Immunization Systems and User Requirements Document (SURD) - Tanzania

System User Requirements Specifications as in the Tanzania Context

DIGITAL SQUARE

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Acknowledgements

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Abbreviations

AEFI	adverse event following immunization
API	Application Program Interface
BCG	Bacillus Calmette–Guérin
CCIT	container closure integrity testing
CHW	community health worker
CIF	case investigation form
CRDM	Collaborative Requirements Development Methodology
CRVS	Civil Registration and Vital Statistics
CTC	Care and treatment center
DHIS2	District Health Information System
DIVO	District Immunization and Vaccination Officer
DOB	date of birth
DTP	Diphtheria, pertussis, and tetanus
DVD-MT	District Vaccination Data Management Tool
eIDSR	electronic Integrated Disease Surveillance and Response system
EIS	electronic immunization system
eSRS	Electronic Sample Referral System
FP	family planning
HCW	health care worker
HF	Health facility
HFR	Health Facility Registry
HIM	Health Interoperability Mediator
HMIS	health management information system
HPV	human papilloma virus
ICT	information communication technology
IPD	Inpatient department
IVD	Immunization and Vaccination Department
MCV	Mean Corpuscular Volume
MOH	Ministry of Health

MR	Measles Rubella
NHIF	National Health Insurance Fund
NMFL	National Master Facility List
OpenLMIS	Open Logistics Management Information System
OPD	Outpatient department
PIRI	Periodic Intensification of Routine Immunization (PIRI)
PORALG	President's Office, Regional Administration and Local Government Tanzania
RCH	reproductive and child health
RIVO	Regional Immunization and Vaccination Officer
RTM	Remote Temperature Monitoring
SIA	Supplementary Immunization Activities
SMS	short message service
SMT	Stock Management Tool
Td	Tetanus Diptheria
TImR	Tanzania Electronic Immunization Registry
TZHEA	Tanzania Health Enterprise Architecture
UCS	Unified Community System
UNICEF	United Nations Children's Fund
VIMS	Vaccine Information Management System
VVM	Vaccine vial monitor
WHO	World Health Organization

Objectives

This systems and user requirements document (SURD) focuses on immunization in the Tanzania context and aims to provide a common language across various audiences--programme managers, software developers, and implementers of digital systems--to ensure a common understanding of the appropriate health information content within the immunization health programme area, as a mechanism to catalyse the effective use of these digital systems. The key objectives of this SURD are:

- To ensure adherence to Tanzania-specific public health and data use guidelines and facilitate consistency of the health content that is used to inform the development of a person-centered digital tracking and decision-support (DTDS) system.
- To enable health programme leads and digital health teams (including software developers) to have a joint understanding of the health content within the digital system, through a transparent mechanism to review the validity and accuracy of the health content.
- To provide a starting point of the core data elements and decision-support logic that should be included within DTDS systems for Immunization.

Information detailed in this SURD has been adapted from the generic workflow processes, data and decision-support algorithms, as derived from the DIPC project conducted by PATH and other related WHO documents described below. In addition, this SURD describes linkages to related services for immunization, such as contact tracing, facility management of an infected patient, and considerations for community management. **Note that this SURD is contextualized to the local Tanzanian policies and requirements.**

SURD components

This SURD comprises eight interlinked components: (1) health interventions and associated recommendations; (2) generic personas; (3) user scenarios; (4) generic business processes and workflows; (5) core data elements; (6) decision-support logic; (7) indicators and reporting requirements; and (8) high- level functional and non-functional requirements. All information within this document came from a generic starting point, which was adapted according to the specific context, in this case Tanzania.

Table 1: Eight components comprising the SURD for immunization in Tanzania.

#	Component	Description	Purpose	Output/artifacts	Adaptation undertaken
1	Health interventions & recommendations	Overview of the health interventions and WHO recommendations included within this SURD. SURDs are meant to be a repackaging and integration of WHO guidelines and guidance documents in a particular health domain. The list of health interventions is drawn from the universal health coverage (UHC) menu of interventions compiled by WHO[1] *(12)*.	**Setting the stage -** To understand how this SURD would be applied to a digital tracking and decision support system in the context of specific health programmes and interventions	**List of related health interventions** based on WHO's universal health coverage essential interventions **List of related WHO recommendations** based on guidelines and guidance documents	Contextualization to reflect current or planned national policies
2	Generic personas	Depiction of the end-users, supervisors and related stakeholders who would be interacting with the digital system or involved in the care pathway.	**Contextualization -** To understand the wants, needs and constraints the end-users.	**Description, competencies, and essential interventions** performed by targeted personas	- Greater specification and details on the end users based on real people (e.g., health workers) in a given context (in this case Tanzania) - High-level information to describe the provider of the health service (e.g., the general background, roles and responsibilities, motivations, challenges, and environmental factors)
3	User scenarios	Narratives that describe how the different personas may interact with each other. The user scenarios are only illustrative and are intended to give an idea of a typical workflow.	**Contextualization -** To understand how the system would be used and how it would fit into existing workflows	Example **narrative** of how the targeted personas may interact with each other during a workflow	Greater specification and details on the real needs of end users in a given context
4	Generic business processes and workflows	A business process is a set of related activities or tasks performed together to	**Contextualization and system design -** To understand how to	Overview **matrix** presenting the **key processes** for immunizations	Customization of the workflows that can include additional

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[1] UHC compendium: repository of interventions for universal health coverage. Geneva: World Health Organization; 2020 (https://www.who.int/universal-health-coverage/compendium/interventions-by-programme-area, accessed 17 December 2020).

#	Name	Description	Purpose	Outputs	Adaptations
		achieve the objectives of the health programme area, such as registration, counselling, referrals *(1,16[2])*. Workflows are a visual representation of the progression of activities (tasks, decision points, interactions) that are performed within the business process *(1,16)*.	system would fit into existing workflows and how best to design the system for that purpose	● **Workflows** for identified business processes with annotations	forks, alternative pathways or entirely new workflows
5	Core data elements	Data elements required throughout the different points of the workflow. These data elements are mapped to the International Classification of Diseases version 11 (ICD-11) codes and other established concept mapping standards to ensure the data dictionary is compatible with other digital systems.	**System design and interoperability** – To know which data elements need to be logged and how they map to other standard terminologies (e.g., ICD, Systematized Nomenclature of Medicine [SNOMED]) for interoperability with other standards-based systems	● List of data elements ● Link to **data dictionary** with detailed data specifications in spreadsheet format (Web Annex A)	Translation of "data labels" into the local language and additional data elements created depending on the context
6	Decision-support logic	Decision-support logic and algorithms to support appropriate service delivery in accordance with WHO clinical, public health and data use guidelines.	**System design and adherence to recommended clinical practice** - To know what underlying logic needs to be coded into the system	● List of decisions that need to be made throughout the encounter ● **Link to decision-support tables** in a spreadsheet format with inputs, outputs and triggers for each decision logic (Web Annex B) ● Scheduling logic for services (Web Annex B)	● Change of specific thresholds or triggers in a logic (IF/THEN) statement (e.g., BMI cut-off, age trigger for "youth friendly" services) ● Additional decision-support logic formulas depending on the context
7	Indicators and performance metrics	Core set of indicators that need to be aggregated for decision-making, performance metrics, and subnational and national reporting. These indicators and metrics are based on data that can feasibly be captured from a routine digital system, rather than survey-based tools.	**System design and adherence to recommended health monitoring practices** – To know what calculations and secondary data use are needed for the system, based on the	**Indicators table** with numerator and denominator of data elements for calculation, along with appropriate disaggregation	● Changing calculation formulas of indicators ● Adding indicators ● Changing the definition of the primary data elements used to calculate the indicator based on data available

[2] Collaborative Requirements Development Methodology (CRDM). In: Public Health Informatics Institute [website]. Decatur, GA.: The Task Force for Global Health; 2016 (https://www.phii.org/crdm/, accessed 11 February 2021).

				Table of functional and **non-functional requirements** with the intended end-user of each requirement, as well as why that user needs that functionality in the system	
			principle of "collect once, use many"[3] *(9)*		
8	Functional & non-functional requirements	List of core functions and capabilities the system must have to meet the end-users' needs and achieve tasks within the business process.	**System design** – To know what the system should be able to do	**Table of functional and non-functional requirements** with the intended end-user of each requirement, as well as why that user needs that functionality in the system	Adding or reducing functions and system capabilities based on budget and end-user needs and preferences

[3] Barton C, Kallem C, Van Dyke P, Mon D, Richesson R. Demonstrating "collect once, use many" – assimilating public health secondary data use requirements into an existing Domain Analysis Model. AMIA, 2011, 98–107.

Notation guidance

Throughout this SURD, there are identification (ID) numbers to simplify tracking and referencing of each of the components. Note that the SURD represents an overview across the different components, while the comprehensive and complete outputs of each component (e.g., data dictionary) are included in appended spreadsheets. The notation guide is as follows:

Component 4: Business processes and workflows
Each workflow should have a "Process name" and a corresponding letter.

- Each workflow should also have a "**Process ID**" that should be structured "**Abbreviated health domain**" (e.g., TIZPS). "Corresponding letter for the process" (e.g., A)
- Each activity in the workflow should be numbered with an "**Activity ID**" that should be structured "**Process ID**" from above "**Activity Number**" e.g., TIZPS.B7

Component 5: Core data elements (data dictionary)

Each data element should have a running number and a "**Data Element (DE) ID**" that should be structured "**Abbreviated health domain**" (e.g., TIZPS). "**DE**". *"Sequential number of the data element" (e.g., TIZPS.B7.DE.1, TIZPS.B7.DE.2*

Component 6: Decision-support logic
Each decision-support logic table should have a running number and a "**Decision-support table (DT) ID**" that should be structured "**Abbreviated health domain**" (e.g., TIZPS). "**DT**". *"Sequential number of the decision-support table" (e.g., TIZPS.DT.1, TIZPS.DT.2)*

Component 7: Indicators and performance metrics
Each indicator should have an "**Indicator ID**" that should be structured "**Abbreviated health domain**" (e.g., TIZPS). "**IND**". *"Sequential number of the indicator" (e.g., TIZPS.IND.1, TIZPS.IND.2)*

Component 8: High-level system requirements
Each functional requirement should have a "**Functional requirement ID**" that should be structured "**Abbreviated health domain**" (e.g., TIZPS). "**FXREQ**". *"Sequential number of the functional requirement" (e.g., TIZPS.FXREQ.1, TIZPS.FXREQ.1)*

Each non-functional requirement should have a "**Non-functional requirement ID**" that should be structured "**Abbreviated health domain**" (e.g., TIZPS). "**NFXNREQ**". *"Sequential number of non-functional requirements" (e.g., TIZPS.NFXNREQ.1, TIZPS. NFXNREQ.2)*

How to use this document

Target audience

The primary target audience for this SURD is health programme managers within the Tanzania Ministry of Health (MOH), who will be working with their digital or health information systems counterparts to determine the health content requirements for an Immunization DTDS system. The health programme manager is responsible for overseeing and monitoring the implementation of the clinical practices and policies for the health programme area, in this case Immunization.

The SURD also equips individuals responsible for translating health-system processes and guidance documents for use within digital systems with the necessary components to kick-start the process of developing a DTDS system in a standards-compliant manner. These individuals are also known as business analysts who interface between health content experts and software development teams. Specifically, the document contains key outputs, such as the data dictionary and decision-support algorithms, to ensure the validity and consistency of the health content with the DTDS system.

Additionally, using this SURD requires a collaboration between health programme managers and counterparts in digital health and health information systems. Although each SURD focuses on a particular health programme area (in this case immunization), the SURDs are envisioned to be used in a modular format and link to other health programme areas within primary health care settings, in an effort to support integration across services.

Tanzania specific immunization SURD

Component 1: Health interventions and recommendations

Interventions referenced in this document are based on WHO's Universal Health Coverage List of Essential Interventions:

- General vaccine administration practices for all age groups, including children
  - Counselling on the vaccine(s) to be administered
  - Observe for any adverse event following immunization (AEFI)
  - Targeted history and physical examination for vaccination
  - Follow-up visit(s)
- Vaccination based on individual characteristics. Vaccinations include:
  - Bacillus Calmette–Guérin (BCG)
  - Cholera
  - Diphtheria, Tetanus and Pertussis (DTP)-containing vaccines
  - *Haemophilus influenzae* type B
  - Hepatitis A
  - Hepatitis B
  - Human papillomavirus (HPV)
  - Measles
  - Meningococcal
  - Mumps
  - Polio
  - Pneumococcal conjugate
  - Rabies
  - Rotavirus
  - Rubella
  - Tick-borne encephalitis
  - Typhoid
  - Seasonal Influenza
  - Varicella
  - Yellow Fever

Please note that the decision support logic related to COVID-19 vaccinations have not been included in this document due to the currently evolving science regarding COVID-19 immunizations regarding boosters, for example, at the time of publication.

Component 2: Personas

A user persona describes the general background, demographics, work environment, motivations, and key challenges for various country stakeholders that interact with the health information system. It is a method for enhancing engagement with stakeholders and building context for prototyping and implementation efforts. The purpose of creating user personas is to enable team members and stakeholders to better understand and relate to end-users with visuals about users, so team members are designing for someone specific. The general personas in charge of the immunization processes are as follows.

No.	Title	Description	Other names
1	Client	A person who intends to receive vaccination services from the targeted health worker personas.	Vaccinated person, Patient, Infant, Baby.
2	Caregiver	This can be the mother, father, guardian, caregiver of the child or infant.	Parent, Guardian.
3	Community health worker	Community health workers provide health education, referral, and follow-up; primary preventive health care; and home visiting services to specific communities. They provide support and help clients by reminding clients to receive their vaccinations and reporting community births.	Community Health Workers (CHWs), Community Health Volunteers (CHVs), Community-Owned Resource Persons (CORPs).
4	Health care worker	Health care workers facilitate education sessions, administer immunizations, provide counseling when needed, record stock movements, and compile/generate and approve facility reports.	Vaccinator, Facility in charge.
5	Clerical staff	Assist in scheduling appointments, answering phones, greeting patients, keeping/documenting medical records, and handling medical billing.	Registration clerk.
6	Subnational level immunization officer	Oversee immunization activities at regional/district level, manage vaccine logistics cold chain system, reporting, surveillance, and supervision.	Regional immunization and vaccination officer (RIVO), District immunization and vaccination officer (DIVO).
7	National staff	Responsible for developing annual and multi-annual plans; immunization communication and mobilization; management of logistics, the cold chain, and vaccines; monitoring, supervision, and evaluation of immunization services; and coordination of immunization activities at the national level.	IVD/MOH; President's office, Regional Administration and Local Government Tanzania (PORALG); MOH M&E national staff.

Detailed personas

Shamsi Macha, Community Health Worker, Arusha City	
Demographics	A 51-year-old woman living in Osunyai ward, Arusha City. Shamsi has 11 years of experience working in community health services, where she received training. However, she currently leads a different professional life as a full-time businesswoman.

Responsibilities	- Community mobilization. - Community health education. - Client follow up. - Referral. - Immunization, nutrition, HIV/AIDS. - Reproductive and child health (RCH) community services including family planning (FP). - Not less than 5,000 population within the catchment area.
Challenges	- Low awareness and demand for vaccines among community members. - Limited knowledge on immunization. - Inadequate tools and resources to support provision of services and follow-ups.
Connectivity and eHealth	- Has a smartphone. - Has limited airtime available for work. - Has connectivity and electricity.

Zakayo Manota, Health Care Worker, Nkwasira Health Center	
Demographics	A dedicated and experienced registered nurse with 11 years of valuable expertise in the healthcare field. At 34 years of age, Zakayo is passionate about providing compassionate and high-quality care to his patients. Zakayo is based in Kilimanjaro, specifically in the Hai district, where he serves at the Nkwansira Health Center. Zakayo's dedication to his profession is complemented by his personal life as a committed husband and father of two children.

Responsibilities	- Maintain cold chain. - Administer vaccines. - Reporting. - Data entry. - Health education. - Outreach. - Provision of RCH services. - Provision of nutrition services. - Labor and delivery. - Outpatient department (OPD), inpatient department (IPD), dispensing, Care and Treatment (CTC).
Challenges	- Short electronic immunization system (EIS) application timeout. - EIS takes a long time to load and the system is slow. - Lack of data bundles. - Stock management challenge in the system. - Insufficient training to use the TImR. - Work overload: multiple responsibilities resulting from not having enough staff at the health center. - Data entry: challenged to enter data during service provision. Needs to take additional time after hours to do data entry for work done during working hours.

Connectivity and eHealth	• Has mobile phone, tablet.
	• Facility has grid electricity power supply.
	• Power management on tablets: challenged when tablet drains to 0% and shuts down, would take longer to boot up.
	• Internet connection challenges.

Neema Daudi, DIVO, Arusha City	
Demographics	She is in her late twenties, with five years of working experience as an immunization and vaccination officer in Arusha City Council, complemented by certifications in Family Planning, Vaccination, and Immunization from esteemed organizations like WHO and UNICEF.
Responsibilities	• Oversee 66 health facilities.
	• Ensure availability of accurate, complete, and updated information required for an effective immunization and vaccination program in the city council.
	• Conduct field visits for monitoring and supervision of vaccination activities to improve immunization coverage across the city.
	• Conduct disease surveillance at health posts and community level for vaccine preventable diseases.
	• Draft monthly, quarterly, and final reports to other levels (e.g., regional and national).
	• Maintain proper vaccine storage across the city council.
	• Implement national immunization and vaccination policy in the community.
	• Conduct vaccine and cold chain audits in health facilities across the city council.
	• Distribute and fill monthly electronic report forms in the VIMS.
	• Participate in routine and COVID-19 data verification.
	• Provide education to the community on vaccine preventable diseases.
	• Participate in periodic immunization sessions (e.g., Supplementary Immunization Activities [SIAs], Periodic Intensification of Routine Immunization [PIRI]).
	• Conduct training for health care workers on immunization activities.
	• Support mapping of defaulters tracing and zero doses of vaccines in Arusha City Council.
Challenges	• Inadequate permanent city council vaccine store.
	• Lack of transport.
	• No budget for airtime and data.
	• Multiple systems in use (VIMS, DHIS2, TImR, VIGIMOBILE, AFYASS, etc.).
	• Scarcity of data tools (registers, updated ledger books) at facility level.
	• Lack of a PC to use for work.
	• Competing priorities in Council Health Management Team (CHMT).
Connectivity and eHealth	• Reliable power supply, good internet connection, tablets.

Bonaventura Nestory, National Supply Chain Officer, IVD Program	
Demographics	A public health specialist in his mid-forties who has been working with the International Vaccine Distribution (IVD) organization for more than 10 years. With extensive experience in the public health domain and expertise in vaccine logistics, Bonaventura plays a crucial role in ensuring the efficient ordering and distribution of vaccines and cold chain equipment.
	Bonaventura's passion for public health led him to pursue a master's degree in supply chain management, allowing him to apply his knowledge to the specific context of vaccine distribution. He has completed various online courses offered by reputable organizations like the WHO and the UNICEF.

Responsibilities	• Prepare procurement plan for cold chain equipment and vaccines. • Prepare training materials and facilitate training for vaccine supply chain and logistics officers at the subnational level. • Monitor performance of cold chain equipment.
Challenges	• Increased demand for distributing cold chain equipment across the country. • Lack of visibility of performance of cold chain equipment especially for those that are not connected to the remote temperature monitoring (RTM) devices. • Competing priorities at national level.
Connectivity and eHealth	• Is computer literate. • Has access to reliable connectivity and power supply.

Component 3: User scenarios

How to interpret user scenarios for functional requirements

User scenarios are helpful tools not only to better understand the context in which a digital tool would operate, but also for some insights into what key data elements would need to be recorded and accounted for in the database. Additionally, the context in which the tool would operate, illuminated by the user scenarios, provides insight into some functional and non-functional requirements that the digital system would also need. For example, highlighted in yellow are some key data elements that need to be recorded and/or calculated. Highlighted in blue are some decision-support logic that can be automated in the system. Highlighted in green are some key functional and non-functional requirements that should be included in the system.

3.1 User scenario for routine vaccination clinic

Key personas	• Care giver (mother): Ruth • Child: Esther • Health worker: Lucy

Ruth is 21 years old and Esther, her first baby, is 10 weeks old. Ruth completed primary school and has basic literacy. Her husband attended secondary school for three years, but he did not finish. They all live in a two-room house with intermittent electricity in a village near Msindo.

Esther was born at home. Although Esther's birth was not registered (and she does not have a birth certificate), the clinic assigned an ID to Esther when Ruth took her in for her first round of immunizations shortly after her birth. It takes Ruth just over an hour to walk to the Msindo clinic from her home. Ruth enjoys going to the clinic as it is a chance to talk to other new mothers and she gets helpful information from the nurse about keeping her baby healthy.

Lucy is a nurse working in the Mbogwe clinic. She has 12 years of experience, and she has a diploma in nursing. Lucy is in charge of the delivery of scheduled vaccines as part of the "under 5 program" at her clinic. Two other nurses also work in this clinic. The clinic operates three days a week in the morning. The clinic sees babies for screening and monitoring to identify any children who are at risk and may require further intervention early on to prevent issues. She also provides some preventative care such as vaccines and other supplements. Lucy also spends time during each clinic doing health teaching about various child health topics.

Ruth and Ester arrive at the clinic just after 9am; there are already five other moms with their babies. When it is Ruth's turn, she goes to the table where Lucy is sitting, and hands her Esther's paper vaccination card (or home-based record) which she received which Ester got on her first clinic visit when she was registered. It contains Ester's name, date of birth and a record of each vaccine given, as well as her weight at that visit. Lucy uses the ID on the top of the card to look up Esther's record on her tablet. She finds the record and can see in the system that Ester is due for four vaccines at this time. Lucy weighs Ester using the scale set up beside the desk, and she records her weight on both the paper card and in the IIS application on her tablet. She tells Ruth that Ester is gaining weight well, and they briefly discuss some questions Ruth has about breast feeding.

Lucy takes the appropriate vaccines out of the small cooler box beside her table. Lucy had filled the cooler box earlier that morning based on what she would typically need based on an average clinic day. She has access to more vaccines, but they are in the fridge in the storage room. She prepares each vaccine, making sure that it is not expired and that the small symbol on the vial indicates it is safe to give. Lucy gives each vaccine (starting with the ones given by mouth, then the injections) to Esther. While Ruth comforts Ester, Lucy records the vaccines given in the application

on the tablet, as well as on Ester's home-based record. She also tells Ruth when to bring Esther back for her next vaccines, and she also writes this on Ester's home-based record. She also advises Ruth on what to do if Esther develops a fever or some other symptom following vaccination. Since the clinic operates every weekday morning, Ruth understands that while she should try to come on the date given, it is not an actual appointment, just a guideline to come within a day or two of that date. Lucy also informs her that they have a new system that can send an SMS reminder when Ester is due for a vaccine to her phone if she would like. Ruth agrees that she would like this reminder and Lucy confirms her phone number in the system and checks the box indicates she would like to receive these notifications.

Corresponding business processes (see Component 3)	This scenario refers to the following business processes: C. Client Reminder E. Register Client F. Query Client Record G. Administer Vaccine

3.2 User scenario for defaulter tracing

Key personas	• Health Worker: Lucy • Community Health Worker: Aminata

As the nurse responsible for the under 5-clinic in Mbagala, Lucy has an estimate for the number of children that live in the area of her clinic that she needs to ensure are vaccinated. This number is estimated based on the population her clinic serves, as it is the only clinic in the area. Lucy works closely with Aminata, a community health worker to find and encourage caregivers to bring their children to the clinic for vaccinations. Aminata lives in the village and is the wife of the school's headmaster. She is well respected in the community, and she has been a community health worker for the past 10 years. While she is not paid for this work, she is happy to know she is helping her community raise healthy children. She is responsible for both children and pregnant women, and she regularly councils them to ensure they attend clinics and get the care they need in a timely manner. Aminata has completed secondary school, and her training for this role has been both on the job, as well as some workshops that are held a few times a year.

At the clinic Lucy registers each child that came for their first vaccines into an electronic immunization registry (EIR) or immunization information system (IIS), that has been implemented to replace the large paper ledger book. When Lucy entered the child's name, sex, date of birth, parents' name and some other identifying information into the IIS system, the system noted each vaccine that needs to be given. Lucy enters the date each vaccine was given in the appropriate place during the visit in which it was done. Since this new IIS system was introduced, Lucy no longer needs to add the same information into a large paper ledger book.

Now with an IIS in place, Lucy no longer takes several hours each week to determine which children need to be followed up with by reviewing her paper ledger each week and calculating overdue status based on dates logged. Lucy can see on her tablet the list of children who are overdue or late for their vaccines based on the vaccine schedules determined by national policies and their relevant contact information she may need for follow-up (e.g., caregivers' name and contact info). This list is also sent to Aminata via an SMS message once a week for her to help with follow up. At the clinic they have just started using the system to automatically send an SMS message to the caregiver to remind them when their child is due to come for the next vaccine. Lucy is hopeful that this will help reduce the number of children who are brought in late for their vaccines.

Corresponding business processes (see Component 3)	This scenario refers to the following business processes: B. Plan Service Delivery C. Client Reminder D. Defaulter Tracing E. Register Client J. Report Generation

3.3 User scenario for catchup campaign

Key personas	• District Immunization and Vaccination Officer: John

John is the district EPI manager; he is 35 years old and has a university degree in management. He has been the EPI manager for his district for the last six years. John is responsible for planning, supporting all of the facilities in his district to manage their immunization programs, supervising and conducting reviews of data of immunization programs in the district. He closely monitors the monthly reports that each facility sends and looks for potential issues that may require his attention, such as inaccurate data on the reports, situations where the overall vaccine coverage in a facility may be lower than their targets, or if they have had times where they have had stock out of a vaccine. John is also responsible for keeping track of the target population of children in his district and a sketch map of where that population is found. John's district, like the rest of the region, have had significant challenges due to the COVID-19 pandemic. Clinics have often been closed or reduced the hours they were giving routine vaccinations. Many parents also did not bring their children for their routine vaccinations even when the clinics were open for fear of contracting COVID-19. As a result, John has noticed their coverage rates for most vaccines is much lower.

After the epidemiological situation of COVID-19 changed, most clinics are now back to operating normally, but there are many children who are overdue for their vaccines. Last month, during a workshop, John and his other EPI Manager colleagues were informed that they should plan for some local catch-up campaigns as part of a coordinated national plan to address this issue. John and his team have conducted these catchup clinics previously, typically one or two times a year during Child Health Week events or Immunization Days. Since this campaign will be larger due to the number of overdue vaccines, the national EPI program is working with other partners to offer additional support. John has the responsibility to review and customize the plan made by the national government for the campaign in his region; he must also review budget and supervise the implementation of the campaign. John works closely with stakeholders (coordination) and the community (communication) to implement the district's immunization plans.

Corresponding business processes (see Component 3)	This scenario refers to the following business processes: B. Plan Service Delivery J. Report Generation

Component 4: Business process and workflows

A business process, or process, is a set of related activities or tasks performed together to achieve the objectives of the health programme area, such as registration, counselling, referrals. Workflows are a visual representation of the progression of activities (tasks, events, interactions) that are performed within the business process[4]. The workflow provides a "story" for the business process being diagrammed and is used to enhance communication and collaboration among users, stakeholders, and engineers.

This SURD focuses on key business processes that are part of routine immunizations programmes and mass immunization campaigns. The most significant difference with campaigns is in the planning phase (*Process B. Service Plan Delivery*). The rest of the workflows, most importantly *Process G. Administer Vaccine* (which drives most of the decision logic to vaccinate versus not vaccinate) is the same regardless of whether it is part of the routine immunization programme or a mass immunization campaign.

These business processes are described in Table 8. For each of these business processes, the corresponding business processes, data elements and decision-support needs are detailed within the following sections of this document.

Overview of Tanzania immunization business processes

This section illustrates the workflows of the identified processes, within the Tanzania context, using standardized notations for business process mapping.

No.	Process name	Process ID	Personas	Objectives	Task set
	Title	ID used to reference this process throughout the SURD	Individuals interacting to complete the process	A concrete statement describing what the process seeks to achieve	The general set of activities performed within the process
A	Generate reminders	TIZPS.A	• HCW • CHW • Client	To communicate to the client or parent/ guardian if a patient is due now, due on a future date, or past due for vaccination.	*Starting point: Health care worker (HCW) checks if client is due for vaccination.* • Check list of clients due for vaccination. • Confirm clinic/outreach dates. • Send reminder message to client. • Send reminder message to CHW. Receive message reminder (client/CHW).
B	Vaccination follow-up	TIZPS.B	• HCW • CHW "Wajumbe wa mtaa"	To identify clients who were due to come for vaccination but missed their follow-up dates and are now past due.	*Starting point: HCW checks registry and determines if vaccinations were missed.* • Review planned vaccination list and determine if some were missed. • Determine if CHW is available in the area. • Follow up with CHW to ensure client is vaccinated. • Follow up with "Wajumbe wa mtaa" to ensure client is vaccinated if the CHW is unavailable. • Record vaccination event. Plan for follow up at clinic/ outreach session for missed vaccinations.

[4] Collaborative Requirements Development Methodology (CRDM). In: Public Health Informatics Institute [website]. Decatur, Ga.: The Task Force for Global Health; 2016 (https://www.phii.org/crdm/, accessed 11 February 2021).

No.	Process name	Process ID	Personas	Objectives	Task set
C	Create newborn record	TIZPS.C	● HCW ● CHW	To create an initial record in the system following the birth of a newborn.	*Starting point: CHW/HCW registers birth of newborn or receives the birth data.* ● Query if the record already exists. Create or update record. *Access of CHW will be limited to registration.*
D	Register facilities	TIZPS.D	● HCW ● RIVO ● DIVO ● HMIS Coordinator Facility Staff	To enroll facilities into TImR for vaccine reporting and reconcile with the National Master Facility List (NMFL).	*Starting point: HCW searches for the facility.* ● Validate NMFL. ● Verify information for additional data required. ● Create or update facility record. ● Generate unique EIS identification. Send facility registration notification.
E	Plan service delivery	TIZPS.E	● HCW	To prepare for an immunization session, either at the facility or done on outreach basis.	*Starting point: HCW wants to prepare for an immunization session.* ● Review register to determine estimates of vaccine needed. ● Check stock levels. ● Order for stock, if needed. Record stock levels taken.
F	Register client	TIZPS.F	● HCW	To start and contribute to the clients' lifelong vaccine record.	*Starting point: HCW wants to register client information into the health record.* ● Before registration, query the client record. ● Create client records. Update a client health record.
G	Query client record	TIZPS.G	● HCW	To correctly locate or identify a client's vaccination record as well as review and update a client's record to provide a client's complete immunization history.	*Starting point: Client vaccination visit.* ● Search for the client using their name/demographic information. ● Determine if there is an exact or partial match. ● Use additional search criteria (barcode number) to establish an exact match. If client is not existing, create a new registration.
H	Administer vaccine	TIZPS.H	● HCW	To determine what vaccines a client needs, administer vaccines, and record the relevant necessary data in the system as well as on the appropriate on home-based record.	*Starting point: Client requires vaccination.* ● Query the client record. ● Compare client record with physical card and probe client's history if there is any discrepancy. ● Determine if vaccine is available and safe to administer. ● Prepare and administer vaccine. ● Record appropriate data. ● Monitor adverse events and record appropriately. ● If needed, reschedule the next date of visit. Generate the digital certificate, if needed.

No.	Process name	Process ID	Personas	Objectives	Task set
I	De-duplication of client patient records	TIZPS.I	● HCW ● DIVO	To identify duplicate client records and consolidate them into one most accurate/suitable record.	*Starting point: Identify duplicate client records and flag for evaluation.* ● Query client record. ● Flag duplicate records for evaluation. ● Produce a list of the duplicate records and review them. ● Determine if duplicate records can be merged into a single record. Merge, as appropriate. If the records are not duplicates, indicate that in the individual records. mark as not duplicate.
J	De-duplication of vaccine events	TIZPS.J	● HCW ● DIVO	To identify duplicate vaccination events within a client record and update into one event.	*Starting point: Identify duplicate vaccine events and flag for evaluation.* ● Identify potential duplicate vaccine events. ● Determine if events are duplicates. ● Update record appropriately. Generate a report to show the resolution.
K	Manage cold chain inventory	TIZPS.K	● HCW	To plan for equipment requirements at facility level.	*Starting point: HCW creates a plan for equipment requirements.* ● Identify routine cold chain equipment maintenance needs. ● Prepare and submit equipment requirements to the council level. ● Monitor daily temperature. Receive equipment and update maintenance reports.
L	Manage arrivals of vaccine and related supplies (stock)	TIZPS.L	● HCW	To manage the arrival of stock at facility level.	*Starting point: HCW creates a plan for vaccine and related supplies requirements.* ● Identify and review vaccine and related supplies requirements. ● Prepare and submit vaccine and stock requirements to the council-level. ● Receive, inspect, and clear the stock order, and update issue voucher. ● Report any discrepancies, like mismatching stock and damage. Accept and submit stock arrival report.
M	Manage stock	TIZPS.M	● HCW	Manage stock at facility level.	*Starting point: stock requirement at starting session.* ● Query the stock availability. ● Compare with physical stock. ● Determine if stock is available and safe to administer (check expiry date, Vaccine vial monitor [VVM] status). ● Automate deduction of vaccine doses used in a Daily basis. ● Automate deduction of syringes for every client vaccinated. ● Automate deduction of diluent for every vial of lyophilized vaccine. ● Update stock at the end of every session. ● Receive and issue stock from other facilities and update. Perform monthly physical count and update for any discrepancies.

No.	Process name	Process ID	Personas	Objectives	Task set
N	Generate reports	TIZPS.N	• HCW • DIVO • RIVO • Authorized system user	The objective is to provide the ability to access and analyze data to improve immunization program decision making. This business process outlines the general steps to generate a variety of reports that are routinely needed by DIVO, RIVO, providers, and other partners.	*Starting point: Time for periodic (monthly, quarterly, semi-annually, annual, and ad-hoc) reporting.* • Check data quality. • Correct fixable errors. • Generate and review aggregate reports. Provide feedback on any issues encountered during the process.

Business process symbols used in workflows

Symbol	Symbol name	Description
	Pool	A **pool** consists of multiple "swim lanes" that depict all the individuals or types of users that are involved in carrying out the business process or workflow. Diagrams should be clear, neat, and easy for all viewers to understand the relationship across the different swim lanes. For example, a pool would depict the business process of conducting an outreach activity, which involves multiple stakeholders represented by different lanes in that pool.
	Swim lane	Each individual or type of user is assigned to a **swim lane**, a designated area for noting the activities performed or expected by that specific actor. For example, a family planning health worker may have one swim lane; the supervisor would be in another swim lane; the clients would be classified in another swim lane. If the activities can be performed by either actor, then those activities can be depicted overlapping the two relevant swim lanes.
	Start event or Trigger event	The workflow diagram should contain both a **start** and an end **event**, defining the beginning and completion of the task, respectively.
	End event	There can be multiple **end events** depicted across multiple swim lanes in a business process diagram. However, for diagram clarity, there should only be one end event per swim lane.
	Activity, process, step, or task	Each **activity** should start with a verb, e.g. "Register client", "Calculate risk". Between the start and end of a task, there should be a series of activities noting the successive actions performed by the actor for that swim lane. There can also be subprocesses of each activity.
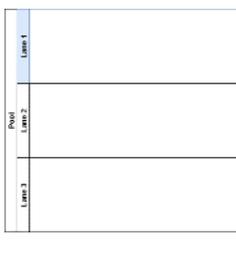
Symbol	Symbol name	Description
	Activity with subprocess	This denotes an activity that **has a much longer subprocess** to be detailed in another diagram. If the diagram starts to become too complex and unhelpful, the subprocess symbol should be used to reference another process depicted on another page.
	Activity with business rule	This denotes a decision-making activity that requires the business rule, or decision-support logic, to be detailed in a decision-support table. This means that the logic described in the decision-support table will come into play during this activity as outlined in the business process. This is usually reserved for complex decisions.
	Sequence flow	This denotes the flow direction from one process to the next. The end event should not have any output arrows. All symbols (except start event) may have an unlimited number of input arrows. All symbols (except end event and gateway) should have one and only one output arrow, leading to a new symbol, looping back to a previously used symbol or to the end event symbol. Connecting arrows should not intersect (cross) each other.
	Message flow	This denotes the flow of data or information from one process to another. This is usually used for when data are shared across swim lanes or stakeholder groups.
	Gateway	This symbol is used to depict a fork, or decision point, in the workflow, which may be a simple binary (e.g. yes/no) filter with two corresponding output arrows, or a different set of outputs.
		There should only be two different outputs that originate from the decision point. If you find yourself needing more than two "output" or sequence flow arrows, you most likely are trying to depict "decision-support logic" or a "business rule". This should be depicted as an "Activity with business rule" (above) instead.
	Throw – Link	The "**Throw – Link**" serves as the start an off-page connector. It is the end of the process when there is no more room on your page for that workflow. It is the end of a process on your current page or the end of a subprocess that is part of a larger process. There will need to be a "Catch – Link" that follows the "Throw – Link".
	Catch – Link	The "**Catch – Link**" serves as the end an off-page connector. It is the start of the new process on a different page from the "Throw – Link" or the start of a subprocess that is part of a larger process. There needs to be a "Throw – Link" that is aligned to the "Catch – Link".
	Ad hoc subprocess	An **ad hoc subprocess** can contain multiple tasks. One or more tasks in this shape should be performed, and they can be performed in any order. However, not all of these activities need to be finished before moving on to the next activity.

Symbol	Symbol name	Description
	Loop activity	This **loop activity** or **loop task** symbolizes an activity or task that is repeated until it no longer needs to be repeated. For example, vaccine administration can happen as many times as the number of vaccines that need to be given.

High level overview of key immunization workflow processes
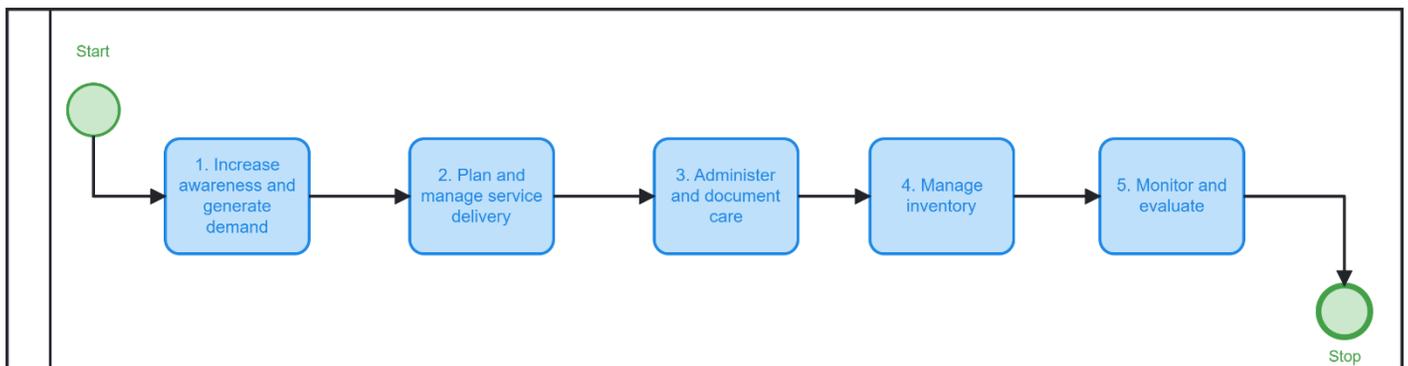
Tanzania immunization process workflows

A. Generate reminders process flow

Objectives: To communicate to the client or parent/ guardian if a patient is due now, due on a future date, or past due for vaccination.
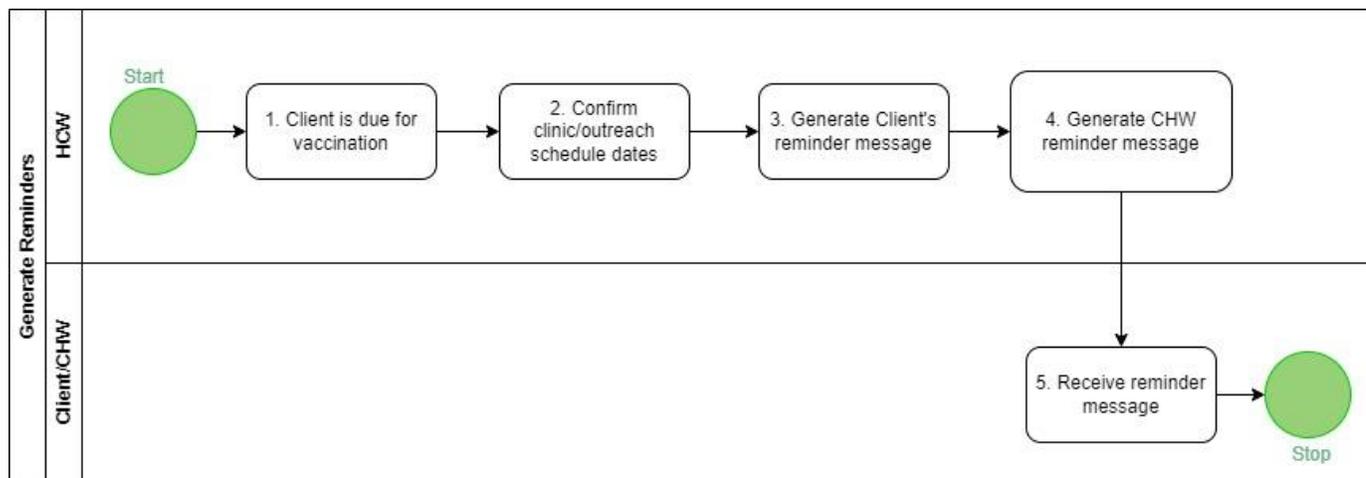
B. Vaccination follow-up process flow

Objectives: To identify clients who were due to come for vaccination but missed their follow-up dates and are now past due.
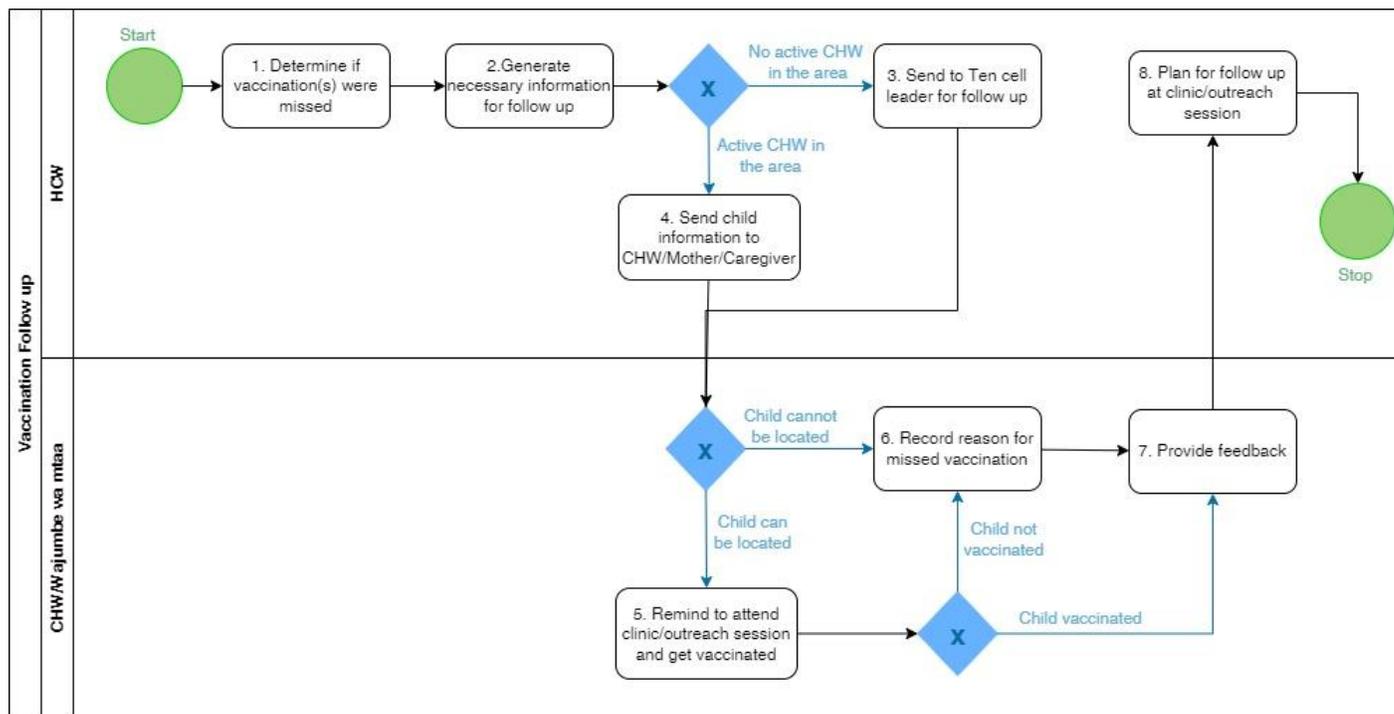
C. Create newborn record process flow

Objectives: To create an initial record in the system following the birth of a newborn.
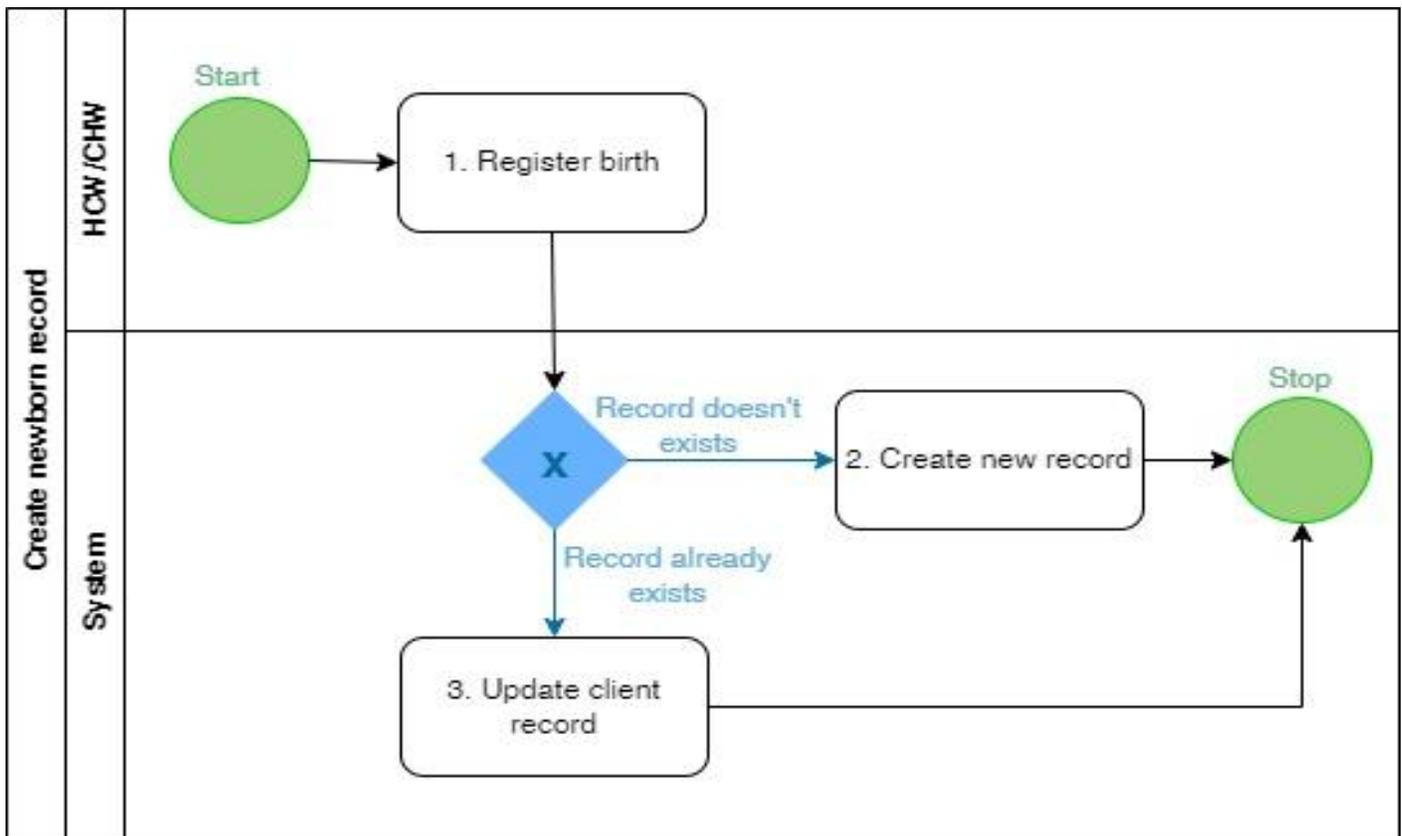
D. Register facilities process flow

Objectives: To enrol facilities into TImR for vaccine reporting and reconcile with the NMFL.
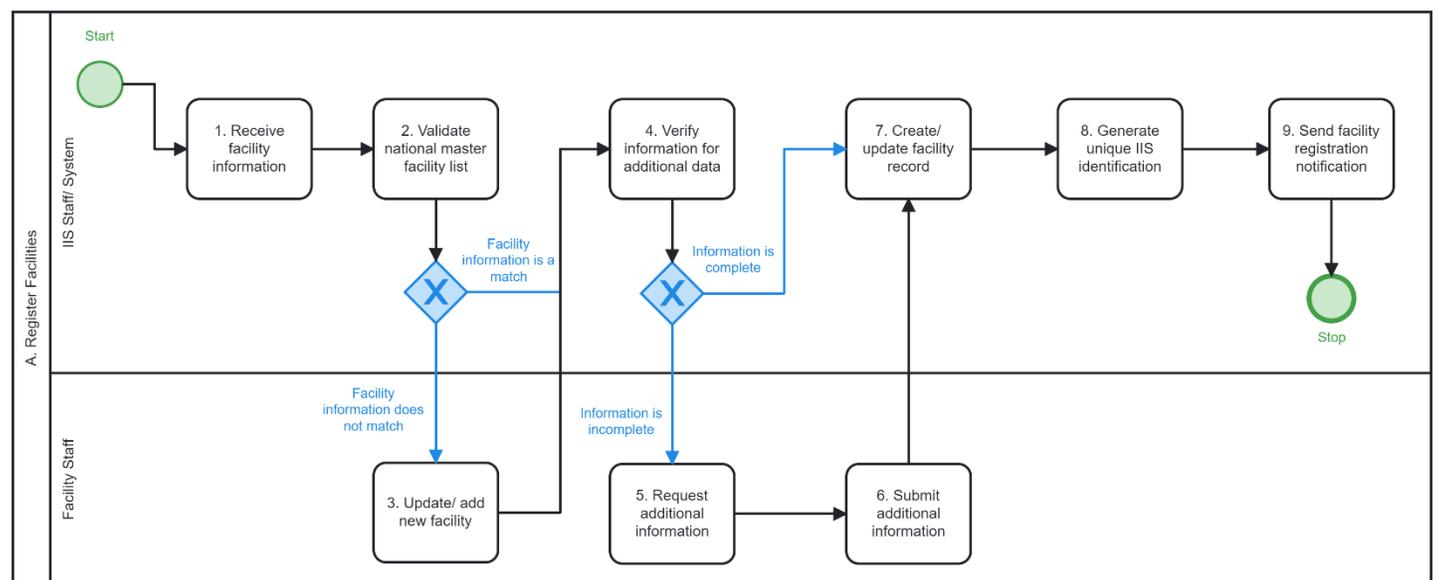
E. Plan for vaccination session process flow
Objectives: To prepare for an immunization session, either at the facility or done on outreach basis
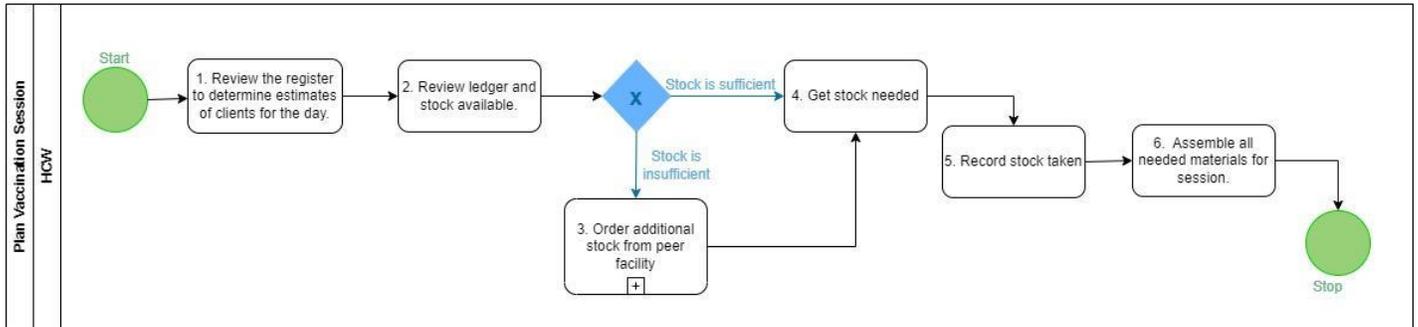
F. Register client process flow
Objectives: To start and contribute to the clients' lifelong vaccine record.
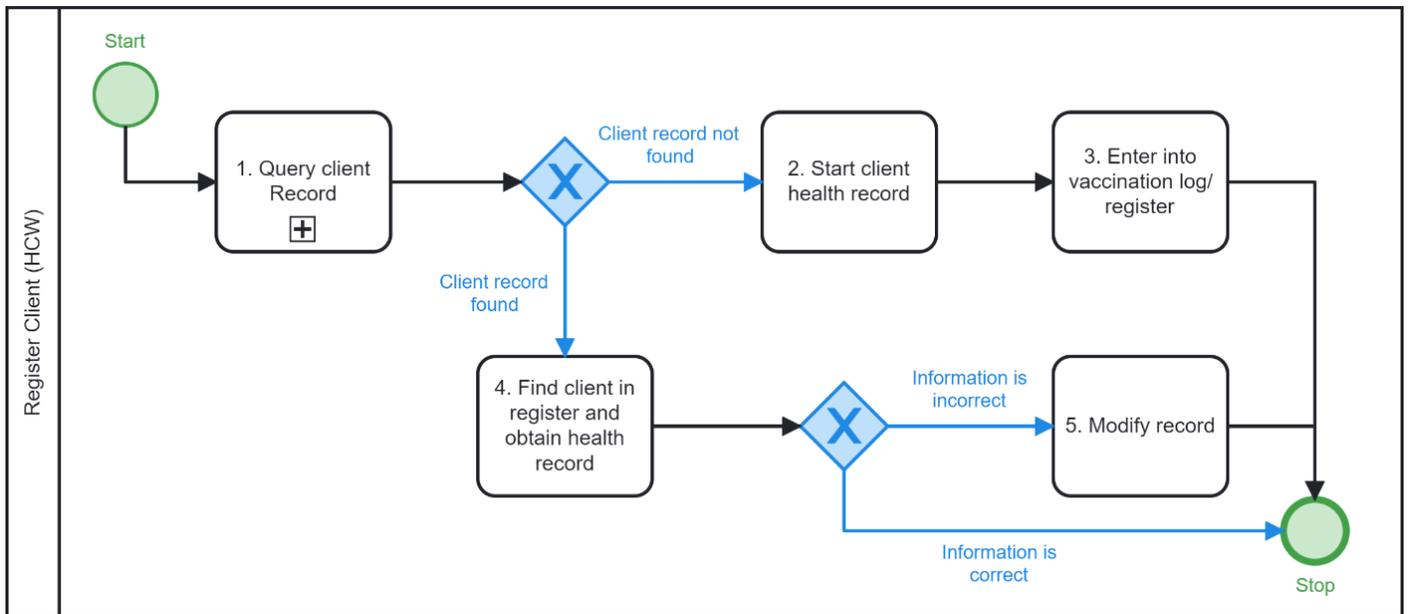
G. Query client record process flow

Objectives: To correctly locate or identify a client's vaccination record as well as review and update a client's record to provide a client's complete immunization history.
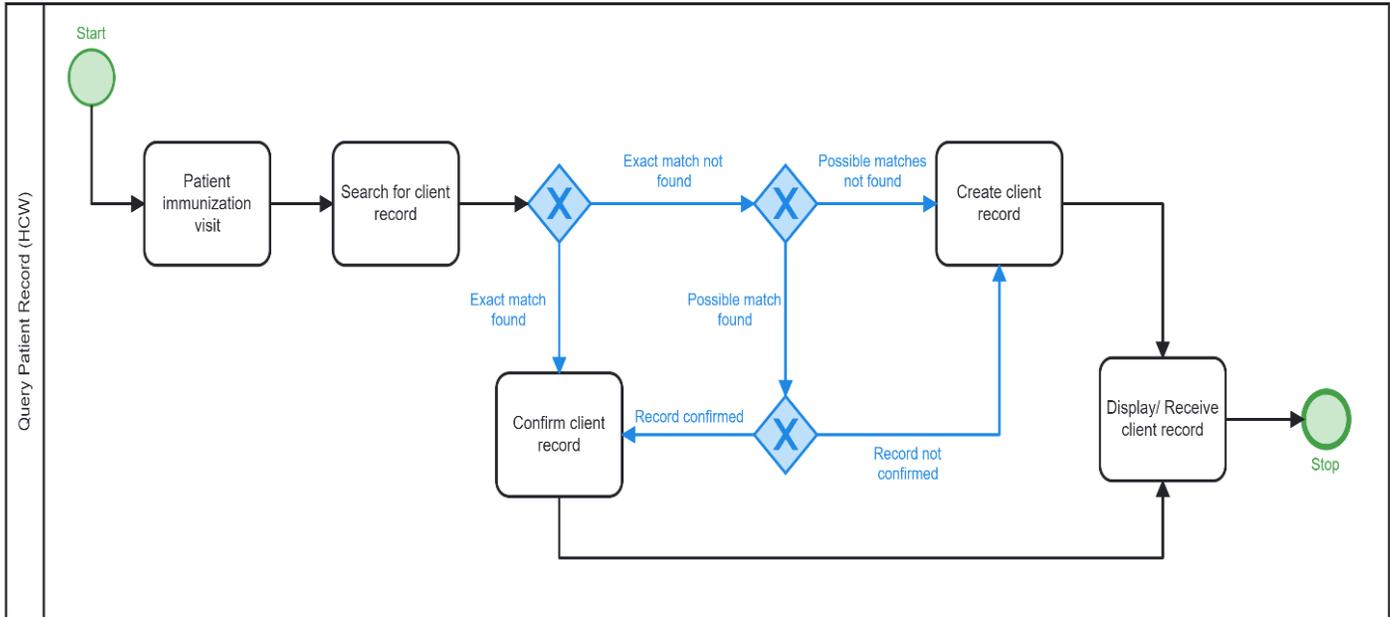
H. Administer vaccine process flow

Objectives: To determine what vaccines a client needs, administer vaccines, and record the relevant necessary data in the system as well as on the appropriate on home-based record.
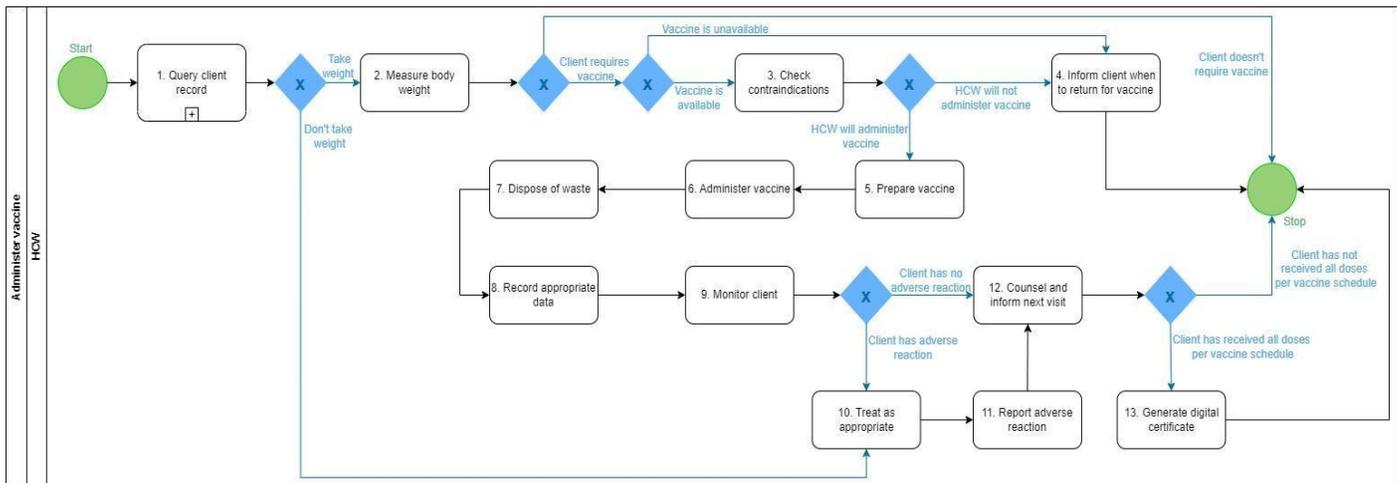
I. De-duplication of client records process flow

Objectives: To identify duplicate client records and consolidate them into one most accurate/suitable record
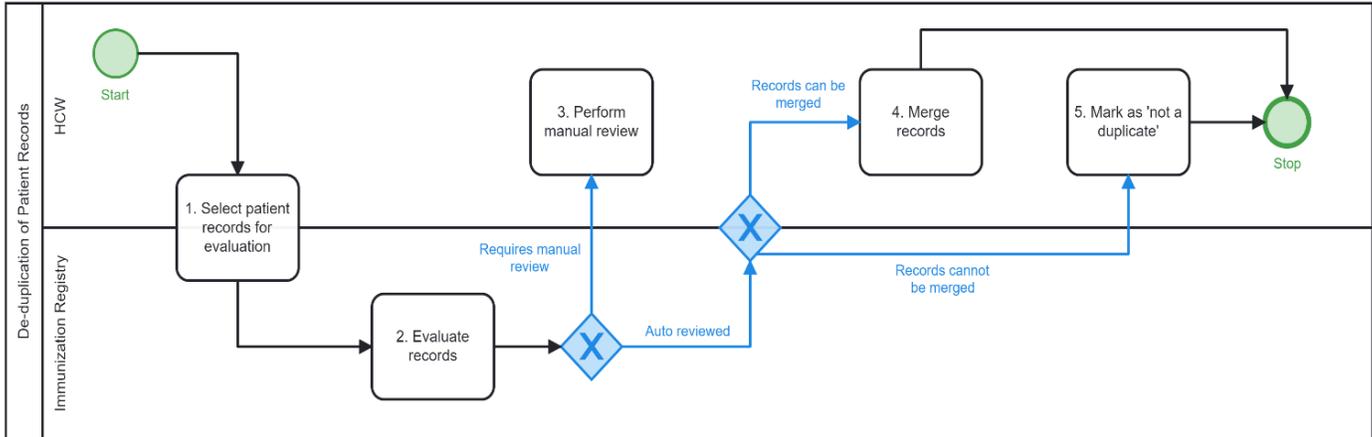
J. De-duplication of vaccine events process flow

Objectives: To identify duplicate vaccination events within a client record and update into one event.
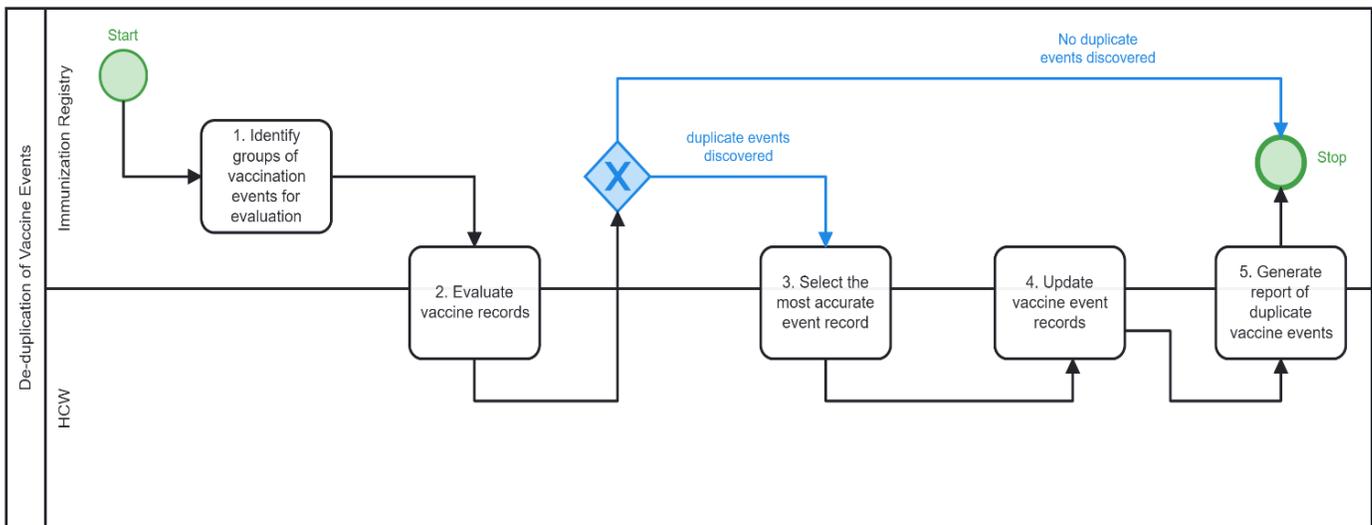
K. Manage cold chain inventory process flow

Objectives: To plan for equipment requirements at facility level.
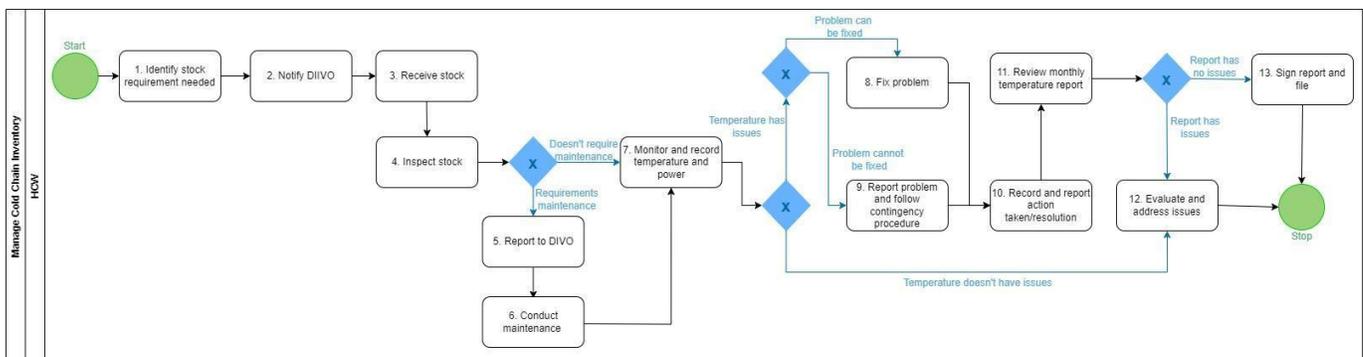
L. Manage arrivals of vaccine and related supplies process flow

Objectives: To manage the arrival of stock at facility level.
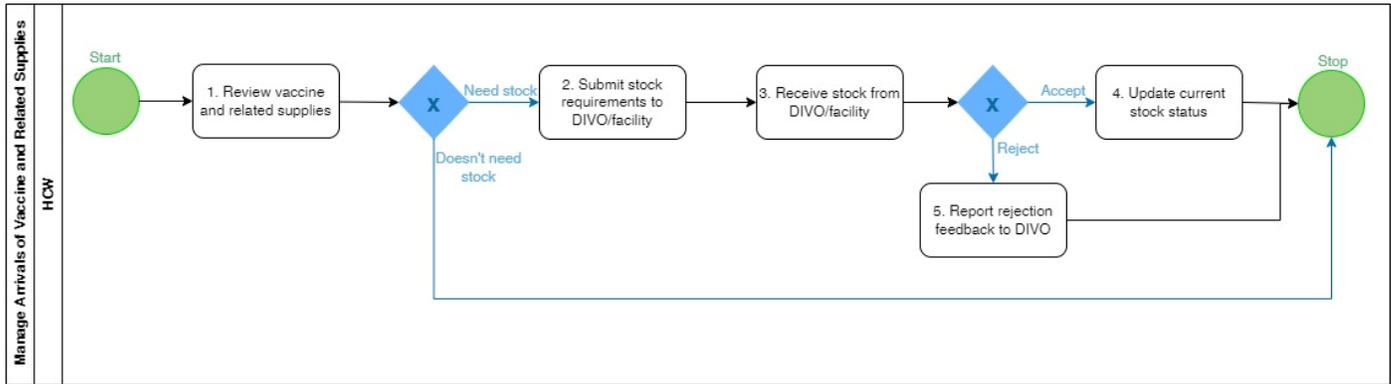
M. Manage stock process flow

Objectives: To manage stock at facility level.
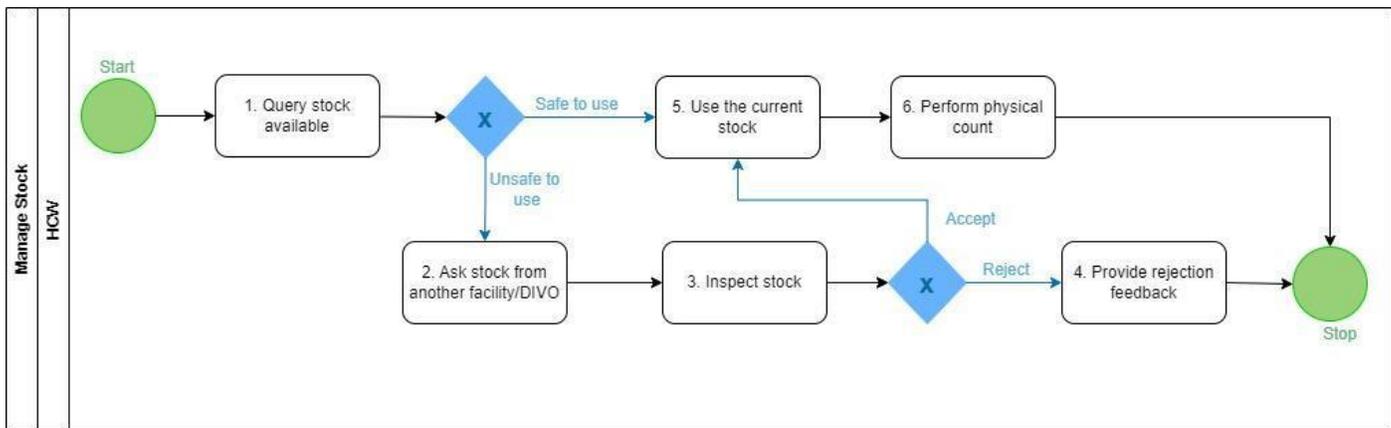
N. Generate reports process flow

Objectives: To provide the ability to access and analyze data to improve immunization program decision making. This business process outlines the general steps to generate a variety of reports that are routinely needed by DIVO, RIVO, providers, and other partners.
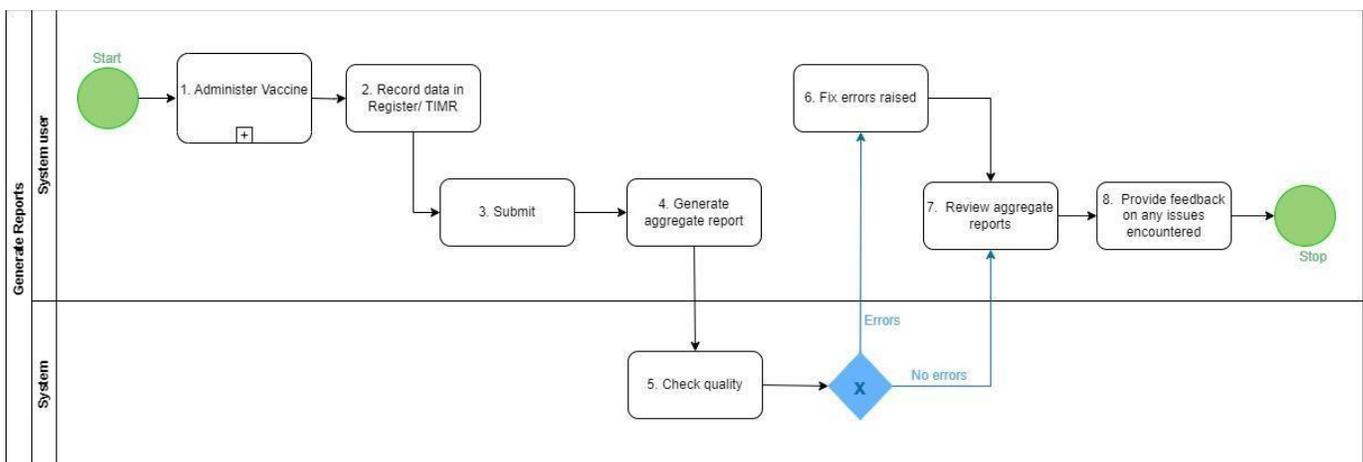
Component 5: Core data elements

This section outlines the minimum set of data corresponding to different points of the workflow within the identified business processes. This data set can be used on any software system and lists the data elements relevant for service delivery and executing decision-support logic, as well as for populating indicators and performance metrics. Although this section provides a high-level overview of the data elements, a more complete data dictionary in spreadsheet form detailing the input options, validation checks, and concept dictionary codes is available in Web Annex A.

Inclusion of a data element in the table does not by itself indicate that collection of the data is required. Additionally, some data elements are dependent on other data elements (e.g., test results are only entered when a test has been performed). This will require review and adaptation. Data elements marked with an asterisk (*) e.g. Client name*, denote elements that have already been gathered in prior processes or activities.

Activity ID Activity name	Data element ID	Data element name	Description and definition
Business process A: Generate reminders			
TIZPS.A1: **Client is due for vaccination**	TIZPS.A1.DE.1	Client ID	Unique, system generated Client ID
	TIZPS.A1.DE.2	Client name	Client's first and last name
	TIZPS.A1.DE.3	Vaccination schedule	Client's required vaccination according to schedule
	TIZPS.A1.DE.4	**Vaccination status**	**Current status of required vaccine**
	TIZPS.A1.DE.5	Client contact number	Client or guardians contact number if available
TIZPS.A2: **Confirm clinic/ outreach scheduled dates**			
	TIZPS.A2.DE.1	Facility name	The name of the facility
	TIZPS.A2.DE.2	Facility location	Physical address of where the facility is located
	TIZPS.A2.DE.3	Outreach start date	Start date of vaccination outreach
	TIZPS.A2.DE.4	Outreach end date	End date of vaccination outreach
TIZPS.A3: **Generate client's reminder message**		*Reminder Message to Client (Template)*	
	TIZPS.A3.DE.1	Client ID*	Unique, system generated Client ID
	TIZPS.A3.DE.2	Client name*	Client's first and last name
	TIZPS.A3.DE.3	Vaccination*	Client's required vaccination according to schedule
	TIZPS.A3.DE.4	Vaccination status*	**Current status of required vaccine**
	TIZPS.A3.DE.5	Facility name*	The name of the facility
	TIZPS.A3.DE.6	**Facility location***	Physical address of where the facility is located
	TIZPS.A3.DE.7	Outreach start date*	Start date of vaccination outreach
	TIZPS.A3.DE.8	Outreach end date*	End date of vaccination outreach
		Reminder Message to CHW (Template)	
TIZPS.A4: **Generate CHW's reminder message**	TIZPS.A4.DE.1	CHW name	CHW's first and last name
	TIZPS.A4.DE.2	CHW service area	CHW's operation location
	TIZPS.A4.DE.3	CHW contact number	CHW's contact number
	TIZPS.A4.DE.4	Client ID*	Unique, system generated Client ID
	TIZPS.A4.DE.5	Client name*	Client's first and last name
	TIZPS.A4.DE.6	Vaccination*	Client's required vaccination according to schedule
	TIZPS.A4.DE.7	Vaccination status*	**Current status of required vaccine**
	TIZPS.A4.DE.8	Facility name*	The name of the facility
	TIZPS.A4.DE.9	**Facility location***	Physical address of where the facility is located
	TIZPS.A4.DE.10	Outreach start date*	Start date of vaccination outreach
	TIZPS.A4.DE.11	Outreach end date*	End date of vaccination outreach
Business process B: Vaccination follow-up			

Activity ID / Activity name	Data element ID	Data element name	Description and definition
TIZPS.B2: Generate necessary information for follow-up	TIZPS.B2.DE.1	Client ID*	Unique, system generated Client ID
	TIZPS.B2.DE.2	Client name*	Client's first and last name
	TIZPS.B2.DE.3	Vaccination*	Client's required vaccination according to schedule
	TIZPS.B2.DE.4	Vaccine status- overdue*	**Current status of required vaccine**
	TIZPS.B2.DE.5	Client contact number*	Client or guardians contact number if available
	TIZPS.B2.DE.6	Facility name*	The name of the facility
	TIZPS.B2.DE.7	Facility location*	Physical address of where the facility is located
	TIZPS.B2.DE.8	Outreach start date*	Start date of vaccination outreach
	TIZPS.B2.DE.9	Outreach end date*	End date of vaccination outreach
	TIZPS.B2.DE.10	Reminder message to CHW & "wajumbe wa mtaa" (template)*	Reminder message
	TIZPS.B2.DE.11	CHW name*	Chw's first and last name.
	TIZPS.B2.DE.12	CHW service area*	Chw's operation location.
	TIZPS.B2.DE.13	CHW contact number*	Chw's contact number
	TIZPS.B2.DE.14	"Wajumbe wa mtaa" name*	"Wajumbe wa mtaa"'s first and last name
	TIZPS.B2.DE.15	"Wajumbe wa mtaa" service area*	"Wajumbe wa mtaa" service area
	TIZPS.B2.DE.16	"Wajumbe wa mtaa" contact number*	"Wajumbe wa mtaa" contact number
Business process C: create newborn record			
TIZPS.C2: Create new record	TIZPS.C2.DE.1	Birth registration date	The date and time of registration of the birth
	TIZPS.C2.DE.2	Date and time of birth	Client's date of birth
	TIZPS.C2.DE.3	Place of birth	Client's place of birth
	TIZPS.C2.DE.4	Facility of birth	The facility where the birth took place, if appropriate
	TIZPS.C2.DE.5	**Sex**	**Baby's biological sex**
	TIZPS.C2.DE.6	Birth weight	Client's weight at birth in grammes
	TIZPS.C2.DE.7	Gestational age	Client's gestational age at birth in weeks
	TIZPS.C2.DE.8	Multiple pregnancy	A multiple pregnancy is a pregnancy with 2 or more fetuses.
	TIZPS.C2.DE.9	**Multiple birth type (name)**	**The birth of more than one baby from a single pregnancy.**
	TIZPS.C2.DE.10	**Baby's state**	**The baby's life state after birth**
	TIZPS.C2.DE.11	Mother's name	Mother's first and last name
	TIZPS.C2.DE.12	Mother's contact	Mothers contact information (mobile number).
	TIZPS.C2.DE.13	Father's name	Father's first and last name.
	TIZPS.C2.DE.14	Father's contact	Father's contact information (mobile number).
	TIZPS.C2.DE.15	Mother's td vaccination status	Mother's td vaccination status.
Business process D: register facility			
TIZPS.D1: Receive facility information	TIZPS.D1.DE.1	Facility ID	The unique identifier for the facility
	TIZPS.D1.DE.2	Facility name	The name of the facility
	TIZPS.D1.DE.3	Facility address	The address of the facility
	TIZPS.D1.DE.4	**Facility type**	**The type of facility**
	TIZPS.D1.DE.5	Facility location (physical address)	Physical address of where the facility is located
	TIZPS.D1.DE.6	Facility contact information	Contact information for the facility
	TIZPS.D1.DE.7	Record date	Date when facility was recorded on the register
	TIZPS.D1.DE.8	Operational status	Operational status of the facility
	TIZPS.D1.DE.9	Administrative level/ areas	Administrative level of the facility

Activity ID / Activity name	Data element ID	Data element name	Description and definition
	TIZPS.D1.DE.10	Geographic coordinates (GPS)	Global positioning system coordinates
TIZPS.D3: **Update/add new facility**			
	TIZPS.D3.DE.1	*Facility information**	**Facility information entry fields**
TIZPS.D8: **Generate unique IIS identification**			
	TIZPS.D8.DE.1	IIS identification	System generated IIS identification
TIZPS.D9: **Send facility registration information**	TIZPS.D9.DE.1	Facility name*	The name of the facility
	TIZPS.D9.DE.2	Facility type*	The type of facility
	TIZPS.D9.DE.3	Facility location*	Physical address of where the facility is located
	TIZPS.D9.DE.4	Facility contact information*	Contact information for the facility
	TIZPS.D9.DE.5	IIS identification*	System generated IIS identification
Business process E: plan service delivery			
TIZPS.E2: **Review ledger and stock available**	TIZPS.E2.DE.1	Vaccine quantity in stock	Number of vaccine units in stock
	TIZPS.E2.DE.2	Vaccine quantity required	Number of vaccine units required
	TIZPS.E2.DE.3	Vaccine quantity shortfall	Number of vaccine units shortfall
	TIZPS.E2.DE.4	Next vaccination session	The date that the next immunization clinic is scheduled
	TIZPS.E2.DE.5	Number of clients due	Number of clients due at the next immunization clinic
	TIZPS.E2.DE.6	Number of clients overdue	Number of clients overdue at the next immunization clinic
TIZPS.E3: **Order additional stock from facility**	TIZPS.E3.DE.1	Vaccine product name	The name of the vaccine
	TIZPS.E3.DE.2	Vaccine product description	The description of the vaccine
	TIZPS.E3.DE.3	Batch number	The vaccine product code.
	TIZPS.E3.DE.4	Vaccine expiry date	The last date of vaccine usage.
	TIZPS.E3.DE.5	Vaccine manufacturer	The name of vaccine manufacturer.
	TIZPS.E3.DE.6	Stock request date	Date new vaccine stock ordered
	TIZPS.E3.DE.7	Stock request number	Unique identifier for the stock request (order)
	TIZPS.E3.DE.8	Stock requestor ID	The UID (provider ID) of the person requesting stock, if available
	TIZPS.E3.DE.9	Stock requestor first name	The first name of the person requesting stock, if UID not available
	TIZPS.E3.DE.10	Stock requestor last name	The first name of the person requesting stock, if UID not available
TIZPS.E5: **Record stock taken**	TIZPS.E5.DE.1	Number of vaccine doses dispensed	Number of vaccine doses dispensed/removed from fridge at facility to prepare for clinic
Business process F: register client			
TIZPS.F2: **Start client health record**	TIZPS.F2.DE.1	Client ID	Unique, system generated client ID
	TIZPS.F2.DE.2	Client first name	Client's first or given name
	TIZPS.F2.DE.3	Client family name	Client's last or family name
	TIZPS.F2.DE.4	Client birth date	Client's date of birth capturing day, month and year of birth
	TIZPS.F2.DE.5	Age	Estimated age in years/ months of the client, captured if client_birth_date is unknown
	TIZPS.F2.DE.6	**Sex**	**Client's biological sex at birth, either male or female**
	TIZPS.F2.DE.7	Contact number	Number where client may be reached
	TIZPS.F2.DE.8	Client adress	Client's address including street name, district/county, city and region

Activity ID Activity name	Data element ID	Data element name	Description and definition
	TIZPS.F2.DE.9	Next of kin	Client's next of kin details including name, address and contact number
TIZPS.F3: Enter into vaccination log/register			
	TIZPS.F3.DE.1	Update vaccination schedule	Align vaccination schedule to client according to age and update vaccination log
TIZPS.F4: Find client in register and obtain health record			
	TIZPS.F4.DE.1	Client ID*	Unique, system generated client ID
	TIZPS.F4.DE.2	Client first name*	Client's first or given name
	TIZPS.F4.DE.3	Client family name*	Client's last or family name
	TIZPS.F4.DE.4	Client birth date*	Client's date of birth capturing day, month and year of birth
	TIZPS.F4.DE.5	Age*	Estimated age in years of the client, captured if client_birth_date is unknown
	TIZPS.F4.DE.6	Sex*	Client's biological sex at birth, either male or female
	TIZPS.F4.DE.7	Contact number*	Number where client may be reached
	TIZPS.F4.DE.8	Client adress*	Client's address including street name, district/county, city and region
	TIZPS.F4.DE.9	Next of kin*	Client's next of kin details including name, address and contact number
Business process H: administer vaccine			
TIZPS.H1: Query client record	TIZPS.H1.DE.1	Client details (search)*	Search any client registration details
	TIZPS.H1.DE.2	Display client record*	Display client record
	TIZPS.H1.DE.3	**Vaccine schedule**	**Display clients current vaccine card**
TIZPS.H2: Measure body weight			
	TIZPS.H2.DE.1	Allergies	Has the client had any severe, life-threatening allergies to vaccines or anything else?
	TIZPS.H2.DE.2	HIV status	Is the client diagnosed with HIV positive or severe immunodeficiency?
	TIZPS.H2.DE.3	Health status	Currently, is the client currently very sick and/or have a very high temperature (>39 degrees celsius)
	TIZPS.H2.DE.4	Administer vaccine (Y/N)	Does the HCW recommend for the vaccine to be administered?
	TIZPS.H2.DE.5	**Reason for non-administration of vaccine**	**Reason for non-administration of vaccine**
TIZPS.H4: Inform client when to return for vaccine			
	TIZPS.H4.DE.1	Client first name*	Client's first or given name
	TIZPS.H4.DE.2	Client family name*	Client's last or family name
	TIZPS.H4.DE.3	Client ID*	Unique, system generated client ID
	TIZPS.H4.DE.4	Vaccine type*	The type of vaccine
	TIZPS.H4.DE.5	Vaccine dose*	Vaccine dose i.E. First, second, third, first booster, etc.
	TIZPS.H4.DE.6	Vaccination status*	Vaccine due/ missed/ requested (non routine).
	TIZPS.H4.DE.7	Follow up date	The scheduled date for immunization follow up
	TIZPS.H4.DE.8	Additional notes	Any additional notes
TIZPS.H6: Administer vaccine			
	TIZPS.H6.DE.1	Vaccine type*	The type of vaccine
	TIZPS.H6.DE.2	Vaccine product code	The vaccine product code
	TIZPS.H6.DE.3	Vaccine dose*	Vaccine dose i.E. First, second, third, first booster, etc.
	TIZPS.H6.DE.4	Date of administration	Date that the vaccine was administered to the client
	TIZPS.H6.DE.5	**Mode of administration**	**Route in which vaccine was administered**
	TIZPS.H6.DE.6	Vaccine batch number	The batch number of the vaccines for traceability purposes

Activity ID Activity name	Data element ID	Data element name	Description and definition
	TIZPS.H6.DE.7	Vaccine manufacturer (drop down?)	The manufacturer of the vaccines for traceability purposes
	TIZPS.H6.DE.8	Place of administration*	The place where the vaccines was administered to the client
	TIZPS.H6.DE.9	Vaccinator (provider ID)*	The UID of the person performing the vaccination, if available
	TIZPS.H6.DE.10	Strategy	E.G.: Campaign, routine, school-based,
	TIZPS.H6.DE.11	Client ID*	Unique identifier generated for new clients or returned from a query to client registry
	TIZPS.H6.DE.12	Client consent	Indicates if the client (or caregiver if client < 18years old) has given consent
	TIZPS.H6.DE.13	Facility ID*	The unique identifier for the facility
	TIZPS.H6.DE.14	Next visit date	Next date client is due for vaccination (immunization appointment)
TIZPS.H9: Monitor client			
	TIZPS.H9.DE.1	Client has an adverse reaction (Y/N)	Client has experienced and adverse reaction to the vaccine
	TIZPS.H9.DE.2	**Type of adverse reaction experienced**	**Adverse reaction experienced by client**
TIZPS.H10: Treat as appropriate			
	TIZPS.H10.DE.1	Treatment received? (Y/n)	Whether or not any kind of treatment was provided to client
	TIZPS.H10.DE.2	Prescription given? (Y/n)	Whether or not any kind of medicine or prescription was provided to client
	TIZPS.H10.DE.3	Type of prescription	Prescription given (list all)
	TIZPS.H10.DE.4	Was case investigation form (CIF) filled for AEFI reporting? (Yes/no)	Whether or not the CIF was filled for AEFI reporting. Note: in case the CIF hasn't been filled, remind to fill the form.
	TIZPS.H10.DE.5	Additional notes	Any extra notes by provider regarding treatment or prescription
	TIZPS.H10.DE.6	Next visit date	Client's next visit day
	TIZPS.H10.DE.7	Additional comments	Any additional comments
TIZPS.H13: Generate digital certificate			
	TIZPS.H13.DE.1	Name*	The full name of the tested person
	TIZPS.H13.DE.2	Date of birth*	The tested person's date of birth (DOB) if known. If unknown, use assigned DOB for administrative purposes.
	TIZPS.H13.DE.3	Unique identifier*	Unique identifier (ID) for the tested person, according to the policies applicable to each country. There can be more than one unique identifier used to link records (e.G. National ID, health ID, medical record ID).
	TIZPS.H13.DE.4	Vaccine type*	The type of vaccine
	TIZPS.H13.DE.5	Vaccine product code*	The vaccine product code
	TIZPS.H13.DE.6	Vaccine dose*	Vaccine dose i.E. First, second, third, first booster, etc.
	TIZPS.H13.DE.7	Date of administration*	Date that the vaccine was administered to the client
	TIZPS.H13.DE.8	Mode of administration*	Route in which vaccine was administered
	TIZPS.H13.DE.9	Vaccine batch number*	The batch number of the vaccines for traceability purposes
	TIZPS.H13.DE.10	Vaccine manufacturer*	The manufacturer of the vaccines for traceability purposes
	TIZPS.H13.DE.11	Place of administration*	The place where the vaccines was administered to the client
Business process L: manage arrivals of vaccines			

Activity ID Activity name	Data element ID	Data element name	Description and definition
TIZPS.L1: Review vaccine			
	TIZPS.L1.DE.1	Date	Today's date
	TIZPS.L1.DE.2	Name of vaccine	Official name of vaccine
	TIZPS.L1.DE.3	Strength	Strength or potency of vaccine (antigen concentration, dosage, etc.)
	TIZPS.L1.DE.4	Condition	Physical condition of vaccine
	TIZPS.L1.DE.5	Number of vaccines	Count of vaccines
	TIZPS.L1.DE.6	Accepted order quantity	Accepted order quantity
	TIZPS.L1.DE.7	Special conditions of care required	Any unique or specific conditions that a vaccine may require during storage and handling to ensure its effectiveness.
	TIZPS.L1.DE.8	Memory test	Checking and verifying the temperature monitoring or recording systems used to track the storage conditions of vaccines.
	TIZPS.L1.DE.9	The highest level	The maximum acceptable temperature or storage condition that a vaccine can tolerate without compromising its potency.
	TIZPS.L1.DE.10	The lowest level	The minimum acceptable temperature or storage condition for a vaccine. Storing vaccines below this recommended lower limit can also jeopardize their efficacy.
	TIZPS.L1.DE.11	Storage space	The physical area or facility where vaccines are stored. The storage space must meet specific requirements, including temperature controls, security measures, and organizational protocols to ensure that vaccines are stored properly.
	TIZPS.L1.DE.12	Memory number to receive	Unique identification number for receipt
	TIZPS.L1.DE.13	Received amount	Count of vaccines received
	TIZPS.L1.DE.14	Received from	Name of DIVO or facility
	TIZPS.L1.DE.15	Manufacturer	Manufacturers name and information
	TIZPS.L1.DE.16	Batch number	Vaccine batch number
	TIZPS.L1.DE.17	Expiration date	Expiration date of batch
TIZPS.L3: Document for delivery			
	TIZPS.L3.DE.1	Memory number to issue	Unique identification number for issue
	TIZPS.L3.DE.2	Name of vaccine*	Official name of vaccine
	TIZPS.L3.DE.3	Issued amount	Count of vaccines issued
	TIZPS.L3.DE.4	Issued to	Name of facility
	TIZPS.L3.DE.5	Manufacturer*	Manufacturers name and information
	TIZPS.L3.DE.6	Batch number*	Vaccine batch number
	TIZPS.L3.DE.7	Expiration date*	Expiration date of batch
TIZPS.L4: Inspect delivery			
	TIZPS.L4.DE.1	Name of vaccine*	Official name of vaccine
	TIZPS.L4.DE.2	Manufacturer*	Manufacturers name and information
	TIZPS.L4.DE.3	Batch number*	Vaccine batch number
	TIZPS.L4.DE.4	Corrections	Any vaccine discrepancies e.G. Mismatching stock and damage
Business process M: manage stock			
TIZPS.M1: Query stock available	TIZPS.M1.DE.1	Name of vaccine*	Official name of vaccine
	TIZPS.M1.DE.2	Manufacturer*	Manufacturers name and information
	TIZPS.M1.DE.3	Batch number*	Vaccine batch number
	TIZPS.M1.DE.4	Available amount	Amount of vaccine stock at hand available at the facility

Activity ID Activity name	Data element ID	Data element name	Description and definition
TIZPS.M3: Inspect stock	TIZPS.M3.DE.1	Vaccine vial monitor	Vaccine vial monitor status (stage I, II, III, IV)

Component 6: Decision support logic

The decision-support logic component of this SURD provides the decision logic and algorithms, as well as the scheduling of services, in accordance with Tanzania guidelines. In this SURD, the decision logic and algorithms deconstruct the recommendations within the immunization guidelines and guidance into a format that clearly labels the inputs and outputs that would be operationalized in a digital decision-support system.

Age	Vaccine
Birth or first contact	BCG
	OPV 0
Six weeks	OPV 1
	DPT-HepB – Hib1
	PCV 1
	Rota 1
Ten weeks	OPV 2
	DPT-HepB – Hib2
	PCV 2
	Rota 2
Fourteen weeks	OPV 3
	DPT-HepB – Hib3
	PCV 3
	Rota 3
	IPV
Nine months	Measles-Rubella1
18 months	Measles-Rubella 2
First contact	TT1
One month after the first dose	TT2
Six months after the second dose	TT3
One year after the third dose	TT4
One year after the fourth dose	TT5
14 years	HPV1
Six months after first dose	HPV2

Component 7: Indicators and performance metrics

This section details indicators and performance metrics considered in the Tanzania context and would be aggregated from core data elements identified in Component 5. The list in the below table is a minimum set of indicators that can be aggregated for decision-making, performance metrics, and subnational and national reporting based on data collected from individual-level, routine health systems. These indicators may be aggregated automatically from the digital tracking tool to populate a digital HMIS, such as DHIS2.

Indicator code	Indicator name	Numerator		Denominator		Definition
		Definition	Computation	Definition	Computation	
TIZPS.IND.01	Proportion of outreach sessions conducted per planned.	Number of outreach session conducted.	COUNT of outreach sessions conducted.	Total number of planned outreach sessions.	COUNT of total outreach sessions planned.	Percent of outreach sessions conducted against total planned outreach sessions that period.
TIZPS.IND.02	Proportion of vaccination session conducted per planned.	Number of fixed sessions conducted.	COUNT of fixed sessions conducted.	Total number of planned fixed sessions.	COUNT of total fixed sessions planned.	Percent fixed vaccination sessions conducted against planned sessions during the period.
TIZPS.IND.03	Proportion of babies born alive.	Number of newborns alive.	COUNT of newborns alive.	Total number of newborns.	COUNT of all newborns who have been born.	Percent of newborns alive during the period.
TIZPS.IND.04	Proportion of facilities registered.	Number of facilities registered.	COUNT of facilities registered.	Total number of facility information received for registry.	COUNT of all facility information received for registry.	Percent of facilities registered during the period.
TIZPS.IND.05	Proportion of HF with adequate vaccines.	Number of HF with adequate vaccine stock (stock greater than 0).	COUNT of immunization vaccines supplied.	Number of immunization vaccines to achieve the 100 percent target in the districts.	COUNT of immunization vaccines if stock is fully supplied.	Percent adequacy of routine immunization vaccine supply against the 100 percent target.
TIZPS.IND.06	Proportion of HF that submitted timely monthly reports.	Number of HF that submitted timely reports to the district level during the period.	COUNT of HF that submitted timely monthly reports.	Total number of HF that submitted monthly reports.	COUNT of all the HF that submitted reports.	Percent of HF that submitted timely reports to the district level during the period.
TIZPS.IND.07	Proportion of HF that submitted complete monthly reports.	Number of HF that submitted complete monthly reports.	COUNT of HF that submitted complete monthly reports.	Total number of HF that submitted complete monthly reports.	COUNT of all HF that submitted complete report.	Percent of HF that submitted complete reports to the district level during the period.
TIZPS.IND.08	Proportion of HF that submitted timely reports in VIMS.	Number of HF that submitted timely reports in VIMS.	COUNT of HF that submitted timely reports in VIMS.	Total number of HF that submitted reports in VIMS.	COUNT of all HF that submitted reports in VIMS.	Percent of HF that submitted timely data reports in VIMS during

Indicator code	Indicator name	Numerator		Denominator		Definition
		Definition	Computation	Definition	Computation	
						the period.
TIZPS.IND.09	Proportion of HF that submitted complete reports in VIMS.	Number of HF that submitted complete reports in VIMS.	COUNT of HF that submitted complete reports in VIMS.	Total number of HF that submitted complete reports in VIMS.	COUNT of HF that submitted complete reports in VIMS.	Percent of HF that submitted complete data in VIMS during the period.
TIZPS.IND.10	Dropout of Diphtheria, Pertussis, and Tetanus (DTP1-DTP3).	Number vaccinated with DTP1.	COUNT of number children vaccinated with DTP1.	Number vaccinated with DTP3.	COUNT of number vaccinated with DTP3.	Percent dropout rate of DTP1-DTP3. FORMULA: $((DTP1 - DTP3)/DTP1)*100$
TIZPS.IND.11	Dropout of DTP1-MR2.	Number vaccinated with DTP1.	COUNT of number vaccinated with DTP1.	Number vaccinated with MR2.	COUNT of number vaccinated with MR2.	Percent dropout rate of DTP1-MR2. FORMULA: $((DTP1 - MR2)/DTP1)*100$
TIZPS.IND.12	Dropout of HPV1-HPV2.	Number vaccinated with HPV1.	COUNT of number vaccinated with HPV1.	Number vaccinated with HPV2.	COUNT of number vaccinated with HPV2.	Percent dropout rate of HPV1-HPV2. FORMULA: $((HPV1 - HPV2)/HPV1)*100$
TIZPS.IND.13	Dropout of MCV1-MCV2.	Number vaccinated with MCV1.	COUNT of number vaccinated with MCV1.	Number vaccinated with MCV2.	COUNT of number vaccinated with MCV2.	Percent dropout rate of MCV1-MCV2. FORMULA: $((MCV1 - MCV2)/MCV1)*100$
TIZPS.IND.14	Proportion of children vaccinated with the first dose of Pentavalent.	Number vaccinated with DTP1.	COUNT of number vaccinated with DTP1.	Number of surviving infants.	COUNT of number of surviving infants.	Percent coverage of Penta-1 FORMULA: $(DTP1/Surviving infants)*100$
TIZPS.IND.15	Proportion of children Vaccinated with	Number vaccinated with	COUNT of number vaccinated with	Number of surviving infants.	COUNT of number of	Percent coverage of

Indicator code	Indicator name	Numerator		Denominator		Definition
		Definition	Computation	Definition	Computation	
	3rd dose of Pentavalent.	DTP3.	DTP3.		surviving infants.	Penta-3. FORMULA: (DTP3/Surviving infants)*100
TIZPS.IND.16	Proportion of children vaccinated with the first dose of measles containing vaccine.	Number vaccinated with MCV1.	COUNT of number vaccinated with MCV1.	Number of surviving infants.	COUNT of number of surviving infants.	Percent coverage of MCV1. FORMULA: (MCV1/Surviving infants)*100
TIZPS.IND.17	Proportion of children vaccinated with the second dose of measles contained vaccine.	Number vaccinated with MCV2.	COUNT of number vaccinated with MCV2.	Number of surviving infants of previous year.	COUNT of number of surviving infants of previous year.	Percent coverage of MCV2. FORMULA: (MCV2/Surviving infants of previous year)*100
TIZPS.IND.18	Proportion of girls of target age vaccinated with one dose of HPV.	Number vaccinated with HPV1.	COUNT of number vaccinated with HPV1.	Number of girls of 14 years old.	COUNT of number of girls of 14 years old.	Percent coverage of HPV1. FORMULA: (HPV1/girls of 14 years old age)*100
TIZPS.IND.19	Proportion of AEFI cases reported and investigated.	Number of AEFI cases investigated.	COUNT number of AEFI cases investigated.	Number of AEFI cases reported.	COUNT number of AEFI cases reported.	Percent of AEFI investigated. FORMULA: AEFI case investigated/AEFI cases reported)*100
TIZPS.IND.20	Proportion of pregnant mothers vaccinated with two or more doses of tetanus contained vaccine.	Number of pregnant women vaccinated with Td2+.	COUNT number of pregnant women vaccinated with Td2+.	Number of pregnant women.	COUNT number of pregnant women.	Percent coverage of Td2+. FORMULA: (pregnant women vaccinated with Td2+/Total pregnant

Indicator code	Indicator name	Numerator		Denominator		Definition
		Definition	Computation	Definition	Computation	
						women)*100
TIZPS.IND.21	Proportion of districts achieving DTP3 coverage of greater than or equal to 90 percent.	Number of districts achieving DTP3 coverage of greater than or equal to 90 percent.	COUNT of districts achieving DTP3 coverage of greater than or equal to 90 percent.	Number of districts in the country.	COUNT of districts in the country.	Percent of districts with coverage Penta-3. FORMULA: (districts achieving DTP3 coverage of =>90%/Total number of districts)*100
TIZPS.IND.22	Vaccines wastage.	Number of vaccine Immunized	COUNT of all Immunized vaccine	#of usable doses plus #of doses received at the beginning of the period minus #of usable doses in stock at the end of the period	COUNT of #of usable doses plus #of doses received at the beginning of the period minus #of usable doses in stock at the end of the period	Percent vaccines wastage rates.
TIZPS.IND.23	Proportion of HF with adequate COVID-19 vaccines per target population.	Number of HF with adequate COVID-19 vaccine.	COUNT of adequate COVID-19 vaccine.	Total target COVID-19 vaccine for 70 percent of target population	COUNT of total adequacy of vaccine in a target population.	Percent adequacy of vaccine supply against the 70 percent target population.
TIZPS.IND.24	Proportion of districts with adequate COVID-19 vaccines per target population.	Number of districts with adequate COVID-19 vaccines in the target population.	COUNT of districts with adequate COVID-19 vaccines in a target population.	Total target COVID-19 vaccine in a target population.	Count of all adequacy of COVID-19 vaccine.	Percent adequacy of vaccine stock supply against the 70 percent target population in the districts.
TIZPS.IND.25	Proportion of districts with adequate COVID-19 Injection syringes per target population.	Number of districts with adequate COVID-19 injection syringes.	COUNT of adequate syringes for COVID-19 in target population.	Total syringes for COVID-19 planned for the target population.	COUNT of syringes in a target population.	Percent adequacy of injection syringes against the 70% target population in the districts.
TIZPS.IND.26	Proportion of COVID-19 vaccination sessions conducted per planned.	Number of COVID-19 sessions conducted.	COUNT of COVID-19 sessions conducted.	Total number of planned COVID-19 sessions.	COUNT of total COVID-19 sessions planned.	Percent of COVID-19 vaccination sessions conducted against planned

Indicator code	Indicator name	Numerator		Denominator		Definition
		Definition	Computation	Definition	Computation	
						sessions during the period.
TIZPS.IND.27	Proportion of HF that submitted timely monthly reports.	Number of HF that submitted timely reports to national level during the period.	COUNT of HF that submitted timely reports.	Total number of HF that submitted reports.	COUNT of all the HF that submitted reports.	Percent of HF that submitted timely reports to national level during the period.
TIZPS.IND.28	Proportion of HF that detected and completely filled AEFI CIF for submission.	Number of HF that completely filled AEFI CIF.	COUNT of HF that completely filled AEFI cases Investigate.	Number of HF that reported AEFI cases.	COUNT of HF AEFI cases reported.	Percent of AEFI CIF submitted.
TIZPS.IND.29	Proportion of HF that submitted complete monthly COVID-19 reports.	Number of HF that submitted complete COVID-19 reports in VIMS.	COUNT of HF that submitted complete COVID 19 reports in VIMS.	Total number of HF that submitted complete COVID-19 reports in VIMS.	COUNT of HF that submitted complete COVID-19 reports in VIMS.	Percent of HF that submitted complete COVID-19 data in VIMS during the period.
TIZPS.IND.30	Dropout of CV1-CV2 by HF.	Number of individuals vaccinated with CV1.	COUNT of number of individuals vaccinated with CV1.	Total # of individual vaccinated with CV2 in HF.	COUNT of # of individual vaccinated with CV2 in a HF.	Percent dropout rate of CV1-CV2 by HF. FORMULA: ((CV1 - CV2)/CV1)*100
TIZPS.IND.31	Dropout of CV1-CV2 by districts.	#of individual vaccinated with CV1.	COUNT of number of individuals vaccinated with CV1.	COUNT of all individual vaccinated with CV2 by district	COUNT of number vaccinated with CV2.	Percent dropout rate of CV1-CV2 by district. FORMULA: ((CV1 - CV2)/CV1)*100
TIZPS.IND.32	Percent of COVID-19 vaccines absorption rate.	#Of vaccine administered at the certain period.	COUNT of number of vaccines received.	Total #of vaccine received at certain period.	COUNT of number of total vaccines received.	Percent of COVID-19 absorption.
TIZPS.IND.33	COVID-19 vaccine utilization.	#of people vaccinated with CV19.	COUNT of number of people vaccinated with CV19.	COUNT of total number of people vaccinated with	COUNT of total number of people vaccinated with CV19.	%COVID-19 vaccine utilization rate.

Indicator code	Indicator name	Numerator		Denominator		Definition
		Definition	Computation	Definition	Computation	
				CV19.		
TIZPS.IND.34	Proportion of eligible population vaccinated with at least one dose of COVID-19 vaccine.	Number of target population of age =>18 years vaccinated with CV1.	COUNT number of Target population of age =>18 years vaccinated with CV1.	Number of Target population of ALL age =>18 years.	COUNT number Target population of ALL age =>18 years.	% Coverage of CV-1.
TIZPS.IND.35	Proportion of eligible population with a completed COVID-19 vaccination schedule.	Number of target population (18 years or older) that are vaccinated with the last dose of the COVID-19 vaccine per schedule.	COUNT of target population (18 years or older) that are vaccinated with the last dose of the COVID-19 vaccine per schedule.	Number of total target population (18 years or older).	COUNT of total target population (18 years or older).	Percent coverage of target populated that are fully vaccinated against COVID-19.
TIZPS.IND.36	Proportion of council reached target for COVID-19 vaccination.	Number of council vaccinated COVID-19 vaccine to 70 percent or more of the eligible population.	COUNT of council vaccinated COVID-19 vaccine to 70 percent or more of the eligible population.	Number of council in the country.	COUNT of council in the country.	Percent of CV19 coverage above 70% of the eligible population.

Component 8: Functional and non-functional requirements

This section provides an overview of illustrative functional and non-functional requirements that may be considered to kick-start the process of designing or adapting a Tanzania specific IIS digital tracking and decision-support system.

Functional requirements describe the capabilities the system must have in order to meet the end-users' needs and achieve tasks within the business process. Non-functional requirements provide the general attributes and features of the digital system to ensure usability and overcome technical and physical constraints. Examples of non-functional requirements include ability to work offline, multiple language settings and password protection.

Functional requirements

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.001	Define criteria	HCW, CHW	Allow user to select reminder/recall parameters. May include but not limited to: Age, vaccination schedule, geographic area, and event trigger.
TIZPS.FXNREQ.002	Define criteria	System	Have the ability to associate a client with a facility/site to generate a provider-based reminder/recall.
TIZPS.FXNREQ.003	Define criteria	System	Have ability to validate data against the vaccination schedule (Note: Can use the vaccination schedule to best schedule reminders/recall for series vaccinations, etc.).
TIZPS.FXNREQ.004	Select notification method	HCW, CHW	Allow user to select one or more notification methods (e.g., text message, email, CHW home visits, etc.).
TIZPS.FXNREQ.005	Select notification method	HCW, CHW	Have the ability to maintain the client's preferred contact method.

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.006	Generate list of clients	System	Have the ability to produce a list of clients according to user-defined parameters.
TIZPS.FXNREQ.007	Generate list of clients	System	Have the ability to print the list of clients.
TIZPS.FXNREQ.008	Generate list of clients	System	Have the ability to display the date the reminder/recall notice was sent to a client.
TIZPS.FXNREQ.009	Generate list of clients	System	Have the ability to display a type of notification indicator per client record (e.g., due or defaulter).
TIZPS.FXNREQ.010	Generate list of clients	System	Have ability to track the number of reminder/recall attempts (i.e., per patient and total).
TIZPS.FXNREQ.011	Generate list of clients	System	Prevent all records given an inactive or deceased status from being included in the list of clients for reminder/recall.
TIZPS.FXNREQ.012	Send notifications	System	Have the ability to generate electronic notifications.
TIZPS.FXNREQ.013	Send notifications	System	Have ability to send electronic notifications depending on the client's age and vaccination schedule. E.g., Reminder on Td vaccine scheduled above five yrs.
TIZPS.FXNREQ.014	Send notifications	System	Send reminder/recall notification to client or designated health worker e.g., via CHW, HCW (the notification should contain a list of all clients who are due for vaccination).
TIZPS.FXNREQ.015	Track client	System	Have the ability to assign CHW to a client.
TIZPS.FXNREQ.016	Track client	System	Have the ability to generate and send a list of defaulted/overdue clients to CHW.
TIZPS.FXNREQ.017	Track client	CHW	Enable CHW to interact directly with the system to submit feedback after follow up.
TIZPS.FXNREQ.018	Update client information and/or status	System	Have ability to track notification attempts and log back to a client's record.
TIZPS.FXNREQ.019	Update client information and/or status	System	Have the ability to maintain an audit log of the changes and history.
TIZPS.FXNREQ.020	Update client information and/or status	System	Have ability to update client records with tracking information in the TImR.
TIZPS.FXNREQ.021	Update client information and/or status	System	Have ability to edit, update, and override client information such as change of address (moved permanently or temporarily).
TIZPS.FXNREQ.022	Client is due for vaccination	System	Produce a report that identifies all children due for vaccination within the next month. The inputs to this report should be the national vaccination schedule (rules based on each antigen), and the individual's vaccine record.
TIZPS.FXNREQ.023	Confirm vaccination dates and outreach schedule dates	System	Validate the vaccination dates for all facilities in the next month (outreach and fixed).
TIZPS.FXNREQ.024	Confirm vaccination dates and outreach schedule dates	System	Provide a means to update the vaccination schedule (e.g., with national holidays).
TIZPS.FXNREQ.025	Does the client have a phone?	System	Identify if the client due for a vaccination has a phone number on the record.

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.026	Generate reminder message	System	Generate a pre-recorded reminder message for the client who is due a vaccination. The message can indicate the date and location of the upcoming vaccination schedule (outreach and fixed).
TIZPS.FXNREQ.027	Generate reminder to CHW	System	Determine the CHW responsible for the area in which the client due for vaccination resides.
TIZPS.FXNREQ.028	Generate reminder to CHW	System	Send a list of all clients (that the CHW is responsible for) that are due for vaccination.
TIZPS.FXNREQ.029	Determine if vaccinations were missed	System	Display a list of clients who missed their vaccination for each antigen.
TIZPS.FXNREQ.030	Determine if vaccinations were missed	System admin	Allow the user or ministry to specify vaccination schedule and thresholds for a client to qualify as requiring follow-up.
TIZPS.FXNREQ.031	Determine if vaccinations were missed	HCW	Allow the user to print a list of clients requiring follow-up.
TIZPS.FXNREQ.032	Determine if vaccinations were missed	HCW	Allow the user to export a list for follow-up.
TIZPS.FXNREQ.033	Record information to follow-up	System	Extract location and personal information.
TIZPS.FXNREQ.034	Record information to follow-up	System	Categorize defaulter information by location and CHW.
TIZPS.FXNREQ.035	Plan for follow- up at facility sessions or during outreach	Authorized system users	Display a list of planned outreach and vaccinations sessions.
TIZPS.FXNREQ.036	Send client information to CHW or mother/caregiver	System	Send list of missing clients by email or SMS to CHW. Note: Checking point (the number of the reminders sent to clients and CHW comments, the number of reminders equal to or over five).
TIZPS.FXNREQ.037	Send client information to CHW or mother/caregiver	System	Send recall SMS to mother/caregiver.
TIZPS.FXNREQ.038	Ensure child is vaccinated	CHW	Mark located client for future follow-up.
TIZPS.FXNREQ.039	Record the reason	HCW, CHW	Allow the user to record reason: either permanent reason for not finding child or reason vaccination was missed.
TIZPS.FXNREQ.040	Create new record	HCW, CHW	Prompt the user to search for the child first, by providing some of the basic mandatory information. Only if the child is not found should they be allowed to continue on and add information to make a full registration.
TIZPS.FXNREQ.041	Create new record	HCW, CHW	Prompt the user to save when navigating away from registration without saving.
TIZPS.FXNREQ.042	Create new record	HCW, CHW	Display a child summary page to enter child weight or immunizations once the information is saved.
TIZPS.FXNREQ.043	Create new record	HCW, CHW	Generate a vaccination schedule based on child date of birth after registration.
TIZPS.FXNREQ.044	Update client record	HCW, CHW	Warn the user of possible match to already existing child by providing enough information to enable the user to make informed decision to avoid duplication.

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.045	Update client record	HCW, CHW	Provide the ability to update the child registration information.
TIZPS.FXNREQ.046	Receive facility information	TImR staff/system	Have ability to receive facility information from multiple sources (e.g., automatically or manually in multiple formats).
TIZPS.FXNREQ.047	Validate HFR	TImR staff/system	Have ability to interface with HFR's database to validate if the facility is already registered in the HFR (Note: If a facility is registered in the HFR, then the facility information should be verified for accuracy and/or updated in the TImR).
TIZPS.FXNREQ.048	Validate HFR	TImR staff/system	Have ability to flag any facilities that are registered in the TImR that are not in the HFR.
TIZPS.FXNREQ.049	Validate HFR	TImR staff/system	Have ability to validate HFR with TImR master list.
TIZPS.FXNREQ.050	Does facility information match?	TImR staff/system	Have ability to update TImR master facility registration information with information from the HFR.
TIZPS.FXNREQ.051	Update/add new facility	Facility staff	Have ability to provide a temporary unique ID to facilities not listed in the HFR.
TIZPS.FXNREQ.052	Update/add new facility	Facility staff	Have ability to add new facilities to TImR master registration list not listed in the HFR.
TIZPS.FXNREQ.053	Update/add new facility	Facility staff	Have ability to link the HFR ID with TImR ID as the same record (Note: Reference table used to show the translation of records [e.g., when records are merged, it maintains a reference of the old/expired/obsolete record ID numbers and references the new ID number]).
TIZPS.FXNREQ.054	Update/add new facility	Facility staff	Have the ability to send notification of new facilities to the HFR manager.
TIZPS.FXNREQ.055	Update/add new facility	Facility staff	Have the ability to update facility information not captured in the HFR.
TIZPS.FXNREQ.056	Update/add new facility	Facility staff	Have the ability to keep an audit log of change history when any facility information is changed and saved (e.g., include date/time stamp).
TIZPS.FXNREQ.057	Verify information for additional data	TImR staff/system	Have the ability to prompt users to accept changes to TImR master registration list.
TIZPS.FXNREQ.058	Verify information for additional data	TImR Staff/System	Have the ability to verify that all required fields are complete.
TIZPS.FXNREQ.059	Verify information for additional data	TImR staff/system	Have the ability to notify users of incomplete mandatory fields.
TIZPS.FXNREQ.060	Validate HFR	TImR staff/system	Have the ability to flag facilities as temporary.
TIZPS.FXNREQ.061	Update/add new facility	TImR staff/system	Have the ability to convert temporary facilities to permanent facilities.
TIZPS.FXNREQ.062	Information complete?	TImR staff/system	Have the ability to verify that all required facility information is complete.
TIZPS.FXNREQ.063	Information complete?	TImR staff/system	Have the ability to generate an exception report.
TIZPS.FXNREQ.064	Information complete?	TImR staff/system	Have the ability to generate reports of missing information.
TIZPS.FXNREQ.065	Information complete?	TImR staff/system	Have the ability to generate email to defined groups
TIZPS.FXNREQ.066	Request additional information	TImR staff/system	Have the ability to support the process of receiving information.
TIZPS.FXNREQ.067	Create/update facility record	TImR staff/system	Have ability to audit facility data changes with date/time stamp "last updated".

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.068	Create/update facility record	TImR staff/system	Have ability to collect total number of facility data changes and report to selected groups
TIZPS.FXNREQ.069	Generate unique TImR ID	TImR staff/system	Have the ability to generate a unique TImR ID.
TIZPS.FXNREQ.070	Send facility registration notification and TImR ID	TImR staff/system	Have ability to send TImR registration notification with TImR ID (e.g., SMS, mail, email).
TIZPS.FXNREQ.071	Send facility registration notification and TImR ID	TImR staff/system	Have ability to insert/include instructions of how to use TImR ID (e.g., reporting requisition).
TIZPS.FXNREQ.072	Receive registration information	Facility staff	Allow users to send/acknowledge confirmation of receipt of the registration notification.
TIZPS.FXNREQ.073	Review register to determine estimates of vaccine needed	HCW	Identify all clients due (or overdue) for vaccination by the next clinic date.
TIZPS.FXNREQ.074	Review register to determine estimates of vaccine needed	HCW	Sort the list by antigen.
TIZPS.FXNREQ.075	Review register to determine estimates of vaccine needed	HCW	Provide range estimates for vaccine needs based on historical data (high and low ranges).
TIZPS.FXNREQ.076	Record details on planning sheet	HCW	Print list of necessary antigens and accessories (syringes, diluent, etc.) based on projected need.
TIZPS.FXNREQ.077	Sufficient stock in immediate location?	HCW	Identify the stock at the facility.
TIZPS.FXNREQ.078	Sufficient stock within facility?	HCW	Compare the list of needed antigens to the stock on hand and indicate if there is sufficient stock.
TIZPS.FXNREQ.079	Sufficient stock in immediate location?	HCW	Show the actual numbers of each antigen in stock.
TIZPS.FXNREQ.080	Order additional stock	HCW	Allow the user to generate a stock request based on the information provided.
TIZPS.FXNREQ.081	Order additional stock	HCW	Allow the user to change the number of each antigen as needed (using the shortage as a guideline).
TIZPS.FXNREQ.082	Order additional stock	HCW	Provide feedback for stock that is not available for ordering (back orders).
TIZPS.FXNREQ.083	Order additional stock	HCW	Indicate that the order has been processed.
TIZPS.FXNREQ.084	Order additional stock	HCW	Provide any relevant details for the order fulfillment (such as time of day to expect delivery or any special instructions).
TIZPS.FXNREQ.085	Order additional stock	HCW	Provide means to include some mandatory user feedback, such as stock on hand, reason for order and Location.
TIZPS.FXNREQ.086	Get needed stock	HCW	Provide a printed list of (antigen) stock order to be fulfilled.
TIZPS.FXNREQ.087	Record stock taken	HCW	Allow bar code reading of stock taken.
TIZPS.FXNREQ.088	Record stock taken	HCW	Record stock removed from cold storage and taken to facility
TIZPS.FXNREQ.089	Record stock taken	HCW	Maintain a tally of stock available at each location (cold fridge at fixed session, outreach).

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.090	Assemble all needed materials for clinic	HCW	Provide a facility materials checklist.
TIZPS.FXNREQ.091	Does the patient have a record?	HCW	Allow the user to search for the client given some demographic information.
TIZPS.FXNREQ.092	Does the patient have a record?	HCW	As a result of the search, return all potential matches.
TIZPS.FXNREQ.093	Does the patient have a record?	HCW	Allow for searching and matching on partial information (such as partial birth dates).
TIZPS.FXNREQ.094	Does the patient have a record?	HCW	Allow searching for children based on family relationships or demographics.
TIZPS.FXNREQ.095	Does the patient have a record?	HCW	Allow a system administrator to configure search parameters: what fields are mandatory, when partial information is acceptable, etc.
TIZPS.FXNREQ.096	Does the patient have a record?	HCW	Allow searching with wild cards.
TIZPS.FXNREQ.097	Does the patient have a record?	HCW	Allow the user to find patient records using QR/barcodes/Unique ID.
TIZPS.FXNREQ.098	Does the patient have a record?	HCW	Include results that look or sound similar to the search term (fuzzy logic).
TIZPS.FXNREQ.099	Start child health card	HCW	There will be a need for the clients to have their own paper record for some time. The child health book contains much more information than just immunizations and will require a much broader and more comprehensive solution to replace. In addition, it will serve as the paper back-up for patients and families as they rarely have online access to information.
TIZPS.FXNREQ.100	Enter into vaccination log/register/ system	HCW	Allow the user to enter all necessary registration data. Note: Include place of domicile and allow registration for catchment and in-service area.
TIZPS.FXNREQ.101	Enter into vaccination log/register/ system	HCW	Allow family relations to be modeled by cross- referencing patient data. The mother and father field would thus refer to other records in the patient database.
TIZPS.FXNREQ.102	Enter into vaccination log/register/system	HCW	Allow the user to select the place of birth from a list as defined by the system administrator.
TIZPS.FXNREQ.103	Enter into vaccination log/register/system	HCW	Allow the user to select the health facility of the patient from a list as defined by the system administrator.
TIZPS.FXNREQ.104	Enter into vaccination log/register/system	HCW	Validate that a patient does not exist before adding a new record. (All added activities must be preceded by a search).
TIZPS.FXNREQ.105	Enter into vaccination log/register/system	HCW	Enforce minimal data set to allow for a new registration.
TIZPS.FXNREQ.106	Enter into vaccination log/register/system	HCW	Enforce all mandatory dataset for a new registration
TIZPS.FXNREQ.107	Enter into vaccination log/register/system	HCW	Uniquely identify every person.
TIZPS.FXNREQ.108	Enter into vaccination log/register/system	HWC	Provide a mechanism to prevent unwanted duplication of records (e.g., the system warns if a child is registered with same name and DOB).
TIZPS.FXNREQ.109	Enter into vaccination log/register/system	HCW	Provide a means to handle duplicates (such as merging records).

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.110	Enter into vaccination log/register/ system	HCW	Allow for remote/offline access and update of patient records (via mobile device).
TIZPS.FXNREQ.111	Find patient in register as well as obtaining the child health booklet	HCW	Allow the system administrator to configure what information and what data will be returned to determine a match.
TIZPS.FXNREQ.112	Find patient in register as well as obtaining the child health booklet	HCW	Allow users to modify or update appropriate patient data as needed.
TIZPS.FXNREQ.113	Review record to determine appropriate action/care	HCW	Allow user to be certain the record belongs to the subject of care (this means it contains enough information/demographics/unique ID, etc.).
TIZPS.FXNREQ.114	Review record to determine appropriate action/care	System	Provide a history of previous care.
TIZPS.FXNREQ.115	Review record to determine appropriate action/care	System	Contain contact information. Note: When client is under 18, use parents/guardian contact information.
TIZPS.FXNREQ.116	Record relevant information	HCW	Update patient's vaccination record with all relevant information (date, dose, lot number, antigen).
TIZPS.FXNREQ.117	Record relevant information	HCW	Allow user to record additional doses, even those that are not included in the national vaccination schedule (PIRI, campaigns).
TIZPS.FXNREQ.118	Record relevant information	HCW	Allow user to record other vaccinations that are not included in the national vaccination schedule.
TIZPS.FXNREQ.119	Does the information belong on the client record?	HCW	Allow space to record any significant observations such as nutrition status that may be specific to that client.
TIZPS.FXNREQ.120	Find appropriate general record/ledger	HCW	Allow for the recording of non-client-specific data, such as counts of antigens given.
TIZPS.FXNREQ.121	Find appropriate general record/ledger	System	Allow for the reporting of aggregate data from the individual data to suit reporting needs.
TIZPS.FXNREQ.122	Query client record	HCW	Search if client is already in system (using at least two identifiers).
TIZPS.FXNREQ.123	Query client record	HCW	Require a user to search if a patient is already in the system prior to starting a new vaccination record entry.
TIZPS.FXNREQ.124	Query client record	System admin	Allow a system administrator to configure or set if a search must happen in advance of allowing a new entry.
TIZPS.FXNREQ.125	Query client record	HCW	Read client information from a bar code/QR code/patient ID and retrieve patient information.
TIZPS.FXNREQ.126	Does client need vaccine?	HCW	Allow the user to customize vaccine protocol.
TIZPS.FXNREQ.127	Does client need vaccine?	HCW	Be able to determine vaccine required by looking at age of client, vaccines already given, and vaccine protocol.
TIZPS.FXNREQ.128	Does client need vaccine?	HCW	Display vaccine(s) already given and vaccines due according to vaccine protocol.
TIZPS.FXNREQ.129	Is required vaccine available?	HCW	Display availability of vaccines stock.

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.130	Is required vaccine available?	HCW	Warn the user if required vaccine is out of stock.
TIZPS.FXNREQ.131	Inform client of next vaccine date	HCW	Display due date of the next vaccine.
TIZPS.FXNREQ.132	Update record	HCW	Allow the user to review antigen information (e.g., batch number, expiry date, VVM status).
TIZPS.FXNREQ.133	Update record	HCW	Allow user to select appropriate antigen at start session.
TIZPS.FXNREQ.134	Update record	HCW	Update stock record. Note: Update stock daily at the end of session.
TIZPS.FXNREQ.135	Update record	HCW	Alert user for stockout during vaccination session.
TIZPS.FXNREQ.136	Update record	HCW	Allow user to add stock to out of stock vaccine/syringe/without finishing the session.
TIZPS.FXNREQ.137	Inform next visit	HCW	Display date of the next vaccine/due date.
TIZPS.FXNREQ.138	Select patient records for evaluation	System	Have ability to automatically identify new patient records as possible duplicates.
TIZPS.FXNREQ.139	Select patient records for evaluation	System	Have ability to automatically identify existing patient records as duplicates.
TIZPS.FXNREQ.140	Select patient records for evaluation	System	Have ability to prompt user of possible duplicate record prior to saving new record.
TIZPS.FXNREQ.141	Select patient records for evaluation	System	Automatically flag duplicate records.
TIZPS.FXNREQ.142	Select patient records for evaluation	System	Have ability to schedule batching of duplicate record process.
TIZPS.FXNREQ.143	Evaluate records	System	Support a rule-based algorithm to evaluate duplicate records.
TIZPS.FXNREQ.144	Evaluate records	System	Have ability to generate a report of like IDs/confidence ratings.
			Note: Possible duplicates: name, address, quality data, reliable information, etc. Filter out missing/invalid value/data.
TIZPS.FXNREQ.145	Evaluate records	System	Allow rules to be easily editable by TIRM staff.
	Manual review?	System	Flag duplicate records that require manual review.
TIZPS.FXNREQ.146	Manual review?	System	Have ability to combine two or more duplicate records according to business rules.
			Note: Business rules should define which criteria to use to merge records (e.g., what information to keep from the duplicates).
TIZPS.FXNREQ.147	Manual review?	System	Automatically flag duplicate clients.
TIZPS.FXNREQ.148	Perform manual review	User	Have ability to alert user of records pending for manual review.
TIZPS.FXNREQ.149	Perform manual review	User	Allow user to view records simultaneously for decision to merge records.
TIZPS.FXNREQ.150	Perform manual review	User	Allow user to navigate the system while reviewing possible duplicates.
TIZPS.FXNREQ.151	Perform manual review	User	Have ability to plan and organize projects/tasks/assignments (e.g., task management, assign statuses like "completed" or "high priority", etc.).
TIZPS.FXNREQ.152	Can records be merged?	System	Have ability to determine if records have appropriate criteria in order to merge (e.g., personal identifying data to watch).

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.153	Merge record	System	Allow user to select data elements to merge into a consolidated record.
			Note: Could access additional source of data to validate information (e.g., ask the person, look up in another database).
TIZPS.FXNREQ.154	Merge record	System	Support an audit trail when records are merged.
TIZPS.FXNREQ.155	Merge record	System	Have ability to produce and access a cross-reference listing of pre- and post-merged records (i.e., a list that shows the old patient record information with the corresponding converted new patient record).
TIZPS.FXNREQ.156	Merge record	System	Have ability to "undo merge".
TIZPS.FXNREQ.157	Mark as "not duplicate" or pending	System	Allow user to flag record as "not a duplicate" Note: The system could believe records are duplicates, but they are not.
TIZPS.FXNREQ.158	Mark as "not duplicate" or pending	System	Have ability to prevent matching for the same pair of records that have been flagged as "not a duplicate".
TIZPS.FXNREQ.159	Mark as "not duplicate" or pending	System	Allow user to manually flag a record as pending for manual review (e.g., not enough information).
TIZPS.FXNREQ.160	Mark as "not duplicate" or pending	System	Have functionality to determine what pair of records is "not a duplicate of" (i.e., record 123 is a duplicate of record 456 and vice versa).
TIZPS.FXNREQ.161	Identify groups of vaccination events for evaluation	System	Have ability to prompt the user that the new vaccine is a duplicate.
TIZPS.FXNREQ.162	Identify groups of vaccination events for evaluation	System	Have ability to generate a list of possible client vaccine duplicates.
TIZPS.FXNREQ.163	Identify groups of vaccination events for evaluation	System	Have ability to manually initiate duplicate search process.
TIZPS.FXNREQ.164	Identify groups of vaccination events for evaluation	System	Have ability to automate duplicate search process.
TIZPS.FXNREQ.165	Identify groups of vaccination events for evaluation	System	Allow users to manually flag duplicate events.
TIZPS.FXNREQ.166	Identify groups of vaccination events for evaluation	System	Have ability to display to the end user the vaccine type, manufacturer, administration date, eligibility, and administrator who entered the dose for manual vaccine de-duplication review.
TIZPS.FXNREQ.167	Evaluate vaccine event records	System	Support a rules-based algorithm to evaluate duplicate events.
TIZPS.FXNREQ.168	Evaluate vaccine event records	System	Support probabilistic algorithm to determine and flag when duplicate events need manual review.
TIZPS.FXNREQ.169	Evaluate vaccine event records	System	Allow rules to be easily editable by DIVO's/IVO's (add, remove, modify) when authorized.
TIZPS.FXNREQ.170	Duplicate events?	System	Allow user to manually flag events for manual review.
TIZPS.FXNREQ.171	Duplicate events?	System	Have ability to alert user of events pending for manual review.
TIZPS.FXNREQ.172	Duplicate events?	System	Allow user to view events and event details simultaneously for decision to merge (i.e., two or more).

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.173	Duplicate events?	System	Allow user to navigate the system while reviewing possible duplicates (optional).
TIZPS.FXNREQ.174	Select the Most accurate/ suitable Event record	System	Have ability to automatically select the most accurate/suitable vaccination event to be used as the (primary or master) record.
TIZPS.FXNREQ.175	Update vaccine event records	System	Allow user to select data elements to merge into a consolidated event record.
TIZPS.FXNREQ.176	Update vaccine event records	System	Have ability to combine two or more duplicate event records according to business rules.
TIZPS.FXNREQ.177	Update vaccine event records	System	Support an audit trail when event records are merged.
TIZPS.FXNREQ.178	Update vaccine event records	System	Have ability to retain "pre-merged" event records.
TIZPS.FXNREQ.179	Update vaccine event records	System	Have ability to generate an audit list of vaccination events that are automatically merged.
TIZPS.FXNREQ.180	Update vaccine event records	System	Allow user to delete a duplicate vaccine event while still maintaining audit record.
TIZPS.FXNREQ.181	Generate report of duplicates	System	Automatically schedule routine reports to run at a specific time.
TIZPS.FXNREQ.182	Generate report of duplicates	System	Allow for the restriction of confidential personal identifiable information.
TIZPS.FXNREQ.183	Manage inventory	User	Be able to enter stock on hand by lot number.
TIZPS.FXNREQ.184	Manage inventory	User	Be able to enter stock adjustment (both negative and positive) and the reason for the adjustment that matches the national waste reporting categories (e.g., transferred in, cold chain failure, expired, etc.).
TIZPS.FXNREQ.185	Manage inventory	System	Allow the user to enable and disable lot numbers that are being used in the health facility.
TIZPS.FXNREQ.186	Manage inventory	System	Allow the user to confirm receiving stock by lot number that has been distributed to a facility from the district vaccine store.
TIZPS.FXNREQ.187	Manage inventory	User	Be able to create stock requisition to bring the facility back to the maximum stock level.
TIZPS.FXNREQ.188	Manage inventory	System	Alert the user if stock is going below or approaching re-order level.
TIZPS.FXNREQ.189	Manage inventory	System	Allow the user to enter stock consumed by other target groups (e.g., Td)
TIZPS.FXNREQ.190	Manage inventory	System	Estimate stock need based on post consumption data, population, and minimum quantity threshold.
TIZPS.FXNREQ.191	Define parameters	System, immunization provider, and other partners	Allow user to select parameters (e.g., time, age, administrative level, health facility, service area, vaccine grouping, vaccine dose count, other program codes, etc.).
TIZPS.FXNREQ.192	Define parameters	System, immunization provider, and other partners	Allow user to select report output parameters (e.g., display options, summary vs. detail report, sort options, alphanumeric vs. date, etc.).
TIZPS.FXNREQ.193	Define parameters	System, immunization provider, and other partners	Allow user to choose a report-generation time frame (i.e., run now or set the time for later).
TIZPS.FXNREQ.194	Define parameters	System, immunization provider, and other partners	Have ability to save parameters as "public" to allow other users to generate the same report using the same parameters.

Req. ID	Task	Entity/role	Requirement (The system should...)
TIZPS.FXNREQ.195	Define parameters	System, immunization provider, and other partners	Have ability to modify/delete saved "public" parameters.
TIZPS.FXNREQ.196	Define parameters	System, immunization provider, and other partners	Have ability for system to determine if the report can be immediately generated or if it must be delayed based on size and generate a message "report processing" (i.e., based on types of criteria, size of data, etc.).
TIZPS.FXNREQ.197	Define parameters	System, immunization provider, and other partners	Have ability to prompt user to confirm the generation of a report at a later time if required.
TIZPS.FXNREQ.198	Generate report	System, immunization provider, and other partners	Have ability to save, display, or print report.
TIZPS.FXNREQ.199	Generate report	System, immunization provider, and other partners	Have ability to export reports in multiple formats (i.e., text delimited file, excel, PDF, CSV, statistical analysis software).
TIZPS.FXNREQ.200	Generate report	System, immunization provider, and other partners	Allow user to delete a report and track on audit log for customized reports.
TIZPS.FXNREQ.201	Generate report	System, immunization provider, and other partners	Allow user to select data elements within a report
			Note: Allows the user to modify report based on the audience.
TIZPS.FXNREQ.202	Generate report	System, immunization provider, and other partners	Automatically schedule routine reports to run at a specific time.
TIZPS.FXNREQ.203	Generate report	System, immunization provider, and other partners	Allow for the restriction of some predefined data such as duplicate records.
TIZPS.FXNREQ.204	Generate report	System	Have ability to generate the report based on the parameters set.
TIZPS.FXNREQ.205	Report acceptable	System, immunization provider, and other partners	Allow user to return to and modify report criteria.
TIZPS.FXNREQ.206	Analyze	System, immunization provider, and other partners	Have ability to verify that the report is in the correct format.
TIZPS.FXNREQ.207	Analyze	System, immunization provider, and other partners	Have ability to send report by email per user specification.
TIZPS.FXNREQ.208	Analyze	System, immunization provider, and other partners	Have ability to export data in selected file formats.
TIZPS.FXNREQ.209	Analyze	System, immunization provider, and other partners	Allow user to configure report displays.
TIZPS.FXNREQ.210	Analyze	System	Ability to generate different report views i.e., tabular, charts and maps.

Non-functional requirements

Requirement ID	Category	Non-functional requirement
TIZPS.NFXNREQ.001	Security – confidentiality	Provide password-protected access for authorized users.
TIZPS.NFXNREQ.002	Security – confidentiality	Provide a means to ensure confidentiality and privacy of personal health information.
TIZPS.NFXNREQ.003	Security – confidentiality	Provide ability for allowed users to view confidential data.
TIZPS.NFXNREQ.004	Security – confidentiality	Anonymize data that is exported from the system.
TIZPS.NFXNREQ.005	Security – confidentiality	Prevent remembering username and password.
TIZPS.NFXNREQ.006	Security – confidentiality	Automatically log out the user after specified time of inactivity.
TIZPS.NFXNREQ.007	Security – confidentiality	Provide encrypted communication between components.
TIZPS.NFXNREQ.008	Security – authentication	Notify the user to change their password the first time they log in.
TIZPS.NFXNREQ.009	Security – authentication	Adhere to complex password requirements.
TIZPS.NFXNREQ.010	Security – authentication	Provide a mechanism to securely change a user's password.
TIZPS.NFXNREQ.011	Security – authentication	Notify the user of password change to their account.
TIZPS.NFXNREQ.012	Security – authentication	Reset a user's password in a secure manner.
TIZPS.NFXNREQ.013	Security – authentication	Lock a user out after a specified number of wrong password attempts.
TIZPS.NFXNREQ.014	Security – authentication	Notify a user if their account is locked due to wrong password attempts.
TIZPS.NFXNREQ.015	Security – authentication	Provide role-based access to the system.
TIZPS.NFXNREQ.016	Security – audit trail and logs	Log system logins and logouts.
TIZPS.NFXNREQ.017	Security – audit trail and logs	Record all authentication violations
TIZPS.NFXNREQ.018	Security – audit trail and logs	Log all activities performed by the user, including date-and-time stamp.
TIZPS.NFXNREQ.019	Security – audit trail and logs	Log access to views of individual client records.
TIZPS.NFXNREQ.020	Security – audit trail and logs	Log access to data summaries, reports, analysis, and visualization features.
TIZPS.NFXNREQ.021	Security – audit trail and logs	Log exchange of data with other systems.
TIZPS.NFXNREQ.022	Security – audit trail and logs	Generate analysis of the usage of different system features and reports.
TIZPS.NFXNREQ.023	Security – audit trail and logs	Log all data and system errors.
TIZPS.NFXNREQ.024	Security – user management	Allow user with permission to create a new user and temporary password.
TIZPS.NFXNREQ.025	Security – user management	Provide role-based access.
TIZPS.NFXNREQ.026	Security – user management	Allow roles to be associated with specific geographical areas and/or health-care facilities.
TIZPS.NFXNREQ.027	Security – user management	Allow cascading user management and assignment of roles.
TIZPS.NFXNREQ.028	Security – user management	Allow user to change their own password.
TIZPS.NFXNREQ.029	Security – user management	Allow admin user to request password reset.
TIZPS.NFXNREQ.030	Security – user management	Notify the user to regularly change their password.
TIZPS.NFXNREQ.031	Security – user management	Allow each user to be assigned to one or more roles.
TIZPS.NFXNREQ.032	Security – user management	Support definitions of unlimited roles and assigned levels of access, viewing, entry, editing and auditing.
TIZPS.NFXNREQ.033	System requirements – general	Provide a unique version number for each revision.
TIZPS.NFXNREQ.034	System requirements – general	Enable earlier versions of a record to be recoverable.
TIZPS.NFXNREQ.035	System requirements – general	Enable deployment in an environment subject to power loss.
TIZPS.NFXNREQ.036	System requirements – general	Work in an environment that is subject to loss of connectivity.

Requirement ID	Category	Non-functional requirement
TIZPS.NFXNREQ.037	System requirements – general	Generate IDs that are unique across different installations or sites.
TIZPS.NFXNREQ.038	System requirements – general	Report version number when saving data to the database.
TIZPS.NFXNREQ.039	System requirements – general	Be designed to be flexible enough to accommodate necessary changes in the future.
TIZPS.NFXNREQ.040	System requirements – general	Allow for offline and online functionality.
TIZPS.NFXNREQ.041	System requirements – general	Show the number of records that are not yet synchronized.
TIZPS.NFXNREQ.042	System requirements – general	Have ability to easily back up information.
TIZPS.NFXNREQ.043	System requirements – general	Warn user if no valid backup for more than a predefined number of days.
TIZPS.NFXNREQ.044	System requirements – general	Must have the ability to store images and other unstructured data.
TIZPS.NFXNREQ.045	System requirements – scalability	Scalable to accommodate new demands.
TIZPS.NFXNREQ.046	System requirements – scalability	Be able to accommodate at least [*x* number of] health-care facilities.
TIZPS.NFXNREQ.047	System requirements – scalability	Be able to accommodate at least [*x* number of] concurrent users.
TIZPS.NFXNREQ.048	System requirements – usability	Be user-friendly for people with low computer literacy.
TIZPS.NFXNREQ.049	System requirements – usability	Provide informative error messages and tooltips.
TIZPS.NFXNREQ.050	System requirements – usability	Alert the user when navigating away from a form without saving.
TIZPS.NFXNREQ.051	System requirements – usability	Support real-time data-entry validation and feedback to prevent data-entry errors from being recorded.
TIZPS.NFXNREQ.052	System requirements – usability	Simplify data recording through predefined drop-down menu or searchable lists, radio buttons, check boxes.
TIZPS.NFXNREQ.053	System requirements – usability	Support multiple languages.
TIZPS.NFXNREQ.054	System requirements – usability	Use industry standard user interface practices and apply them consistently throughout the system.
TIZPS.NFXNREQ.055	System requirements – usability	Easy to learn and intuitive to enable user to navigate between pages.
TIZPS.NFXNREQ.056	System requirements – usability	Provide guidance to users to better support clinical guidelines and best clinical practices.
TIZPS.NFXNREQ.057	System requirements – usability	Be reliable and robust (minimize the number of system crashes).
TIZPS.NFXNREQ.058	System requirements – usability	Adjust display to fit small screens (e.g., mobile phones).
TIZPS.NFXNREQ.059	System requirements – configuration	Configure the system centrally
TIZPS.NFXNREQ.060	System requirements – configuration	Configure business rules in line with guidelines and standard operating procedures (SOPs).
TIZPS.NFXNREQ.061	System requirements – configuration	Configure error messages.
TIZPS.NFXNREQ.062	System requirements – configuration	Configure workflows and business rules to accommodate differences between facilities.
TIZPS.NFXNREQ.063	System requirements – interoperability	Communicate with external systems through mediators.
TIZPS.NFXNREQ.064	System requirements – interoperability	Provide access to data through application programming interfaces (APIs).
TIZPS.NFXNREQ.065	System requirements – interoperability	Link with insurance systems to verify eligibility and submit claims.
TIZPS.NFXNREQ.066	System requirements – interoperability	Exchange data with other approved systems.
TIZPS.NFXNREQ.067	System requirements – interoperability	Accept data from multiple input methods including paper, geocoding (GPS).

Requirement ID	Category	Non-functional requirement
TIZPS.NFXNREQ.068	System requirements – interoperability	Communicate with external systems through mediators.
TIZPS.NFXNREQ.069	System requirements – hardware and connectivity	Allow for data exchange and efficient synchronization across multiple facilities and points of service when Internet is available, even when it is intermittent and slow.

Glossary

Business process	A set of related activities or tasks performed together to achieve the objectives of the health programme area, such as registration, counselling, referrals (1,16).
Clinic	The setting where health workers are administering services that include vaccinations. This may be in under 5 clinics which include monitoring and some other health promotion activities, or it may be in standalone vaccination clinics set up for specific vaccinations, such as COVID or flu.
Campaign	A time limited event aimed at vaccinating a main target population against one or more specific diseases. Campaigns may be *supplemental immunization activities (SIA)* or "catch up campaigns" which are *periodic intensification of routine immunization (PIRI)* activities, or through innovative local strategies that ensure individuals have the opportunity to receive routine immunizations for which they are overdue and eligible. This may also include the activities around new vaccine introductions.
Data dictionary	A centralized repository of information about the *data elements* that contains their definition, relationships, origin, usage, and type of data. For this SURD, the data dictionary is provided as a spreadsheet.
Data element	A unit of data that has specific and precise meaning.
Decision-support logic	A set of decision rules for standard and exceptional cases that is separate from the *business process*. This would help reduce the complexity of the *business process* depiction without losing the detail necessary for coding the rules required for system functionality.
Decision support (for health workers)	Digitized job aids that combine an individual's health information with the health worker's knowledge and clinical protocols to assist health workers in making diagnosis and treatment decisions *(7,8)*.
Decision-support table	Semi-structured way to depict each discrete decision that will need to be embedded in the system. Depending on the complexity of the clinical guidelines, there will likely be multiple decision-support tables.
Defaulter	A person who has missed the scheduled dose of a vaccine.
Digital health	The systematic application of information and communications technologies, computer science and data to support informed decision-making by individuals, the health-care workforce and health systems, to strengthen resilience to disease and improve health and wellness *(1,37)*.
Digital tracking	The use of a digitized record to capture and store clients' health information to enable follow-up of their health status and services received. This may include digital forms of paper-based registers and case management logs within specific target populations, as well as electronic medical records linked to uniquely identified individuals *(7,8)*.
Functional requirement	Capabilities the system must have in order to meet the end-users' needs and achieve *tasks* within the *business process*.
Health information system (HIS)	A system that integrates data collection, processing, reporting and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services *(38)*.
Health management information system	An information system specifically designed to assist in the management and planning of health programmes, as opposed to delivery of care *(38)*.
Interoperability	The ability of different applications to access, exchange, integrate and use data in a coordinated manner through the use of shared application interfaces and standards, within and across organizational, regional and national boundaries, to provide timely and seamless portability of information and optimize health outcomes.

Non-functional requirement	General attributes and features of the digital system to ensure usability and overcome technical and physical constraints. Examples of non-functional requirements include ability to work offline, multiple language settings, and password protection.
Periodic Intensification of Routine Immunization (PIRI)	An umbrella term to describe a spectrum of time-limited, intermittent activities used to administer routine vaccinations – including catch-up doses – to under-vaccinated populations and/or raise awareness of the benefits of vaccination. Examples include Child Health Days, National Vaccination Weeks, intensified social mobilization efforts, etc. PIRI activities are intended to augment routine immunization services by providing a catch-up opportunity for those who are the usual target for routine services but have been missed or not reached during the year. A key distinction between PIRI and SIAs (see below) is that PIRI doses are recorded on the home-based record/immunization card as routine immunization doses and included in the administrative routine immunization coverage data. In contrast, SIA doses are considered "supplemental" and not included as part of the administrative routine immunization coverage
Persona	A generic aggregate description of a person involved in or benefitting from a health programme.
Reminder	A notification sent to remind a client that they have a vaccine due. The same mechanism may be used to alert clients that they have missed a scheduled vaccine.
Standard	In software, a standard is a specification used in digital application development that has been established, approved and published by an authoritative organization. These rules allow information to be shared and processed in a uniform, consistent manner independent of a particular application.
Supplementary Immunization Activity (SIA)	Vaccination campaigns that aim to quickly deliver vaccination of one (or multiple) antigens to a large target population with the objective of closing immunity gaps in the population. Achieving high population level immunity and speed are the priority, and typically there is no screening of vaccination history/status. The supplementary doses given are tallied but not included in the routine administrative national coverage data. SIA doses may only be recorded in campaign cards. Note: these campaigns are out of scope for this document.
Task	A specific action in a *business process*.
Terminologies	For clinical care, terminologies are structured vocabularies covering health-related concepts – such as diseases, diagnoses, laboratory tests and treatments – to enable the storage, analysis and exchange of data in a consistent and standard way *(39,40).*
Workflow	A visual representation of the progression of activities (*tasks*, events, decision points) in a logical flow illustrating the interactions within the *business process (16)*.