



# Electronic Recording and Reporting at Indus Hospital, Karachi, Pakistan

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Indus Hospital TB Program

Interactive Research & Development





Quality care



free of cost

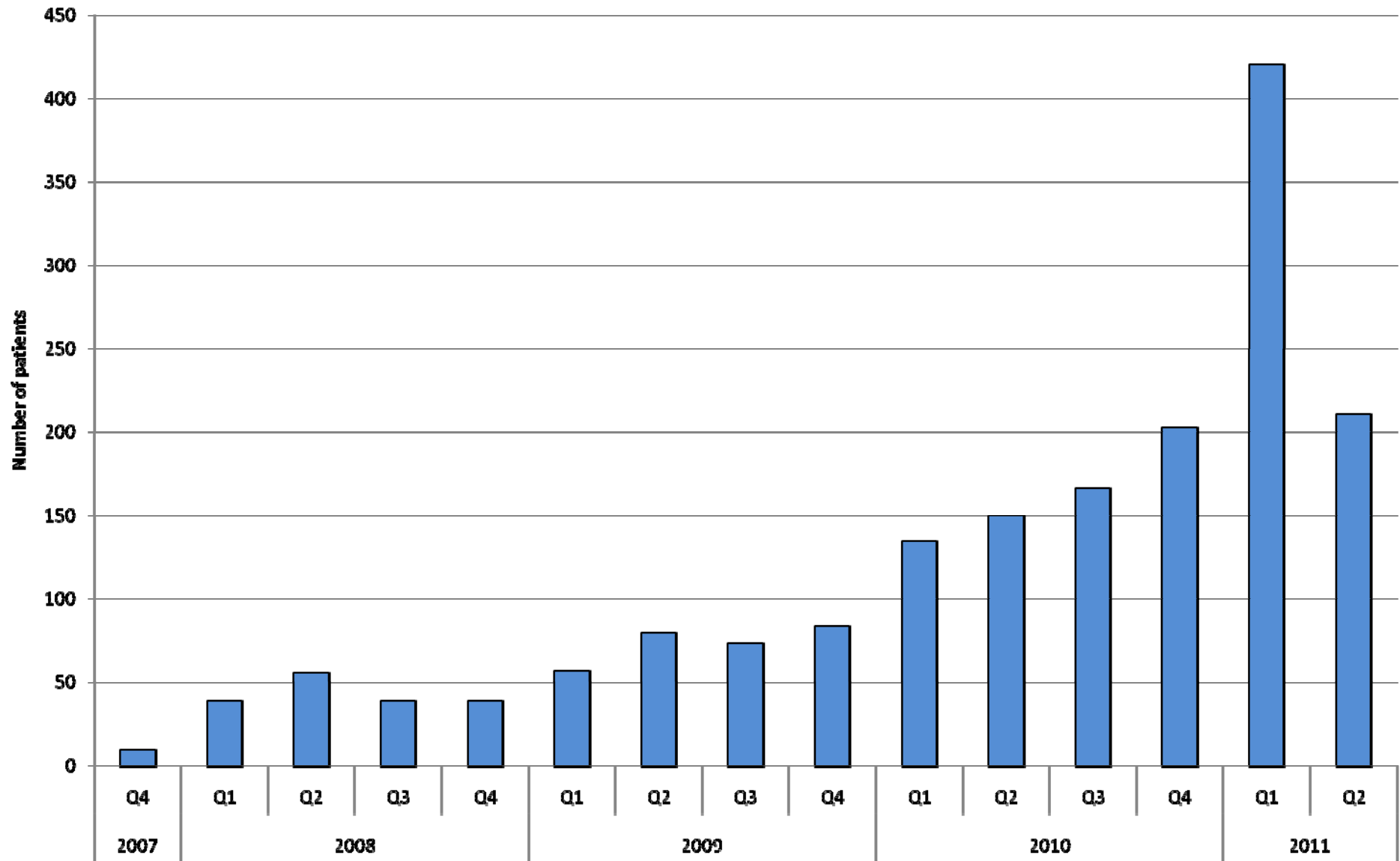




# TB Program Overview

Updated till April 22, 2011

# TB (all forms) case notification Indus Hospital DOTS Clinic 2007-2011



# Indus Hospital DR-TB patients (Apr 13, 2011)

Treatment Status	XDR TB N(%)	MDR SUSPECT N(%)	MDR TB N(%)	PDR TB N(%)	MONO TB N(%)	MOTT N(%)	TOTAL N(%)
Registered	8	3	282	37	24	12	366
Enrolled	7 (88)	3 (100)	231 (82)	34 (92)	20 (83)	4 (34)	299 (81)

Round 9 SR for Sindh and Balochistan province

5500 MDR-TB patients to be put on treatment in Sindh/Balochistan

# Rationale for ERR

- Private sector provider reporting to NTP - must follow national R&R system
- Most patients treated in the private sector are not reported to NTP
- Need a system that can be implemented in both the private sector along with the public sector
- DR-TB patient management is complex









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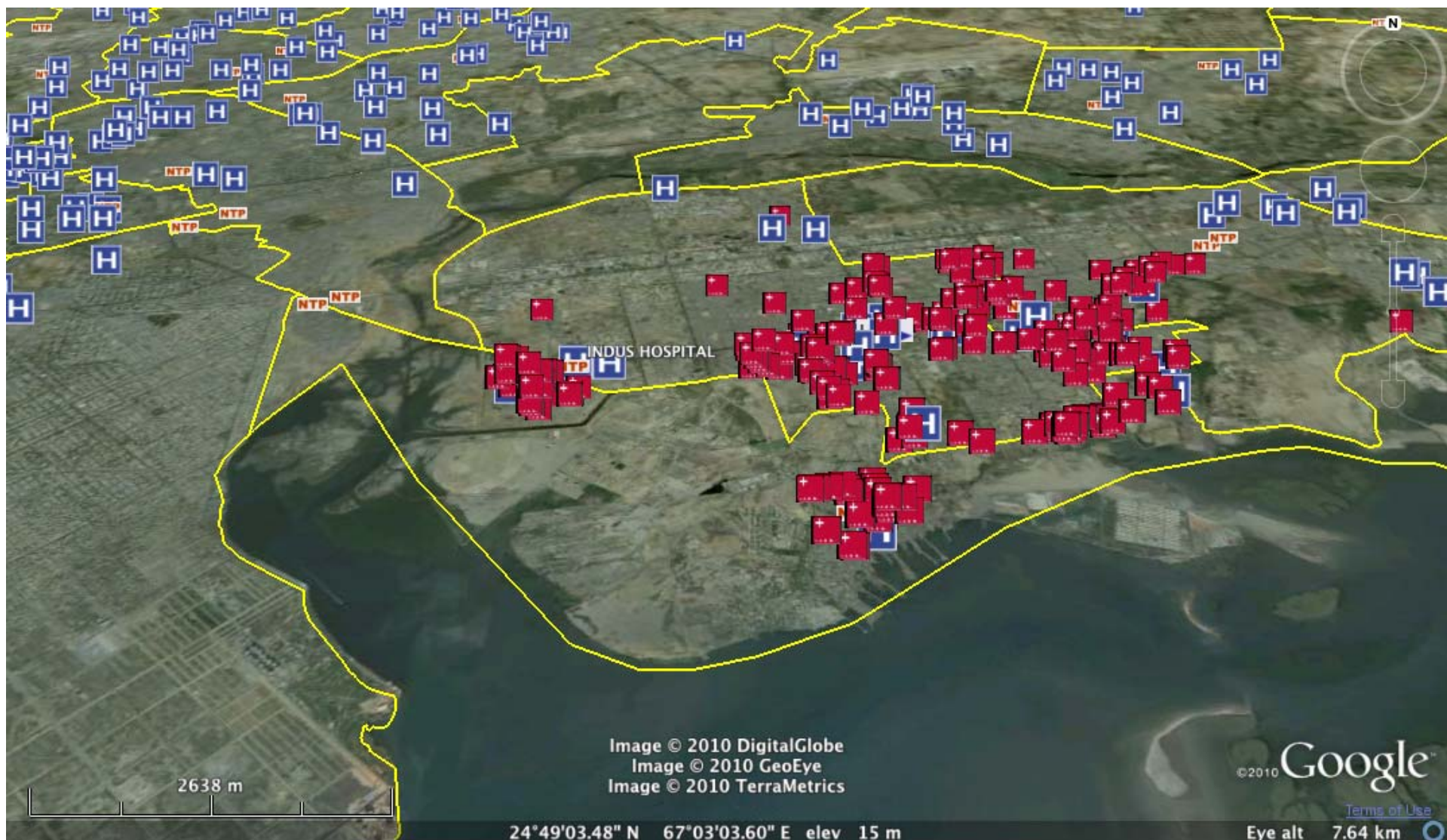
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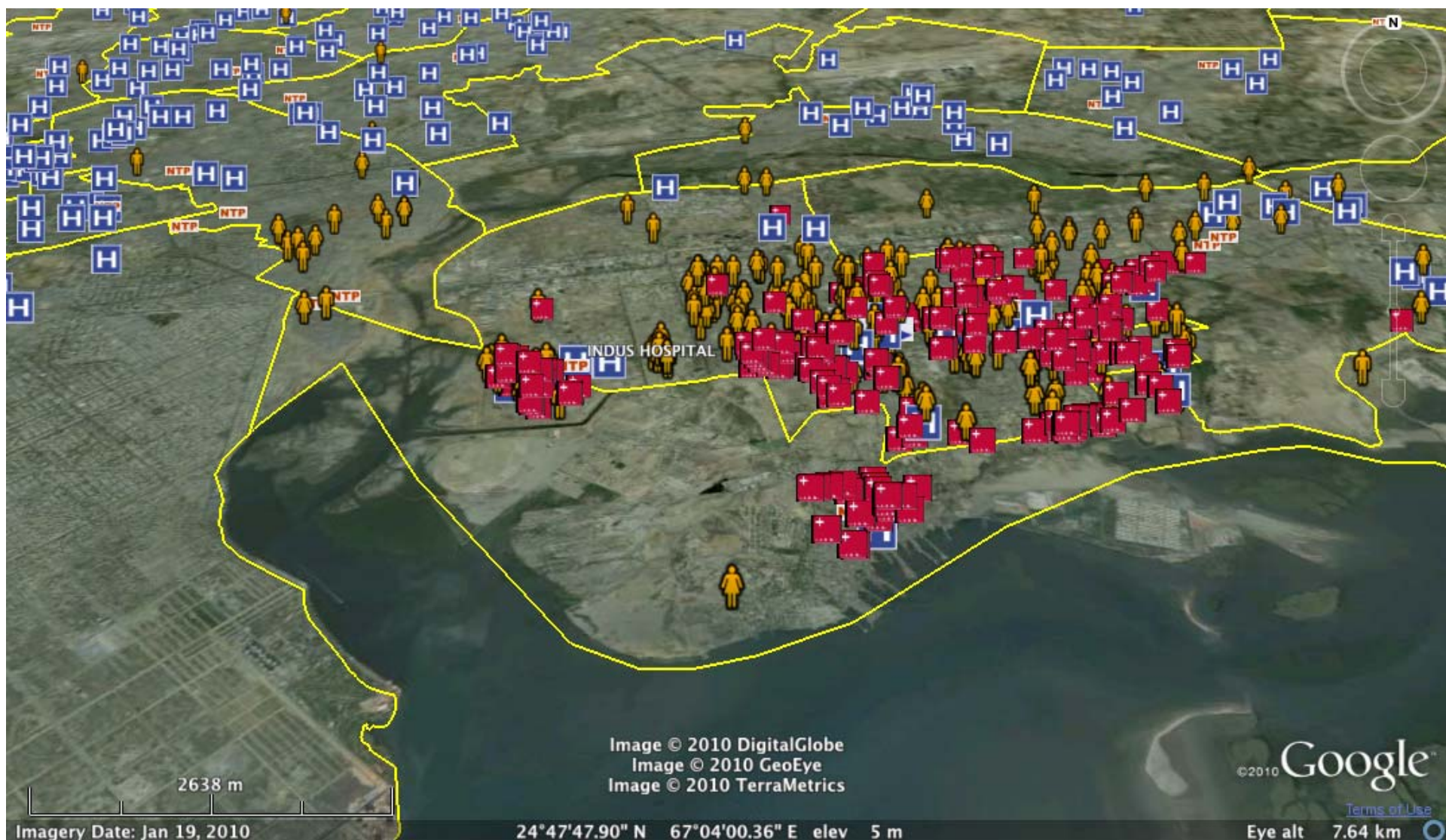




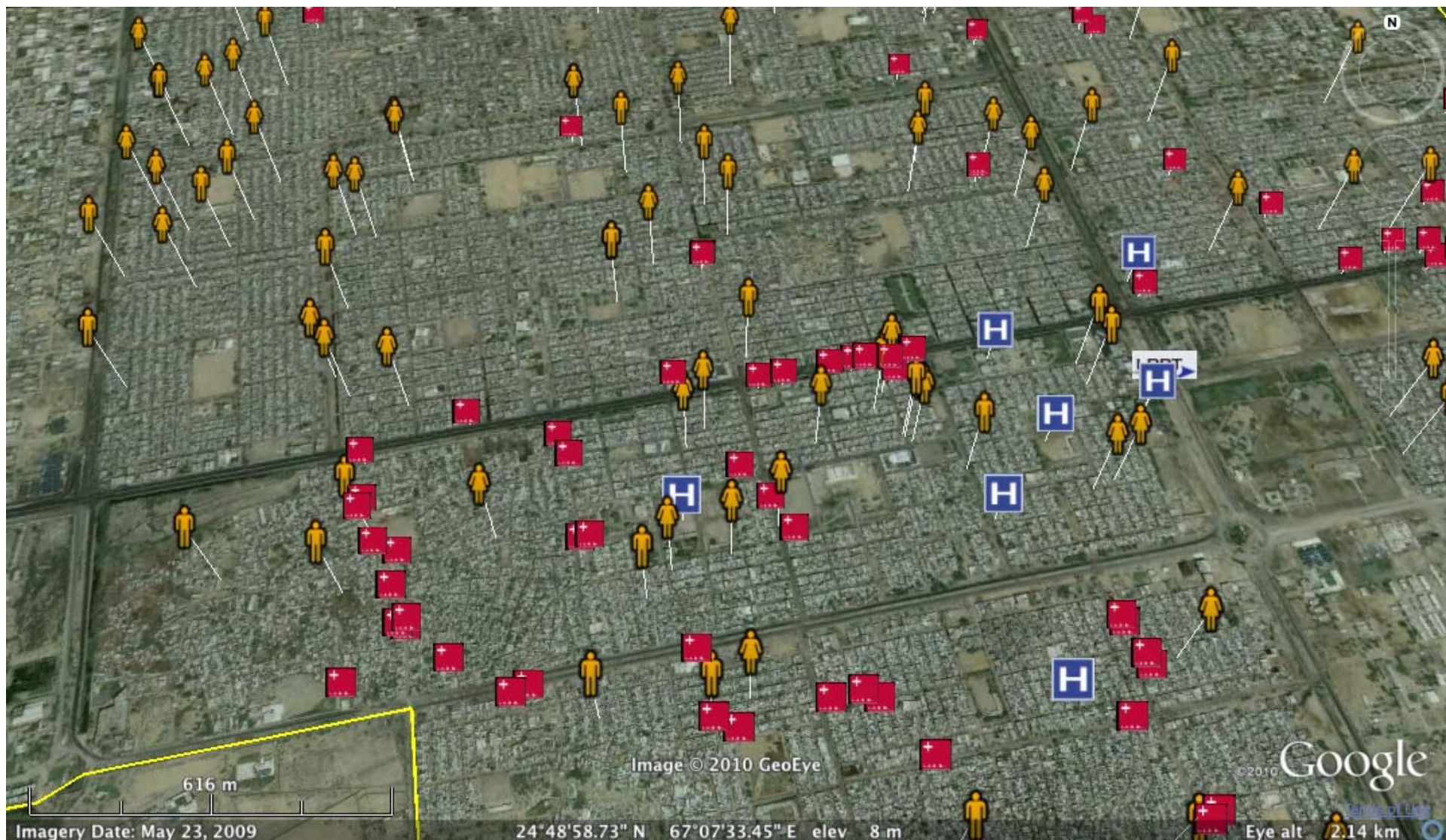




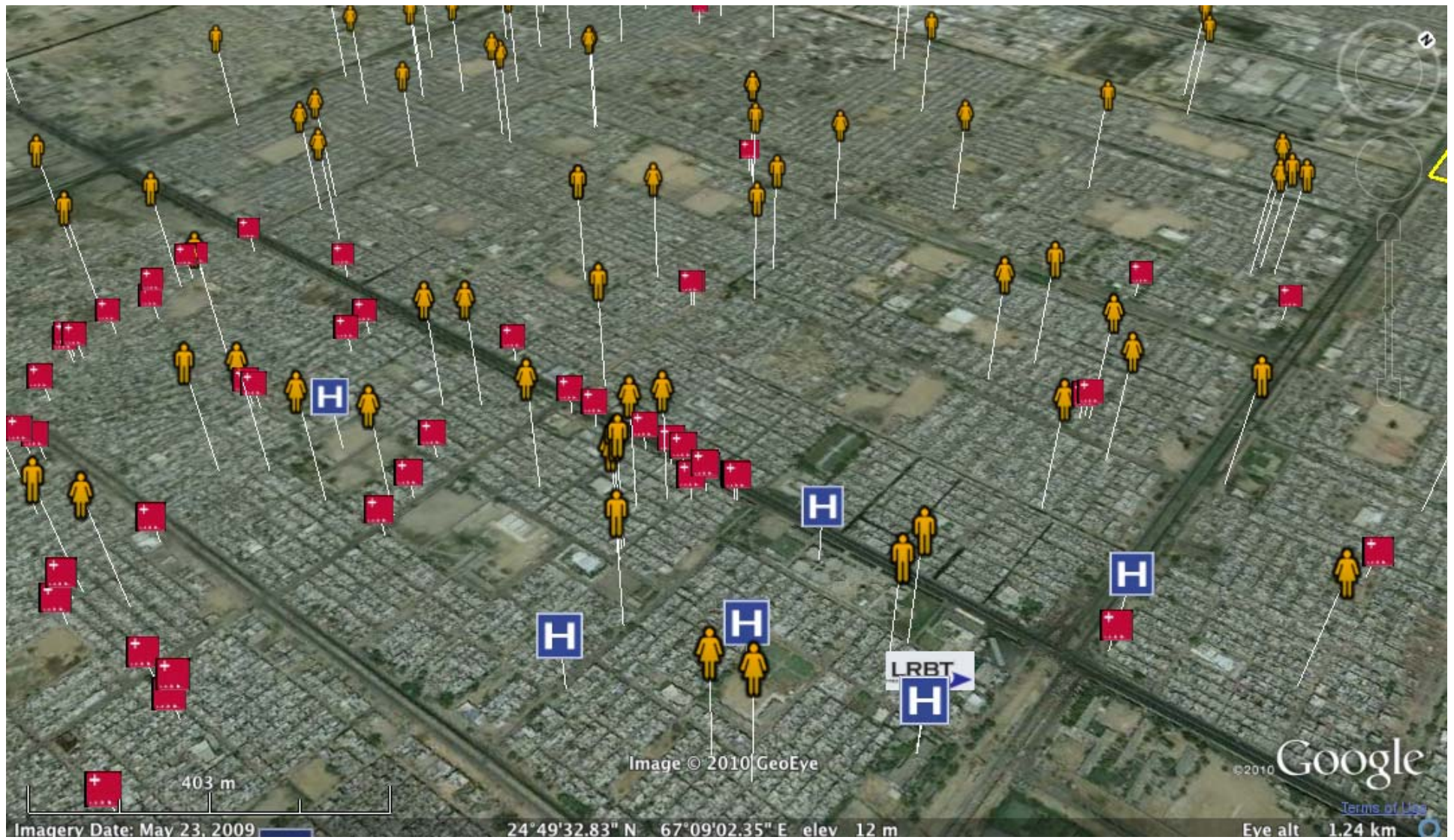




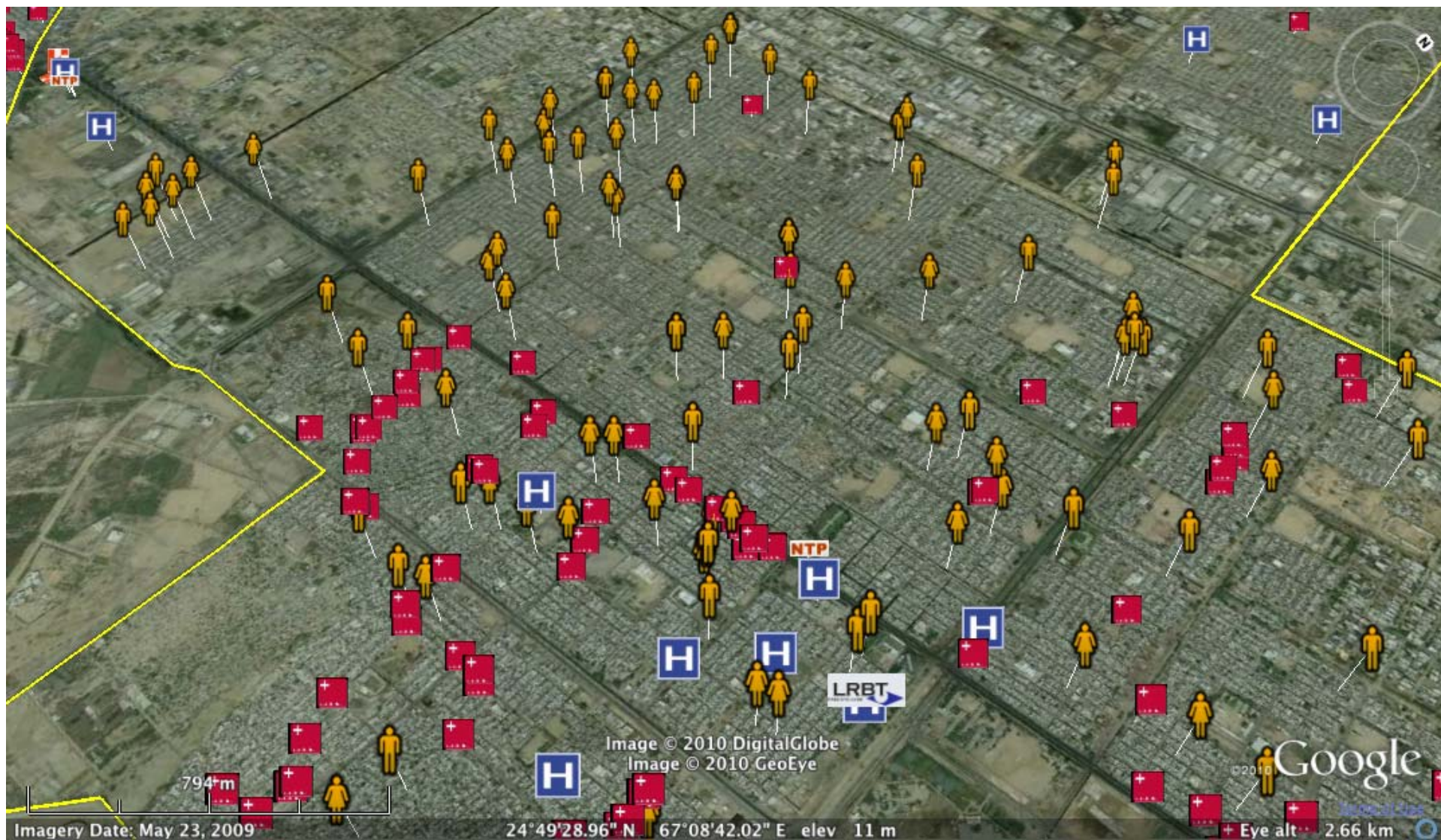












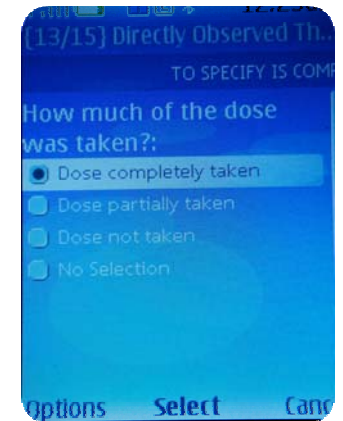
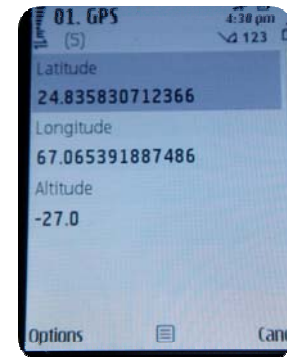
# Why ERR?

- Improved data quality
- Easier backup and storage
- Faster reporting
- Easier analysis
- Accessible remotely
- Role-based access allows security



# Solution

- Open-source: low-cost of initial acquisition, moderate cost of operation
- Integration: 2 existing open-source solutions OpenMRS and openXdata
- Development: GIS visualization module for both OpenMRS and openXdata

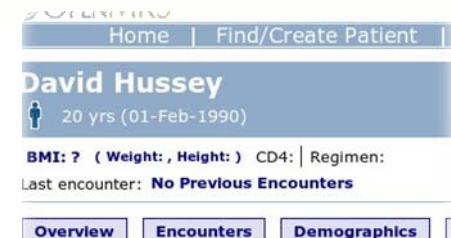




- Open Medical Record System
  - in use since 2008
  - 600+ patients on the system
- MDR-TB module
  - Lab tests (smear, culture, DST)
  - Regimens
  - Tracking treatment e.g. conversion
  - Type of TB etc
  - Transitioning to version 2

# OpenMRS Mobile

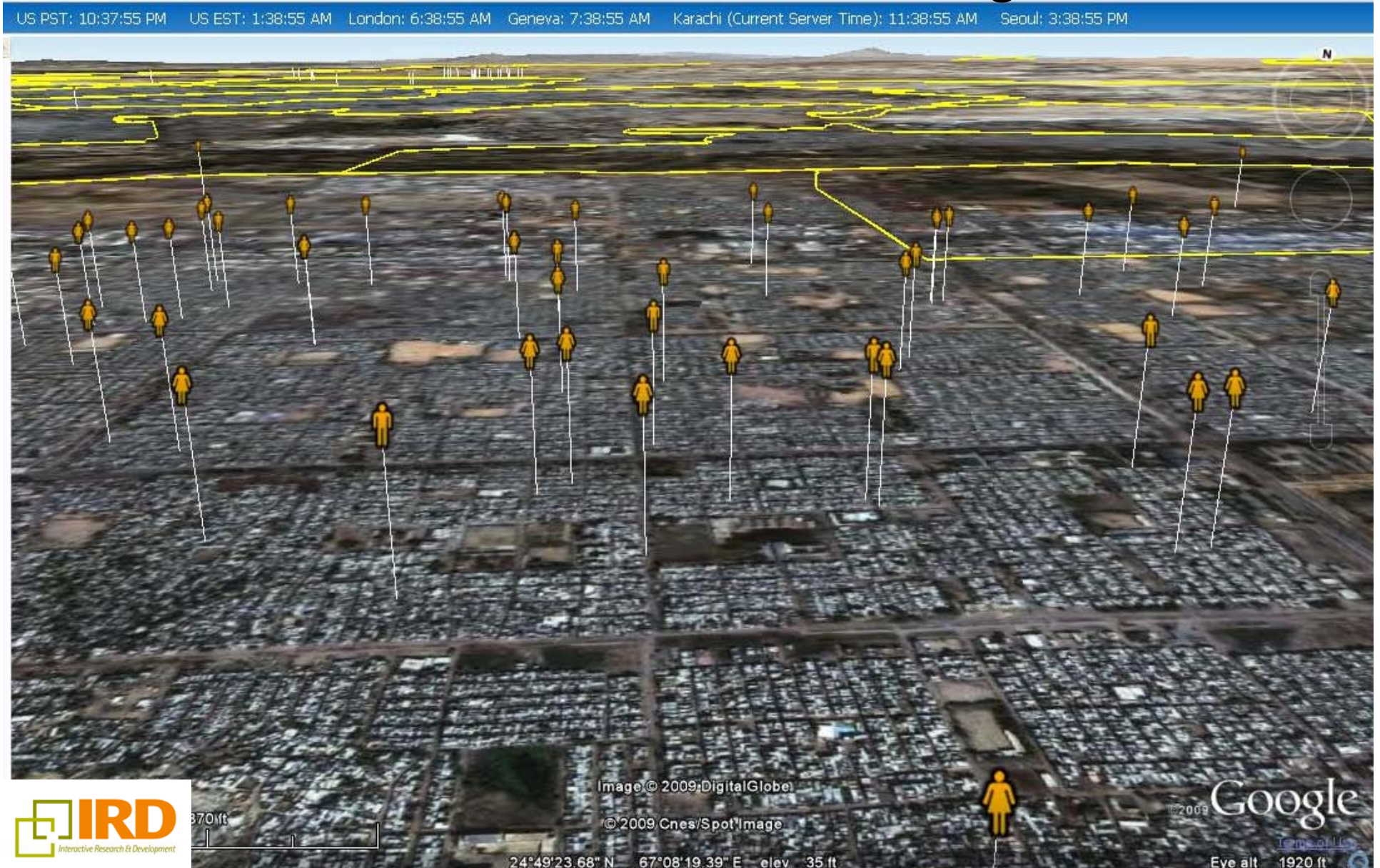
- MDR-TB DOT data via cell phone
  - Connects to OpenMRS
  - Treatment supporters visit patient daily
  - Enter DOT data on the cell phone
    - Real-time
  - Allows effective monitoring
  - Removes paper from the system
    - Improves data quality
  - Scale-up underway
  - Use can be expanded beyond DOT





# TB horizon

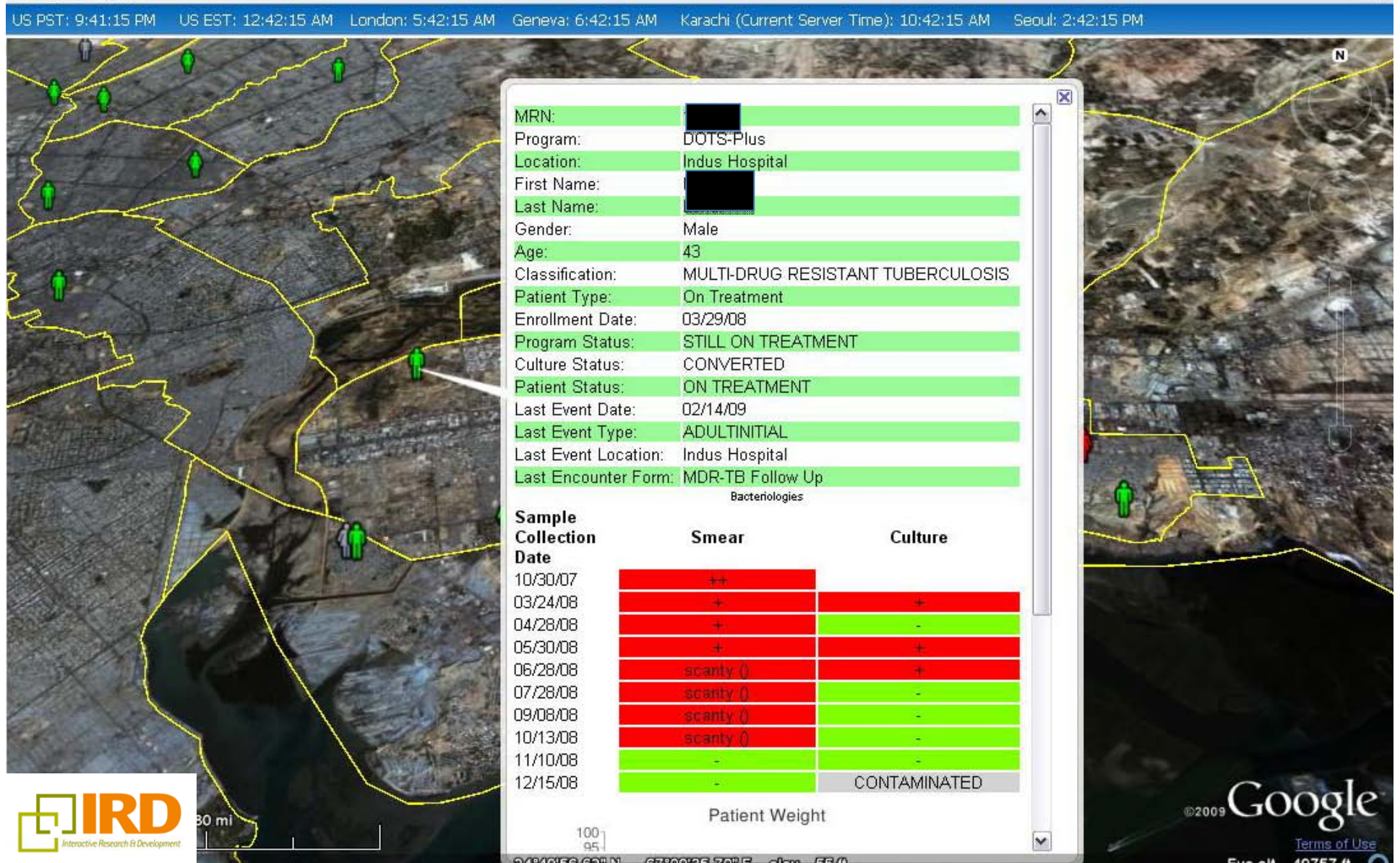
## Real-time data visualization on Google Earth





# Patient medical records

## Real-time data visualization on Google Earth

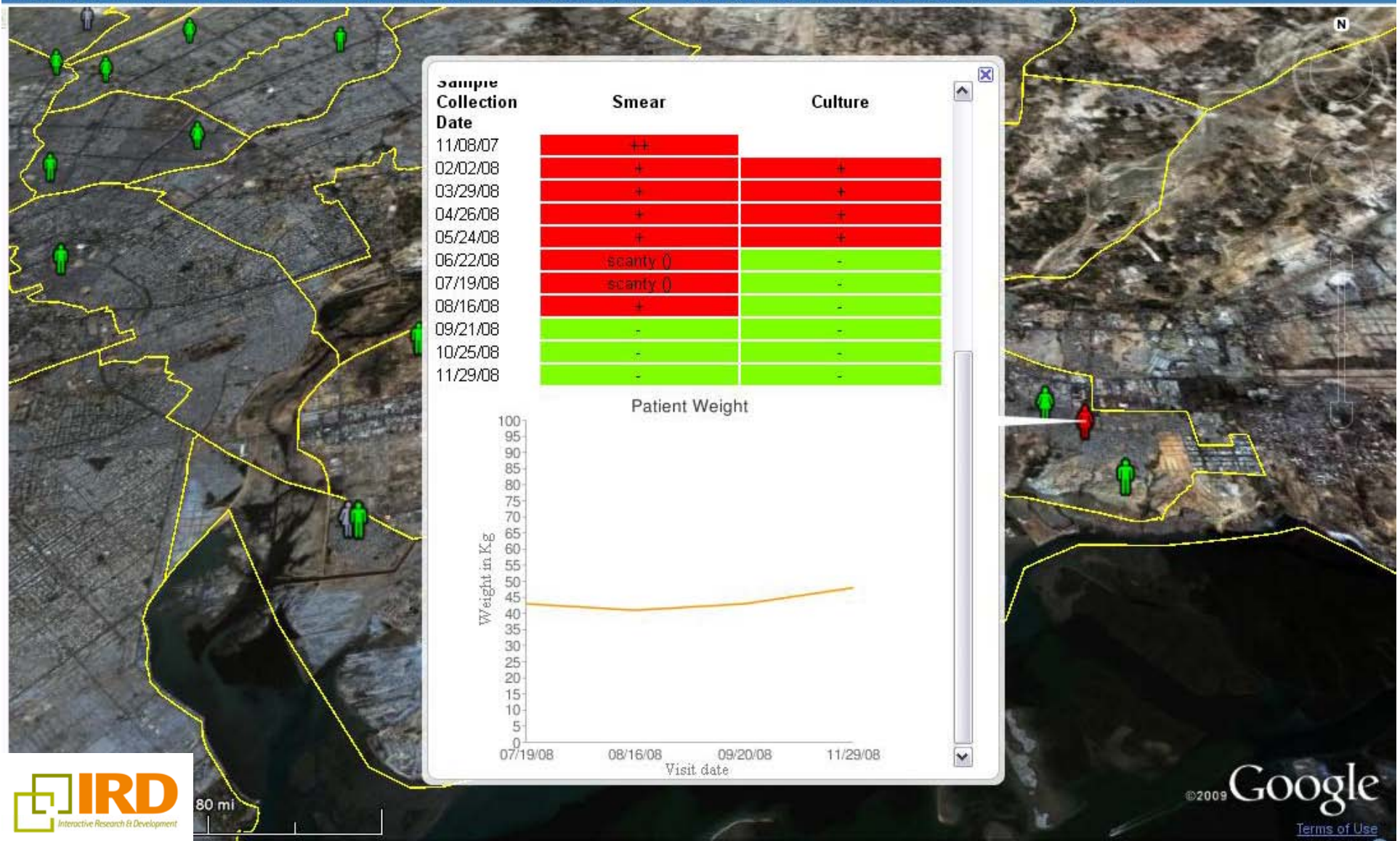




# Patient medical records

## Real-time data visualization on Google Earth

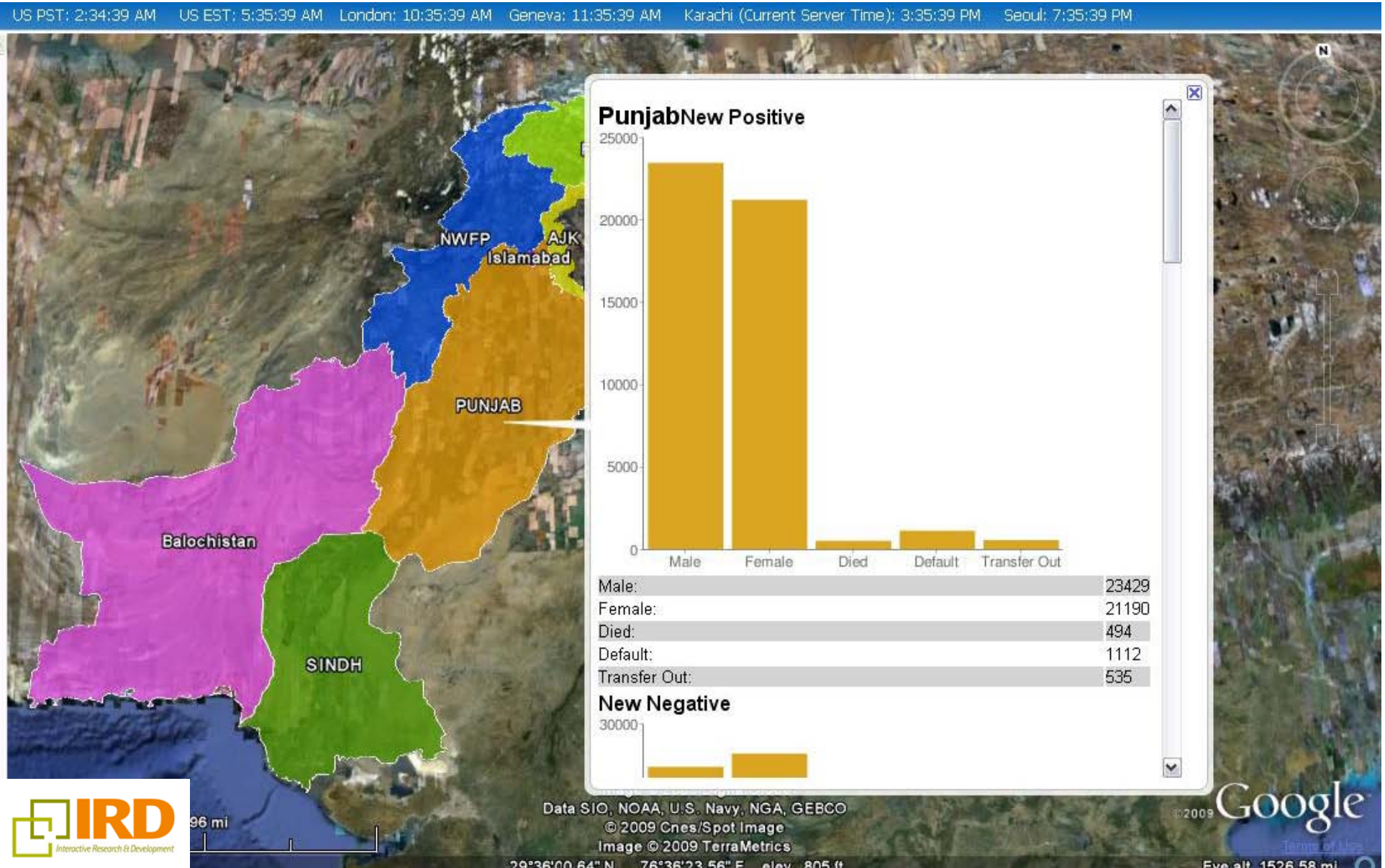
US PST: 10:27:30 PM US EST: 1:28:30 AM London: 6:28:30 AM Geneva: 7:28:30 AM Karachi (Current Server Time): 11:28:30 AM Seoul: 3:28:30 PM





# Individual → Aggregate

## Real-time data visualization on Google Earth



# OpenMRS MDR-TB module v2

- Currently in transition
- Faster system
- Better documented
- Easier to install and set up
- More user friendly
- Downside:
  - no data migration path from v1 to v2
  - development required to connect to openMRS mobile



Bacteriologies			DSTs																
Smears	Cultures	Bacteria	INH	R	E	Z	S	CM	KM	AMK	CPX	OFX	LFX	Moxi	Ethio	CS	PAS	Prothio	THI
+++	POS	M. TUBERCULOSIS COMPLEX	R	R	R	R	R	S	S	S		R			S				
Treatment Start Date			Treatment Start Date																

#### Program Status

**Enrollment Date:** 24/Mar/2011  
**Enrollment Location:** TB Clinic Indus

**Registration Group - Previous Drug Use:** PREVIOUSLY TREATED WITH SECOND LINE DRUGS  
**Registration Group - Previous Treatment:** FAILURE OF CATEGORY I TREATMENT

[Edit Program](#) [Close Program](#)

#### Treatment Status: Currently on treatment

Regimen	Start Date	End Date	Type
AMK + B6 + CS + Ethio + LFX + PAS + Z	24/Mar/2011	Present	

[Edit Treatment](#)

#### Visit Status

**Intake:** [18/Mar/2011 at TB Clinic Indus](#)  
**Most Recent Follow-up:** [24/Mar/2011 at TB Clinic Indus](#)  
**Next Scheduled Follow-up:** None

[Add Follow-up Visit](#)

#### Hospitalizations: Not currently hospitalized

[Add Hospitalization](#)

#### MDR-TB Diagnosis

**Resistance Type:** Confirmed MDR-TB  
**Resistance Profile:** INH + R + E + Z + S + OFX  
**Site:** Pulmonary

	Result	Date Collected	Lab	Date completed
<b>Diagnostic Smear</b>	<a href="#">STRONGLY POSITIVE (+++)</a>	24/Sep/2010	AKU Hospital	25/Sep/2010
<b>Diagnostic Culture</b>	<a href="#">POSITIVE</a>	24/Sep/2010	AKU Hospital	03/Nov/2010

#### Bacteriology Status

**Smear Status:** Not Converted  
**Culture Status:** Not Converted

	Result	Date Collected	Lab	Date completed
<b>Most Recent Smear</b>	<a href="#">STRONGLY POSITIVE (+++)</a>	24/Sep/2010	AKU Hospital	25/Sep/2010
<b>Most Recent Culture</b>	<a href="#">POSITIVE</a>	24/Sep/2010	AKU Hospital	03/Nov/2010

[Add Test Results](#)

#### HIV Status: Unknown

**Most Recent Test Result:** Unknown  
**ART Treatment:** Currently not on treatment  
**Current Regimen:** None  
**Most Recent CD4 Count:** Unknown

[Another calculation](#)

Count Patients Taking **TUBERCULOSIS TREATMENT DRUGS** for **All patients in system (221 patients)** on **27/04/2011**

Medication	# patients
<b>Amoxicillin/Clavulantic Acid (Amx/Clv)</b> AMOXICILLIN AND CLAVULANIC ACID mg	<b>4</b>
<b>Clarithromycin (Clr)</b> CLARITHROMYCIN mg	<b>2</b>
<b>Cycloserine (Cs)</b> CYCLOSERINE mg	<b>14</b>
<b>Ethambutol (E)</b> ETHAMBUTOL mg	<b>12</b>
<b>Ethionamide (Eto)</b> ETHIONAMIDE mg	<b>15</b>
<b>Kanamycin (Km)</b> KANAMYCIN mg	<b>18</b>
<b>Moxifloxacin (Mfx)</b> MOXIFLOXACIN mg	<b>6</b>
<b>Ofloxacin (Ofx)</b> OFLOXACIN mg	<b>13</b>
<b>P-aminosalicylic acid (PAS)</b> P-AMINOSALICYLIC ACID mg	<b>7</b>
<b>Pyrazinamide (Z)</b> PYRAZINAMIDE mg	<b>2</b>
<b>RHEZ</b> RIFAMPICIN ISONIAZID PYRAZINAMIDE AND ETHAMBUTOL 1.0 tab(s)	<b>1</b>
<b>Rifampicin (R)</b> RIFAMPICIN mg	<b>3</b>

[Another calculation](#)

Drug Usage Calculation for **TUBERCULOSIS TREATMENT DRUGS** for **All patients in system (221 patients)**  
from **01/01/2008** to **31/12/2008 (365 days)**

Medication	Average Daily Usage	Total Quantity Required	Price per unit	Cost for this drug
<b>Amikacin (Am)</b> AMIKACIN mg	67.1	<b>24500.0</b>	$\times \$ 0.5$	= \$12250
<b>Cycloserine (Cs)</b> CYCLOSERINE mg	75.3	<b>27500.0</b>	$\times \$ 0.75$	= \$20625
<b>Ethambutol (E)</b> ETHAMBUTOL mg	667.3	<b>243600.0</b>	$\times \$$	= \$0
<b>Ethionamide (Eto)</b> ETHIONAMIDE mg	323.9	<b>118250.0</b>	$\times \$$	= \$0
<b>Kanamycin (Km)</b> KANAMYCIN mg	367.8	<b>134250.0</b>	$\times \$$	= \$0
<b>Ofloxacin (Ofx)</b> OFLOXACIN mg	1126.5	<b>411200.0</b>	$\times \$$	= \$0
<b>P-aminosalicylic acid (PAS)</b> P-AMINOSALICYLIC ACID mg	7320.5	<b>2672000.0</b>	$\times \$ 0.33$	= \$881760
<b>Rifampicin (R)</b> RIFAMPICIN mg	461.5	<b>168450.0</b>	$\times \$$	= \$0
Total cost: \$914635				

OpenMRS

Currently logged in as Super User | [Log out](#) | [My Profile](#) | [Help](#)

[Home](#) | [Find/Create Patient](#) | [Dictionary](#) | [Cohort Builder](#) | [MDR Administration](#)

**Data Export 'Converted' Generated**

[Admin](#) | [Run Reports](#) | [Manage Reports](#) | [Manage Report Macros](#) | [Manage Data Exports](#) | [Manage Cohorts](#) | [Manage Patient Searches](#) | [Manage Report Elements](#)

## Data Export Management

[Add New Data Export](#)

### Existing Data Exports

Name	Description	
<input type="checkbox"/> <a href="#">All DOTS-Plus MRNs</a>	Exports the medical record number of all DOTS-Plus patients.	
<input checked="" type="checkbox"/> <a href="#">Converted</a>	Culture Converted	<a href="#">Download</a> (1kB) Generated On 27 April 2011 10:51:12 PKT)
<input type="checkbox"/> <a href="#">Coordinates</a>	Test data export with GPS coordinates.	
<input type="checkbox"/> <a href="#">MRS-OC MDR-TB Intake Data</a>	MDR-TB Intake Form data (limited) for the OpenMRS-OpenClinica Demonstration.	
<input type="checkbox"/> <a href="#">Drug Regimens</a>		
<input type="checkbox"/> <a href="#">All MRNs</a>	Exports a listing of the internal ID, preferred MRN, first name, last name, longitude and latitude of every patient in the system.	
<input type="checkbox"/> <a href="#">DOTS-Plus OpenMRS - Google Earth</a>	Data export for Google Earth	<a href="#">Download</a> (218kB) Generated On 27 April 2011 10:49:04 PKT)
<input type="checkbox"/> <a href="#">DOTS Plus Drug Regimens</a>		

[Generate Exports](#) [Delete Data Export\(s\)](#)

Converted-20110427\_1051.xls - Microsoft Excel

MDR-TB Program Identifier				
	A	B	C	D
				MULTI-DRUG RESISTANT TUBERCULOSIS CULTURE STATUS
1	MDR-TB Program	Gender	Age	Location
2	XXXXX	F	38	RECONVERTED Indus Hospital
3	XXXXX	M	52	CONVERTED Indus Hospital
4	XXXXX	M	43	RECONVERTED Indus Hospital
5	XXXXX	F	29	CONVERTED Indus Hospital
6	XXXXX	F	25	CONVERTED Sindh Government Hospital
7	XXXXX	F	48	CONVERTED Indus Hospital
8	XXXXX	F	18	CONVERTED Indus Hospital
9	XXXXX	M	45	CONVERTED Indus Hospital
10	XXXXX	F	22	CONVERTED Indus Hospital
11	XXXXX	M	37	CONVERTED Indus Hospital
12	XXXXX	M	68	CONVERTED Indus Hospital
13	XXXXX	F	38	CONVERTED Indus Hospital
14	XXXXX	F	27	CONVERTED Indus Hospital
15	XXXXX	F	19	CONVERTED Marie Adelaide Leprosy Center
16	XXXXX	M	45	CONVERTED Indus Hospital
17	XXXXX	F	18	CONVERTED Indus Hospital
18	XXXXX	M	43	CONVERTED Indus Hospital
19	XXXXX	F	23	CONVERTED Indus Hospital
20	XXXXX	M	27	CONVERTED Indus Hospital
21	XXXXX	F	38	CONVERTED Unknown Location
22	XXXXX	M	47	CONVERTED Indus Hospital
23	XXXXX	F	31	CONVERTED Unknown Location

# Challenges

- Requires dedicated IT staff
- High memory consumption in older software version
  - New version and dedicated hardware have helped
- Initial implementation requires a lot of effort
  - From IT staff
  - From program staff
  - From clinical staff
- Interaction with Indus Hospital's HMIS
  - In the works



# **Mobile phone based Conditional Cash Transfer**

Indus TB REACH grant

- GPs: identifying and referring suspects, TB case confirmation, cure/completion
- CHWs: household contact tracing, identifying and referring suspects, TB case confirmation, cure/completion

# Q1 2011 in comparison to Q4 2010

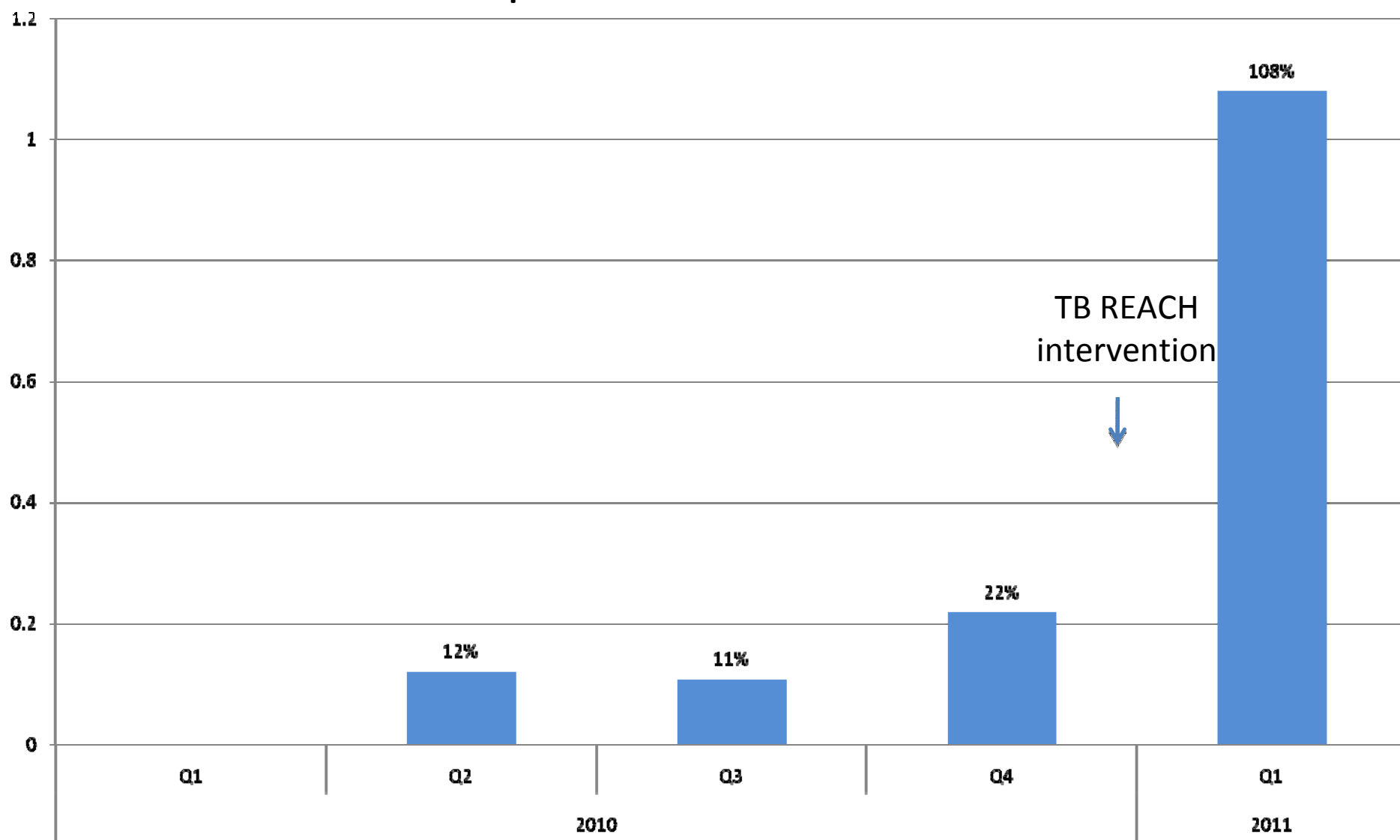
## Indus Hospital DOTS Clinic 2010-2011

- **108%** increase in all forms TB
- **125%** increase in pulmonary TB
- **133%** increase in SS+ pulmonary TB
- **114%** increase in SS- pulmonary TB
- **75%** increase in extra-pulmonary TB
- **44%** increase in childhood TB

Indus Hospital has become the **highest DOTS reporting center** in Sindh province in Q1 2011

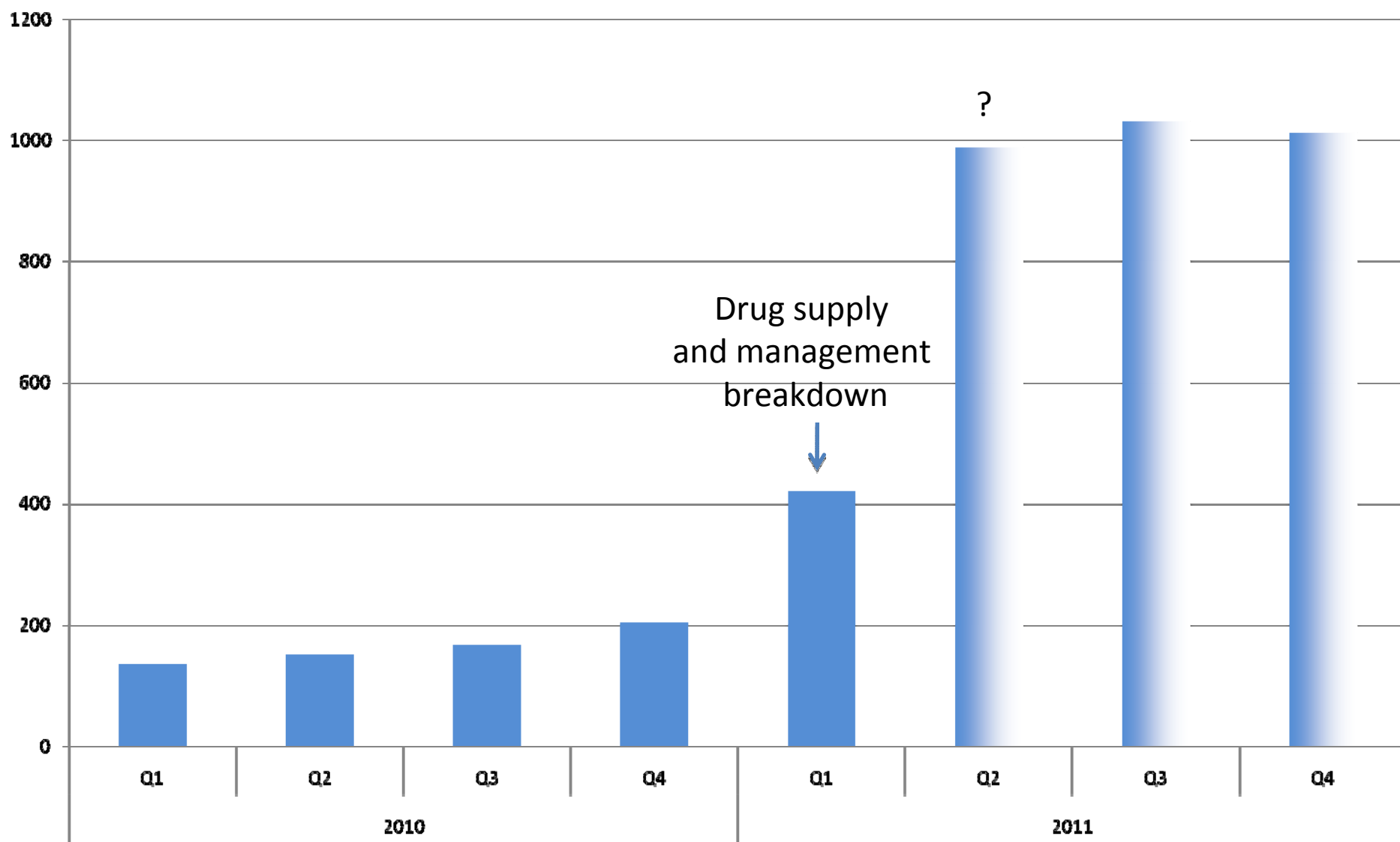


# Percent change over previous quarter in DOTS TB (all forms) case notification Indus Hospital DOTS Clinic 2010-2011



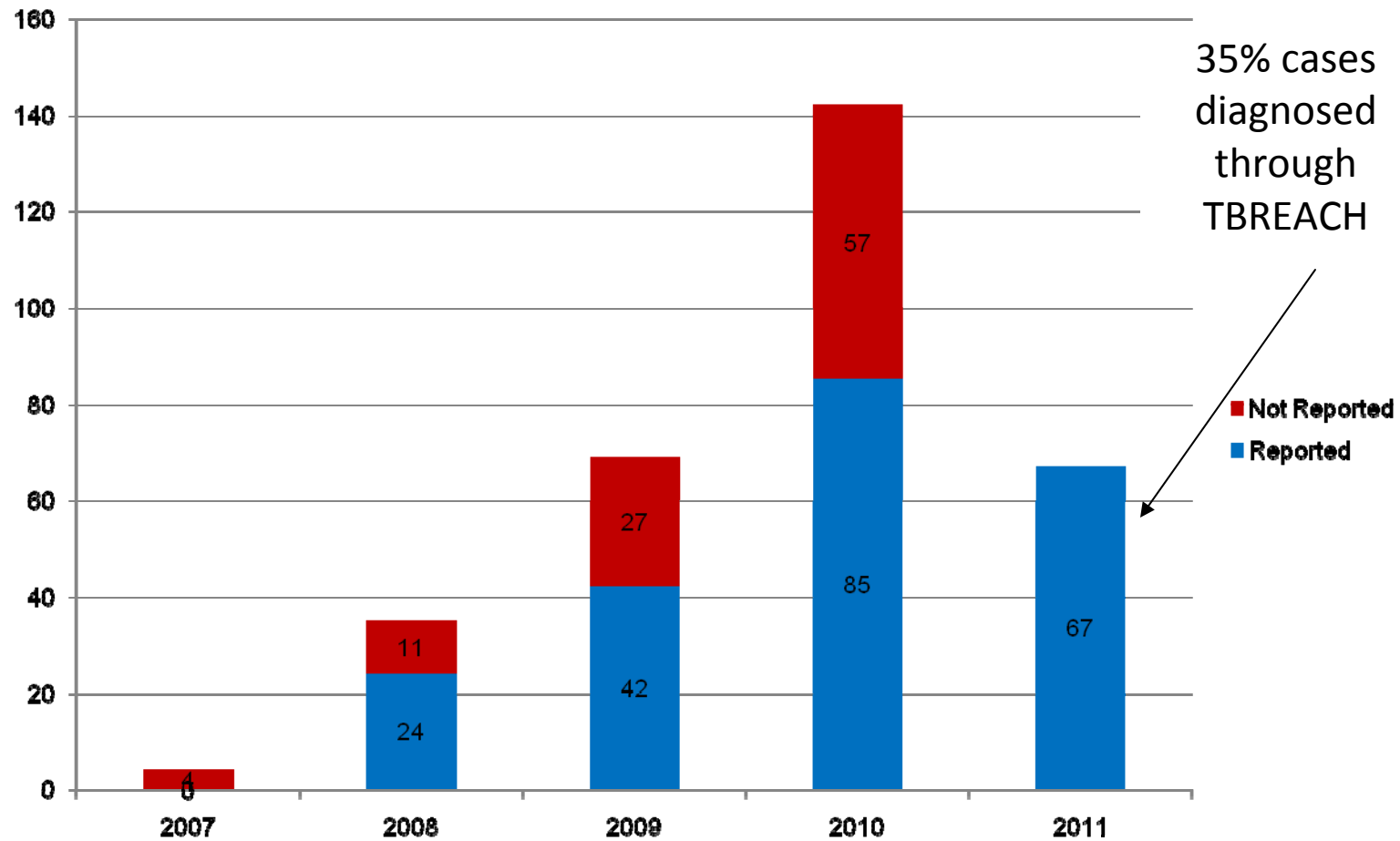
# Projections: DOTS TB registration at April 2011 rate

## Indus Hospital DOTS Clinic 2010-2011





# Pediatric TB cases at Indus Hospital: Annual enrollment and Reporting to NTP



2010: Children accounted for 20% (142/709) of total TB cases

# HIV, HCV & HBV Serology Status in Registered DR TB Patients (Apr 13, 2011 )

Results	HIV N(%)	HCV N(%)	HBV N(%)
Reactive	2 (1)	35 (13)	11 (4)
Borderline	0	4 (2)	0
Non-reactive	324 (99)	222 (85)	248 (96)
Total Tested	326	261	259

# HbA1c > 6.5% in Registered DR TB Patients (Apr 13, 2011)

Age Range N(%)	Proportion Positive of Total Tested N(%)				Total Patients >6.5%	Total Tested N
	Male		Female			
	>6.5	Tested	>6.5	Tested		
0-<15	0	5	0	6	0	11
15-<25	3 (10)	31	6 (11)	55	9 (10)	86
25-<35	5 (21)	24	2 (7)	28	7 (13)	52
35-<45	10 (32)	31	4 (20)	20	14 (27)	51
45-<55	3 (27)	11	4 (36)	11	7 (32)	22
55-<65	2 (25)	8	2 (33)	6	4 (29)	14
>65	1 (50)	2	0	2	1 (25)	4
Total	24 (21)	112	18 (14)	128	42 (18)	240



# Key lessons learnt & advice for countries

- The R&R system must provide useful feedback to data generators
- TB is a complex disease; ERR systems need to allow for locally relevant data points
- Partnerships are key. There is no single solution available for countries.
- Visit ERR sites before selecting a system.



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