How To Digitize Mass Drug Administration Campaigns for PC-NTDs Using ODK and XLSForms

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Objectives of document

The purpose of this document is to provide a practical how-to guide for Neglected Tropical Disease (NTD) programs considering digitizing mass drug administration (MDA) campaigns, with a particular emphasis on XLSForm or ODK-adjacent solutions.

The case for digitizing MDA campaigns

The transition from paper-based to electronic data capture and visualization represents a critical upgrade that can dramatically enhance mass drug administration MDA campaigns against PC-NTDs. Electronic data capture systems demonstrate significantly better data quality and efficiency compared to paper-based methods, with fewer errors, instant data submission, and easier handling, while real-time reporting platforms provide much greater visibility during campaign - allowing programs to identify areas falling behind target and investigate issues immediately while the campaign is still underway, significantly improving data quality, supervision capabilities, and reducing drug wastage. By eliminating transcription errors, enabling immediate data validation, providing dashboard visualizations for instant coverage analysis, and facilitating rapid response to implementation challenges, electronic data capture transforms MDA campaigns from reactive to proactive operations, ultimately maximizing population coverage and ensuring optimal resource utilization in the fight against neglected tropical diseases.

Introduction to the XLSForm and the ODK ecosystem

What is XLSForm?

XLSForm is a standardized form definition technology for creating data collection instruments in resource-constrained environments. The foundational Excel base transforms familiar spreadsheet formatting into sophisticated mobile data collection forms, creating a common form file that multiple digital platforms can leverage.

XLSForm operates on a simple yet powerful principle: form designers create their data collection instruments using standard Excel spreadsheets with specifically structured worksheets. The core structure includes a *survey* sheet that defines questions and their properties, a *choices* sheet that specifies multiple-choice options, and a *settings* sheet that configures form-level parameters like form title and submission URLs.

XLSForms in relation to ODK and other platforms

XLSForm was originally created within the ODK ecosystem at Columbia University's Sustainable Engineering Lab, making ODK the first major platform to adopt and popularize the standard. Over time however, the XLSForm and ODK ecosystem has spawned several other powerful platforms for mobile data collection based on this XLSform standardized form definition technology, each with distinct strengths and use cases. These include KoBoToolbox, SurveyCTO, CommCare, Ona, Enketo, and Survey123, among others. There are also toolkits and packages developed using XLSForm technology and its supporting platforms – ESPENCollect for example, is built on ODK.

This standardized approach means that a form created for one ODK-compatible platform can theoretically work across any other platform that supports the XLSForm specification. The form definition is platform-agnostic - it describes what data to collect, how to collect it, and what validation rules to apply, without being tied to any specific implementation or user interface. Going back to the ESPENCollect example, this means that the ESPENCollect infrastructure can used as-is through the ESPEN portla, or its XLSForms can be downloaded and installed on other MoH-owned XLSForm platforms.

When implementing an XLSForm, implementers will still need to decide which platform they will use to host and manage the deployment. Platform options are described in the Section “How to digitize a campaign using XLSForms, Phase 2” of this guidance document.

Are XLSForms the right fit for my campaign needs? Are there other tools I should consider?

For neglected tropical disease (NTD) programs implementing mass drug administration (MDA) campaigns, selecting the right data collection platform requires careful consideration of both immediate campaign needs and long-term health system integration goals.

Strategic Integration Considerations and Mainstreaming Opportunities

NTD programs should first explore whether MDA campaigns can be integrated into existing national health information systems. Many countries have established platforms through their Ministry of Health's Department of Information Systems, HMIS Units, Digital Health units, or equivalent bodies that manage routine health data collection and public health campaigns. Systems like the HMIS or eCHIS may already support campaign-style data collection for immunization drives, vector control activities, or other mass health interventions. Before implementing standalone solutions, NTD programs should engage with national health information system managers to assess whether MDA data collection can be incorporated into existing workflows and systems. This approach offers several advantages: leveraging established technical infrastructure, support systems and associated financing, ensuring NTD data flows into national health reporting mechanisms, maintaining consistency with other public health campaign approaches, and supporting long-term sustainability through government ownership. If existing systems can accommodate MDA-specific requirements, integration should be the preferred approach. The Integrated Campaign Digitization Toolkit published by WHO AFRO provides a comprehensive set of guidance for stakeholders interested in pursuing integrated, multipurpose digital solutions that benefit multiple programs and align with routine health information systems[1].

When Standalone Solutions Become Necessary, and Considerations for a Hybrid or Cutover Approach for Longer-term Integration

Many NTD programs find that existing national systems, while excellent for routine health data, may not be able to adequately support specific and time-sensitive requirements of an upcoming MDA campaign. Common limitations include inflexible form design processes, lengthy approval and deployment timelines, or insufficient human resource capacity to rapidly configure campaign-specific data collection tools. In these situations, XLSForm provides an ideal immediate solution.

Where ODK particularly excels compared to traditional health information systems is in its rapid form deployment capabilities. Deployment speed is critical for MDA campaigns, which often have narrow implementation windows. Because the XLSForm can be designed in Excel, this allows program staff to quickly create and modify complex data collection forms with skip logic, validation rules, and multimedia elements using familiar spreadsheet software and without extensive technical training. A new form can be designed, tested, and deployed within hours or days. Changes can be made rapidly between campaign rounds or adapted for different contexts without requiring database administrators or extensive system knowledge.

In contrast, systems like DHIS2 require more intensive metadata management and system configuration, alongside more planning, testing, and staged deployment processes. While DHIS2's comprehensive approach is excellent for routine health information systems, setting up new data

[1] World Health Organization. Regional Office for Africa. (2025). Integrated campaign digitization toolkit. World Health Organization. Regional Office for Africa. https://iris.who.int/handle/10665/380775. License: CC BY-NC-SA 3.0 IGO

collection instruments in DHIS2 typically requires deeper technical expertise and more time investment in configuring organizational units, data elements, and program rules. Ministry of Health-associated developers may also have competing priorities that do not permit them to dedicate the time and effort needed to properly digitize an MDA campaign.

Ultimately, NTD programs should ensure they have discussed both immediate and long-term needs and options with digital units in the MoH and align on an approach and roadmap. Rather than viewing XLSForms and existing health information systems as competing platforms, NTD programs can adopt a complementary approach.

- **Option1:** XLSForms are used a rapid temporary solution to meet immediate campaign digitization needs while broader health information systems are updated and enhanced to meet future MDA digitization needs.
- **Option 2**: XLSForms are used for data collection during campaigns and then later processed and imported into national health information systems for integration with broader health system reporting once the campaign is over.

How to digitize a campaign using XLSForms

This section of the document will summarize key points and best practices for digitizing a campaign using an XLSForm, providing guidance NTD programs in situations where an XLSForm represents the best or most immediately viable options.

Phase 1: Planning and Requirements Analysis

1.1 Identify Reporting Forms and Indicators for Digitization

Begin by conducting a comprehensive audit of all paper-based forms currently used in your MDA campaign. Categorize these forms by function:

- Distribution Forms: Community drug distributor (CDD) registers, household visit logs, individual treatment records
- Supply Chain Forms: Drug inventory tracking, requisition forms, stock transfer documents
- Stock Consumption Forms: Daily consumption reports, wastage tracking, expiry monitoring
- Supervision Forms: CDD performance checklists, quality assurance forms, adverse event reports

Then elaborate the indicators needed to support operational decisions during the campaign and map these indicators to the form data sources. Then, decide which data to digitize. Prioritize forms and indicators based on their impact on decision-making rather than trying to digitize everything. Data that directly influences resource allocation or campaign adjustments should take precedence. Avoid the temptation to collect "nice-to-have" data that doesn't directly inform

campaign management decisions, as this increases complexity without proportional benefit. Example of common high-priority indicators include:

- Real-time coverage rates by geographic area
- Drug consumption patterns and forecasting needs
- Adverse event frequencies and geographic clustering
- CDD performance metrics and support needs
- Population accessibility challenges requiring intervention

1.2 Map Data Collection Workflows and Actors

Create workflow diagrams that map each data collection process from initiation to final reporting. Identify all actors involved in the data flow, including Community Drug Distributors (CDDs), health facility supervisors, district health teams, regional coordinators, central program managers, data managers and analysts, and any other critical actors. For each workflow, document the timing requirements, data validation points, and decision triggers. This mapping exercise often reveals redundancies in paper data collection tools and opportunities for streamlining that can significantly improve campaign efficiency. Generalized workflows can be found in the *publication Improving data use for decision making by neglected tropical disease program teams: eight use cases*[2].

1.3 Select and Quantify Your Use Base

The volume of users often becomes the primary limiting factor for digitization scope, not only in terms of the number of devices needed but also additional resources needed for training (to ensure all users are comfortable with the digital tools), supervision and support structures (to ensure all users are properly using the tool and have access to support when facing challenges), and data review and response capacity (to ensure the volume of incoming digitized data can be reasonably digested and responded to).

Consider these approaches:

- **Household-Level Digitization**: Provides granular data with precise GPS coordinates for each household, enabling powerful spatial analysis and targeted follow-up. However, this approach requires devices and training for every CDD, significantly increasing resource requirements.
- **Aggregate Reporting**: Daily summary reporting by team and geographic area offers improved data resolution compared to traditional paper systems while managing resource intensity by only requiring supervisors to be equipped with devices. This intermediate approach can provide a balance of data quality and implementation feasibility.

[2] Grubin, L., Balachandran, L., Bartlett, S., Biritwum, N.-K., Brooker, S., Fleming, F., … Zoure, H. (2021). Improving data use for decision making by neglected tropical disease program teams: Eight use cases. Gates Open Research, 5, 153. https://doi.org/10.12688/gatesopenres.13407.1

- **Hybrid Approaches**: Consider digitizing different forms at different levels of granularity. For example, adverse event reporting might remain at household level for safety reasons (requiring some data transcribing later in the day by the CDD's supervisor), while routine distribution could use aggregate reporting from the CDD supervisor.

1.4 Define Device Requirements and Select a Procurement Strategy

Calculate device requirements based on your actor mapping, proposed digitized data workflows, and user base quantification as completed in 1.1-1.3. This will enable the quantification of mobile devices required for the selected digitized data collection and M&E processes. Consider the following factors:

- **Primary users**: Those who will directly input data (typically CDDs, supervisors)
- **Secondary users**: Those who need read-only access for supervision and monitoring
- **Backup requirements**: Additional devices to account for breakage, loss, or technical failures (typically 10-15% buffer)
- **Shared device scenarios**: Determine where devices can be shared among users without compromising data quality or timeliness

Three primary approaches exist for device acquisition:

- **Procurement Approach**: Purchasing dedicated devices provides maximum control over specifications, security settings, and lifecycle management. This approach works best for large-scale, multi-year programs where the investment in dedicated hardware can be amortized across multiple campaigns.
- **Ministry of Health Integration**: Leveraging existing MoH devices will typically reduce costs and improve sustainability. This approach requires careful planning and coordination to ensure device availability during campaign periods.
- **BYOD (Bring Your Own Device)**: Personal smartphone usage can dramatically reduce hardware costs. BYOD works best in contexts where smartphone penetration is high and users are comfortable with technology, though careful planning and coordination is needed to ensure device compatibility with the selected platform. There may also be additional considerations for data security and equitable access.

Whichever approach is selected, ensure the devices will meet the minimum specifications required by your selected platform (process described in Phase 2 below). XLSForm-based apps are typically lightweight and do not require significant RAM and advanced OS versions, but the exact minimum specifications will vary depending on the platform and version selected. Device planning and platform selection are interdependent processes: your platform choice should be informed based on the devices available in-country or the level of funding present for devices (for low end vs. high end devices, which will have very different storage and processing capabilities), and your device choice should be compatible with the specifications required by your platform and the complexity of your forms. Most digital public goods have published minimum device specifications that can be used as a reference, however the required specifications will also

depend on the complexity of the forms digitized (long dropdowns and complex skip logic or auto-calculation logic requires more RAM). When in doubt, secure a device to test on before committing to large-scale device choices.

Phase 2: Platform Selection and Setup

2.1 XLSForm Platform Selection

Evaluate XLSForm platform options based on your specific requirements and resource availability. A non-exhaustive snaptop of common XLS-compatible platforms is depicted below:

ODK (Open Data Kit)	A free, open-source suite of tools consisting of ODK Collect for mobile data collection and ODK Central, which is the official server component of the ODK ecosystem. ODK offers both free self-hosted deployment for organizations with technical capacity and a paid managed cloud option for those wanting professional hosting without infrastructure management.
KoBoToolbox	A free, open-source data collection platform specifically designed for humanitarian emergencies and challenging field environments, and is the most widely-used tool in humanitarian emergencies. KoBo consists of KoboCollect (mobile app based on ODK Collect) and KoboToolbox server with an integrated form builder that allows users to configure forms through a web-based interface in addition to an xls file. KoBo offers free hosting on their global servers for most global health entities, EU-based servers for GDPR compliance, and private server options for organizations with advanced data collection needs.
SurveyCTO	A commercial platform specializing in flexible and secure data collection with enterprise-grade security and compliance features, supporting both online and offline data collection across web and mobile devices. SurveyCTO consists of SurveyCTO Collect (mobile app) and a cloud-based server with advanced form building, data quality controls, and case management capabilities. SurveyCTO offers paid subscriptions only, with different tiers.
CommCare	A commercial platform that differs from traditional mobile data collection tools by specializing in case management that links forms together, allowing seamless tracking of subjects and analyzing changes over time. CommCare consists of CommCare mobile apps and a cloud-based server with sophisticated case management, workflow automation, and integration capabilities designed for frontline workers. CommCare offers paid subscriptions only, with different tiers.
Ona	A mobile data collection and data visualization platform that supports offline/online data collection on any device, with features for capturing GPS, photos, signatures, and complex form logic. Ona consists of mobile data collection capabilities (using ODK Collect or web forms) and a cloud-based server with advanced visualization tools and real-time data syncing. Ona offers both free personal accounts and paid organizational plans, with unique integrated apps including seamless Google Sheets integration for real-time data collaboration and advanced mapping and visualization capabilities.
Enketo	An open-source web application that renders XLSForms in web browsers, enabling form completion on any device with offline capabilities and serving as a web alternative to mobile apps. Enketo consists of web-based form rendering engines that can be embedded in other platforms or used as standalone applications. Enketo is free and open-source, available for self-hosting or through services that run Enketo, making it ideal for mixed-device environments or when app installation isn't feasible.
Survey123	Esri's smart form builder integrated with the ArcGIS platform, providing drag-and-drop form creation with advanced geographic data collection, analysis, and visualization capabilities. Survey123 consists of Survey123 mobile app, web designer, and Survey123 Connect (desktop form builder) all integrated with ArcGIS Online/Enterprise servers. Survey123 is part of ArcGIS subscriptions with user-type based pricing, targeting organizations requiring sophisticated

	geospatial analysis, smart mapping, and seamless integration with the broader ArcGIS ecosystem

2.1 Dashboard Platform Selection

Many XLSForm platforms only provide very basic visualization capabilities that are not suitable for robust campaign M&E monitoring, however, many of these platforms offer integrations with tools such as PowerBI, Tableau, ArcGIS, and Google Sheets/Looker Studio such that collected data can be pushed to these tools for advanced calculations and visualizations. Plan for real-time or near-real-time data synchronization to ensure dashboards reflect current campaign status for operational decision-making. Evaluate the built-in visualization capabilities of your selected platform, and plan to leverage external dashboard tools in many cases.

Phase 3: Development and Configuration

3.1 XLSForm Development

Design forms with the end-user experience as the primary consideration:

- Minimize data entry burden through smart defaults and calculated fields
- Use conditional logic to show only relevant questions
- Implement real-time validation to prevent data entry errors
- Optimize for small screen sizes and touch interfaces

For campaign targets such as population targeted by health area or village, data points can be incorporated either by using an XLSForm that users enter targets into, or by uploading denominators separately into analysis files used by the dashboard. There are many publicly available training resources for XLSForm configuration. XLSForm platforms such as ODK, CommCare, KoboToolbox, etc. also have many platform-specific manuals for guidance during configuration and set-up.

3.2 Dashboard Development

Build dashboards that support real-time decision-making during campaign implementation. Design distinct and action-oriented dashboards for different user types based on different decision-making needs.

- **Coverage indicators**: Real-time progress against targets by geographic area and demographic group
- **Resource monitoring**: Drug consumption rates and stock status by location
- **Quality indicators**: Data completeness, timeliness, and accuracy metrics
- **Alert systems**: Automated notifications for coverage gaps, stock-outs, or data quality issues

There are many publicly available training resources for external dashboard tools specific to the selected technology.

Phase 4: Testing and Refinement

4.1 Technical Testing

Once the forms and dashboard are drafted, thorough testing should be conducted. Testing should be designed to validate different aspects of the campaign:

1. **Pressure testing under realistic field conditions**
    a. **Connectivity testing:** Verify offline functionality and data synchronization in areas with poor network coverage
    b. **Volume testing:** Test system performance with realistic data volumes and concurrent users
    c. **Device compatibility:** Test across different device models and operating system versions
    d. **Battery optimization:** Assess power consumption and develop charging strategies for field conditions
2. **End user testing to validate the design of the tools and how fit-for-purpose they are.** Conduct user testing with representative end-users in realistic field environments. Common issues discovered during pressure testing include:
    a. **Form issues**: e.g. form length exceeding realistic completion times, complex skip logic causing user confusion, data validation rules that are too restrictive for field realities, incorrect user access permissions, missing selections in dropdown lists
    b. **Dashboard issues**: e.g. dashboards difficult to interpret, dashboard indicators not calculating correctly, sub-optimal legend colors, sub-optimal thresholds and alerts, visualizations not at an appropriate resolution or disaggregation for decision-making
    c. **Operationalization issues**: e.g. tools are poorly aligned with real-world workflow, additional training requirements are surfaced, synchronization expectations need to be adjusted

Phase 5: SOP Development

5.1 User Support Infrastructure (HelpDesk)

Establish multi-tiered HelpDesk support systems:

- **Level 1 Support:** Field supervisors trained to handle common technical issues and user questions. Provide job aids and quick reference materials.
- **Level 2 Support:** Technical specialists available via phone or messaging for complex issues. Include remote troubleshooting capabilities where possible.
- **Level 3 Support:** Platform administrators and developers for system-level issues. Establish clear escalation criteria and response time commitments.

5.2 Standard Operating Procedures (SOPs)

Develop detailed SOPs for each type of user. Include job aids and quick references such as troubleshooting flowcharts for common technical issues, contact information and escalation procedures, data-to-action charts, video tutorials, etc.

- **Community Drug Distributors**: Step-by-step procedures for form completion, data submission, basic troubleshooting, and accessing and interpreting built-in analytics. Include visual aids and local language translations where appropriate. Include escalation procedures for any technical issues encountered.
- **Supervisors and Campaign Managers:** Procedures for data review, quality assurance checks, and support provision to CDDs. Include escalation procedures for technical and data quality issues. Include extensive data review protocols – which dashboards are supervisors expected to review, at what frequency, and what decisions and actions are they expected to trigger in response to data.
- **Data Managers:** Technical procedures for system administration, data export, and analysis. Include backup and recovery procedures.

Phase 6: Training and Deployment

6.1 User Account and Device Setup and Distribution

Develop and document standardized asset management, user account, and device setup procedures including:

- **Asset tagging:** Unique identifiers for each device
- **User account setup:** Unique user credentials and appropriate permissions
- **Assignment tracking**: Clear records of device-to-user assignments
- **Application installation:** Automated installation where possible for the data collection apps, and any supporting apps.
- **Security configuration**: Screen locks, data encryption, and remote wipe capabilities
- **Backup and sync settings:** Automated data backup and synchronization configuration

Mobile Device Management solutions can help manage the bulk set-up and oversight of large volumes of devices. Resources such as Managing Devices at Scale published by Dimagi, and Managing Mobile Devices published by the University of Oslo provide more detailed guidance on device management specifically.

6.2 User Training

Design training programs emphasizing hands-on practice with realistic scenarios. Include training on the following components:

- **Basic Digital Literacy (as needed)**: For users new to smartphones or tablets, provide foundational training on device operation, not just application use.
- **Application-Specific Training**: Focus on workflows rather than just form completion. Include practice with error scenarios and recovery procedures.
- **Data Use Training:** Focus on interpreting dashboard outputs and how to link them to taking decisions and actions
- **Troubleshooting Skills**: Train users to handle common technical issues independently, and how to leverage the HelpDesk process.

Phase 7: Monitoring the System and Campaign Performance

Implement real-time monitoring of technical performance, user adoption and HelpDesk Operations to ensure the platform and its supporting infrastructure are functional, and that bottlenecks and challenges are being resolved.

- **System performance**: Track server response times, synchronization success rates, error frequencies
- **User engagement**: Track form submissions, synchronization frequencies, support request patterns
- **Data quality**: Track completeness, accuracy, and timeliness metrics with automated alerts
- **HelpDesk response time monitoring**: Track and report support request resolution times, identify common problems for training updates or system improvements, consolidate feedback on system usability

Ensure data review forums are active, regularly reviewing and interpreting data, and responding to issues surfaced through the incoming data. Commo issues that be identified and addressed through regular data review include:

- **Anticipating and preventing stock-outs**, based on distribution and consumption patterns
- **Improving data quality** through providing targeted supervision and/or feedback to specific teams
- **Adjusting team deployments** based on geographies or populations that remain unreached
- **Adjusting campaign scheduled and calendars,** for example by extending the campaign when falling short of coverage targets

Phase 8: End of Campaign Closeout

Following the conclusion of the MDA campaign, final data compilation and evaluation processes can commence. For the XLSForm system, ensure all data is backed up and stored for long-term retrieval and access. Consider how final data values and indicators can be imported into broader Ministry of Health systems such as the HMIS or Campaigns system. Gather feedback from end

users to improve the process going forward, assessing not only technical components but the broader operational processes as well. Finally, continue engagement with the MoH digital health units to discuss longer-term opportunities and synergies, such as transitioning MDA campaign management into a broader cross-program system.