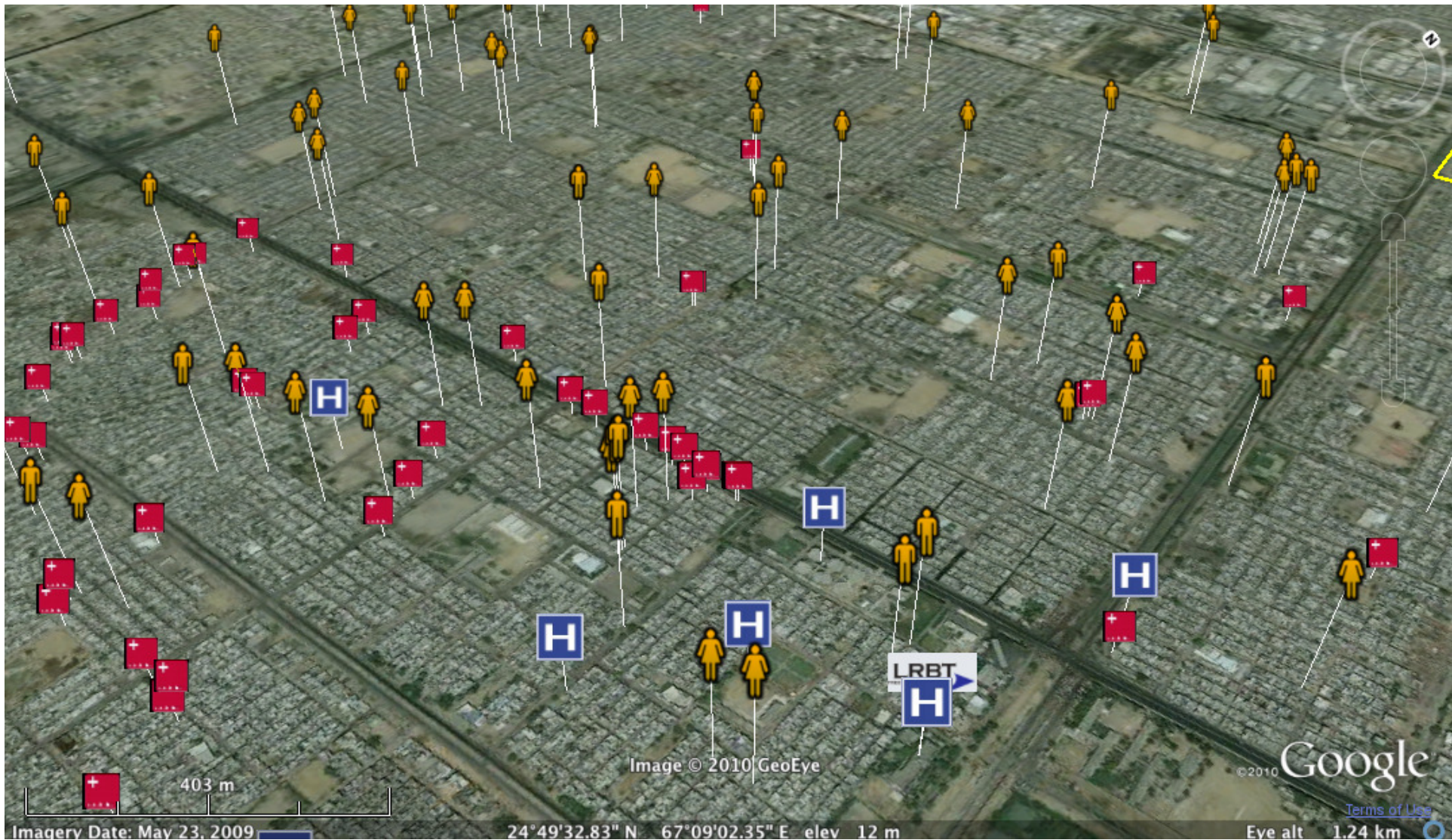


Innovative approaches and private sector involvement for GeneXpert scale up

Aamir Khan, MD PhD
Executive Director
Interactive Research & Development





National
TB Control Programme



Training



Marketing



Health workers



Free tests



Free drugs



Electronic data



General
Practitioner
clinics



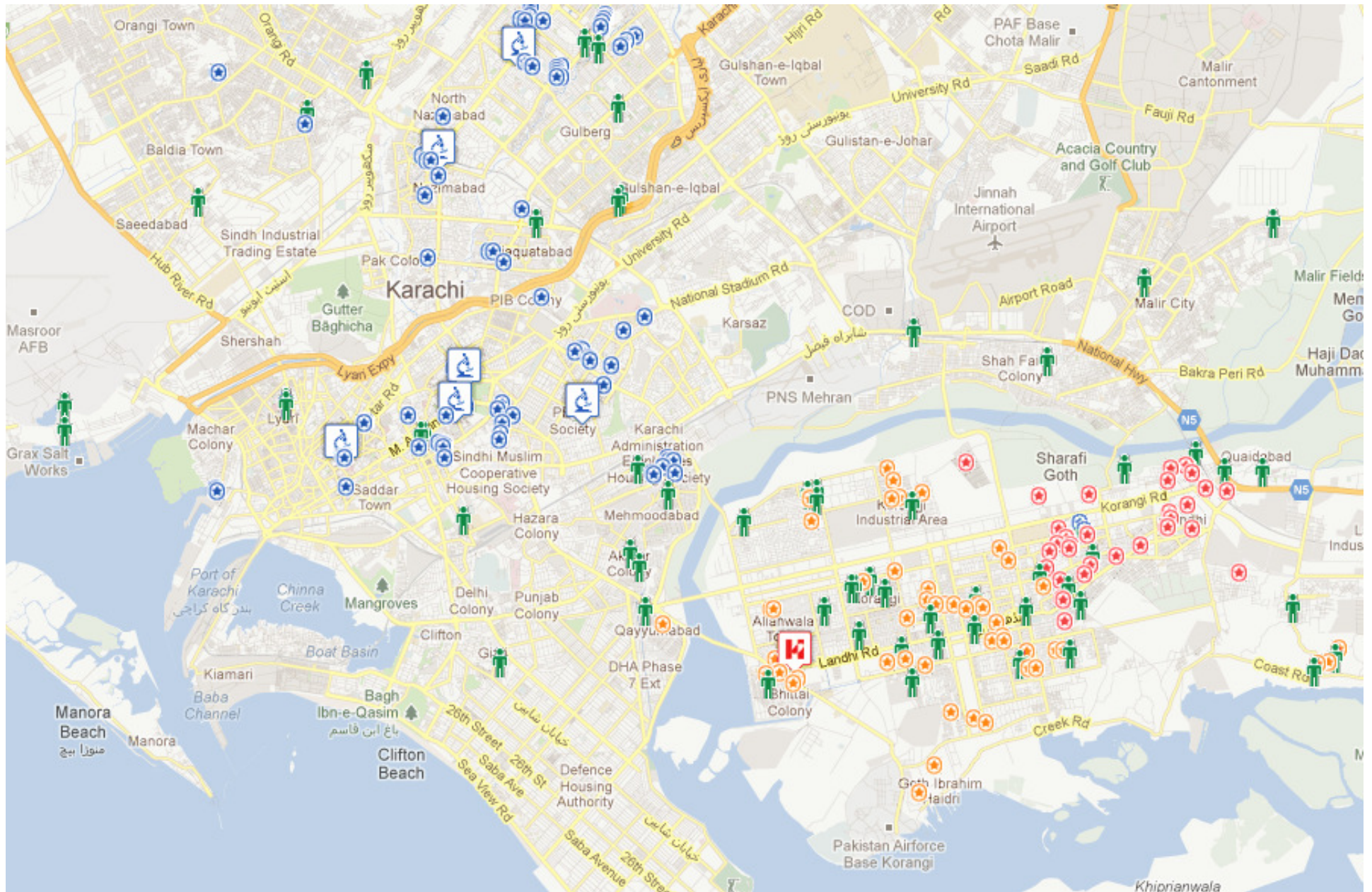
Private
laboratories









Private
pharmacies



Patient access
Free standard of care



- 
Indus Hospital
- 
Indus Hospital Treatment Supporter
- 
TB REACH 1 General Practitioner
Korangi
- 
TB REACH 1 General Practitioner
Landhi
- 
TB REACH 2 Private Laboratories
- 
TB REACH 2 General Practitioner



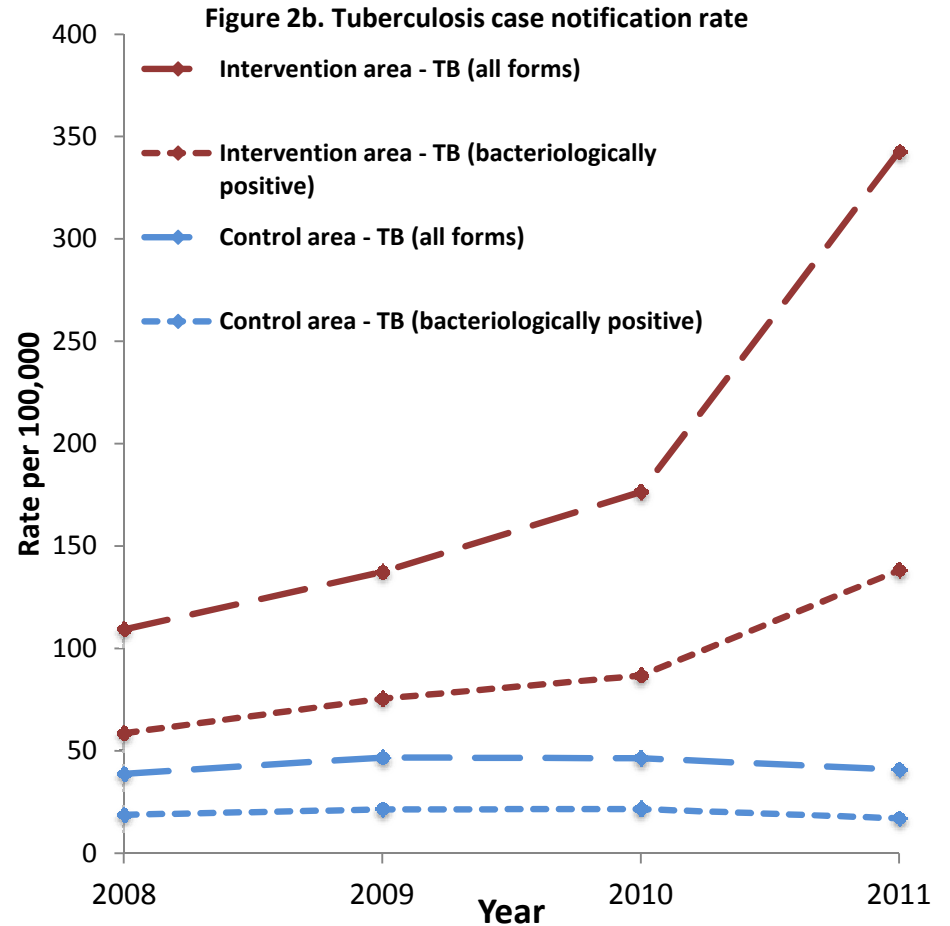
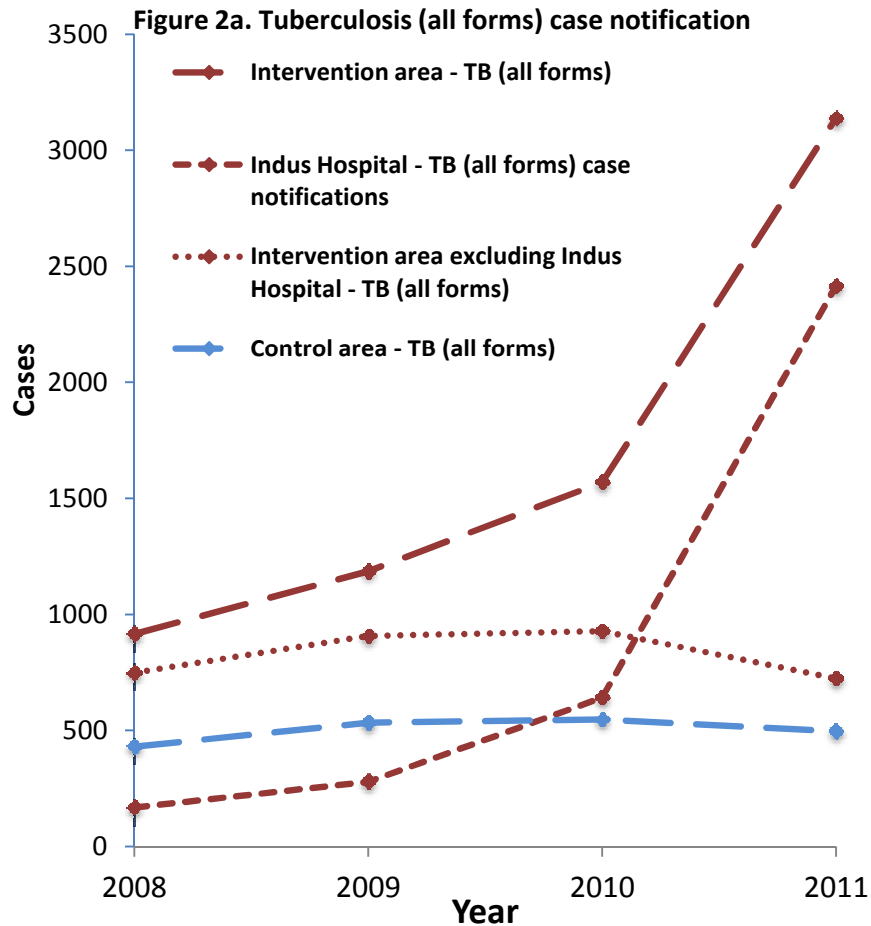
Private Sector Engagement

Funding	Months of Operation	City	Site	# Screened	# Suspects	# B+ Cases	# All Cases
TB REACH 1	15	Karachi	GP Clinics	498,233	6,089	365	909
TB REACH 1	15	Karachi	Indus Hospital OPD	95,897	2,405	229	430
TB REACH 2	6	Karachi	Private Labs	215,165	4,820	470	514
TB REACH 2	4	Dhaka	Private Labs	53,090	1,991	121	170
Total				862,385	15,305	1,185	2,023

	TBR1 Karachi	TBR2 Karachi	TBR2 Dhaka
Site	GPs, Indus Hospital	Private Labs	Private Labs
# GXP Systems	1 (4-module)	4 (2-module)	2 (2-module)
# GXP Cartridges Consumed	440	1,250	360
# GXP Cartridges Remaining	2,750	2,020	770
Cost of GXP systems and testing	\$70,783	\$103,132	\$43,052

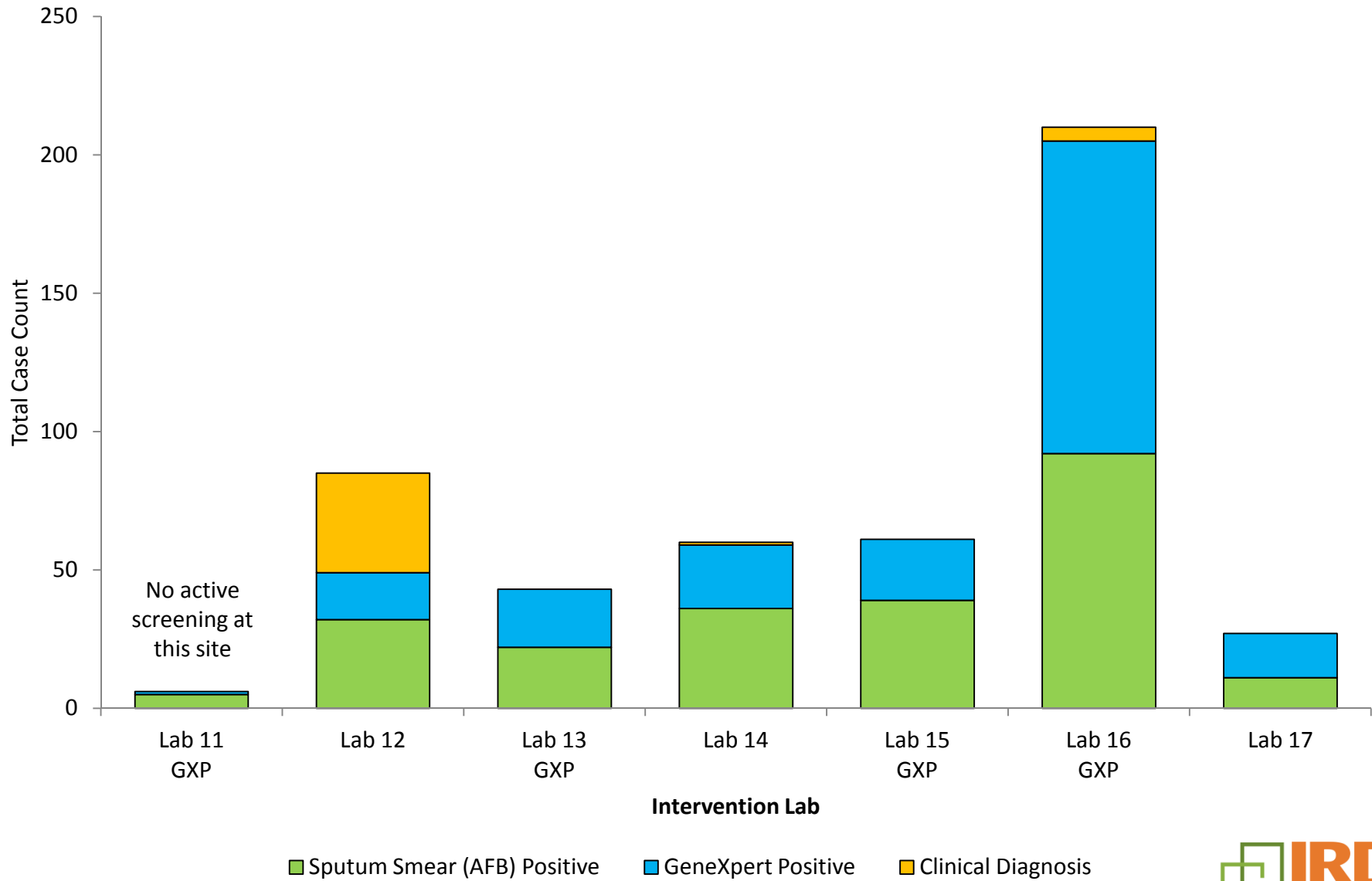
Impact of Mass Screening Intervention

TB REACH 1 Karachi, Jan-Dec 2011

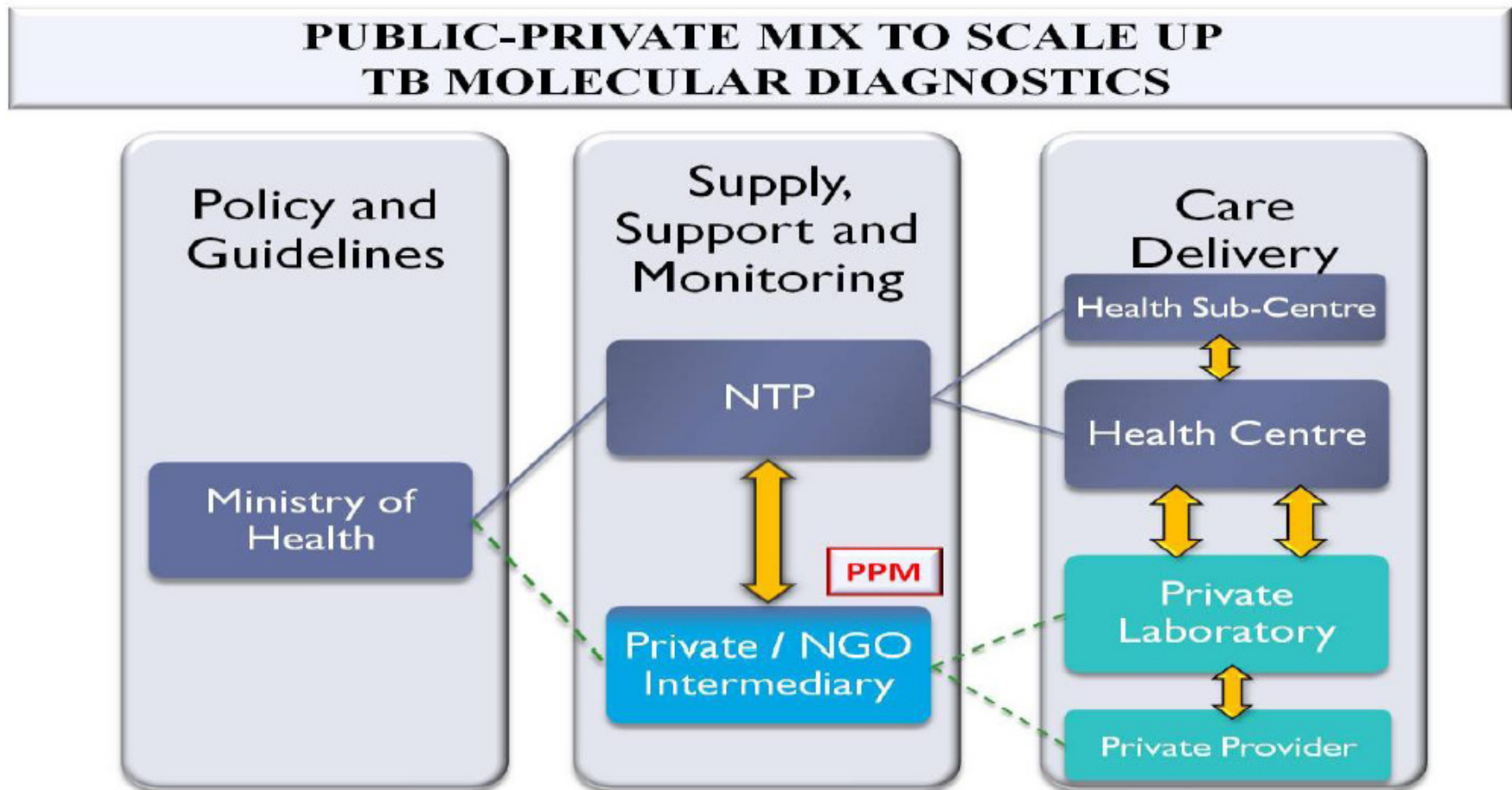


Case Detection by Private Lab and Diagnostic Method

TB REACH 2 Karachi



Generic PPM Model to Scale-up TB Molecular Diagnostics

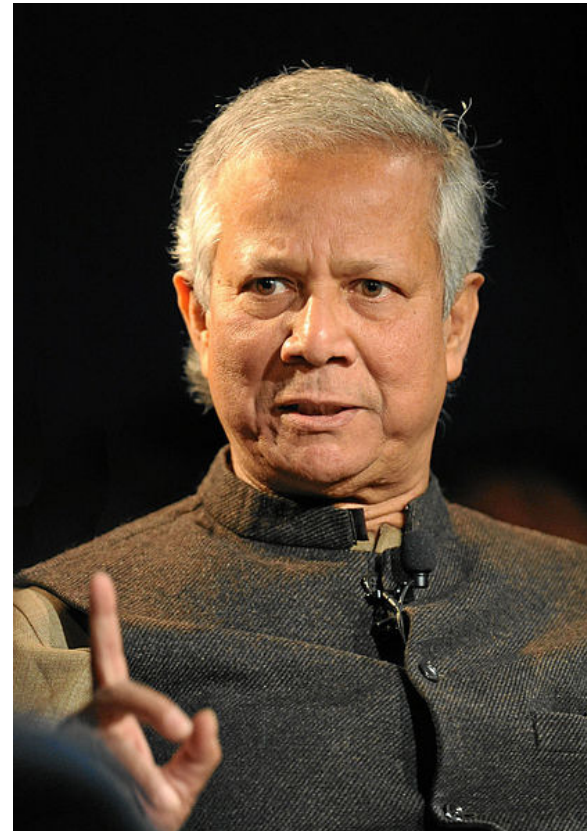


A Social Business Delivery Model for GXP?

Description

- A non-loss, non-dividend company designed to address a social objective within the highly regulated marketplace
- Should generate a modest profit, but this is used to improve the product or service

Muhammad Yunus



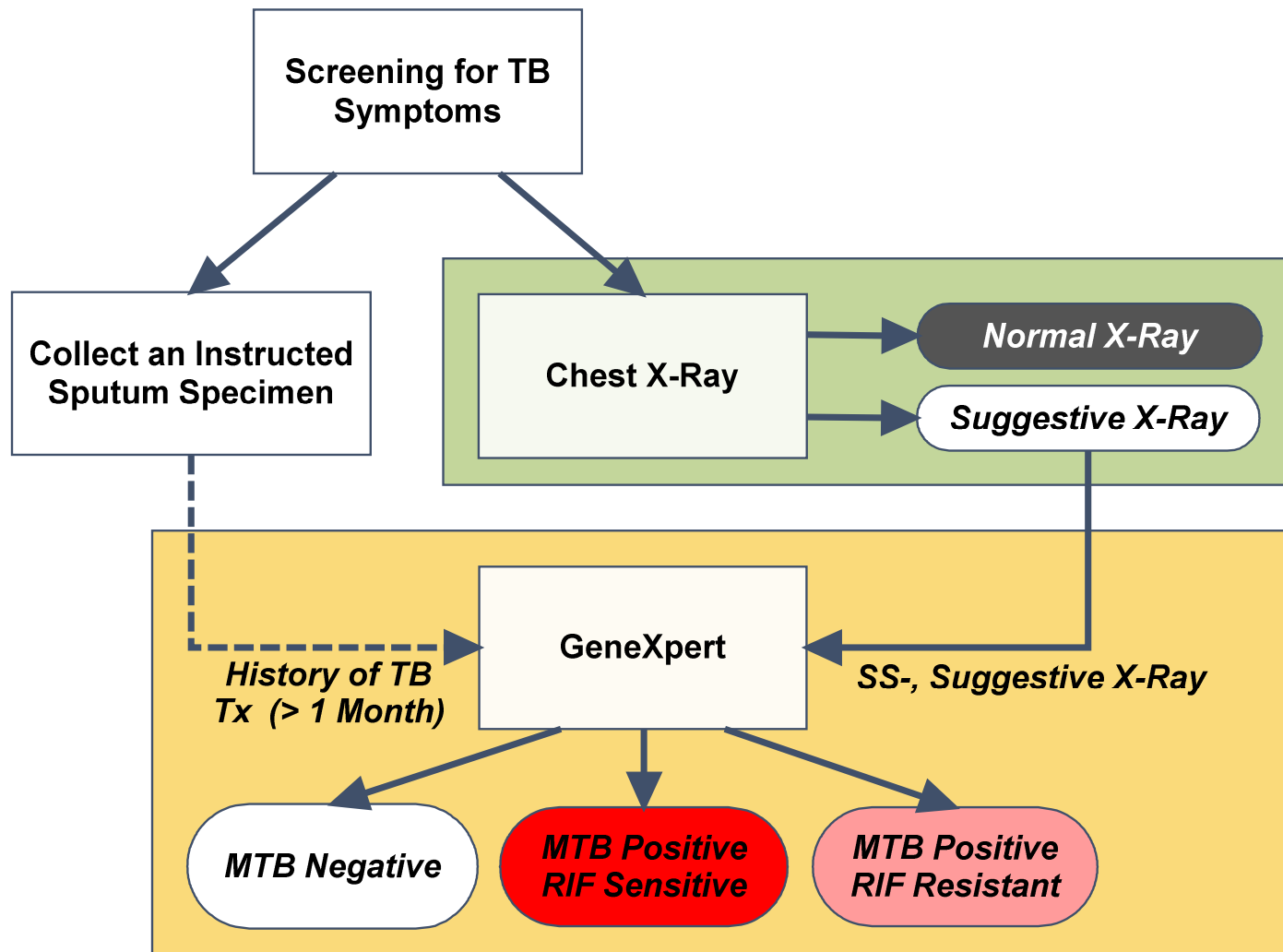
GXP Social Business Delivery Model

Screening and CHW Numbers

	Year 1	Year 2	Year 3	Total (1-3)
Individuals Screened <i>(private clinics/labs/hospitals)</i>	9,000,000	9,000,000	9,000,000	27,000,000
GXP Machines Operational	30	30	30	30
Participating Facilities <i>(private clinics/labs/hospitals)</i>	250	250	250	250
Community Health Workers <i>(for screening and case holding)</i>	250	250	250	250
Patients Screened / Site / Day <i>(private clinics/labs/hospitals)</i>	138	138	138	138

- TB REACH 1 Pakistan Data (>500,000 screened in 12 months):
 - average # people screened/day at Indus Hospital OPD = 291
 - average # people screened/GP clinic/day = >50
- TB REACH 2 Pakistan Data (>100,000 in 3 months):
 - average # people screened/lab/day = 257 (128 per field worker)

GXP Social Business Delivery Model
Diagnostic Algorithm



GXP Social Business Delivery Model

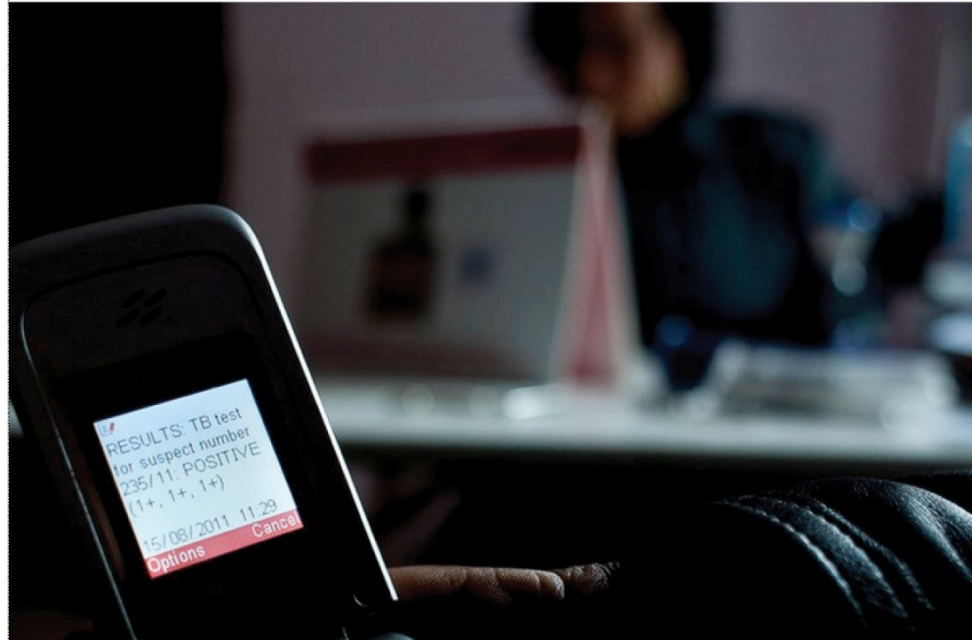
Testing Numbers and Revenue

Process Indicators / Outputs	Assumptions	Year 1	Year 2	Year 3	Years 1-3
# X-rays Performed	-	147,915	147,915	147,915	443,745
# TB Suggestive X-rays	-	66,562	66,562	66,562	199,685
# GXP Cartridges (History of TB Tx)	-	17,861	17,861	17,861	53,582
# GXP Cartridges (SS-, X-ray Suggestive)	-	48,923	48,923	48,923	146,769
Total GXP Cartridges Consumed	-	66,783	66,783	66,783	200,350
Patients Detected by GXP	-	12,771	12,771	12,771	38,314
Expenses					
	Funder				
X-ray Cost (at \$2.50)	Patient	\$369,788	\$369,788	\$369,788	\$1,109,363
GXP Cartridges	UNITAID?	\$751,981	\$751,981	\$751,981	\$2,255,943
CHW Incentives	TB REACH?	\$180,000	\$180,000	\$180,000	\$540,000
Operational Costs	TB REACH?	\$500,000	\$500,000	\$275,000	\$1,275,000
Subtotal		\$1,121,768	\$1,121,768	\$1,121,768	\$3,365,305
Income					
GXP Cartridge Cost to Patient		\$0	\$0	\$0	\$0
Income - X-rays (at \$4)	TB REACH	\$591,660	\$591,660	\$591,660	\$1,774,980
Service Fee (at \$3)	Patient	\$146,769	\$146,769	\$146,769	\$440,306
Subtotal		\$738,429	\$738,429	\$738,429	\$2,215,286
Surplus/Deficit per Year		\$368,641	\$368,641	\$368,641	\$1,105,923

- Surplus used to fund GXP cartridge purchases, CHW incentives and operational costs in the 'Sustainability Phase' (Years \geq 4)

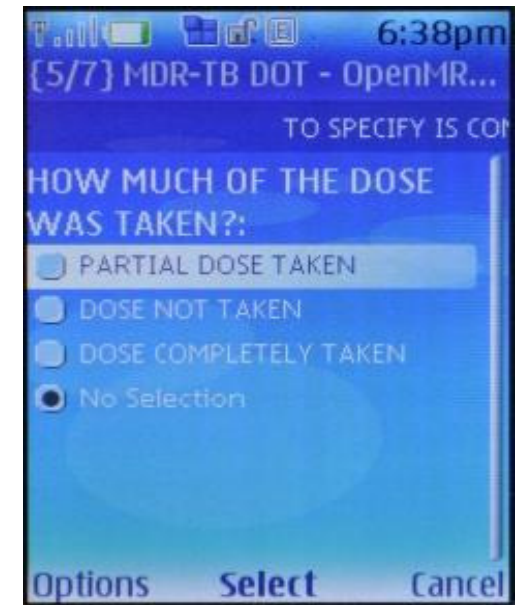
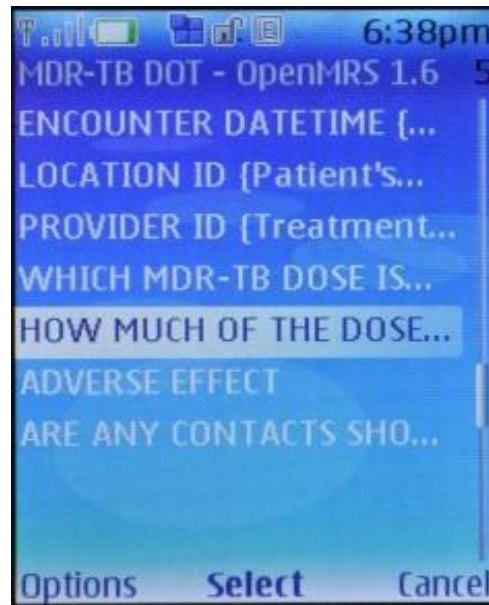
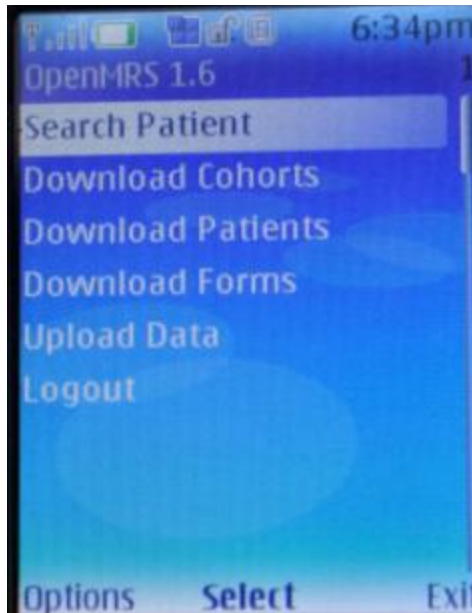
The logo features a stylized bar chart with four vertical bars of increasing height on the left, followed by a large red letter 'M'. To the right of the 'M' is the word 'HEALTH' in a bold, red, sans-serif font.

FOR TB MANAGEMENT AND CONTROL



Partner of the
Stop TB Partnership





Data uploads to server and is integrated into patient medical records in real-time

Mobile phone-based data collection allows for decentralized, personalized care

New approaches to managing drug-resistant TB in Bangladesh, Nepal, Pakistan, Tajikistan



Over 1500 MDR-TB patients
On treatment in Nepal,
Pakistan and Tajikistan



7 GeneXpert machines in Pakistan and Bangladesh
8 NTP GeneXperts machines in Tajikistan
DOTS reporting in Tajikistan & Indonesia

Closing the GeneXpert reporting loop

1. GeneXpert test results automatically relayed to a netbook



2. Data securely transferred to remote country server and integrated into patient medical records



4. Data securely transferred to remote global server for integrated reporting



3. Data accessible to patient, clinicians, and program teams remotely via SMS alerts, mobile phones, and a web interface



The reporting challenge for rapid new diagnostics in TB control & MDR-TB scale up

- How do we provide programs with electronic reporting tools to achieve the full potential of rapid testing?
- What existing electronic systems might a GeneXpert reporting tool be linked too?

Low-cost, open source electronic reporting and training tools

- Electronic recording and reporting based on GPRS and SMS text services
 - Reporting laboratory results (smears, GXP)
 - Basic medical records for continuity of care
 - DOT records for treatment compliance and adverse event reporting
- Management applications
 - Supply chain for lab supplies and drugs
 - Training and competency testing?
 - Physicians, nurses, health workers
 - Laboratory staff
 - Pharmacists

Electronic Medical Records Systems (eMRS)

Лаборатория	Мазок	Посев	INH	R	E
ОЦБТ Куляб	+	+	R	R	R
ОЦБТ Куляб	++	ПОЛ			

Tajikistan

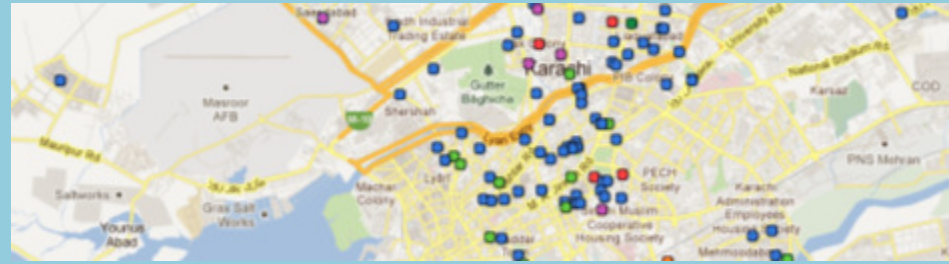
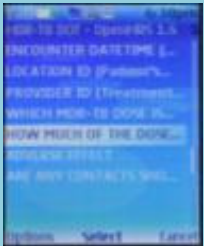
Lab	Smears	Cultures	Bacteria	INH	R	E
Indus Hospital		POSITIVE		R	R	R
Indus Hospital	++	POSITIVE				
Indus Hospital	NEGATIVE	NEGATIVE				

Pakistan

GENETUP	+++	+++
GENETUP	++	+
GENETUP	NEGATIVE	NEGATIVE
GENETUP	NEGATIVE	NEGATIVE

Nepal

Mobile Phone Data Collection & GIS Mapping



Training and Competency Testing Tool



About Moodle

PATIENT MEDICAL RECORDS: OPENMRS + OPENXDATA

REAL-TIME DATA VISUALIZATION ON GOOGLE EARTH

US PST: 9:41:15 PM US EST: 12:42:15 AM London: 5:42:15 AM Geneva: 6:42:15 AM Karachi (Current Server Time): 10:42:15 AM Seoul: 2:42:15 PM

The screenshot displays a Google Earth interface with a satellite view of a city. Several green human-shaped markers are scattered across the map, representing patient locations. A popup window is open, showing detailed medical records for a specific patient. The records include personal information, clinical status, and a table of sample collection results. The popup window has a close button (X) in the top right corner and a scroll bar on the right side.

MRN: [REDACTED]
Program: DOTS-Plus
Location: Indus Hospital
First Name: [REDACTED]
Last Name: [REDACTED]
Gender: Male
Age: 43
Classification: MULTI-DRUG RESISTANT TUBERCULOSIS
Patient Type: On Treatment
Enrollment Date: 03/29/08
Program Status: STILL ON TREATMENT
Culture Status: CONVERTED
Patient Status: ON TREATMENT
Last Event Date: 02/14/09
Last Event Type: ADULTINITIAL
Last Event Location: Indus Hospital
Last Encounter Form: MDR-TB Follow Up

Bacteriologies

Sample Collection Date	Smear	Culture
10/30/07	++	
03/24/08	+	+
04/28/08	+	-
05/30/08	+	+
06/28/08	scanty 0	+
07/28/08	scanty 0	-
09/08/08	scanty 0	-
10/13/08	scanty 0	-
11/10/08	-	-
12/15/08	-	CONTAMINATED

Patient Weight

100
95

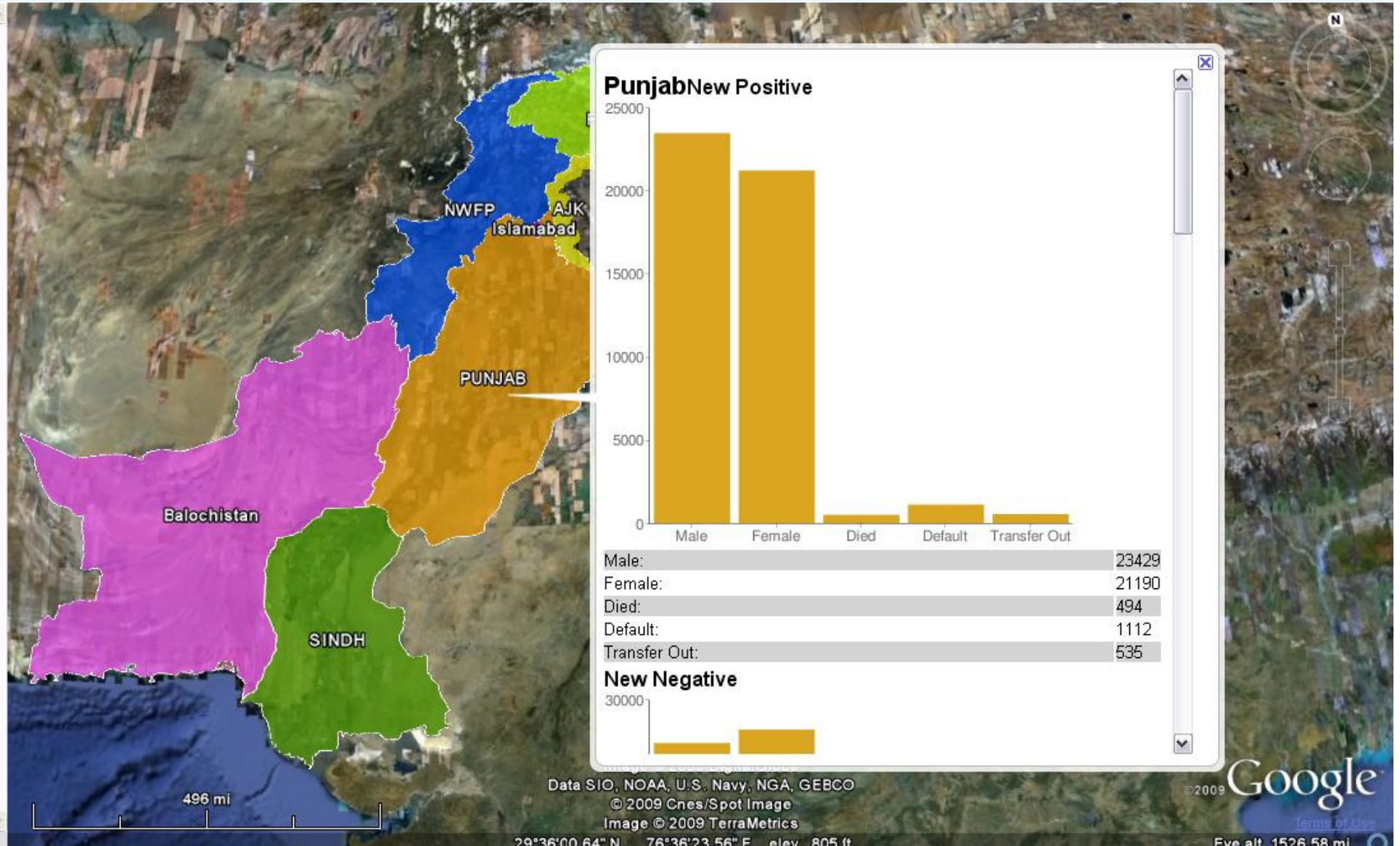
24°49'56.62"N 67°09'35.70"E alt: 55 ft

©2009 Google
Terms of Use
Eye alt: 49757 ft

INDIVIDUAL LEVEL → AGGREGATE DATA

REAL-TIME DATA VISUALIZATION ON GOOGLE EARTH

US PST: 2:34:39 AM US EST: 5:35:39 AM London: 10:35:39 AM Geneva: 11:35:39 AM Karachi (Current Server Time): 3:35:39 PM Seoul: 7:35:39 PM



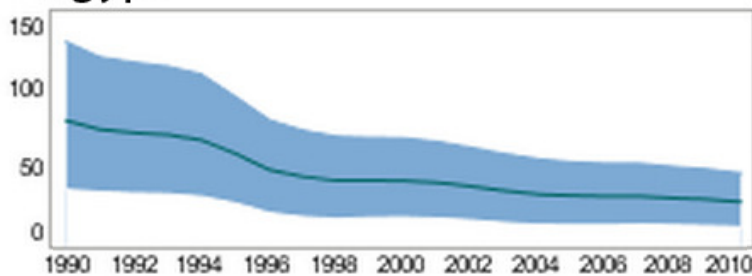
Remote, real-time data for Global Health Delivery



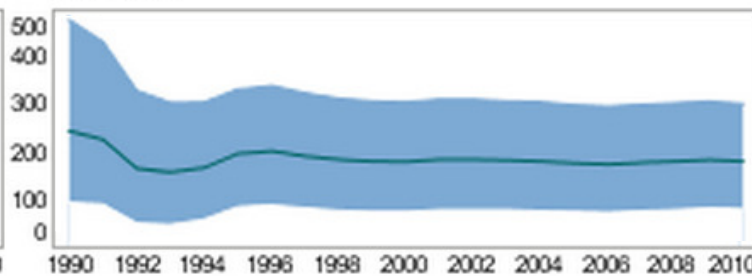
Tuberculosis Diabetes HIV/AIDS Malaria Clinical Trial

TB Prevalence Rate (per 100,000)

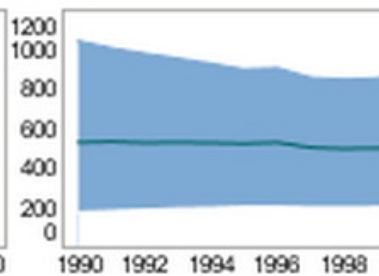
Egypt



Sudan

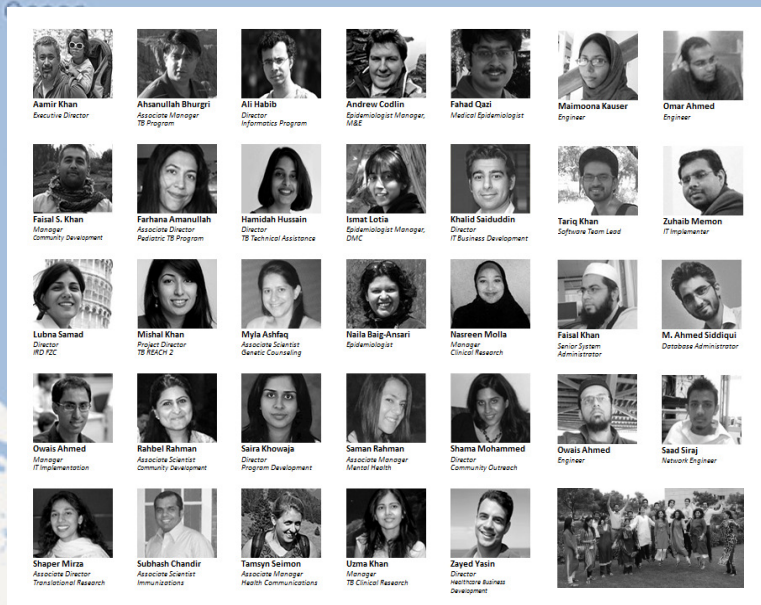


Pakistan



300+

SCIENTISTS, MANAGERS & FIELD STAFF IN 5 COUNTRIES



Implementing Partners

- icddr,b
- Indus Hospital
- Partners in Health
- SUMMIT

Implementation Sites

- Pakistan
- Bangladesh
- Tajikistan
- Nepal
- Indonesia
- Kenya

Networks

- Innovations in International Health
- Innovations for Poverty Action
- OpenMRS
- OpenXData
- Stop TB Partnership

UN Agencies

- United Nations Development Programme

WHO Universities

- Harvard Medical School
- Harvard School of Public Health
- Johns Hopkins Bloomberg School of Public Health
- Johns Hopkins School of Medicine
- London School of Hygiene and Tropical Medicine
- Massachusetts Institute of Technology

of Technology

- University of Berger
- University of Texas
- School of Public Health

Acknowledgements

Donors

TB REACH Initiative through CIDA

UNDP

WHO

Partners

National TB Programmes - Bangladesh, Nepal, Pakistan, Tajikistan

Indus Hospital

icddr,b

LSHTM

FIND

OpenMRS/Partners in Health

openXdata/University of Bergen