

# **Mobile Data Collection and Reporting Across Multiple Developing African Countries**

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# Our Work Environment ...



# Agenda

- Project Characteristics and Requirements
- Acquisitions and configuration of tablets
- Data collection
  - Household Surveys
  - Household Listings (pre-survey)
- Use of ODK software and other capabilities on tablets
- Data reporting across multiple countries
- Capacity building with these technologies

# Project Characteristics & Requirements

- Research Areas
- Environment
- Software/Device
- Data Flow

# Project Characteristics & Requirements

## Research Areas



- 2 Key Projects:
  - FEEDBACK / FEED THE FUTURE with USAID
  - PHIA (Population Based HIV Impact Assessments) with ICAP (International Center for AIDS Care and Treatment Programs) and CDC
- International - mostly developing countries
- Over 300,000 households surveyed across 13 countries
- Planning for 100K's of surveys across 20 countries
- Utilize third party field staff with varying experience
- Considerations for in-country capacity building

# Project Characteristics & Requirements Environment

- Often data collection is performed in developing areas
  - Limited Infrastructure
    - Power Availability
    - Communications Infrastructure
    - Travel Difficulty
  - Rough Conditions
    - Unpaved Roads
    - Dusty Environments
    - High Humidity
  - Seasonal Conditions (e.g. rainy/monsoon season)

# Project Characteristics & Requirements

## Software/Device

### Software

- Government clients like Open Source solutions!
- International partners like Open Source solutions!
- Original Hope – Software with a quick learning curve, a low barrier to entry, and without a need for highly sophisticated developers

### Device

- Small, light-weight devices (tablets)
- Cost-effective devices (Android vs. Windows)



# Project Characteristics & Requirements

## Data Flow

Acquire tablets and ship to country

→ download data collection form from Westat

→ collect household data on tablets

→ transfer data to Westat

→ identify subsample for survey

→ download survey form with subsample data

→ collect survey data from subsample

→ transfer data to Westat

→ process, report, analyze data



# Tablet Acquisitions and Configurations



# Tablet Acquisitions and Configurations

- Going from paper to tablets
- FEEDBACK – 1,100 Google Nexus 7 Android tablets acquired between 2012 through 2013
- PHIA – 1,700 Google Nexus 9 Android Tablets acquired between 2015 through 2016 (model is now discontinued)
- Optimal configurations to:
  1. Maximize performance
  2. Increase battery life
  3. Avoid distractions/conflicting applications
  4. Simplify tablet use
  5. Standard the look, feel, and functionality across all tablets

# Data Collection

## (1) Household Listings and (2) Household Surveys



# Data Collection for Household Surveys

- Surveys in 13 African countries – Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Nepal, Rwanda, Senegal, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe
- Planning for surveys in more countries (Namibia, Cameroon, Ivory Coast, and maybe a few others)
- Length of some surveys are several hours
- Data used for a wide-range of assessments including rates of poverty, food expenditure levels, and HIV rates

# Data Collection for Household Listings

- Household Listings (pre-survey) for 300,000+ households
- PHIA – one of the 1<sup>st</sup> projects to ever use tablets for household listings in Central Africa
- Significantly lower cost/time on data cleaning
- Routing/skip patterns on tablet pretty much force the user to get good data

# Use of ODK Software on Tablets



# Use of ODK Software on Tablets

- Open Data Kit (ODK) is an Open Source mobile data collection tool
- Developed and primarily maintained by graduate students of the University of Washington
- Actively being used by academia and a number of international research projects
- Initially funded by Google Research Award
- Is Java based. All source code available for review and/or mod.
- Runs on Android mobile devices

# Use of ODK Software on Tablets

Functions ODK Supports Include:

- Instrument/form authoring
- Field data collection
- Transmission of collected data
- Centralized storage and management of data

Primary components of ODK

- ODK Build
- ODK Collect
- Aggregate Server



## Use of ODK Software on Tablets

- Operates in a disconnected mode
- Non-proprietary solution allows for capacity building
- Source code available for modification if specialized capabilities are needed
- Data are securely transmitted to Westat's hosting facilities.
- Use of tool by data collectors doesn't require specialized application skills
- Data can be extracted and used in a variety of forms

# ODK Capabilities

## Multi-Language and Multi-Selection For Data Capture

The screenshot displays the ODK Collect application on a mobile device. The interface is in Portuguese and shows a form titled 'MODULO G > MODULO G > Actividade (4:00 - 6:45)'. The instruction 'Select all that apply.' is visible. The form is structured with a grid of activities and time slots. The activities are listed on the left, and the time slots are listed at the top. The activities are grouped by language: (PRIMÁRIO) and (secundário). The activities are: A. Dormir e descansar, B. Comer e beber, and C. Cuidados Pessoais. The time slots are: 4 :15 :30 :45, 5 :15 :30 :45, and 6 :15 :30 :45. Each activity has a row of checkboxes corresponding to the time slots. The form is displayed in a multi-column layout, with the activities and time slots repeated across columns. At the bottom of the screen, there are navigation buttons: a back arrow, a home button, a recent apps button, and a menu button.

	4	:15	:30	:45	5	:15	:30	:45	6	:15	:30	:45
(PRIMÁRIO)												
A. Dormir e descansar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(secundário)												
A. Dormir e descansar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(PRIMÁRIO)												
B. Comer e beber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(secundário)												
B. Comer e beber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(PRIMÁRIO)												
C. Cuidados Pessoais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# ODK Capabilities

## Wide Range of Data/Image Types

- Text
- Numeric
- Calculations
- Select one / multiple
- Date / Time
- Barcode
- GPS
- Photo / Video / Audio Capture
- More...

The screenshot displays the ODK Collect application on a mobile device. The status bar at the top shows the time as 1:16. The app title 'ODK Collect' is visible. The survey path is 'Module C > MODULE C. HOUSEHOLD ROSTER AND DEMOGRAPHICS. > C02 - C04'. The current question is 'C02. What is [NAME] 's sex?' with three radio button options: 'Male', 'Female', and 'Refused'. Below this is question 'C03. What is [NAME] 's relationship to the primary respondent?' with a dropdown menu currently set to 'Primary respondent'. The next question is 'C04. What is [NAME] 's age?' with a subtext '(in years)\* (99 if refused)' and a text input field. A detailed note at the bottom explains that for children under 5 years of age, age in months will be screened and determined in Module I for feeding and anthropometry modules. The bottom of the screen shows navigation arrows and an Android-style home button.

ODK Collect

Module C > MODULE C. HOUSEHOLD ROSTER AND DEMOGRAPHICS. > C02 - C04

C02. What is [NAME] 's sex?

☐ Male

☐ Female

☐ Refused

C03. What is [NAME] 's relationship to the primary respondent?

Primary respondent

C04. What is [NAME] 's age?

(in years)\* (99 if refused)

\*Note, it is not necessary to collect age in months for children under 5 years of age. All children under 6 years of age will be screened and their age in months will be determined in Module I to identify those to whom the child feeding and anthropometry modules apply. All children identified as under 6 years of age in the household roster are screened to ensure those under 60 months are accurately captured for anthropometry and anemia, if applicable.

# ODK Capabilities

## Simple Data Entry & User-Friendly Interface

ODK Collect

Module 2 > MODULE 2. HOUSEHOLD ROSTER AND DEMOGRAPHICS (2) > Household Member

ID: 2

201. Household member name  
(Start with household head)

Member 2

ODK Collect

Module 2 > MODULE 2. HOUSEHOLD ROSTER AND DEMOGRAPHICS (2)

203. Member 2's sex

☐ Male

☒ Female

☐ Don't Know

☐ Refused

ODK Collect

Module 2 > MODULE 2. HOUSEHOLD ROSTER AND DEMOGRAPHICS (2)

Age in completed years

n 1 year; -8 for Don't Know; -9 for Refused

← →

1 2 3 4 5 6 7 8 9

# \$ % & \* - + (

~\| < > = : ; , . !

ABC / @ [ \ English (US)

→

1 2 3

4 5 6

7 8 9

\* 0 #

← →

↶ ↷

# Barcode Reading Within a Tablet Survey



# Barcode Reading Within a Tablet Survey

- Launch barcode app within ODK, and then return to ODK
- Used to read specimen labels
- A few challenges which required tablet upgrades (Google Nexus 7 → Google Nexus 9):
  - Lighting conditions
  - Quality of barcode reading
  - Ease of use

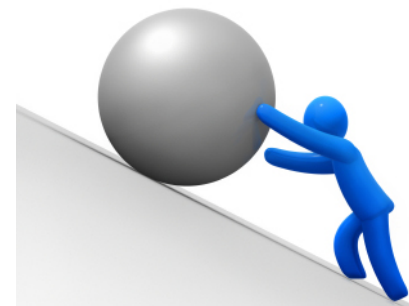
# ODK at Westat

## Staffing Skill Levels to Use ODK



- Junior Instrument Developers
- Senior Software Developers (Java skills are a plus!)
- Server Configuration & Security Management
- Field Teams – easy to use, low learning curve

## ODK at Westat Our Challenges



- No built in Case Management and Assignment
- Limited approach for Supervisor data review and QC
- Need for support of other project specific requirements
- More senior development than previously anticipated



# ODK at Westat

## Our Contributions to the ODK Community



- Significant feedback on server size limitations
- Passing data from one tablet to another (**NEW**)
- ACASI capabilities (**NEW**)
- Variety of feedback on advanced technical issues

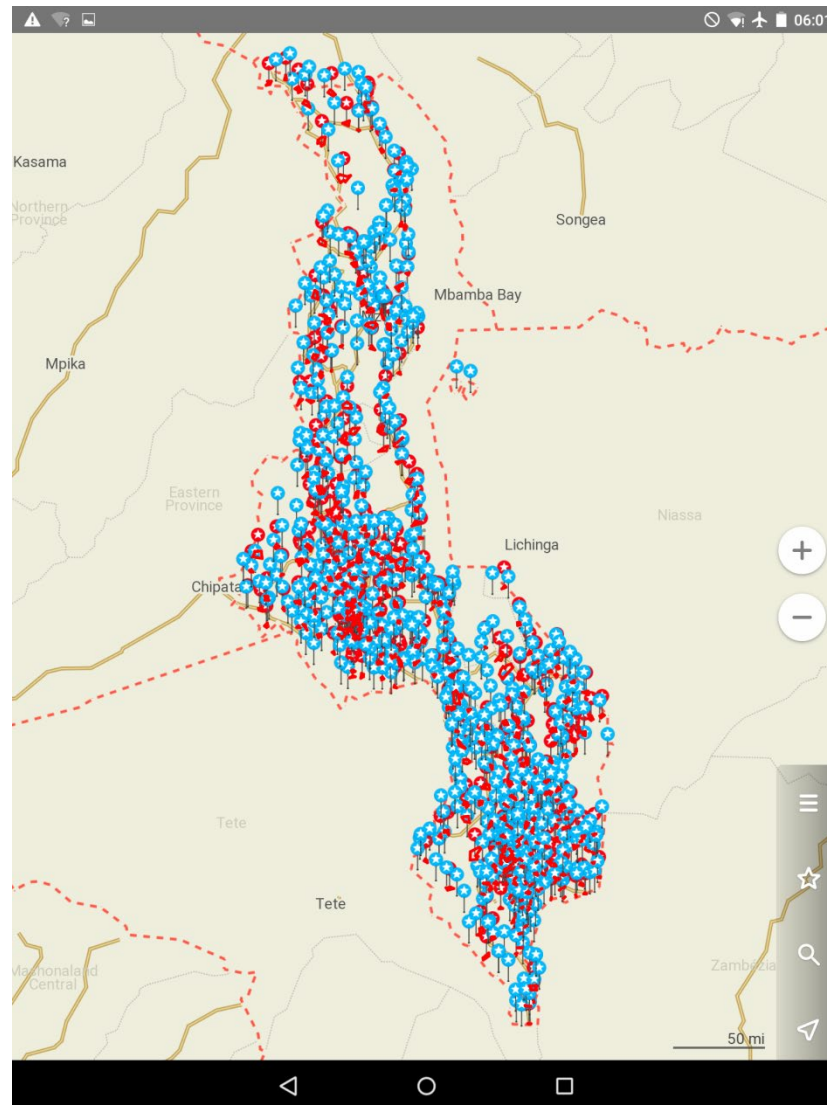
## ODK at Westat

### Thoughts on Overall Use

- Implementation of ODK surveys has been positive
- Unique needs should be identified early in the process
- Westat has stretched ODK to its limits in some ways
- Ease of use is highly dependent on complexity of survey

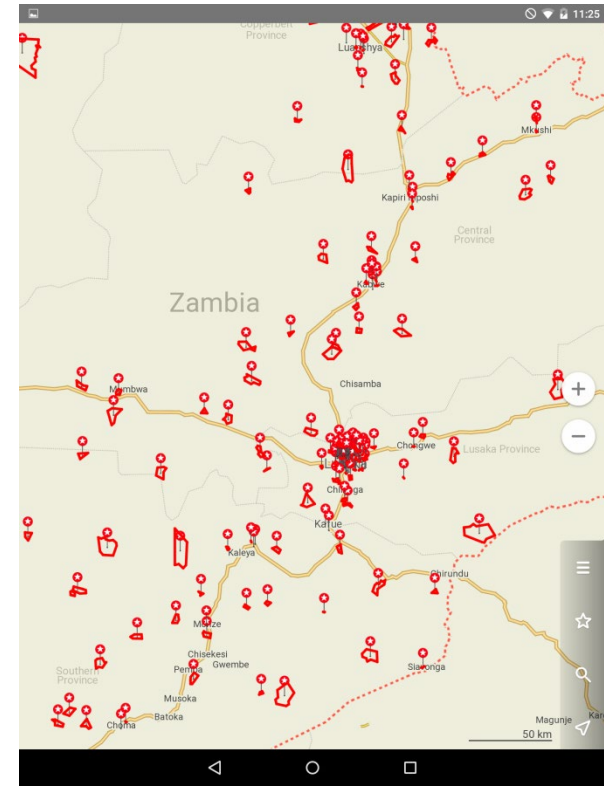
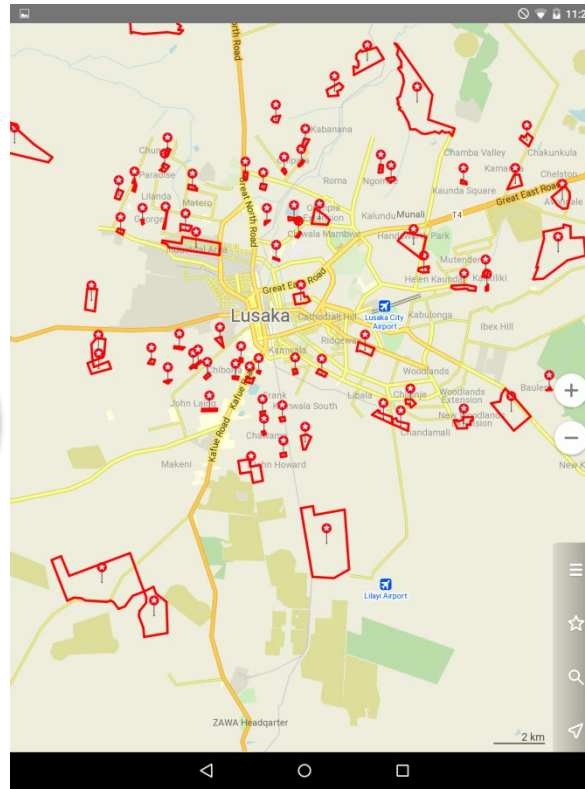
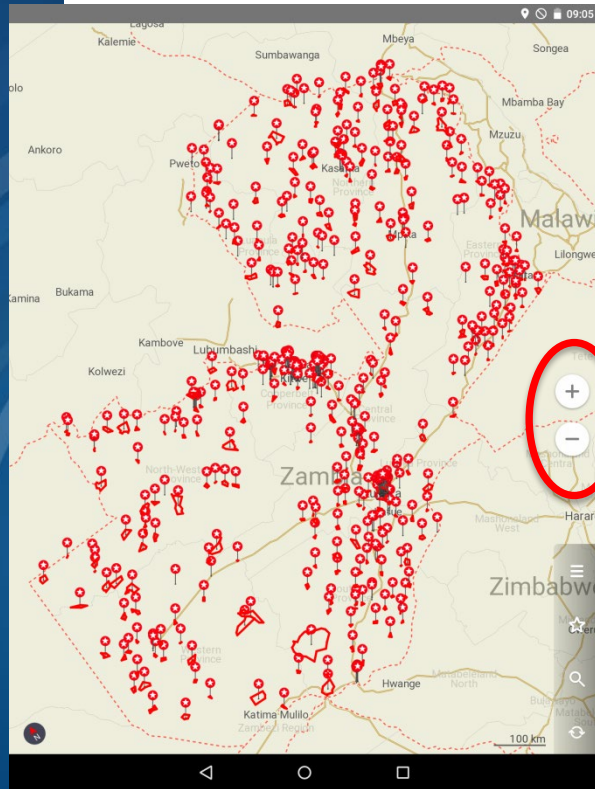
# Other Tablet Capabilities

## Use of Offline, GPS/Map Guidance on Tablets



# OTHER TABLET CAPABILITIES

## ZOOMING IN AND OUT OF THE MAP



You can (1) tap zoom buttons (+ or -) or you can (2) use your fingers to SWIPE in or out

## **Other Tablet Capabilities**

### **Use of Offline, GPS/Map Guidance on Tablets**

- MAPS.ME (MapsWithMe)
- Used to navigate to an Enumeration Area (EA) and visualize the surrounding location, such as EA boundaries and major streets or landmarks
- Household listing data added to maps
- Uses GPS capabilities
- Offline maps, don't need the internet

# Data Reporting Across Multiple Countries

- Each country only sees their own data
- Sponsors (CDC and USAID) see all data
- Dashboard uploaded daily for monitoring / management

The screenshot displays the Westat Automated Reports Portal. The header features the Westat logo and the text "Automated Reports Portal". Below the header, a green navigation bar contains "My Projects" and a user welcome message: "Welcome PHIA\_Super\_User [ Log Out ]". On the left, a sidebar menu under the "PHIA" heading lists countries: "All Countries", "Malawi" (highlighted), "Swaziland", "Tanzania", "Uganda", "Zambia", and "Zimbabwe". The main content area is titled "Malawi" and contains a list of reports:

- EA Line Listing
- Laboratory Process and Quality Measures
- Line List of HH Forms Not Received By EA
- Overall Recruitment and Response Rates
- Overall Recruitment and Response Rates By EA - Excel
- Overall Recruitment and Response Rates by Team
- Overall Recruitment and Response Rates by Team - Excel
- Recruitment vs. Target Graph
- Weekly Overall Response Rates by Sex and Age
- Weekly Recruitment and Response Rates
- Weekly Recruitment and Response Rates - Excel



# Data Reporting Across Multiple Countries

- Wide-range of metrics and indicator variables
- Data compared overall, by week, by team, and by lab

PHIA Monitoring Report: Lab Overall as of Week 26  
Survey Start Date: 10/18/2015; Run Date: 07/12/2016

		Lab Location					
	All	Lab A	Lab B	Lab C	Lab D	Lab E	Lab F
Specimen Handling							
Total number of tubes received	54105	2	408	1636	6056	1555	3928
Total number of PTIDs associated with tubes received	27463	1	213	829	3014	799	2005
Number of aliquots transported out of lab	140170	4	1133	4355	15946	4179	10462
Satellite lab to Central	140170	4	1133	4355	15946	4179	10462
For PTIDs with 10ml or 4 ml, % with 5-6 aliquots (plasma and DBS cards)	19832 ( 96.28% )	0 ( 0.00% )	160 ( 96.97% )	610 ( 94.87% )	2212 ( 95.72% )	584 ( 96.85% )	1465 ( 95.07% )
% of 10 ml tubes with 3-4 plasma aliquots	19856 ( 96.45% )	0 ( 0.00% )	160 ( 96.97% )	610 ( 94.87% )	2226 ( 96.49% )	584 ( 96.85% )	1465 ( 95.07% )
% of 4 ml tubes with 2 DBS cards	20514 ( 99.62% )	0 ( 0.00% )	165 ( 100.00% )	640 ( 99.69% )	2284 ( 98.92% )	600 ( 99.50% )	1528 ( 99.16% )
% of 6 ml tubes with 4 aliquots (2 plasma, 2 DBS)	5099 ( 93.03% )	1 ( 100.00% )	29 ( 96.67% )	140 ( 93.96% )	532 ( 91.57% )	138 ( 92.00% )	309 ( 88.54% )
% of 6 ml tubes with 2 plasma	5105 ( 93.14% )	1 ( 100.00% )	29 ( 96.67% )	140 ( 93.96% )	533 ( 91.74% )	138 ( 92.00% )	309 ( 88.54% )
% of 6 ml tubes with 2 DBS cards	5415 ( 98.80% )	1 ( 100.00% )	29 ( 96.67% )	147 ( 98.66% )	577 ( 99.31% )	147 ( 98.00% )	347 ( 99.43% )
% of 1 ml tubes with 2 DBS cards	666 ( 49.37% )	0 ( 0.00% )	12 ( 66.67% )	20 ( 52.63% )	45 ( 35.71% )	31 ( 68.89% )	66 ( 59.46% )
% of 1 ml tubes with 1 DBS cards	482 ( 35.73% )	0 ( 0.00% )	6 ( 33.33% )	14 ( 36.84% )	40 ( 31.75% )	13 ( 28.89% )	36 ( 32.43% )
# of plasma and/or DBS aliquots marked QNS	4062	0	15	149	526	111	312
# of plasma and/or DBS aliquots marked SNC (e.g., entry error)	1583	0	0	40	331	12	102
# of plasma and/or DBS aliquots unexpected condition codes (not SAT, SHV, QNS, SNC)	511	0	8	24	55	22	62
Total number of PTIDs with any comments	889	0	1	17	115	6	50
Number of PTIDs that took over 1 day from time of specimen collection to placement in freezer*	41	0	0	1	38	0	1
Number of PTIDs with frozen time not recorded	521	0	0	0	431	0	45
Number of PTIDs with <del>unstored</del> SAT/SHV specimens	10	0	0	0	2	0	5

# Capacity Building with These Technologies

- Active participation of in-country tablet configurations
- Training to manage tablets after we left the countries
- Training / working with in-country teams to review, reconcile, and resolve data issues



# Mobile Technology Advancements Summary

- Many challenging and exciting advancements going on
- Was a big effort to move from the standard use of paper to survey data collection on tablets (PROCESS)
- Getting data faster and resolving data issues faster! (ALSO PROCESS)

# Questions?

