Use Cases and Solution Profiles for the NTD Data Innovation Incubator

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NTD INNOVATION INCUBATOR USE CASES AND SOLUTION PROFILES

Use Case 1

Drug distributor needs to be able to collect accurate, comprehensive, and timely data using data collection tools that include streamlined data indicators to ensure that all data collected are high-value and used by NTD stakeholders for decision-making.

Table 1.1: *Introduction to the Use Case*

Priority Data Source	Treatment Registers
Relevant key challenge(s)	Data accuracy, timeliness, and CDD workload
Relevant activity/ scenario	Field-based data collection by health workers, teachers, and community volunteers involved with delivering MDA
Objective of use case completion	Improve accuracy, comprehensiveness, timeliness, access, and use of treatment register data for good decision-making in support of improved NTD country programs

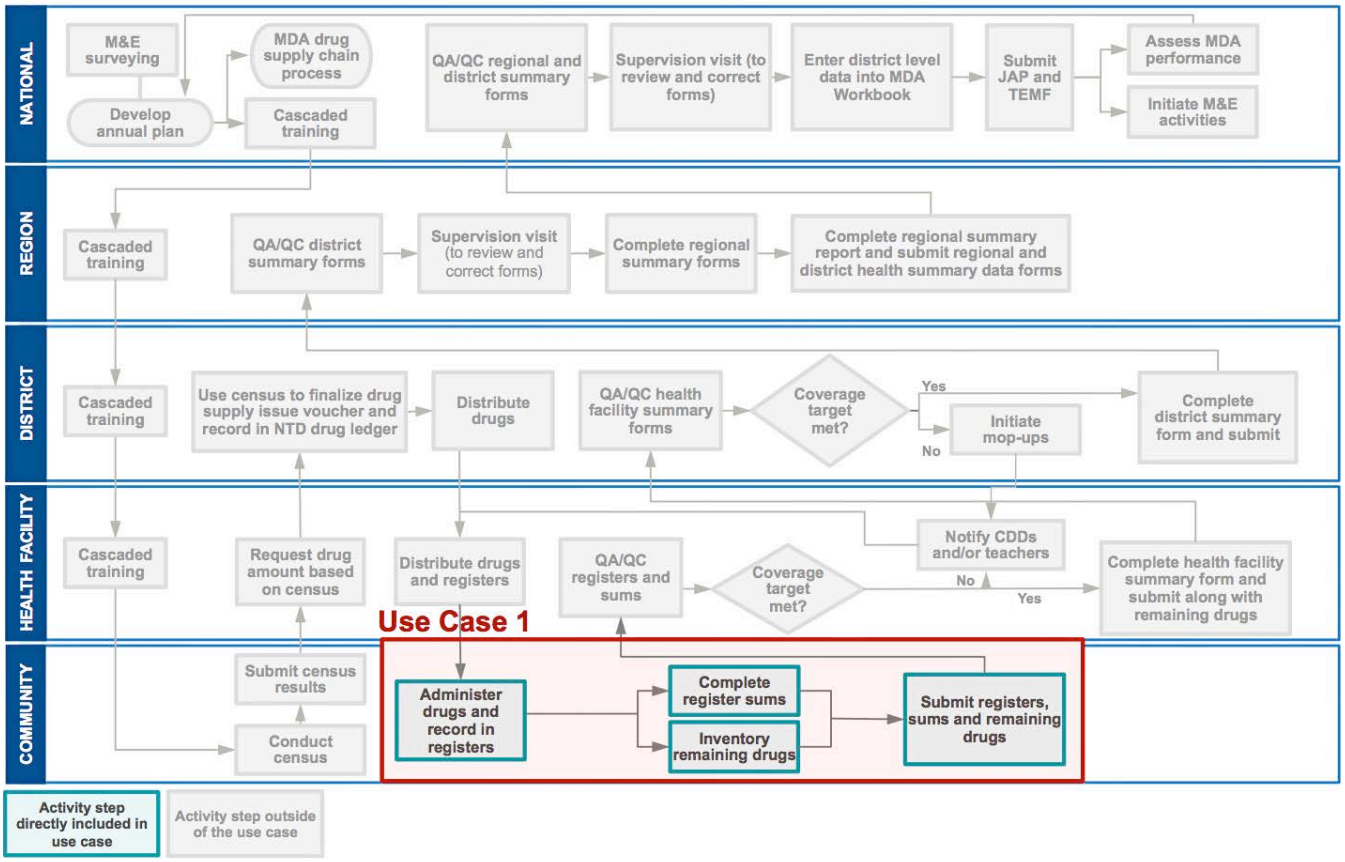
The Desired State: when the use case is successfully completed, what implications are there for the overall NTD program?

The *Desired State*

The successful completion of the use case would improve treatment register data, enabling more effective and informed decision-making in the context of NTD country programs. The achievement of this "desired state" for this use case will be evaluated as follows:

- ✓ Improved program effectiveness, as measured by the consistent ability to reach coverage targets
- ✓ Improved program efficiency, as measured by NTD actors spending less work time on data collection, aggregation, review, and correction, and more work time on delivery of health services
- ✓ Strengthened supply chain, as measured by accurate drug inventory maintained at health facility and district levels

Figure C: Use Case One in the Context of the MDA Process Flow



Use Case Characteristics

Table 1.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ Drug distributors collect more data than are actually used by the NTD program. Despite drug distributors collecting the name, gender, and age of all individuals who receive PC drugs, only the aggregate data are shared and used by the district level and above. ▸ Drug distributors are required to use data collection tools that are not user-friendly. They must carry bulky paper registers and have no access to tools to support the aggregation calculations that are required on the summary forms. ▸ Treatment register data, collected by drug distributors, often have many errors and is missing required elements. ▸ It is time-consuming for drug distributors to record all data and complete summary sheets. This leads to delays in reporting data to the health

	facilities, presenting challenges for stakeholders who need to access the data for timely decision-making during the MDA. ▸ Even when data are made accessible to decision-makers, the poor quality makes it a questionable resource, with differences or inaccuracies between treatment registers, summary sheets, and remaining drugs.
Root cause(s) of the challenges	▸ **High volumes of data** must be collected by drug distributors, there is **insufficient training** for drug distributors, and the **available data tools are limited** in their ability to support drug distributors. ▸ **Insufficient or late stipend payments** to drug distributors can contribute to reporting delays. ▸ **Insufficient funds for operations** can result in delays or lack of drugs being returned to the health facility.
Implications of the challenges for NTD country programs	▸ **Inefficiencies:** Actors at higher levels of the health system spend time and resources working to review, correct, and understand poor quality data. ▸ **Effectiveness**: Coverage calculations are unreliable and can hinder elimination goals. ▸ **Weakened supply chain:** Inventory of remaining drugs is inaccurate, impacting planning for next year's MDA and potentially compromising ability to reach coverage targets.

Table 1.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the Intervention	CDDs	Teachers	FLHWs
Characteristics of the user	▸ Literate ▸ Volunteers who receive a minimal stipend ▸ Language spoken might vary by region ▸ Some users participate in multiple MDAs but there are always new volunteers ▸ Potentially have access to feature phones ▸ Capacity to leverage technology for data collection and reporting is variable	▸ Literate, more education than CDDs ▸ Full-time teachers who receive minimal stipend for drug distribution activities ▸ Potentially have access to feature phones ▸ Capacity to leverage technology for data collection and reporting is variable	▸ Literate, more education and health training than CDDs ▸ Salaried health care professional ▸ Likely to have access to feature phones ▸ Capacity to use technology is likely higher than CDDs

Relevant level of the health system	▸ Community	▸ Community (in schools)	▸ Health facility level, but data collection at the community level
Relevant research findings	▸ Data collected by CDDs is lower quality than data collected by teachers or FLHWs ▸ Pilots targeting CDDs submitting data by SMS were not successful ▸ Burkina Faso's use of tally sheets demonstrated opportunity to streamline data collection, reduce workload, and collect only data that would be used by NTD decision makers	▸ Data quality is higher than CDD data	▸ Pilots targeting FLHWs submitting data summaries by SMS were successful (Mango)
Key questions for decision making by user(s) **(Note: Where questions differ by actor, it will be noted.)**	▸ For what households or students am I responsible? ▸ Which people in my comprehensive census need treatment for which NTDs? ▸ Which drugs and what dosage should I give to each person? ▸ What data needs to be collected? ▸ Is the data quality high enough to ensure accurate results are reported? ▸ Is the person having a negative reaction after taking the drug?		
Other Impacted Stakeholders			
Key stakeholders impacted by the use case	▸ CDD supervisors	▸ District NTD officers	▸ National NTD program team ▸ District and regional pharmacists
Primary way in which key stakeholders are impacted	▸ Dedicate time and resources to reviewing and correcting treatment registers	▸ Require treatment register derivative data during MDA (rather than post-MDA) to determine coverage, and make decision to continue or stop MDA	▸ Require access to treatment register derivative data to determine coverage post-MDA, plan for future MDAs, and evaluate the NTD program ▸ Require access to treatment register derivative data to calculate Preventative Chemotherapy (PC) drugs that remain after MDA, so that request for following year's MDA drug supply can be completed

Table 1.4: *Enabling environment of the current context*
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▸ Drug distributors are distributing PC drugs at households/schools and recording data in treatment registers ▸ Drug distributors are aggregating totals from treatment register data into summary sheets ▸ Drug distributors are submitting treatment registers, summary sheets, and remaining drugs to FLHW supervisors at the health clinic
Drivers of solution needs: what drives the need for the solution?	▸ Data in treatment registers is incomplete or inaccurate ▸ CDD workload is high, leading to poor data quality ▸ FLHWs spend excessive time to review and correct treatment registers due to errors ▸ CDDs are delayed in submitting treatment registers and summary sheets to FLHWs ▸ CDDs spend excessive time recording data in treatment registers and aggregating data onto summary sheets
Environmental or programmatic dependencies	▸ Network and cellular limitations ▸ CDD cadres are not always the same, so new volunteers will require training each time ▸ NTD actors below the national level do not report to the national NTD team, so that team doesn't have hire/fire responsibilities or power; can be challenging to ensure right people are selected ▸ Challenge of providing tablets or phones to volunteer CDDs (100,000+ CDDs in Tanzania) in places where very large populations need to be reached, e.g., in Tanzania 20M adults reached during MDA

Solution Profile for Use Case 1

Solution Overview

Solutions that address this use case will support drug distributors in their responsibilities to collect, aggregate, and report treatment data during MDA campaigns, while streamlining and reducing their workload. Solutions will improve the accuracy and comprehensiveness of the data within treatment registers and support the timely reporting of register data.

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 1.5 lists the activities and data use objectives, based on the previous NTD country data systems assessments[1], that are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

Table 1.5: Key Activity Steps and Actor Needs

Use Case 1: Drug distributor needs to be able to collect accurate, comprehensive, and timely data using data collection tools that include streamlined data indicators to ensure that all data collected are high-value and used by NTD stakeholders for decision-making.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
Administer PC drugs and record in treatment register	Drug distributor	Accurately and comprehensively record PC drugs and dosages distributed to individuals, differentiated by age and gender	▶ Streamlined data fields (i.e., including only data elements that will be used for decision-making) ▶ Data collection tool and process aligned with actor capacity and skill set ▶ Offline capability (capable of being used for ~12 hours without access to Internet or power) ▶ If digital, consider ability to collect GPS coordinates actively or passively when recording PC drug distribution, and passive GPS route recording (if feasible for device power consumption)
Complete register sums	Drug distributor	Accurately and comprehensively complete calculations	▶ Includes an easy-to-use job aid to ensure calculations (e.g., daily totals) are made and checked correctly and consistently by drug distributors, or if digital, calculations are made automatically ▶ Offline capability (capable of being used for ~12 hours without access to Internet or power)

[1] These activity steps (aligned with the MDA process flow shown in Figure C) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g. steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

Inventory remaining PC drugs	Drug distributor	Accurately and comprehensively count and record remaining PC drugs	▶ Includes an easy-to-use job aid to ensure PC drug counts are made and checked correctly and consistently by drug distributors, or if digital, counts are checked automatically against drug distribution calculations ▶ Offline capability (capable of being used for ~12 hours without access to Internet or power)
Submit registers, sums, and remaining PC drugs to supervisor	Drug distributor	Efficiently share accurate and comprehensive data set with supervisor	▶ Communication mechanism to complete reporting within specified time for the program objectives (e.g., within one day)

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs, in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make, and to evaluate the effectiveness of the NTD program. Table 1.6 below lists the data inputs and outputs.

Table 1.6: Data Elements[2]

Data Inputs	Data Outputs
▶ Individuals who received PC drugs (name, age, gender)	▶ Total number of individuals who received drugs (age, gender)
▶ Individuals who refused treatment and reason why (name, age, gender)	▶ Total number of individuals who refused treatment and reason why (age, gender)
▶ Quantity and type of PC drugs dispensed to each individual	▶ Total quantity and type of drugs administered ▶ Total quantity of drugs lost, damaged, and remaining

[2] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

The success criteria for solutions associated with Use Case 1 include:

1. **Data Quality:** Solutions must have the ability to measure data accuracy and comprehensiveness of treatment register data, and track over time, with demonstrated improvement.
2. **Transmission Time:** Solutions must improve timeliness of reporting treatment register data.
3. **Access:** Solutions must increase access to the treatment register data for use by relevant stakeholders during and after a MDA campaign.
4. **Reduced Workload:** Solutions must streamline the work of data collection and reporting for drug distributors, contributing to an overall reduction in workload.

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 1.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, taken from frameworks[3] developed for digital health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

Table 1.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▸ At the country level, the solution should be pre-configured and customized to use the appropriate national or global standards (e.g., WHO guidelines) for data indicators for collection during MDA campaigns ▸ No additional customization or configuration should be done by the end user (drug distributor). The solution should be deployed ready for use ▸ The solution should require minimal effort to customize for use in different country contexts (e.g., language, structure of the data)

[3] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19]. http://who.int/life-course/publications/mhealth-toolkit/en/

Integration / Interoperability	The ability to allow two-way sharing of data with other data systems, platforms, or solutions (e.g., the national HMIS)	▸ The solution should be capable of providing data in a format that is readily transferable (e.g., from paper to electronic format in as few steps as possible) or easy to upload (e.g., Excel or other file format that can be imported into other electronic databases in a standardized way) ▸ Other NTD actors (District or National NTD officers) and stakeholders must be able to easily access treatment register data sets and conduct analysis to support decision-making
User-centered Interface	Prioritizing the needs and skills of the user for the design of the solution	▸ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the drug distributors. This includes support for the drug distributor aggregating data and making calculations ▸ Solutions should leverage existing tools where possible, as users will be more comfortable and familiar with pre-existing tools (e.g., if RapidPro is already implemented for messaging, continue to use)
Data Validation Rules	Quality and format control of data being submitted in a systematic way	▸ The input and aggregate level data should strictly specify the data inputs and formats (e.g., text fields are for text only) for data forms and tally sheets, as well as any aggregate level data being submitted to the facility level ▸ Data should be validated on input and on aggregation to identify and correct any data input errors
Portability	The durability and portability of a solution designed for field-based use	▸ The solution should be highly portable (i.e., easy to carry or store) and robust (i.e., able to resist water, shock, and several years of use), as drug distributors will use the tool when visiting numerous households during annual MDA campaigns and must be able to carry the tools with them and store them safely when not in use ▸ Power consumption for digital solutions should be minimal, considering the lack of reliable electricity at many sites (or coupled with a solar charging station if feasible)

Offline Capability	Ability to perform tasks (e.g., data collection, analysis, review) without Internet or cellular connection	▸ The solution should not require a consistent network connection, as data collection often takes place in remote areas. The drug distributor has to complete their data collection, aggregation, and reporting activities, regardless of connectivity status ▸ For digital solutions operating in offline mode, they must store data for upload once connection is established
Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▸ The solution should be designed to require minimal changes over time that might result in disruptions in drug distributors' ability to use the solution (e.g., scheduled downtime, updates) ▸ If digital, the solution should include a simple and effective support system to quickly address issues that may arise during field work (e.g., local level support to fix common issues or replace damaged solutions, helpdesk available via WhatsApp, IVR, voice, or other platform for advanced troubleshooting) ▸ The solution should include a plan for building capacity of super users and other, locally available individuals who can provide in-person or remote support and training
Deployment	The resources required to roll out and implement the solution	▸ The solution should require the minimum viable level of human and other resources due to existing constraints (i.e., they should use existing devices, supervisors, trainers, and training programs to implement wherever possible). ▸ The solution should be limited in its value outside of campaigns, such that theft is disincentivized and the solution should be easily handed over from one drug distributor to another, as many drug distributors are community volunteers who do not always return for the next MDA

Use Case 2

Supervisor (FLHW or District NTD officer) for drug distributors needs to be able to provide consistent and adequate training and support to drug distributors so that they can successfully complete their coverage targets.

Table 2.1: ***Introduction to the Use Case***

Priority Data Source	Treatment Registers
Relevant key challenge(s)	Data accuracy, timeliness, and CDD workload
Relevant activity/ scenario	Training and supervision of drug distributors
Objective of use case completion	Improve accuracy, comprehensiveness, timeliness, access, and use of treatment register data for good decision making in support of improved NTD country programs

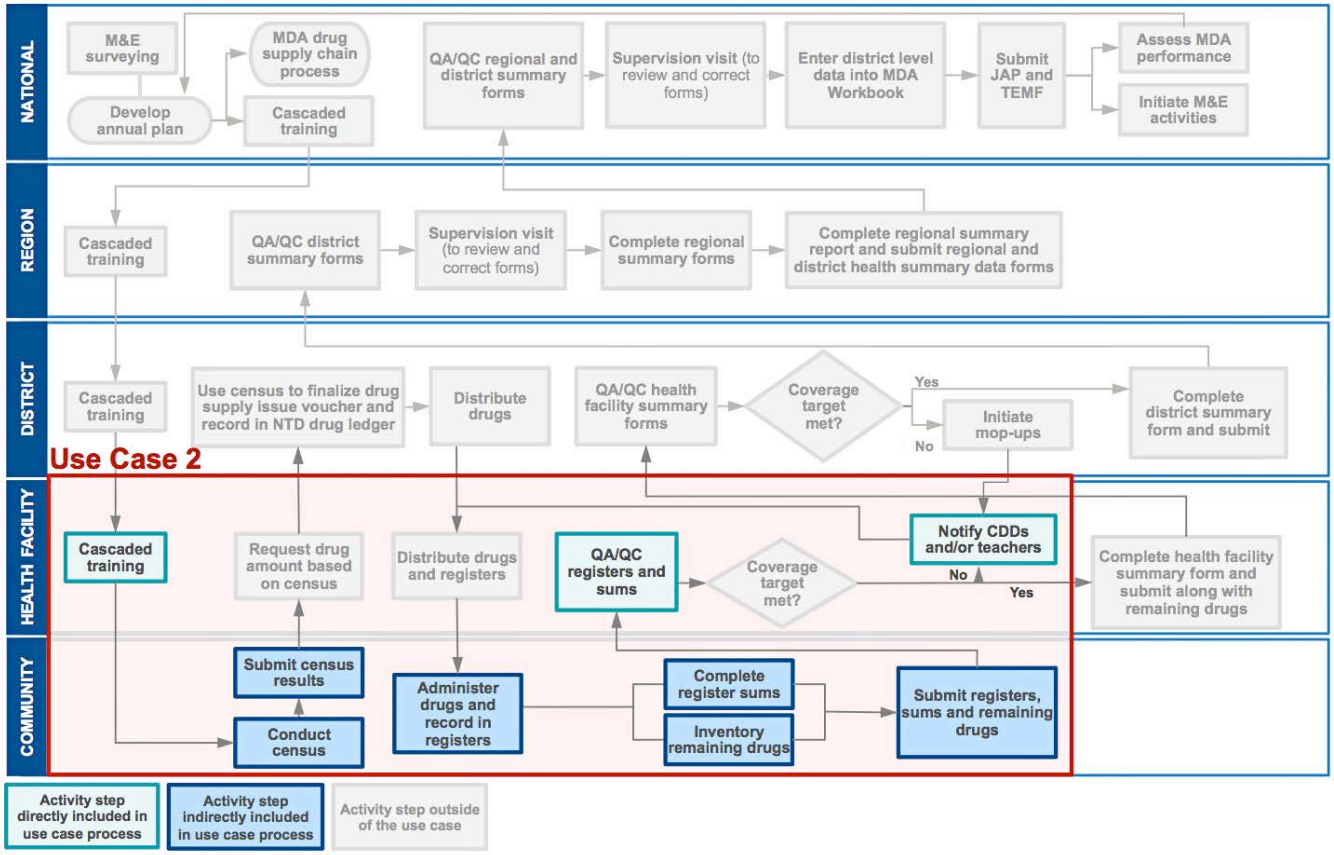
The Desired State: When the use case is successfully completed, what implications are there for the overall NTD program?

The *Desired State*

The successful completion of the use case would provide access to training and supervision for drug distributors during MDA activities. This would lead to improving treatment register data, driving more effective and informed decision-making in the context of NTD country programs. The achievement of this "desired state" for this use case will be evaluated as follows:

- ✓ Improved program effectiveness, as measured by the consistent ability to reach coverage targets
- ✓ Improved program efficiency, as measured by NTD actors spending less work time on data collection, aggregation, review, and correction, and more work time on delivery of health services
- ✓ Strengthened supply chain, as measured by accurate drug inventory maintained at health facility and district levels, and reduced need to redistribute drugs due to inaccurate stock estimates

Figure D: Use Case Two in the Context of the MDA Process Flow



Use Case Characteristics

Table 2.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ Drug distributors collect and submit data **without consistent or adequate supervision** or access to support if they have questions or encounter problems. In some NTD programs**, drug distributors have minimal, if any, regular contact with their supervisors**, only seeing them at the end of MDA when they are submitting their registers and summary sheets ▸ **Poor communication** between drug distributors and supervisors means that performance or data quality cannot be addressed in a timely way. If drug distributors have questions (e.g., what to do if household members are not home, or if there is a new household) as they conduct their activities, there is **no one they can reach out to for prompt advice or support**. This can hinder efforts to reach treatment thresholds

	▸ Drug distributors typically submit all data at the end of the MDA, **receiving no review or feedback on their work during MDA**. This allows **errors to go uncorrected** and supervisors are left to review and correct all treatment registers at the end of the MDA. It is more **time-consuming,** taking time away from health service delivery, and also means that **data are unavailable during MDA** ▸ When supervisors review treatment register data, it is rare for drug distributors to be present, and thus they **lack guidance** on how to improve their performance from their supervisor
Root cause(s) of the challenges	▸ **Supervisors must review very high volumes of data**, as they oversee numerous drug distributors, each submitting treatment registers with numerous data elements. ▸ Supervisors have job responsibilities outside of NTD, and **human resources are limited** to complete all necessary health facility responsibilities. ▸ **Insufficient training and no ongoing supervision mechanism** leave drug distributors without adequate guidance while doing their jobs. ▸ **Insufficient data tools or systems** exist to support supervision.
Implications of the challenges for NTD country programs	▸ **Time inefficiencies:** Actors at higher levels of the health system spend time and resources working to review, correct, and understand poor-quality data. ▸ **Reduced effectiveness:** Coverage calculations are unreliable and could hinder elimination goals. ▸ **Weakened supply chain**: Inventory of remaining drugs is inaccurate, impacting planning for next year's MDA and potentially compromising ability to reach coverage targets.

Table 2.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the Intervention	FLHWs	District NTD Officer (if in charge of CDD supervision)
Characteristics of the user	▸ Literate, more education and health training that CDDs ▸ Salaried health care professional ▸ Likely to have access to feature phones ▸ Capacity to use technology is likely higher than CDDs	▸ Trained health professional with requisite education ▸ Responsible for MDA implementation throughout district ▸ More likely to be familiar with computers and smart phones ▸ Familiar with variety of paper-based reporting processes and requirements
Relevant level of the health system	▸ Health facility	▸ District

Relevant research findings	▸ Excessive workloads lead to faulty data. ▸ Trainings are delivered in a cascaded, one-time approach; no ongoing training is provided. ▸ There is limited supervision because of human resource constraints. ▸ Burkina Faso's practice of daily supervision and reporting led to more consistent data reporting and fewer treatment register data errors.
Key questions for decision-making by user(s) **(Note: Where questions differ by actor, it will be noted.)**	▸ Are my CDDs correctly completing their job responsibilities? ▸ Are catchment area coverage targets being obtained? ▸ Are the drugs being requested in time? ▸ Is the event an Adverse or Serious Adverse Event (SAE)?

Other Impacted Stakeholders			
Key stakeholders impacted by the use case	▸ District NTD officers	▸ National NTD program team	▸ District and regional pharmacists
Primary way in which key stakeholders are impacted	▸ Require treatment register derivative data during MDA (rather than post-MDA) to determine coverage and make decision to continue or stop MDA.	▸ Require access to treatment register derivative data to determine coverage post-MDA, plan for future MDAs, and evaluate the NTD program.	▸ Require access to treatment register derivative data to calculate PC drugs that remain after MDA, so that request for following year's MDA drug supply can be completed.

Table 2.4: *Enabling environment of the current context*
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▸ Pre-MDA training of CDDs should happen, including retraining and weekly check-ins ▸ Drug distributors are distributing PC drugs at households/schools and recording data in treatment registers, summing totals, and submitting to supervisors at health clinics ▸ Supervisors are reviewing treatment registers and summary sheet data, making corrections and giving feedback to CDDs ▸ CDDs have questions or problems when distributing drugs during MDA

Drivers of solution needs: What drives the need for the solution?	▸ Poor quality data in treatment registers ▸ Treatment registers are submitted late ▸ Coverage targets are not being met ▸ Drug inventory based on treatment registers is inaccurate ▸ CDD workload and/or responsibilities are misaligned with capacity ▸ High turnover of staff due to the inability to complete the work
Environmental or programmatic dependencies	▸ Low network coverage ▸ Low level of technology ▸ Travel and logistics costs for training ▸ High turnover and retraining ▸ Large catchment area

Solution Profile for Use Case 2

Solution Overview

Solutions that address this use case will enhance the ability of actors supervising drug distributors (e.g. FLHWs or district NTD officers) to provide better training and supportive supervision for drug distributors as they complete their MDA activities. This includes solutions that allow supervisors to communicate regularly with their reports and review data and provide feedback quickly, as well as solutions that provide drug distributors with consistent support while on the job (e.g. job aids).

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 2.5 lists the activities and data use objectives, based on the previous NTD country data systems assessments[4], that are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

[4] These activity steps (aligned with the MDA process flow shown in Figure D) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g., steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

Table 2.5: Key Activity Steps and Actor Needs

Use Case 2: Supervisor (FLHW District or District NTD Officer) for drug distributors needs to be able to provide consistent and adequate training and support to drug distributors so that they can successfully complete their coverage targets.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
Provide training to drug distributors	Supervisor	Provide training for drug distributors ahead of the MDA as well as throughout the MDA, as necessary, ensuring they have sufficient capacity to successfully complete their responsibilities, as related to data collection, aggregation, and reporting	▸ Training modules that address data-related activities ▸ Guidelines for proper data collection and review processes easily accessible during MDA campaigns ▸ Job aid that helps supervisors identify if, when, and to whom additional training is required
Supervise the successful completion of activities conducted by drug distributors during MDA	Supervisor	Provide ongoing supervision and access to support to drug distributors as they conduct their MDA activities. This includes support for data collection, aggregation, and reporting activities	▸ Procedural guidelines related to how and when to contact direct report if questions / challenges arise ▸ Communication mechanism that supports at least once daily contact between supervisors and drug distributors
QA/QC of registers and sums	Supervisor	Review treatment register data reported by drug distributors and provide feedback on quality to support performance improvement	▸ Job aid to support collaborative review and/or feedback on treatment register data on same day as report is submitted ▸ Ability to track results of QA/QC conducted by supervisors
Notify drug distributors if coverage targets were met	Supervisor	Efficiently and promptly notify drug distributors if coverage targets have been met and MDA can stop or if PC drug administration must continue	▸ Communication mechanism that supports contact between supervisors and drug distributors when coverage results are estimated ▸ Standardized formats and common channels for communication (e.g., WhatsApp)

Receive supervision and guidance during MDA activities	Drug distributor	Access to guidance and supervision if questions or challenges arise during MDA activities	▶ Job aid to support data collection, aggregation, and reporting activities ▶ Communication mechanism that supports at least once daily contact between supervisors and drug distributors ▶ Procedural guidelines related to how and when to contact a supervisor or direct report if questions / challenges arise ▶ Updates when there are changes to process or procedure, campaign delays

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs, in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make, and to evaluate the effectiveness of the NTD program. Table 2.6 below lists the data inputs and outputs, based on the current state.

Table 2.6: Data Elements[5]

Data Inputs	Data Outputs
▶ Training guidelines ▶ Type and quantity of PC drugs to dispense ▶ Protocol for data QA/QC ▶ Data analysis guidelines	▶ Complete and accurate aggregate data set ▶ Complete and accurate reports demonstrating the effectiveness of the program

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

[5] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

The success criteria for solutions associated with Use Case 2 include:

1. **Adherence:** Solutions must improve the effectiveness of training campaigns for drug distributors and adherence to guidelines.
2. **Supportive Supervision:** Solutions must improve the provision of and access to supervision during an MDA and be able to track related differences in drug distributor performance.
3. **Data Quality:** Solutions must have the ability to measure data accuracy and comprehensiveness and track over time, with demonstrated improvement.

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 2.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, taken from frameworks6 developed for digital health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

Table 2.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▸ The solution should allow supervisors to have minimal configuration control over creating reports and aggregate level data ▸ The solution should require minimal effort to customize for use in different country contexts (e.g., language, structure of the data) ▸ The solution must incorporate a format and type for the notifications, including templates or pre-set data ▸ The training materials and guidelines need to be standardized for the local context
User-centered Interface	Prioritizing the needs and traits of the user for the design of the solution	▸ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the drug distributors, trainers, and supervisors ▸ Communications between drug distributors, supervisors, and other support staff should leverage readily-available

[6] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19]. http://who.int/life-course/publications/mhealth-toolkit/en/

		and commonly-used forms of communication (e.g., in-person meetings, phone, WhatsApp)
Portability	The durability and portability of a solution designed for field-based use	▸ Job aids and communication mechanisms for support should be portable so that the drug distributor can use the solution while they are in the field
Offline Capability	Ability to perform tasks (e.g., data analysis, review) without Internet or cellular connection	▸ The solution should not require a consistent network connection for drug distributors to access job aids while conducting their activities in remote areas ▸ Communication channels between the supervisor and drug distributor should consider local context and rely on the most reliable communication platforms that are available (e.g., voice, SMS, mobile data)
Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▸ The solution should be designed to require minimal changes over time that might result in disruptions in drug distributors' or supervisor ability to use the solution (e.g., scheduled downtime, updates) ▸ If digital, the solution should include a simple and effective support system to quickly address issues that may arise during field work (e.g., local level 1 support to fix common issues or replace damaged solutions, helpdesk available via WhatsApp, IVR, voice, or other platform for advanced troubleshooting) ▸ The solution should include a plan for building capacity of super users and other, locally available individuals who can provide in-person or remote support and training
Deployment	The resources required to roll out and implement the solution	▸ The solution should require the minimum viable level of human and other resources due to existing constraints (i.e., they should use existing devices, supervisors, trainers, and training programs to implement wherever possible) ▸ The solution should be limited in its value outside of campaigns, such that theft is disincentivized and the solution should be easily handed over or shared between actors

Use Case 3

An NTD stakeholder needs accurate community-level population information for planning, implementation, and evaluation of MDAs.

Table 3.1: ***Introduction to the Use Case***

Priority Data Source	Census data
Relevant key challenge(s)	Lack of accurate community-level census data, potentially due to Census bias, frequency/resolution not sufficient, or incorrect growth rate
Relevant activity/ scenario	Determination of households and population numbers to ensure coverage targets are met during an MDA campaign
Objective of use case completion	Provide sufficiently accurate community-level denominator data to inform resources needed and coverage rates achieved for MDA campaigns

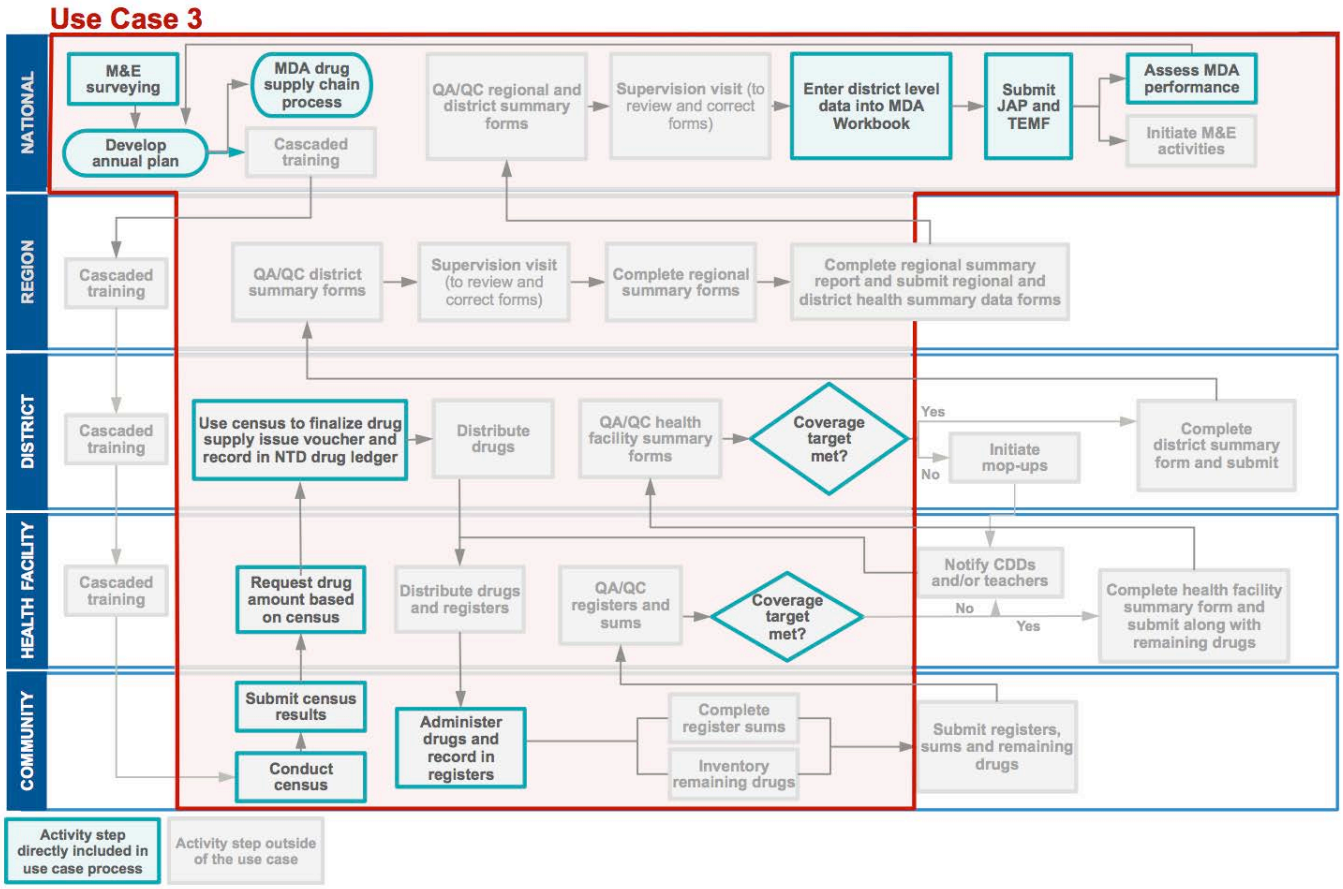
The Desired State: When the use case is successfully completed, what implications are there for the overall NTD program?

The *Desired State*

The successful completion of the use case would provide sufficiently accurate denominator data at the community level. This would enable more accurate and efficient planning, as well as more successful implementation of MDA activities. The achievement of this "desired state" for this use case will be evaluated as follows:

- ✓ Improved program effectiveness, as measured by the consistent ability to reach coverage targets
- ✓ Improved program efficiency, as measured by drug supply requested matches demand
- ✓ Improved program evaluation, as measured by ability to calculate adequate baseline for campaigns and to determine if coverage targets have been reached

Figure E: Use Case Three in the Context of the MDA Process Flow



Use Case Characteristics

Table 3.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ There is a **lack of reliable denominator data,** especially at the sub-district-level. This impedes planning for MDA campaigns, which **requires community-level population data to inform resources (e.g., human resources, drug supply, etc.) required to meet treatment thresholds**. Overall, poor denominator data can lead to low coverage during MDA campaigns. ▸ Some NTD programs conduct micro-census prior to MDA campaigns, but this is an unofficial population count. It requires **additional resources** and can also have its own inaccuracies. Conflicting results between the micro-census and the national census leads to uncertainty about which baseline is correct, hindering **challenges with program evaluation**.

	▸ **Attempts to estimate sub-district population levels are hampered** by uncertainty regarding what growth rates to apply and which census data to use (national or micro).
Root cause(s) of the challenges	▸ **Lack of financial resources** to conduct census with sufficient frequency, or at sub-district levels. ▸ **Dependency on data** from other government bureaus, which might lack incentive or resources to maintain accurate sub-district level data. ▸ **Lack of appropriate tools** or systems to aggregate the data and check for outliers, or alternative methods of arriving at sufficiently accurate denominator data.
Implications of the challenges for NTD country programs	▸ **Planning:** Unreliable population data inhibit accurate forecasting and the determination of resources required to successfully complete MDA. ▸ **Implementation:** Impedes implementation as district NTD officers are not sure that they are reaching the target population and thus reaching coverage targets. ▸ **Evaluation:** Impedes evaluation because they do not have accurate baseline to evaluate MDAs and thus do not have accurate data to calculate if coverage targets were reached.

Table 3.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the Intervention	Drug Distributors	District NTD Officer	National NTD Team
Characteristics of the user	▸ Literate ▸ Volunteers who receive a minimal stipend ▸ Language spoken might vary by region ▸ Some users participate in multiple MDAs, but there are always new volunteers ▸ Potentially have access to feature phones ▸ Capacity to leverage technology for data collection and reporting is variable	▸ Trained health professional with requisite education ▸ Responsible for MDA implementation throughout district ▸ More likely to be familiar with computers and smart phones ▸ Familiar with variety of paper-based reporting processes and requirements	▸ Trained professional with requisite education and experience ▸ NTD-specific focus in their job responsibilities ▸ Responsible for planning, implementation, and evaluation of MDAs and of the whole NTD program ▸ Computer-savvy and familiar with smart phones

Relevant level of the health system	▶ Community	▶ District	▶ National
Relevant research findings	▶ Drug distributors conduct micro-census ahead of MDAs in some countries ▶ They share these results with the FLHWs, who share with the district, informing quantity of drugs required to reach treatment threshold	▶ District NTD officers are responsible for forecasting, relying on census data to plan for MDAs.	▶ National team relies on census data to request drug supply from pharmaceutical partners. If micro-census data conflicts with national level census, will use higher number to ensure adequate drug supply.
Key questions for decision-making by user(s) **(Note: Where questions differ by actor, it will be noted.)**	▶ Which communities am I responsible for? ▶ Did I treat all households and community members? ▶ Did I record all community members, by household, accurately?	▶ What is the volume of drugs required to reach district coverage targets and the quantity required at each health facility? ▶ Was the treatment threshold met?	▶ What is the volume of drugs required to reach national coverage targets and the quantity required for distribution in each district?

Other Impacted Stakeholders			
Key stakeholders impacted by the use case	▶ FLHWs and CDDs	▶ Pharmaceutical partners	▶ Implementation partners	▶ National Bureau of Statistics
Primary way in which key stakeholders are impacted	▶ Require accurate household lists to know where to distribute drugs and who needs to receive the drugs.	▶ Inaccurate denominator leads to wasted drugs and cost inefficiencies.	▶ Need sufficiently accurate population numbers to inform resources required to support MDA implementation.	▶ Need sufficiently accurate population numbers to inform resources required to conduct next census.

Table 3.4: *Enabling environment of the current context*
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▸ National team is planning for MDA and needs sufficiently accurate hamlet-level population data to inform multiple aspects of MDA implementation (population to reach coverage targets, training and support requirements, drug distribution, etc.) ▸ National team is evaluating coverage targets post-MDA ▸ National team is evaluating impact of MDA through impact surveys ▸ National team is requesting PC drugs for next year's MDA ▸ District NTD officer is determining population to reach treatment threshold for upcoming MDA ▸ District NTD officer is determining resources needed to implement MDA (human, operations, drugs, etc.) ▸ District NTD officer is evaluating coverage during MDA
Drivers of solution needs: What drives the need for the solution?	▸ Sufficiently accurate hamlet-level population data is not available ▸ Differences between national census data and micro-census data cannot be reconciled ▸ Coverage rates are too high or too low, indicating faulty population data or inaccurate treatment data
Environmental or programmatic dependencies	▸ MOH requirements about census data (acceptable to use micro-census or must use National Bureau of Statistics census data) ▸ Resources available to conduct micro-census (financial and human)

Solution Profile for Use Case 3

Solution Overview

Solutions that address this use case will support NTD stakeholders throughout the health system to access sufficiently accurate community-level census data. As there are currently challenges with both collecting accurate community-level census data, and access to those data, solutions will need to address both of these issues to successful complete the use case.

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 3.5 lists the activities and data use objectives, based on the previous NTD country data systems

assessments[7], that are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

As stated above, the primary challenges with census data currently relate to either lack of access to community-level census data or challenges with collecting the community-level census data. Thus, the table groups the activities by those two categories (access and collection).

For all activities where an actor requires access to community-level data, the critical solution feature required is the same. That feature can be defined as:

- Access to the most current community-level denominator data (e.g., through integration or efficient process for sharing data) for analysis and use by the relevant actor. If the solution is digital, this could involve integration or data exchange between the solution and another electronic system where census data is stored, or, if non-digital, this could involve implementation of an efficient process for sharing census data with all stakeholders.

For all activities related to collection of community census data, the critical solution feature(s) is provided in the table.

Table 3.5: Key Activity Steps and Actor Needs

Use Case 3: An NTD stakeholder needs accurate community-level population information for planning, implementation, and evaluation of MDAs.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
Activities Associated with Access to Community-level Census Data			
Activities Associated with Collection of Community-level Census Data	National NTD team	Inform annual plan for MDA, including decisions related to resource allocation and distribution	▸ Access to the most current community-level denominator data (e.g., through integration or efficient process for sharing data) for analysis and use by the relevant actor. If the solution is digital, this could involve integration or data exchange between the solution and another electronic system where census data is stored, or, if non-digital, this could involve implementation of an efficient process for sharing census data with all stakeholders.
Use census data to finalize PC drug supply request	District NTD officer	Request sufficient inventory from the National NTD team to reach treatment thresholds for the district, without over-estimating need	
Administer PC drugs and record in registers	Drug distributors	Use census data to inform who should be receiving the PC drugs,	

[7] These activity steps (aligned with the MDA process flow shown in Figure E) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g., steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

		and that no individuals or households are missed
Determine if coverage target is met for the catchment area	FLHWs (*will depend on country context if this decision is made by this actor*)	Review treatment registers sums, and compare with census data to determine if catchment area coverage targets are being/were met
Determine if coverage target is met for the district	District NTD officer	Review health facility summary forms, and analyze with census data to determine if district coverage targets are being/were met
Enter district-level data into MDA workbook	National NTD team	Determine coverage reached by each district, for entry into the national MDA workbook/data set
Submit JAP and TEMF	National NTD team	Report accurate results of MDA and request for next year's PC drug inventory
Assess MDA performance	National NTD team	Evaluate ability to meet treatment thresholds and successfully complete MDA activities
M&E surveying	National NTD Team	Inform and support planning, implementation, and analysis of NTD impact surveys

Activities Associated with Collection of Community-level Census Data			
Conduct micro-census	Drug distributor	Accurately and comprehensively record individuals, by household, in assigned community area	▶ Streamlined data fields, including only data elements that will be used for decision making, and standardized templates and indicators for collection ▶ Data collection process aligned with actor capacity and skill set ▶ Offline capability (capable of being used for ~12 hours without access to Internet or power) ▶ Data indicators aligned with requirements of national program, and format that is readily transferable and summable for use at other levels of the health system
Submit micro-census results to supervisor	Drug distributor	Efficiently share accurate and comprehensive data set with supervisor	▶ Communication mechanism to complete reporting within timeframe aligned with country program protocols (e.g., within one day)
Request catchment area PC drug amount based on micro-census	FLHW	Inform accurate PC drug inventory request to receive sufficient stock to complete MDA	▶ Access to most current community-level census data for the community (e.g., through an efficient process for sharing data) for use by the FLHW

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make, and to evaluate the effectiveness of the NTD program. Table 3.6 below lists the data inputs and outputs, based on the current state.

Table 3.6: Data Elements[8]

Data Inputs	Data Outputs
▸ Individuals, by household (gender, age, household, community/hamlet)	▸ Community-level census data (gender, age, household)
▸ Number of households	▸ Aggregate number of households per community

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

The success criteria for solutions associated with Use Case 3 include:

1. **Flexibility:** Solutions must work for different actors, across various types of locations and working environments, each with potentially different levels of access to technology, power, connectivity, etc.
2. **Access:** Solutions must increase access to community-level census data for use by relevant stakeholders before, during, and after MDA campaigns.
3. **Data Quality:** Solutions must have the ability to measure data accuracy and comprehensiveness and track over time, with demonstrated improvement

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 3.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, taken from frameworks[9] developed for digital health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

[8] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

[9] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19].http://who.int/life-course/publications/mhealth-toolkit/en/

Table 3.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▸ The solution should not require the users to configure or customize for access of collection of census data ▸ If the solution is digital, the National NTD stakeholders should be able to configure customizations for data reporting needs or templates in order to provide the analysis to other stakeholders ▸ The solution should require minimal effort to customize for use in different country contexts (e.g., language, structure of the data)
Integration / Interoperability	The ability to allow two-way sharing of data with other data systems, platforms, or solutions (e.g., the national HMIS)	▸ The aggregate data should be centralized across multiple data sets, allowing actors (national NTD team members) to run reports across various indicators ▸ Other NTD actors and stakeholders must be able to easily access the dataset in the system to better understand population coverage numbers (e.g., assign login and user) ▸ The solution providing the data at the national level should recognize the differences or irregularities in the data coming from different sources and standardize it for reporting needs
User-centered Interface	Prioritizing the needs and skill of the user for the design of the solution	▸ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the NTD stakeholders. This includes providing census data in a format and by a means that are compatible with the actor who needs access to it ▸ If digital, the solution must work with the simplest interface or approach and standardization ▸ Communications between drug distributors, supervisors, and other support staff should leverage readily available and commonly used forms of communication (e.g., in-person meetings, phone, WhatsApp)
Data Validation Rules	Quality and format control of data being submitted in a systematic way	▸ The control of the input and aggregate level data should be strict, either in the specification of how the data is aggregated or stored, in order to avoid anomalies in data sets (e.g., outliers, wrong formats)

Portability	The durability and portability of a solution designed for field-based use	▸ The data collection solution should be highly portable (i.e., easy to carry or store), for the CDD and data collection in the field ▸ The aggregate level data solution does not need to be portable as it will be located in a more central location, likely in an office or area with power ▸ Power consumption for digital solutions should be minimal, considering the lack of reliable electricity at many sites (or coupled with a solar charging station given the context)
Offline Capability	Ability to perform tasks (e.g., data collection, analysis, review) without Internet or cellular connection	▸ The solution should not require a consistent network connection, as data collection often takes place in remote areas. The drug distributor has to collect census data regardless of connectivity status ▸ For digital solutions operating in offline mode, they must store data for upload once connection is established ▸ Offline capability is not required for the national level data access, as it will be used in an office setting
Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▸ The solution at the NTD national level should not require routine updates or hardware at a specific location ▸ The solution at sub-national levels should be designed to require minimal changes over time that might result in disruptions in actors' ability to use the solution (e.g., scheduled downtime, updates) ▸ If digital, the solution should include a simple and effective support system to quickly address issues that may arise during field work (e.g., local level 1 support to fix common issues or replace damaged solutions, helpdesk available via WhatsApp, IVR, voice, or other platform for advanced troubleshooting) ▸ The solution should include a plan for building capacity of super users and other, locally available individuals who can provide in-person or remote support and training
Deployment	The resources required to roll out and implement the solution	▸ The deployment for the digital analytics engine should be done with little hardware or additional devices (i.e., similar to the HIS) ▸ The solution should require the minimum viable level of human and other resources due to existing constraints (i.e., they should use existing devices,

		supervisors, trainers, and training programs to implement, wherever possible) ▶ The solution should be limited in its value outside of campaigns, such that theft is disincentivized and the solution should be easily handed over from one drug distributor to another, as many drug distributors are community volunteers who do not always return for the next MDA

Use Case 4

A district NTD officer needs to create an accurate inventory of PC drugs (both pre- and post-MDA) and needs to be able to share the inventory in a timely way with key actors at the regional and national level to inform their decision-making.

Table 4.1: ***Introduction to the Use Case***

Priority Data Source	Drug Ledgers
Relevant key challenge(s)	Disconnect between NTD & national supply chain systems down to district
Relevant activity/ scenario	Drug supply management and integrated reporting of inventory across different levels of the health system
Objective of use case completion	Improve accuracy, transparency, and access to NTD drug supply chain data (including reverse supply chain) at all levels of the health system to allow for effective resource management and sufficient drug supply for successful MDA campaigns

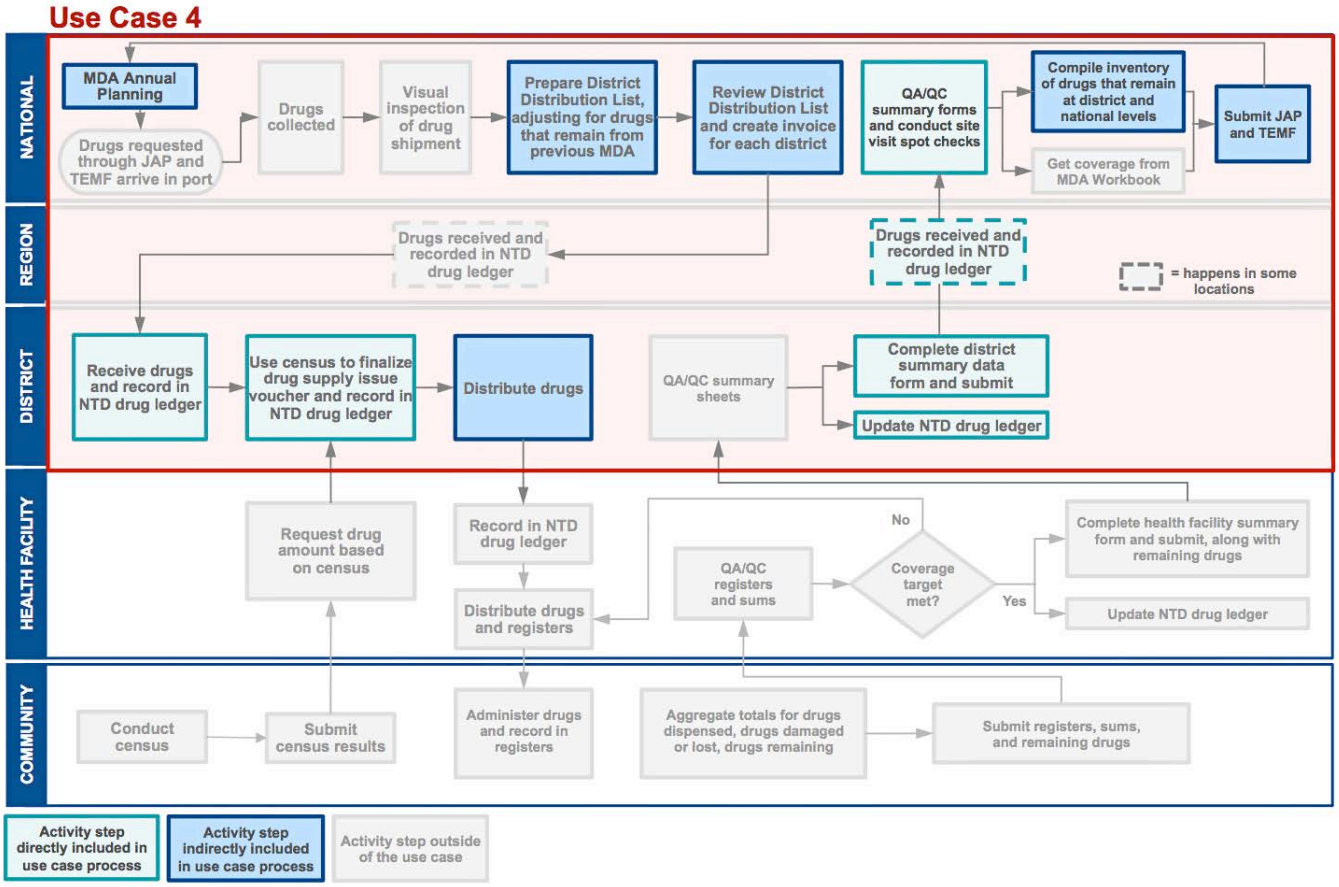
The Desired State: When the use case is successfully completed, what implications are there for the overall NTD program?

The *Desired State*

The successful completion of the use case would provide an accurate inventory of PC drugs, both before and after MDA, which is accessible to regional and national-level NTD actors. This would enable more accurate and efficient planning, as well as more successful implementation of MDA activities. The achievement of this "desired state" for this use case will be evaluated as follows:

- ✓ Improved program efficiency, as measured by minimal quantities of drugs remaining after MDA, showing that the right amount was ordered to reach treatment thresholds
- ✓ Improved program operations, as measured by the maintenance of accurate PC drug inventory and minimal need for redistribution during MDA campaigns
- ✓ Enhanced supply chain management and integration with national program standards

Figure F: Use Case Four in the Context of the MDA Process Flow



Use Case Characteristics

Table 4.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ NTD district pharmacists receive data related to PC drug inventory from the health facility summary sheets, detailing how many drugs were dispensed during MDA, and how many remain; however, **data quality is poor** and **unreliable.** ▸ Remaining drugs are not always returned in a timely manner, or at all, post-MDA, resulting in **inconsistent drug quantities** listed on summary sheets and the actual PC inventory. ▸ District pharmacist tracks NTD drugs separately from other routine health medicines, sometimes using a separate paper ledger, resulting in **incomplete drug ledgers and siloed systems.** ▸ District pharmacist communicates drug inventory back to regional and/or national teams using drug inventory ledgers; however, official

	drug inventory is reported via the district summary forms, creating two **parallel reporting streams.** ▸ Regional pharmacist works to support redistribution of drugs during MDA but **lacks easy access to current PC inventory** levels. ▸ National program team **lacks access to accurate PC inventory**, which **impacts planning** for the next MDA as well as completing the Joint Application Package (JAP) to request drugs for the next year.
Root cause(s) of the challenges	▸ Lack of financial resources to support reverse supply chain ▸ Lack of appropriate tools and systems ▸ Capacity issues regarding training for NTD supply chain data management
Implications of the challenges for NTD country programs	▸ **Inefficiency:** NTD district officers and pharmacists do not know accurate inventory, which can lead to over-requesting of PC drugs to be sure coverage targets can be met. Additional site visits to validate inventory are resource-intensive. ▸ **Operations:** MDA planning is compromised without accurate inventory.

Table 4.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the Intervention	District NTD Officer/Pharmacist	Regional NTD Officer/Pharmacist	National NTD Team
Characteristics of the user	▸ Trained health professional with requisite education ▸ Responsible for MDA implementation throughout district ▸ More likely to be familiar with computers and smart phones ▸ Familiar with variety of paper-based reporting processes and requirements	▸ Trained health professional with requisite education ▸ Responsible for MDA support within region ▸ Support redistribution of drugs during MDA to prevent stockout ▸ Computers literate ▸ Familiar with variety of paper-based reporting processes and requirements	▸ Trained professional with requisite education and experience ▸ NTD-specific focus to their job responsibilities ▸ Responsible for planning, implementation, and evaluation of MDAs and whole NTD program ▸ Computer-savvy
Relevant level of the health system	▸ District	▸ Regional	▸ National

Relevant research findings	▸ District pharmacist typically in charge of maintaining inventory but works closely with District NTD officer	▸ Regional NTD actors are more involved with support (training, drug management) than implementation of MDAs. ▸ Have multiple responsibilities beyond NTD.	▸ Some teams have logistician on their team but not always.
Key questions for decision making by user(s) **(Note: Where questions differ by actor, it will be noted.)**	▸ Did I receive the correct drugs (type and quantity) so that I can maintain correct and sufficient inventory to reach district treatment threshold? ▸ What quantity of which drugs does each facility need to reach their treatment threshold? ▸ What quantity of drugs remains after MDA?	▸ Does the district have the correct drugs (type and quantity) so that they can maintain correct and sufficient inventory to reach district coverage targets?	▸ What is the inventory of PC drugs at the district remaining post-MDA, and what amount will be viable (not expired) for use during the next MDA? ▸ What amount of drug supply needs to be requested from pharmaceutical partners, based on viable drugs that remain at the district?
Other Impacted Stakeholders			
Key stakeholders impacted by the use case	▸ Pharmaceutical partners		
Primary way in which key stakeholders are impacted	▸ Inaccurate inventory leads to wasted drugs and cost inefficiencies		

Table 4.4: *Enabling environment of the current context*
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▶ Drug distribution is occurring during MDA ▶ District NTD actor is compiling inventory of drugs at the district level ▶ District NTD actor is sharing inventory with regional NTD officer/pharmacist ▶ Regional pharmacist is assessing inventory across district to determine if redistribution needs to take place ▶ National program team is assessing district-level inventory for MDA planning or preparing JAP to request resupply of PC drugs for next MDA cycle
Drivers of solution needs: What drives the need for the solution?	▶ Drug data from summary sheets doesn't match count of drugs returned ▶ Drugs are not being returned to the district post-MDA ▶ Drug inventory at the district is incomplete or inaccurate ▶ Regional or national teams do not have access to district-level drug inventory data
Environmental or programmatic dependencies	▶ Requirements regarding return of PC drug supply (i.e., PC NTD drugs cannot be used for routine health care unless they are going to expire before the next MDA) ▶ Resources available to support return of PC drugs after MDA campaigns

Solution Profile for Use Case 4

Solution Overview

Solutions that address this use case will support NTD district officers or pharmacists (from here forward: NTD district officer) to collect and maintain an accurate PC drug inventory and allow them to share the inventory in a timely way with actors at the regional and national levels of the health system.

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 4.5 lists the activities and data use objectives, based on country

data systems assessments[10], which are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

Table 4.5: Key Activity Steps and Actor Needs

Use Case 4: A district NTD officer needs to create an accurate inventory of PC drugs (both pre- and post-MDA) and needs to be able to share the inventory in a timely way with key actors at the regional and national level to inform their decision-making.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
Receive PC drugs and record in NTD drug ledger	District NTD officer	Accurately and comprehensively record PC drugs received into inventory system (drug type, quantity, batch number, expiration date)	▸ Streamlined data fields, including only data elements that will be used for decision-making ▸ Data collection process aligned with actor capacity and skill set ▸ Data collection process should be standardized and support the needs of getting results (e.g., with as few steps as possible) ▸ Interoperability of data for potential integration with routine LMIS
Use census to finalize request for the PC drug supply required for each catchment area and record in NTD drug ledger	District NTD officer	▸ Determine PC drug inventory required for each catchment area, based on sufficiently accurate community-level census data ▸ Accurately and comprehensively record drugs to be distributed to each catchment area into inventory system (drug type, quantity, batch number, expiration date)	▸ Access to accurate data for stock inventory on hand ▸ Access to most current community-level census data for the district (e.g., through integration or efficient process for sharing data) for analysis by the District NTD officer ▸ Interoperability of data for potential integration with routine LMIS ▸ Established report templates or dashboards to support easy analysis
Distribute PC drugs to health facilities, pre-MDA	District NTD officer	Provide sufficient inventory to each health facility	▸ Communication mechanism to request additional inventory from the national team, if needed to meet treatment thresholds ▸ If digital, automatic notifications triggered by low inventory levels

[10] These activity steps (aligned with the MDA process flow shown in Figure F) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g., steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

			▸ Tracking mechanisms or process to know if PC drugs reach target locations
Complete district summary data form and submit	District NTD officer	Accurately and comprehensively record PC drugs administered, across all district catchment areas, into inventory system (drug type, quantity, batch number, expiration date)	▸ Streamlined data fields, including only data elements that will be used for decision-making ▸ Simple interface for completing the form and summary data ▸ Data aggregation process aligned with actor capacity and skill set ▸ Interoperability of data for potential integration with routine LMIS ▸ Communication mechanism to complete reporting within timeframe set by country program (e.g., within one day)
Update NTD drug ledger	District NTD officer	Accurately and comprehensively record PC drugs returned into the inventory (drug type, quantity, batch number, expiration date)	▸ Streamlined data fields, including only data elements that will be used for decision-making ▸ Data collection process aligned with actor capacity and skill set ▸ Interoperability of data for potential integration with routine LMIS
Drugs received and recorded in NTD drug ledger; report submitted to national level	Regional NTD officer / pharmacist (*will depend on country context if this action is taken by this actor*)	Accurately and comprehensively record PC drugs returned into the inventory (drug type, quantity, batch number, expiration date)	▸ Streamlined data fields, including only data elements that will be used for decision-making ▸ Data collection process aligned with actor capacity and skill set ▸ Interoperability of data for potential integration with routine LMIS ▸ Communication mechanism to complete reporting within timeframe set by country program (e.g., within one day)
QA/QC summary forms and conduct site visit spot checks	National NTD team	Confirm coverage targets and PC drug inventory remaining	▸ Access to current district-level PC drug inventory (e.g., through integration or efficient process for sharing data) ▸ Permissions to modify data, if error correction is required

			▸ Interoperability of data for potential integration with routine LMIS
Compile inventory of PC drugs that remain at the district and national levels	National NTD team	Compile district-level inventories into nation-wide inventory, for use with planning and drug request submissions	▸ Access to accurate and current district-level PC drug inventory (e.g., through integration or efficient process for sharing data) ▸ Established report templates or dashboards to support easy analysis ▸ If digital, an interface to create reports from a centralized data source
Submit JAP and TEMF	National NTD team	Provide district-level inventory of PC drugs that remain, and quantity of drugs required to meet next year's treatment thresholds	▸ Access to accurate and current district-level PC drug inventory (e.g., through integration or efficient process for sharing data) ▸ Established report templates or dashboards to support easy analysis and integration with the JAP and TEMF reporting formats
MDA annual planning	National NTD team	Plan for PC drug distribution to each district, ahead of MDA implementation	▸ Access to accurate and current district-level PC drug inventory (e.g., through integration or efficient process for sharing data) ▸ Access to community-level census data ▸ Established report templates or dashboards to support creation of invoices ▸ Interoperability of data for potential integration with routine LMIS
	National NTD team	Distribute drugs to districts, ahead of MDA	
Review distribution list and create invoice for each district	National NTD team	Distribute drugs to districts, ahead of MDA	

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs, in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make, and to evaluate the effectiveness of the NTD program. Table 4.6 below lists the data inputs and outputs, based on the current state.

Table 4.6: Data Elements[11]

Data Inputs	Data Outputs
▸ Community-level census data	▸ PC drug inventory required, by community, to reach treatment thresholds
▸ PC drugs dispensed to health facilities (type, quantity, batch number, expiration date), pre-MDA	▸ Total number of PC drugs dispensed to health facilities (type, expiration date), pre-MDA
▸ PC drugs returned to district (type, quantity, batch number, expiration data), post-MDA	▸ Total number of PC drugs returned to the district (type, expiration date), post-MDA
▸ PC drugs administered, to which individuals, during MDA, by catchment area (type, gender, age)	▸ Total number of treatments administered during MDA, aggregated for the district
▸ PC drugs lost or wasted during MDA, by catchment area (type, quantity)	▸ Total number of PC drugs lost or wasted during MDA, aggregated for the district (type, quantity)

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

The success criteria for solutions associated with Use Case 4 include:

1. **Transparency:** Solutions must improve oversight for the PC drug inventory (stock levels, distribution, reallocation needs, etc.).
2. **Transmission Time:** Solutions must improve timeliness of reporting PC drug inventory data.
3. **Access:** Solutions must increase access to the PC drug ledger data for use by relevant stakeholders.
5. **Data Quality:** Solutions must have the ability to measure data accuracy and comprehensiveness of drug ledger data, and track over time, with demonstrated improvement.

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 4.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, taken from frameworks[12] developed for digital

[11] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

[12] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University

health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

Table 4.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▶ The solution should be pre-configured and customized to use the appropriate national or global standards (e.g., WHO guidelines). ▶ National NTD officers should be able to configure custom reports for data needs for inventory levels. ▶ If digital, the solution should enable the users to configure various simple templates to be used for distribution lists. ▶ The solution should enable users to incorporate external data sources without too much configuration (e.g., through an API or adaptor). ▶ The solution should require minimal effort to customize for use in different country contexts (e.g., language, structure of the data). ▶ The solution should come pre-configured for the messaging service or notifications for inventory levels.
Integration / Interoperability	The ability to allow two-way sharing of data with other data systems, platforms, or solutions (e.g., the national HMIS)	▶ The solution should be capable of providing data in a format that is readily transferable (e.g., from paper to electronic format in as few steps as possible) or easy to upload (e.g., Excel or other file format that can be imported into other electronic databases in a standardized way). ▶ The solution should enable a way to mitigate data indicator issues across data sets. ▶ The solution should provide a simple and easy way to review distribution lists and totals defined by area. ▶ The solution should enable quick and easy integration with existing data sources to validate data. ▶ Other NTD actors and stakeholders should be able to access the system through a profile or login.

Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19]. http://who.int/life-course/publications/mhealth-toolkit/en/

User-centered Interface	Prioritizing the needs and traits of the user for the design of the solution	▶ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the different actors. ▶ The solution should enable the users to have a standardized interface across several systems to reduce the amount of training. ▶ The solution should provide a set of templates, if digital, for the distribution lists that are simple and easy to use. ▶ If other systems are already in use, the interface should be similar or aligned with the existing system, as users are already familiar and used to that system.
Data Validation Rules	Quality and format control of data being submitted in a systematic way	▶ The control of the input and aggregate level data should be strict either in the specification for the forms (e.g., can only enter numbers), and the aggregate numbers being submitted to the national level. ▶ The numbers rolled up from the district level should be checked for control purposes if outside of a certain range.
Portability	The durability and portability of a solution designed for field-based use	▶ The solution does not need to be portable for the aggregate level data; however, digital solutions can be introduced to increase reliable data collection.
Offline Capability	Ability to perform tasks (e.g., data collection, analysis, review) without Internet or cellular connection	▶ The solution for aggregate level data and summaries will have access to power and will not need offline collection capability. ▶ For digital solutions operating in offline mode, they must store data for upload once connection is established.

Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▶ The solution should enable the actors to effectively perform their assigned tasks without having complications that arise from maintenance-related issues (e.g., downtime, updates, changes to features). ▶ The solution should entail a plan for support and maintenance over time. ▶ The solution should not require ongoing costs for data and other messaging services that will increase over time. ▶ The solution should encompass a simple and effective support system for any issues that arise from field work (e.g., IVR, phone line, text message support, USSD).
Deployment	The resources required to roll out and implement the solution	▶ Deployment can be enabled through a remote approach without requiring the acquisition of expensive hardware. ▶ The solution should require the minimum viable level of human and other resources due to existing constraints (i.e., they should use existing devices, supervisors, trainers, and training programs to implement wherever possible). ▶ The solution should be limited in its value outside of campaigns, such that theft is disincentivized and the solution should be easily used for multiple MDAs across multiple years.

Use Case 5

A district NTD officer needs to determine how coverage across the district is going during an MDA so that drug administration can continue if treatment thresholds are not being met.

Table 5.1: ***Introduction to the Use Case***

Priority Data Source	Routine MDA data
Relevant key challenge(s)	Manual processes, lack of integration across systems, no central data warehouse or aggregate data level
Relevant activity/ scenario	Data analysis and visualization (e.g., dashboards that pull data from one or more disparate datasets)
Objective of use case completion	Improve access to NTD data at all levels of the health system to inform performance, to visualize coverage areas to see effective rates of treatment vs. unsupported areas, and to moderate and control areas after elimination on a national scale

The Desired State: When the use case is successfully completed, what implications are there for the overall NTD program?

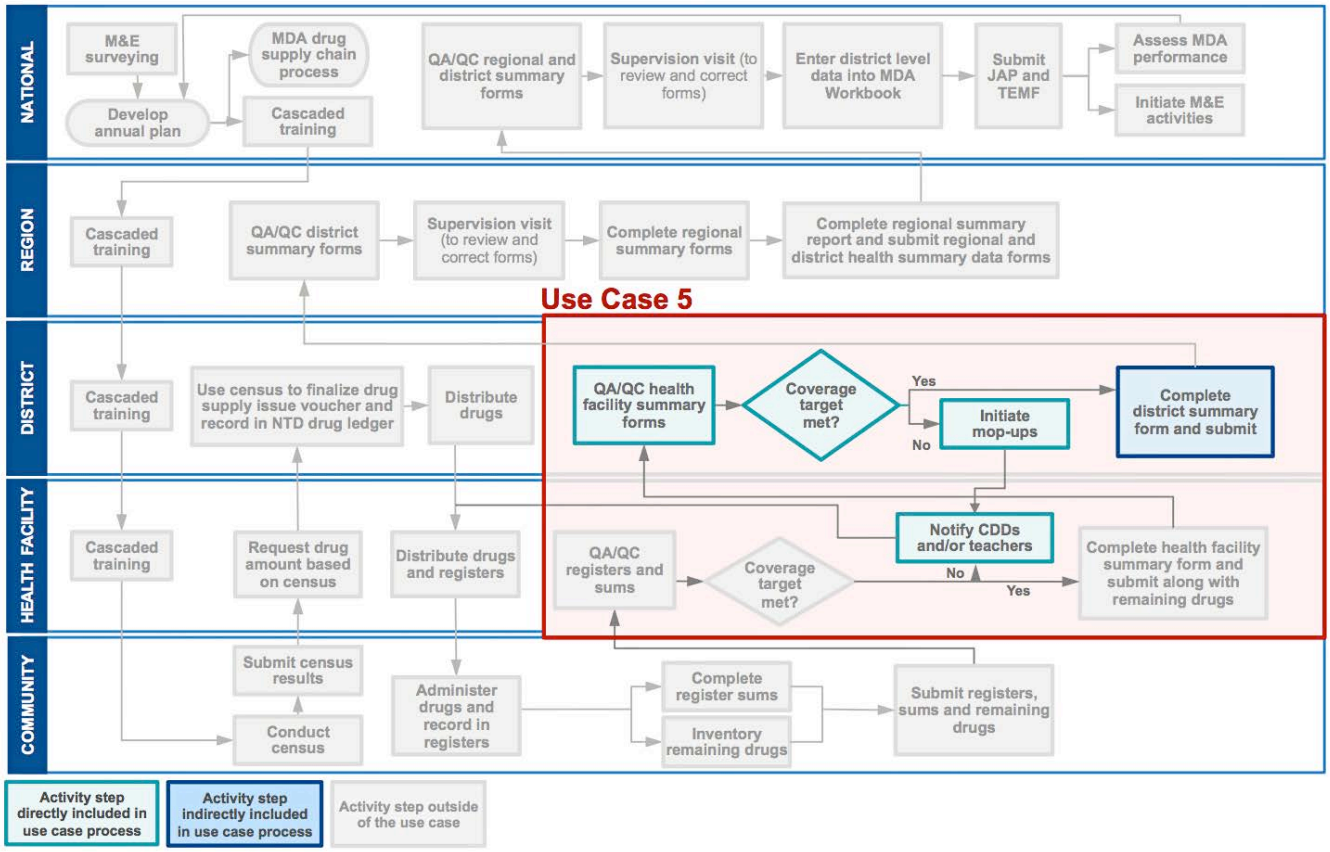
The *Desired State*

The successful completion of the use case would provide NTD district officers with access to sub-district treatment data during MDA. This would enable that actor to determine if areas are on track to meet treatment thresholds, and therefore decide if drug administration should continue[13]. The NTD district officer could reallocate resources during MDA if certain catchment areas needed more support. Overall, this would drive more effective and efficient NTD programs. The achievement of this "desired state" for this use case will be evaluated as follows:

- ✓ Improved program effectiveness, as measured by consistent ability to reach coverage targets
- ✓ Improved program monitoring and timely data use, as measured by District NTD officers being able to ensure treatment thresholds are met, based on timely analysis of coverage rates
- ✓ Improved program efficiency, as measured by reduction in wasted PC drug inventory

[13] The protocol for continuing or stopping MDA, or initiating mop up, varies by NTD country program. The desired state will align with the specific country context.

Figure G: Use Case Five in the Context of the MDA Process Flow



Use Case Characteristics

Table 5.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ NTD district officer is responsible for reviewing health facility summary forms from all health facilities participating in MDA throughout the district. These forms often have **inaccurate and incomplete data.** ▸ Health facility summary **forms are typically submitted after the MDA has concluded**, meaning the district officer cannot calculate coverage during MDA, limiting ability to continue drug distribution if treatment thresholds have not been met. ▸ It is **time-consuming** for the district officer to review the necessary forms (i.e., health facility summary forms, donor forms) with incomplete or inconsistent indicators, and then manually create the district summary form to report to the regional or national level. ▸ Health facility summary forms are paper-based, which are **time-consuming** to review, correct, analyze, and synthesize.

Root causes(s) of the challenges	▸ **Insufficient data tools and systems** to support the easy review and analysis of coverage data, and the timely sharing of data. ▸ **Lack of human resources** (workload) to conduct all MDA activities, as well as other health service (non-NTD) activities that are part of the NTD District Officer's job description.
Implications of the challenges for NTD country programs	▸ **Effectiveness:** Coverage targets might be missed during MDA, as NTD district officer can't calculate coverage until after MDA is complete. Compromises NTD program ability to meet coverage targets and make progress on elimination goals. ▸ **Monitoring:** Determination of coverage reached might be wrong, due to inaccurate data submitted to the NTD district officer, likely rooted in poor data quality of treatment registers. ▸ **Efficiency:** Increased resources (human, financial, etc.) required if MDA must continue for more days than planned, or mop up is required.

Table 5.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the Intervention	District NTD Officer
Characteristics of the user	▸ Trained health professional with requisite education ▸ Responsible for MDA implementation throughout district ▸ More likely to be familiar with computers and smart phones ▸ Familiar with various paper-based reporting processes and requirements
Relevant level of the health system	▸ District
Relevant research findings	▸ District NTD officers aggregate data and determine coverage days after MDA activities have concluded. ▸ Lack of accurate community-level denominator data also presents a challenge in timely calculation of coverage during MDA. ▸ Burkina Faso's practice of daily reporting from health facility to district, via a Closed User Group phone line, allowed district officers to calculate progress coverage daily during MDAs and mitigate problems in real time.
Key questions for decision making by user(s)	▸ Are district coverage targets being met during MDA? ▸ Should MDA stop treatment or continue distribution? ▸ Were district coverage targets met for the MDA? ▸ What is the margin of error? ▸ Where have drugs been allocated and has remaining stock been returned?

Other Impacted Stakeholders		
Key stakeholders impacted by the use case	▸ CDDs and FLHWs	▸ NTD national team
Primary way in which key stakeholders are impacted	▸ Receive notification if drug distribution should continue	▸ Receive accurate and timely coverage calculations

Table 5.4: ***Enabling environment of the current context***
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▸ District NTD officer is receiving health summary forms from FLHWs supervising CDDs. ▸ District officer reviews forms and calculates district-level coverage progress during the MDA. ▸ District officer reviews forms and calculates district-level coverage after MDA. ▸ District officer compiles district summary form and submits to the region/national NTD team.
Drivers of solution needs: What drives the need for the solution?	▸ Health summary forms are submitted late (too late for coverage calculations to be made during MDA). ▸ Coverage targets are not met but coverage calculations are done too late to continue MDA activities. ▸ Health summary forms have inaccurate or incomplete data.
Environmental or programmatic dependencies	▸ Timing of CDD treatment register submission ▸ Timing of FLHW review of treatment registers and completion of health facility summary form ▸ Ability of FLHW to submit health facility summary forms to the district (e.g., is travel required? can they place a phone call?) ▸ Ability of District officer to calculate coverage in during the MDA, rather than post-MDA (e.g., do they have the right tools? do they have the right training?)

Solution Profile for Use Case 5

Solution Overview

Solutions that address this use case will support District NTD Officers to access, analyze, visualize, and monitor PC drug distribution and calculate coverage rates across their district, allowing them to make decisions during MDA that ensure coverage targets are reached.

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 5.5 lists the activities and data use objectives, based on the previous NTD country data systems assessments[14], that are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

Table 5.5: Key Activity Steps and Actor Needs

Use Case 5: A district NTD officer needs to determine how coverage across the district is going during an MDA so that drug administration can continue if treatment thresholds are not being met.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
QA/QC health facility summary forms	District NTD officer	Review summary forms reported by FLHWs and correct errors to improve data accuracy	▸ Procedural guidelines related to QA/QC process and best practice
Determine if the district coverage target has been met	District NTD officer	Calculate status of coverage in the district, using summary form data and community-level census data	▸ Readily available summary form data and community-level census data ▸ Established report templates or dashboards to calculate coverage assessment, and, if digital, visualize coverage on a map ▸ Job aid to support understanding and interpretation of reports and dashboards ▸ Procedural guidelines for decision support and action

[14] These activity steps (aligned with the MDA process flow shown in Figure G) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g., steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

			planning based on coverage assessment
Notify FLHWs (and subsequently CDDs and/ or teachers) if treatment administration should continue	District NTD officer	Determine if MDA should continue or if treatments can stop because coverage targets have been met	▶ Communication mechanism to share results of coverage analysis and decision to continue or stop MDA
Initiate mop-ups	District NTD officer (*will depend on country context if this action is taken by this actor*)	Determine where MDA should continue and for how long	▶ Access to most current community-level census data for the district ▶ Access to catchment area treatment data ▶ Access to catchment area PC drug inventory data ▶ Established report templates or dashboards and guidelines to support mop-up planning
Compile district summary form and submit	District NTD officer	Efficiently share accurate and comprehensive data set with regional and/or national NTD team	▶ Communication mechanism to submit report in a timely fashion and obtain feedback

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs, in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make and to evaluate the effectiveness of the NTD program. Table 5.6 below lists the data inputs and outputs, based on the current state.

Table 5.6: Data Elements[15]

Data Inputs	Data Outputs
▸ Population who received treatment, aggregated by gender and age, at the catchment area-level	▸ Total population who received treatment, aggregated at the district level (gender, age)
▸ Population who refused treatment and why, aggregated by gender and age, at the catchment area-level	▸ Population who refused treatment and why, aggregated by gender and age, aggregated at the district level
▸ Quantity and type of PC drugs dispensed, aggregated at the catchment area-level	▸ Total quantity and type of PC drugs administered, aggregated at the district level
	▸ Total quantity of PC drugs lost, damaged, and remaining

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

The success criteria for solutions associated with Use Case 5 include:

1. **Transmission Time:** Solutions must improve timeliness of reporting summary form treatment register data to the district level.
2. **Access:** Solutions must increase access to the summary form treatment register data for use by relevant stakeholders during the MDA campaign.
3. **Analysis:** Solutions must summarize and quantify data in a simple interface, allowing NTD District officers to view patterns and totals, and use data for decision-making.

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 5.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, taken from frameworks[16] developed for digital health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

[15] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

[16] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19]. http://who.int/life-course/publications/mhealth-toolkit/en/

Table 5.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▸ NTD District officers should have the ability to make some custom adjustments to the solution (e.g., select from a menu of different visualizations to create a preferred custom dashboard, ability to add labels and notes on action steps, etc.). ▸ The solution should provide customizable templates for broadcast and individualized communication with drug distributors and other actors (e.g., chat, SMS). ▸ The customizations for the solution should be at an interface level, not a database or model level (e.g., can change screens, indicators, views, but not data structure). ▸ The solution should require minimal effort to customize for use in different country contexts (e.g., language, color schemes, logos).
Integration / Interoperability	The ability to allow two-way sharing of data with other data systems, platforms, or solutions (e.g., the national HMIS)	▸ The solution should be able to integrate with external data sources using a standard system API interface. ▸ Other NTD actors should be able to access shared data, dashboards and interpretations, and review coverage targets as needed from the tool they use during campaigns. ▸ The solution includes the ability to display and validate data against other authoritative data sources (e.g., check pre-NTD census data against national statistics database).
User-centered Interface	Prioritizing the needs and traits of the user for the design of the solution	▸ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the NTD district officers. ▸ The interface should enable different stakeholders to view data and coverage targets in dashboards customized to support their data use needs. ▸ The interface should resemble a solution they have used or have experience using (e.g., DHIS2).

Data Validation Rules	Quality and format control of data being submitted in a systematic way	▶ The coverage totals should also be validated against previous campaign data to alert the NTD officer if coverage totals are widely different from previous experience, so that data input errors can be ruled out. ▶ The MDA program totals should be verified against existing totals to ensure they are aligned correctly.
Portability	The durability and portability of a solution designed for field-based use	▶ The solution does not need to be portable, as it will be hosted centrally and accessed by users with reliable Internet connectivity.
Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▶ The solution should be responsive to the evolving capacity and needs of NTD officers and include a plan for continuous maintenance and regular updates to the solution, if chosen for long-term implementation. ▶ The solution should include a clear and effective support system (i.e., helpdesk) to escalate any issues that arise for advanced technical support (level 2) or referral to the solution provider's development team (level 3).
Deployment	The resources required to roll out and implement the solution	▶ The solution should be designed and developed to the ability to be remotely deployed and hosted.

Use Case 6

An FLHW supervisor or district NTD officer with oversight of health facilities or a district needs to share MDA results back with teams, understand how the performance of their catchment area compares with others, recognize how their efforts are contributing to the overall NTD program objective, and identify areas for improvement.

Table 6.1: ***Introduction to the Use Case***

Priority Data Source	M&E survey data: routine MDA data and MDA monitoring results
Relevant key challenge(s)	No appropriate feedback to sub-national levels of the health system
Relevant activity/ scenario	Feedback mechanisms to share monitoring data, program performance, and potential actions to health staff at lower levels of the health system
Objective of use case completion	Improve access to NTD M&E survey-related data at all levels of the health system to inform performance, to visualize coverage areas to see effective rates of treatment vs. unsupported areas, and to moderate and control areas after elimination on a national scale

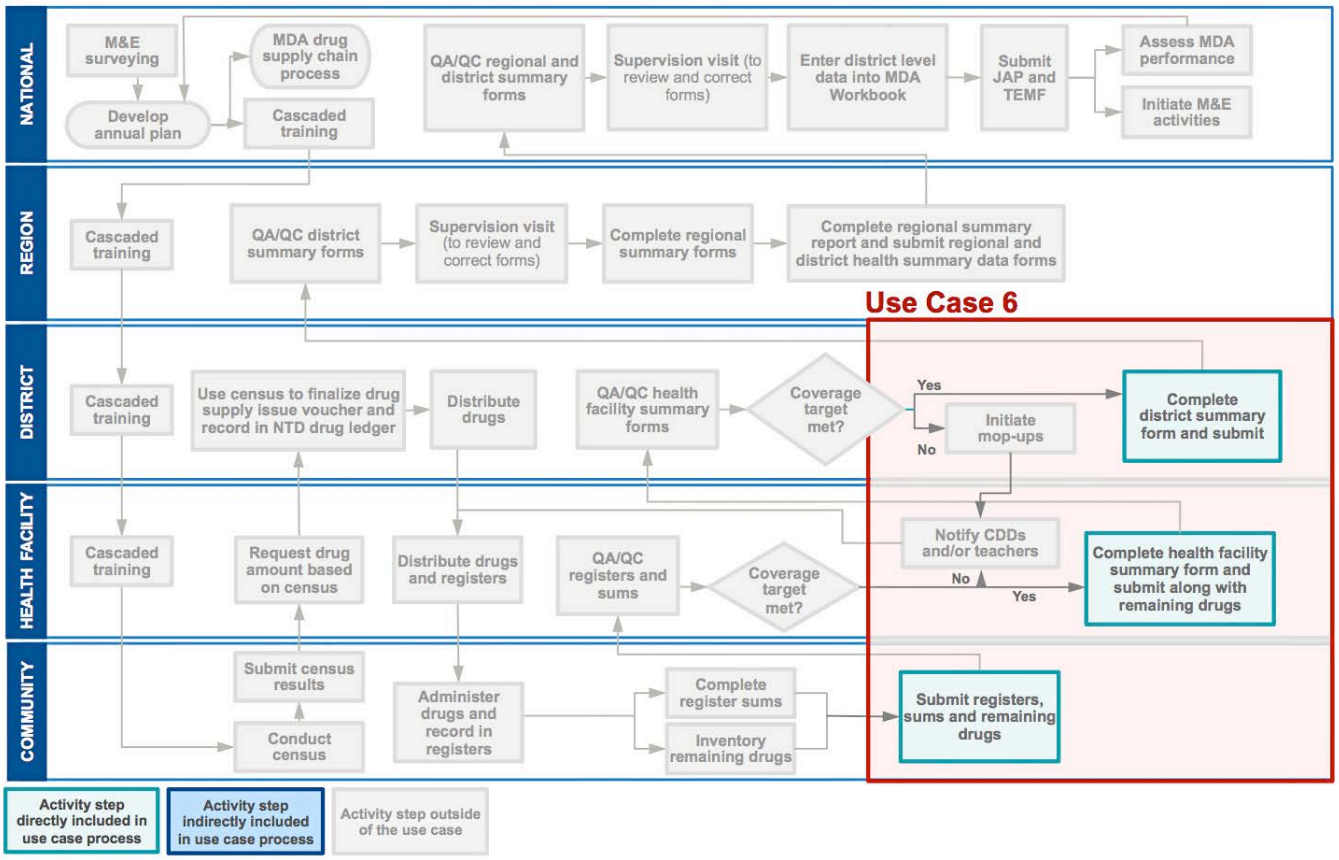
The Desired State: when the use case is successfully completed, what implications are there for the overall NTD program?

Figure H: Use Case Six in the Context of the MDA Process Flow

The *Desired State*

The successful completion of the use case would create feedback loops to sub-district levels of the health system. FLHWs and drug distributors would have access to data related to their performance, both as relates to coverage targets as well as data quality. Supervisors would share this information with their teams, informing necessary performance improvements and incentivizing the valuation of data. Overall, this would strengthen the NTD program as a whole. The achievement of this "desired state" for this use case will be evaluated as follows:

- ✓ Improved program effectiveness and performance, as measured by increased coverage rates in subsequent MDAs
- ✓ Improved data quality and use at sub-district levels, as measured by requests made by sub-national NTD team members for data and improved quality of reporting as a result of increased analysis and use of aggregate data sets



Use Case Characteristics

Table 6.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ **Data only flows one way,** creating a **lack of data access and use** at community and health facility levels. These actors are trained to collect data, **but not incentivized to use it**, which can have implications for the quality of the data they collect. ▸ **Results and feedback** on performance within or between catchment areas and data quality are **not shared** with the community or health facilities frequently, consistently, or comprehensively, resulting in a **lack of ability to identify areas for improvement** in subsequent MDAs. ▸ District NTD officers **rarely share data and results of program evaluation** back to sub-national levels, **causing a lack of awareness** as to the value of the work being done at sub-district levels.

Root cause(s) of the challenges	▸ **Insufficient data tools or systems** to support data sharing and feedback looks. ▸ **Lack of training/capacity** to promote data use. ▸ **Lack of human resources** to frequently and comprehensively share data and results of program evaluation back with teams.
Implications of the challenges for NTD country programs	▸ **Data quality:** CDDs are not incentivized to see value in the data they collect, which has implications for data quality. ▸ **Reduced effectiveness:** FLHWs do not know how their catchment area performed in relation to others, creating a disconnect between activities and NTD program objectives of coverage targets.

Table 6.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the intervention	CDD	FLHW	District NTD Officer
Characteristics of the user	▸ Literate ▸ Volunteers who receive a minimal stipend ▸ Language spoken might vary by region ▸ Some users participate in multiple MDAs but there are always new volunteers ▸ Potentially have access to feature phones ▸ Capacity to leverage technology for data collection and reporting is variable	▸ Literate, more education and health training that CDDs ▸ Salaried health care professional ▸ Likely to have access to feature phones ▸ Capacity to use technology is likely higher than CDDs	▸ Trained health professionals with requisite education ▸ Responsible for MDA implementation throughout district ▸ More likely to be familiar with computers and smart phones ▸ Familiar with variety of paper-based reporting processes and requirements
Relevant level of the health system	▸ Community	▸ Health facility	▸ District

Relevant research findings	▸ CDDs reported rarely getting results of their work.	▸ Efforts to share data back with FLHWs and CDDs has shown positive results in terms of incentivizing data use and the value of data. ▸ FLHWs interviewed talked about reviewing data and discussing results with CDDs but it did not happen consistently.	▸ Burkina Faso's practice of data review meetings was very effective in terms of incentivizing data use at the sub-district level.
Key questions for decision making by user(s) **(Note: where questions differ by actor, it will be noted)**	▸ Is the data quality high enough to ensure accurate results are reported?	▸ Was the treatment threshold for my catchment area achieved? ▸ Is the data quality high enough to ensure accurate results are reported? ▸ Are there issues of data quality that must be addressed to determine accurate coverage rates?	▸ Which health facilities performed well and how can those lessons be applied to others? ▸ What issues of data quality need to be addressed through additional training or support? ▸ Which catchment areas failed or struggled to reach coverage targets and what additional support will they require for the next MDA?
Other Impacted Stakeholders			
Key stakeholders impacted by the use case	▸ National NTD team		
Primary way in which key stakeholders are impacted	▸ Have data that should be shared with sub-national levels		

Table 6.4: *Enabling environment of the current context*
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▶ Summary forms and MDA reports are completed. ▶ Evaluation of MDA is complete.
Drivers of solution needs: What drives the need for the solution?	▶ FLHWs and CDDs are not aware of MDA results. ▶ FLHWs and CDDs are not aware of their performance, what went well, what should improve for next time. ▶ FLHWs and CDDs are not aware of how their catchment area did in relation to others. ▶ FLHWs and CDDs are not aware of how their work contributed to overall NTD program goals.
Environmental or programmatic dependencies	▶ Resources to convey results of MDA to different levels of the health system ▶ Appropriate tools to convey results in level of detail best aligned with each health system actor ▶ Time required to gather CDDs and FLHWs to convey results in a productive way ▶ Lack of financial support for CDDs might compromise motivation

Solution Profile for Use Case 6

Solution Overview

Solutions that address this use case will enable feedback loops between the district NTD team and sub-district levels of the health system and will enhance overall communication between teams helping them better achieve their objectives. Solutions will include components that promote a deeper understanding of data at the district, health facility, and community levels, and seek to incentivize data use.

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 6.5 lists the activities and data use objectives, based on the previous NTD country data systems assessments[17], that are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

[17] These activity steps (aligned with the MDA process flow shown in Figure H) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g., steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

Table 6.5: Key Activity Steps and Actor Needs

Use Case 6: An FLHW supervisor or district NTD officer with oversight of health facilities or districts needs to share MDA results back with teams, understand how the performance of their catchment area compares with others, recognize how their efforts are contributing to the overall NTD program objective, and identify areas for improvement.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
Submit registers, sums, and remaining PC drugs to supervisor	Drug distributor	Receive feedback from supervisors on performance as relates to coverage targets and data quality to support better understanding of data and incentivize data use	▶ Communication mechanism (virtual or in person) to allow for feedback to be conveyed ▶ Reports and data from the district containing feedback in format that aligns with actor capacity and skill set ▶ Templates to support creation of reports to share feedback with actors at each relevant level health system ▶ Forum to foster discussion and support to interpret and understand data for actors at each relevant level of the health system ▶ Offline capability to ensure reports and data can be shared regardless of Internet connectivity
Complete health facility summary form and submit to the district, along with remaining PC drugs	FLHW	▶ Receive feedback from the district on performance as relates to coverage targets and data quality to support better understanding of data and incentivize data use ▶ Provide feedback to drug distributors, disaggregated by community	
Complete district summary form and submit to the regional or national NTD team	District NTD officer	▶ Receive feedback from the national team on performance as relates to coverage targets and data quality to support better understanding of data and incentivize data use ▶ Provide feedback to FLHWs, disaggregated by catchment area	

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs, in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make, and to evaluate the effectiveness of the NTD program. Table 6.6 below lists the data inputs and outputs, based on the current state.

Table 6.6: Data Elements[18]

Data Inputs	Data Outputs
▸ Treatment register data	▸ Coverage reached in each community ▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)
▸ Health facility summary form data	▸ Coverage reached in each catchment area ▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)
▸ District summary form data	▸ Coverage reached in the district ▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)
▸ National coverage data, by district	▸ Coverage reached, by district, with comparisons ▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)
▸ Data Quality Assessment and/or Supervisor's Coverage Tool findings	▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

The success criteria for solutions associated with Use Case 6 include:

1. **Data Aggregation & Visualization:** Solutions must be able to aggregate data from disperse data sets and enable users to quickly and effectively visualize data and create reports to share information with stakeholders at sub-district levels of the health system.

[18] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

2. **Feedback Loops:** Solutions must enhance bilateral communication between NTD district, health facility, and community-level actors, focused on providing feedback and information to project teams at each level.
3. **Access:** Solutions must increase access to the data for use by relevant stakeholders.
4. **Data Use**: Solutions must include mechanisms and approaches to improving data use at sub-district levels of the health system.

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 6.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, taken from frameworks[19] developed for digital health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

Table 6.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▸ The solution should be configured in a way that users have limited ability to customize functionality, but are able to update content, and tailor reports and messages for feedback. ▸ The stakeholders should not have to configure the solution for receiving feedback. ▸ The solution should enable the actors to customize the formats or templates for the communication. ▸ The solution should require minimal effort to customize for use in different country contexts (e.g., language, structure of the data). ▸ The solution should be simple and easy to update or change the layout for the reports and messages.

[19] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19]. http://who.int/life-course/publications/mhealth-toolkit/en/

Integration / Interoperability	The ability to allow two-way sharing of data with other data systems, platforms, or solutions (e.g., the national HMIS)	▸ The solution should transfer data in a standardized way, enabling external systems to examine or track the messages over time. ▸ The solution should be generic enough to be used across several types of stakeholders (e.g., have the same source data available for multiple stakeholders).
User-centered Interface	Prioritizing the needs and skills of the user for the design of the solution	▸ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the various actors. ▸ Communications between drug distributors, supervisors, and other support staff should leverage readily-available and commonly-used forms of communication (e.g., in-person meetings, phone, WhatsApp).
Data Validation Rules	Quality and format control of data being submitted in a systematic way	▸ The data for the messages for the feedback, or the approach, should use standardized data and be validated to ensure it makes sense to all users and can be recorded in a systematic way.
Portability	The durability and portability of a solution designed for field-based use	▸ The solution will need to incorporate the range of devices and formats (digital and non-digital) needed for effective delivery actors at different levels of the health system and will need to be portable.
Offline Capability	Ability to perform tasks (e.g., data collection, analysis, review) without Internet or cellular connection	▸ The solution will need a connection in order for the communication to take place bi-laterally, unless a communication is done offline (e.g., paper reports distributed with results or in-person data review meetings).
Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▸ The solution should be easy to keep up and update over time. ▸ The solution should encompass a simple and effective support system for any issues that arise from field work (e.g., IVR, phone line, text message support, USSD).

Deployment	The resources required to roll out and implement the solution	▶ The solution should require the minimum viable level of human and other resources due to existing constraints (i.e., they should use existing devices, supervisors, trainers, and training programs to implement wherever possible). ▶ The solution should be limited in its value outside of campaigns, such that theft is disincentivized and the solution should be easily used to support multiple MDAs across multiple years.

Use Case 7

An NTD national team member needs to share results back with teams at other levels of the health system, demonstrate district comparisons, share how their work contributes to the overall program objective, and how performance can be improved.

Table 7.1: ***Introduction to the Use Case***

Priority Data Source	M&E survey data: Routine MDA data and MDA monitoring results
Relevant key challenge(s)	No appropriate feedback to sub-national levels of the health system
Relevant activity/ scenario	Feedback mechanisms to share monitoring data, program performance, and potential actions to health staff at lower levels of the health system
Objective of use case completion	Improve access to NTD M&E survey-related data at all levels of the health system to inform performance, to visualize coverage areas to see effective rates of treatment vs. unsupported areas, and to moderate and control areas after elimination on a national scale

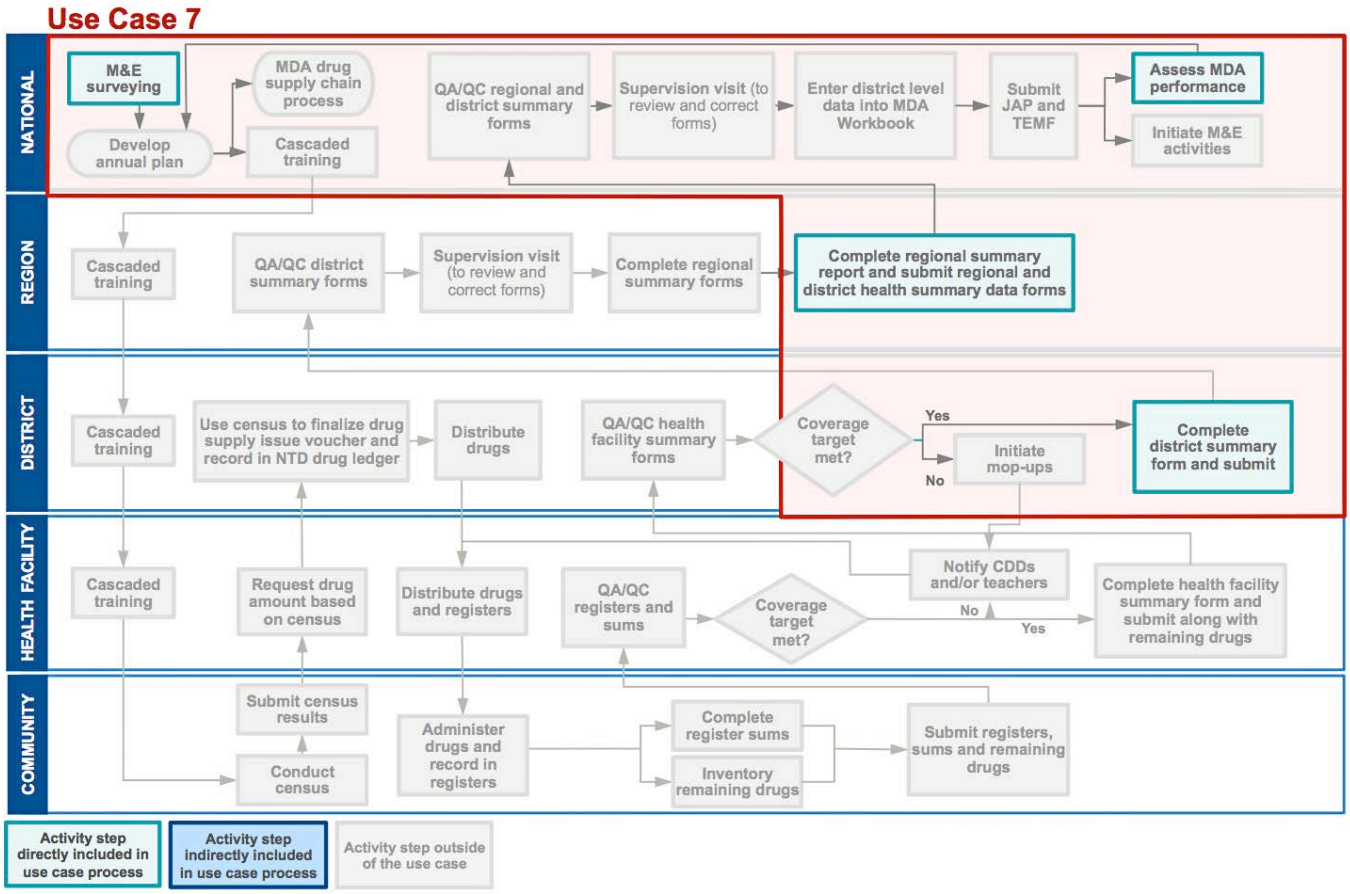
The Desired State: When the use case is successfully completed, what implications are there for the overall NTD program?

The *Desired State*

The successful completion of the use case would create feedback loops to sub-national levels of the health system. Regional and district supervisors would have access to data related to their district or catchment area's performance, both as relates to coverage targets as well as data quality. Supervisors would share this information with their teams, informing necessary performance improvements and promoting data valuation. Overall, this would drive performance improvements and promote data use. The achievement of this "desired state" for this use case will be evaluated as follows:

- ✓ Improved program effectiveness and performance, as measured by increased coverage rates in subsequent MDAs
- ✓ Improved data quality and use at sub-national levels, as measured by requests made by sub-national NTD team members for data and improved quality of reporting as a result of increased analysis and use of aggregate data sets

Figure I: Use Case Seven in the Context of the MDA Process Flow



Use Case Characteristics

Table 7.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ Data only flows one way, creating a **lack of data access and use** at the regional and district levels (as well as sub-district levels, as covered in Use Case 6). Actors are trained to review and aggregate data, but not incentivized to use it, which can have implications for the quality of the data they report. ▸ **Results and feedback** on performance within or between catchment districts and data quality are **not shared** with the sub-national levels frequently, consistently, or comprehensively, resulting in a **lack of ability to identify areas for improvement** in subsequent MDAs. ▸ National NTD teams **don't consistently share data** and results of program evaluation back to sub-national levels, causing a **lack of awareness as to the value of the work** being done by those teams.

Root causes(s) of the challenges	▸ Insufficient data tools or systems ▸ Lack of training/capacity ▸ Lack of human resources
Implications of the challenges for NTD country programs	▸ **Evaluation:** District NTD officers do not know how their district performed in relation to others, creating a disconnect between activities and NTD program objectives. They cannot take steps to improve performance next time.

Table 7.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the Intervention	District NTD Officer	National NTD Team
Characteristics of the user	▸ Trained health professional with requisite education ▸ Responsible for MDA implementation throughout district ▸ More likely to be familiar with computers and smart phones ▸ Familiar with variety of paper-based reporting processes and requirements	▸ Trained professional with requisite education and experience ▸ NTD-specific focus to their job responsibilities ▸ Responsible for planning, implementation, and evaluation of MDAs and whole NTD program ▸ Computer-savvy
Relevant level of the health system	▸ District level	▸ National level
Relevant research findings	▸ District level rarely receives feedback from national level.	▸ NTD national teams have access to all relevant NTD data (e.g., coverage targets/rates, drug supply, impact evaluation), but all stored in separate files and databases. ▸ Integration of these sources would make data visualization and sharing of results with other levels of the health system more feasible.
Key questions for decision making by user(s) (Note: Where questions differ by actor, it will be noted.)	▸ How did the district do with reaching coverage targets, and what can be done differently to achieve a better outcome next time? ▸ What resources and training are required to achieve better outcomes?	▸ Which districts performed well and how can those lessons be applied to other districts? ▸ What issues of data quality need to be addressed through additional training or support?

		▸ Which districts areas failed or struggled to reach coverage targets and what additional support will they require for the next MDA?
Other Impacted Stakeholders		
Key stakeholders impacted by the use case	▸ CDDs	▸ FLWHs
Primary way in which key stakeholders are impacted	▸ Need to receive feedback on performance, areas of accomplishment, value of the data they collected, and how it contributes to the NTD program goals.	▸ Need to receive feedback on performance, areas of accomplishment, value of the data they collected, and how it contributes to the NTD program goals.

Table 7.4: *Enabling environment of the current context*
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▸ Summary forms and MDA reports are completed. ▸ Results of MDA are available. ▸ Results of impact evaluation are available.
Drivers of solution needs: What drives the need for the solution?	▸ District NTD officers are not aware of MDA results. ▸ District NTD officers are not aware of their performance, what went well, what should improve for next time. ▸ District NTD officers are not aware of how their district did in relation to others. ▸ District NTD officers are not aware of how their work contributed to overall NTD program goals.
Environmental or programmatic dependencies	▸ Resources to convey results of MDA to different levels of the health system ▸ Right tools to convey results at the appropriate level of detail for each health system actor ▸ Time required to gather CDDs and FLHWs to convey results in a productive way ▸ Lack of financial support for CDDs might compromise motivation

Solution Profile for Use Case 7

Solution Overview

Solutions that address this use case will enable feedback loops between the national, regional and district levels of the health system and will enhance overall communication between teams, helping them better achieve their objectives. Solutions will include components that promote a deeper understanding of data at the regional and district levels and seek to incentivize data use.

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 7.4 lists the activities and data use objectives, based on the previous NTD country data systems assessments[20], that are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

Table 7.5: Key Activity Steps and Actor Needs

Use Case 7: An NTD national team member needs to share results back with teams at other levels of the health system, demonstrate district comparisons, share how their work contributes to the overall program objective, and how performance can be improved.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
Complete district summary form and submit to the regional or national NTD team	District NTD officer	Receive feedback from the national or regional team on performance as relates to coverage targets and data quality to support better understanding of data and incentivize data use	▶ Communication mechanism (virtual or in person) to allow for feedback to be conveyed post-MDA ▶ Reports and data from the district containing feedback in format that aligns with actor capacity and skill set ▶ Templates to support creation of reports to share feedback with actors at each relevant level health system ▶ Forum to foster discussion and support to interpret and understand data for
Complete regional summary report and submit regional and district health summary data forms	Regional NTD officer	▶ Receive feedback from the national team on performance as relates to coverage targets and data quality to support better understanding of data and incentivize data use	

[20] These activity steps (aligned with the MDA process flow shown in Figure I) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g., steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

		▸ Provide feedback to district team, disaggregated by catchment area	actors at each relevant level of the health system ▸ Depending on country context, offline capability could be necessary to ensure reports and data can be shared regardless of connectivity
Assess MDA performance	National NTD team	Provide feedback to regional and/ or district teams, disaggregated by district, on performance as relates to coverage targets and data quality to support better understanding of data and incentivize data use	
M&E surveying	National NTD team	Provide feedback to Regional and/or District NTD teams on the results of surveys to support understanding of program effectiveness and how their activities align with overall program goals	▸ Same as for above activities, but report templates and feedback mechanism timeline to align with timing of impact evaluation surveys

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs, in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make, and to evaluate the effectiveness of the NTD program. Table 7.5 below lists the data inputs and outputs, based on the current state.

Table 7.6: Data Elements[21]

Data Inputs	Data Outputs
▸ District summary form data	▸ Coverage reached in the district ▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)
▸ Regional summary form data	▸ Coverage reached in each region ▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)

[21] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

▸ National coverage data, by district	▸ Coverage reached, by district, with comparisons ▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)
▸ Data Quality Assessment and/or Supervisor's Coverage Tool findings	▸ Performance as relates to coverage ▸ Performance as relates to data quality (accuracy, comprehensiveness, timeliness)
▸ Impact survey findings	▸ Impact and effectiveness of MDA, by district

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

The success criteria for solutions associated with Use Case 7 include:

1. **Data Aggregation & Visualization:** Solutions must be able to aggregate data from disperse data sets and enable users to quickly and effectively visualize data and create reports to share information with stakeholders at other levels of the health system.
2. **Feedback Loops:** Solutions must enhance bilateral communication between the national NTD team and NTD regional and district teams, focused on providing feedback and information to project teams at each level.
3. **Access:** Solutions must increase access to the data for use by relevant stakeholders.
4. **Data Use**: Solutions must include mechanisms and approaches to improving data use at sub-national levels of the health system.

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 7.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, taken from frameworks[22] developed for digital health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

[22] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19].http://who.int/life-course/publications/mhealth-toolkit/en/

Table 7.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▸ The solution should allow for NTD national team actors to configure custom reports, but the system itself should not be highly configurable. ▸ The NTD national team should be able to input the performance targets as indicators that should be measurable over time. ▸ The solution should require minimal effort to customize for use in different country contexts (e.g., language, color scheme, logos). ▸ The solution must incorporate a format and type for the notifications, including templates or pre-set data.
Integration / Interoperability	The ability to allow two-way sharing of data with other data systems, platforms, or solutions (e.g., the national HMIS)	▸ The QA/QC data set should be accessible from external systems or in a standardized format that can be imported to external systems. ▸ The solution should enable external systems to access aggregate level data sets. ▸ The system should include standard interface or API to communicate with external systems.
User-centered Interface	Prioritizing the needs and traits of the user for the design of the solution	▸ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the different relevant NTD actors. ▸ The solution design must align with regional or local considerations around communication and uptake. ▸ Communications between drug distributors, supervisors, and other support staff should leverage readily-available and commonly-used forms of communication (e.g., in-person meetings, phone, WhatsApp).

Data Validation Rules	Quality and format control of data being submitted in a systematic way	▸ The input and aggregate level data should strictly specify the data inputs and formats (e.g., text fields are for text only) for data forms and tally sheets, as well as any aggregate level data being submitted to the facility level. ▸ The system should verify the indicators for performance and others to increase adherence to targets.
Offline Capability	Ability to perform tasks (e.g., data analysis, review) without Internet or cellular connection	▸ The solution will need a connection in order for the communication to take place bi-laterally. If regional and district offices lack reliable power and connectivity, reports may need to be delivered in person or information shared by phone.
Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▸ The solution should be responsive to the evolving capacity and needs of NTD actors and include a plan for continuous maintenance and regular updates to the solution, if chosen for long-term implementation. ▸ The solution should include a clear and effective support system (i.e., helpdesk) to escalate any issues that arise for advanced technical support (level 2) or referral to the solution provider's development team (level 3).
Deployment	The resources required to roll out and implement the solution	▸ The solution should require the minimum viable level of resources due to constraints with staffing and managing the deployment. ▸ The solution should incorporate as many existing devices as possible to simplify the deployment.

Use Case 8

An NTD national team member needs to easily conduct data analysis and visualization across multiple disparate data sets to support accurate program evaluation and effective decision-making. This must include access to NTD program data, as well as relevant data housed in other national HIS. NTD program data must be exposed to other data systems as appropriate to support NTD program management in both control and surveillance phases.

Table 8.1: ***Introduction to the Use Case***

Priority Data Source	M&E survey data: Routine MDA data, morbidity data, impact evaluations
Relevant key challenge(s)	Lack of integration across systems, no central data "warehouse," manual processes AND sustainability of the "system" as programs evolve to surveillance
Relevant activity/ scenario	Data analysis and visualization (e.g., dashboards that pull data from one or more disparate datasets) ANDpPost-MDA surveillance and integration with the existing health system
Objective of use case completion	Improve access to NTD M&E survey-related data at all levels of the health system to inform performance, to visualize coverage areas to see effective rates of treatment vs. unsupported areas, and to moderate and control areas after elimination on a national scale

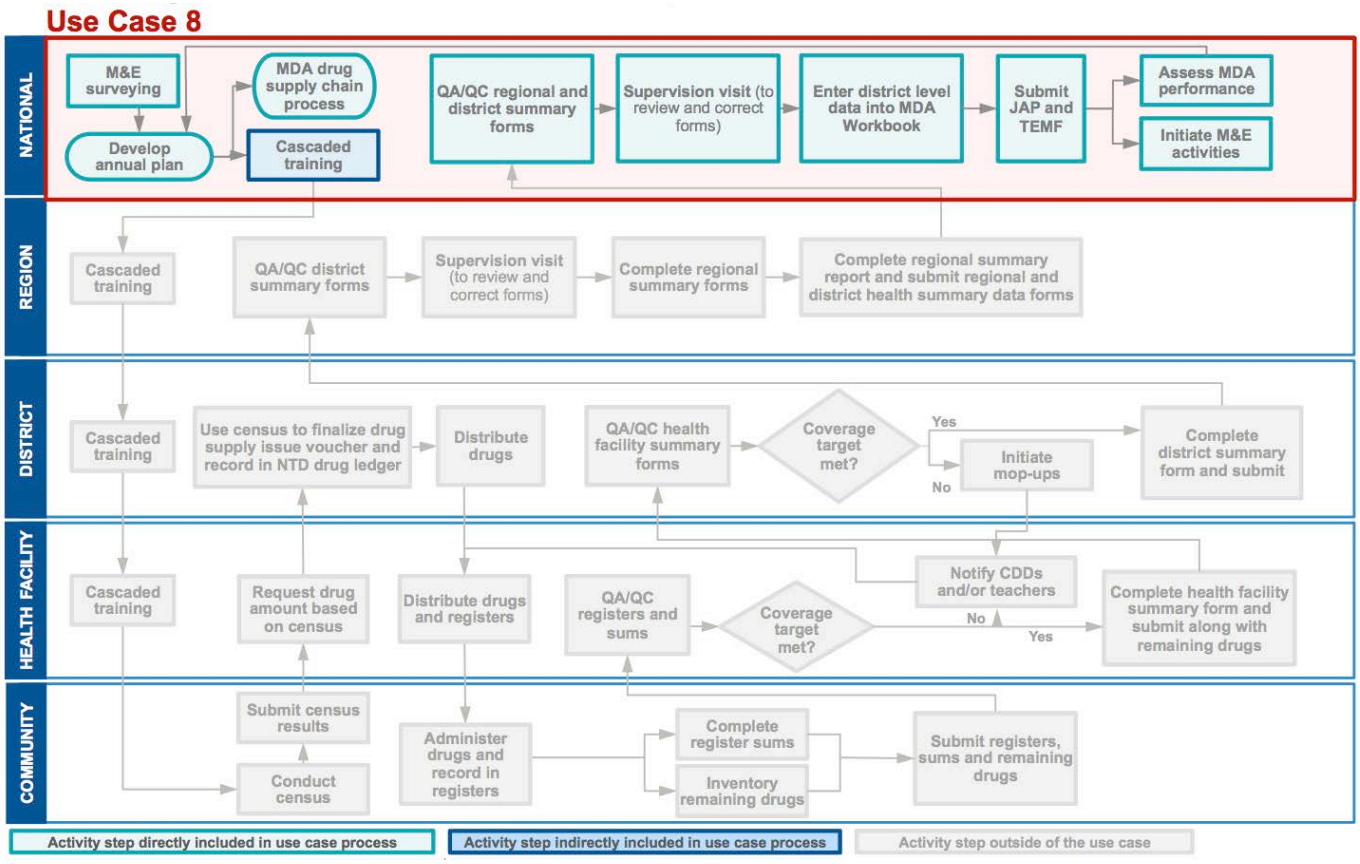
The Desired State: When the use case is successfully completed, what implications are there for the overall NTD program?

The *Desired State*

The successful completion of the use case would enable the NTD national team to conduct streamlined analysis of multiple datasets to better understand program performance and inform planning. NTD program data would be integrated into relevant national HIS to support the transition from control to surveillance phases. Overall, this would enhance decision-making for the National team and create a sustainable transition plan for long-term NTD management. The achievement of this “desired state” for this use case will be evaluated as follows:

- ✓ Program sustainability, as measured by integration of data with national HIS
- ✓ Improved program efficiency, as measured by a reduction in the time previously needed to manually pull data from different sources and conduct analysis
- ✓ Improved program effectiveness through streamlined and strengthened data use, as measured by greater ability to utilize data to improve performance during next MDA campaign and reach treatment thresholds

Figure J: Use Case Eight in the Context of the MDA Process Flow



Use Case Characteristics

Table 8.2: *Challenges within the current state*

Key challenges and bottlenecks existing in the current state that prevent the successful completion of the use case.

Current state: What happens today, including the key problems facing the NTD actors	▸ NTD program data are kept in both paper and electronic format, **limiting accurate and efficient planning and implementation** of MDA activities. ▸ Data sources are stored across multiple servers, hard drives, paper-file, and electronic formats, making it **difficult to conduct complex data analysis and visualization.** ▸ Very few NTD indicators are integrated with national HIS, resulting in **challenges for long-term sustainability** of NTD management.
Root cause(s) of the challenges	▸ **Data tools and systems that exist are insufficient** to support analysis and decision-making. ▸ **Lack of human resources** stretches national team.

	▸ **Lack of financial resources** limit deployment of necessary systems and tools.
Implications of the challenges for NTD country programs	▸ **Efficiency:** National NTD program team spends additional time to manually pull data from different sources. ▸ **Effectiveness**: Ability to evaluate programs is impeded, due to limited access to data sources. Cannot take steps to improve performance next time.

Table 8.3: *Stakeholders*

Key users of the solution and other stakeholders indirectly involved with the use case.

Users of the Intervention	**National NTD Team**		
Characteristics of the user	▸ Trained professional with requisite education and experience ▸ NTD-specific focus to in job responsibilities ▸ Responsible for planning, implementation, and evaluation of MDAs and whole NTD program ▸ Computer-savvy		
Relevant level of the health system	▸ National level		
Relevant research findings	▸ NTD national teams have access to all relevant NTD data (coverage targets/rates, drug supply, impact evaluation), but all stored in separate files and databases. ▸ Integration of these sources would make data visualization and sharing of results with other levels of the health system more feasible.		
Key questions for decision making by user(s)	▸ What volume of drugs is required to reach national coverage targets, and where they should be distributed? ▸ Is the data quality high enough to ensure accurate results are reported to the WHO? ▸ What steps must be taken to ensure successful MDA campaigns?		
Other Impacted Stakeholders			
Key stakeholders impacted by the use case	▸ Donors	▸ Implementation partners	▸ WHO
Primary way in which key stakeholders are impacted	▸ Require regular reports and program evaluations	▸ Support MDA implementation and rely on NTD national team for information and direction	▸ Support efforts to reach elimination targets

Table 8.4: *Enabling environment of the current context*
The current state in which the use case takes place. This includes scenarios in which the use case takes place, drivers of the need for a solution, and factors related to the enabling environment.

Context and application: What is the context in which this use case takes place?	▶ Planning for the MDA requires coverage calculations (need census data, previous coverage calculations, and results of impact surveys). ▶ Supply chain management to support upcoming MDA. ▶ Complete the JAP for submission to the WHO. ▶ Evaluate NTD program and progress being made towards elimination targets.
Drivers of solution needs: what drives the need for the solution?	▶ Data sources are stored in different places. ▶ Data visualization and analysis tools do not exist. ▶ NTD data are not integrated with national HIS.
Environmental or programmatic dependencies	▶ Disparate data sets must be in import/export format for integration. ▶ NTD program team must be capacitated to conduct necessary analysis and utilize reports and visualizations.

Solution Profile for Use Case 8

Solution Overview

Solutions that address this use case will support an integrated central NTD data system for use by the NTD national team, enabling multi-dataset analysis (e.g., MDA data, morbidity data, impact survey data) and supporting NTD program management, including post-MDA surveillance and integration with external health information systems.

Key Activity Steps and Actor Needs

To fully address the use case, the solution must be designed to support the key activities conducted within it and the associated ways in which the actor must interact with data in order to fulfill their responsibilities. Table 8.5 lists the activities and data use objectives, based on the previous NTD country data systems assessments[23], that are critical to determining where data quality, access, and use could be enhanced through the introduction of an innovative solution.

[23] These activity steps (aligned with the MDA process flow shown in Figure J) and data use objectives are based on the current state of NTD country programs. The solution can propose to streamline (e.g., steps can be removed) or to modify to improve upon this process, with the direct involvement and approval of the NTD country program.

Table 8.5: Key Activity Steps and Actor Needs

Use Case 8: A NTD national team member needs to easily conduct data analysis and visualization across multiple disparate data sets to support accurate program evaluation and effective decision-making. This must include access to NTD program data, as well as other relevant data housed in other national HIS. NTD program data must be exposed to other data systems as appropriate to support NTD program management in both control and surveillance phases.

Activity	Actor	Data Use Objective (as pertains to associated priority data source)	Critical Solution Features
Develop annual plan	National NTD team	Determine resources required to successfully complete MDA, and finalize implementation plan	▸ Easy access to all relevant and necessary data sets (e.g., through integration of data sets) ▸ Dashboards and report templates to support annual planning activities and outputs ▸ Access to previous annual plans and MDA performance
Oversee MDA PC drug supply chain	National NTD team	Ensure PC drugs are distributed in correct quantities for each district to meet their treatment thresholds	▸ Easy access to all relevant and necessary data sets (e.g., through integration of data sets) ▸ Capable of integration with LMIS ▸ Dashboards and report templates to support inventory management
Initiate cascaded training	National NTD team	Determine resources required to implement cascaded training pre-MDA	▸ Easy access to all relevant and necessary data sets (e.g., through integration of data sets) ▸ Dashboards and report templates to support planning and implementation of cascaded training
QA/QC district and regional summary forms	National NTD team	Review summary forms reported by regions and/or district, and correct errors to improve data accuracy	▸ Procedural guidelines related to QA/QC process and best practice
Supervision visit (to review and correct forms)	National NTD team	Improve accuracy of data reported through select site visits	▸ Procedural guidelines related to supervision visits (e.g., selection of sites) and how to modify the data set based on findings

Enter district level data into National MDA Workbook	National NTD team	Assess coverage across all districts nationally, determine if targets were met, and implications for next year's MDA activities	▸ Streamlined data entry system to support entry of valued and used NTD data ▸ Data structure that keeps data disaggregated to the district level ▸ Integration with other NTD data sources (e.g., NTD PC drug supply system, morbidity data, impact evaluation survey data) ▸ Capable of integration with national HMIS ▸ Dashboards and visualization to support analysis and understanding of the data
Submit JAP and TEMF	National NTD team	Provide results of MDA, impact evaluations, and district-level inventory of PC drugs that remain, as well as quantity of PC drugs required to meet next year's treatment thresholds	▸ Integration with key NTD data sources required to complete the JAP and TEMF ▸ No redundant data entry (data should be pulled from other relevant data sets through integration or easy upload) ▸ Established report to export directly into necessary JAP and TEMF formats for easy submission
Assess MDA performance	National NTD team	Determine if coverage targets were met and implications for NTD program activities and priorities	▸ Easy access to all relevant and necessary data sets (e.g., through integration of data sets) ▸ Dashboards and visualization capabilities to support performance assessment ▸ Report templates to support communication about performance and sharing results with sub-national levels of the health system
Initiate M&E surveys	National NTD team	Determine where impact surveys should be conducted, based on MDA results and other relevant data	▸ Easy access to all relevant and necessary data sets (e.g., through integration of data sets) ▸ Dashboards and report templates to support M&E survey planning

M&E surveying	National NTD team	Analyze data to evaluate impact of MDA and other relevant NTD activities	▸ Easy access to all relevant and necessary data sets (e.g., through integration of data sets) ▸ Dashboards and visualization capabilities to support use of impact survey data ▸ Report templates to support communication about performance and sharing results with sub-national levels of the health system

Data Elements

Across the activities contained in the use case, data is being collected, aggregated, and reported. This results in a set of data inputs (those data which are collected) and data outputs (the final data set that is reported). The solution must be designed to collect the right data inputs, support an accurate and timely aggregation process, and generate a complete and accurate set of data outputs, in a format that is readily consumable by NTD actors. The actors rely on the data set for decisions they must make, and to evaluate the effectiveness of the NTD program. Table 8.6 below lists the data inputs and outputs, based on the current state.

Table 8.6: Data Elements[24]

Data Inputs	Data Outputs
▸ MDA routine data, disaggregated to the district level	▸ Annual MDA plan ▸ JAP and TEMF ▸ NTD program evaluation
▸ Results of Data Quality Assessments	
▸ PC drug inventory, disaggregated to the district level	
▸ Morbidity data	
▸ Impact evaluation survey data and reports	

[24] These data inputs and outputs are based on the current state of NTD country programs. The solution can propose to modify the data inputs and/or outputs if it can be demonstrated to be in the best interest of completing the use case. Any changes must be made with the direct involvement and approval of the NTD country program.

Solution Success Criteria

Success criteria provide a means of evaluating a solution's ability to address the key challenges within the use case and define a measurable outcome against which the solution demonstrates success in addressing the key problems.

The success criteria for solutions associated with Use Case 8 include:

1. **Integration**: Solutions must be able to import or access data from disparate data sets that may be stored in different paper or electronic systems (e.g., routine MDA data, PC drug inventory data, morbidity data, impact evaluation surveys, non-NTD data sets that are relevant to NTD program management) to facilitate centralized access to these data and improved data use.
2. **Data Analysis and Visualization:** Solutions must enable users to quickly and effectively conduct analysis and data visualization to enhance data use and support decision-making.
3. **Data Quality:** Solutions must have the ability to measure data accuracy and comprehensiveness and track over time, with demonstrated improvement.

Solution Requirements

The solution requirements describe the high-level capabilities that a solution must have in order to support and be contextually aligned with all activities in the use case (compared to Table 8.5 within this document, which calls out the solution features required at the activity level). The following table represents the identified solution requirement categories, each aligned with one or more of the defined success criteria and taken from frameworks[25] developed for digital health solutions, to provide more detail, and speaks to the implications for solution design in the context of this use case.

Table 8.7: Solution Requirements

Requirement Category	Definition	Implication for Solution Design
Configuration / Customization	The ability to modify or change system components	▸ The solution should be delivered where the user should only have to configure profiles and user access, but no major configuration requirements needed. ▸ The system should allow the user to customize types of reports and setup of indicators without having to change the structure of the system. ▸ The solution should enable the NTD officer to customize M&E indicators they wish to review or need for the program. ▸ The solution should require minimal effort to customize for use in different country contexts (e.g., language,

[25] Digital Health Interventions Framework: http://apps.who.int/iris/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf;jsessionid=40F81F1B02A148133FA269CC6744C190?sequence=1; World Health Organization. UN Foundation. Johns Hopkins University Global mHealth Initiative mHealth MAPS toolkit: mHealth Assessment and Planning for Scale. 2015. [2016-10-19]. http://who.int/life-course/publications/mhealth-toolkit/en/

		the ability to configure or customize what data elements are captured).
Integration / Interoperability	The ability to allow two-way sharing of data with other data systems, platforms, or solutions (e.g., the national HMIS)	▶ The solution should have an interface that allows several different types of data to be integrated. ▶ The solution should keep various data sets with unique IDs, but one central data source for the reporting (e.g., data warehouse). ▶ The solution should maintain a record for the data over time, storing it in a centralized approach.
User-centered Interface	Prioritizing the needs and traits of the user for the design of the solution	▶ The solution must be designed to align with the capabilities, skills, responsibilities, and workflow of the national NTD team. ▶ The interface should be adaptable based on the requirements for the reporting (e.g., dashboards, report builder).
Data Validation Rules	Quality and format control of data being submitted in a systematic way	▶ The control of the input and aggregate level data should be strict either in the specification for the tally sheets or forms, and the aggregate numbers.
Portability	The durability and portability of a solution designed for field-based use	▶ The solution does not need to be portable, as it will be used in the NTD country program office.
Offline Capability	Ability to perform tasks (e.g., data collection, analysis, review) without Internet or cellular connection	▶ The solution will be a central data repository and system and will require Internet connectivity.
Maintenance and Support	Issues relating to solution upkeep and troubleshooting	▶ The solution should encompass a simple and effective support system for any issues generated by the system (e.g., IVR, phone line, text message support, USSD).
Deployment	The resources required to roll out and implement the solution	▶ The deployment for the digital analytics engine should be done with little hardware or additional devices (i.e., similar to the HIS).