

Clinical lab information systems for low income countries v3

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Disclosures

- No relevant disclosures within the past year
- Over the years, I have advised many health systems, as well as several of the companies in the LIS, laboratory instrumentation, and clinical informatics fields

Acknowledgements

- My team are the participants in the whole field of pathology informatics, not just in an individual institution. Dozens of my colleagues have been essential collaborators, co-workers, and mentors, including
- Many of the people at this meeting, an abundance who are not, and several who have passed away (Ramzi Cotran, Tom Lincoln, Mike McNeeley, Bill Dito, and others)
- I started a comprehensive list, but realized I would miss too many
- So Thank you!!!

Low and Middle Income Countries (World Bank, 2015)

- Low income countries - median income less than \$1045 per year
- High income countries - median income greater than \$12,736 per year
- Middle-income countries - median income between \$1045 and \$12,736

Examples of low income countries

184	Cambodia	1,020
185	Chad	980
186	South Sudan	970
187	Tanzania	920
188	Benin	890
189	Zimbabwe	840
190	Haiti	820
191	Comoros	790
192	Nepal	730
193	Burkina Faso	700
193	Rwanda	700
193	Sierra Leone	700
196	Afghanistan	680
197	Uganda	670

Low Income, continued

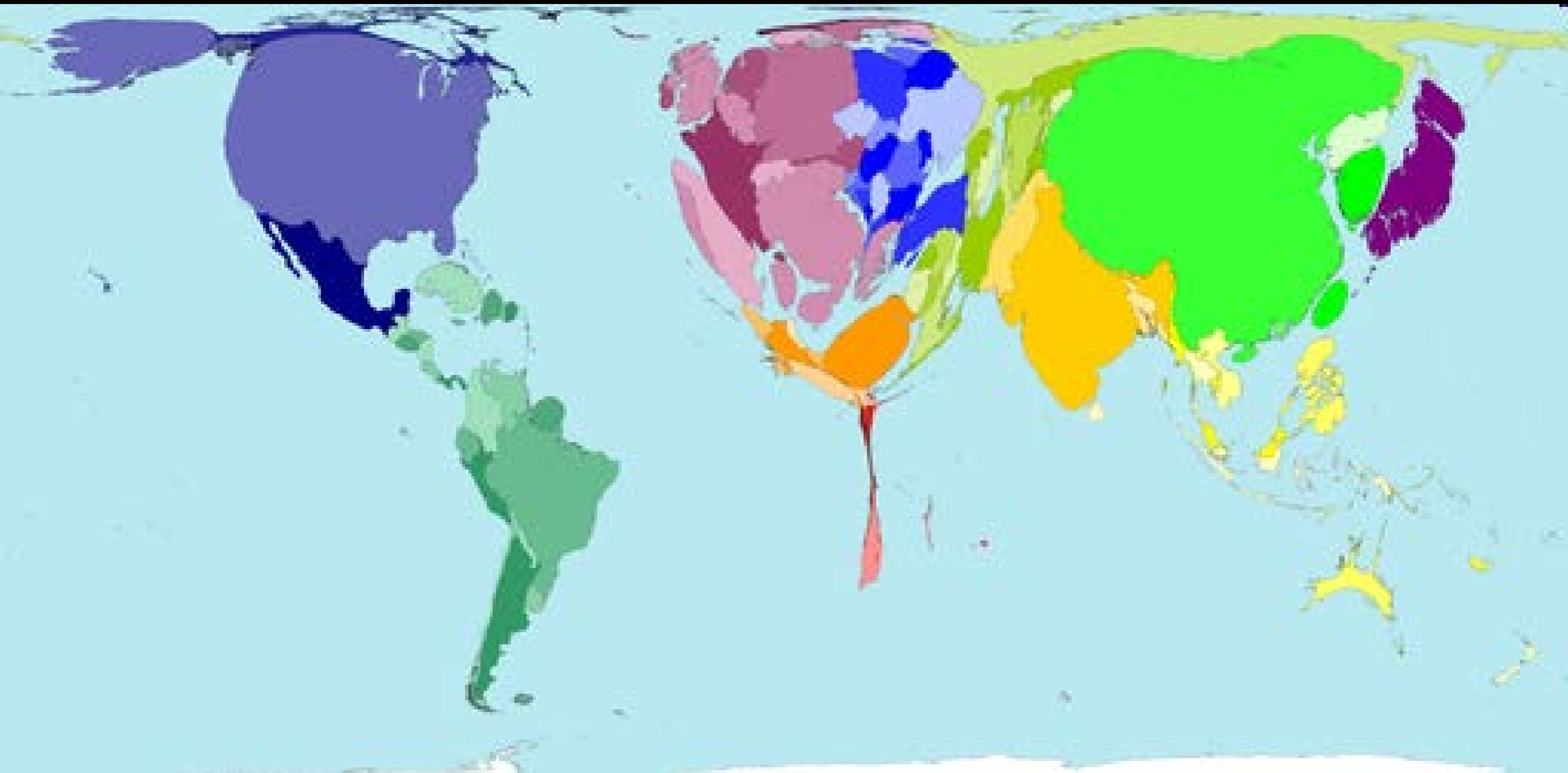
198	Mali	650
200	Mozambique	600
201	Togo	570
202	Ethiopia	550
202	Guinea-Bissau	550
205	Guinea	470
206	Gambia, The	460
207	Madagascar	440
208	Niger	410
209	Congo, Dem. Rep.	380
210	Liberia	370
211	Central African Rep.	320
212	Burundi	270
213	Malawi	250

A note on terminology

- 1960's (during the cold war) - "the third world"
- 1970's - "under-developed countries"
- 1980's - "emergent nations"
- 2000's - "resource limited countries"
- 2005 - still see use of "developing nations" - (American Heritage dictionary)
- 2017 - Low income countries

Low staffing levels

World map distorted by number of doctors



?write an LIS from scratch

- US-based, NGO/Not for profit
- Open source, “modern” tools
- Designed/built by non-laboratorians
- Did not know difference between a LIS and a LIMS - or between a public health lab and a clinical lab.
- Built initially for public health labs, then adapted to labs in LIC who had no experience with mainstream LIS
- Based on specification - build, rather than agile/rapid prototype
- Misleading terminology - system is “implemented” in 10 laboratories (this means, software has been loaded onto 10 servers, but nobody has been trained, no cases are being processed)
- Result: a failed initiative
- Many other examples of otherwise expert companies/groups who failed to create a usable LIS

Preferred approach

- Determine what robust systems are already live in comparable settings (LIC, lab size) - this is a major missing link of research
- **** Talk to those labs - how well does the supplier support their operation?
- Established vendor partners will succeed where de novo development will add time and risk - and probably failure
- We are talking about suppliers who have DONE this dozens of times, and their clients endorse - not vendors who claim “oh, I can do that”
- Request for proposal: a useless and dangerous exercise.
 - if you have to use one, firewall it!
- Don't restrict to a particular software architecture - unless it is notably proven (e.g., edge database, associative database)

Choice of technology often dependent on robustness of internet

- No-speed - do you have service twice a day, or can you do something through the cellular data network?
- Low-speed - for support of lab software in LIC sites, static images (microbiology, etc.)
 - Avoid software designs that depend on availability of internet
- Moderate-speed - for certain selective WSI apps
- High-speed - for offsite servers, other WSI, dynamic telepathology
- Key role of cellular data network
- Future role of satellite linkages, other technologies?

Limitations to laboratory service in LIC

Skilled staff

- Numbers

- Understanding of principles

Infrastructure: electricity, temperature, water

Equipment maintenance (day to day) and

repair - poorly maintained equipment yields poor quality results.

Supply chain – local, cross-border

Information handling (lack of LIS)

Sustainability!

Success stories

There is not one magic formula

Heavy involvement by those who know clinical lab operations in an LIS context

Project is driven by laboratorians, not by I/T folk

Widely deployed is a better bet than a few sites

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

Impediments and mistakes

Confusing LIMS with LIS

Assuming that the 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

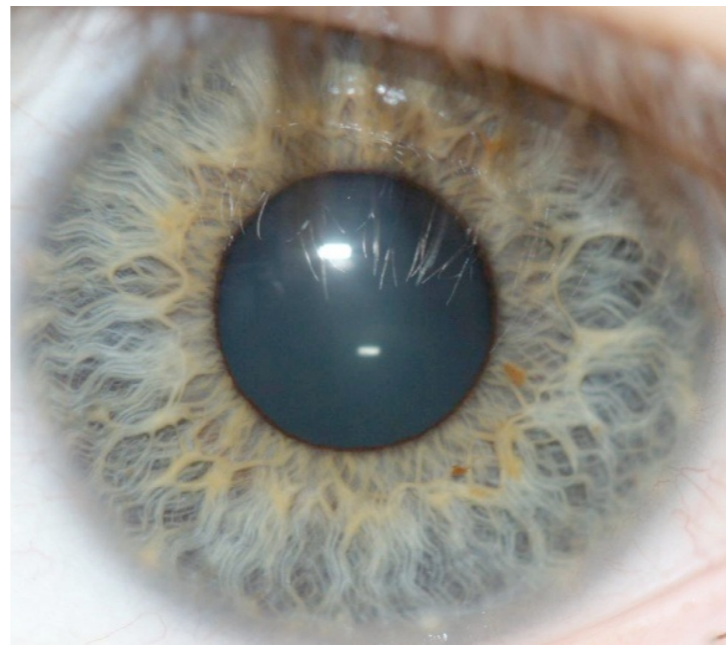
Key functionality

- One can list several important LIS features - and we do, in November 2016 CAP Today
- ** The most important feature is not a feature at all -
 - how do the vendors do in supporting their clients as a business partner
- Some functionality developed for US/European sites may not be necessary in LIC - and may add unnecessary complexity

Who is the patient?

- ** The most critical component of any medical system is to robustly identify the patient - with biometrics
 - Fingerprint, iris, palm vein, face recognition
 - One approach - biometrically identify, use that to label the specimen tube, tie that identification to processing of the specimen
 - The most critical characteristic of a laboratory is their unequivocal identification of their patients

Biometric Tools



These, and several others

Many countries and agencies are WAY ahead of healthcare in the United States

- India - have established a database of over 1 Billion residents! Face recognition, iris, 10-fingerprint. Only a few associated text fields.
- State of Georgia - DMV registrations
- Immigration, TSA, and airports
- Many others
- 3-day conference on biometrics in DC, in May - Out of 800 participants, there was ONE healthcare practitioner.

Known LIS systems in LIC

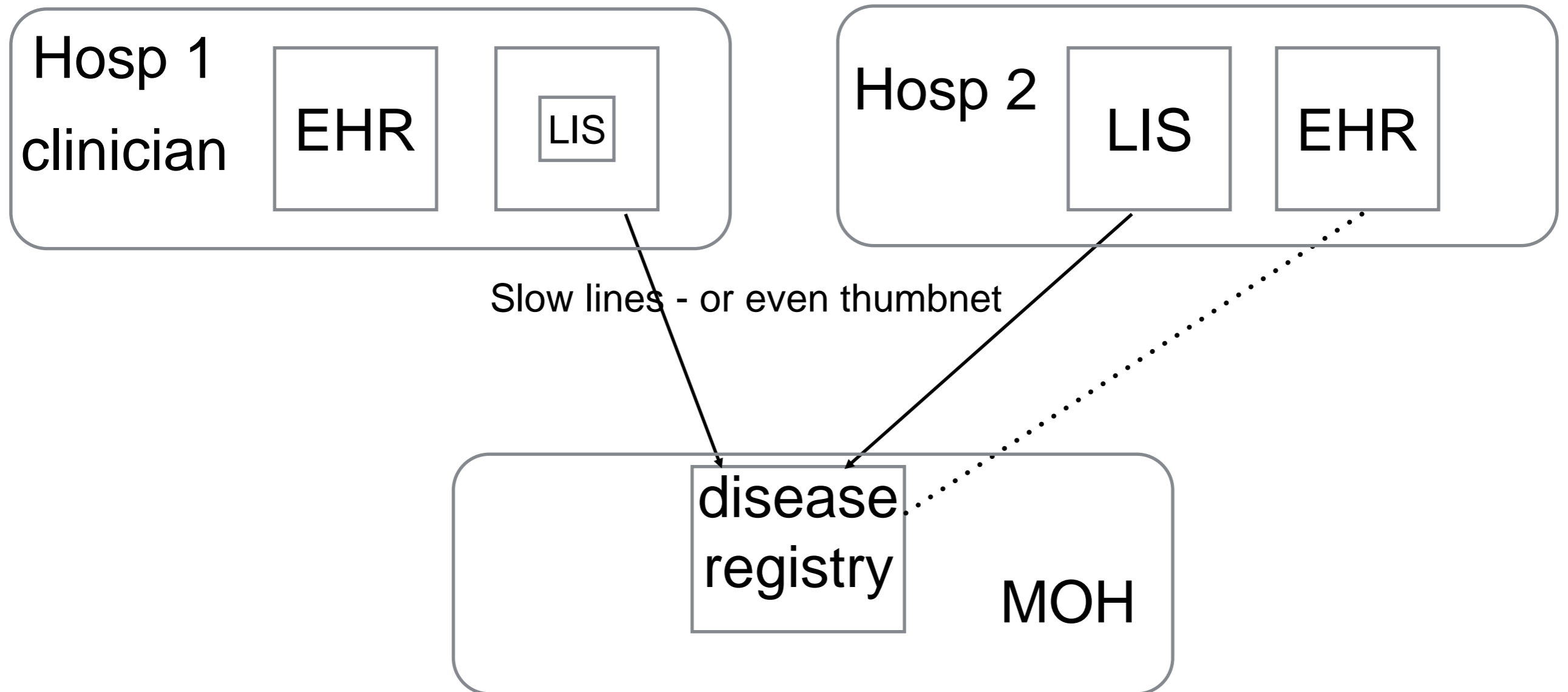
- Sources: CAP Today, February 2016 and CAP Today, November 2015
- We have not listed systems running in developed, robustly developing, or well funded countries (eg UAE, China)

What LIS's are installed in LIC?

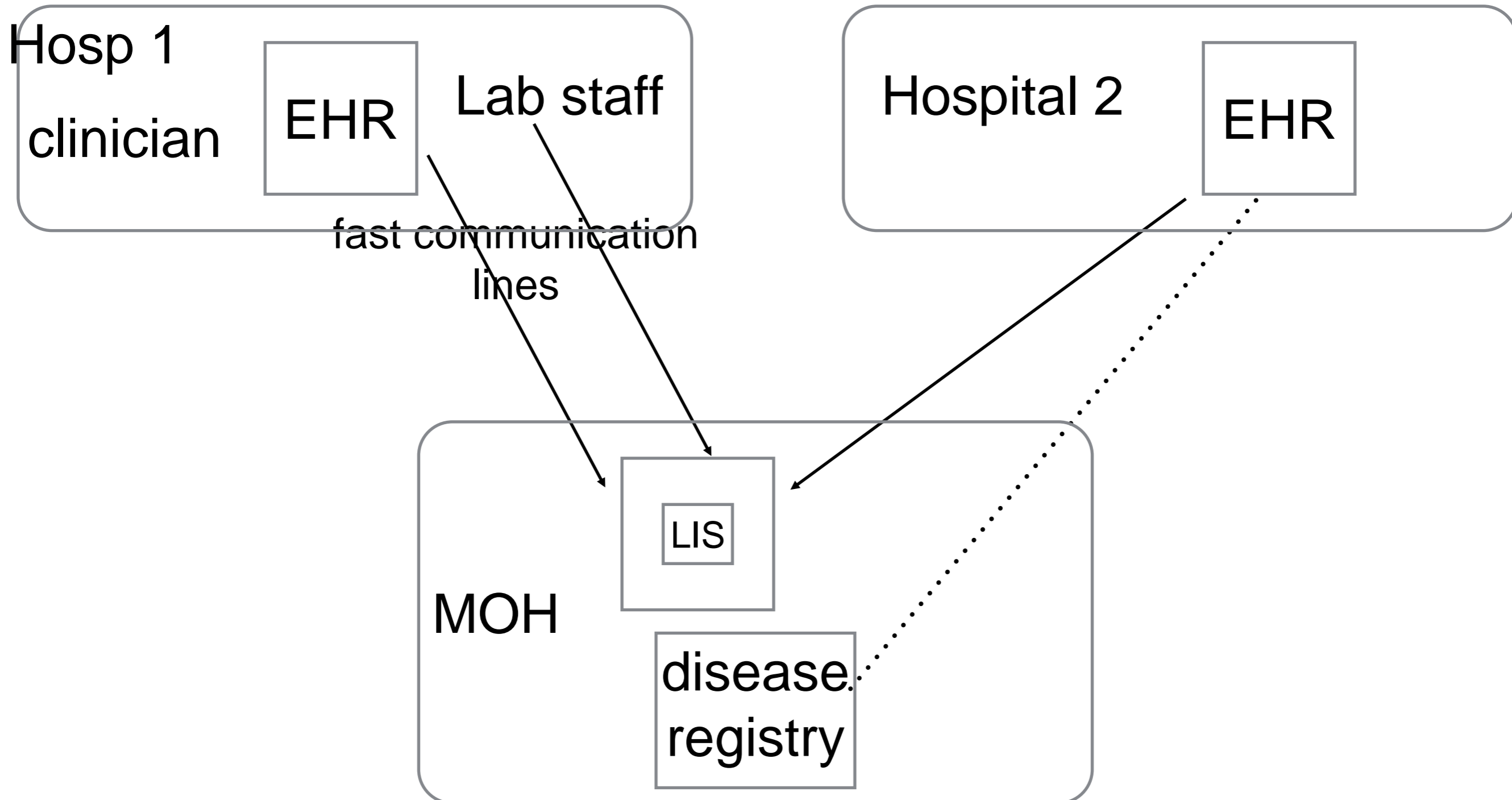
LIS	Countries
Compromed	Eritrea, Ethiopia, Phillipines, Bhutan, Malawi
Compugroup	Malawi
Labsoft	Trinidad
Labware	India, Kenya, Columbia
SCC Soft	Jamaica, Malaysia
Schuyler House	Caribbean (15 different countries), Malaysia, Ghana, Surinam, American Samoa
SimpleLIMS	India
Technidata	Phillipines, Zambia
VA Vista	India, Mexico, Samoa, Columbia, Jordan, Pakistan, Nigeria, Egypt, Uganda, Kenya
Ireland: NetAquire	Mozambique, others
S. Africa: DISA	Mozambique, Tanzania, others
Specialized/research	TB (Blaya), hIV (Pepfar)

Source: Aller, Weiner and Carey, CAP Today, November 2015

How to configure systems in a LIC - slow internet



How to configure systems in a LIC - reliable internet



Infrastructure and staff requirements

- With slow internet, must have ability to install and maintain in-hospital LIS - outside communications capability not crucial
- To place servers centrally, MUST have fast and reliable communication lines

Costs

- some vendors have a sliding fee structure, or have directly donated software (and sometimes hardware and implementation)
- One vendor provides
 - a free version of the software, widely installed in LIC
 - for more complex sites, a sliding scale, such that their fees for installations in the Caribbean are much lower than an equivalent site in the US (even though company/travel costs are higher for international sites)
- Another vendor
 - Donated systems for dozens of labs in Butan, Ethiopia, and other countries.
 - Transport of hardware, installation/training on software by missionaries (trained by company before their trip)

Warning !

Missing data!!!

Data sources

- We have presented a very US-centric view.
- We tried consulting the publication: “The World Market for Laboratory Information Systems” - “unfortunately the report does not provide any information on countries in Africa, the Caribbean or other developing areas”. (it covers the US, Europe, China, Brasil).
- **Needed:** a project to survey, in each LIC, the LIS’s installed and in use - and if possible to assess how effectively they are being supported, and used

Research questions - information management

- Optimal patient/specimen identification (biometric)
- What LIS are in use in LIC?
- Which have had stable, reliable, solid support?
- Is the supplier willing/able to increase their installed base?

TLAlgia

- Being a medical conference, use of acronyms is required
- Source: HIMSS Dictionary of Healthcare Information Technology Terms, Acronyms, and Organizations, HIMSS, 4th edition, Chicago, 2017

Questions to ask - LIS installed in LIC lab (draft 0.2)

- **Questions for suppliers:**
 - Supplier name - product name - where based
 - How many contracts/installations world wide?
 - Data for _____ country as of _____ date.
 - How many labs (and hosts) are supported in the country?
 - Is support local, or only from worldwide HQ?
 - Screens and reports are in what language?
- **Questions for the labs**
 - Does the supplier effectively support the lab?
 - Are there followup visits to the lab? (by local support, or from headquarters?)
- **Costs?**

References

- Aller RD, Kidane S, Robinson C, Majide D: Laboratory Information Systems in Resource-Limited Countries, ASCP 2014 WS9019
- Aller R, Weiner H and Carey K, Survey of Laboratory Information Systems, CAP Today, November 2015, 2016
- http://www.hardhats.org/adopters/vista_adopters.html

Questions?

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