Computing and Global Health

Richard Anderson
Undergraduate Research Seminar
January 20, 2012

Broad interest in introducing computing based solutions to health challenges
Rapidly changing technological landscape

Research Domains

- ICTD / CHANGE
- Mobile Wellness Toolkit: NSF Project
  - Anderson/Borriello/Kolko
- Educational Technology
- Computing for Low Resource Environments Capstone (CSE 490D / CSE 481K)
- PATH

Extended Sabbatical at PATH (2009–2011)

- Seattle based NGO working in health technologies
- Program for Appropriate Technology in Health
- Focus areas:
  - Maternal and Child Health
  - Reproductive Health
  - Immunization
  - Infectious diseases
  - Safe Water

NSF Mobile Wellness Toolkit Project

- 3 year NSF funded project
- UW co-PI’s:
  - Richard Anderson, Gaetano Borriello, Beth Kolko
- Partner: PATH
- Mobile technology for health and wellness

Immunization systems

- One of the worlds most effective health interventions
  - Wide coverage of basic vaccines
    - Diphtheria, Pertussis, Tetanus: 77% in poorest countries
    - Tremendous reduction in deaths
    - Some diseases close to elimination
- Large scale global programs
  - Decade of Vaccines
  - Introduction of new vaccines
    - Pneumococcal and Rotavirus vaccines
Immunization: National Health Information Systems

- Manage health information on national scale
- Reporting from facility level
  - Web based submission to central database
- Integrate tools into existing systems

Immunization: Health System Modeling

- Analyze health system based on data
  - PATH CCEM: Vaccine Cold Chain Analysis

<table>
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<tr>
<th>Country</th>
<th>IR units</th>
<th>Gas/Tar units</th>
<th>Cold rooms</th>
<th>Cost USD 1M</th>
<th>IR units</th>
<th>Gas/Tar units</th>
<th>Cold rooms</th>
<th>Cost USD 1M</th>
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Immunization: Facility Monitoring

- Data collection to understand status of health facilities
- Link with multiple sources of data

Immunization: Health Worker and Manager Support

- Develop (mobile) tools to support management of the health system
- Manage and track assets
- Record information during facility visits

Communication and Education

- Promote behavior change and adoption of practices:
  - Maternal and child health focuses on small number of interventions
    - Taking iron pills
    - Exclusive breast feeding
    - Keeping babies warm
    - Promoting institutional delivery
    - Birth preparedness
  - Mobile Interventions
    - Multimedia playback
    - Reminders
    - Community building
    - Spam

Digital Public Health
### Mobile Job Aids
- Job aids
  - Process walk through
  - Calculator
  - Care protocol
- Support with mobile applications
  - Tool for use during care
  - Often these tasks are rare
  - Training
  - Standardization

### Community Health Worker Supervision
- Health workers not permitted to treat patients
  - CHW, ASHA, VHV, . . .
- Tracking pregnancies, promoting health practices, identifying disease suspects, collecting information
- Mobile applications
  - Job aids, data collection, supportive supervision
  - Technology issues
  - Usability, low cost phones

### C4D Capstone
- CSE Capstone course
  - Winter: Design seminar
  - Spring: Implementation
  - Offered since 2008

### Encouragement System for CHWs
- Develop system to for automatic reminders
- Allow different levels of escalation and triggers
- Key technical challenge: develop a finite state machine implementation

### Smart Phone Vaccine Register
- Register to track children and immunizations
- Link to existing PC systems

### Interactive Health Videos
- Digital Green Model
  - Community created content
  - Facilitated showings
  - Work with Global2Local

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**MAGNESIUM SULFATE DILUTION CHART**

<table>
<thead>
<tr>
<th>Solution</th>
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<tr>
<td>25% solution 1.25g in 2mL</td>
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<tr>
<td>50% solution 1g in 2mL</td>
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<tr>
<td>10g in 20mL</td>
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**PRESENTATION**

<table>
<thead>
<tr>
<th>REQUIRED SOLUTION</th>
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<tr>
<td>5g in 10mL (20% solution)</td>
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<tr>
<td>4g in 20mL (20% solution)</td>
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<tr>
<td>8g in 1000mL</td>
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</table>

**DILUTION INSTRUCTIONS**

- Combine the contents of 5 vials. Use without dilution.
- Combine the contents of 1 vial (5mL, 1.25g). Add to 1000mL of normal saline.
- Combine the contents of 3 vials (15mL, 3.75g) with 6mL of a 20% solution.
- Combine the contents of 4 vials (4 g total, 8mL) to 4mL of a 50% solution.

**RESULTING SOLUTION**

- 1008mL of a 0.8% solution containing 5g MgSO4
- 1032mL of a 0.77% solution containing 8g MgSO4
- 1000mL of normal saline
- 1/20/2012
Application builder for mobile phone job aids
- Small mobile phone applications to support medical tasks
  - Calculators
  - Decision trees
  - Protocols
- Allow public health professions to create mobile application through a wizard

Game based interface for public health modeling
- Geographic modeling
- User interface challenge
  - Setting scenarios
  - Manipulating facility information
- Idea: interface from games

Mobile phone integration with a health information system
- Health Information System
  - Internet based system for national reporting of health information
- Interface with smart phone for facility operations
  - Internet access by cellular network
  - Many advantages of mobile phone over desktop system

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