INDEPTH Network
Better Health Information for Better Health Policy

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OpenHDS implementation in Manhiça HDSS: challenges, achievements and lessons learned.

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Outline

- Background
- Reason for implementation OpenHDS in Manhica
- Manhica HDSS study area
- Implementation of OpenHDS in Manhica
- Conclusion
- Acknowledgment

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Background

- The Manhica HDSS was established in 1996 and all demographic histories of individuals and household characteristics were collected on paper based forms.

- The demographic data were stored on a relational database based on the Household Registration System (HRS) version 1 implemented in Microsoft Visual FoxPro v5.

- In 2011, a new paper-free system based in PDAs (Cogent Mobile Ident 3) was deployed.
  - ➢ Why?
  - The amount of paper forms used were enormous (storage room, mainteinance)
  - Time consuming (data entry process)
  - Lack of data validation and consistence in the field (eg. Migration reconciliation)

- This application was developed using Microsoft Visual Basic .NET forms and a SQLite database, and feeding a central data warehouse based in MySQL version 5.1.

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Background

- The paper-free system (baptized Vutisela) was developed by South African company called Inathi.

- The system had limitations including the following:
  - ➢ The difficult maintenance of the PDA devices
  - ➢ Impossibility of error corrections and perform any software updates due to lack of support by the developers.

- OpenHDS (Open Health and Demographic Surveillance System) was choice to replace Vutisela.

Why OpenHDS was chosen to be implemented in Manhica?

- Only advanced system that was developed for HDSS.
- Free and open-source client-server application designed for HDSS purpose.
- Electronic system that can be implemented using Smartphone's or tablets devices as the client side of the system with the help of the tool ODK(Open Data Kit).
- Customizable system that can answer our local needs.
- Local experiences on using ODK Tools for studies on our site
- Access of technical support and implemented in some sites within INDEPTH sites.

The Manhica HDSS study area

	Before 2015	From 2015
Area (km²)	500	2,380
Households	20,120	37,500
Population	95,000	165,000

Rounds

- Once a year : all households
- Household and members information

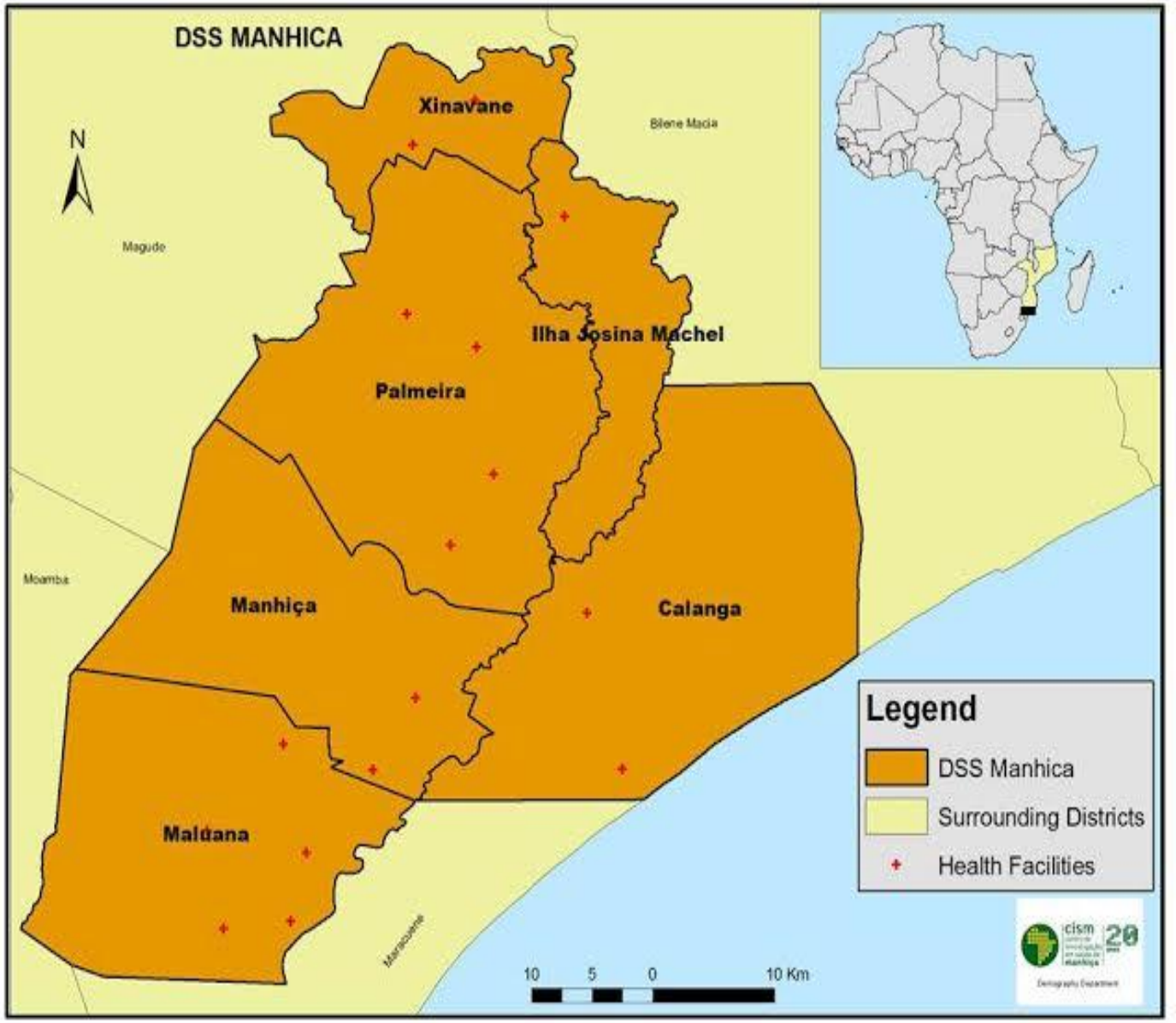
Key informants

- Weekly visits
  - General information

Health facilities

- Daily visits:
  - Pregnancy identification
  - Pregnancy outcomes
  - Death

Database



Implementation of OpenHDS in Manhica

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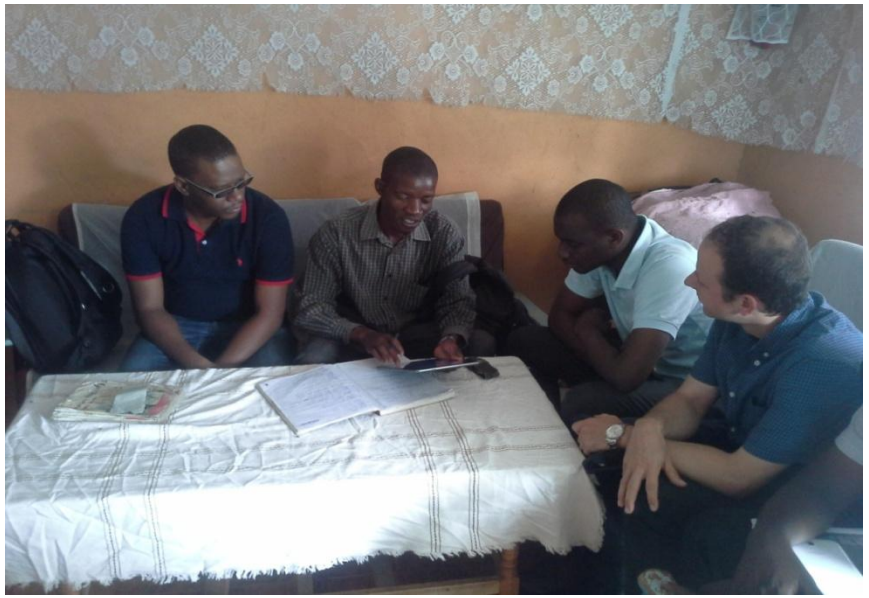
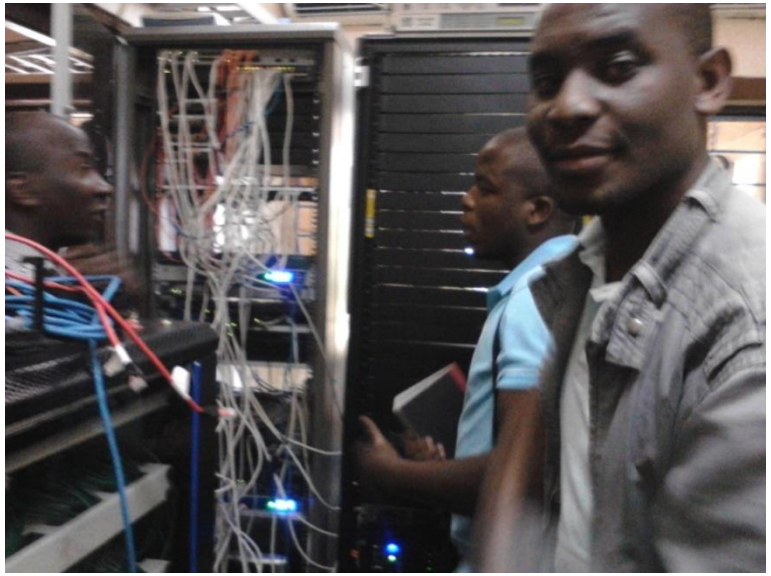
System requirements: Feasibility and hardware

- Exploratory contacts with SwissTPH to establish a collaboration
- Recruitment of technical staff to implement the system
- Understand the OpenHDS and the needs for implementation in Manhica:
  - A visit to Rusinga HDSS in Kenya were OpenHDS was implemented by SwissTPH to understand the requirements of systems infrastructures, hardware and documentation.
- Collaboration with the SwissTPH to understand OpenHDS code due to the lack of documentation at the time and requirements for Data migration.

Visit to Rusinga HDSS in Kenya





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System customization and development of forms

- Customize the system to our local context:
  - ✓Translate the application to Portuguese
  - ✓Increase one more Location Hierarchy Level to 6 (Country, Province, District, Administrative Post, Locality and Neighborhood)
  - ✓Integrate the traditional ids (individuals, households) with OpenHDS standard ids(extId's).
    - Traditional Household Number: **3270-192**
    - OpenHDS Standard Id for a Household Location: **CIB000192**
  - ✓Development of extra forms (immunization, malaria survey, household assets, etc) and customization internal forms.

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Data migration

- Amount of Data to migrate:
  - 18 years of events history
  - 49.000 households
  - 260.000 individuals (residents, deaths and out migrated)
- Challenges:
  - Different Database Structures between Vutisela and OpenHDS
  - Data consistency (some errors on events sequences)
  - Limited time to correct errors and migrate data (only 2 months)
- Solutions:
  - We have chosen to just migrate members and household information including last known residency status and death.
  - Migration and fertility data will be migrated after the current data collection round

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System Setup

- On Server:
  - MySQL Server Database (v5.5)
  - GNU/Linux Server (Ubuntu 14.04).
  - ODK Aggreate (v1.4.4).
  - Mirth Connect 3.1.1
  - For security reasons all connections to the server are through HTTPS.
- On Tablets:
  - 7 inch Tablets based on Android version 4.4.2
  - A Costumized OpenHDS Tablet Application
  - ODK Collect 1.4.4
  - GPS Status Application – To facilitate GPS Coordinates capture
- 3G Mobile Routers for remote access to the servers using Internet

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Human resources and training

- We quickly trained 24 field workers including 6 supervisors.
- Field operations manuals that include tablet and data collection system procedures were developed.

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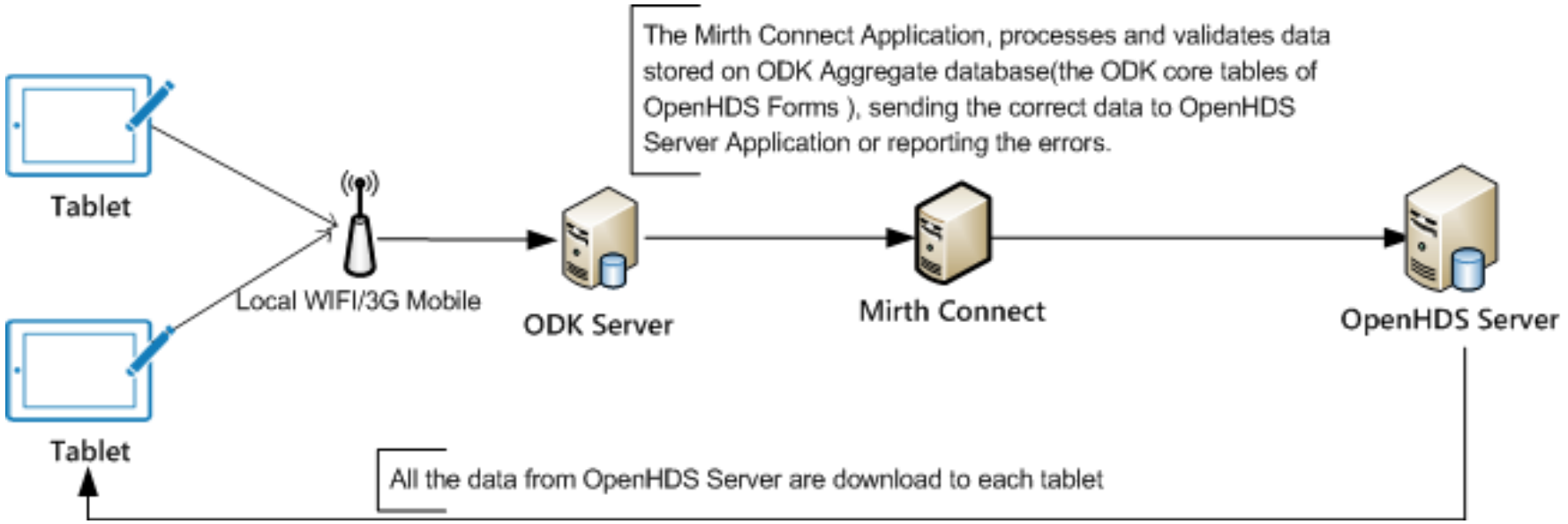
Synchronization and data cleaning

- To transfer the collected data and synchronize with the server we use:
  - Wi-Fi connections on headquarters office (direct server access)
  - 3G Mobile Router for remote access (far from headquarters, via Internet)
- The data is *uploaded* every week and the synchronization is made every 15 days. (*Friday – To upload, Monday - synchronize/download data*)



Synchronization and data cleaning

- The Mirth App processes the data and sent to OpenHDS to be validated
  - The successfully validated data are stored on OpenHDS Database
  - For the rejected data, logs a generated with the errors description
  - Data managers clean those errors and re-sent to Mirth

- Challenges:
  - Time for the Data managers team to clean errors
  - Crash of Mirth App caused by uploads of large amount of data

- Solution:
  - Reasonable staff to handle errors to avoid stopping field data collection
  - Improvement of Mirth internal MySQL queries to process the data in small pieces.

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Conclusion

- Institutional commitment and financial resources is crucial for implementation of this application.

- OpenHDS or other electronic data capture based on tablets is feasible in rural settings such as Manhiça HDSS but issues like connectivity and power-source must be considered.

- Good planning, especially for hardware acquisition, timelines and data migration is crucial.

- Hiring appropriate human resources to implement this application must be considered carefully due to its complexity.

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