Evaluation of the Better Immunization Data Initiative

Synthesis of Findings from Zambia and Tanzania

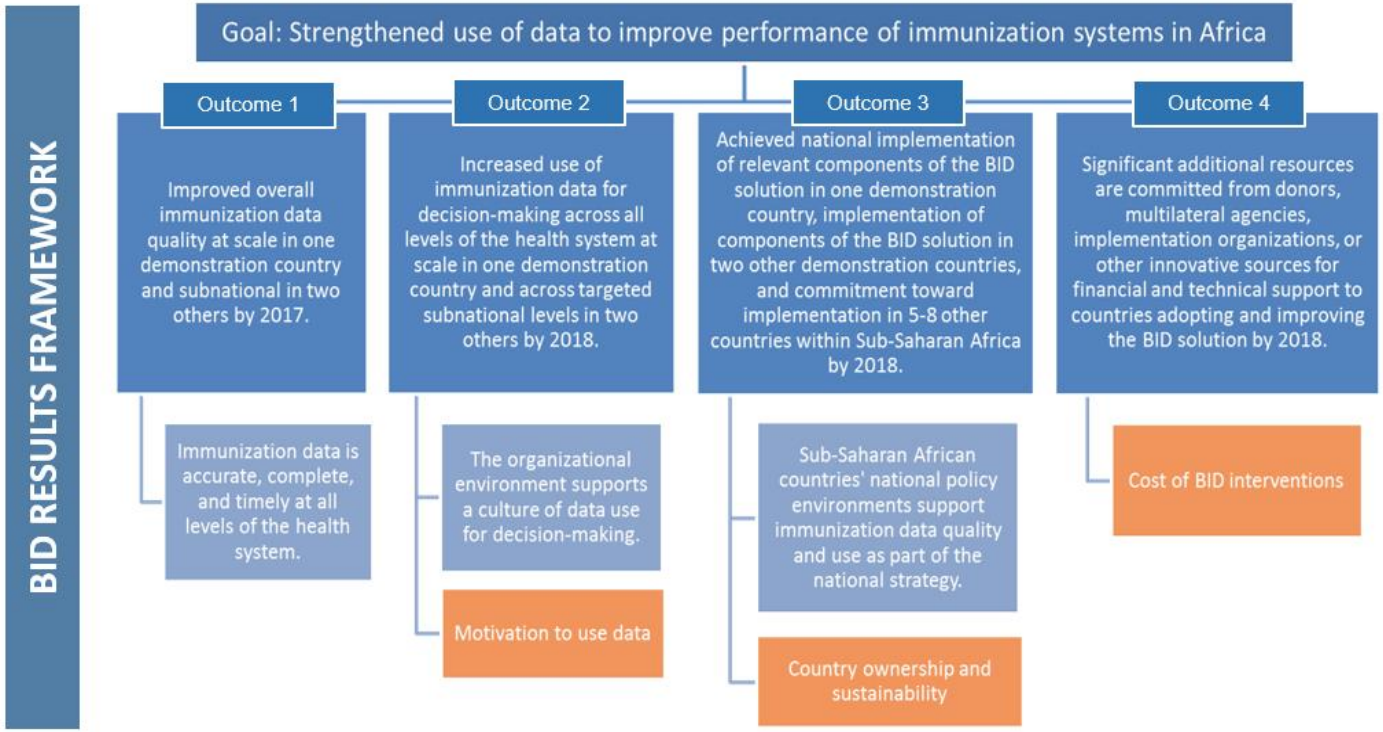
September 2019

Background

The BID Initiative

BID aimed to improve the quality and use of data for more effective immunization programs in Sub-Saharan Africa

The expected results from BID were defined in a results framework



Components of the BID Initiative

The BID Initiative had 3 main components

1

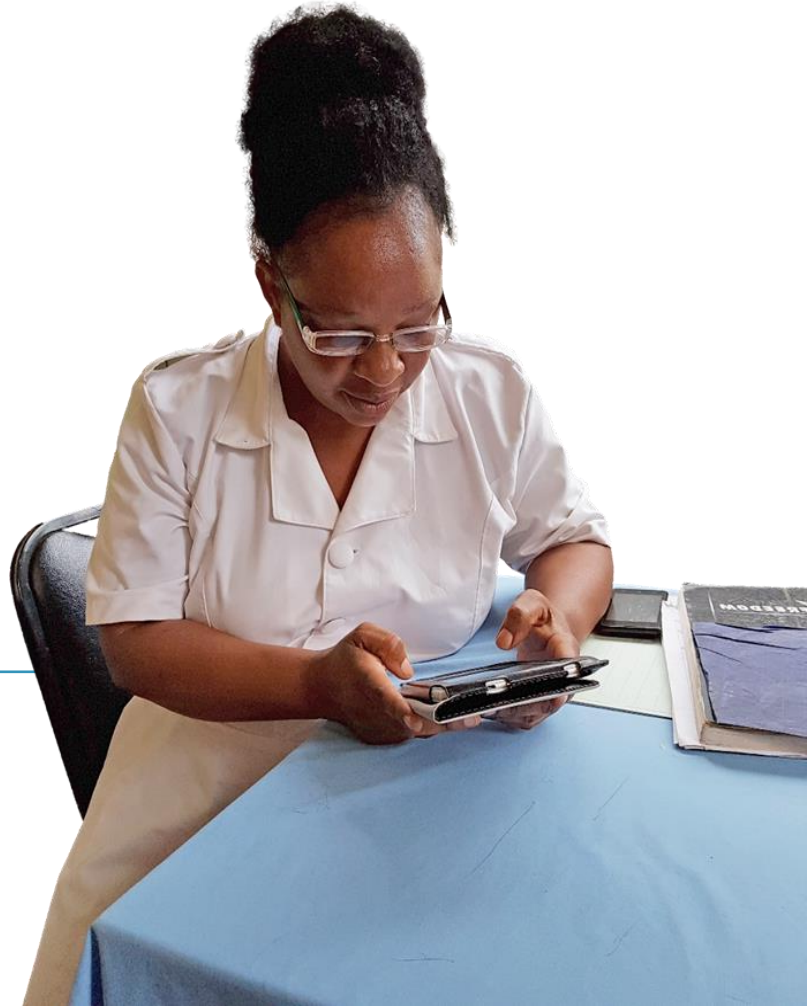
An electronic immunization registry (EIR) as an application on a tablet computer

2

Vaccine stock management solutions

3

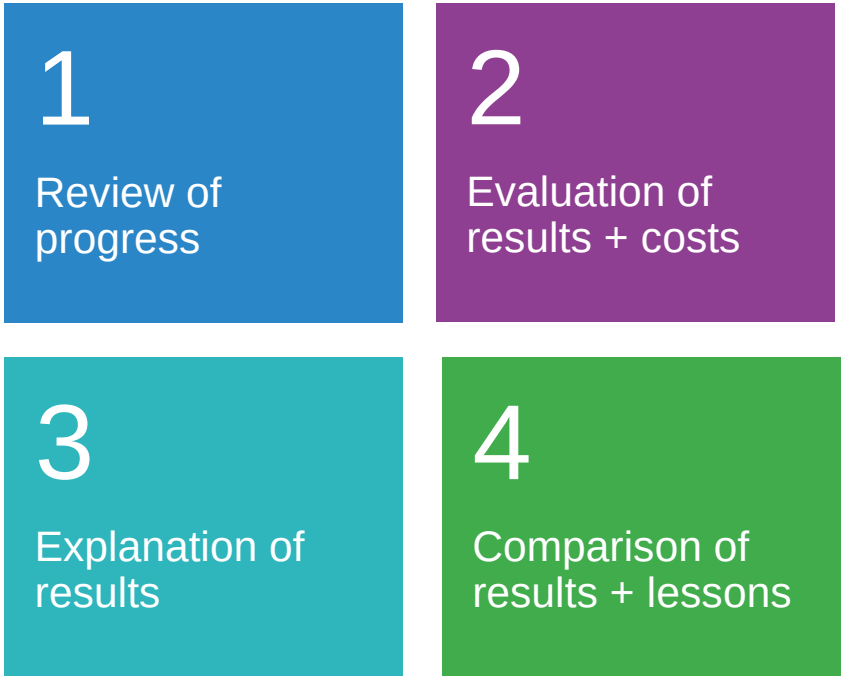
Data use interventions



- Additionally, the BID Learning Network (BLN) shared learning & experience through a regional community of practice

Evaluating the BID Initiative

- Mott MacDonald provided independent evaluation services for the BID Initiative (2014-2019)
- Evaluation design:
  - Non-experimental, theory-based design tailored to the complexity of the BID Initiative and the innovative nature of the interventions
  - Aimed to complement PATH's survey work with more in-depth explanatory explanations
- This presentation summarizes key findings from successive evaluations, including a special study from Dodoma Region



MAIN ELEMENTS OF THE EVALUATION WORK

Methodology (1)

Focused on in-depth reviews of case study districts and a panel sample of health facilities

Selection of case study districts

Purposeful sampling – for optimal representation of urban/rural/border districts, facility types + duration of program exposure

Panel sample of health facilities

Stratified sampling used to select 6 health facilities in each case study district covering all facility types. This ‘panel sample’ used for each evaluation

In Zambia

3 case study districts: Southern Province (Livingstone, Kazungula & Sinazongwe)

Milestone evaluations

Conducted at baseline, ‘end of intervention’ & around 1 year post program to track progress, make comparisons & assess sustainability (Slide 7)

In Tanzania

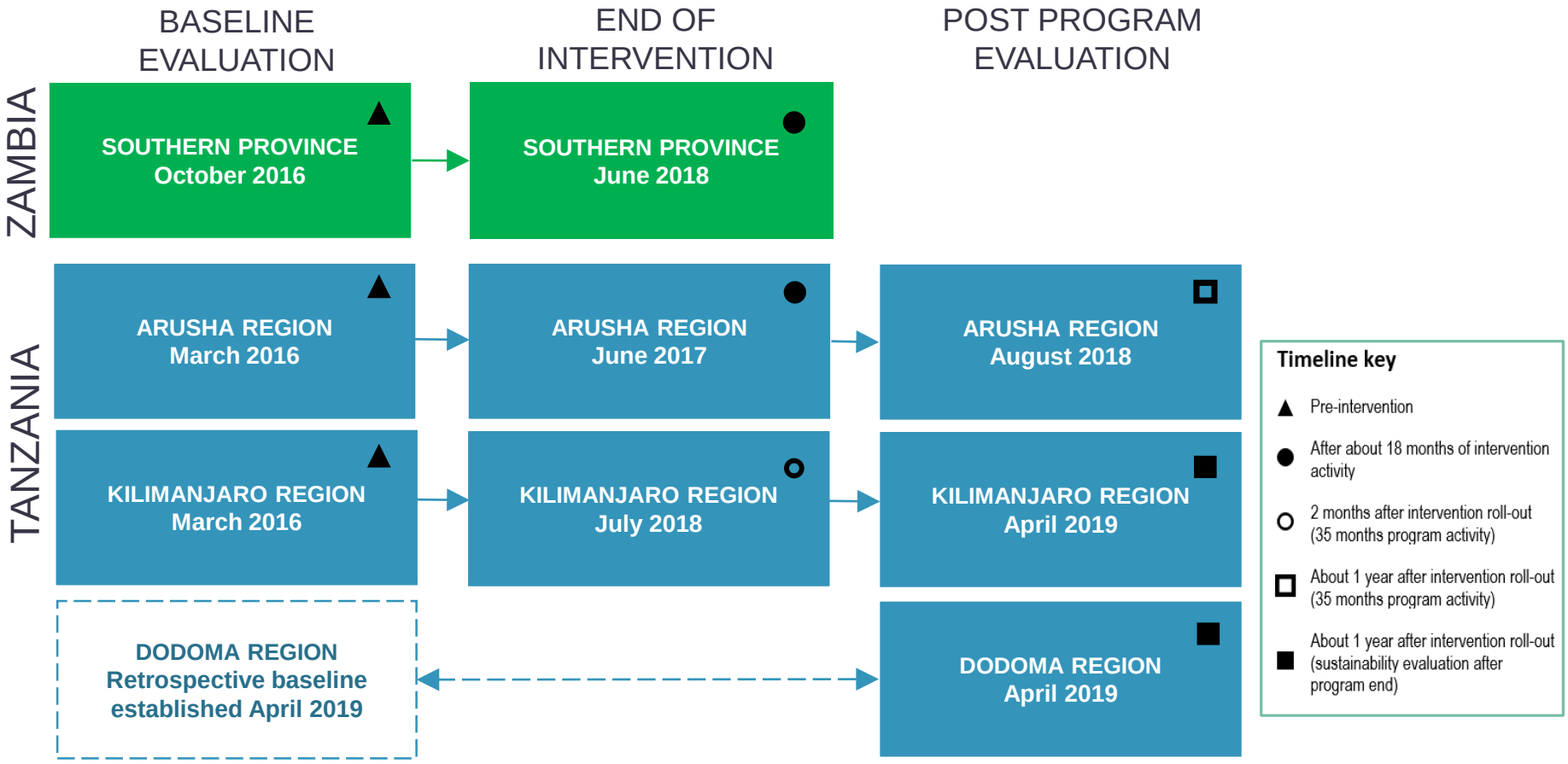
7 case study districts: Arusha Region (Arusha City, Karatu & Longido); Kilimanjaro Region (Moshi Municipal & Mwanga); Dodoma Region (special study in Dodoma Urban & Bahi)

Notes

Mott MacDonald was not required to conduct post-program evaluation in Zambia

Dodoma ‘special study’ was completed as part of the post program evaluation

Schedule of milestone evaluations



Methodology (2)

Standardized methodology for each milestone evaluation

Approach

Triangulated, mixed method approach for assessments against the BID theory of change & results framework

Assessment of data quality

Standard DQA* methodology to assess availability, completeness + accuracy of immunization & stock data - focus 6 proxy antigens over 3-month period in panel sample of health facilities

Assessment of EIR data accuracy

DQA methodology applied to review EIR master data against most reliable primary records at facility

Counterfactual referencing

Periodic assessments of legacy system to review attribution themes + provide a comparison point for reviewing EIR data quality

Assessment of data use

Focused on user skills in entering, retrieving and interpreting EIR data – applied a standardized competency assessment tool to score a range of user skills

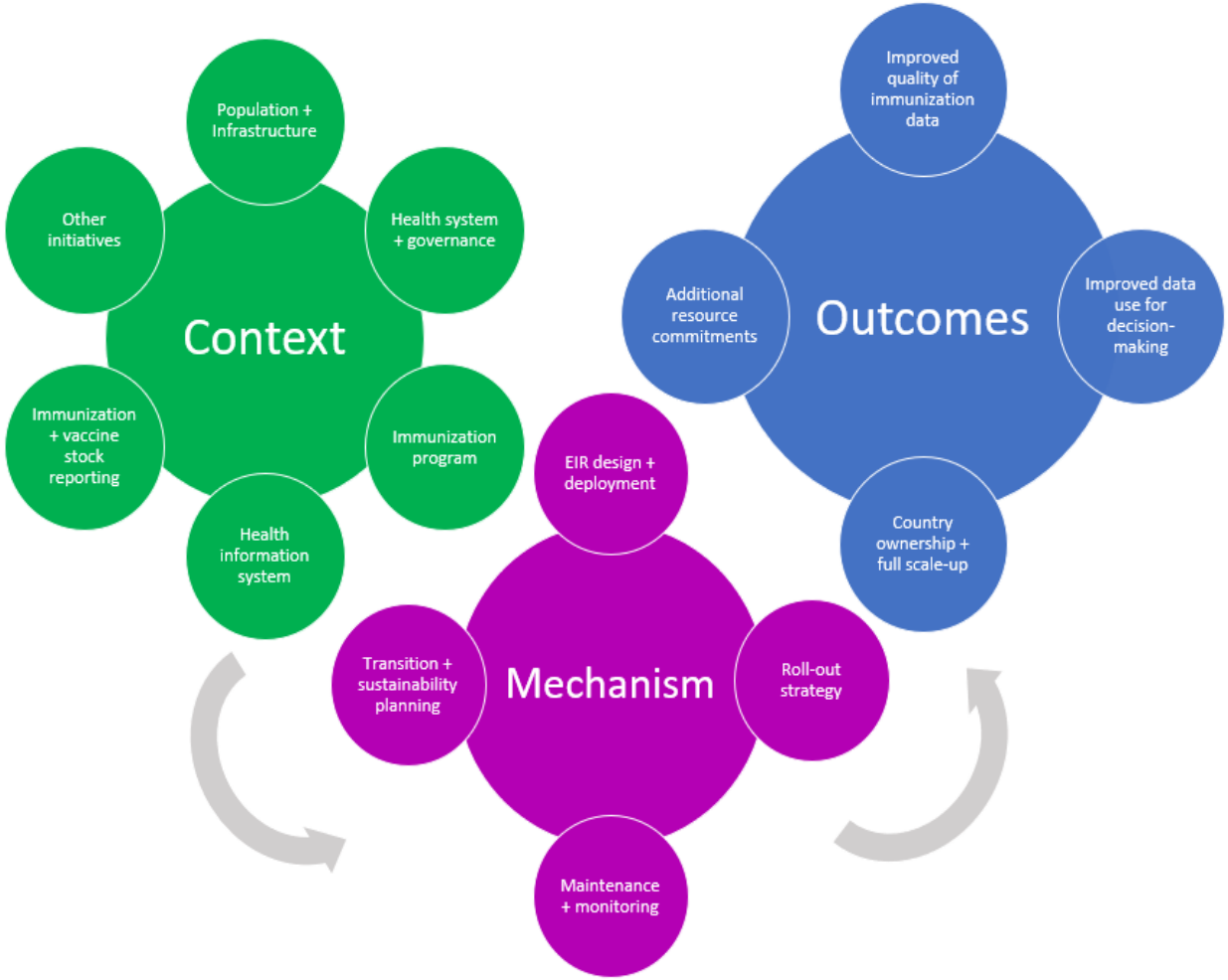
Assessment of country ownership + resourcing

Assessments for Outcomes 3 & 4 conducted qualitatively (key informant/ in-depth interviews at each system level, direct observation and review of secondary data)

Methodology (3)

Analytical approach

- Realist analytical framework applied to structure comparisons between case study sites
- Findings therefore organized around context, the mechanism (implementation of interventions) and outcomes



Note: Dodoma Special Study

Additional study

Extension to Mott MacDonald's scope of work for final phase - so no earlier milestone evaluations

Focus

Alternative scale-up strategy, the IMPACT Team approach. Developed by JSI/InSupply in collaboration with PATH for implementation in Dodoma Region

Purpose of special study

To assess: distinctive features of the approach; effects on intended results; and cost implications

Study methodology

Applied standard evaluation methodology to support comparison with PATH's District Data Use Mentors (DDUM) strategy in Northern Zone. Focused on a purposeful sample of 2 case study districts - Dodoma Urban and rural Bahi District

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Findings I

Key findings from Zambia

Presentation of findings

We will follow themes of the analytical framework

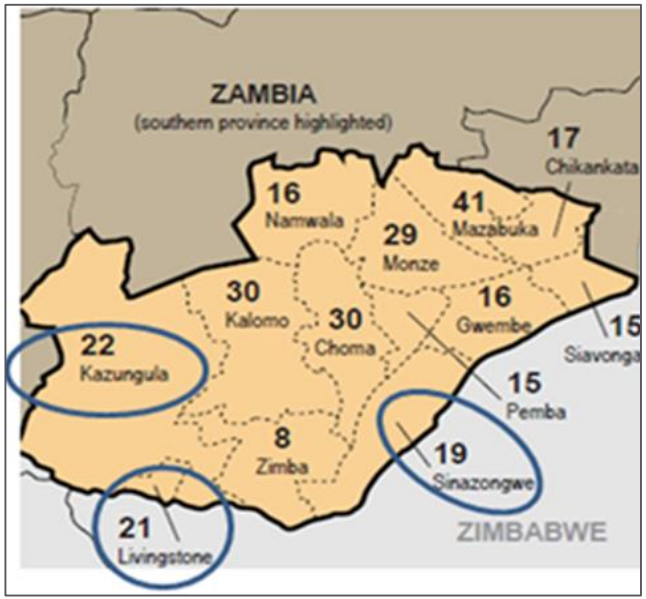
1. Findings on context and mechanism from Zambia
2. Findings on Outcome 1 (improved data quality) including a counterfactual review of the legacy system and the Zambia EIR (ZEIR) over time
3. Findings on Outcome 2 (improved data use) focusing on competencies in using ZEIR for key data tasks
4. Findings on Outcome 3 (scale-up & country ownership) & Outcome 4 (costing study + resource commitments)

Zambia key findings:

Context and mechanisms

Findings on the Zambian context

Location of case study districts



CASE STUDY DISTRICTS IN SOUTHERN PROVINCE

Key features of implementation context

- Unreliable internet connectivity (especially at rural facilities) and a dependence on supplies of internet bundles
- A ‘legacy’ immunization reporting system that was fully integrated into DHIS2 reporting with multiple data dependencies
- A separate vaccine stock logistics system
- Multiple cadres of health care workers involved in immunization reporting
- Routine provision of immunization outreach services
- The presence of other related digital health initiatives

Findings on the mechanism in Zambia

Our review of the mechanism considered the full intervention cycle

EIR design

First sub-contractor unable to deliver scalable design. Replacement sub-contractor (Ona) faced compressed timeframes

Ona successfully built Zambia EIR (ZEIR) using Open SRP platform - fully functional by end of intervention phase

Key design challenges: provision for offline working; multiple users of single devices; data exports to DHIS2

Rollout strategy

Four ‘touch visits’ delivered by PATH staff over three stages with some support provided by trained district & facility mentors;

Achieved rollout to all 298 eligible facilities in Southern Province by March 2018

Key implementation challenges: data back entry; downloading of version updates; provision for outreach; additional user cadres

Maintenance & sustainability

Provision for long-term system monitoring, maintenance and upgrades still uncertain by end of intervention

Key challenge: scalable package still uncertain by program end - government requiring better integration with other initiatives (e.g. with UNICEF’s mVacc)

Zambia key findings

Outcome 1: Improved data quality at scale

Data quality in the legacy system

For counterfactual referencing, we monitored the HIA2 legacy system over time

Data timeliness, availability & completeness

We found timeliness, availability & completeness of legacy system data was similar at baseline & the final end of intervention evaluation

This was the case for immunization & stock data at facility & district levels

Accuracy of facility immunization data

From comparison of reported and primary source data, there was a small deterioration in overall accuracy between baseline and end of intervention – with 24% paired data points (n=374) matching at baseline and 19% (n=324) of paired data points matching at end of intervention

See Slide 18

Accuracy of district immunization data

From comparison of district reports and facility (HIA2) reports, there was a small deterioration in overall accuracy between baseline and end of intervention – with 46% paired data points (n=288) matching at baseline and 41% (n=184) of paired data points matching at end of intervention

See Slide 18

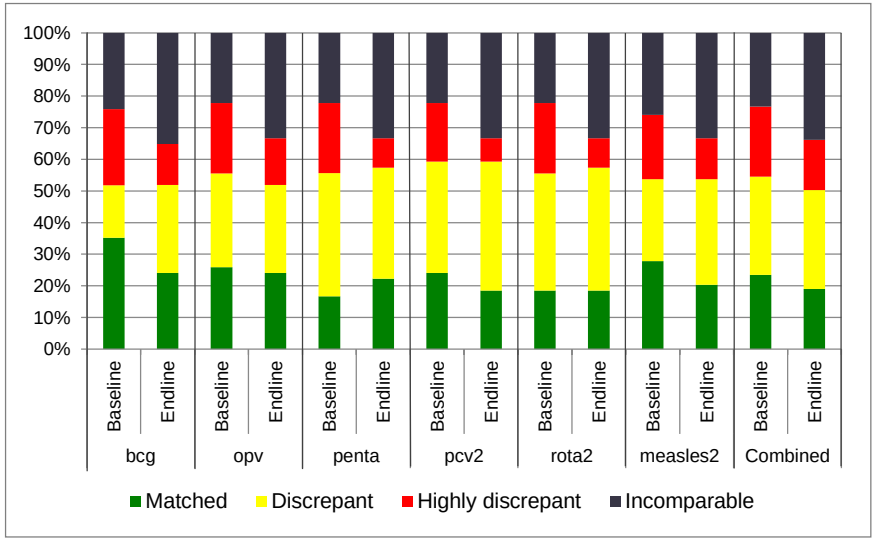
Qualitative investigations

Suggested the multiplicity of parallel reporting systems at facility level could be affecting reporting accuracy

E.g. nurses were often maintaining the legacy system, SmartCare, ZEIR and sometimes other digital systems

Data quality in legacy system at Baseline and End of Intervention

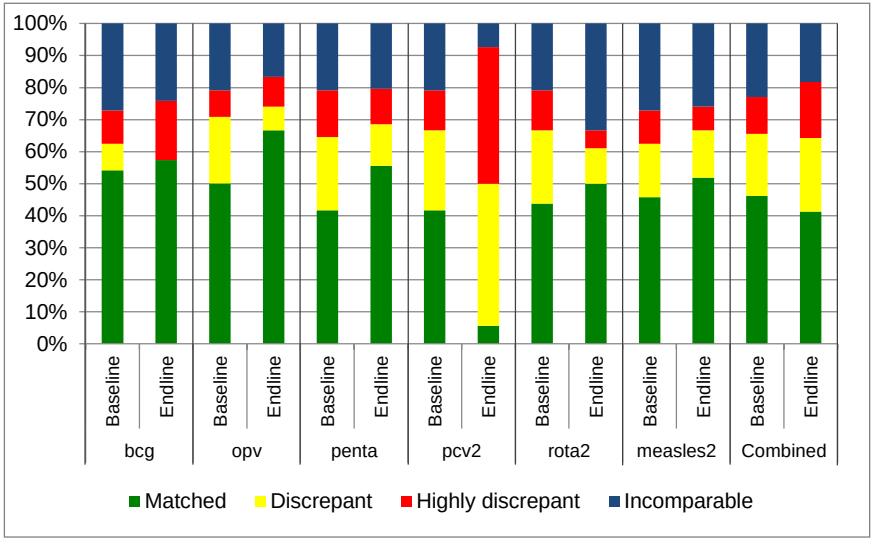
Facility Level



At Baseline, estimated accuracy of facility HIA2 immunization data was 24% (n=374 paired data points) for all antigens combined over a 3 month period.

At End of Intervention (endline), estimated accuracy of facility HIA2 data was 19% (n= 324 paired data points) –with the decline possibly associated with an increased reporting burden

District Level



At Baseline, estimated accuracy of district reports when compared to facility HIA2 reports was 46% (n=374 paired data points) for all antigens combined.

At End of Intervention (endline), estimated accuracy of district reports was 41% (n= 324 paired data points) – possibly associated with increasing reporting burdens (reason for PCV2 decline unclear)

Data quality in ZEIR (final end of intervention evaluation)

We focused on the accuracy of immunization data in the ZEIR master database

Accuracy of facility immunization data

Applying the standard DQA methodology, ZEIR data did not compare well to primary records for immunizations - hardly any ZEIR totals matched primary records over the 3-month review period in the sampled facilities

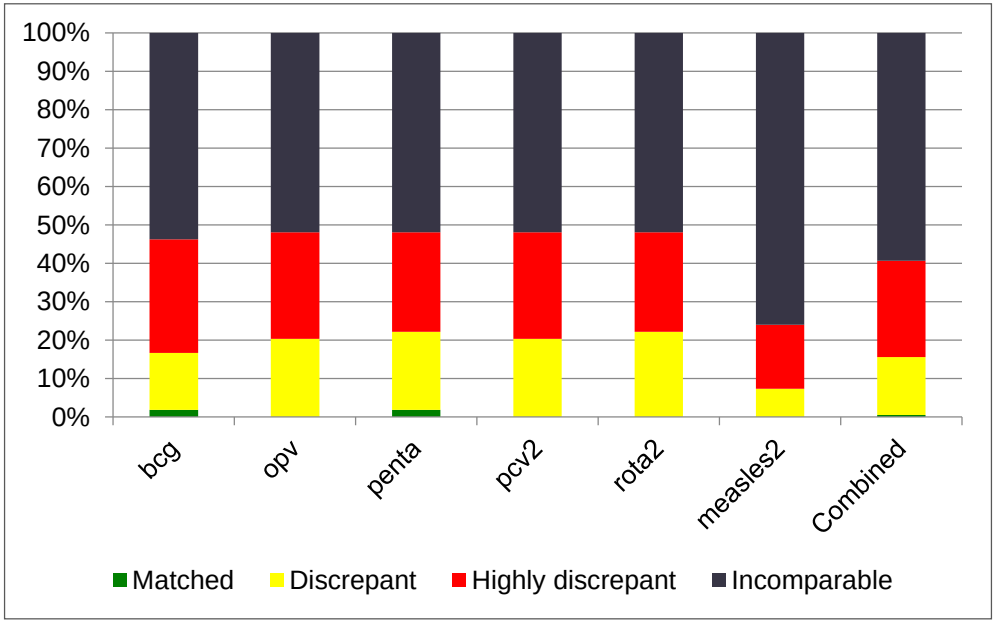
Primary records (tally sheets) always recorded more immunizations, suggesting ZEIR data was incomplete (see Slide 20)

Qualitative investigations

Confirmed facility staff were not using ZEIR consistently. Key reasons were: user training issues; slow functioning of the tablet; and/or workload demands

We also found that outreach data was rarely entered into ZEIR

Review of ZEIR data quality at end of intervention



Comparison of records in the ZEIR master database and primary records (6 proxy antigens over 3 month period) for sampled facilities at the end of intervention evaluation, Zambia (June 2018)

Zambia key findings

Outcome 2: Improved data use for decision-making

Outcome 2: improved data use for decision-making

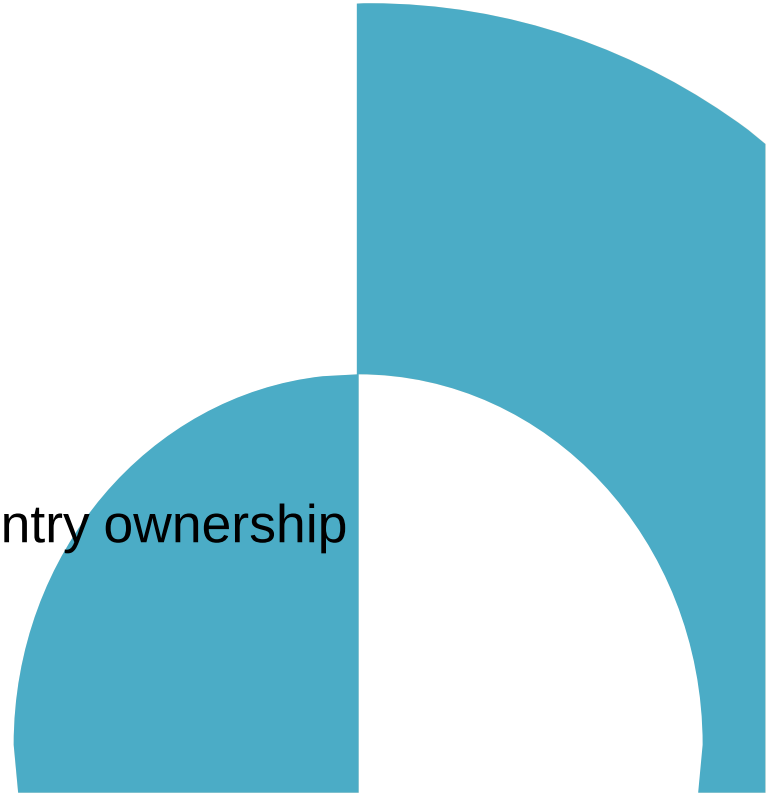
We assessed competency in key ZEIR data use tasks

- At the final end of intervention evaluation we used a standardized assessment tool to score nurse's skills in using ZEIR for tasks on patient registration, immunization coverage, defaulter tracing & stock management
- Good ZEIR registration skills: in the 18 sampled facilities, we assessed 74% of users (n=19) as being fully or mostly competent in registering a new child
- Other skill sets could not be assessed because, at the time of evaluation, the required ZEIR updates had not yet been downloaded at any of the sampled facilities

Zambia key findings:

Outcome 3: Implementation at scale & country ownership

Outcome 4: Resource commitments



Outcome 3: Implementation at scale and country ownership

Successful implementation at scale

All 298 eligible health facilities in Southern Province had received the BID package of interventions by March 2018

Country ownership

Interviews with district, provincial and national key informants suggested the potential benefits of ZEIR were widely recognized - especially benefits of real-time data transfers and data visibility at each system level

Stakeholder concerns

Some stakeholder concerns about: the long timeframes for software development; poor harmonisation of digital health initiatives; resource requirements after program end; technical and user capacity constraints

Peer networking & the BLN

Good participation in BLN country-based events by national EPI staff. Less involvement by sub-national teams l – although some relevant peer networking through WhatsApp groups

Outcome 4: resource commitments

Assessing total cost of ownership (TCO)

- Partial TCO assessment: PATH provided a sound cost analysis but was not able to provide a complete TCO assessment due to challenges in defining:
  - Costs incurred by other role-players (e.g. government)
  - The scalable package + long-term maintenance and scale-up costs
- PATH's costing data allows some analysis:
  - From PATH's data (see table), we can see that the total PATH's total project expenditure in Zambia (2015-2018) was US$ 3,579,413
  - We can also see the distribution of expenditure and some of the cost drivers. But, the information provided does not tell us much about total future recurring costs, as most of these were not estimated.

System design and development	
System design and development costs of electronic immunization registry (in use)	US$486,965
Learning costs (electronic immunization registry which was shelved)	US$427,407
Other costs	
Back entry costs	US$21,086
Labor costs	
BID Initiative staff	US$1,851,105
Southern Province-specific costs	
Rollout costs	
Hardware	US$254,424
Meetings	US$32,470
Training	US$29,368
Deployment (per diems, transport and accommodation to access health facilities etc.)	US$445,655
Annual recurrent costs	
Internet connectivity	US$20,007
Data hosting (server)	US$8,000
Printing (e.g. QR codes + ZEIR resource materials)	US$2,926
Total costs over project period	**US$3,579,413**

PATH expenditure data for the BID Initiative in Zambia (2015-2018)

Outcome 4: resource commitments

Review of costs to inform resource mobilisation

Distribution of expenditure

From PATH's data we estimated 14% of total project expenditure was for system design & development costs (or 26% if we include the cost of the first version); 52% was for BID staffing costs & 21% was for rollout costs

PATH estimated annual recurrent costs at < 1% but this did not include many of the actual costs of operating the system at scale*

Scale up costs

Extrapolating from PATH's data (with the limitations of recurrent cost data): we estimated the cost of scale-up to all 10 provinces would be ~US$10.8m – of which total rollout costs would be ~US$8 m (spread over several years)

For Zambia, US$8 m equates to 15% of all annual immunization expenditure by government & its partners

Data requirements

Decision-makers from government and international agencies need complete costing information to inform their choices e.g. how many additional immunizations could be generated by better information

The cost estimates for Zambia cannot yet be compared to measurable outcomes – this is needed to build a structured business case for investment

Mobilising additional resources

In 2019, Government, PATH & other partners were awarded a US$ 1.4m Gavi EPI-Optimization grant to strengthen system linkages & usage & build national capacity & ownership, with a view to scaling-up to Western Province

This includes a partnership with UNICEF to link ZEIR to mVacc (for SMS data transfers on births & community immunization monitoring)

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Findings II

Key findings from Tanzania

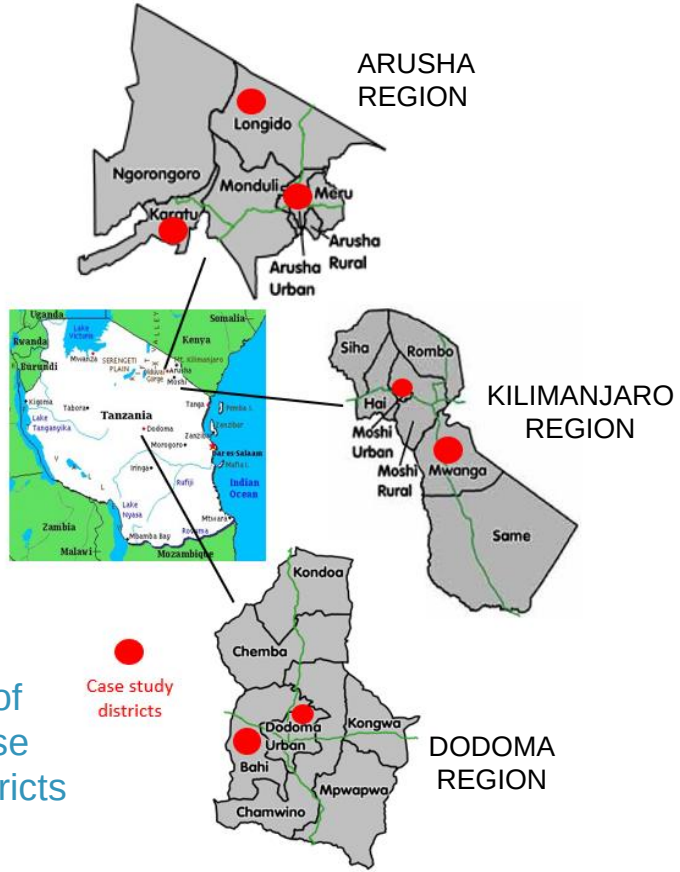
We will follow themes of the analytical framework

1. Findings on context and mechanism from Tanzania
2. Findings on Outcome 1 (improved data quality) including a counterfactual review of the legacy system and the Tanzania EIR (TImR) over time
3. Findings on Outcome 2 (improved data use) focusing on competencies in using the Tanzania EIR for key data tasks
4. Findings on Outcome 3 (scale-up & country ownership) & Outcome 4 (costing study + resource commitments)

Tanzania key findings

Context and mechanisms

Findings on context in Tanzania



Location of seven case study districts

Key features of implementation context

- Operational context similar in all regions, but Dodoma Region characterized by more private facilities in Dodoma Urban (new capital) and more outreach activities in rural areas

All regions had:

- A cadre of dedicated immunization officers at district and regional levels (DIVOs & RIVOs)
- Unreliable power supplies & internet connectivity – with most health facilities dependent on internet bundles
- Legacy immunization & stock management systems that remained in place throughout the BID implementation period – at facility level, these included paper-based IVD & HMIS reporting; at district level, these included DHIS2 & DVD-MT reporting systems
- A new Vaccine Information Management System (VIMS) at district level – replaced DVD-MT reporting in Dec 2018 after phased rollout; designed to be interoperable with the BID EIR

Findings on the mechanism in Tanzania

Review of the mechanism considered the full intervention cycle

EIR design

First sub-contractor unable to deliver scalable EIR solution, but developed TIIS* prototype. Replaced by MEDIC (Mohawk College) who successfully developed the Tanzania Immunization Registry (TImR) despite compressed timeframes – TImR built on a standards-based Open IZ platform

Key design challenges: offline working & synchronisation; data warehousing & processing speeds; the need to add new features “on the fly” while providing system maintenance services (all satisfactorily addressed)

Rollout strategies

Started with PATH-led ‘touch strategy’. Evolved to become District Data Use Mentors (DDUM) strategy with district officers trained as mentors to lead scale-up - found to improve country ownership & sustainability. Further adaptations led to the IMPACT Team approach used for Dodoma Region *(next slide)*

Key challenges: touch strategy resource intensive, limited government ownership. DDUM approach an improvement, but some challenges with quality assurance & duration of inputs

Maintenance & sustainability

Considerable investment in building ICT capacity at national level + joint working on server capacity + building strategic vision through Data Use Partnership (DUP)

Key challenges: Loss ICT capacity due to staff turnover - now a major gap. Also additional support to districts/ facilities re budgeting for bundles, replacement hardware etc

Spotlight: Rollout Dodoma Region

Key features

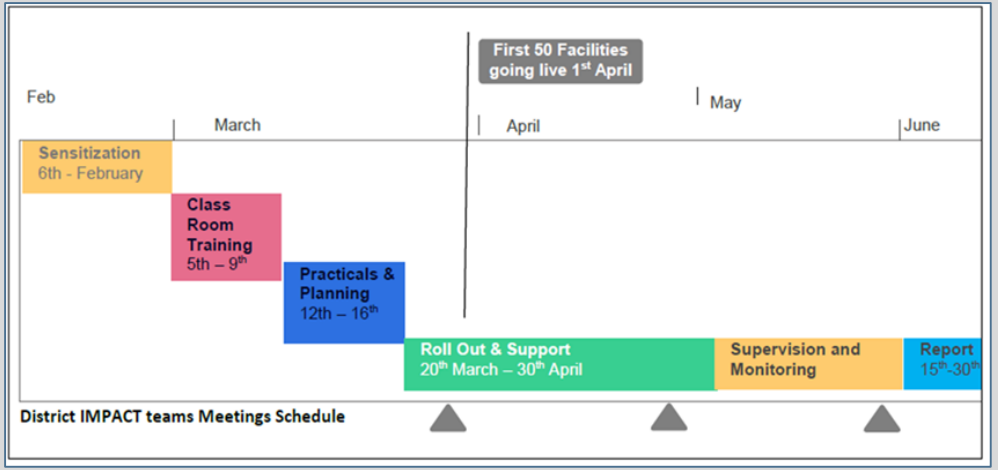
Regional & district health officers become trainer of trainers (ToT) for data-driven quality improvement initiative. Team goal: improved immunization results

Key steps

- Classroom-based ToT training
- 1 week practical training in facilities
- Monitoring & supervision (4-6 weeks)
- Remote technical support + review visit (Nov 2018)

Challenge

Limited resources, so JSI/InSupply inputs highly rationalised



IMPACT Teams implementation schedule (2018)

Source: JSI/InSupply Progress Report April 2018

Tanzania key findings

Outcome 1: Improved data quality at scale

Data quality in the legacy system

We monitored the IVD legacy system in the Northern Zone for counterfactual referencing over the period 2016 - 2019

Data accuracy at baseline

At baseline in the Northern Zone, estimated accuracy of immunization data in facility IVD reports was 47% (n=324 paired data points) using the standard methodology

Findings were similar across all antigens for both regions. Accuracy findings for stock data were weaker, largely due to calculation errors

Accuracy at 35 months

At the 35-month evaluation point, estimated accuracy of facility immunization data in the Northern Zone was 44% (n=288 paired data points)

Overall accuracy was similar to baseline – there was no significant difference across districts

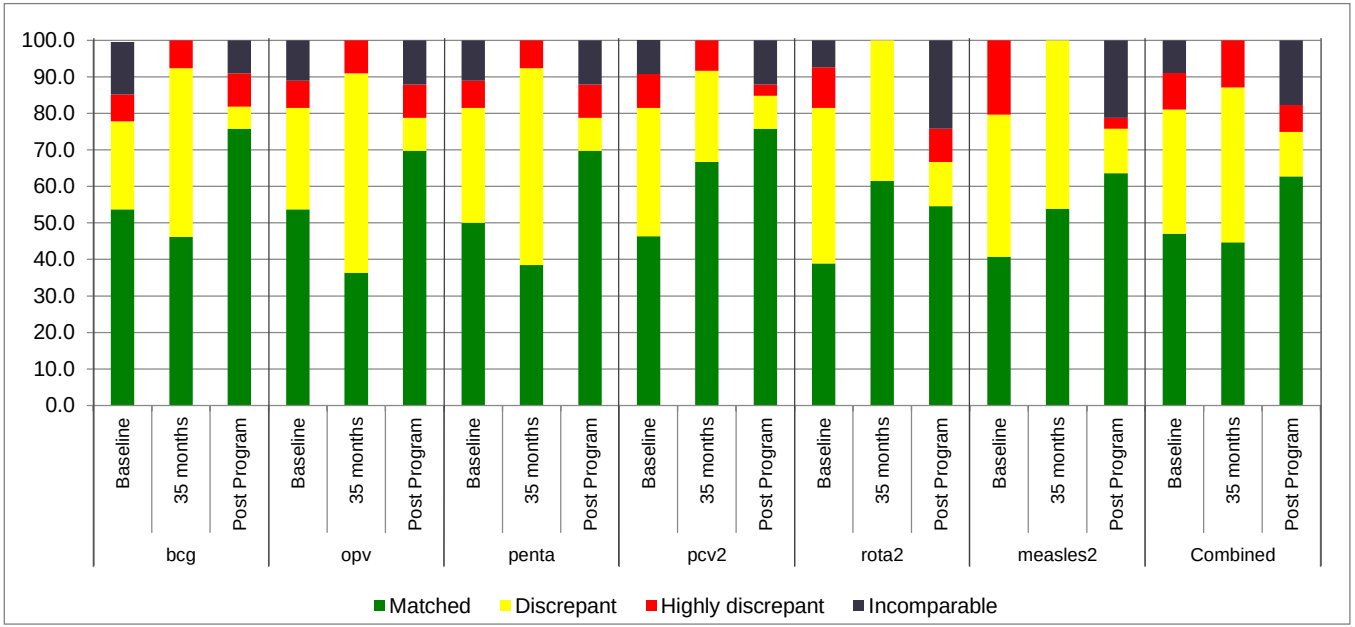
Post Program Accuracy

At the Post Program evaluation in Kilimanjaro Region (only) estimated accuracy of facility immunization data was 63% (n=231 paired data points)

This improvement could have been related to changes in IVD reporting formats (see note below)

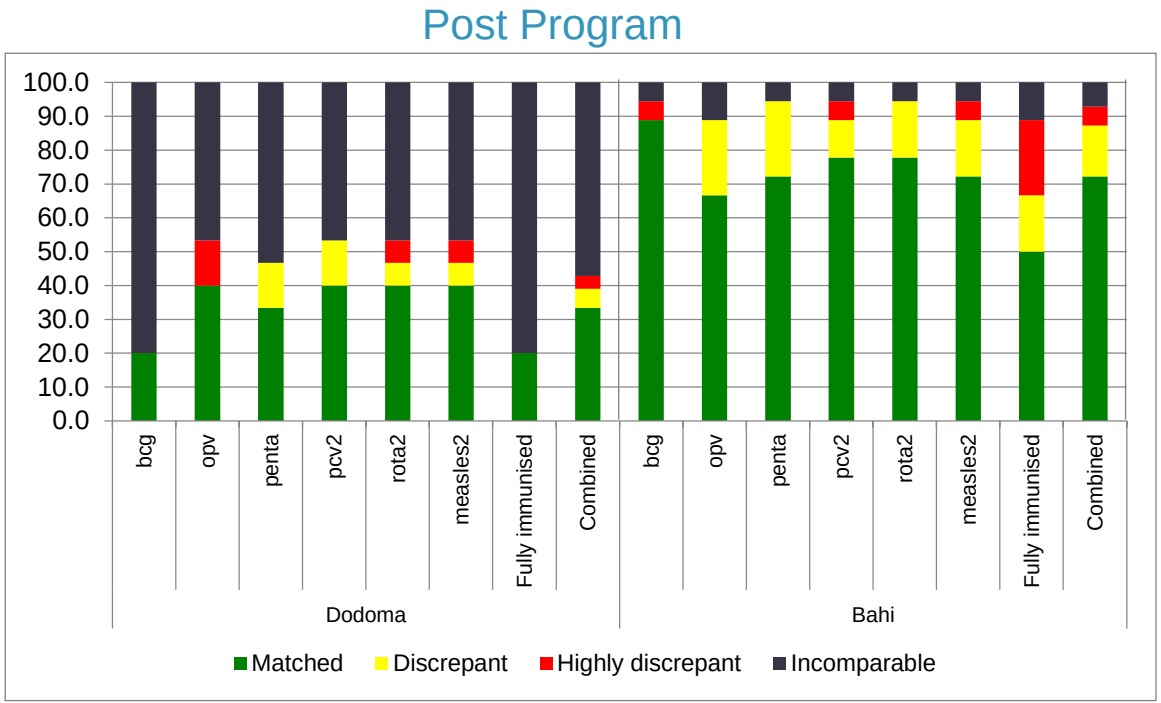
Northern Zone: data quality in the legacy system over time

Data quality in the legacy system at Baseline, 35 months and the Post Program evaluation



At baseline, estimated accuracy of facility immunization data in the Northern Zone was 47% (n=324 paired data points) for all antigens combined. At 35-months, estimated accuracy for the Northern Zone was 44% (n=288 paired data points) for all antigens combined – similar to baseline. At the Post Program evaluation in Kilimanjaro Region (only) estimated accuracy of facility immunization data was 63% (n=231 paired data points) – this improvement was probably due to changes in IVD reporting formats

Dodoma Region (special study): data quality in the legacy system



Dodoma Region

Qualitative baseline (retrospective) indicated legacy system was similar to Northern Zone. At Post Program evaluation, overall accuracy of facility immunization data was estimated to be 53% (n= 231 paired data points)

But, accuracy in rural Bahi District was found to be 72% (n= 105), compared to just 33% (n= 126) in Dodoma Urban – probably due to differences in continuity of management support

Data quality in the Tanzania EIR – Arusha Region

We focused on the accuracy of immunization data in the EIR master database over time

EIR data accuracy at End of Intervention evaluation

At the End of Intervention evaluation in Arusha Region (June 2017), only 8% of BID EIR records matched primary records across all antigens combined (n= 288 paired data points). Primary records (tally sheets) consistently recorded more immunizations administered than the EIR database, suggesting the EIR data was not complete.

Qualitative enquiries confirmed nurses were not using the EIR consistently – mostly because they found the application (then the TIIS version) to be slow and unstable.

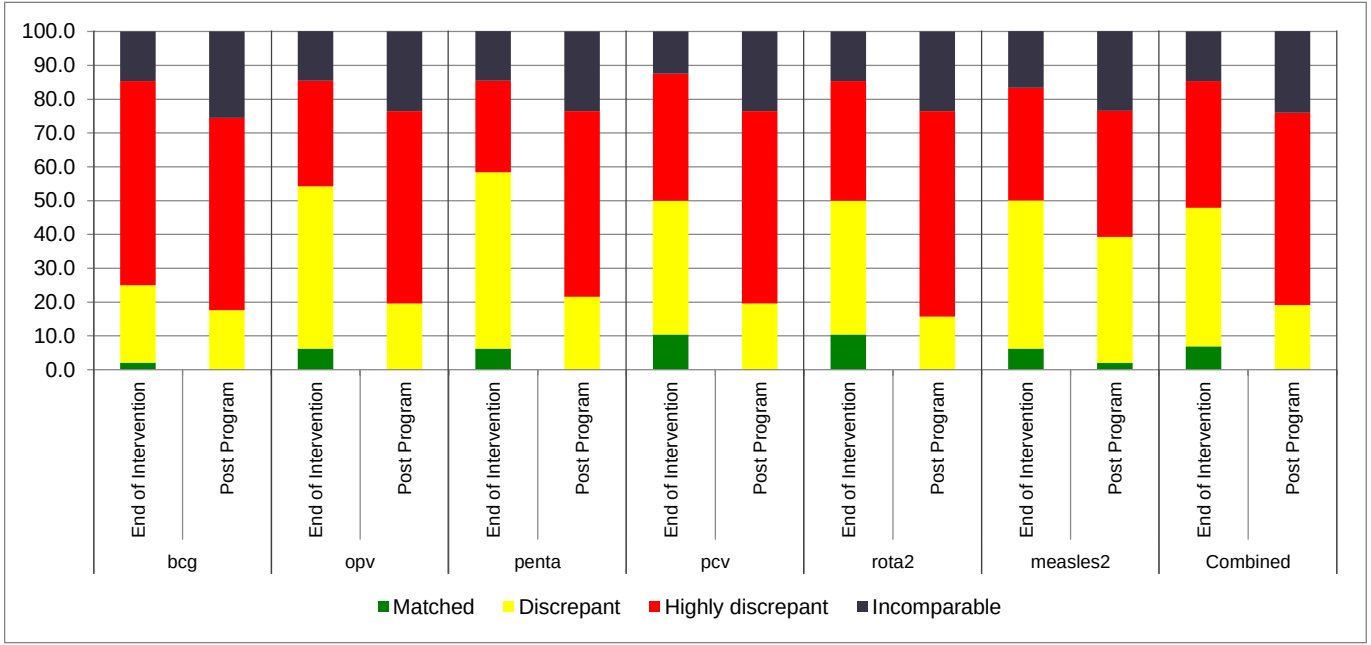
EIR data accuracy at Post Program evaluation

At the Post Program evaluation in Arusha Region (August 2018), accuracy (completeness) of EIR data had declined further (Slide 38).

Qualitative investigations indicated nurses were still not using the EIR for every client – many nurses trained in the TIIS version were now not confident in using the new TImR update. There were also growing uncertainties about supplies of internet bundles.

Arusha Region: EIR data quality over time

Data quality in the EIR at the End of Intervention and Post Program evaluations



At End of Intervention (June 2017), of 288 paired data points in the EIR database, 8% matched primary records across all antigens combined over a 3 month period (range 2-10%)

At the Post Program evaluation (August 2018), of 375 EIR data points, only a small percentage of Measles 2 data matched primary records; nearly all other records were discrepant over the 3 month review period

Data quality in the Tanzania EIR – Kilimanjaro Region

We focused on the accuracy of immunization data in the EIR master database over time

EIR data accuracy at End of Intervention evaluation

At the End of Intervention evaluation in Kilimanjaro Region (July 2018), only 5% of BID EIR records matched primary records across all antigens combined (n= 231 paired data points) - although the accuracy of BCG and Measles2 data was considerably higher at 18% and 12% respectively.

Qualitative investigations again pointed to inconsistent EIR usage. In this region, users had benefited from training in the TImR update from the outset, but many felt they needed more practice & support.

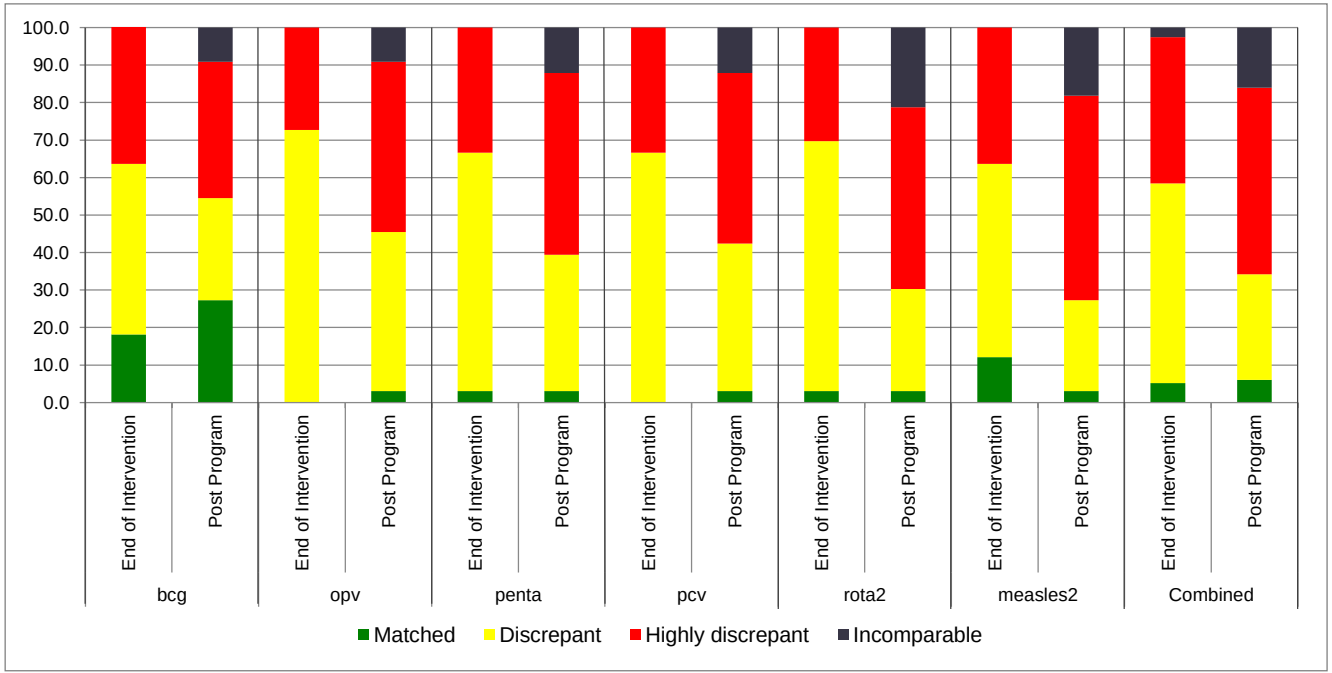
EIR data accuracy at Post Program evaluation

At the Post Program evaluation (April 2019), 6% of 231 paired data points in the EIR database matched primary records; accuracy of BCG records was still relatively good (see Slide 40).

Qualitative enquiries indicated EIR usage was still inconsistent. Very few users had downloaded recent TImR updates. Overall, usage in Moshi Municipal was better than in rural Mwanga District, probably due to the active follow-ups by the Moshi DIVO. At this stage, there were growing reports of hardware problems – either due to loss, damage, malfunctions or reduced battery life

Kilimanjaro Region: EIR data quality over time

Data quality in the EIR at the End of Intervention and Post Program evaluations



At End of Intervention (July 2018), of 231 paired data points in the EIR database, 5% matched primary records across all antigens combined over a 3 month period (range 0-18%)

At the Post Program evaluation (April 2019), of 231 EIR data points, 6% matched primary records across all antigens combined over a 3 month period (range 3-27%)

Data quality in the Tanzania EIR – Dodoma Region

In the special study, we were able to examine EIR data stored on the tablet computers and data uploaded to the master database

EIR data accuracy – master database

For the Post Program evaluation, we used the standard methodology to compare data in the EIR master database and primary records. Of 231 paired data points, only 4% of immunization data points matched across all antigens combined for the two case study districts in Dodoma Region

See Slide 42

EIR data accuracy – tablet computers

At the Post Program evaluation, we also compared facility primary records with data stored on the EIR tablet computers. From the review of paired data points, we found that for Bahi District 16% of data points matched accurately (with Measles 2 accuracy reaching 28%); however, for Dodoma Urban, accuracy results were extremely poor (see Slide 42)

Overall accuracy results were better from the EIR tablets than for the EIR master database – suggesting that not all EIR data had been successfully uploaded from the tablets to the EIR master database

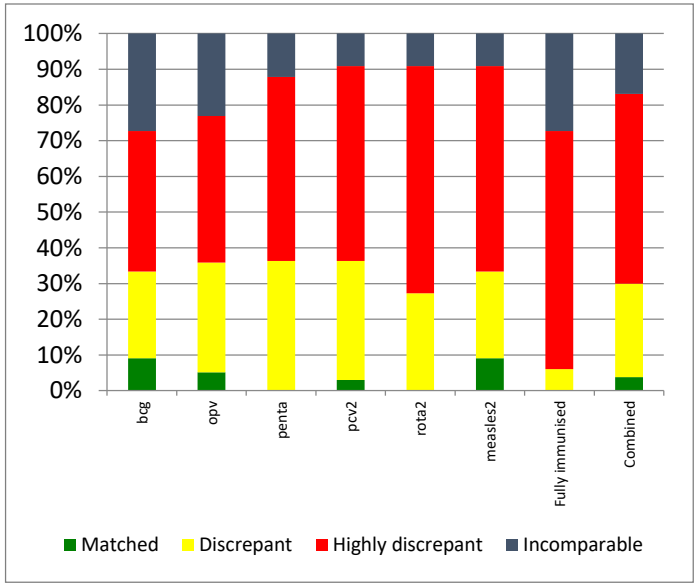
Qualitative findings

Qualitative investigations indicated that, even in Bahi District, the EIR was not being used for every client so, as in Northern Zone, EIR data was not complete. There were also considerable hardware distribution problems in Dodoma Urban

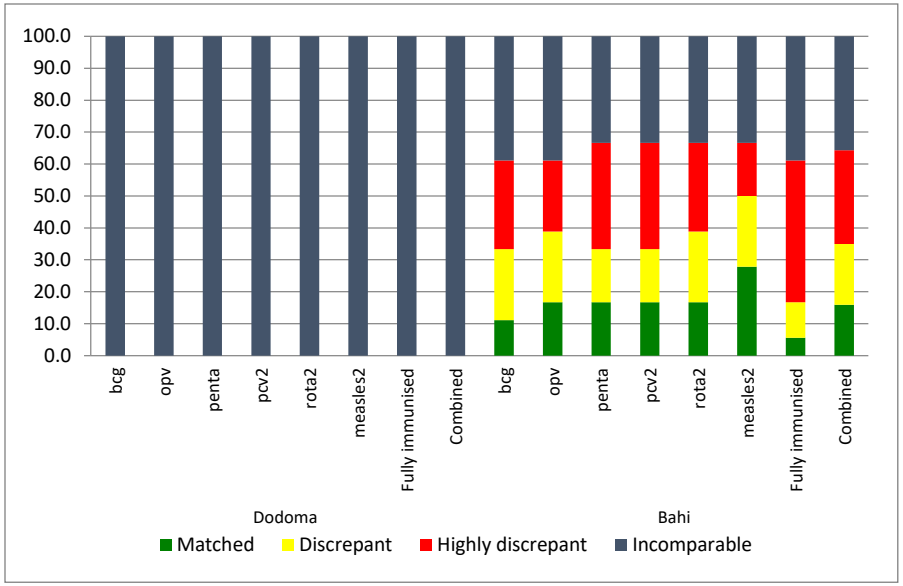
Access to data bundles for internet access was a problem in both districts – this prevented timely uploading of data

Dodoma Region: EIR data quality

EIR master database



EIR tablet data



Using the standard method to compare primary records with data in **EIR master database**, we found that just 4% of 231 data points matched accurately across all antigens combined

From comparison of paired data points in primary facility records and the **EIR tablet data,** we found findings for Dodoma Urban were poor, but in Bahi District, accuracy results increase to 16% (n=105) across all antigens combined. These findings pointed to problems in uploading data and confirmed multiple usage issues in Dodoma Urban

Tanzania key findings

Outcome 2: Improved data use for decision-making

Data use for decision making – Arusha Region

We assessed competency in key EIR data use tasks across the 3 case study districts

Competency at End of Intervention evaluation

Using a standardized assessment tool, we found very good EIR competency for registering a new client, with 86% of nurses (n=20) assessed as fully or mostly competent. For the other task sets (e.g. defaulter identification, report generation), 82% (n=24) nurses were fully/mostly competent

Scores from rural Longido District were especially impressive

Competency at Post Program Evaluation

Scores for using the EIR to register a new client still very good with 74% (n=20) nurses were fully/mostly competent;

BUT, a marked decline in performance on other data use tasks, where only 30% (n=21) nurses were scored as fully/mostly competent

See Slide 45

Qualitative findings

Qualitative investigations suggested: Longido's exceptional performance was related to the enthusiasm of the DIVO.

Declining performance in more other data use tasks was mostly explained by nurses not being confident in using the new TImR update

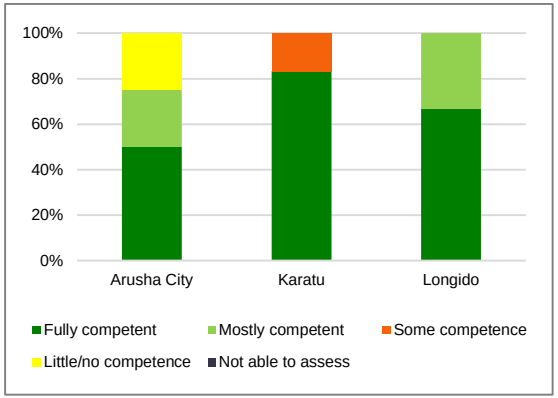
There was little consistent evidence for use of EIR data for reporting or decision-making at facility or district levels

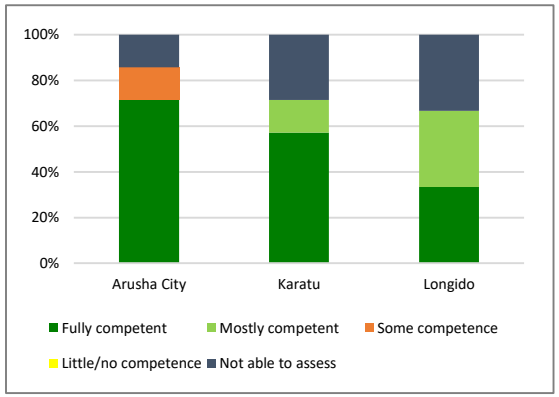
Arusha Region: user competency scores at evaluation milestones

End of Intervention

Post Program

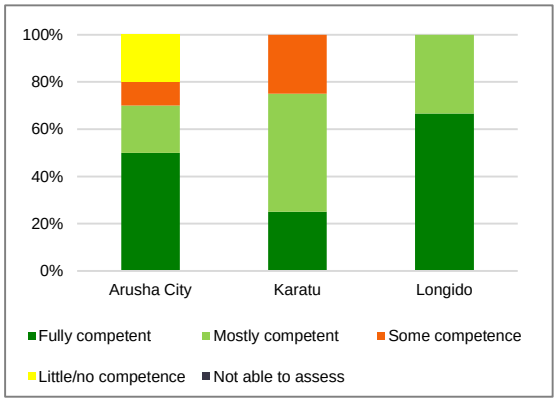
EIR task set: registering a new patient

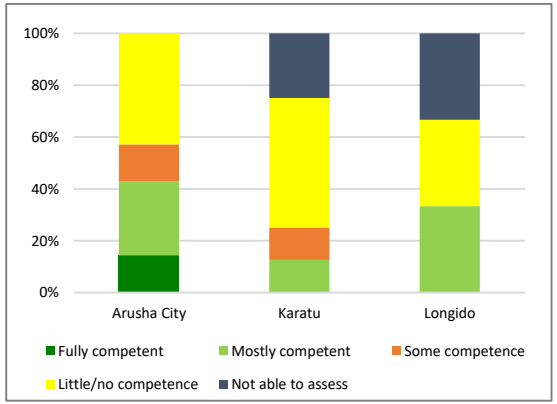




In Arusha Region, user competency in using the EIR to register a new patient were generally good to very good over time

EIR task set: other data use tasks





In Arusha Region, other EIR competency skills (e.g. defaulter identification, report generation) deteriorated over time

Data use for decision making – Kilimanjaro Region

We assessed competency in key EIR data use tasks across the 2 case study districts

Competency at End of Intervention evaluation

Good overall levels of EIR competency for registering a new client, with 78% of nurses (n=14) assessed as fully/mostly competent. Scores for other data use tasks were weaker, with just 47% (n= 16) nurses scored as fully/mostly competent.

For other data use tasks, scores for rural Mwanga were much weaker than Moshi Municipal

Competency at Post Program Evaluation

Scores for using the EIR to register a new client still very good at 84% (n=12) (and Moshi nurses being 100% competent in this task). BUT, there was a decline in scores for other data use tasks.

For other data use tasks, only 29% nurses in Moshi Municipal were scored as fully/mostly competent; in Mwanga these skills were minimal (Slide 47)

Qualitative findings

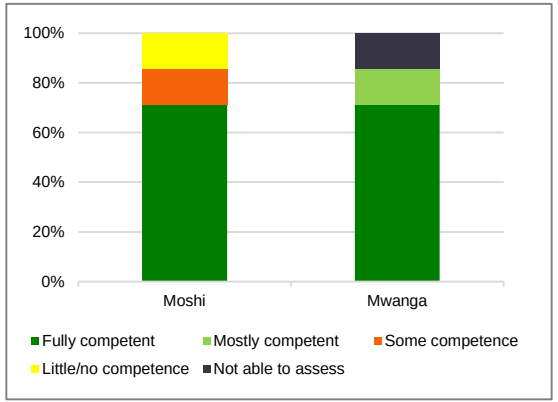
Qualitative investigations indicated that end of intervention scores were high because training was still fresh – although mostly focused on patient registration skills

By Post Program, many nurses were only using the EIR for registration. Users were finding EIR data retrieval slow, especially in mountainous Mwanga where there were internet constraints. Few nurses used barcode scanners, believing it slowed data retrieval

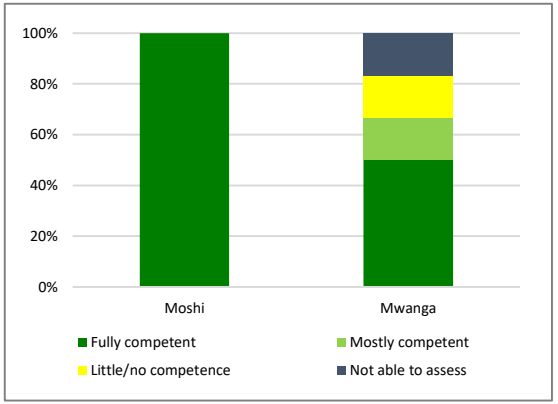
Kilimanjaro Region: user competency scores at evaluation milestones

EIR task set: registering a new patient

End of Intervention

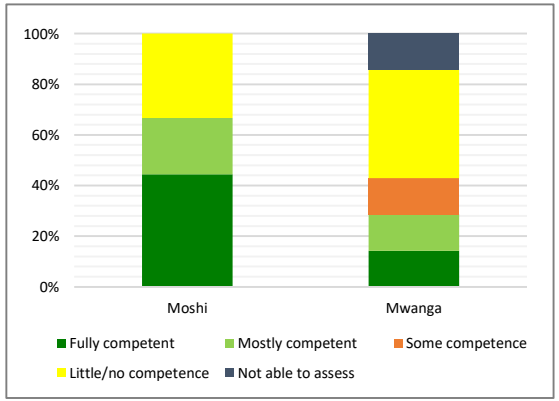


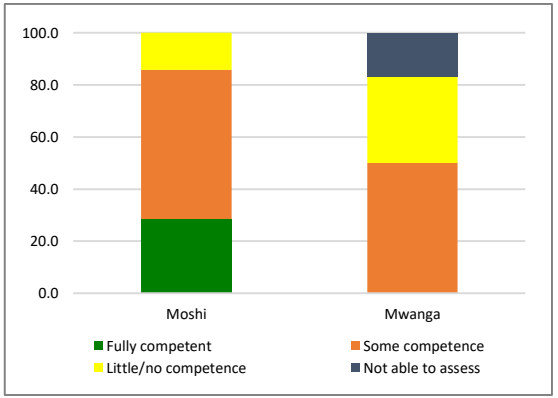
Post Program



In Kilimanjaro Region, user competency in using the EIR to register a new patient were generally very good over time, although there was a small decline in rural Mwanga District

EIR task set: other data use tasks





In Kilimanjaro Region, other EIR competency skills (e.g. defaulter identification, report generation) deteriorated further over time

Data use for decision making – Dodoma Region

We assessed competency in key EIR data use tasks across the 2 case study districts

Limitations in Dodoma Region

For the Post Program competency assessments in Dodoma Region, sample sizes were reduced

This was because some tablets were not working (Dodoma Urban) or were not available at time of the evaluation visit (Bahi).

Competency at Post Program Evaluation

Among nurses who could be assessed, 100% (n=8) in Bahi District were scored as fully competent in using the EIR to register a new client; this compared to just 33% (n=7) in Dodoma Urban. Similarly, for other data use tasks, 100% (n=8) assessed nurses in Bahi District were fully/mostly competent, compared to 43% (n=7) in Dodoma Urban.

Notably, nurses assessed in Dodoma Region appeared to have good all-round EIR competency skills (Slide 49).

Qualitative findings

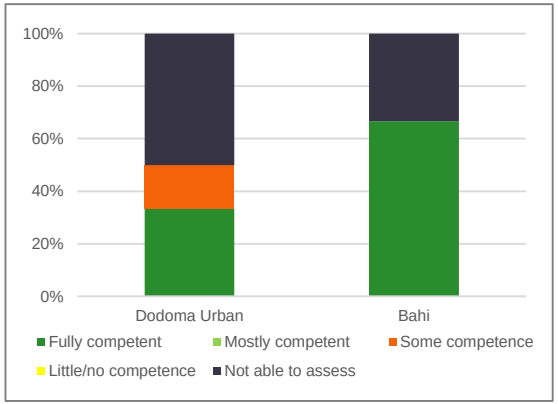
Qualitative investigations suggested high management/DIVO turnover in Dodoma Urban affected user training and distribution of hardware. Meanwhile, evaluation interviews & observations in Bahi District suggested management teams were effective & highly committed.

There was no evidence that district IMPACT Teams were meeting as expected to review/use immunization data; however, there were relevant WhatsApp exchanges amongst team members.

Dodoma Region: user competency scores at evaluation milestones

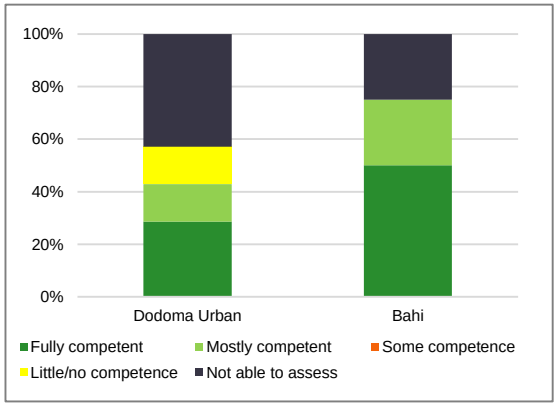
Post Program

EIR task set: registering a new patient



In Dodoma Region, user competency in using the EIR to register a new patient were somewhat better in rural Bahi Region than urban Dodoma Region

EIR task set: other data use tasks

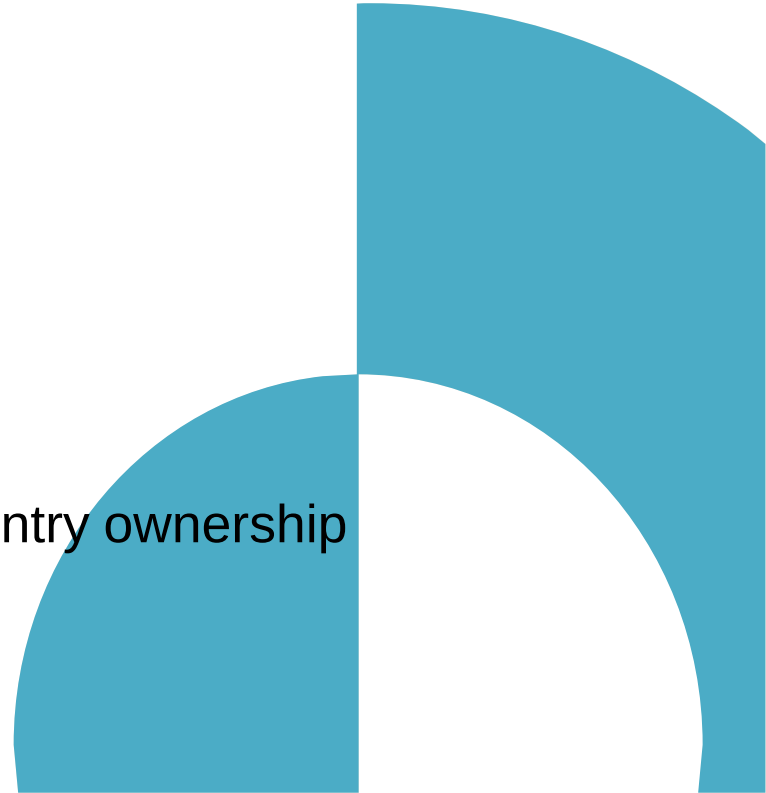


In Dodoma Region, user competency skills in other data use tasks were relatively good - and had been retained especially well in Bahi Region where management support was strong

Tanzania key findings:

Outcome 3: Implementation at scale & country ownership

Outcome 4: Resource commitments



Outcome 3: Implementation at scale and country ownership

Successful implementation at scale

By program end, the BID Initiative had been rolled out to 1,273 health facilities in Tanzania

This includes Arusha, Tanga, Kilimanjaro & Dodoma Regions

Country ownership

National key informants confirmed good levels of ownership & involvement. In part driven by vision for EIS* - integrated EIR and VIMS systems (with resources from a Gavi country grant)

Government commitment indicated by trial of paperless reporting in Tanga Region

Stakeholder concerns

Key concerns included need to significantly expand server & ICT capacity to support sustain scale-up; also need to improve EIS integration and data flows – especially for vaccine logistics

Challenges mentioned: resource requirements for hardware & recurrent costs (internet bundles etc) – concerns that recent procurement delays are slowing scale-up

Peer networking & the BLN

BLN & peer networking: good participation by national IVD program managers, but less at sub-national levels

BLN impressive technical exchanges & peer dialogue within community of practice – but requires considerable maintenance & moderator support

Outcome 4: resource commitments

Assessing total cost of ownership (TCO)

- Partial TCO assessment: again, PATH provided a sound cost analysis, but was not able to provide a complete a full TCO assessment due to challenges in measuring costs incurred by other role-players (e.g. government, Gavi) and longer term maintenance & scale-up costs
- PATH's costing data allows some analysis:
  - From PATH's data (see table), we can see that PATH's total project expenditure in Northern Tanzania (2015-2018) was US$ 4,193,647
  - We can also see the distribution of expenditure and some of the cost drivers. But, the information provided does not tell us much about total future recurring costs, as most of these were not estimated

System design and development			
System design and development costs of electronic immunization registry (in use)			US$867,851
Learning costs (electronic immunization registry which was shelved)			US$527,644
Other costs			
Back entry costs			US$84,441
Peer learning and printing of guidelines			US$6,242
Labor costs			
BID Initiative staff			US$1,648,484
Region-specific costs			
	Arusha	**Tanga**	**Kilimanjaro**
Rollout costs			
Hardware	US$187,232	US$158,588	US$93,289
Meetings	US$8,728	US$9,783	US$7,097
Training	US$33,232	US$20,686	US$17,148
Deployment	US$146,701	US$162,353	US$103,617
Annual recurrent costs			
Internet connectivity	US$16,930	US$19,807	US$16,301
Data hosting	US$9,086	US$10,630	US$8,308
Supportive supervision	❖	US$6,178	US$8,786
Printing (e.g. barcodes)	US$4,702	US$5,501	US$4,300
Total costs over project period			**US$4,193,647**

PATH expenditure data for the BID Initiative in Northern Tanzania (2015-2018)

Outcome 4: resource commitments

Review of costs to inform resource mobilisation

Distribution of expenditure

From PATH's costing data, we estimated 21% of total project expenditure was for system design & development (or 33% if the cost of the first version is included); 39% was for BID staffing costs & 23% was for rollout (of which just under half was for hardware)

PATH estimated annual recurrent costs at ~2% but this did not include many of the actual costs of operating the system at scale*

Scale up costs

Extrapolating from PATH's data (with the limitations of the recurrent cost data), we estimated the cost of scale-up to all 31 regions of Tanzania would be ~US$14m – of which total rollout costs would be ~US$11m spread over several years.

For Tanzania, this US$11m equates to 9% of all annual immunization expenditure by government & its partners

Projected costs

For Tanzania, PATH estimated future annual recurrent costs per region at ~US$36,850, which would come to $1,142,350 each year for 31 regions. This would cover internet bundles, data hosting, supportive supervision and printing. BUT these estimates do not include central recurrent costs, the cost of procuring additional / replacement tablet computers, & other system development costs (e.g. investments in ICT & server capacity)

None of these cost estimates can yet be compared to measurable outcomes –this would be required to create a business case for further investment

Outcome 4: resource commitments

Cost implications of the alternative rollout strategy

- We reviewed InSupply's costing data for the IMPACT Team approach; we then compared this with PATH's costing data for a comparable region (Kilimanjaro) over a similar timeframe
- Available data indicated rollout costs in Dodoma Region were approx. US$260 per facility, compared to approx. US$438 per facility in Kilimanjaro Region – although alignment of budget lines was not straightforward
- Cost savings for the IMPACT Team approach were likely to be due to delivery by a smaller [InSupply] team that provided highly structured inputs at defined intervals over shortened timeframes
- But we cannot draw definitive conclusions because:
  - Stakeholders suggest the IMPACT Team approach needs to include more follow-up support
  - Once again, there are no definitive links to intended outcomes for assessing cost-effectiveness

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Discussion

Discussion themes

The evaluation design allowed for comparisons across case study districts over time

Context in Tanzania

The next slide presents a timeline showing key findings at each evaluation –an overview for comparison purposes. Interpretation of findings can be grouped into several broad themes

EIR data use themes

EIR competency skills were strongest immediately after training but then, without adequate follow-up support, skills declined – more advanced stock management skills and data interpretation skills deteriorated fastest

EIR usage themes

We have seen that, in both countries, ongoing usage issues meant that even once a fully functional EIR had been developed, this did not directly translate into improved data quality in the immunization system

Health system themes

E.g. in Tanzania: staff turnover + burden of work; uncertain supplies of data bundles and barcodes; lack of ICT/technical support; & governance issues all contributed to inconsistent EIR usage

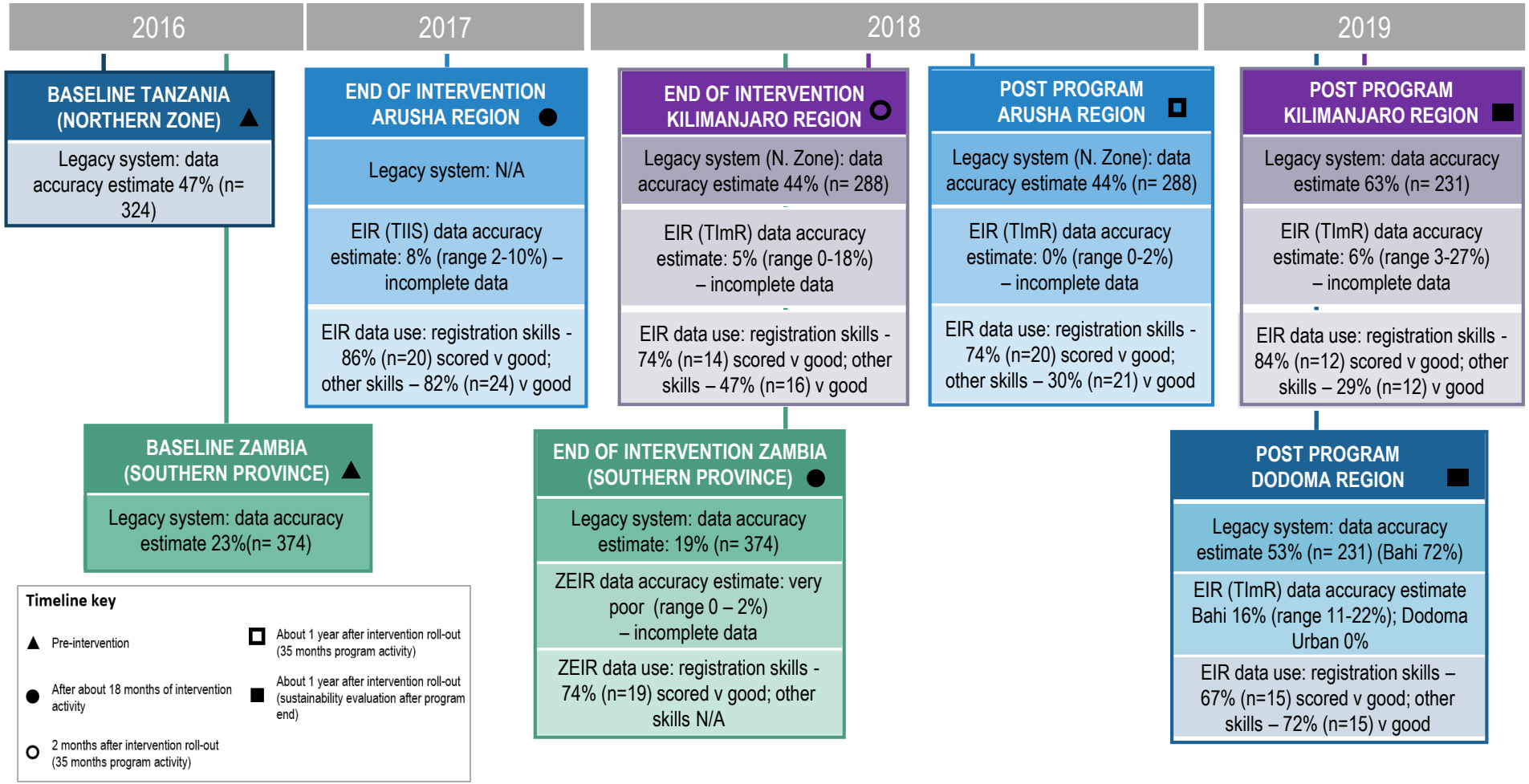
EIR data quality themes

In all case study districts, the core problem was that the EIR was not used for every new client. This, in combination with data upload issues, meant EIR master data remained incomplete & was not reliable for decision-making

Institutional themes

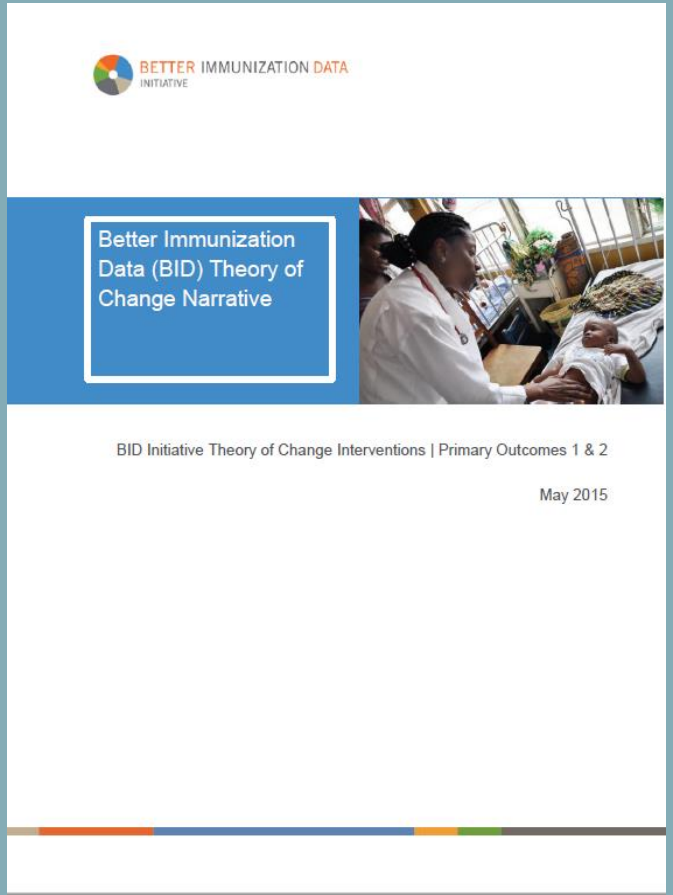
In Tanzania, there was some evidence (e.g. from Dodoma Region) that good EIR performance was linked to the quality of ongoing supportive supervision & effective communication of government's strategic vision

Timeline & Evaluation Summary



Reflecting on the theory of change

- The BID Initiative theory of change was based on an overarching primary hypothesis
- The primary hypothesis posited: the BID package of interventions would lead to improved immunization data quality and use at scale in 2 demonstration countries; these outcomes would, in turn, lead to increased country commitments & resources for scale-up
- We've identified six supplementary hypotheses from the evaluation work – these could usefully tested in future collaboration, learning and adaptation cycles to strengthen the theory of change



Six hypotheses

Several supplementary hypotheses could be usefully tested to strengthen the BID theory of change

Hypothesis 1

It is better to recruit early adopters in low volume facilities. In these settings, users have more time to practice & work through operational issues; users in high volume facilities are already over-burdened

Hypothesis 2

Premature rollout of the EIR solution risks demotivating users & policy makers. It can be counterproductive to move to scale-up before the EIR app is fully developed & successfully piloted – data use interventions can be an interim measure

Hypothesis 3

Take-up of EIR & data use solutions is more successful in strong health systems. Alternatively, these solutions need to be introduced as part of coherent health systems strengthening (and eHealth) approaches that engage with all system levels & ‘building blocks’

Hypothesis 4

If technical & workflow constraints prevent nurses using the EIR for every client, designers should consider a mixed digital-paper solution that is tailored to workplace realities & allows gradual transition to e-reporting

Hypothesis 5

If immunization reporting is fully integrated in the RMNCH continuum of care (as in Zambia), it is more efficient to introduce an integrated approach to electronic data reporting from the outset (rather than expand from a vertical immunization reporting solution)

Hypothesis 6

The IMPACT Team approach offers a cost-effective rollout strategy that brings additional benefits for a sustainable culture of data use, if introduced as part of a more extensive quality improvement initiative

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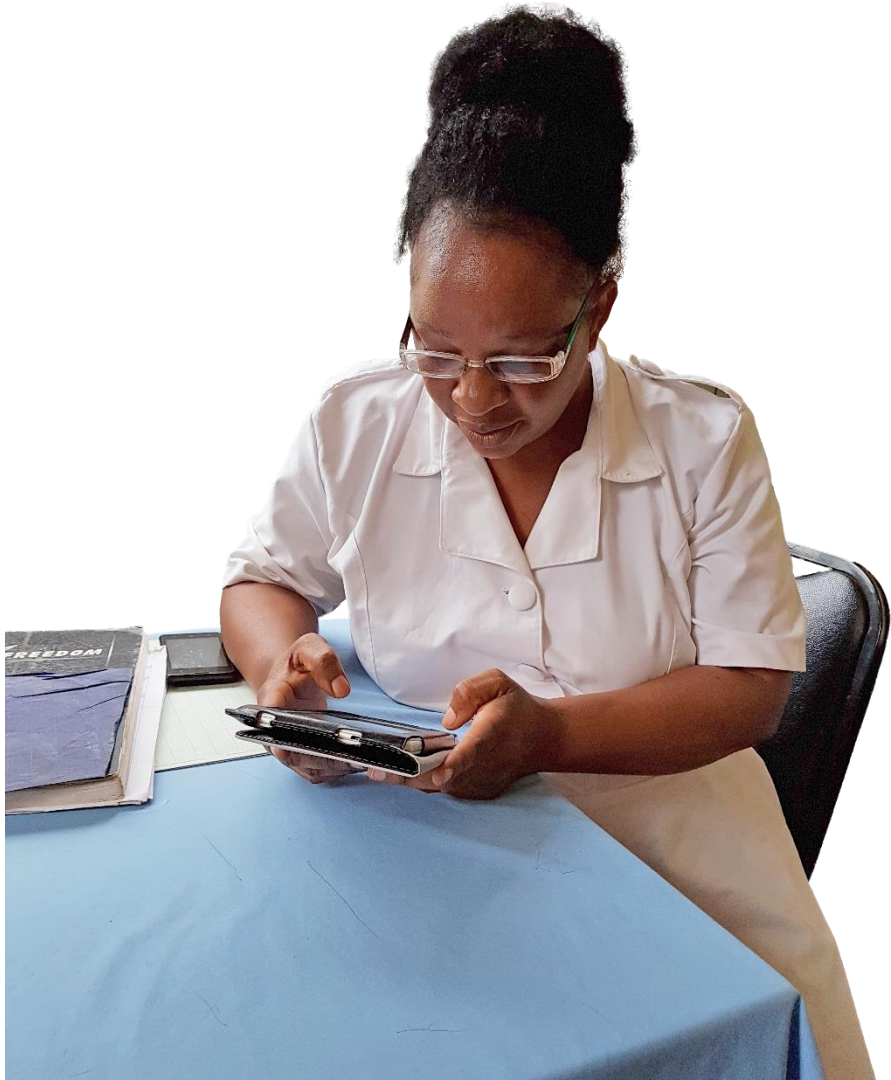
Conclusion & recommendations

Conclusion

- There is growing momentum in the use of EIRs & other digital health solutions to drive improved data quality and use in immunization programs in LMICs
- Our evaluation work has shown there are multiple factors that may determine the effectiveness of these solutions – some are about design, deployment and maintenance of the technology, and some are about the wider health systems environment
- Processes for finding the most appropriate digital health solutions for different settings can take time; they also require an openness to adaptation and course-correction
- Ultimately, like all digital health initiatives, EIR-based solutions must be measured against their potential to cost-effectively deliver improved health outcomes



Recommendations for Donors and Development Partners

3 key recommendations have emerged from the evaluation work

Build the evidence base

Make provision for credible, independent evaluation of other initiatives aiming to improve immunization data quality & use in LMICs to expand the evidence base and inform future scale-up

Commission periodic evidence reviews - identify factors in success and prompts for course correction

Test new hypotheses

Enrich the evidence-base by seeking opportunities to test the hypotheses listed in Slide 59 – ensure the evidence is robust, is fully shared with key stakeholders

Incorporate evidence from hypothesis-testing into revised theories of change to inform program design

Generate robust data on the cost implications

Make provision for TCO analysis to be included in similar projects to contribute to the evidence base. Build consensus on a standard TCO methodology that takes account of direct & indirect costs over short and long timeframes

Ensure TCO findings are shared with decision-makers and inform cost-effectiveness assessments against alternative interventions

Recommendations for governments and implementing partners (1)

The following recommendations are intended to strengthen the program legacy in Zambia and Tanzania

ICT capacity gap

Ensure gaps in ICT capacity at the national level are addressed

This investment is needed for EIR scale-up, monitoring, maintenance, upgrades & ongoing system enhancements

Hardware specifications

Review specifications for tablet computers: consider investing in high spec. tablets with built-in scanners

This investment will contribute to hardware durability, easier data retrieval from barcodes & better data processing speeds in challenging environments

EIR Focal Points

Consider investing in local Focal Points to provide rapid & accessible technical, troubleshooting, training and user operations support

Focal Point services could usefully be provided through a Helpdesk. This investment would also assist system monitoring

Server hosting capacity

Strengthen in-country server capacity to overcome the constraints of current cloud-based server arrangements

This investment could help maintain the EIR system at scale & improve adequate data processing speeds

Recommendations for governments and implementing partners (2)

The following recommendations are intended to strengthen the program legacy in Zambia and Tanzania

Data security

Commission regular data security assessments to ensure personal health data is fully protected.

Ensure health care workers are trained to observe the highest standards of data privacy & ethical practice

Robust M&E

In Tanzania, commission a robust evaluation study of paperless reporting in Tanga Region to review progress, assess feasibility & identify lessons for scale-up

Continue to monitor system scale-up carefully to identify & address problems early

Scale-up strategy

Commission studies to identify the most cost-effective implementation strategy for scale-up in each country setting

These should review all options, including the IMPACT Team strategy & government's recent hybrid approach

Cost of ownership

Think critically about capital and recurrent costs over the short-term and long-term and weigh these against *potential* benefits & impacts of the solution

Situate this analysis within wider cost-effectiveness reviews of alternative interventions

And finally

- The Mott MacDonald evaluation team would like to thank the Bill and Melinda Gates Foundation for the opportunity to evaluate the BID Initiative in Zambia and Tanzania. We would especially like to thank Tove Ryman for her leadership in guiding and directing the evaluation assignment.
- Mott MacDonald's country-based partners - KCMUCo in Tanzania and the research team led by Victor Kabwe in Zambia - have shown outstanding professionalism and commitment throughout.
- Mott MacDonald would particularly like to thank the PATH and JSI/InSupply teams who implemented the BID Initiative. Their openness to sharing data, lessons and experience has been exceptional, and has contributed greatly to the successive evaluations.
- Finally, Mott MacDonald would like to extend its appreciation to the many respondents who have contributed to the evaluations by sharing their time, experience and insights.
- We trust the findings captured in the evaluation reports will be seen as constructive and useful for policy-makers in both Zambia and Tanzania.