Laboratory Computing Models for Resource-Limited Countries

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What is a resource-limited country?

1. A function of national income per capita
2. For health assessment, can also look at physicians per 1000 population
3. How many to list? 25? 50? 50%?

Old names:
"Third world"
"Developing world"
"Resource poor countries"

Acknowledgements

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Countries with the lowest per capita income (World Bank)

Burundi

Congo Dem

Liberia

Eritrea

Malawi

Afghanistan

Ethiopia

Sierra Leone

Zimbabwe

Niger

Guinea

Mozambique

Madagascar

Countries with the fewest physicians per 1000 population

Malawi

Tanzania

Burundi

Ethiopia

Liberia

Mozambique

Sierra Leone

Niger

Somalia

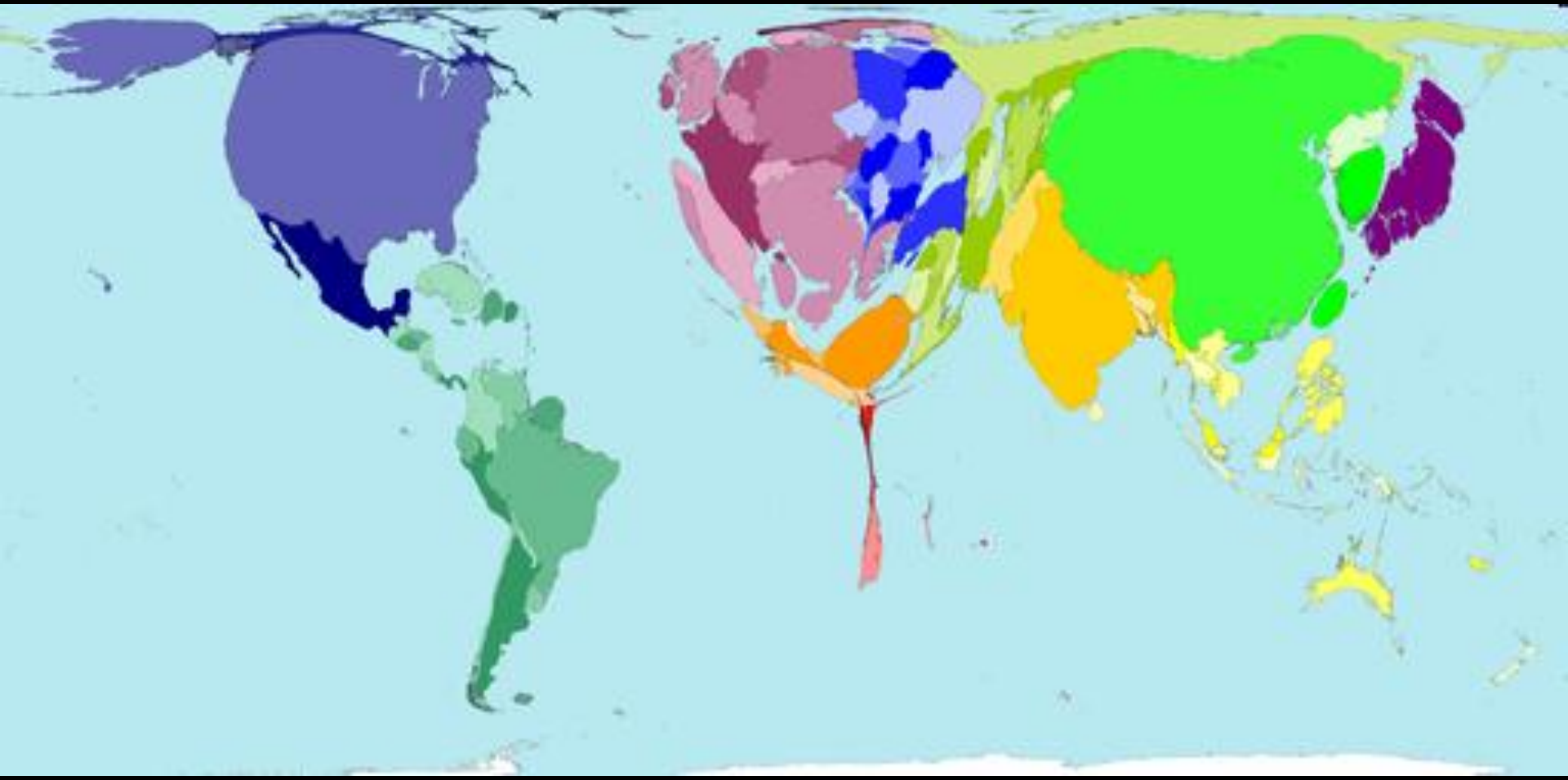
Chad

Eritrea

Lesotho

Low staffing levels

World map distorted by number of doctors



www.worldmapper.com Via Gerry Douglas

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Various approaches

Install an LIS previously developed and proven elsewhere

Design and build and LIS specifically for the resource-limited setting

Terminology is important

LIMS vs LIS

EMR/HIS vs LIS

Lab reporting system vs. an LIS

PACS vs PACCS

Open source

“Installed” systems

“support” of an installed system

Impediments and mistakes

Confusing LIMS with LIS

Assuming that major cost is in software license fee

Being overly defensive (not sharing insights or experiences with colleagues)

Being ignorant of local conditions - “you should love our $1 million system!”

Arrogance

Declining offers of assistance from colleagues

Disturbing realities

Corruption

In certain countries, leader's relatives control granting of contracts – with strings

Customs impediments

- Salary level

Political instability

Developed-world vendors “who seem to regard abandonment as an integral part of technical support.”

Success stories

There is not one magic formula

Vendor-developed and open source

Widely deployed is a better bet than a few sites

A necessary prerequisite – many (?300) cycles of prototyping/agile development

VA-Vista

- Developed beginning in 1977
- Several hundred sites in US
- The primary basis for “no better care anywhere”
- Open source
- Uses medically-oriented database paradigm (sparse-array) rather than accounting model (relational)
- With all these advantages, why not everywhere?

VA-Vista: implementation more difficult that it would seem

Complex, interwoven set of code, tailored to the VA environment

However, it has been successfully implemented in Indian Health Service (Davies Award winner), several other US sites

Many US-specific specializations (primary key: social security number)

For lab, have to implement more than just lab – core functions (admitting, etc.)

VA-Vista Lab 1

Active development to industry leadership in 1988

Then 20 years of funding neglect

Central office, rather than trying to catch up on all that deferred maintenance, chose to instead contract for a commercial LIS

Chose one with good salesmen, less-capable database, but fancy features

After about 3 years, getting the first sites activated

“but what about us?”

- Many other users of VA-Vista – such as Indian Health Service, and international sites, don't have the option of spending millions on a lab module
- An effort is underway, through hardhats.org, worldvista, and others, to build the next-generation VAV-LIS

VA-Vista in Resource-limited settings

India

Samoa

Jordan

Nigeria

Uganda (blood bank)

Egypt

Kenya

Pakistan http://www.hardhats.org/adopters/vista_adopters.html

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CAP Today Nov 2010
LIS Survey – sites in RLC

Antek	**MD**	**8**	**Incl Malawi, Uganda, Tanzania**
CompProMed	**CA**	**45**	**Eritrea, Ethiopia, Phillipines, Bhutan**
Hex	**CA**	**11**	**mideast**
Labsoft	**FL**	**2**	**Carribean**
Schuyler	**CA**	**20**	**Carribean, Guam**

CompProMed

Installing LIS's since the early 1980's

Very stable peer-based platform

Largest number of RLC labs in Ethiopia (a few dozen), only LIS in Bhutan (over 40)

Resilient database design – not damaged by kicking a plug of one of servers out of the wall

Practical – not fashionable

Schuyler House

Installing GUI-centric LIS's since the early 1990's

Recent release – SchuyLab Basic – single user, no license fee – available in most parts of the world

Sites in Ghana, Dominican Republic, Guyana, Suriname, total 20 countries

Antek LabDaq

Thousands of sites in US labs

RLC: Malawi, Uganda, Tanzania

Other US-based and multinational vendors

Meditech

StarLIMS

LabWare

Lack of data from other countries

Unfortunately, we have not so far found a regular tabulation of companies based in or doing business in other countries, to parallel the survey of US-operating countries we publish each November in CAP Today

I would *very* much appreciate pointers to data sources on companies in other countries.

Technidata

French-based

Installations in 25 countries

Distributors/subsidiaries in 28 countries

Countries listed include Zambia, Vietnam, Indonesia, Philippines

Client machines can continue running even if connection to server is lost

LIS vendors based in other countries

- Custom Software, Ireland – small company, but well regarded. Netaquire LIS
  - 16 labs in Ireland,
  - Mozambique – 4
  - Tanzania – 4
  - Www.customsoftware.ie
- Laboratory System Technologies (Pty) Ltd, South Africa (DISAlab)
  - Several labs in S. Africa, some other countries

Software on which I have found less data

Prelink, South Africa

Bika Open Source LIMS – wine, water quality, geology, etc

BLIS (CDC, USA).

Focused/research LIS's

TB LIS for Peru – Blaya, 2007

World Wide Lab Improvement

Founded in early 1990's

Focuses on equipment and supplies for mission labs

In 2010, served 50+ countries and over 100 organizations

In 2006, began building an LIS – which morphed into a mini-HIS, in Kabul, Afghanistan

System has now been rebuilt using different tools, planned for deployment in 2012

Deals with both LIS and hospital-wide needs

World Wide Lab Improvement – histopathology and telepathology

Bill Walker, MD – International Pathology Services – receives about 1200 specimens via FedEx per year, reports via eMail.

Have configured static telepathology with several labs

- Entire configuration, including microscope and camera, less than $2000
- Capture images into PC, attach to eMail, send
- Dr. Walker and other volunteers read images, send back their impression via eMail

Pathologists Overseas

Founded 1991

Concentrate on surgical pathology in several RLCs

Facilitated LIS implementation (Bhutan)

Telepathology

15+ articles on their general work

Association for Public Health Labs

- Published 5 guidance documents 2005
- (The first update is expected by early 2012)
- Sponsored development of OpenELIS
- Facilitated CDC PEPFAR project to assist RLC in selecting LIS: including Mozambique, Botswana, Kenya, Swaziland, Tanzania, Lesotho, Ethiopia, and other locations

OpenELIS

- Funded by APHL, CDC, PH labs, UW, HRSA, others beginning in about 2005
- Originally envisioned as a LIS for US Public Health labs
- Iowa, Minnesota, (Kansas) began development
- Recently, Minnesota is working on one version, Iowa on another
- U Washington/iTech adopted 2007 for use in Haiti

Now 4 variants

OE 1 – development by Minnesota, partly operational in Missouri

OE Vietnam – installed in 7 Vietnamese labs,

- Has been evolved by local software developer
- recent APHL grant to UW to converge with OE iTech

OpenELIS continued

OE 2 – development by Iowa, expected to be operating in a few months

OE iTech – Extensively adapted for use in Haiti and Ivory Coast –

3 labs operating in Haiti, one HIV lab in IC

Recent innovations

- Use of agile development (2 week cycles)
- Instrument interfacing tool
- Interface with iSante EMR

For any systems – vendor or custom-developed ….

We face some challenges...

Impediments to implementation - expected

Financial

Internet infrastructure

Logistics – transportation

Vendor organization

Availability/familiarity with local vendors/products

Impediments 2

Getting the first lab in....

Beware of big ideas and marginal honesty whose “deal” is all at your expense and their profit

IT people who want you to install the LIS on Windows95, or on the instrument computer

Impediments 3

Staff willing to travel aboard

time differences in supporting remotely

safety concerns when traveling aboard

communication between implementation staff and end users

contract processes.

Internet access

Variable from one country, or region, to another

If reliable, you can consider options such as remote hosting, or rely on internet delivery of results

If not available or reliable, then pursue a technology that doesn't require communication with the outside world.

Suitable offerings 1

Configurable – not programming

Minimize need for IT support

Architectures than can run even when not connected to server or each other

(or) Use of thin clients

Track record of deployment in *many* labs

"we really do work"

Single server – or no server

Fraser and Blaya

“One successful system beats 10 almost ready”

Suitable offerings 2

Ease of use

- Language-independent – icons?

Flexibility

Reliability

Large library of instrument interfaces – rapidly configurable instrument subsystem – less than one day

The role of instrument interfacing

No interfaces = 0^{th} generation LIS

In a very small lab, may not be worthwhile

Configure so it is not a frequent point of failure

Some projects, deferred instruments

Need a fast, reliable, and cost-free methodology

How are LISs funded?

Country government (e.g., Bhutan)

Non-governmental organizations

Universities, via governmental grants

EU or US aid (espec for HIV programs)

Private labs – e.g., Ethiopia, Caribbean

- Neighbors come – ask govt, international

Instrument vendors bundle LIS

Lessons we haven't yet learned

1. We need to learn from our mistakes – there have been a number of failed LIS installations – but these are swept under the rug. Long ago in medicine we learned that errors were expected – but failure to learn from them was not acceptable.
2. We forget how complex even a small lab is – even a lab with 3 techs has 10 departments – therefore, we underestimate the difficulty of development from scratch.

Questions

- Thoughts? Comments? Objections?
- If you think of something later, please eMail - raller@usc.edu