monitoring of immunization and surveillance

a) **WHO to develop a common definition, attributes, and indicators of data quality** (i.e., small panel of indicators corresponding to the different data quality attributes), using those identified in this report as a starting point

b) **Integrate ongoing monitoring of data quality indicators** alongside other routine programme performance (e.g., coverage) and impact indicators

c) Develop and utilize data quality assessment approaches for immunization programme data other than coverage (i.e., VPD surveillance, stock data, etc.)

d) **Evaluate the impact, cost and sustainability of interventions** which aim to improve data quality, management, and use to inform decisions on scale-up

Proposed Recommendations — 2

Increase workforce capacity and capability for data quality & use starting at lowest level, where data collection occurs

a) **Develop and disseminate data-related competencies guidance** and capacity building tools to implement assessment of workforce at country-level

b) **Ensure data functions (collection, analysis, and use) are accounted for & resourced in workforce management plans**, e.g., devoting adequate person-time equivalents, staff recruitment, retention

c) **Build data capabilities across various levels and career stages** (pre-service, refresher, supportive supervision, etc.), considering new approaches (e.g., e-Learning) potential efficiencies created by coordination across programmes

Proposed Recommendations — 3

Take actions to improve the accuracy of immunization programme targets (denominators)

a) **WHO and UNICEF to revise and finalize the draft guidance on *Assessing and Improving the Accuracy of Target Population Estimates for Immunization Coverage* (2015)**, including proposing practical and evidence-based solutions

b) **Increase immunization programme coordination with national statistics office, birth/civil registration offices**, and other relevant programmes/organizations for improving the quality of denominators

c) Identify and attempt to address the technical (e.g., resident vs non-resident) and non-technical barriers (e.g., political) to accurate denominators in countries, including the use of operational denominators

d) **Document best practices & country experiences about using different sources** (birth cohorts, vital registries & census estimates) **or methods for improving denominators**.

Proposed Recommendations — 4

Enhance use of existing data for tailored action, including immunization programme planning, management and policy-change

a) **At all levels, increase the use of data sources beyond administrative coverage** for monitoring, planning and decision-making (e.g., numerators, denominators, surveys, surveillance, vaccine supply, service delivery, serosurveys)

b) **Develop /incorporate guidance and training on data triangulation** for immunization and surveillance programmes at the national and subnational level

c) Support the development and use of decision-support tools (e.g., monitoring charts, dashboards), as needed, for better planning and programme management

d) **Further work on defining the role of serosurveys** for immunization programme management at different levels, across different diseases and different epidemiological contexts

Proposed Recommendations — 5

Adopt a data-driven continuous quality improvement (CQI) approach as part of health system strengthening

a) **Shift from identifying data quality issues to root cause analysis and improvement planning**, as outlined in the draft *Handbook on the Use, Collection and Improvement of Immunization Data*

b) Monitor the implementation and impact of previous recommendations to improve accountability and inform new recommendations (e.g. create data-driven improvement cycles)

c) **Strengthen data collection & use by implementing multi-component strategies**, which may include capacity-building activities, tools, supportive supervision, actionable feedback, staff recognition (e.g. certificates, awards) & accountability mechanisms

d) Recognize that perverse incentives may have led to overestimation in reported coverage, and ensure that data quality improvements leading to lower coverage are not penalized (i.e., promote accurate reporting)

e) **Develop a vision and strategic framework for a CQI approach for EPI**, including measuring relative changes, in addition to achieving absolute indicator targets

Proposed Recommendations — 6

Strengthen governance around piloting & implementation of new information, communication, & technology (ICT) tools for immunization & surveillance data collection & use

a) **Design systems and tools based on needs, requirements, and context** (e.g., sustainability)

b) Review existing evidence on cost, impact and effectiveness when considering pilot or scale up new tools for data collection/ management

c) **Plan for and ensure integration & interoperability** of any newly introduced tools within the existing information system

d) Ensure new information systems include historical data, support all data management functions (archiving, security, and linkage of relevant data), and are accompanied by guidance, standards and specification

Proposed Recommendations — 7

Improve data sharing and knowledge management across areas and organizations for improved transparency and efficiency.

a) Include best practices on data management (archiving, migration, sharing, and security) in immunization monitoring and surveillance guidance and training

b) **Make data, guidelines, documentation, and reports readily available and accessible to relevant users** by building and maintaining user-friendly websites, mobile apps and other communication tools

c) **Improve routine coordination between stakeholders** (epidemiologic surveillance, laboratory, and immunization units;, private providers, CSOs, and partners) **with regards to reporting/sharing of relevant data and information**

Proposed Recommendations — 8

WHO & UNICEF to continue strengthening global reporting and monitoring of immunization and surveillance data through a periodic needs assessment and revision process

a) Continue development and implementation of global (WIISE) and regional information systems, including electronic JRF

b) **Collect and monitor disaggregated coverage** (e.g., subnational) **and surveillance data** (e.g., by age, vaccination, lab confirmation)

c) **Develop approaches for data collection & routine monitoring of emerging immunization issues, e.g.,**
   - Coverage equity
   - Vaccination across the life-course
   - Vaccination coverage and disease incidence among migrants / mobile populations who move across borders
   - Qualitative data (e.g., reasons for non-vaccination, recommendations from assessments), including data management

d) Collaborate to convene new research & validate existing research for improving denominators & national/ subnational coverage (e.g., spatial modelling), including use of data sources beyond coverage (e.g., stock), to inform guidance for programme use

Proposed Recommendations — 9

WHO & SAGE should periodically review the implementation status of the WG recommendations, lessons learned, and the gaps to be addressed.

This work is dedicated to Tony Burton, RIP

Acknowledgements

- Denise DeRoeck (Independent Consultant)
- Marta Gacic-Dobo (WHO-HQ)
- Jan Grevendonk (WHO-HQ)
- Minal Patel (WHO-HQ)
- Adam Cohen (WHO-HQ)
- Laure Dumolard (WHO-HQ)
- Sebastien Antoni (WHO-HQ)
- Polio team (WHO-HQ)
- Alain Poy and team (AFRO)
- Martha Velandia (AMRO/PAHO)
- Marcela Contreras (AMRO/PAHO)
- Robin Mowson and team (AMRO/PAHO)
- Nadia Teleb (EMRO)
- Kamal Fahmy and team (EMRO)
- Siddhartha Datta (EURO)
- Paul Chenoweth and team (EURO)
- Roberta Pastore and team (WPRO)
- Sharifuzzaman Md and team (SEARO)
- Mamadou Diallo and regional office staff (UNICEF)
- David Brown (Independent Consultant)
- Liz Krow-Lucal (CDC)
- Morgane Donadel (CDC)
- Chris Murrill (CDC)
- Angela Montesanti (CDC)
- Peter Bloland (CDC)
- Anita Samuel (CDC)
- Richard Franka (CDC)
- Kirsten Ward (CDC)
- Kristie Clarke (CDC)
- Lora Davis (CDC)
- Amalia King (CDC)
- Steve Wassilak (CDC)
- Nalini Iyanger (PHE)
- Allison Osterman (PATH)
- Jessica Shearer (PATH)
- Nicole Salisbury (PATH)
- Laurie Werner and team (PATH)
- Katherine Harrison (Shifo)
- Eunice Turawa (Stellenbosch University)

Key informants from World Health Organization HQ and regional offices, several country offices, several countries, UNICEF, an independent consultant expert on Multiple Indicator Cluster Surveys, Gavi, the Bill and Melinda Gates Foundation, U.S. Centers for Disease Control and Prevention (CDC), International Red Cross, and one consultant on countries in humanitarian crisis.