



# Using the OpenMRS electronic medical record system to strengthen health care delivery in Rwanda

Dr Hamish SF Fraser

Partners In Health

Division of Global Health Equity, BWH

Harvard Medical School





# Overview



- Partners In Health and the PIH-EMR
- OpenMRS and open source systems
- Evaluating the impact of systems
- Building a community for developing and implementing OpenMRS in Rwanda





# Partners In Health Model of Care



- Access to health care for all people
- Creation of long-term development by partnering with local people and communities
- Use of community health workers to grow a local and sustainable work force
- Addressing the effects of poverty including poor nutrition, water, and housing
- Drawing on the resources of the world's elite medical and academic institutions and on the lived experience of the world's poorest and sickest communities





## PIH-EMR history



- 2001: created a web based EMR system to support the scale up of MDR-TB treatment in Peru
- 2003: created a version of PIH-EMR to support HIV treatment in rural Haiti
- 2004: plan to create a new, general and flexible platform to build EMR systems
- 2006: OpenMRS first used in Kenya and then Rwanda and South Africa
- 2007: OpenMRS released as open source





# OpenMRS



- A modular, open source EMR system
- Developed as a collaboration of PIH, the Regenstrief Institute and South African MRC
- Uses a concept dictionary for data storage
- Modular design simplifies adding new functions
- Open standards for interoperability
- Multiple languages, English, French, Spanish +
- Core of paid programmers and growing community
- [www.openmrs.org](http://www.openmrs.org)



Partners In Health



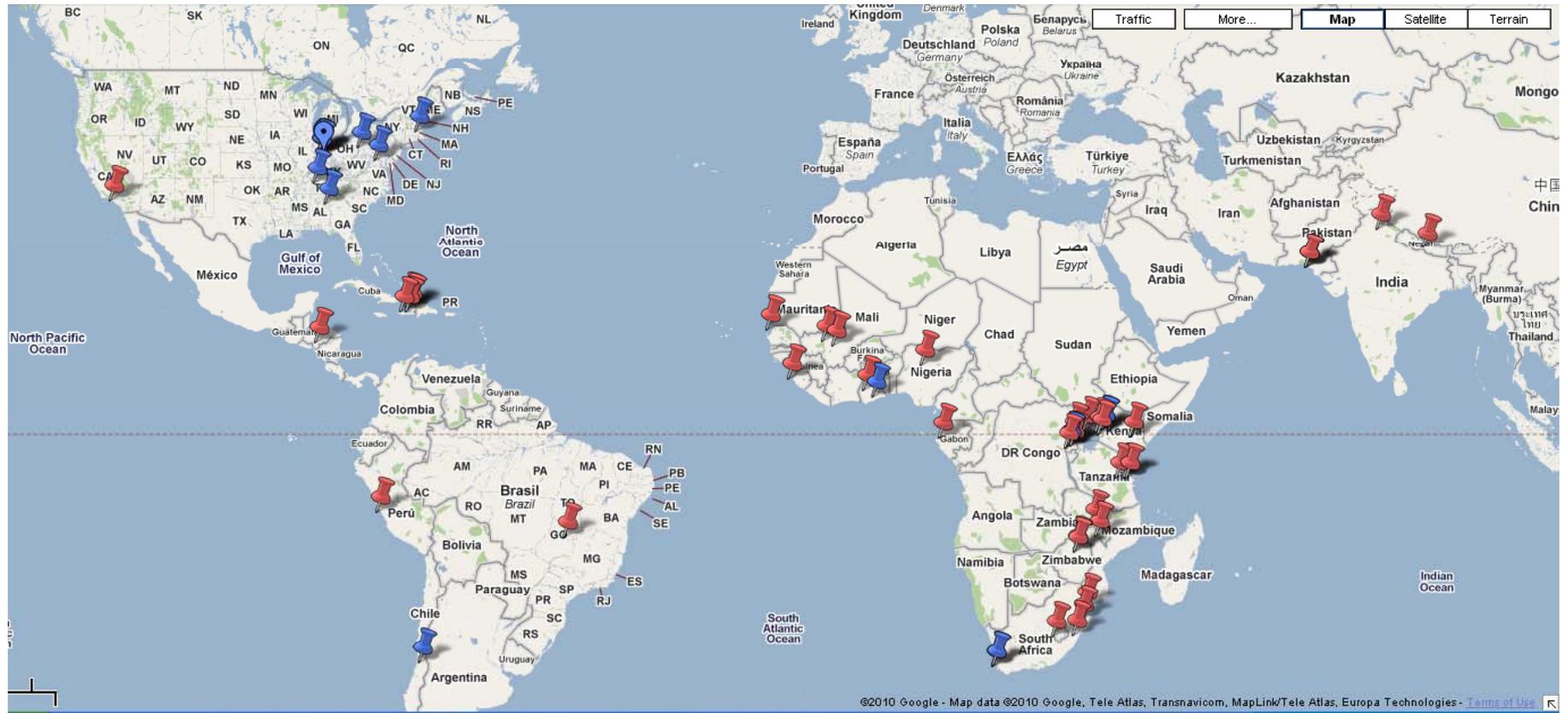
Regenstrief Institute



Medical research  
council SA



# OpenMRS sites (partial list)



Red clinical use, blue development





## OpenMRS at PIH sites in Rwanda

- Currently used for 12 PIH supported health centers
- Data for patients with HIV, TB and now heart failure
- Over 10,000 patients tracked
- Team of Rwandan data officers trained to enter data, ensure data quality & produce reports



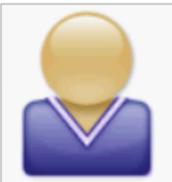


## OpenMRS uses in Rwanda



- Access to up to date clinical data including drug regimen and lab results
- Direct point of care use in HIV clinics
- Analysis and reporting function with new framework for non-programmers
- Support for drug forecasting
- Primary care version being implemented
- Research data collection including DDCF primary care research center (PHIT)





# Physician looking up ARV patient



Back Print

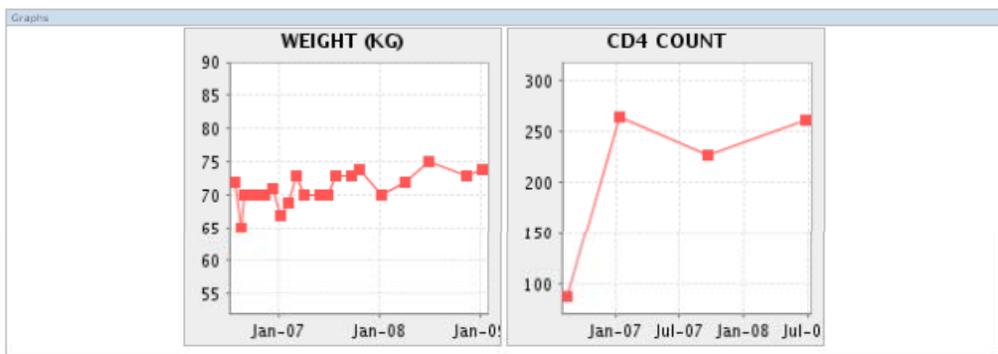
IMB ID ██████████ HIVEMR-V1: 10257  
 Gender **Male** TRACnet ID: ██████████  
 Age **39 yrs** (~Jan 1, 1970)  
 Adult HIV PROGRAM **GROUP 19**  
**ON ANTIRETROVIRALS**  
 Last Visit **4 months ago** (Jan 7, 2009)  
**ADULT RETURN VISIT** by ██████████  
 ██████████@Kirehe

Alerts	Comments
<b>NO CHEST XRAY</b> <b>NO CD4 IN THE LAST 6 MONTHS</b>	No adverse effects No opportunistic infections No previous diagnoses

Recent Symptoms	Date
FEVER	Jun 27, 2007
NIGHT SWEATS	Jun 27, 2007
COUGH	Jun 27, 2007
PRODUCTIVE COUGH	Jun 27, 2007
NIGHT SWEATS FOR LESS THAN 3 WEEKS	Jun 27, 2007

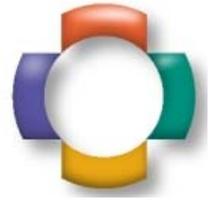
Drug Orders	Dose	Frequency	Start Date	Stop Date	Comments
<b>Triomune-30</b>	1.0 tab(s)	2/day x 7 days/week	Aug 12, 2008		
<b>TMP/SMX 800/160</b>	1.0 tab(s)	1/day x 7 days/week	Aug 18, 2006		
Triomune-40 (stopped)	1.0 tab(s)	2/day x 7 days/week	Jul 26, 2006	Aug 12, 2008	TREATMENT GUIDELINES CHANGED

Lab Tests	7/25/06	8/14/06	1/10/07	5/30/07	9/19/07	6/25/08
<b>CD4</b>		88.0	265.0		227.0	262.0
<b>AST</b>	20.8			50.64		
<b>ALT</b>	18.5			24.15		
<b>Cr</b>	55.51			89.8		





## CD4 Access, Rwinkwavu, Rwanda



- We evaluated whether the ID physicians had access to the latest CD4 count for their patients in Rwinkwavu, Rwanda
- The physicians record the result they have on the follow-up form based on paper lab result forms
- We checked if they were up to date before and after a new lab component was added to the EMR to generate results forms





## Results – Access to CD4 counts



- The proportion of CD4 counts conducted within the past 60 days but unknown to the clinician at the time of consultation was:
  - 24.7% in the pre-intervention period
  - 16.7% in the post intervention period
  - This is a 32.4% reduction in CD4 loss ( $p=.002$ )
- We will evaluate the effect of direct clinician access to the EMR next



*Amoroso C, et al: in press*





# Systematic review of evaluation studies



POLICIES & POTENTIAL

By Joaquin A. Blaya, Hamish S.F. Fraser, and Brian Holt

doi: 10.1377/hlthaff.2009.0894  
HEALTH AFFAIRS 29,  
NO. 2 (2010): 244-251  
©2010 Project HOPE—  
The People-to-People Health  
Foundation, Inc.

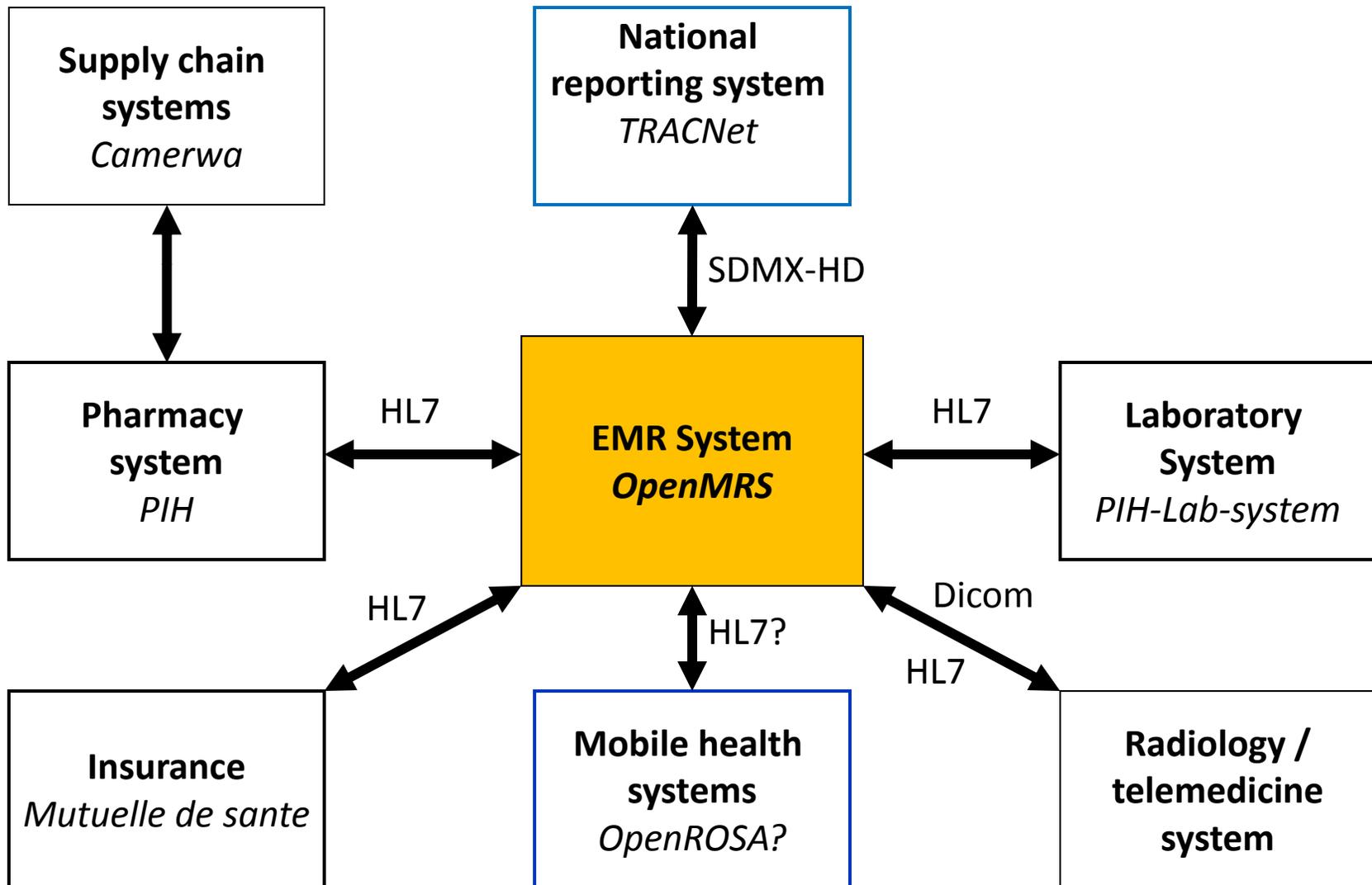
## E-Health Technologies Show Promise In Developing Countries

*Health Affairs 2010, 29;2: 244-251*





# National eHealth architecture for Rwanda, potential components and links





# Government of Rwanda EMR roll out



- The Government of Rwanda is committed to having a strong national EMR program
- MoH has announced that OpenMRS will be used for national roll out to health centers and small hospitals
- A non-disease specific system which can assist in the management of all outpatients
- Developing detailed rollout plan
- First sites due to start this year





# Developer training, Rwanda



- Training program in Kigali for computer science graduates
- One year, mentored training course
  - Web development
  - Java programming
  - OpenMRS programming
  - Medical informatics
- Ten students graduated last fall
- Now supporting OpenMRS rollout as well as building software development capacity in Rwanda





# Community: OpenMRS Wiki



2008 IMPLEMENTERS MEETING

Looking for [Google Summer of Code Projects?](#)

OpenMRS® is a community-developed, open-source, enterprise [electronic medical record system](#) framework. We've come together to specifically respond to those actively building and managing health systems in the developing world, where AIDS, tuberculosis, and malaria afflict the lives of millions. Our mission is to foster self-sustaining health information technology implementations in these environments through peer mentorship, proactive collaboration, and a code base that equals or surpasses proprietary equivalents. You are welcome to come participate in our community, whether by implementing our software, or contributing your efforts to our mission!

- » [About OpenMRS](#)
- » [Getting Started](#)
- » [Online Demo](#)
- » [Downloads](#)
- » [FAQ](#)
- » [Blog](#)



## Discuss

Join community conversations via our [forums](#), [mailing lists](#), and [online chats](#).

### Recent Posts:

- » 24-May [OpenMRS Forum: Installation of Latest Stable Release 1.4.2](#)
- » 24-May [OpenMRS Forum: Re: Problem list, Fx/SH - how stored?](#)



## Community

Get project updates through our [blog aggregator](#) or join a [working group](#).

### Recent Blog Updates:

- » 24-May [Lu Zhuang Wei: Weekly Report for project\(2009-05-24\)](#)
- » 23-May [Omar Verduga: Finally, running 500k observations in my alpha module :D](#)



## Develop

Suggest changes and view project timelines via our [development site \(trac\)](#) or [learn how to contribute code!](#)

### Recent Submissions:

- » 23-May [OpenMRS Changesets: Changeset \[8008\]: groovy module: groovify the controller w/ GStrings](#)

**Navigation**

- [What is OpenMRS?](#)
- [FAQ](#)
- [Data Model](#)
- [Source](#)
- [Road Map](#)
- [Design Plans](#)
- [Recent changes](#)
- [Contact Us](#)
- [Help](#)

**Toolbox**

- [What links here](#)
- [Related changes](#)
- [Upload file](#)
- [Special pages](#)
- [Printable version](#)
- [Permanent link](#)

Font: A A A A A  
Hide | Move





# Disease-specific EMR (MDR-TB)



**Joia Test Mukherjee**  
 28 yrs (~Jan 1, 1981) Health Center: Mulindi

BMI: 20.9 (Weight: 57.0 kg, Height: 165.0 cm) | Regimen: Tricard  
 Last encounter: Bacteriology Result @ Unknown Location  
 MDR-TB program start date: Apr 3, 2008  
 Treatment start date: Apr 10, 2008  
 Culture status: **Converted**  
 Culture Conversion Date: May 10, 2008

Warning: The following drugs from this patient's active orders are contra-indicated by DST results:  
 RIFAMPICIN (R)  
 ETHIONAMIDE (ETHIONAMIDE)  
 ETHAMBUTOL (E)

cheduled visit: 01/22/2008

Status Form Entry Drug Regimen **Bacteriologies** Contacts

[Add New Bacteriology](#)

sample collection date	smear	culture
Jan 2, 2008	+	+
Apr 2, 2008	+	+
Apr 3, 2008	MDR-TB PROGRAM START DATE	
Apr 10, 2008	TUBERCULOSIS DRUG TREATMENT START DATE	
May 1, 2008	++	
May 6, 2008	+	++
		+++
May 10, 2008	-	-
	MULTI-DRUG RESISTANT TUBERCULOSIS CULTURE STATUS: CONVERTED	
Jun 11, 2008	-	-

SERINE	AMK	CPX	Moxi	GATIFLOXACIN	PROTHIONAMIDE	Duration (days)
			✓			59
			✓			69
			✓			156
			✓			1
			✓			5
			✓			15





# OpenMRS-Google Maps-SMS-Integration, Karachi



MRN: [REDACTED]  
Program: DOTS-Plus  
Location: Indus Hospital  
First Name: [REDACTED]  
Last Name: [REDACTED]  
Gender: Male  
Age: [REDACTED]  
Classification: MULTI-DRUG RESISTANT TUBERCULOSIS  
Patient Type: On Treatment  
Enrollment Date: [REDACTED]  
Program Status: STILL ON TREATMENT  
Culture Status: CONVERTED  
Patient Status: ON TREATMENT  
Last Event Date: [REDACTED]  
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

24°54'32.04" N 67°04'40.81" E

Credit: Owais Ahmed, Aamir Khan

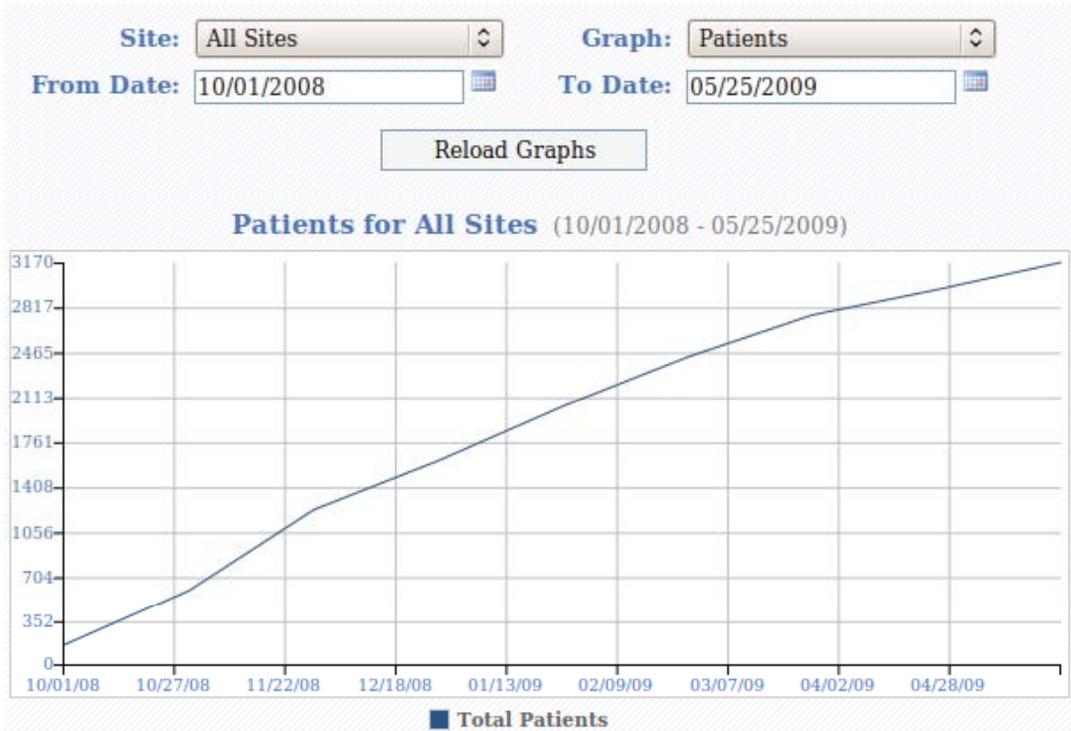




# TB in homeless patients in Los Angeles



Credit: Monica Waggoner



Encounter Type A (Not Recorded)  
 Created By  Dec 10, 2008

Where did the patient sleep last night?

Collection Date	Total Patients
10/01/08	167
10/27/08	598
11/22/08	1232
12/18/08	1616
01/13/09	2043
02/09/09	2429
03/07/09	2758
04/02/09	2956
04/28/09	3170
05/25/09	3170





# Challenges for OpenMRS deployments



- Understanding needs and workflow
- Support for equipment, power supplies and software
- Data management and quality control
- Evaluation
- Training – IT, programming, data management, users, researchers





# Collaborators and Funders



- Partners In Health
- Regenstrief institute
- Brigham and Women hospital
- Harvard Medical School
- Medical Research Council, South Africa
- Millennium Villages Project
- JEMBI



- 
- International Development Research Centre, Ottawa
  - Rockefeller Foundation
  - World Health Organization
  - US Centers for Disease Control
  - Fogarty International Center, NIH
  - Google Inc



