SMS Applications

Lecture 5:   CSE 490c

Administrivia

- Programming Assignment 1 Posted
- Reading Assignment – Ken Banks, FrontlineSMS
- Reading Assignment – CGNet Swara

Current Events

India's Top Court Limits Sweep of Biometric ID Program

MUMBAI, India — In a landmark ruling on Wednesday, India's Supreme Court placed strict limits on the government's national biometric identity system while also finding that the sweeping program did not fundamentally violate the privacy rights of the country's 1.3 billion residents.

A five-justice panel of the court decided by 4-1 to approve the use of the program, called Aadhaar, for matters involving the public purse, such as the distribution of food rations and other government benefits and the collection of income taxes.

But the panel struck down Prime Minister Narendra Modi's efforts to require the digital ID for other purposes, including verifying the identity of students taking exams, and established new protections meant to prevent the government from misusing the data in the name of national security.

SMS Applications

- Server capable of sending and receiving SMS messages

- Interaction with service through a basic mobile phone

- Use cases

- SMS Gateway Technology

- Practical challenges

Messaging Applications

- One way push messages
  - Sign up for service, receive messages based on customer information

- Announcements

- Special offers

- Adherence reminders

- Appointment information

- Behavior change messaging

- Pregnancy messaging

Mom Connect

- Text Messages to new and expectant mothers
- Managed by South Africa Department of Health
  - Previously supported by Johnson and Johnson with USAID support
- 95% of health clinics participate, reaches 2M women
- South Africa has a high HIV burden
  - Prevent transmission to child
- Mom Connect has enabled other services
  - Registration, Text help line, Aggregation and reporting
- Multiple Technology Partners

Messaging With Acknowledgement

- Add a user response to a basic push message

- Adherence reminders
  - "Have you taken your pill"
  - "What is the code number in the blister pack"

- Special offers
  - Allow acceptance

- Appointment reminders
  - Confirmation or cancelation

Two Way SMS

	SMS group (number [%])	Control group (number [%])	RR (95% CI)*	p value
Primary outcome				
Intention-to-treat analysis†				
Self-reported adherence (>95%)	168 (62%)	132 (50%)	0·81 (0·69–0·94)	0·006
Viral suppression (<400 copies per mL)	156 (57%)	128 (48%)	0·85 (0·72–0·99)	0·04
Complete-case analysis‡				
Self-reported adherence§	168 (91%)	132 (91%)	1·00 (0·94–1·07)	0·94
Viral suppression¶	156 (75%)	128 (66%)	0·88 (0·77–1·00)	0·047
Secondary outcomes				
Total attrition (missing)	53 (19%)	61 (23%)	1·24 (0·82–1·89)	0·31
Loss to follow-up	17 (6%)	27 (10%)	1·69 (0·91–3·23)	0·094
Mortality	25 (9%)	30 (11%)	1·27 (0·72–2·22)	0·42
Withdrawal	7 (3%)	3 (1%)	2·26 (0·59–8·67)	0·34||
Transfer out	4 (1%)	1 (0%)	0·25 (0·19–2·17)	0·38||

Percentages do not add up to 100% in some cases because of rounding. *For non-adherence or virologic failure. †273 patients in the SMS group and 265 in the control group. ‡Because the intention-to-treat analysis classed all patients with missing data as non-adherent or having viral failure, the number of adherent patients and number of patients with viral suppression are the same here as in the intention-to-treat analysis. §185 patients in the SMS group and 145 patients in the control group. ¶208 patients in the SMS group and 194 patients in the control group. \|\|Fisher's exact test.
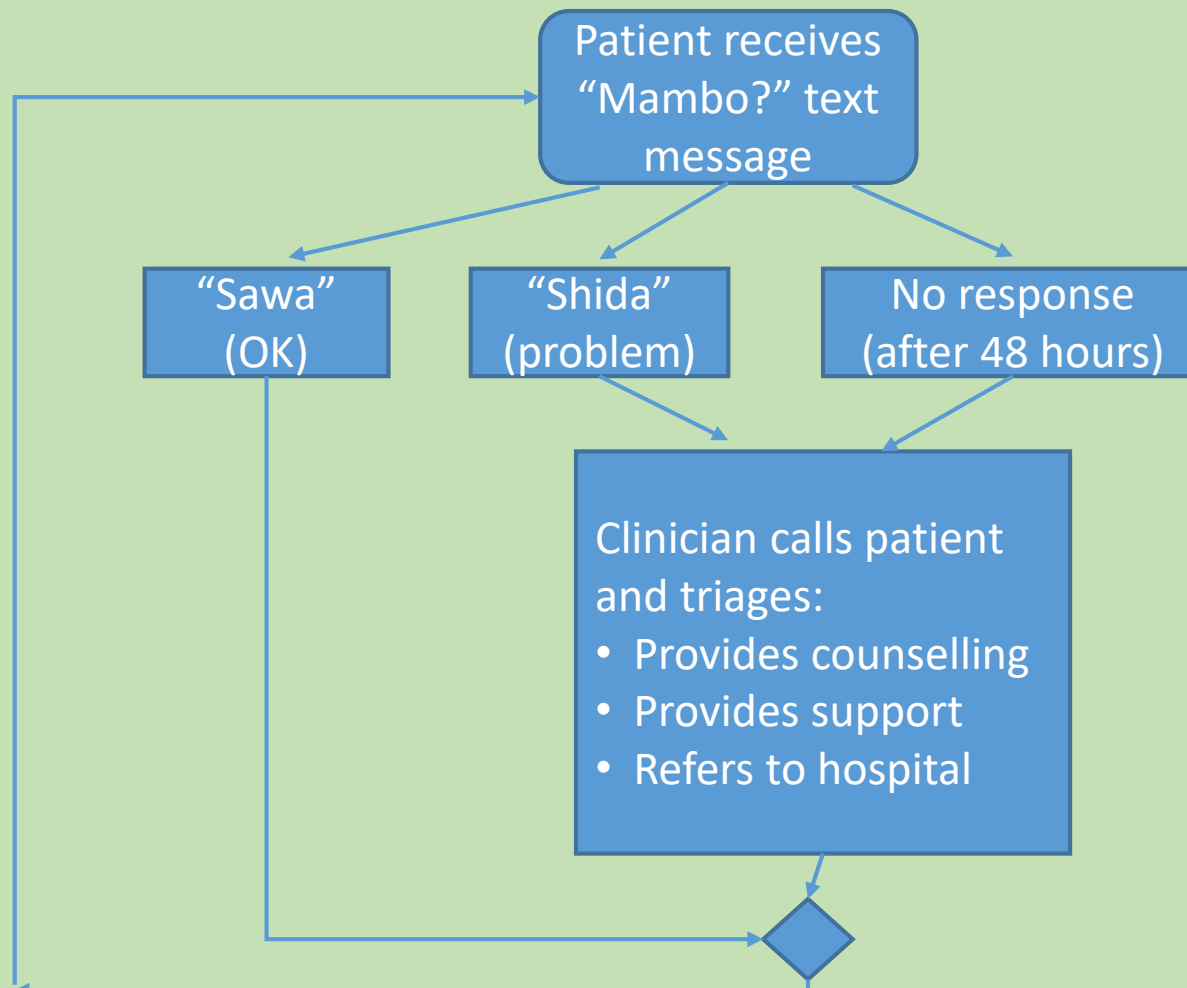
Table 2: Primary and secondary outcomes

- Messaging that requests a response
- WelTel study – does SMS messaging improve ART adherence for HIV positive patients
  - Randomized Control Trial (RCT)
    - Treatment Arm – Receive SMS message once per week
    - Control Arm – No SMS
  - Measurement – CD4 count of viral load
  - Result
    - Treatment Arm: 156 of 273 suppressed viral load
    - Control Arm: 128 of 265 suppressed viral load
    - Statistically significant

WelTel Intervention

Patient receives "Mambo?" text message

- "Sawa" (OK)
- "Shida" (problem)
- No response (after 48 hours)

Clinician calls patient and triages:
- Provides counselling
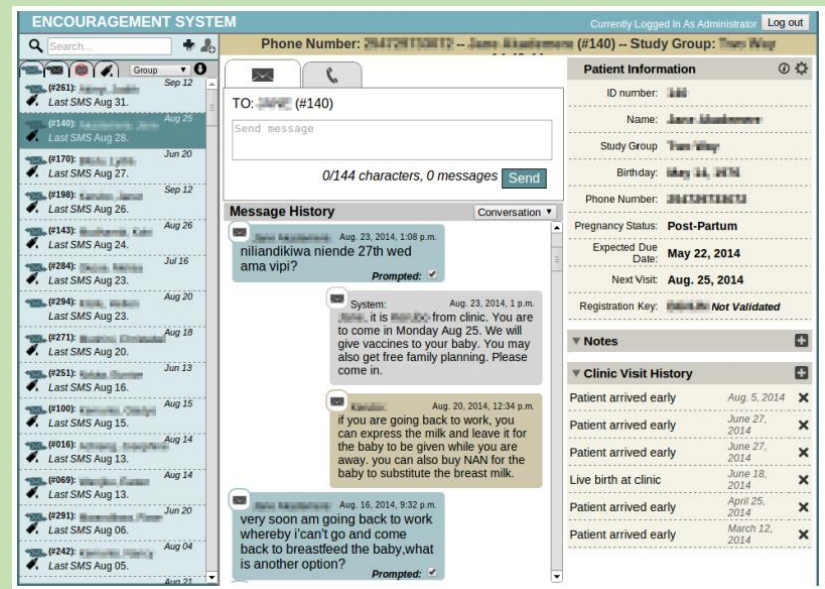- Provides support
- Refers to hospital
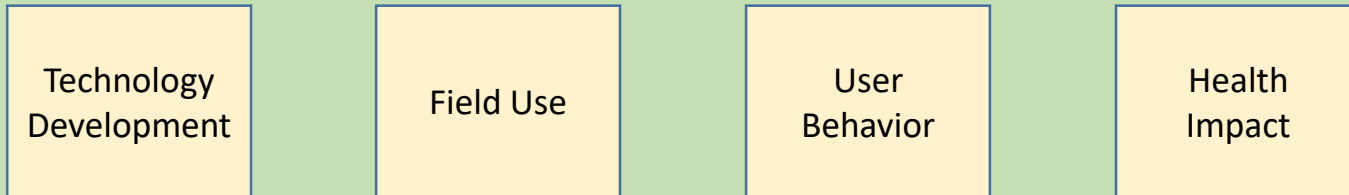
MWach

- Maternal health messaging with requests for response
  - Managed by nurses who send regular health messages
- UW Dept of Global Health Project
  - Health study – comparing results of multiple study conditions
  - Several clinics in Kenya
  - Different versions have targeted different populations
- Implementation by UW Graduate student
  - Multiple iterations of the technology

MWach Platform

- Send weekly SMS with questions
  - Message queue based on events (due date)
- Hybrid Human-SMS system
- Python-based Django web application
- Back end: Africa's Talking
- Threaded chat representation
- Substantial feature growth
  - Message forwarding
  - Prioritization of messages to respond to

MWach Deployment

Technology Development	Field Use	User Behavior	Health Impact

- High use over multiple projects

- Messaging Behavior
    - People usually respond quickly, if at all
    - Nurses only respond on weekdays (best to send messages early in the week)
    - Off topic responses most interesting
    - Highest engagement in messaging around birth

- Complex, sometimes multilingual responses

> My nxt visit will be on 29th may.na nina sweat sana siku hizi xana xana usiku.can u elaborate on this pliz

Reporting

- Data collection from the field
  - Regular reporting: Health Indicators from facility reported monthly
  - Survey: Price of a commodity from different markets
  - Event reports: Details of Dengue Fever cases
- Solution
  - Send a structured SMS message which is parsed by receiver
  - Messages can be validated by sender phone number
- Example
  - Malaria stock reporting
  - SMS for life
  - Y4B3R0G2Q99

Figure 1: SMS stock levels and interpretation

Y4: Coartem Yellow, for babies 5–15 kg: 4 boxes

B3: Coartem Blue, for children 15–25 kg: 3 boxes

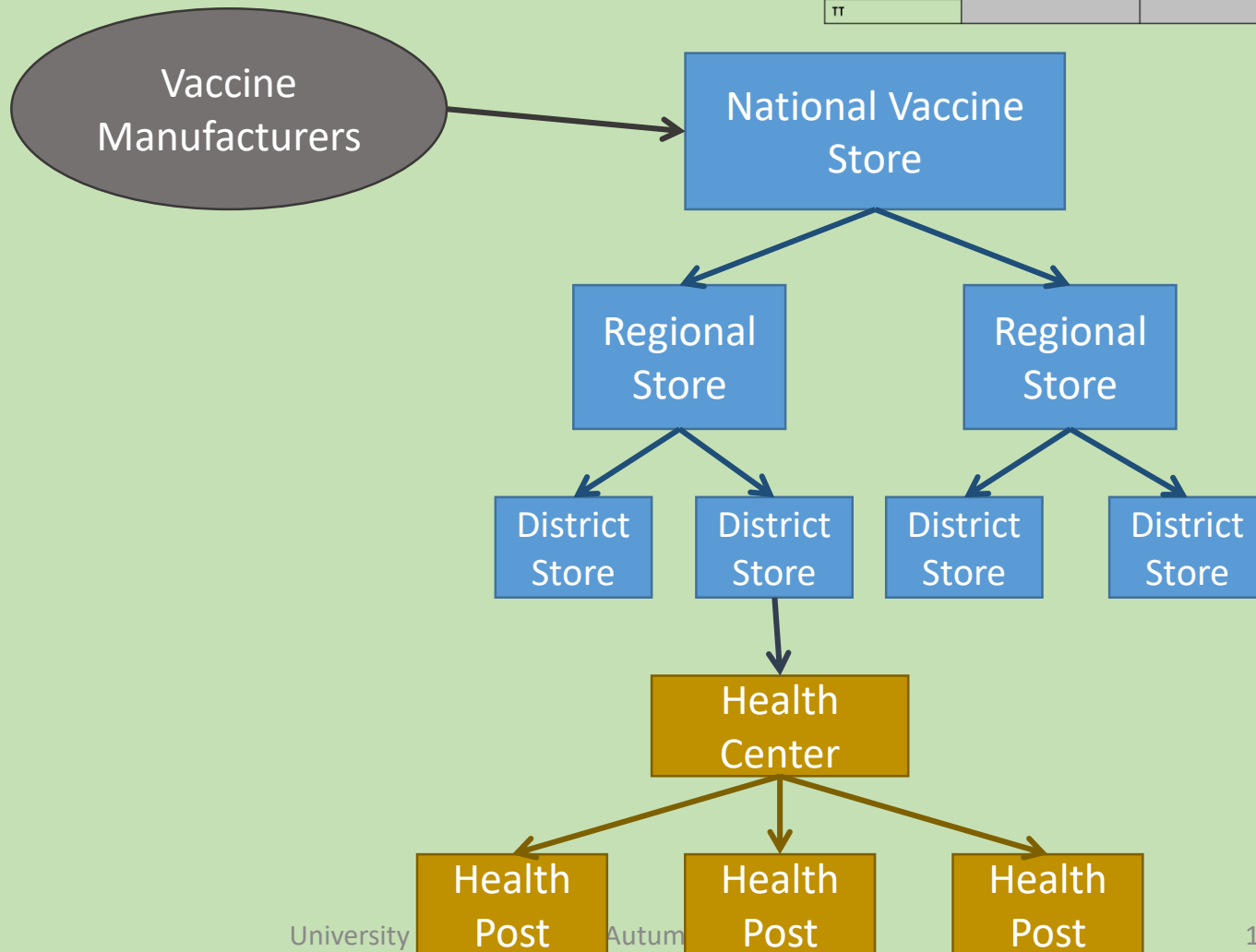R2: Coartem Red, for children 25–35 kg: 0 boxes

G1: Coartem Green, for children above 35 kg and adults: 2 boxes
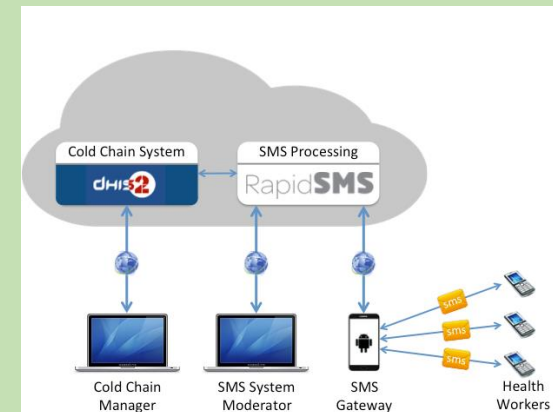
Q99: Quinine injectables: 99

Vaccine Cold Chain

	Primary vaccine store Up to 6 Months	Intermediate vaccine store		Health centre Up to one month	Health post Up to one month
		Region- up to 3 months	District- up to one month		
OPV	-15°C to -25°C				
BCG					
Measles, MR, MMR	2°C to +8°C			+2°C to +8°C	
YF	(-15°C to -25°C also possible)				
Hib freeze-dried					
Meningococcal A&C					
HepB					
IPV					
DT, DTP, DTP Hep B	+2°C to +8°C Never Freeze !				
Hib liquid					
Td					
TT					

Vaccine Manufacturers → National Vaccine Store

National Vaccine Store
- Regional Store
  - District Store
  - District Store → Health Center
    - Health Post
    - Health Post
    - Health Post
- Regional Store
  - District Store
  - District Store

Monthly Temperature Reporting

- Problem
  - Report when refrigerator is too hot or too cold

- Laos Solution
  - Monthly SMS report of number of times refrigerators had high alarms or low alarms (from FridgeTag)
  - Consultant designed SMS codes
    - Refrigerators labeled A, B, C etc.
    - High Alarms followed by low alarms: A10B00C35
    - If more than 5 alarms, just report 5
    - Allow reporting 00 with 0, if one refrigerator, A not needed, optional FT
    - Add stock level SL, followed by letter codes for vaccines and doses on hand
  - Developed a system with an Android phone running an SMS Gateway

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Field lessons

1. ft a 0 b 0 sl d 30 p 20
2. a00b00sld30p20
3. A 0 0 B0 SL D30 P20
4. ft a0,b0;sl d30; p20
5. Ft0 SL d   30, p 20

- A very flexible input form was designed, including backward compatibility as it evolved
- All health worker phones supported Thai, not Lao
  - All health workers could read Lao written in Thai
  - 65% of health workers could read Lao in Latin script
  - 22% of health workers could read English script
  - The government prohibited use of Thai
- Some confusion in SMS between '0' and 'O' and '$' and 'S'
- Complications in tracking phones used by health workers, as people changed phones for various reasons
- Phone availability and SMS cost were not issues

Querying

- User sends text and system responds
- Market price queries
  - Send commodity name and market, get current price
- One bus away
  - Send route and location, get bus time
- Sports scores
  - Send team and date, get result
- Free form
  - Send question, get answer
- Wikipedia
  - Send keword start of entry
- News
  - Send keyword, get headline associated with keyword

Market matching

- Similar to query, but match buyers and sellers
- System receives buy and sell messages – many different versions
    - Kudu:

3.1 SMS

Users can send a toll-free SMS to 8228 using any of the following templates:

buy [crop] [quantity] [unit price]
sell [crop] [quantity] [unit price]
price [crop]

Programming Assignment 1 Temperature Reporting

If I did my own assignments

- Design Input Language HCx, SLx, FTx
  - Include health center number to make it easier to test
- Database (or table) of reports, 10 HCs, 12 Months
- Create server side form
- Implement HC message
- Implement Ack and Nag
- Implement Next Month
- Implement FT and SL parsing and logic

Next Month	Nag Deadbeats

Table of Parsed Values	Messages Received