Rapid reporting technologies: The architecture and getting started

Surveillance and Response Working Group Meeting
Olivier Celhay, MORU
October 18-21, 2016
Motivation: Improved Surveillance for Malaria Elimination

Elimination requires surveillance data:

- At the individual level
- In good time
- Incorporating geographical dim.
- Good quality
- Comprehensive
Motivation: Learn on technology

The same technology can be used for:

• Communication & Training
• Disease Management & Compliance (reminder for patients to take treatments)
• Conducting surveys
  – Active Case Detection
  – Foci investigation
Preparation work

- Learn on existing Research
- Document existing Information Systems
- Develop partnerships with Private Sector
- Understand the Human Resources needed
- What data? Where Geographically? What levels? What frequency?
- How?
Research

• Most research on technology for surveillance still focus on pilot projects as opposed to scaled-up projects

• Network
  – Other programmes (HIV, TB, ...)
  – APMEN countries & beyond

• Literature & Blogs
  – Michael Trucano: three blog posts looking at the use of mobile phones in data collection efforts
Information Systems

To ensure data reconciliation, the project should use standards promoted by the MoH/Gvt esp. same coding for all the geographical places.

Need regularly updated Health Facility Registry

– If none exist, advocate for the creation of one
– Possibly expand the registry to include Malaria CHWs
Partnership with Private Sector

• Potential to interest private partners
• Mining companies
• Pharmacies & clinics
• Telecom operators can provide for a limited time free use of SMS/Data.
  – Payment via mobile solutions
  – Information on network coverage
Human Resources (National)

- Data manager familiar with both MoH & Malaria’s IS
- Trained staff for day-to-day operations (update registries, check completeness, follow-up reporting, manually correct entry errors...)
- (Finance officer)
- Manager at the State/Province/District
- Motivated & trained staff/volunteer
- Experienced programme manager to lead the project
What data to collect?

What are the high level goals of the data collection effort being considered?

Collecting **individual-based** data : 8 questions to each patient will help cover many recommended indicators.
What data to collect?

• Partner Consultation
  – All units within the NMCP (including epidemiologists, logisticians, entomologists)
  – Other: MoH, implementing partners, researchers, donors...

• All data collected should be useful
  1. To guide quick action
  2. To inform medium/long-term decision making
  3. (For reporting)
Where to collect data?

Clear geographical target area following established administrative boundaries and possibly based on endemicity.

- If high-endemicity, balance costs/benefits
- **Medium-endemicity (recommended)**
- If low-endemicity, is it the best method?
At what level(s)?

When possible, be fully comprehensive.
Provincial, District Hospitals staff; Pharmacies & clinics owners; Health centre staff; CHWs?

1. Staff capacity
2. Access to network
3. Potential workload: (Min/Average/Max) number of patients tested/positive per week per health facility
At what frequency?

– Real-time (recommended)
– Daily
– Weekly (recommended)
– Bi-weekly
– Monthly

Mandatory zero-reporting!
Case study: Finam
RRTs for Malaria Control & Elimination in Finam

About Finam

Finam is an Asian country, famous for the traditional folk dances, beautiful mountainous areas in the North and a modern school of mathematicians. Finam is the second most gold producing country. The largest gold mining company uses modern robotised extraction processes. The supply of electricity in the capital and along the Southern coast is often interrupted during the rainy season when typhoons are frequent.

Finam population is of 45,263,000 inhabitants according to the census conducted in 2016. Seventy percent of the population in Finam speaks Finamish language and the remaining use the second official language which is based on a unique, original script.

Finam classifies as upper middle income country.

HIV prevalence in Finam has declined remarkably in recent years and the National Aids Control Program has been praised for their innovative use of technologies to provide better access to treatment.
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How?

• Choose a **Technology** = a data collection method
• Choose a **Platform** = an implementation of the technology
• An **Implementing Partner** = to provide technical and/or logistical support
• Choose appropriate solution for **devices & server**
• Proceed to design the **workflow** = sequence of actions from data collection to data use & dissemination
• **Design SOPs** to support the workflow & **train**
Choosing a Technology

- Structured SMS
- Interactive SMS
- Voice Data Collection
- Mobile Platform App
- Webform

Typically basic mobile phone
No internet

Smartphone or PC,
Internet connection
Structured SMS

<table>
<thead>
<tr>
<th>Form name</th>
<th>Patients Tested</th>
<th>Treated</th>
<th>Confirmed Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSGMAL #10 #2 #1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Maximise information in one unique SMS (160 characters, low cost)
- No “user interface” and prone to errors

Adapted for situations requiring the sending of simple, aggregate data.
Interactive SMS

Great. First, can you please reply with your age in years? (reply with a number between 18 and 100)

Sorry, your answer must be between 18 and 100. Please try again.

Thanks. Now, please rate your satisfaction with your visit by replying with a number from 1-5 (1 = very satisfied and 5 = not at all satisfied).

Branching & unlimited questions

Difficult to go beyond sending numbers; cost of multiple SMS; language limitations?

Ideal for situations of emergency as requires limited training.
Voice Data Collection

“Hi. I’d like to ask you some questions about the service you recently received at our facility. Please press 1 to continue to the questions, or just hang up if you do not wish to answer the questions.”

- [ ] Works with illiterate or less literate population
- [x] Direct, human to human call more suitable?
Mobile App/Web App

- Rich interface: photos, videos, multiple language, conditional lists, GPS coordinates...
- Require smartphone, access to internet at one point & training required

Most flexible solution!
<table>
<thead>
<tr>
<th>Data Complexity</th>
<th>Type of phone</th>
<th>Internet (EDGE/3G/4G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured SMS</td>
<td>Simple</td>
<td>Low specs</td>
</tr>
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<td>Interactive SMS</td>
<td>Medium</td>
<td>Low specs</td>
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<tr>
<td>Voice Data Collection</td>
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<td>Low specs</td>
</tr>
<tr>
<td>Mobile App</td>
<td>Complex</td>
<td>Smartphone</td>
</tr>
<tr>
<td>Webform</td>
<td>Complex</td>
<td>Smartphone or PC</td>
</tr>
</tbody>
</table>
Selecting a Platform

The same technology can be implemented on different platforms

• Additional functionalities: send reminders, provide feedback

• Open Source or proprietary; exotic or mainstream; one-use or recyclable

• Acquisition and maintenance costs

• Locked from data collection to data visualisation or genuinely open

dhis2
Open Data Kit
CommCare
epi info
magpi
Platforms

- DHIS 2 SMS
- DHIS 2 Android App
- Epi Info
- Open Data Kit (ODK)
  - ODK Collect
  - CommCare
  - KoBoToolBox
- RapidPro
- Magpi (NOT Open Source)
- ...

Implementing Partners

- Self-implementation
- iNGO & local NGO
- Consultancies companies
  - BAO Systems, HISP: DHIS2
  - Magpi: Magpi solutions
  - Dimagi: CommCare
  - Kobo: KoBoToolBox
  - ONA.io: ODK, RapidPro
  - ...

Long term goal run: sustain at minima
Devices

Are people already using devices?

• Low-specs phone, smartphone, tablet?
• Which operating system?
• Features: GPS, size screen, camera, battery life, processor speed.
• How many do you need? (plan replacements)
• Recommended: good quality, military-type protection
The server is a computer that will receive and store submissions and respond to requests for data. There are several options possible:

<table>
<thead>
<tr>
<th>Option</th>
<th>Requirements</th>
</tr>
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</table>
| (1) Internal hosting within the Ministry of Health | • Human capacity for server administration and operation.  
• Reliable solutions for automated backups, including local off-server and remote backup.  
• Stable connectivity and high network bandwidth  
• Stable power supply  
• Secure environment for the physical server regarding issues such as access, theft and fire.  
• Feasible, powerful and robust hardware. |
| (2) Hosting within a government data centre | • Company selected is reliable.  
• Data is encrypted |
Workflow design

• After pre-selection of technology + platform + IP, reassess: what data, where to collect, at what level, at what frequency?

• Develop the App: user-centred design,
  – do not listen to your users, observe them!
  – same order as in the paper-form

• Prioritise dissemination of results (online dashboard, local Line groups, phone calls)

• Create as simple as possible workflow (e.g. China’s intuitive 3/5/7 framework)

• Budget adequate for the long-term?
Common Challenges

• Duplicated reports ➔ manual data reconciliation
• Irregular reporting, no reporting
  ➔ Follow-up with a phone call
  ➔ Rapid replacement of a broken/lost device
  ➔ Incentive provided in time?
  ➔ Refresher training
• Lack of data use
  ➔ establish weekly follow-up meetings
  ➔ collect additional data
  ➔ develop/upgrade to an interactive dashboard
Case study: Finam
National Malaria Control Program

Every two years, a large Active Case Detection survey is conducted. Data from this survey is combined with Passive Case Detection data to update the map of malaria risk, and the training of new CHWs wherever required.

In the central districts of the country, the situation is moderately endemic with a stable API between 1 and 5 per 1,000. There are occasional outbreaks following hard to predict patterns. The treatment and detection of malaria cases in these districts is mainly through health centres and district hospitals but 20% of malaria cases are detected by CHWs.

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<th>Mobile/Internet access</th>
<th>Health Access</th>
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<td>High</td>
<td>Poor</td>
<td>Mainly CHWs</td>
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<td><strong>45 Central Districts</strong></td>
<td>Medium</td>
<td>Good</td>
<td>Health Centres and district hospitals, CHWs</td>
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<td><strong>76 Southern Districts</strong></td>
<td>10 districts malaria-free. Otherwise Low</td>
<td>Very Good</td>
<td>Provincial and national hospitals. Private clinics.</td>
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Project: Application in central Finam

The project will target central districts and use the MoH recent mapping of all 240 health centres & district hospitals in central Finam. During the dry season, a survey has shown that 70% of malaria staff & volunteers in central districts own a smartphone (55% Android; 15% Apple iOS) and 25% own a low-spec phone and that 3G connectivity is reliable.

It has been decided to pilot a Mobile App. Tablets are provided to all health centres staff. The program will use a server externally hosted and maintained and a questionnaire has been drafted where you can select the language and then enter the following information for each patient:

- Name, Age, Sex of the patient
- Checkbox: [ ] Test by RDT; [ ] Test by Microscopy
- Checkbox: [ ] Negative result; [ ] Pf case; [ ] Pv case
  - how many time the patient been diagnosed in the last 6 months
The project will target central districts and use the MoH recent mapping of all 240 health centres & district hospitals in central Finam. (Mapping of CHWs?)

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• **Name**, Age, Sex of the patient
• **Local/Imported**
• Checkbox: [ ] Test by RDT; [ ] Test by Microscopy
• Checkbox: [ ] Negative result; [ ] Pf case; [ ] Pv case
  — how many time the patient been diagnosed in the last 6 months [ ]
• **Treatment**
• **Does the patient understand that sleeping under an ITN will decrease the risk of malaria?**
The Open Data Kit platform

- Set of Open Source tools to manage mobile data collection
- Free – funded by a Google Focused Research Award
- Used in the ISS
- Deployed and used in various settings: https://opendatakit.org/about/deployments/
Build a data collection form within Excel

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>name</td>
<td>label: thai, hint: thai, media: image</td>
</tr>
<tr>
<td>note</td>
<td>introduction_note</td>
<td>Malaria Verboice Questionnaire</td>
</tr>
<tr>
<td>begin group</td>
<td>household</td>
<td></td>
</tr>
<tr>
<td>text</td>
<td>village_number</td>
<td>Village Number</td>
</tr>
<tr>
<td>text</td>
<td>hh_number</td>
<td>Household Number</td>
</tr>
<tr>
<td>text</td>
<td>initial_name_head_hh</td>
<td>Initial of Head of household’s name</td>
</tr>
<tr>
<td>select_one yes_no</td>
<td>community_leader</td>
<td>Is it the household of the community leader:</td>
</tr>
<tr>
<td>select_one area</td>
<td>area</td>
<td></td>
</tr>
<tr>
<td>integer</td>
<td>address_nb</td>
<td>Address number:</td>
</tr>
<tr>
<td>text</td>
<td>village_cluster</td>
<td>Village/Cluster:</td>
</tr>
<tr>
<td>text</td>
<td>phone</td>
<td>Home phone/Mobile phone:</td>
</tr>
<tr>
<td>end group</td>
<td>household</td>
<td></td>
</tr>
<tr>
<td>date</td>
<td>date_visit_1</td>
<td>Date of the visit #1:</td>
</tr>
<tr>
<td>text</td>
<td>name_interviewer_1</td>
<td>Interviewer’s name visit #1:</td>
</tr>
<tr>
<td>text</td>
<td>code_interviewer_1</td>
<td>Interviewer’s code visit #1:</td>
</tr>
<tr>
<td>select_one result</td>
<td>result_visit_1</td>
<td>Result of the Visit #1:</td>
</tr>
<tr>
<td>text</td>
<td>not_complete_1</td>
<td>Other, specify for visit #1:</td>
</tr>
<tr>
<td>date</td>
<td>date_next_planned_visit_1</td>
<td>Next Planned Visit</td>
</tr>
<tr>
<td>integer</td>
<td>members_hh</td>
<td>Total number of members in household:</td>
</tr>
<tr>
<td>note</td>
<td>section1_note</td>
<td>Section 1: Household Malaria Knowledge and Awareness</td>
</tr>
<tr>
<td>select_multiple health_issues</td>
<td>health_issues</td>
<td>What are the main health issues affecting most people in this area?</td>
</tr>
<tr>
<td>select_multiple top_sickness</td>
<td>top_sickness</td>
<td>If someone has fever, what are the top three sickness that you think he/she might suffer from?</td>
</tr>
</tbody>
</table>

http://xlsform.org
XLS2XFoma tool: allow conversion of an Excel file to an ODK form
Install ODK Collect on Android device
Data collection with mobile device

- Intuitive interface
- Support images and videos
- Multi-language
- GPS collection (depend on device)
- Image collection (depend on device)
- Allow conditional branching
- Do not need internet access during data entry
- Easy backup
Data collection with web browser

Do not need internet access during data entry
Server & Data upload

- www.ONA.io is offering different free and paid server plans.
- Once connected to internet, upload data for storage and sharing.
Data Analysis & Dissemination

• Limited data visualisation tools provided by ONA.io (better with other platforms)

• In Lao PDR, ODK is used to collect stock on hand data and two custom solutions for showing data:
  – Simple Dashboard in Excel
  – Advanced Dashboard with R/Shiny
  – Bi-weekly feedback by email
Thank You!

Plasmodium GO!