Computing and Global Health
Lecture 3
Last mile data collection and Tracking

Winter 2015
Richard Anderson
Today’s topics

• Readings and assignments
  – Cold chain assignment review
• HISP Case study – Ghana
• Last mile data reporting
• Tracking vs. Surveillance
• Electronic Registers
  – Challenges
Readings and Assignments

• Homework 2
  – Requirements for aggregating facility reports

• Readings
  – DHIS2 Tracker, Saugene
    • Generic Software Systems
  – Child Health Information Services
  – Biometrics papers

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<th>Date</th>
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Assignment 3

- DHIS2 Assignment

Questions to fahadp@cs

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Cold chain data reporting

• Distribution of countries
• Burden of Disease
• Cold chain reporting
  – Design a system for reporting ‘up time’ of all refrigerators
    • National surveillance problem
    • Indicator was identified
    • Challenges in getting data, transmitting data, interpreting data
Cold chain data reporting

• Automated reporting linked to server
  – Real time temperature monitoring
• Reporting on temperature loggers
• Reporting of status in monthly report
• Link to existing structures
  – Monthly immunization reporting
  – Refrigerator repair
  – District immunization management
Surveillance summary

• Aggregate data to evaluate the strength of the health system or to meet external requirements
• Indicators
• Data challenges
• Integrated vs. Parallel reporting
• DHIS2
HISP Case Study

- Ghana
Health Information Systems

• Challenges
  – Collection of irrelevant data
  – Poor data quality
  – Poor timeliness of reporting
  – Parallel and duplicate data collection
  – Low information usage and poor feedback

• Donor driven reporting
  – Lack of requested data elements in national reporting
  – Development of parallel reporting systems
DHIMS

- 2007: Roll out of District Health Information Management System
- 2008: Health Metrics Network (HMN), framework for integrated HIS
- 2011: Implementation of DHIMS2 in DHIS2
DHIMS2 vs. DHIMS

• Centralization of expertise
  – Greater expertise needed, but can be centralize
• Improved data flow and reporting speed
• Increased access to information
  – No longer restricted to a local database
• Consistent national deployment
  – Avoid inconsistent development in different areas
• Substantial capacity development
Why Open Source?

- OpenMRS
- Open Data Kit
- DHIS2
- Open LMIS
- ...

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Last mile data reporting

• Collecting data from health facilities
• Issues
  – Limits on infrastructure
  – Technical background of data reporters
  – Incentives of data reporters
  – Ownership of technology
  – Model for data collecting
Internet

• Must be considered as an option
• Challenges of maintaining a computer at remote sites
• Need to support online/offline data entry
Feature phone

- Java phones to run applications
- Interest in the technology has declined
- Projects generally targeted a small range of models as portability of applications a challenge
- Feature phones retain some market share as multimedia phones
- Series of mobile phone applications based on XForms
Smart phone / ODK

• Growing interest in utilizing Smart Phones
• Cost and programmability drive interest in Android
• Open Data Kit
  – University of Washington developed system for data collection on mobile phones
  – Forms based application running on Phone
  – Back end system for aggregating submissions
  – Goal to make it easy for organizations to deploy survey tools on smart phones
    • Example: IHME deployment of verbal autopsy tool
  – Common approach, collect data on a tablet, and sync data by wifi when back in the office
SMS

• Data submission by raw text messages, interpreted by server
• In many cases, it can be assumed everyone has access to an SMS phone
• Challenges if a large amount of data is required
SMS Wheel

• Attempt to simplify SMS reporting by giving a job aid to convert data into a numeric code with a checksum
Paper to Digital

- Scan paper forms
- Allows entry on paper (which is easier)
- Reduces manual entry
- More later . . .
Device ownership

- Personally owned versus provided devices
- Computers – generally facility devices
- Mobile phones
  - Personal
    - Cheaper to the project
    - Incentives to keep charged
    - Heterogeneous
    - Must support lowest common denominator
  - Provided
    - Can be costly
    - Substantial effort to manage
    - Security risks
    - Training
    - Allow uniform deployment environment
    - Can be a mismatch with target users
    - Potential for cross project utilization
Who collects the data

- Health workers
- Dedicated data collectors
- Derived or automatically collected
Health Information Systems challenge: Generating a Master Facility List

• MFL – list of all health facilities in the country
  – Facility ID (Primary key)
  – Classification by services

• Best case: Kenya
  – http://www.ehealth.or.ke/facilities/
Challenges in building MFL

• List all public health facilities
  – Determine which ones are active
  – Identify new facilities
  – Resolve duplicate names

• Determine other types of facilities to include
  – Private, Faith based

• Establish unique ID codes
  – Central administration of list
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Registers

• What are registers

• Surveillance vs. Tracking vs. Medical Records
Register definitions

class ImmunizationRecord {
    int UniqueID;
    String Name;
    Date BirthDate;
    ImmunizationData immunizations;
}

ImmunizationRecord[] immunizationRegister;
Immunization cards
Immunization

• Routine immunization
• Track immunizations received and dates of immunization

Table 2: Immunization schedule, 2011

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<tr>
<th>Vaccine</th>
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<td>Pentavalent 1</td>
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<td>PCV 1</td>
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<td>TT</td>
<td>+15 Years (WCBA 15-49 Yrs), + 1 month, + 6 months, + 1 year, + 1 year</td>
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Infectious Disease

• Tuberculosis
  – Processes established for identification and treatment
  – Strict regimen of treatment
    • Two months of Isoniazid, Rifampicin, Pyrazinamide, Ethambutol
    • Four months of Isoniazid, Rifampicin
  – Testing at completion

• TB Record
  – Testing dates
  – Medication
Case tracking

• Identification of carriers of specific diseases
  – Malaria (for complete eradication)
  – Measles (exposure tracking)
  – Acute Flaccid Paralysis (AFP)
Maternal Health

- Tracking mothers through pregnancy
- Registration of pregnant women
- Antenatal care visits
Health use cases

• Surveillance
  – More accurate than reporting events
  – Better estimates of coverage
• Tracing defaulters
• Disease elimination
• Care and program planning
• Reporting
• Reminders
• Formalizing care
• Coordination of care across providers
Challenges

- Unique identifier
- Biometrics
- Name resolution
- On-line, off-line mode
- Undocumented people
- Conflict zones
- Privacy
How do we track people

• National or patient ID
  – How are IDs assigned

• Alternate IDs
  – Facebook, email, mobile number

• Mother’s name

• Name
  – Name and birthdate
  – Name and birthdate and village
  – Name and birthdate and village and father’s name
  – Name and birthdate and village and father’s name and father’s village
Patient ID

- Generate health ID
- Provide to patient on paper or a smart card
Biometrics

• Some large initiatives based on biometrics
  – Finger prints, Iris

• Finger prints are challenging for young children
Name resolution

- Additional challenges in the developing world
  - Lack of records
  - Spelling of names
  - Imprecise dates
On-line, off-line access

- Standard synchronization problems
- In practice this is much harder than it should be
Undocumented people

• Clearly, this is a complicated, political issue
• Delivery of services to people without official status
• Maintain separate registration
• Alternate means of identification
Register/Tracker Implementations

• Many stand alone implementation
  – Simple database backend
• Extract information from a medical record system
• Extension of DHIS2
  – Tracker is a new data model