Health Information Systems

Use of health metrics

MSc IBE
Concepts in Epidemiology 2009

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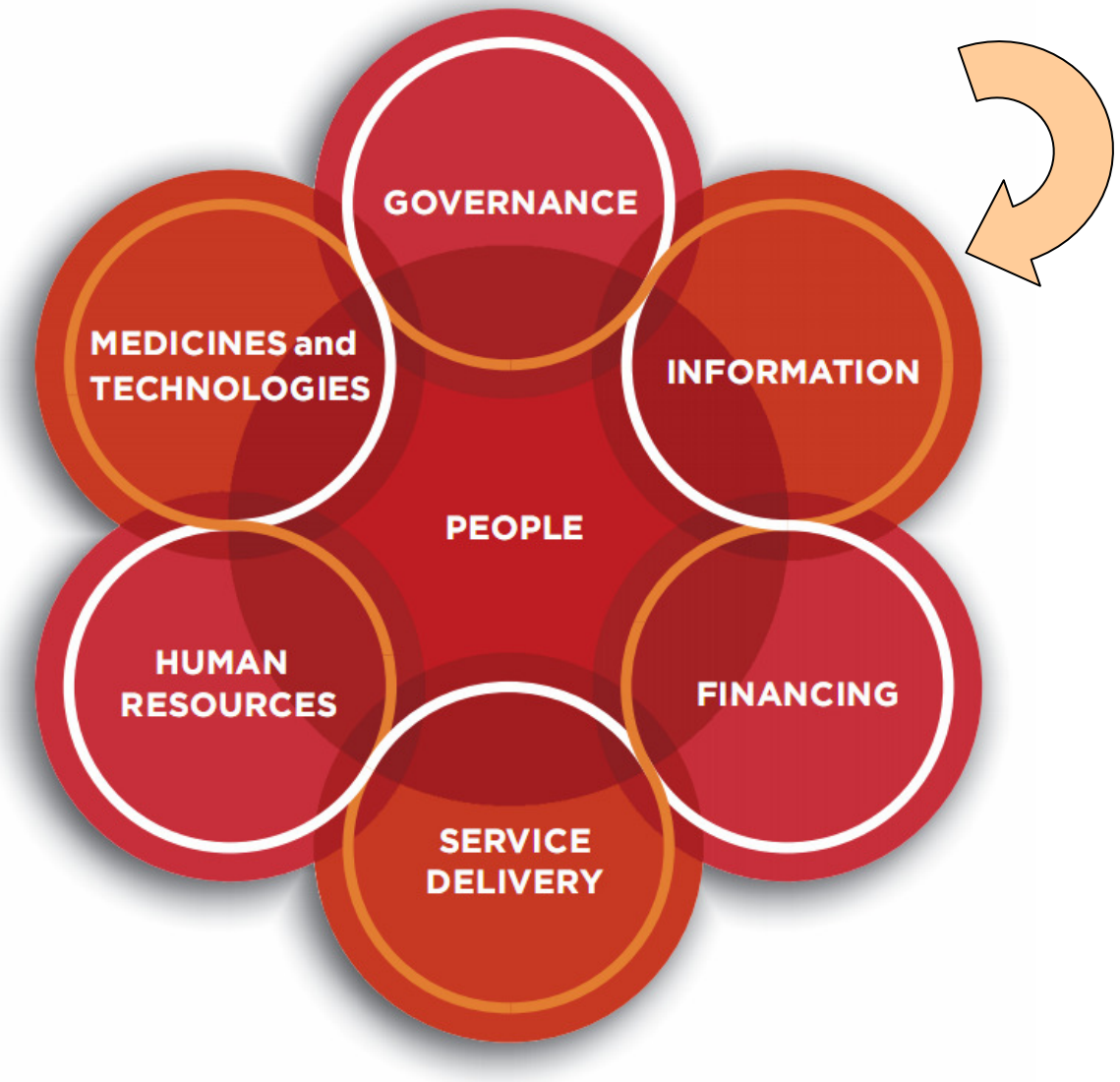
"Everything we do as individuals and society is done in the context of an information-feedback system"

"Missing information flows is the most common cause of system malfunction"

Donella Meadows. Thinking in Systems (2008)

Health systems

Framework of building blocks (sub-systems)



Source: de Savigny and Adam (2009)

Learning objectives

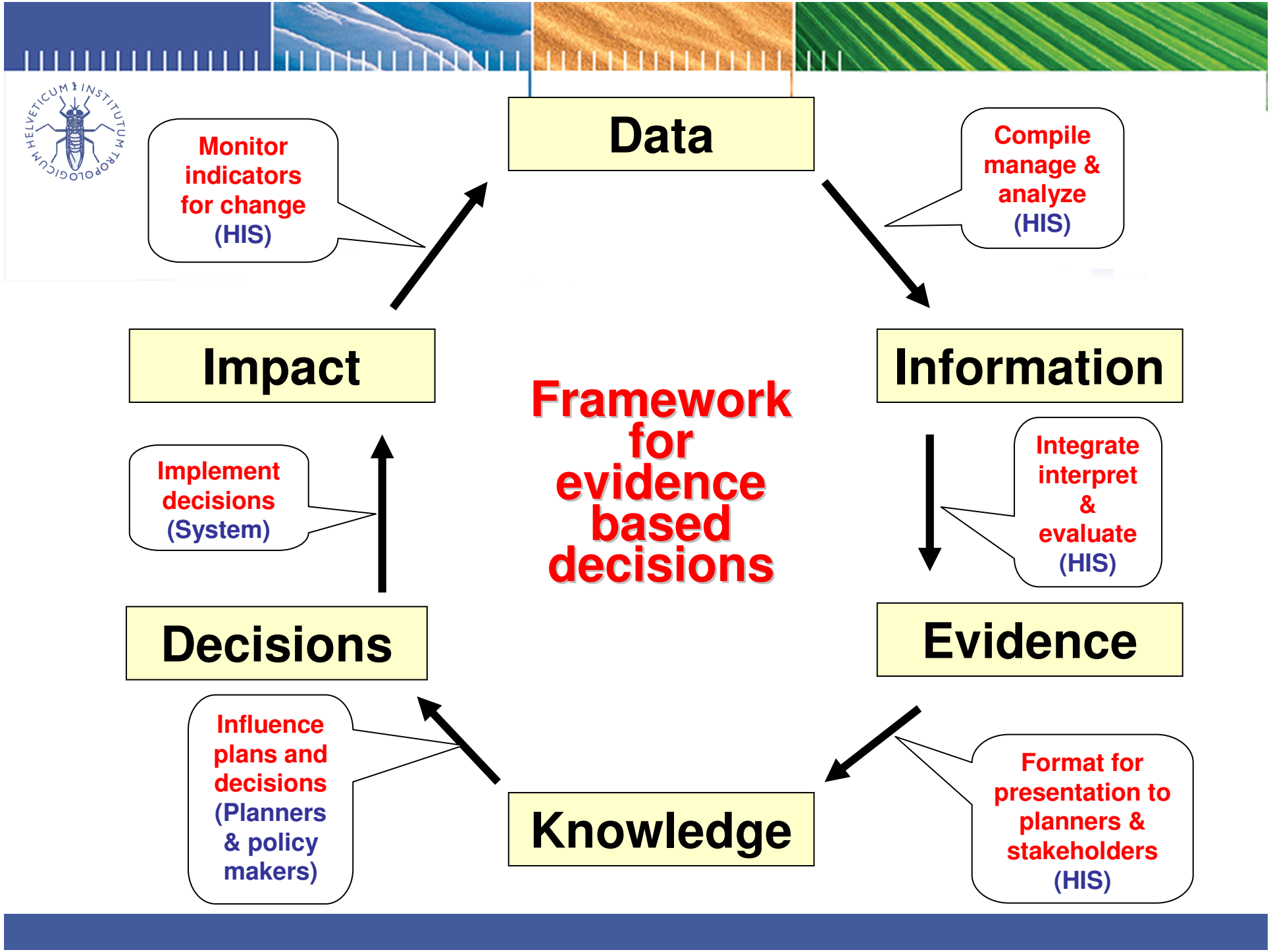
- Gain an appreciation of health informatics as a core function of health systems and prerequisite for rapid health development;
- To understand the different sources of health information and their roles, strengths and weaknesses;
- Be able to define key terms associated with Health Information Systems

Finagle's Law of information

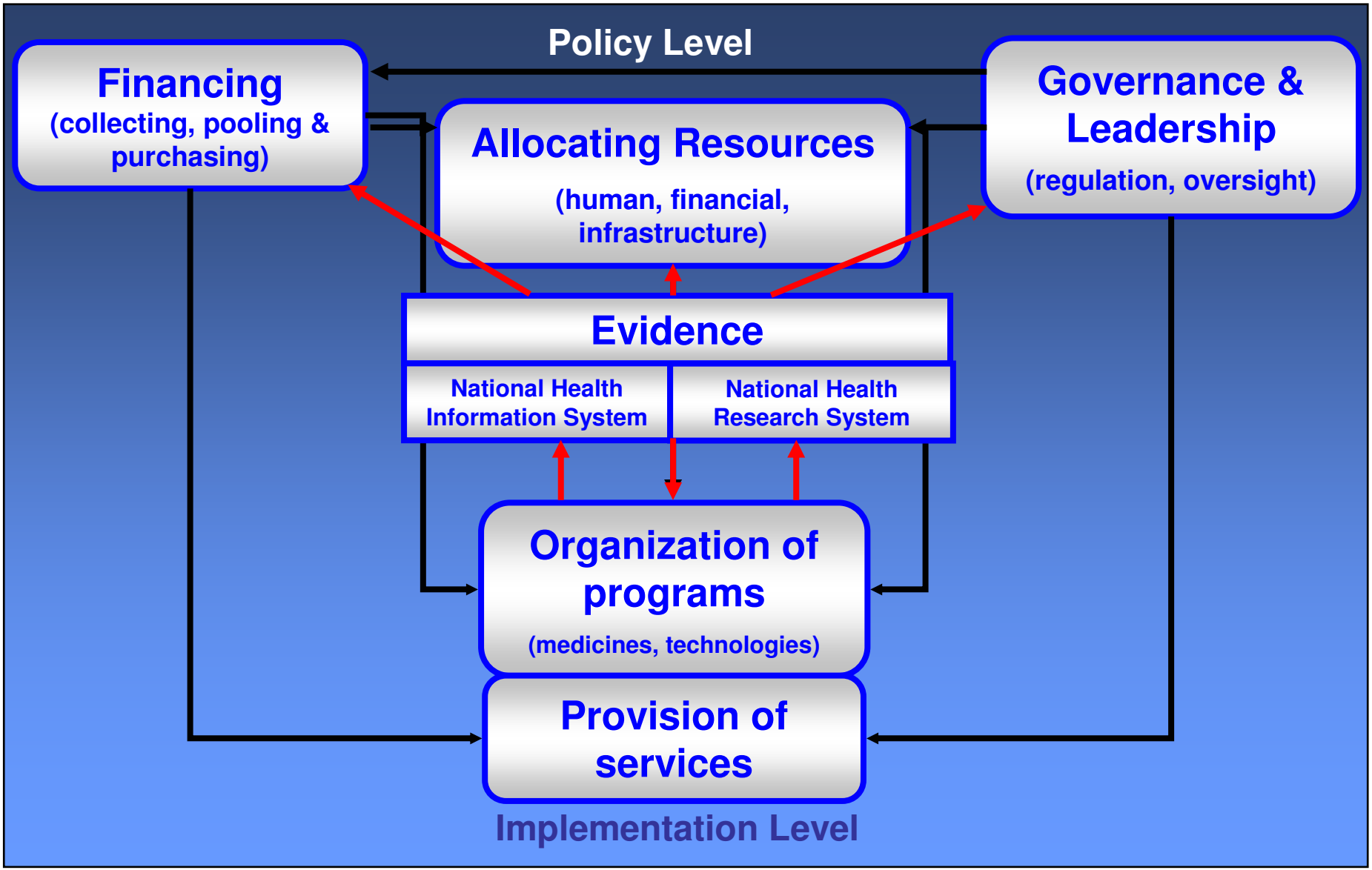
"The data we have…
are not the data we want."

"The data we want…
are not the data we need."

"The data we need ….
are not available."

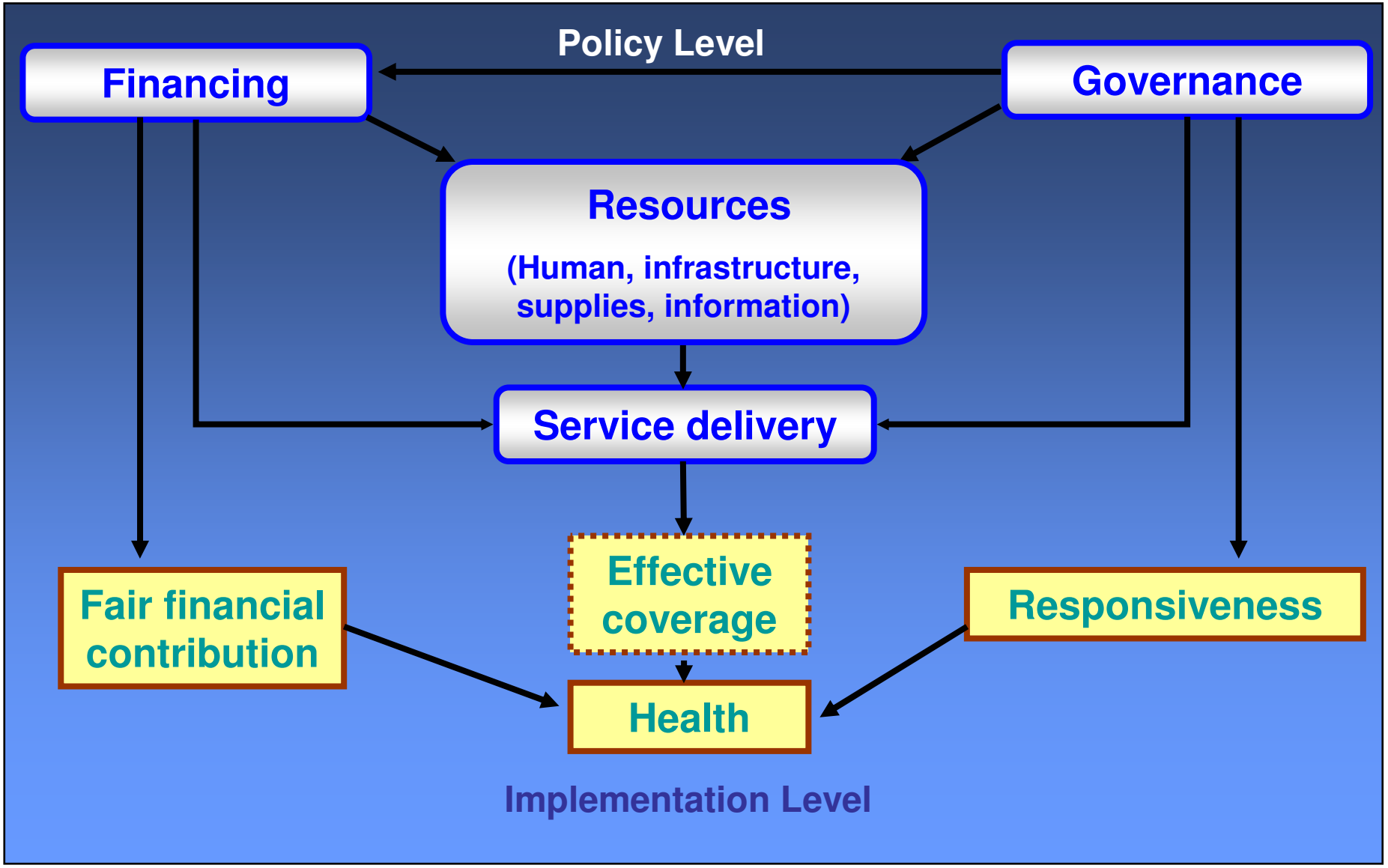

Framework for evidence based decisions
Data
Compile manage & analyze (HIS)
Information
Integrate interpret & evaluate (HIS)
Evidence
Format for presentation to planners & stakeholders (HIS)
Knowledge
Influence plans and decisions (Planners & policy makers)
Decisions
Implement decisions (System)
Impact
Monitor indicators for change (HIS)

Health system functions

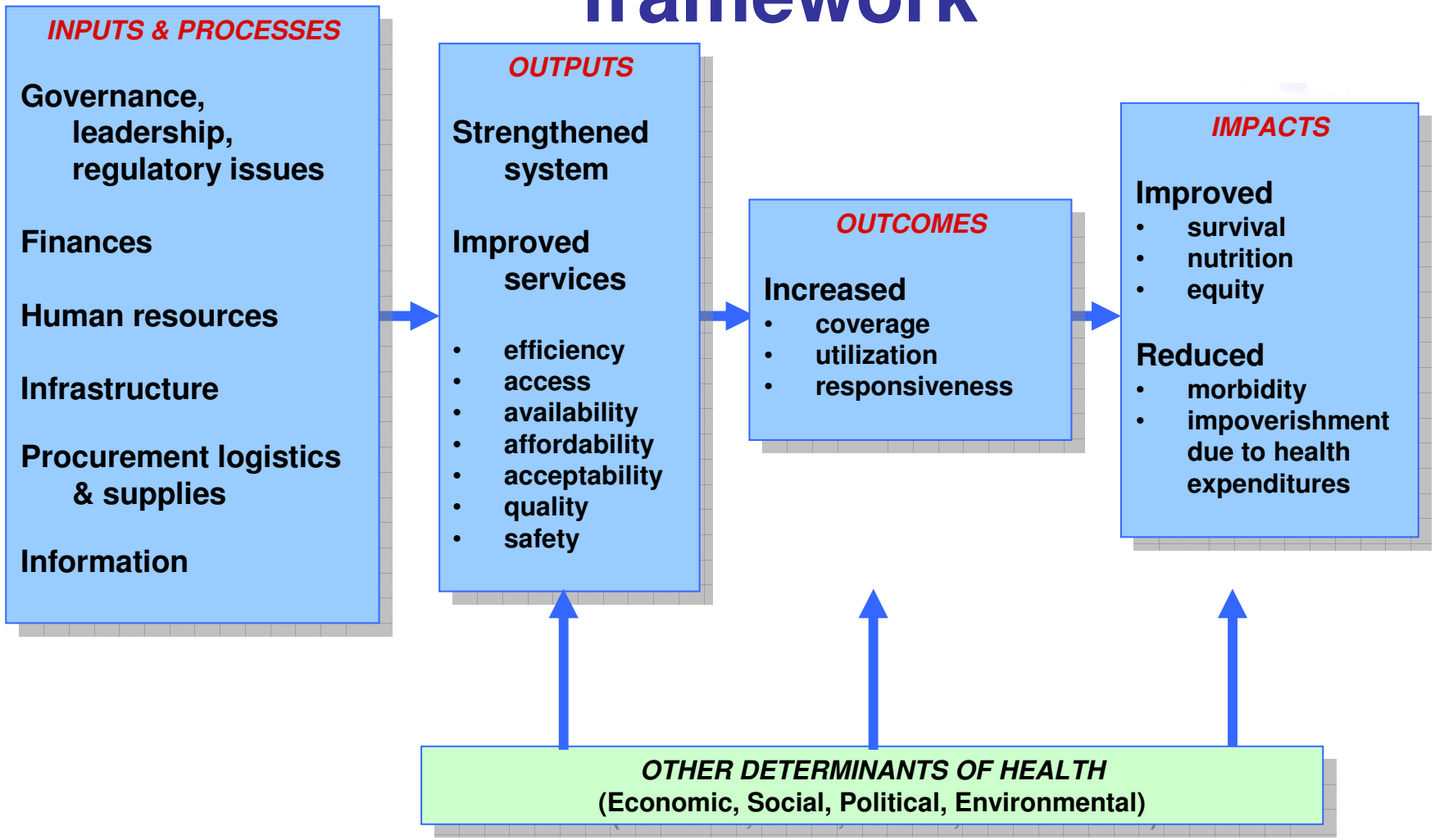


Source: Modified from WHO World Health Report, 2000

Relationship of functions to values

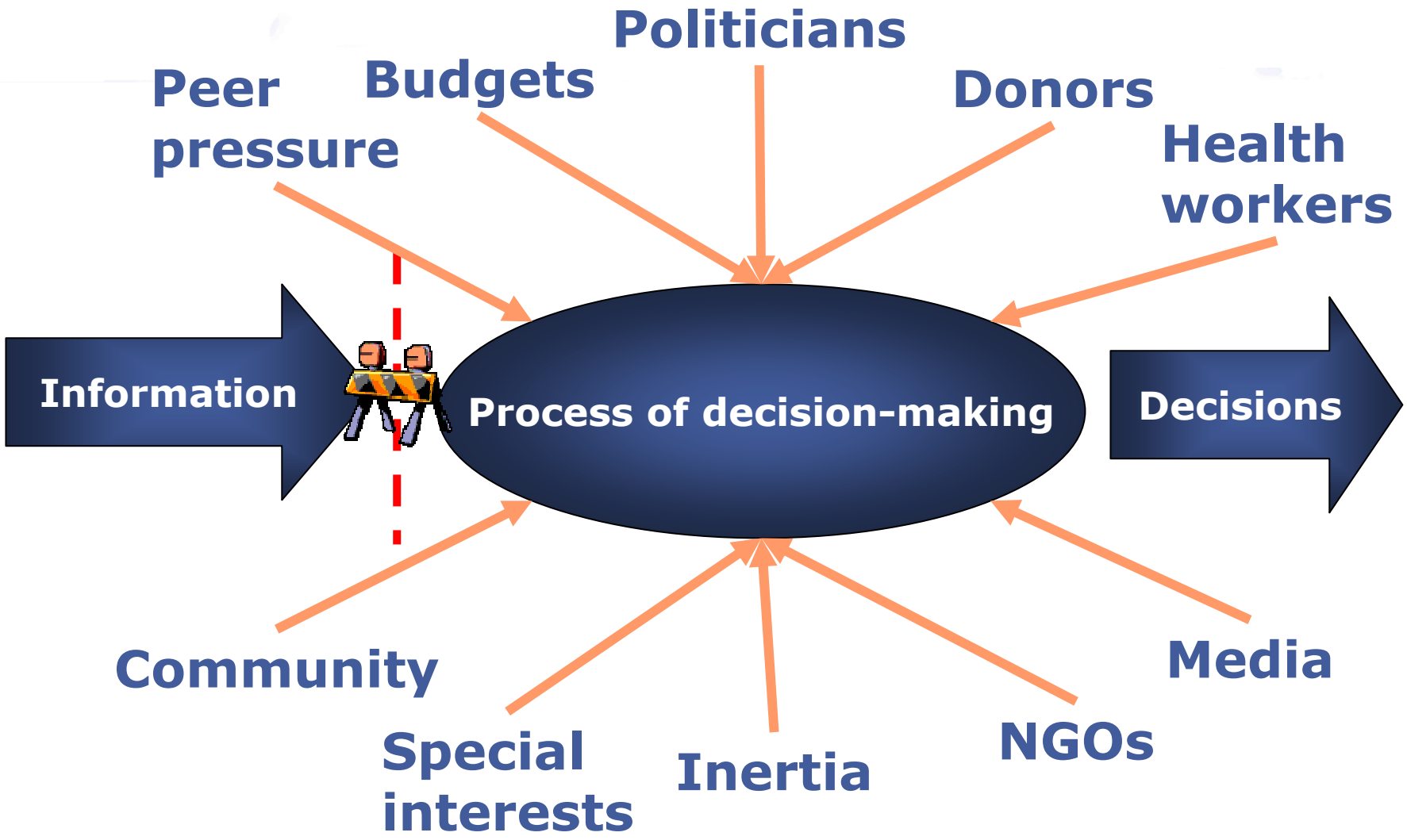


Basic health system framework



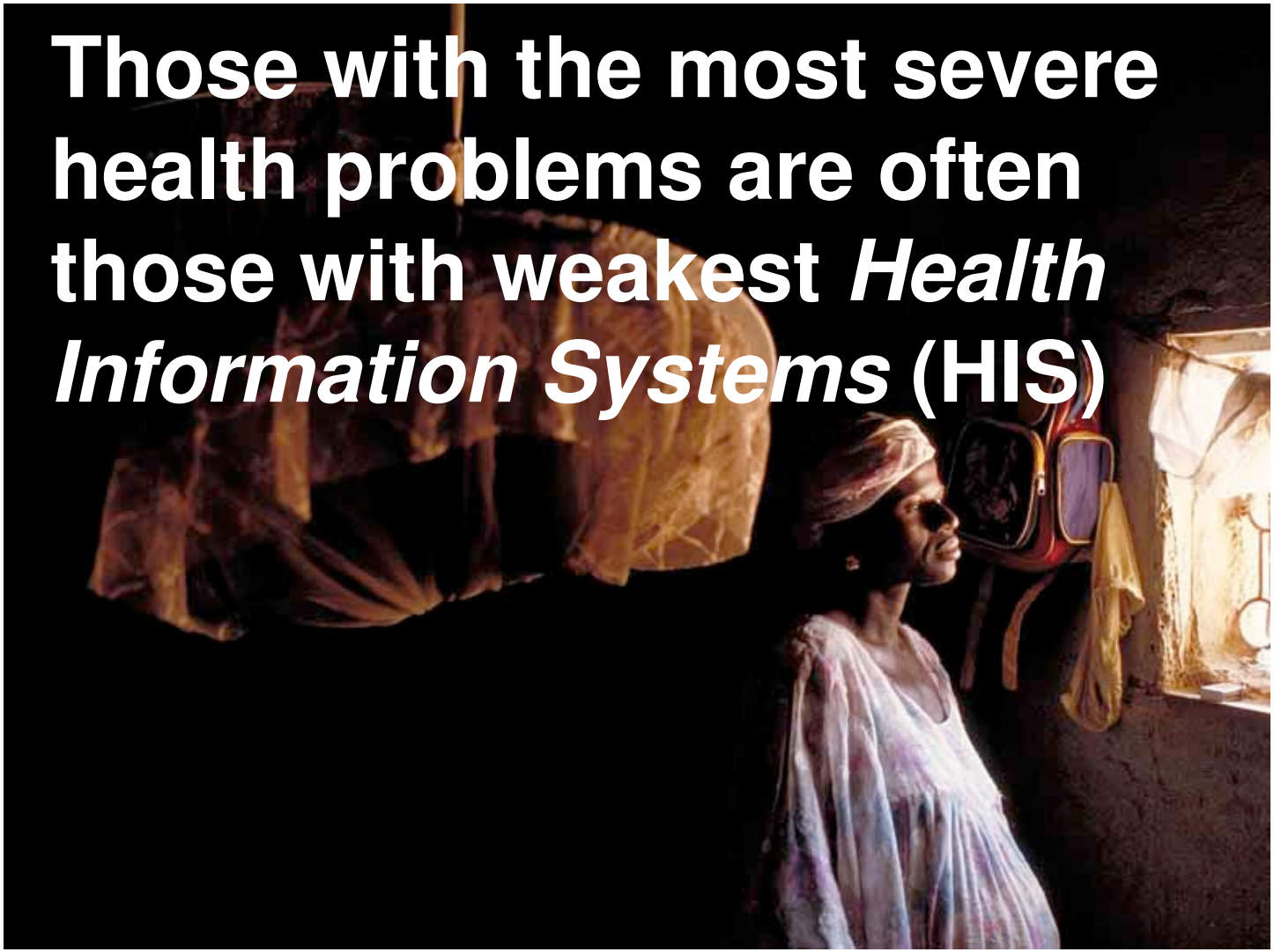
Modified from: WHO Everybody's business, 2008 & Health Metrics Network Framework, 2008

Lack of Evidence-Based Decision-Making



Adapted from Lippeveld et al WHO 2000

Information inequity



Source: Health Metrics Network

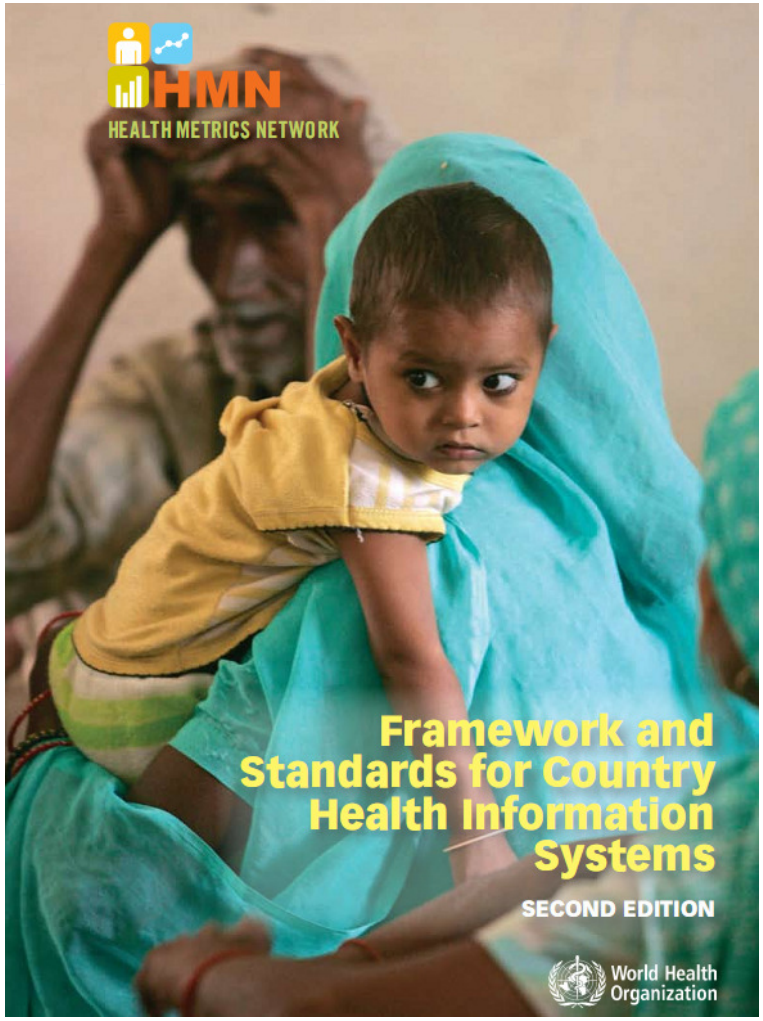
Message from WHO Lao PDR Feb 2004

"We have been working very hard over the last couple of years to improve the health information system, (with Luxembourg funds), but still we are far away from satisfactory results. This is mainly due to the fact that **each agency, NGO, and even each programme, has introduced different health information system(s).** As a result we have **one system for malaria (with 20 forms or so...!!** See Kunming indicators) **another system for EPI, another for RPH introduced by UNFPA, another for children's health by UNICEF another for PHC, introduced by the WB/ADB and so on..... The end result is a terrible MESS** and the generation of reports/indicators that are FAR AWAY from any reality."

Source: Health Metrics Network

Increasing fragmentation in Global Health

Health Metrics Network



Health Metrics Network

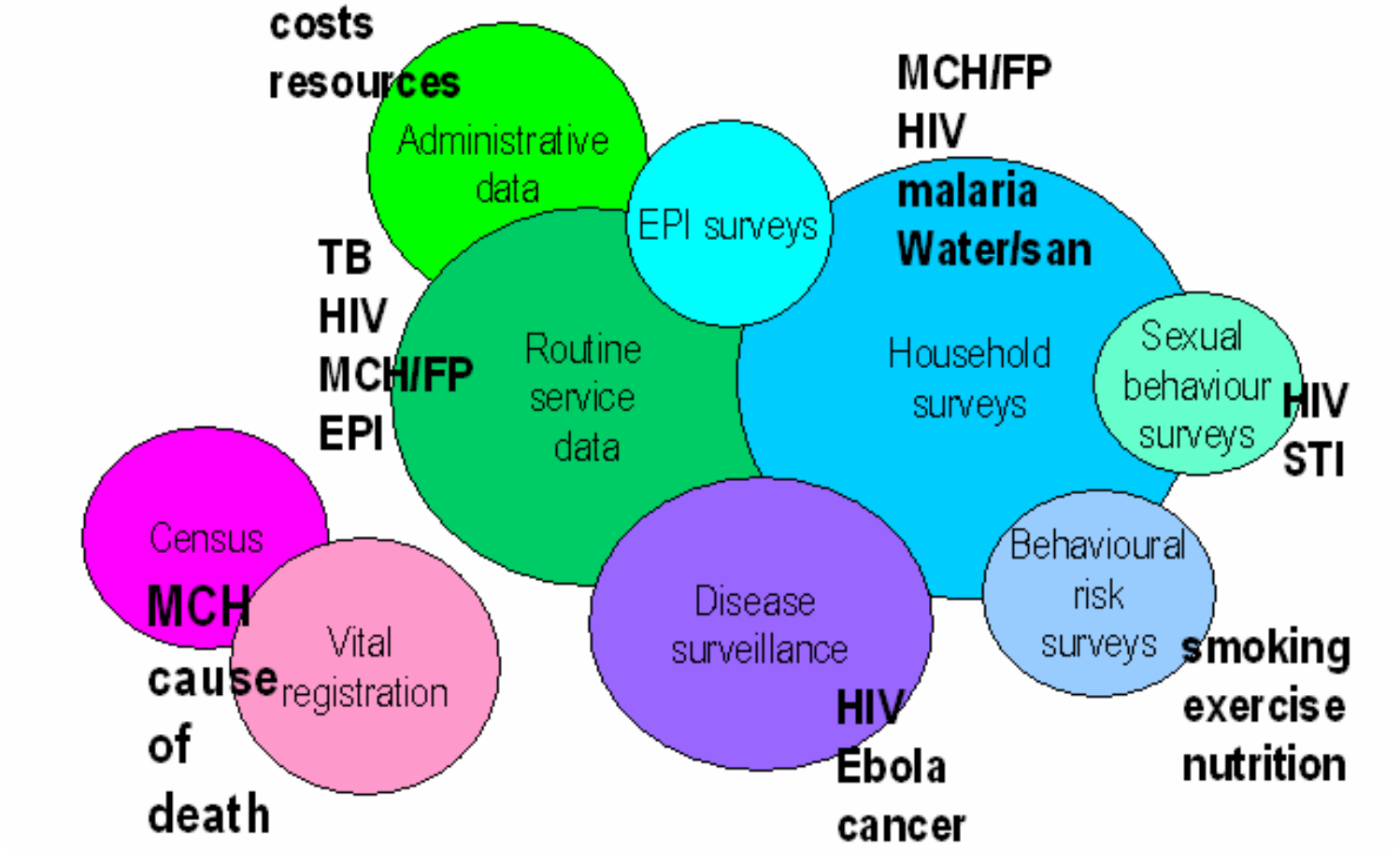
First global health initiative dedicated to a system-wide issue

Health Information Systems

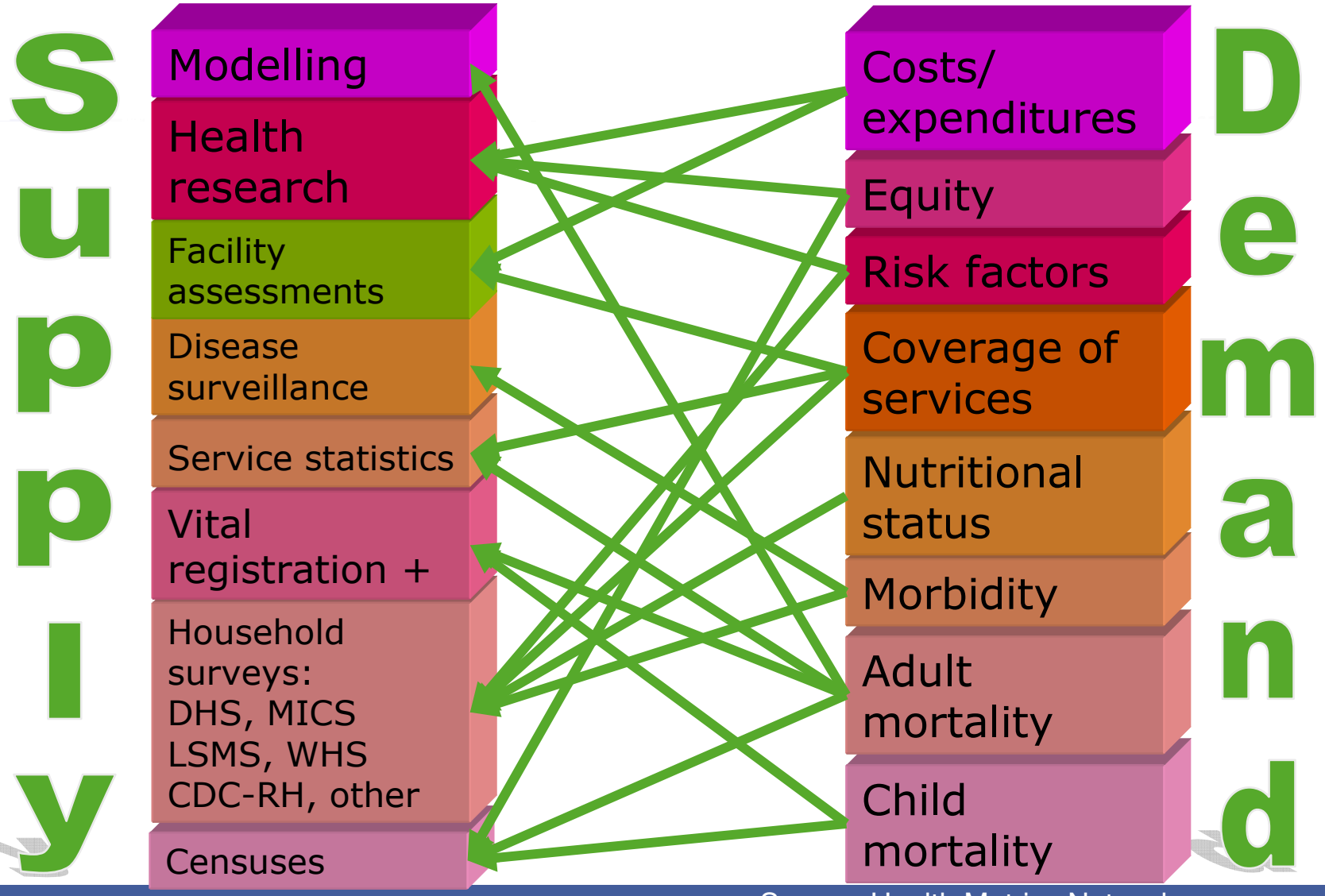
- Should be foundation for better health systems
- Why renewed interest ?

  - Significant increases in health financing
  - Significant fragmentation in demands
  - Performance based resource allocation
  - Demand to monitor scale-up
  - Need to drive improvements in quality
  - Greater concerns for equity

Little coherence among health information sources

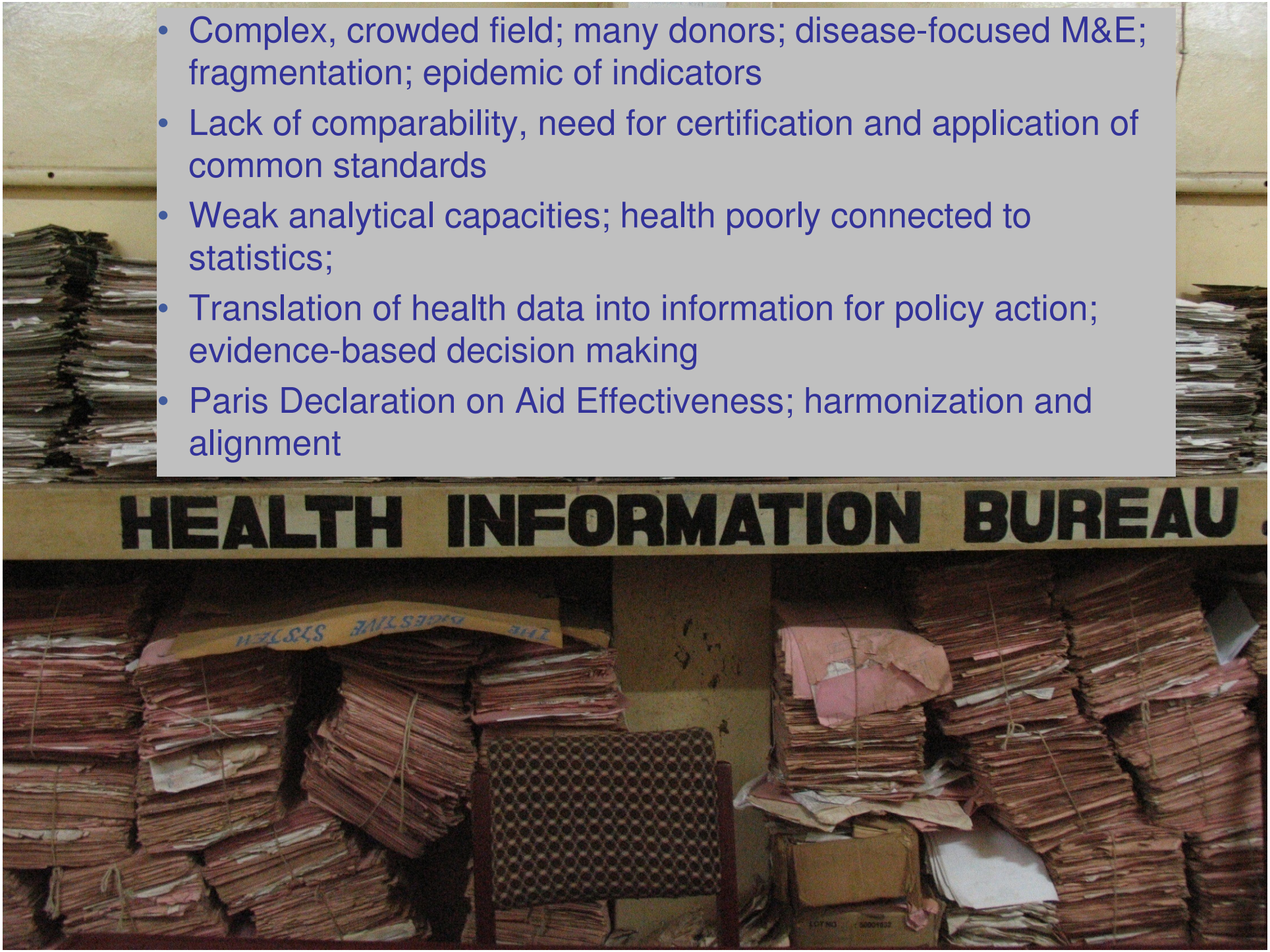


Imbalance between supply & demand



Source: Health Metrics Network

- Complex, crowded field; many donors; disease-focused M&E; fragmentation; epidemic of indicators
- Lack of comparability, need for certification and application of common standards
- Weak analytical capacities; health poorly connected to statistics;
- Translation of health data into information for policy action; evidence-based decision making
- Paris Declaration on Aid Effectiveness; harmonization and alignment



Some definitions

Health Information System (HIS)

Essential health system component that ensures;

- **production**
- **analysis**
- **dissemination**
- **use**

of reliable and timely information on health determinants, health systems performance and health status.

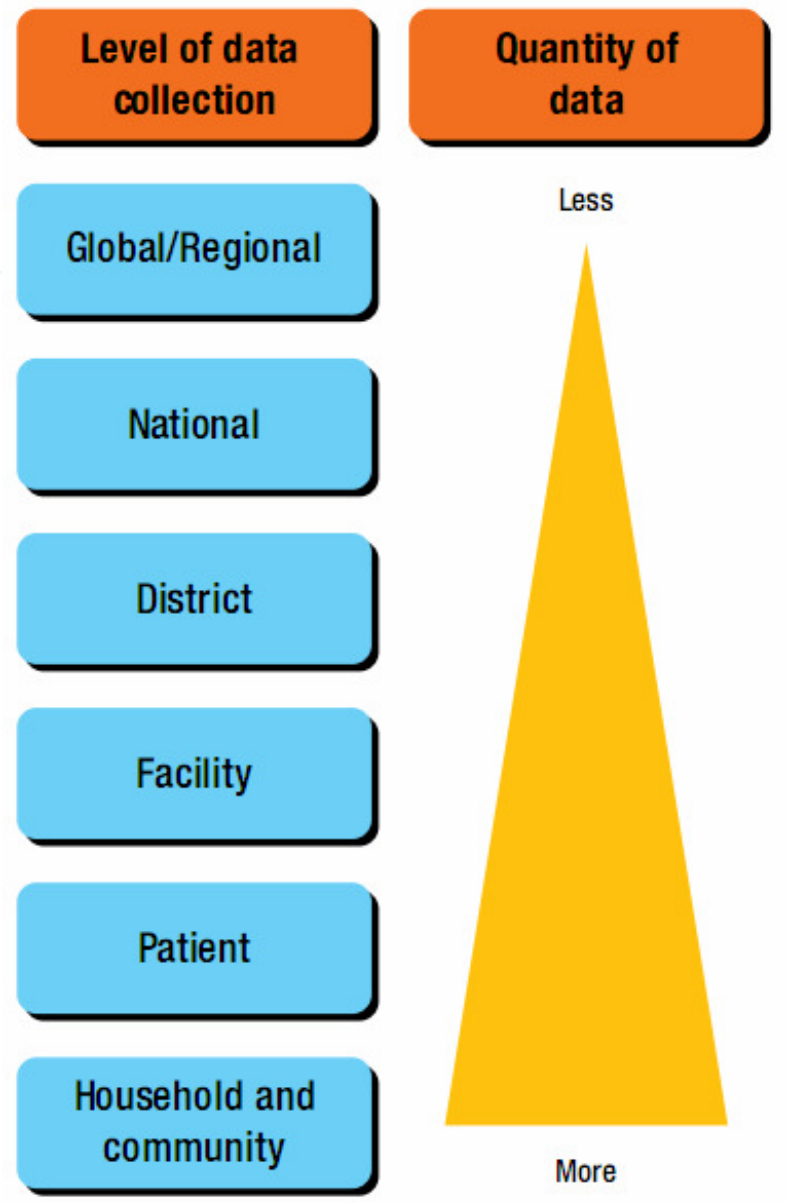
It is a systems approach to combine statistical data from multiple sources to derive evidence about:

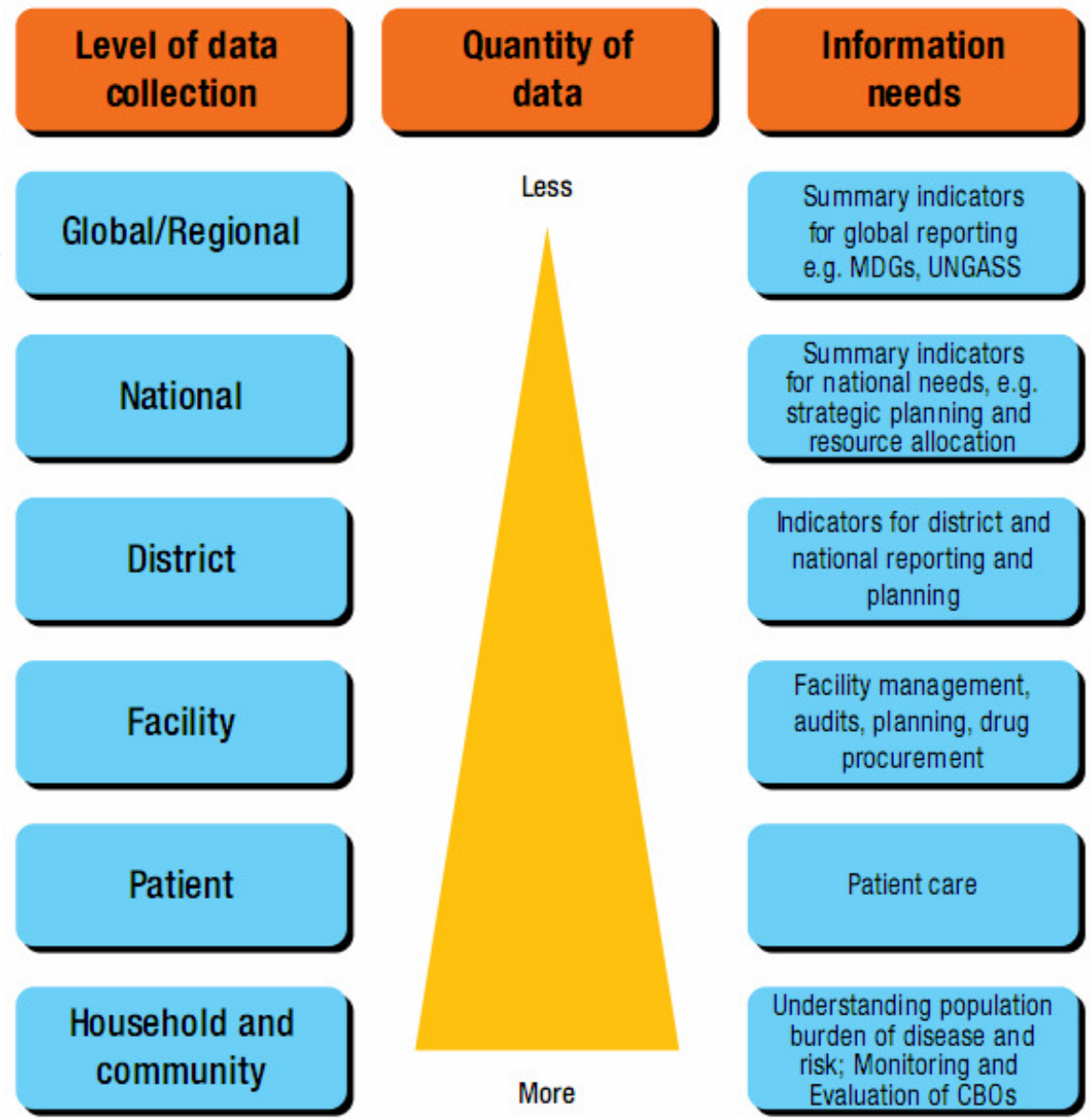
- **health needs,**
- **health resources**
- **health costs**
- **use of health services**
- **health outcomes**

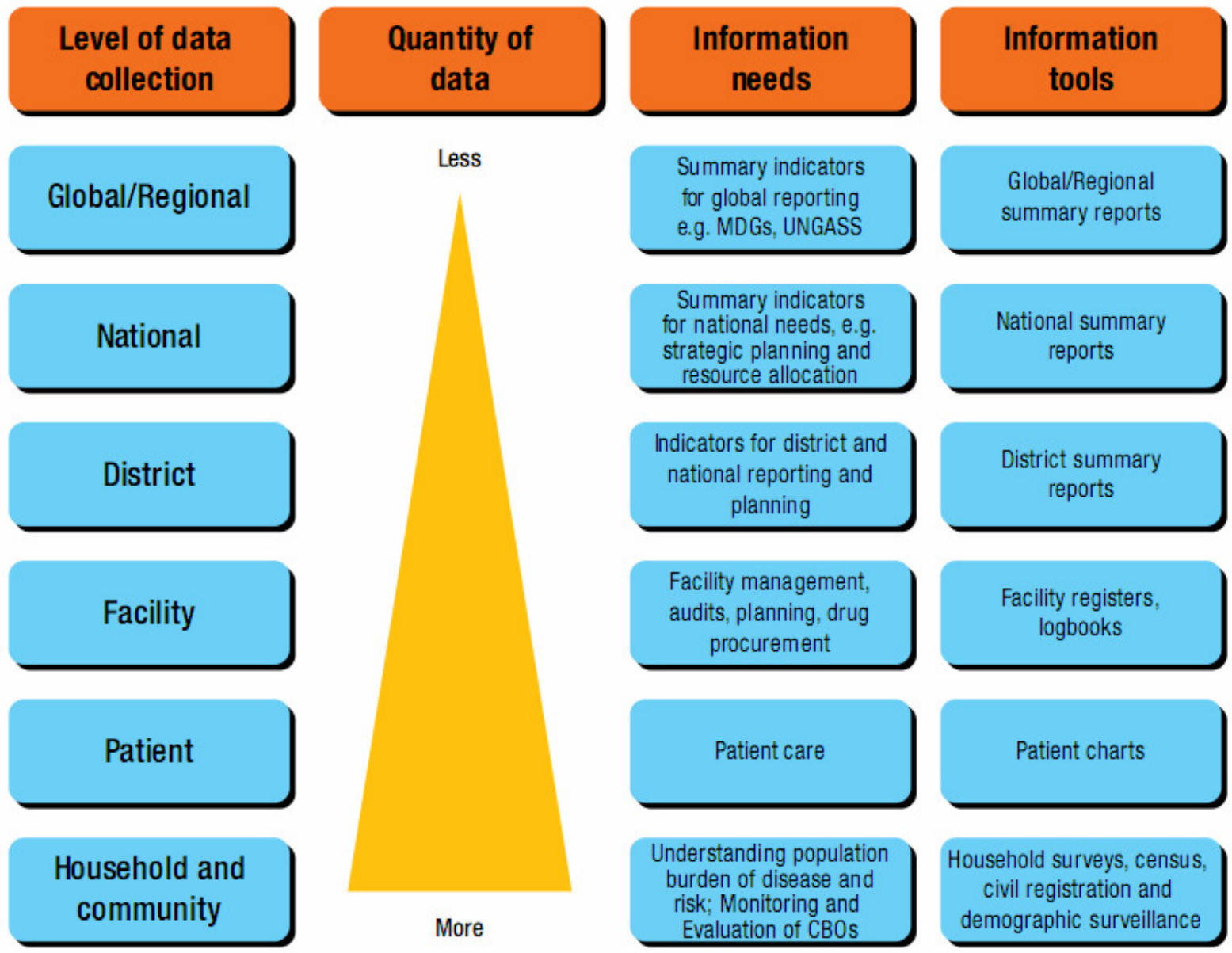
for the population of a specified jurisdiction

Level of data collection

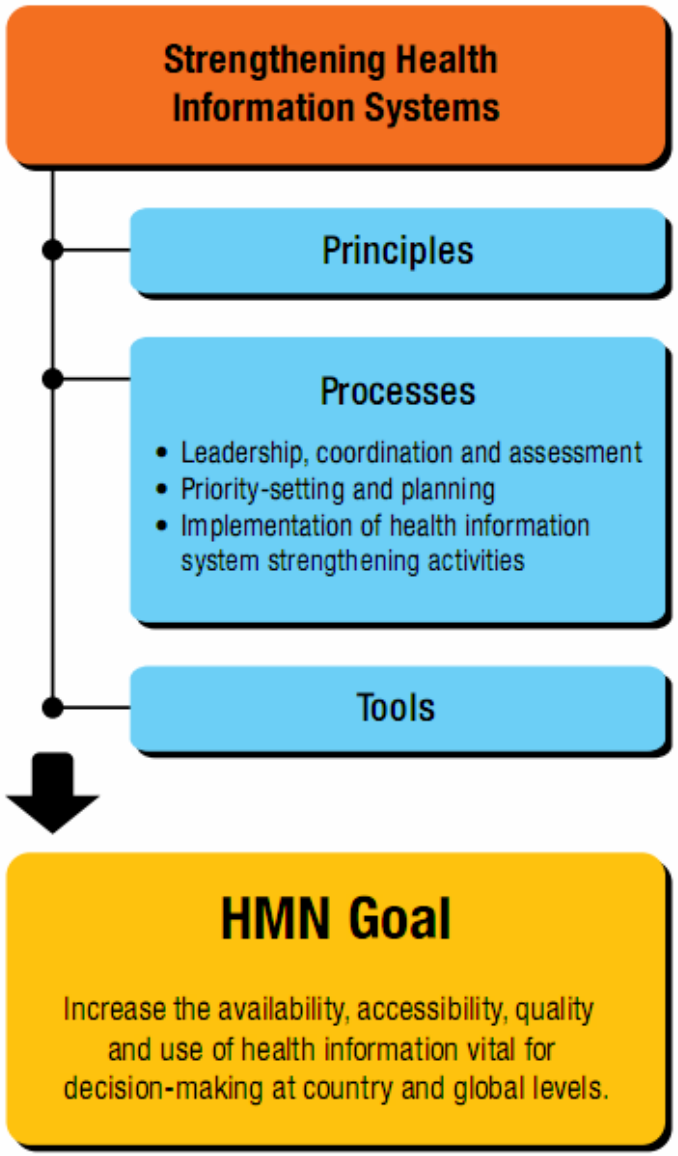
- Global/Regional
- National
- District
- Facility
- Patient
- Household and community

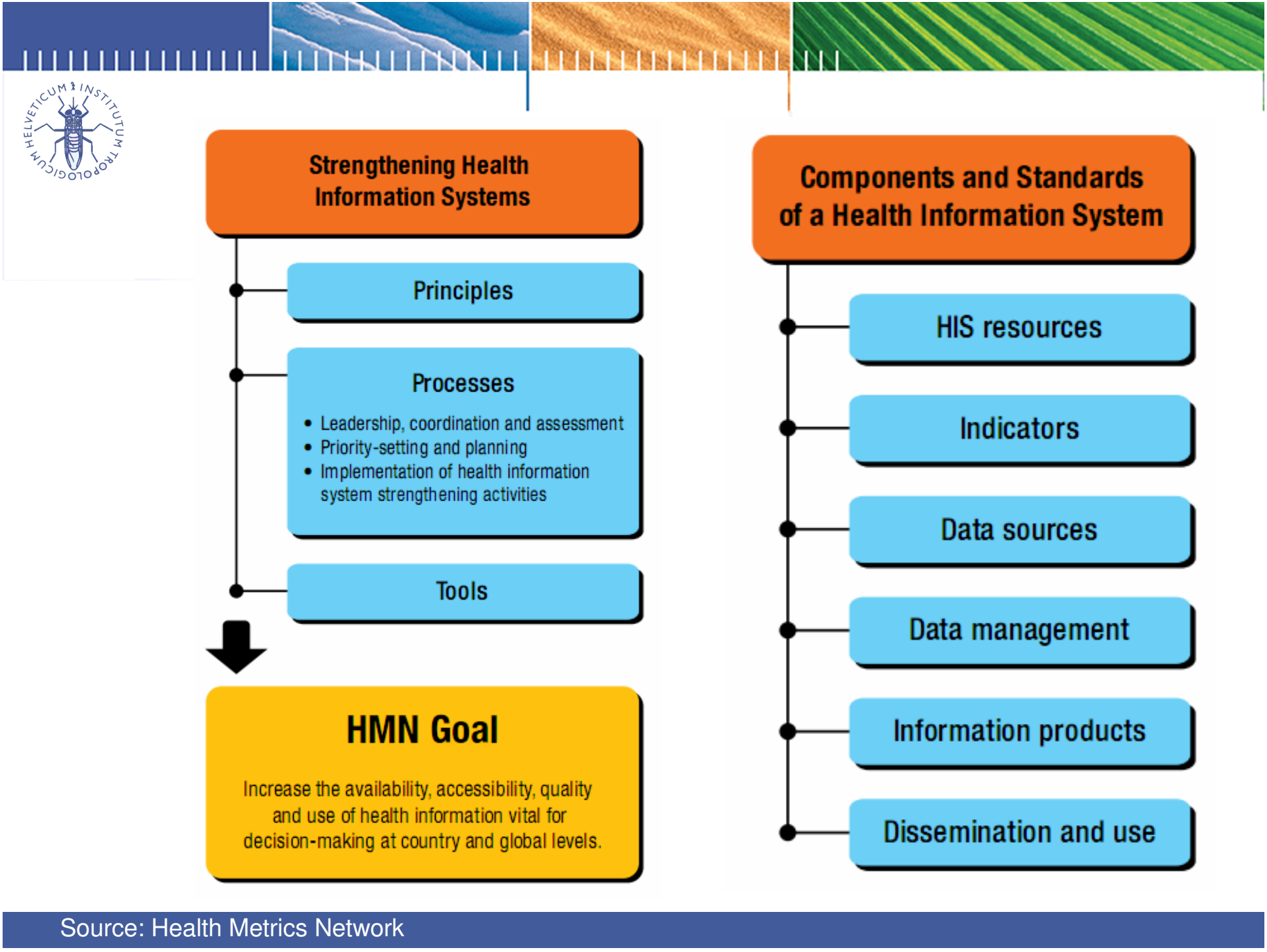

Level of data collection
Quantity of data
Global/Regional
National
District
Facility
Patient
Household and community
Less
More


Level of data collection
Quantity of data
Information needs
Global/Regional
National
District
Facility
Patient
Household and community
Less
More
Summary indicators for global reporting e.g. MDGs, UNGASS
Summary indicators for national needs, e.g. strategic planning and resource allocation
Indicators for district and national reporting and planning
Facility management, audits, planning, drug procurement
Patient care
Understanding population burden of disease and risk; Monitoring and Evaluation of CBOs



Source: Health Metrics Network


Strengthening Health Information Systems
Principles
Processes
• Leadership, coordination and assessment
• Priority-setting and planning
• Implementation of health information system strengthening activities
Tools
HMN Goal
Increase the availability, accessibility, quality and use of health information vital for decision-making at country and global levels.



Source: Health Metrics Network

Assessment tool switchboard

Health Metrics Network

Health Information System Assessment Tool

Version 1.96

Enter Scores

- I. Resources
- II. Indicators
- III. Data Sources
- IV. Data Management
- V. Information Products
- VI. Dissemination & Use

View Results

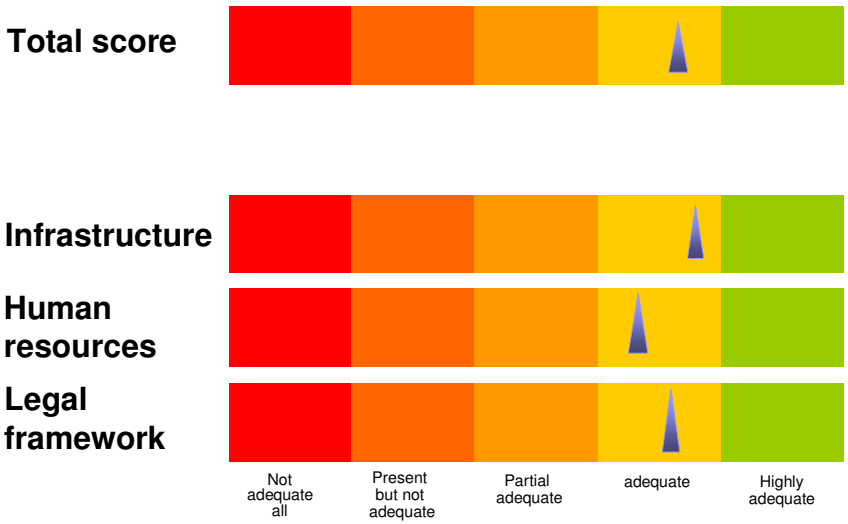
- Summary of Results
- Summary of Comments
- Overall Assessment
- Data Sources Assessment
- Information Products Assessment
- Quality of Health Information

Score Entry Progress

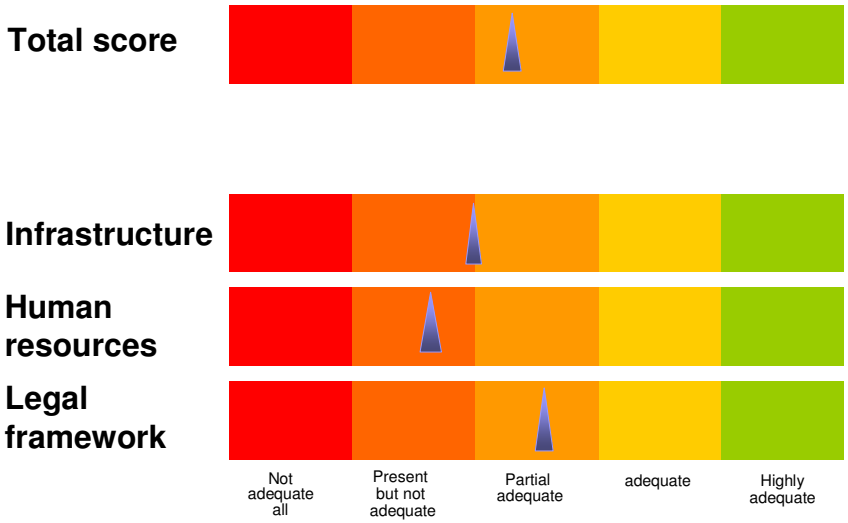
Source: Health Metrics Network

Rating context & resources for HIS; Thailand & Ghana 2005

Summary score, Thailand 2005:
Context & resources for HIS



Summary score, Ghana 2005:
Context & resources for HIS



Key:

Not adequate at all	Present but not adequate	Partially adequate	Adequate	Highly Adequate

Source: Health Metrics Network

Health Metrics Video

..\..\..\..\My Videos\HMN Video.wmv

Sources of health information

Census…….	• National, periodic mortality
Vital registration..	• National, continuous cause of death
SRS……..	• Sample Registration System
DSS……..	• Demographic Surveillance System
DHS……..	• Demographic & Health Survey
MICS…….	• Multiple Indicator Cluster Survey
HMIS…….	• Health Management Information System
IDS…….	• Integrated Disease Surveillance
HF…….	• Health Facility Surveys
GIS…….	• Geographic Information System
RS…….	• Remote sensing
HBS……..	• Household Budget Survey
LSMS…….	• Living Standards Measurement Survey

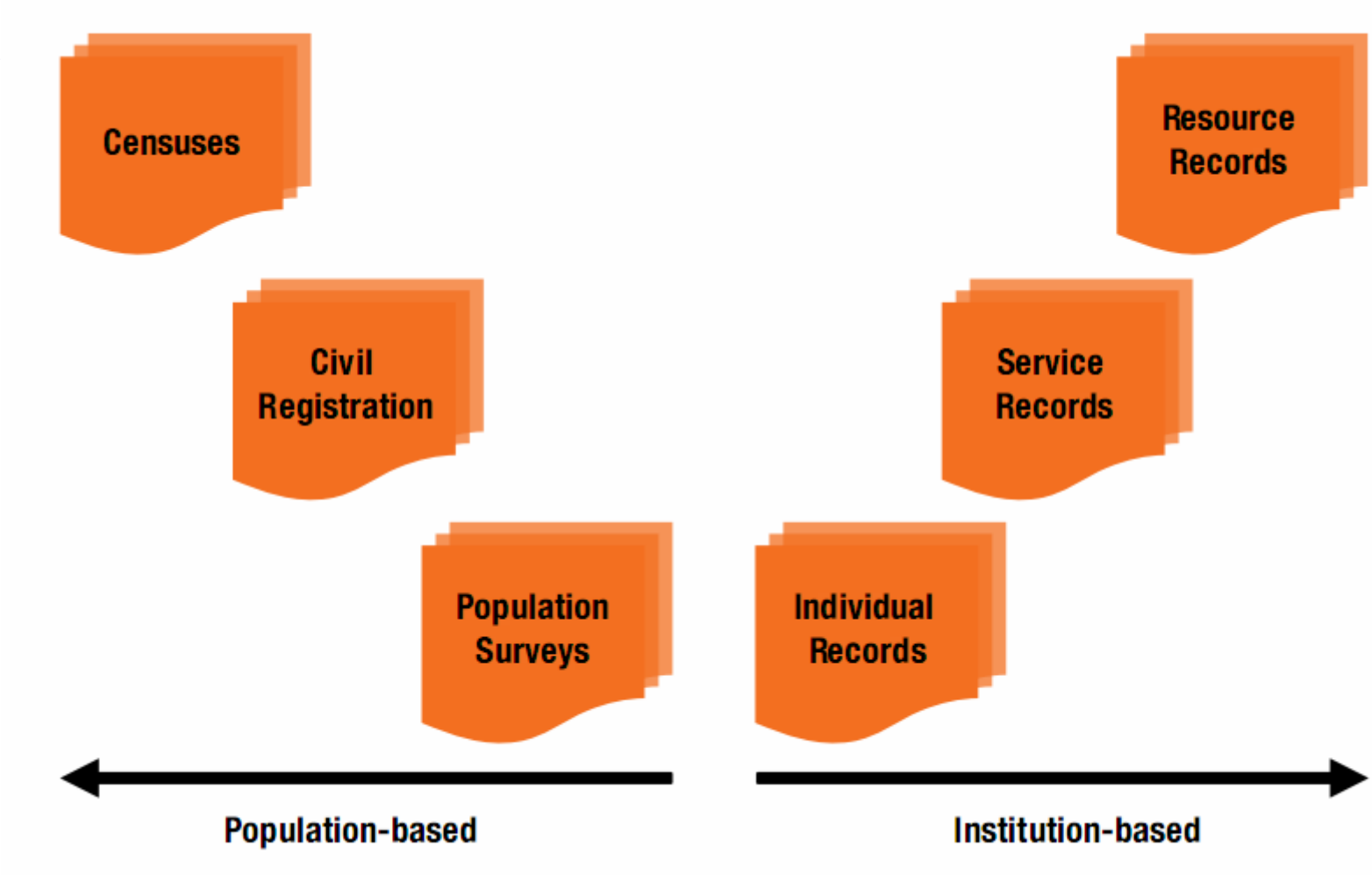
Sources of health information
Sample web sites for each source

Census…….	• http://www.tanzania.go.tz/census/
Vital registration..	• http://www.statcan.ca/start.html
SRS……..	• http://www.censusindia.net
DSS……..	• http://www.indepth-nework.net/
DHS……..	• http://www.measuredhs.com/
MICS…….	• http://www.childinfo.org/
HMIS…….	• http://www.cpc.unc.edu/measure/rhino/
HF…….	• http://www.who.int/imci-mce/Methods/HF_survey.htm
IDS…….	• http://www.cdc.gov/epo/dih/idsafrica.html
GIS…….	• http://www.mara.org.za
RS…….	• http://edcintl.cr.usgs.gov/adds
HBS……..	• http://www.tanzania.go.tz/statisticsf.html
LSMS…….	• http://www.worldbank.org/lsms/

Features of information sources

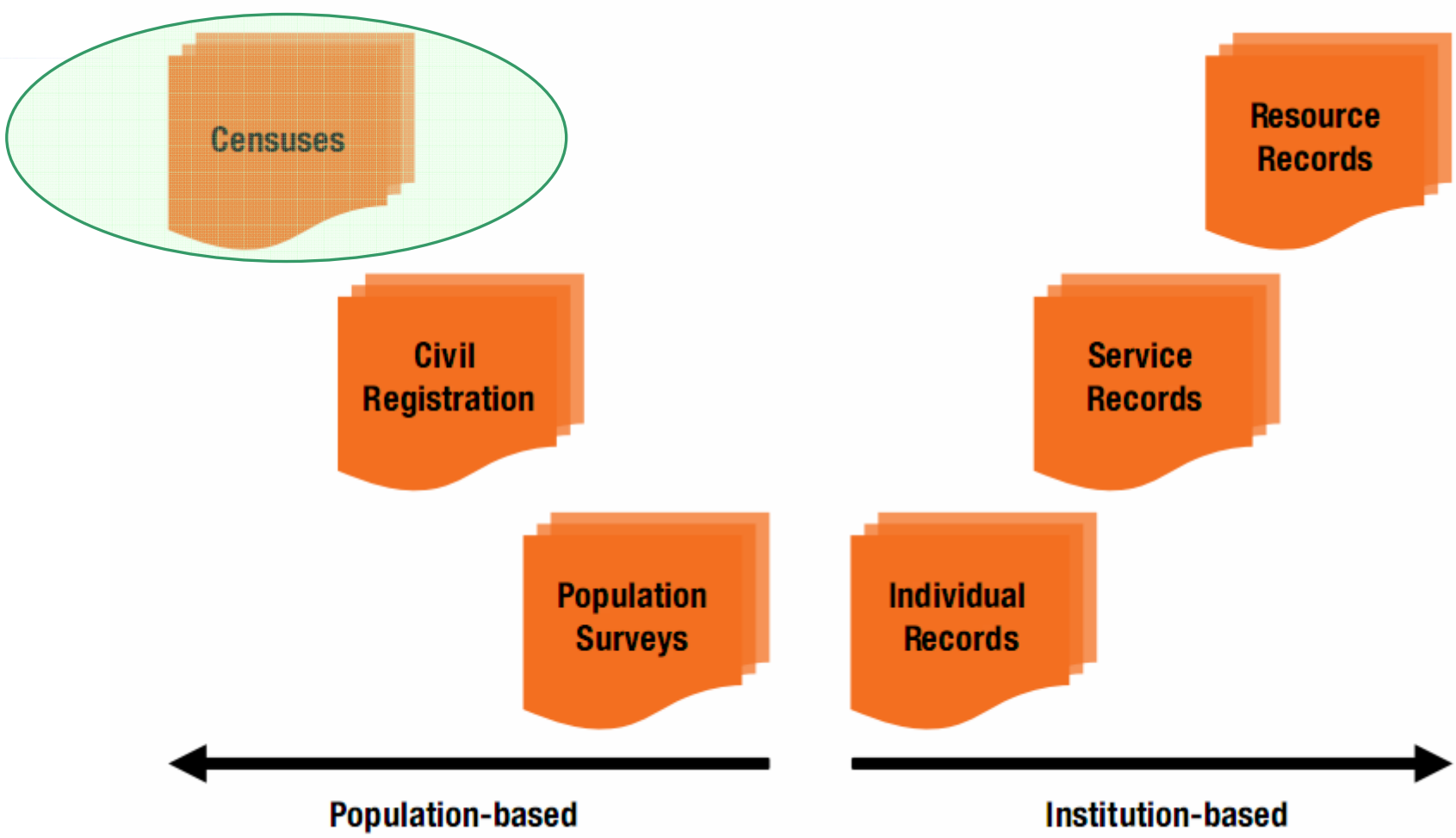
Level	Type	
	X-Sectional Retrospective	Longitudinal Prospective
Individual & Household	Population Surveys (Census, DHS, MICS)	Prospective Surveillance (Vital Events and DSS)
Health Facility	HF Surveys	Routine Reporting (HMIS, IDS)
Modeling	Risk Mapping (GIS)	Remote Sensing & Early Warning Systems

Data sources



Source: Health Metrics Network

Data sources

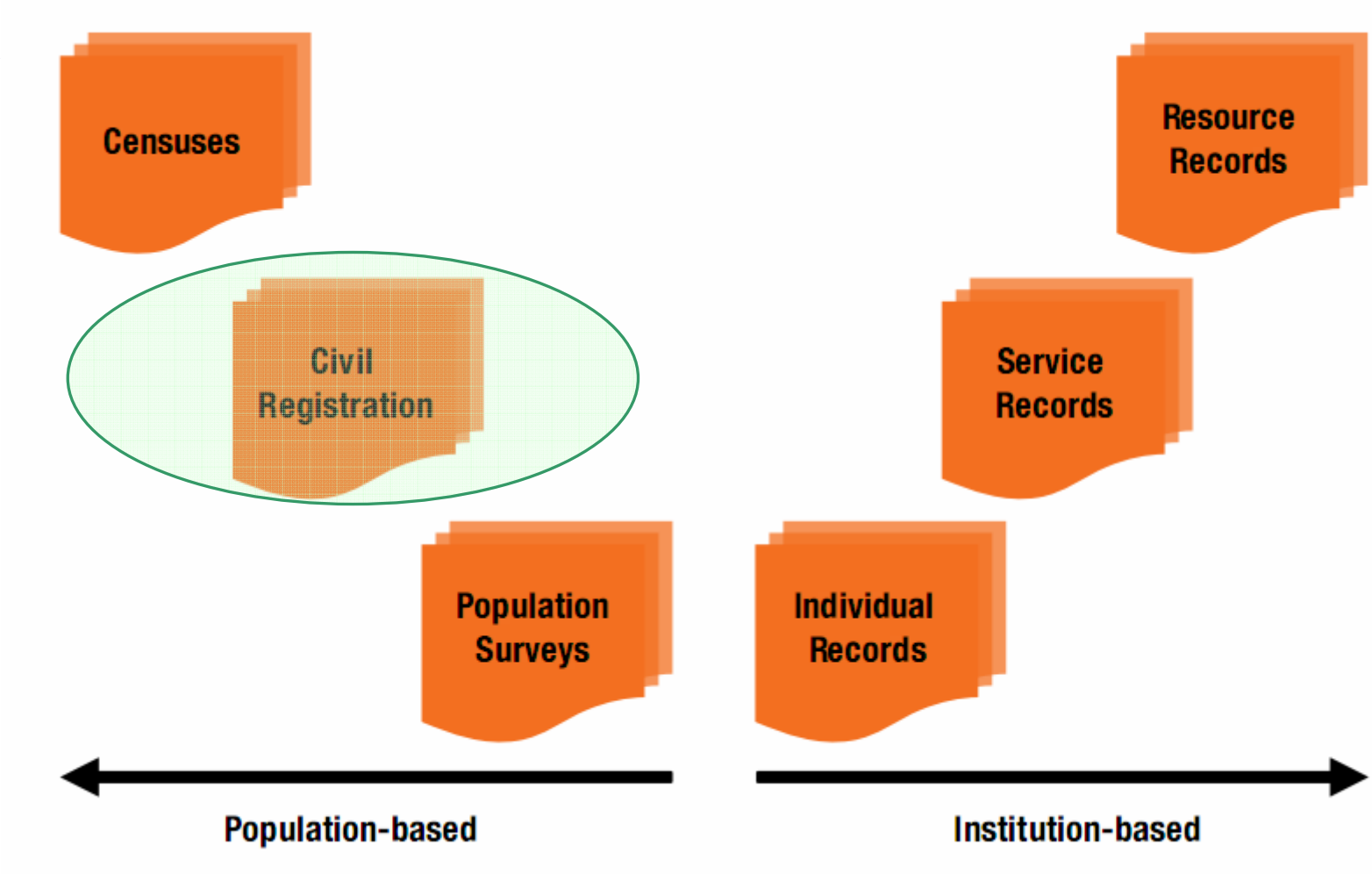


Source: Health Metrics Network

Census

- Usually every 10 years
- Extremely costly
- A source of population denominators for health facility catchment areas
  - Rarely used
  - Rarely extrapolated
- A source of mortality data down to 4th administrative level
  - Obtained from *indirect birth history*
    - Maternal respondents
    - Children ever born
    - Children still alive
    - No dates
    - Uses model life tables to estimate mortality

Data sources



Source: Health Metrics Network

Civil (vital) event registration

- In Africa, most people are born, live and die without leaving a trace in the official record.

Vital registration
Vital statistics

”If there is one single foundational policy that the world’s poorest states should be encouraged to undertake in pursuit of their citizens’ long-term health and security, it is a full and accurate registration of all their citizens from birth to death.”

Simon Szreter, 2004

Vital registration

Vital events

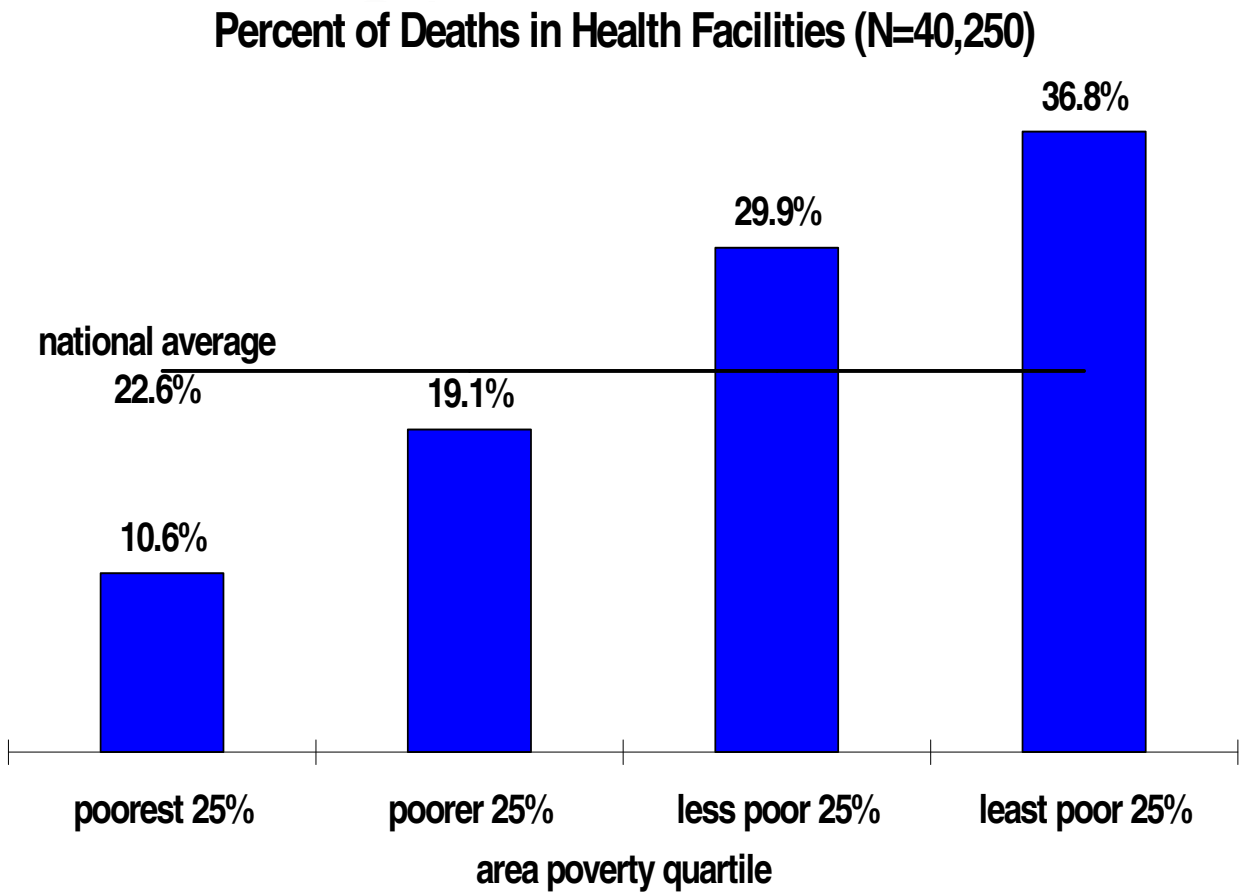
Advantages

- Required by international law
- Provides key measures on births, deaths, causes of death, fertility, and migration.
- Necessary but insufficient factor in successful social security systems
- Necessary for successful land tenure, property rights, rights of inheritance, wealth accumulation, famine prevention, etc.

Disadvantages

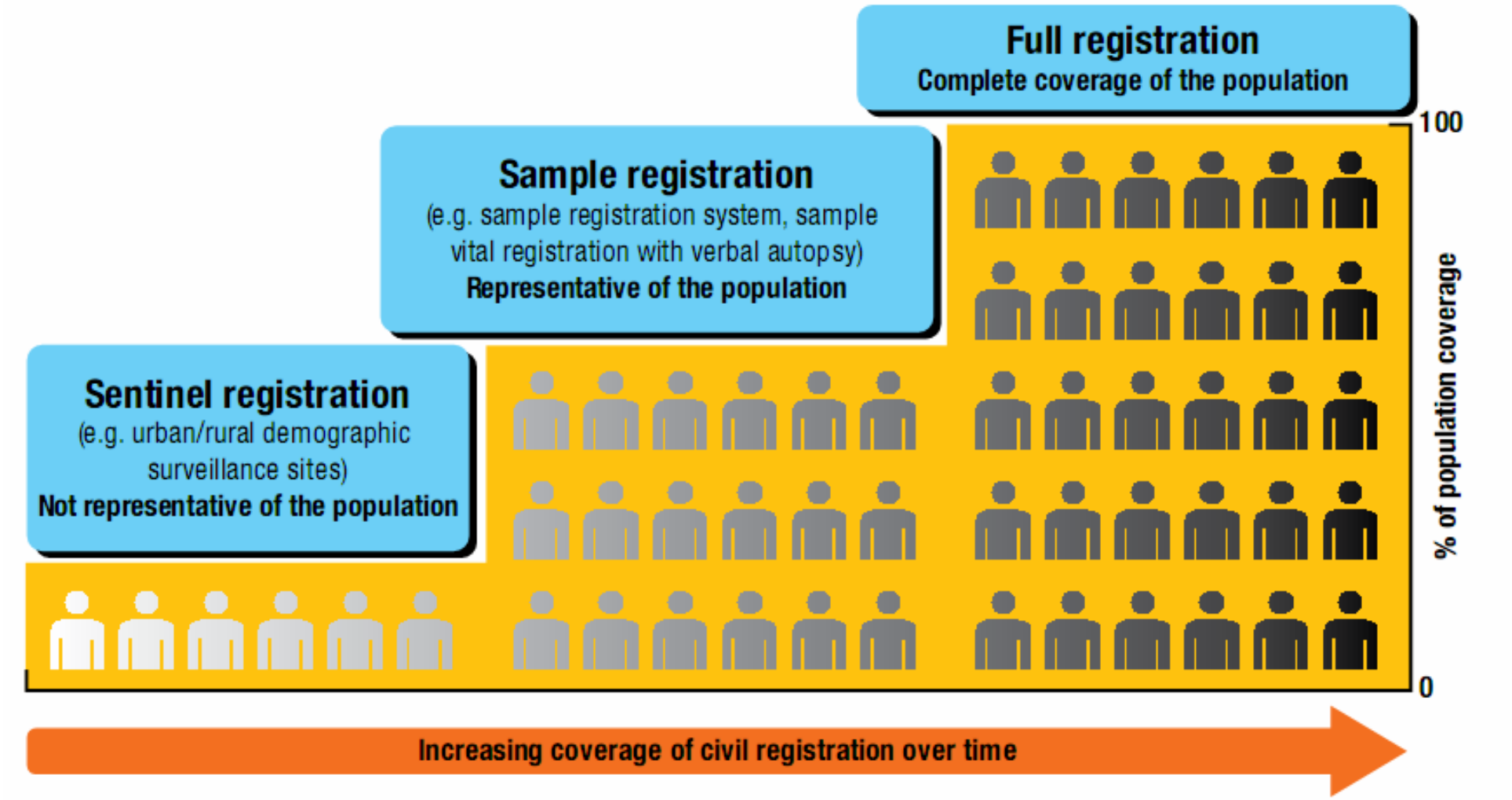
- Beyond the capacity of most developing countries to provide
- Only 8 countries in Africa and Southeast Asia register events

Routine health service statistics are not a good source of vital statistics



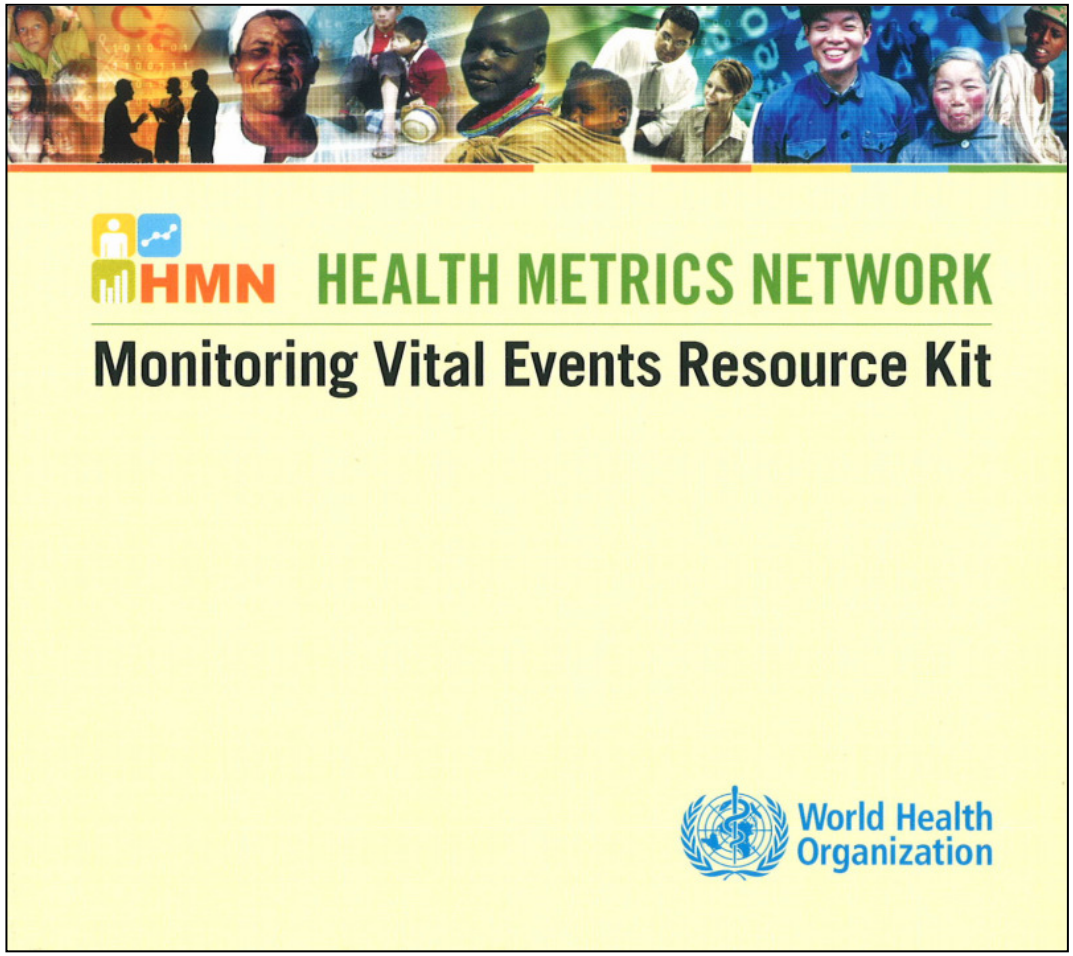
Source: Measure Evaluation

Stepping stones to a vital statistics system



Source: Health Metrics Network

Tool Kit CD Available with all methods



Sentinel/Sample Registration

Demographic Surveillance Systems with VA

Advantages

- Longitudinal
- Contemporary data
- Full array of measures
- High quality
- Household based
- Individually linked
- Richly contextual
- Good value for money
- Good for local and national planning
- Can evaluate impact
- Can evaluate interventions

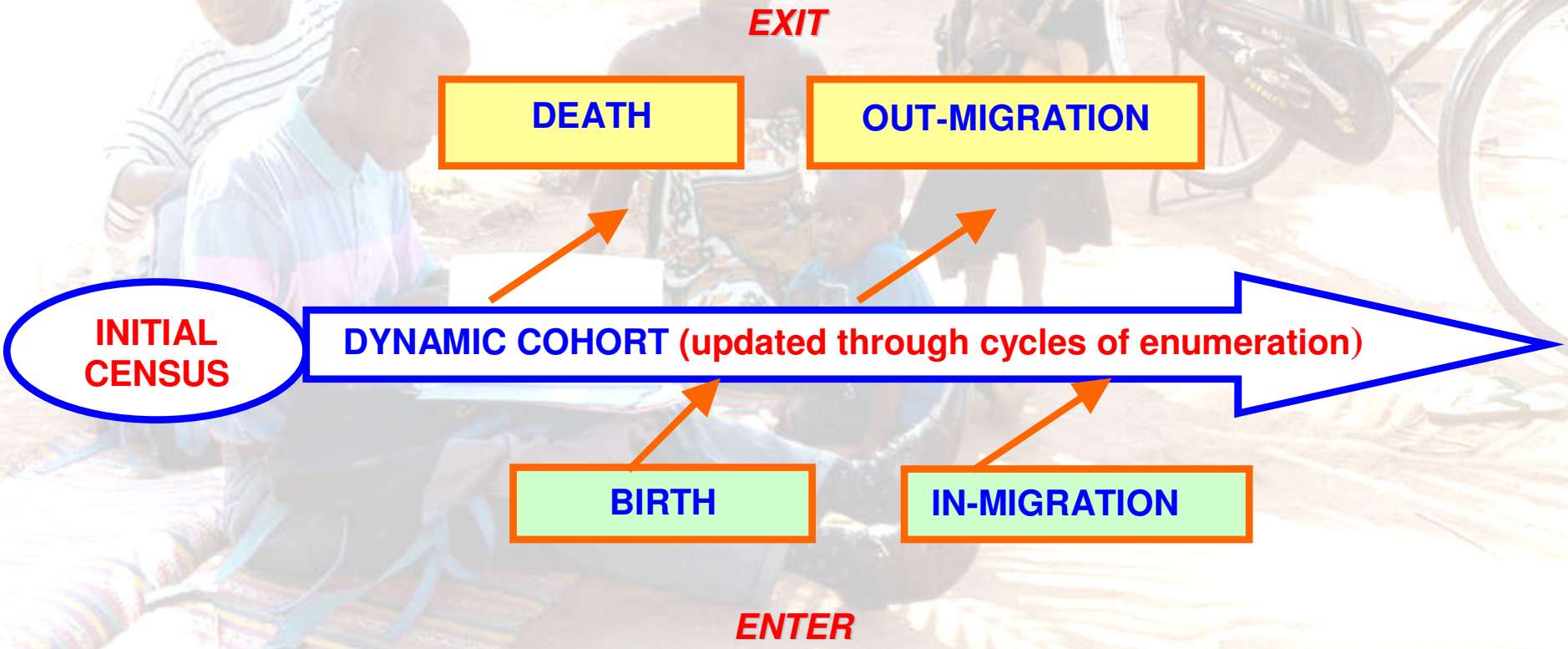
Disadvantages

- Perceived as costly
- Questions of generalizability
- Sustained mainly by research funding
- Weak on non-fatal morbidities

What is the DSS?

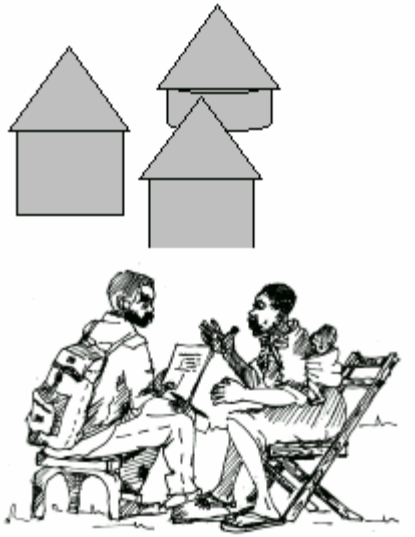
- Demographic Surveillance System
  - Large dynamic cohort in which all births, deaths, causes of death, in-migration and out-migration are registered prospectively.
  - Provides a powerful information platform.
  - Provides a powerful research platform.
  - Uses a household registration system
    - Software system that maintains a consistent record of demographic events, generates register books that are used by fieldworkers, and computes demographic rates.

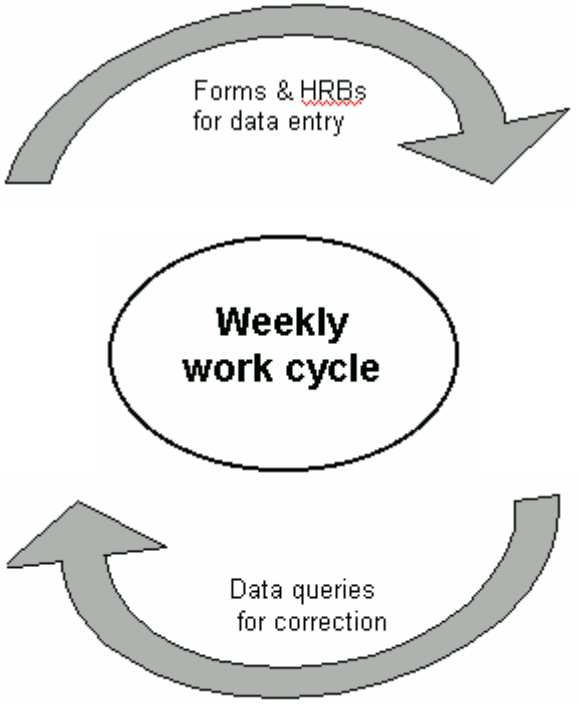
Prospective monitoring of demographic and health events



New technologies improving DSS cost-efficiency

Integrated field and data systems





Field team

Data collected through household visits

Data queries resolved

Data room team

Databases updated

Databases checked

Queries sent back to field

How does a DSS operate?

- Typical size: 70,000 population, larger if urban
- 150 Independent Key Informants from communities
- 25 DSS Enumerators with bicycles (on foot if urban)
- DSS Supervisors with motorcycles (public transport if urban)
  - 3 Key informant supervisors
  - 7 Enumerator supervisors
  - 3 Verbal Autopsy supervisors
  - 3 Migration supervisors
- DSS data manager and 5 data entry clerks
- 3 Independent VA coders (part time or computer algorithm)
- DSS Scientists, Management and Administrator
- 3-4 enumeration update rounds per year
- GIS / GPS for all households, community structures
- *De facto* population registered: person-time residency
- Events by cause, age, sex all linked to resident population
- Annual recurrent costs: ~$130,000 USD ($<0.01 per capita).

DSS core outputs

- Mortality rates (all cause and cause-specific)
- Life table probabilities
- Fertility rates
- Migration rates

Is that all ?

DSS outputs: Rich context

- Typical DSS can produce over 100 demographic, health and poverty indicators for understanding trends and determinants for:
  - population characteristics
  - household characteristics, assets and wealth indexing
  - health status / disease burdens
  - access, use and impact of health services
  - health seeking behaviours for severe and fatal conditions
  - environmental contexts, risks, exposures
  - household food security
  - impact of poverty reduction strategies
  - impact of health interventions
  - timely evidence for planning and setting priorities

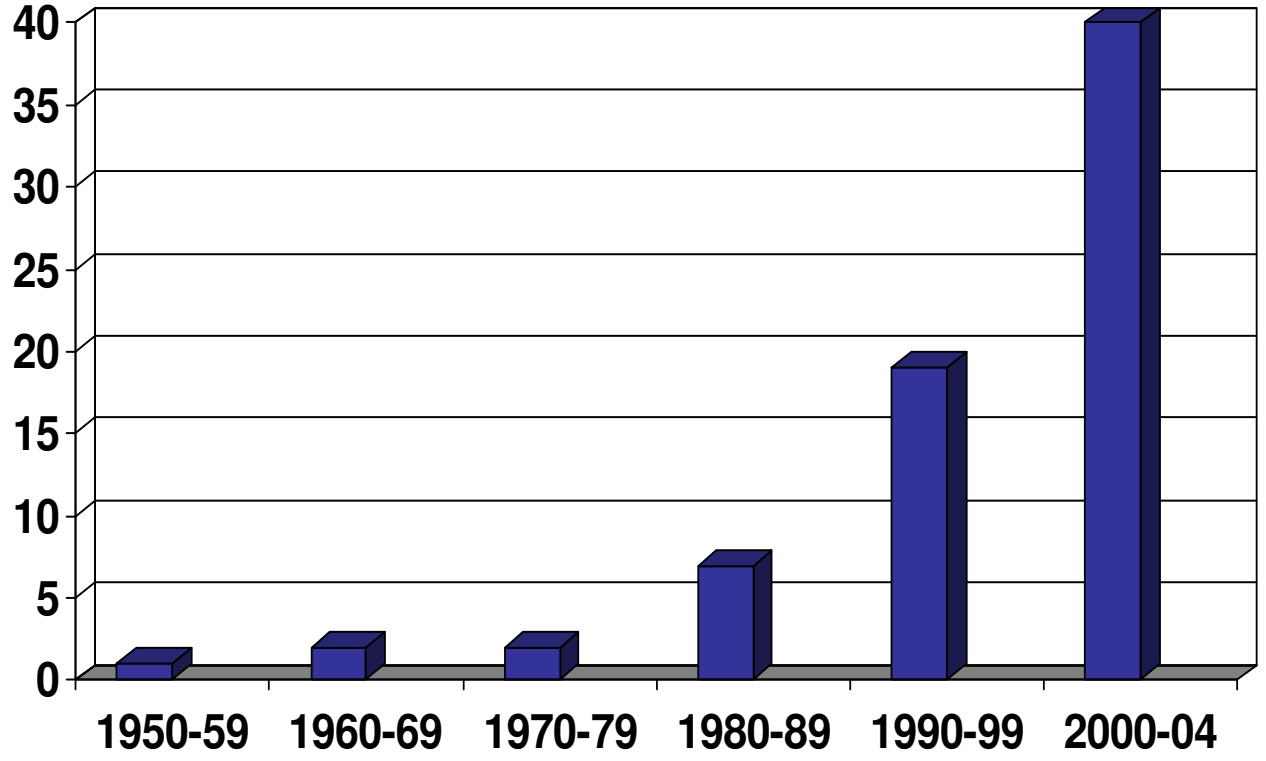
"DSS represents for most of Africa the single best source of data on cause-specific mortality within defined populations."

Korenromp, Williams, Gouws, Dye and Snow

Measurement of trends in childhood malaria mortality in Africa.

Lancet Infect Dis 2003; **3:** 349-58.

DSS field sites in developing countries



A Guide to DSS Sites in the INDEPTH Network

INDEPTH Network (2002).

Population and Health in Developing Countries.

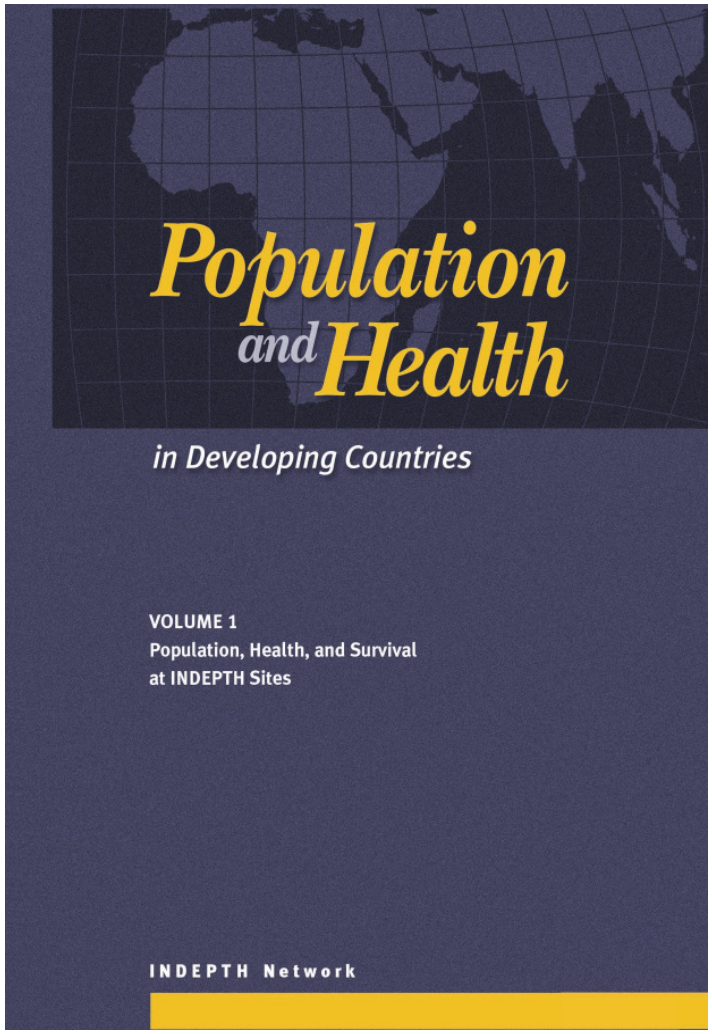
Volume One:

Population, Health and Survival at INDEPTH Sites.

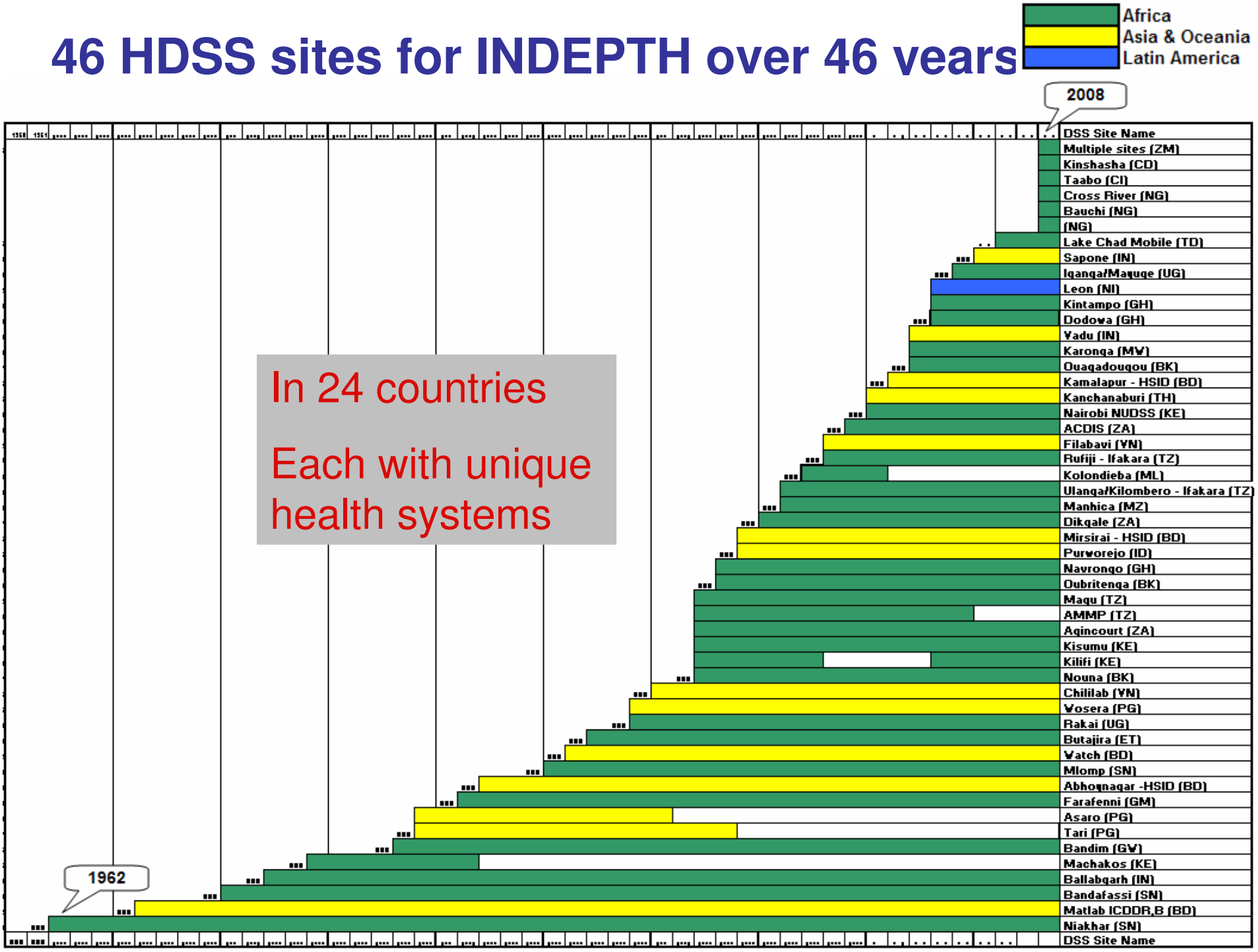
IDRC, Ottawa, Canada. 356 pp.

French edition published in April 2003

www.indepth-network.net



46 HDSS sites for INDEPTH over 46 years



In 24 countries

Each with unique health systems

Southern Africa

Manhica, Mozambigue	(80,000)
Dikgale, South Africa	(8,000)
Agincourt, South Africa	(70,000)
Africa Centre, South Africa	(90,000)
Karonga, Malawi	(40,000)

West Africa

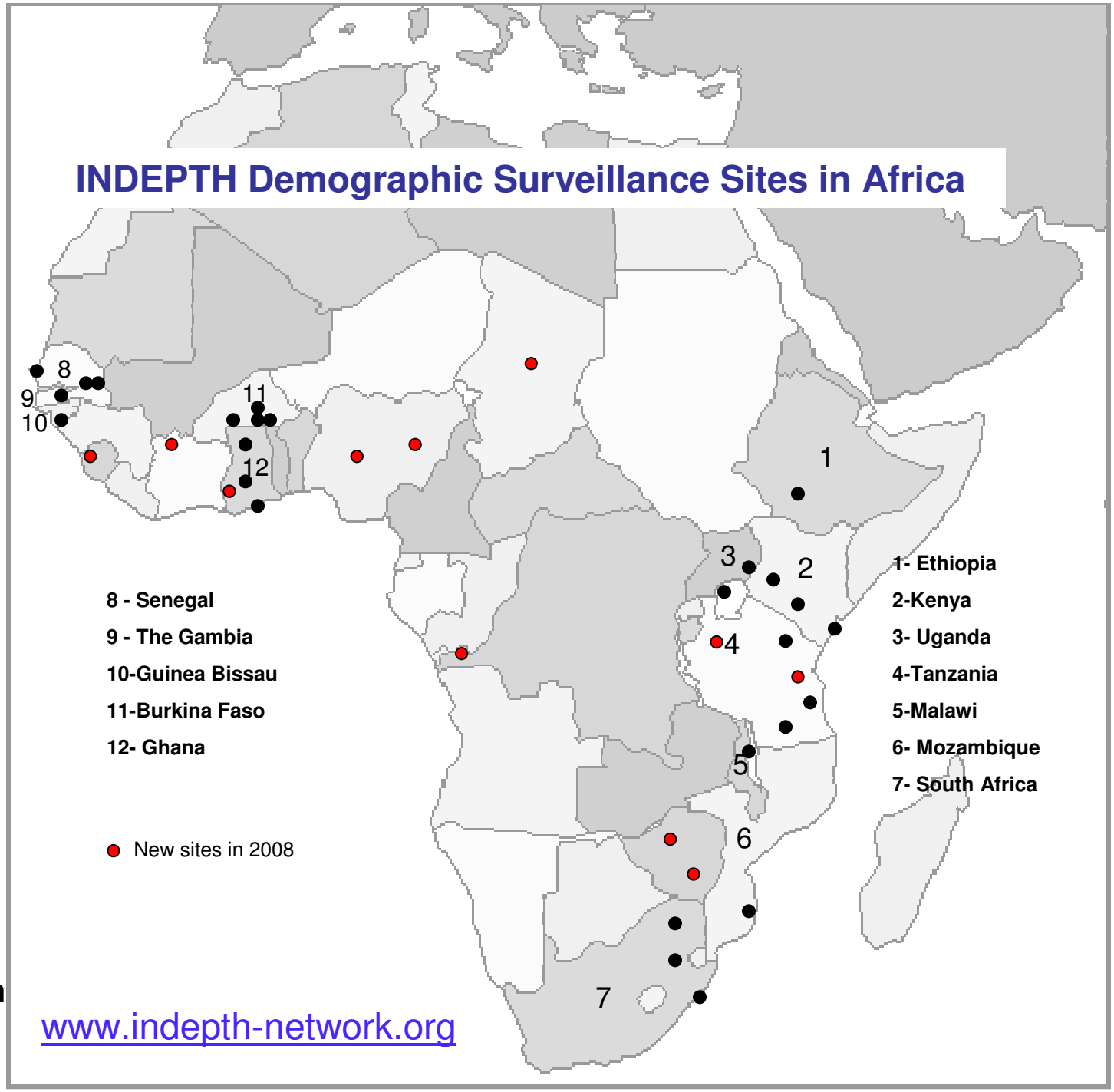
Oubritenga, Burkina Faso	(150,000)
Nouna, Burkina Faso	(76,847)
Ouagadougou, Burkina Faso	(4,500)
Sapone, Burkina Faso	(19,900)
Navrongo, Ghana	(140,000)
Kintampo, Ghana	(145,000)
Dodowa, Ghana	(96,921)
Farafenni, The Gambia	(16,883)
Bandim, Guinea Bissau	(101,000)
Niakhar, Senegal	(35,000)
Mlomp, Senegal	(7,500)
Bandafassi, Senegal	(11,200)

East Africa

Butajira, Ethiopia	(40,000)
Rakai, Uganda	(12,000)
Iganga, Uganda	(62,000)
Nairobi, Kenya	(68,598)
Kisumu, Kenya	(135,000)
Kilifi, Kenya	(220,000)
Ifakara, Tanzania	(67,000)
Rufiji, Tanzania	(90,000)
Magu, Tanzania	(28,000)

Total Population

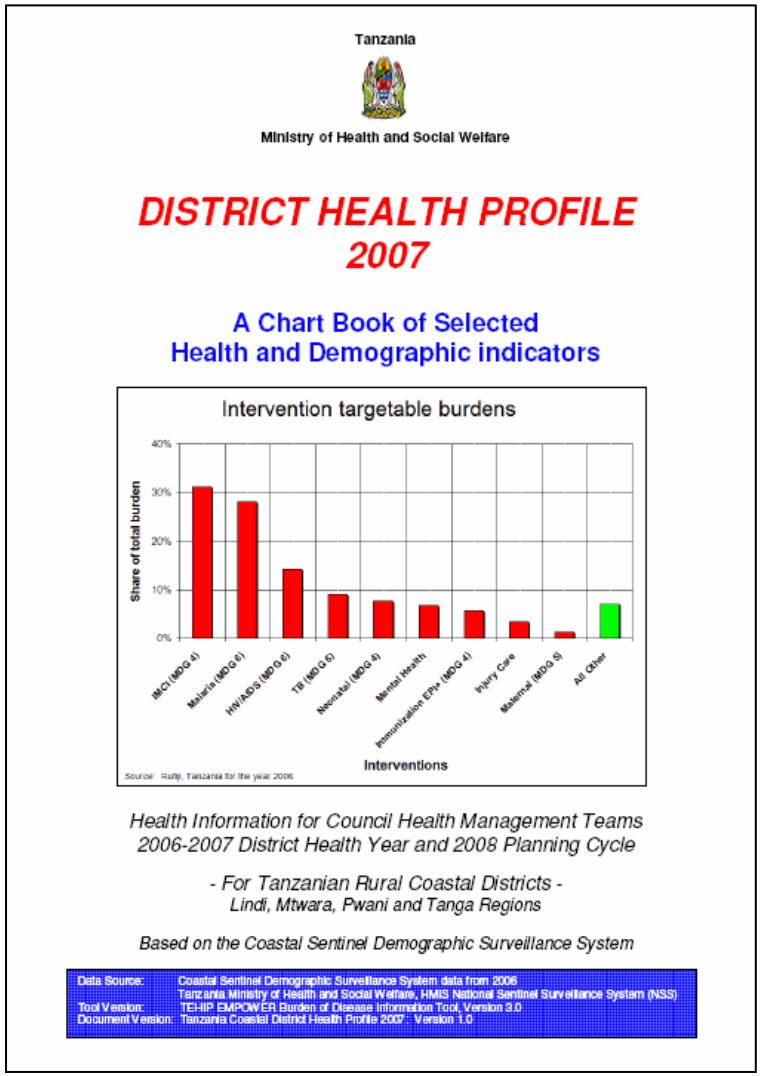
1,815,349



Districts hosting Sentinel DSS in Tanzania (population 250,000)

- Kigoma (Urban)
- Kilombero
- Korogwe
- Magu
- Morogoro
- Mvomero
- Rufiji
- Ulanga

Annual profiles issued to Districts


Tanzania

Ministry of Health and Social Welfare

DISTRICT HEALTH PROFILE
2007

A Chart Book of Selected
Health and Demographic indicators

Health Information for Council Health Management Teams
2006-2007 District Health Year and 2008 Planning Cycle

- For Tanzanian Rural Coastal Districts -
Lindi, Mtwara, Pwani and Tanga Regions

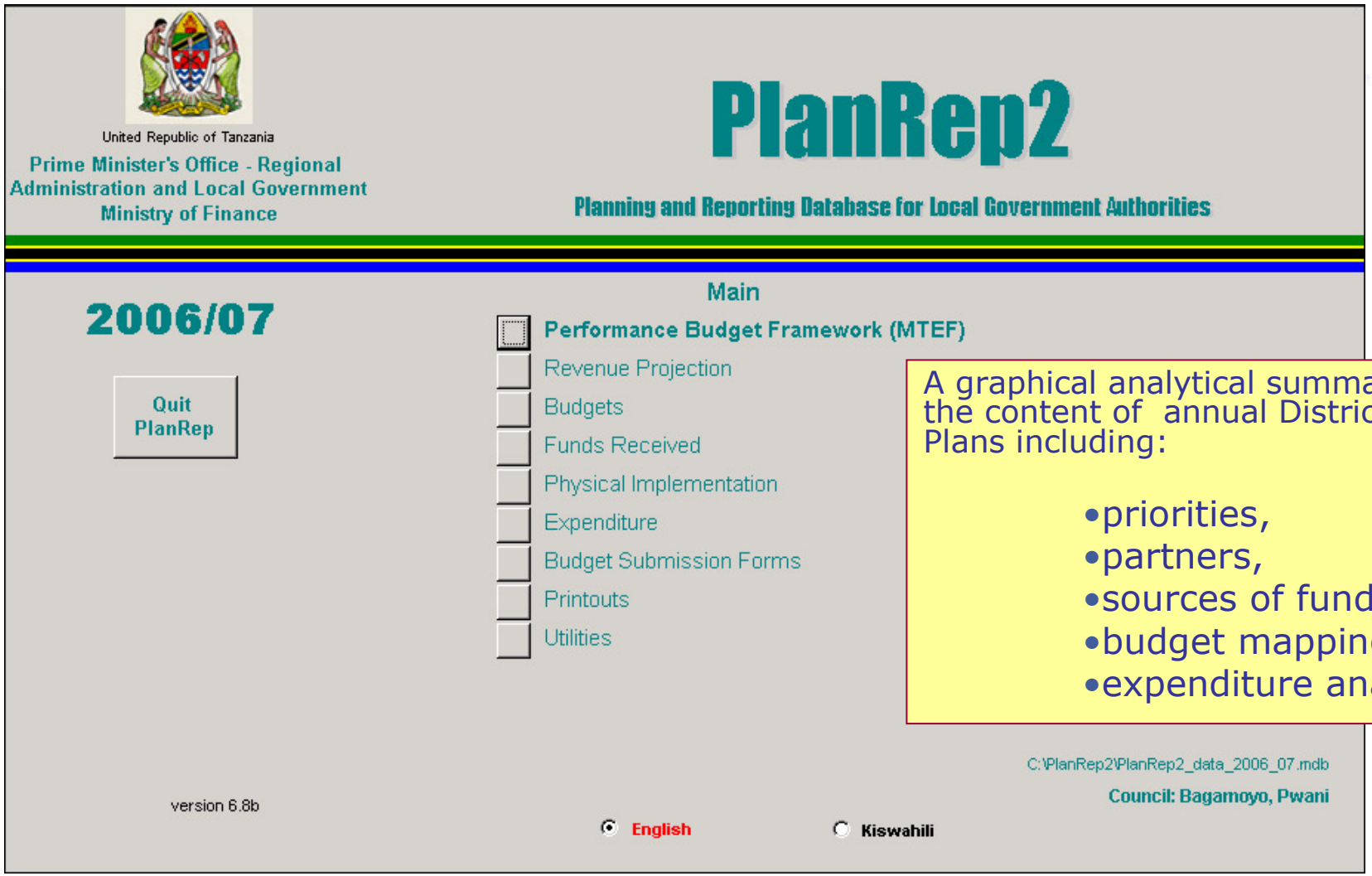
Based on the Coastal Sentinel Demographic Surveillance System

Data Source:	Coastal Sentinel Demographic Surveillance System data from 2006 Tanzania Ministry of Health and Social Welfare, HMIS National Sentinel Surveillance System (NSS)
Tool Version:	TEHIP EMPOWER Burden of Disease Information Tool, Version 3.0
Document Version:	Tanzania Coastal District Health Profile 2007 : Version 1.0

- Annual chart book produced by MOH DSSs
- Issued prior to annual planning cycle
- Used to assist priority setting
- Provides graphical display of cost-effective interventions by burden share addressed
- Intervention addressable YLLs

- Sample graphics and messages follow…

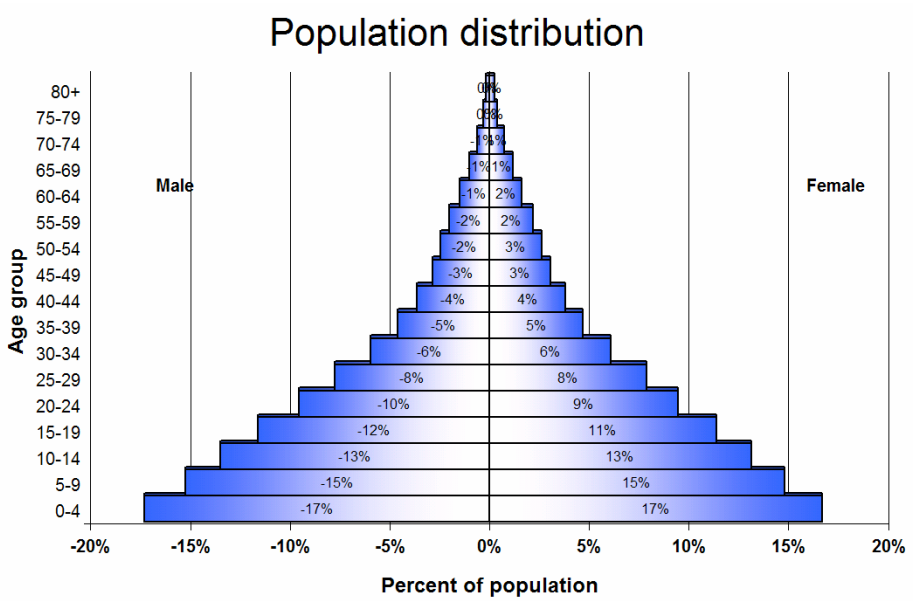
District Health Accounts

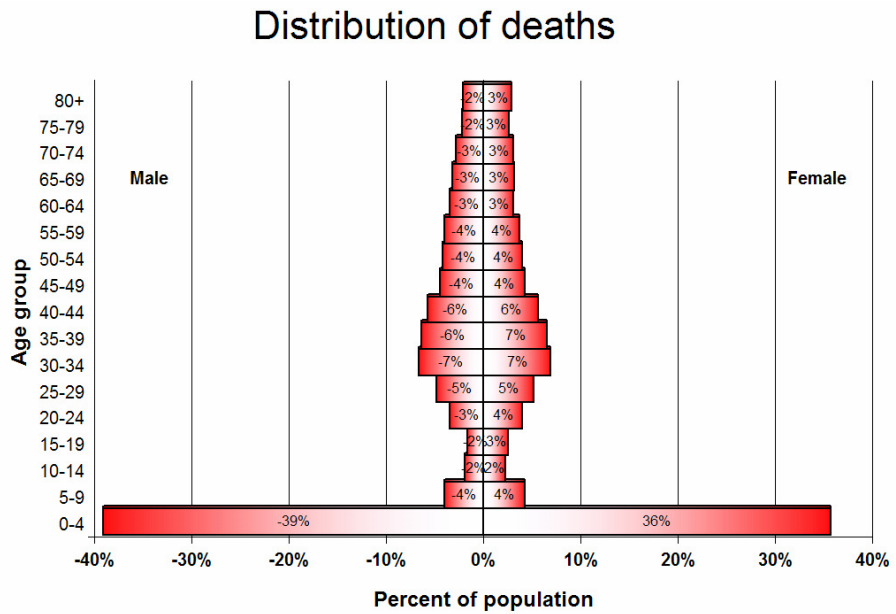


A graphical analytical summary of the content of annual District Health Plans including:

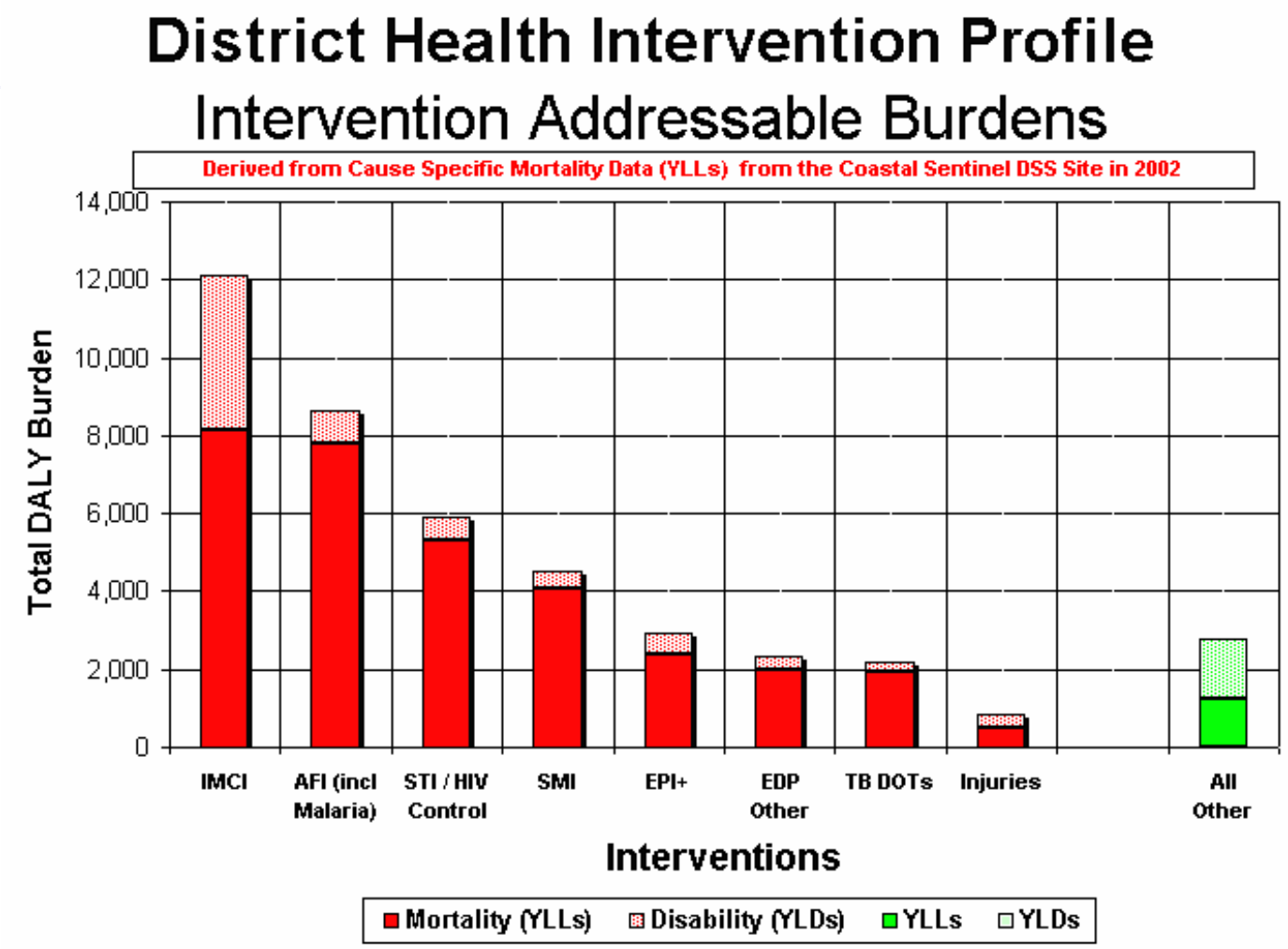
- priorities,
- partners,
- sources of funding,
- budget mapping,
- expenditure analyses

Where does risk concentrate?

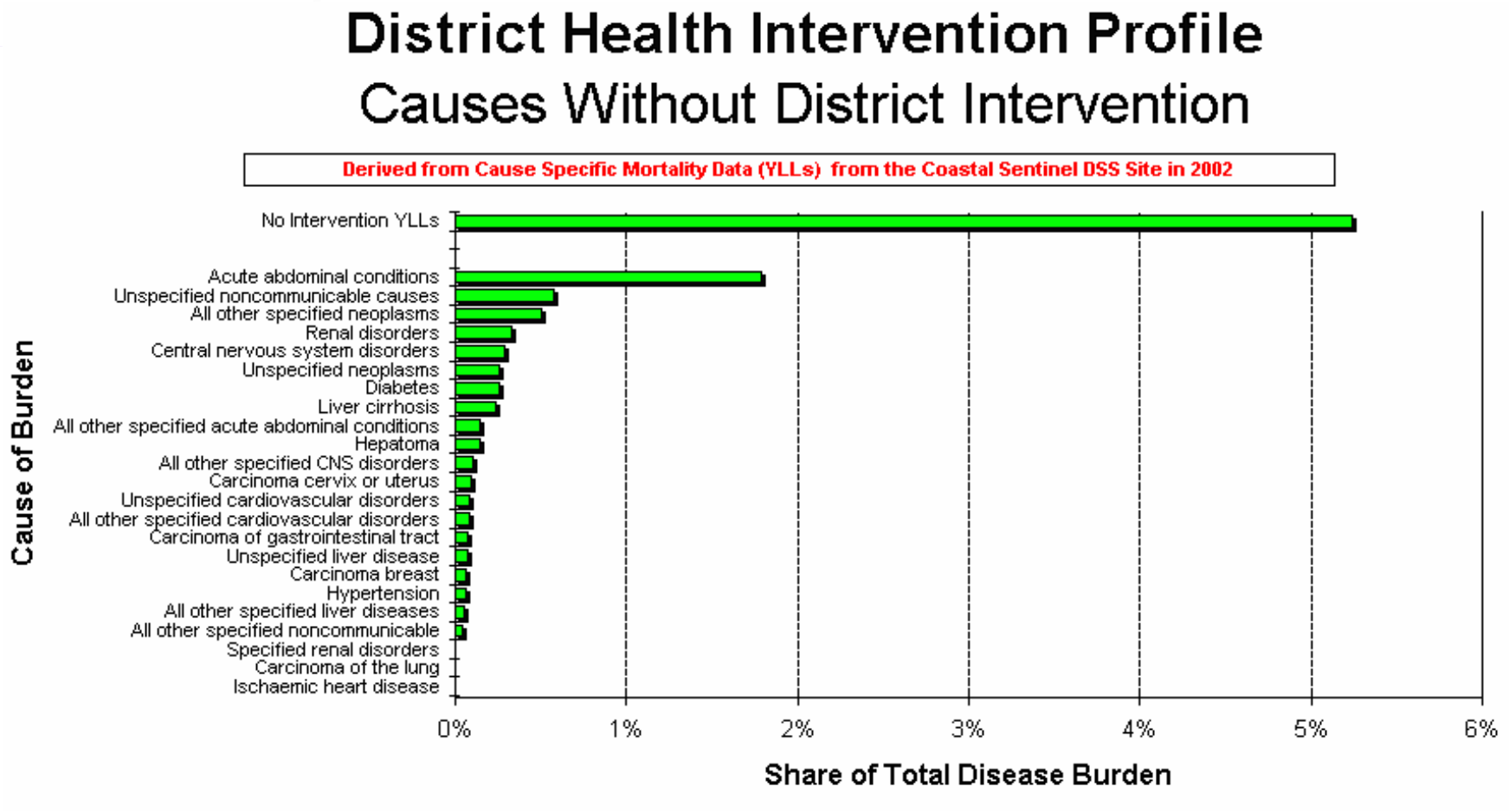




Intervention priorities by burden (DALYs)



Proportional NCD burden at rural level

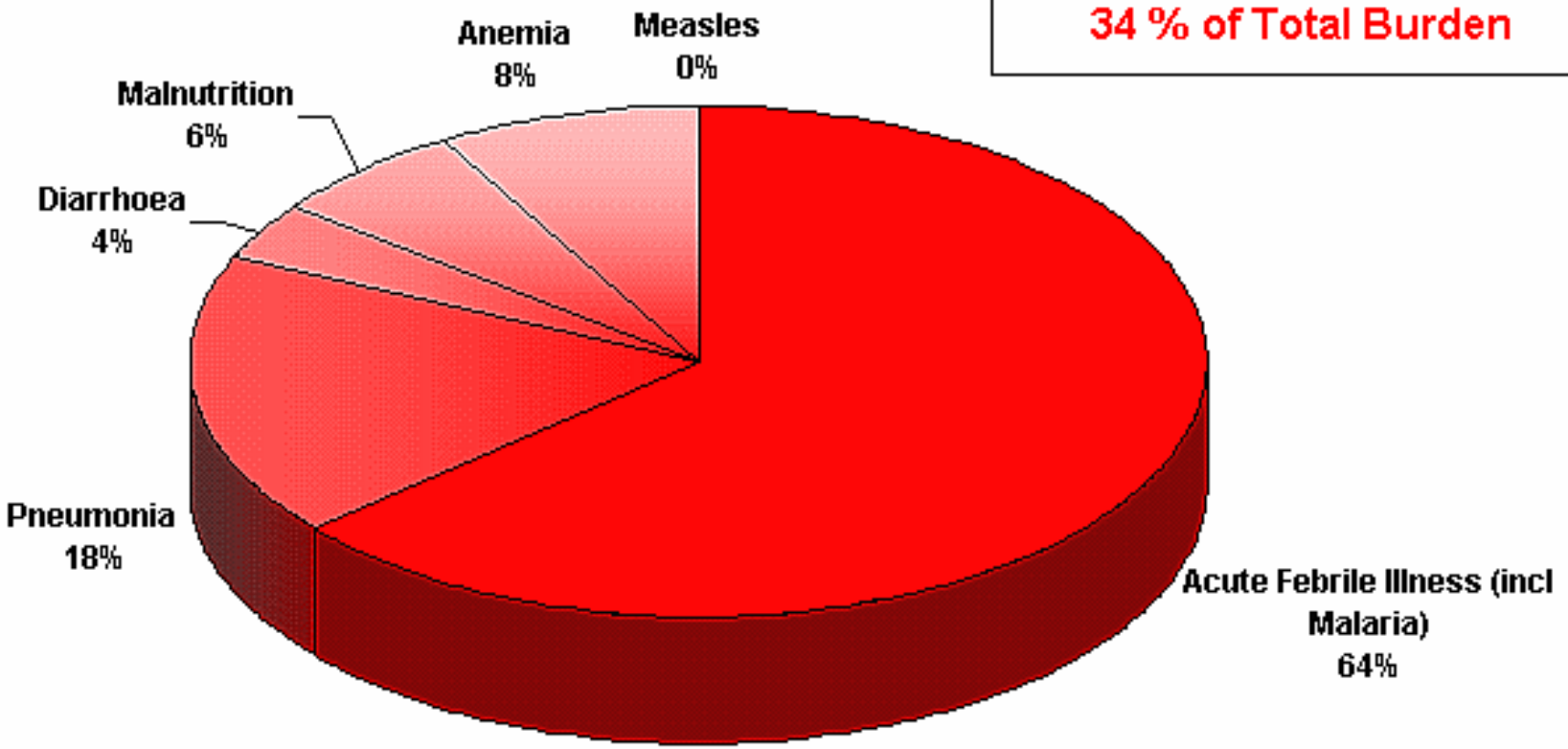


District Health Intervention Profile

IMCI Addressable Conditions

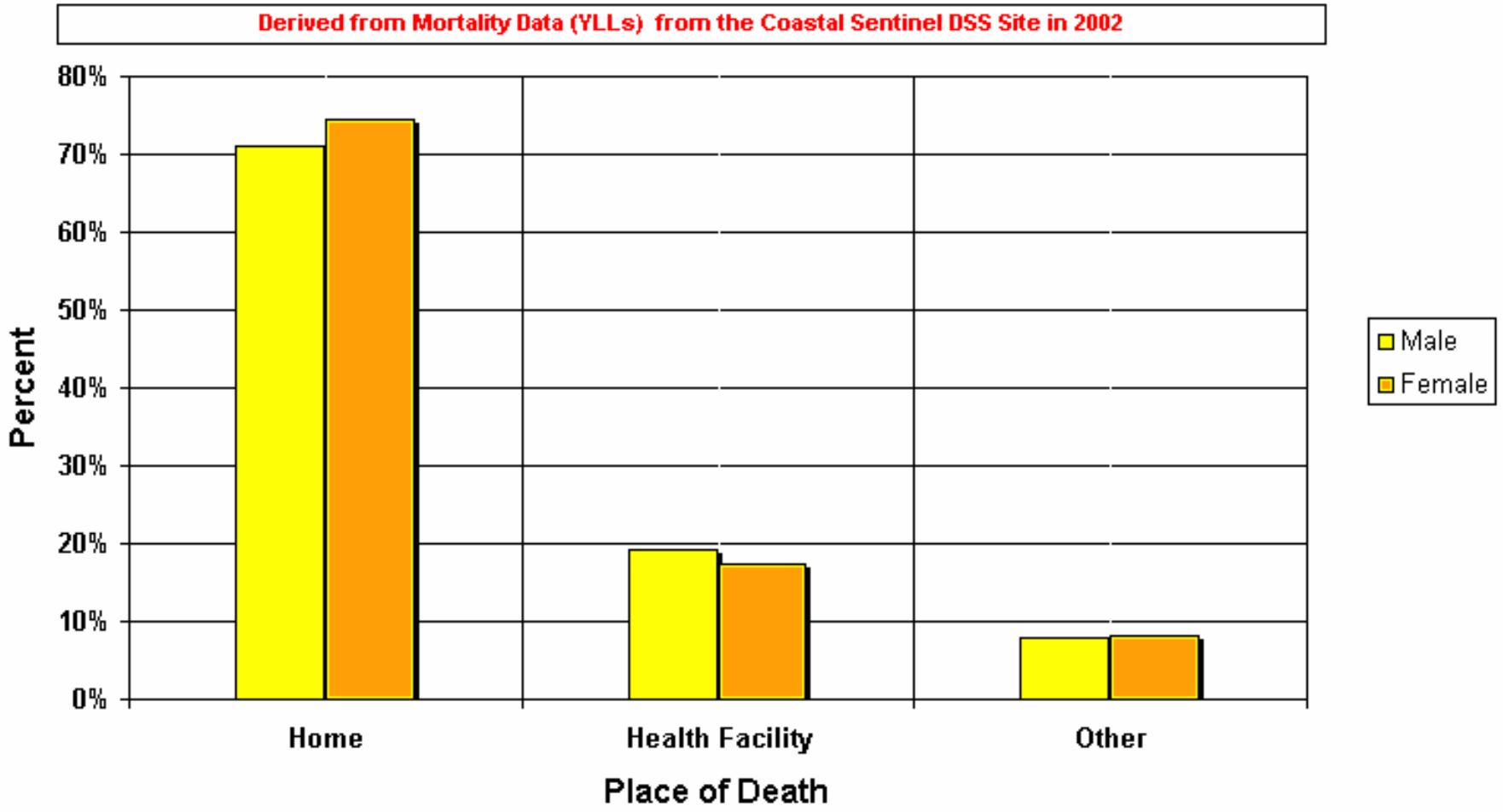
Derived from Cause Specific Mortality Data from the Coastal Sentinel DSS Site in 2002

IMCI Addressable Causes are 34 % of Total Burden



District Health Intervention Profile

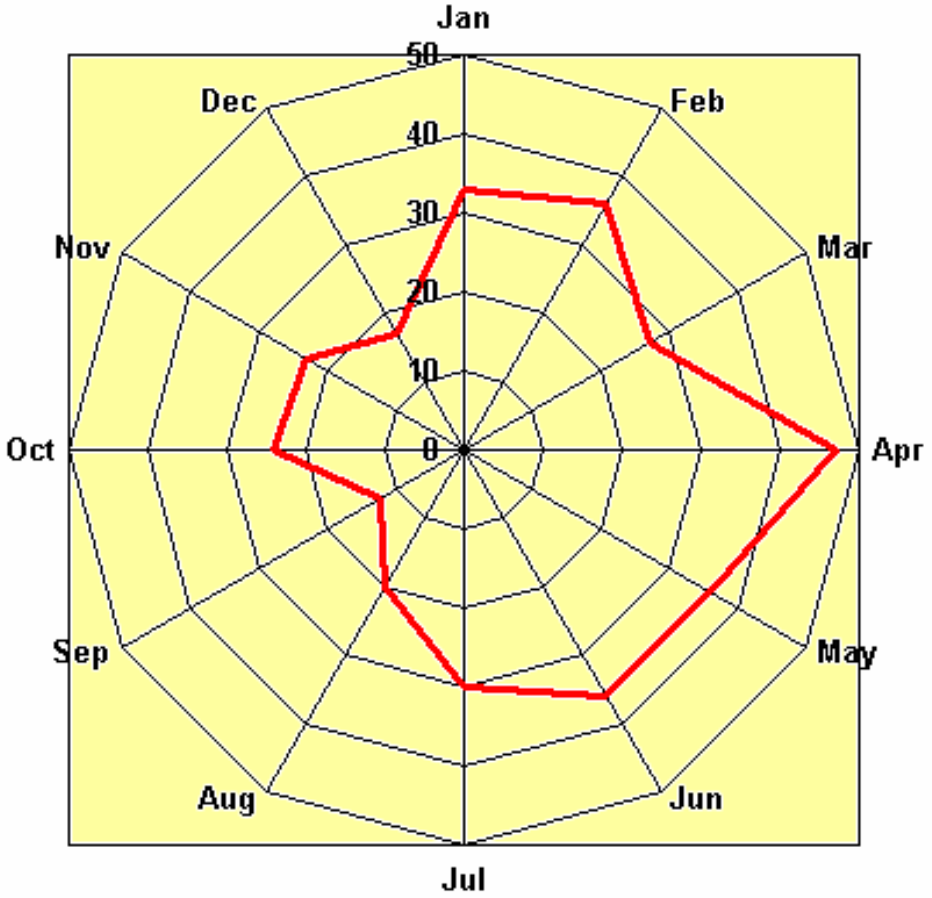
Place of Death



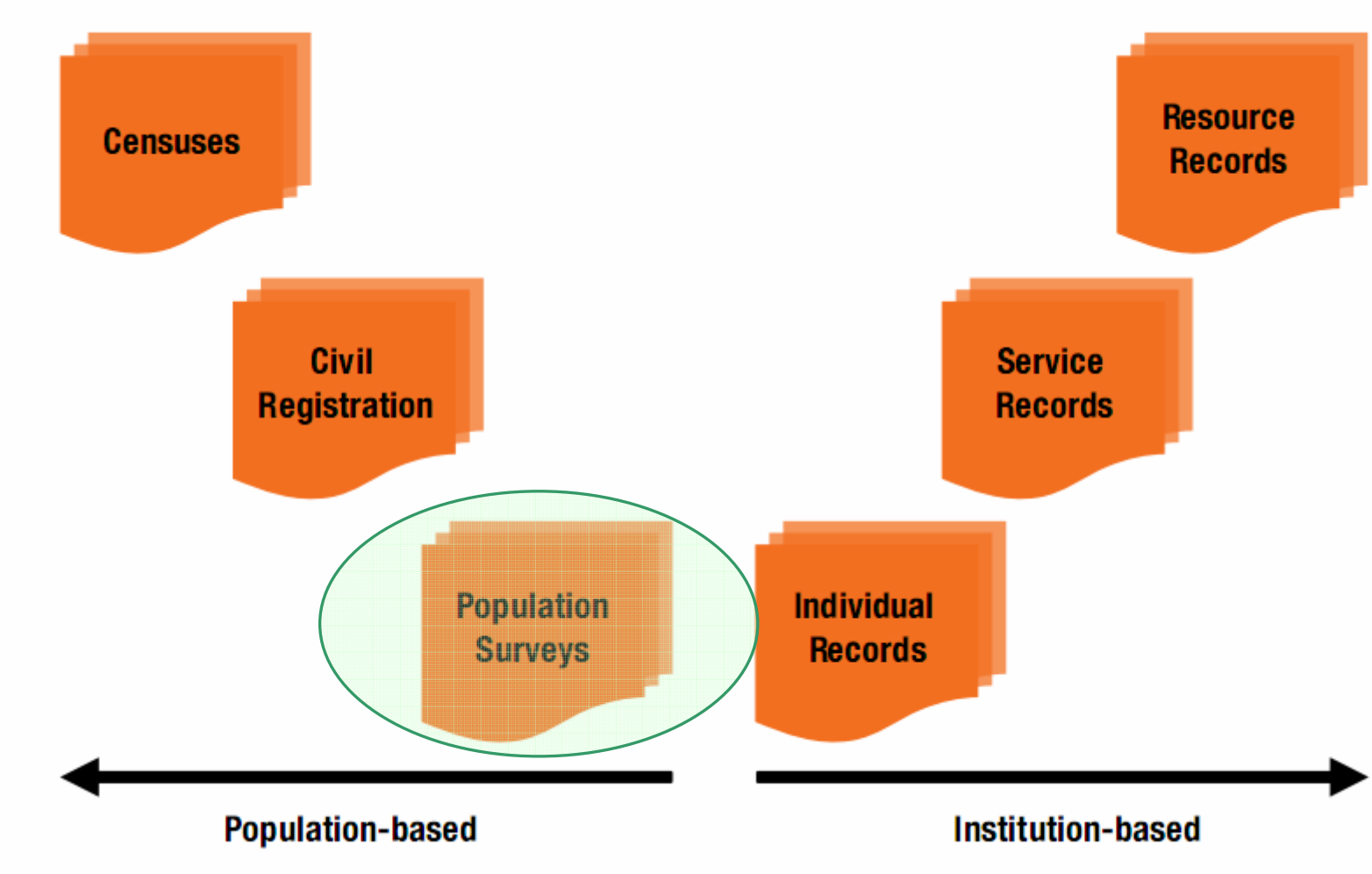
District Health Intervention Profile

Seasonality of Child Deaths

Derived from Mortality Data from the Coastal Sentinel DSS Site in 2002



Data sources



Source: Health Metrics Network

Demographic and Health Surveys (DHS)

Population surveys (DHS & MICS)

Advantages

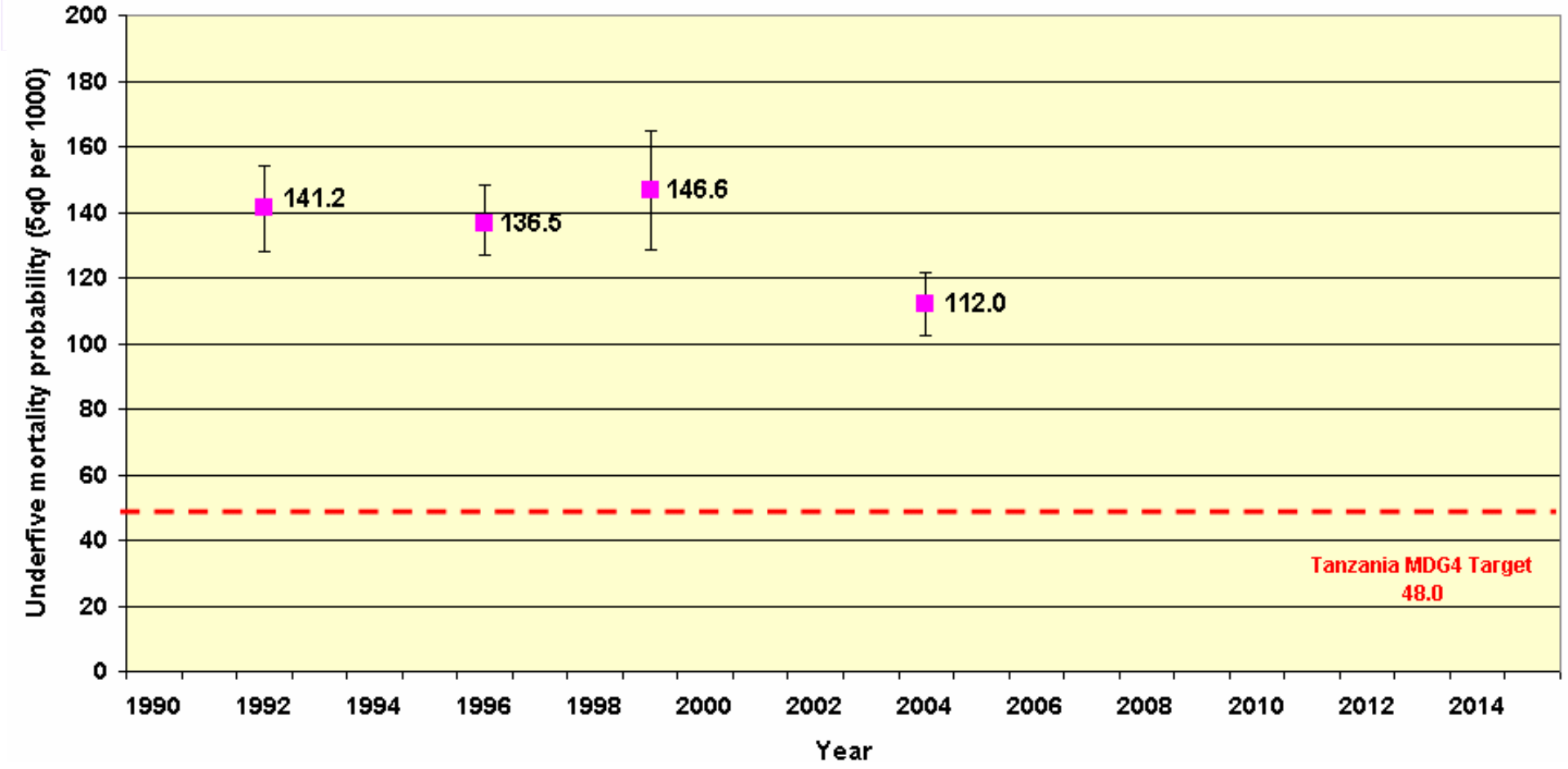
- Nationally representative
- Provides mortality estimates
- Direct birth histories
- Provides health related behaviours
- Very standardized
- Well used by donors, researchers and national authorities
- Broad dissemination

Disadvantages

- Infrequent (every 4-8 years)
- No specificity lower than regional level
- Not used by districts
- Mortality estimates are retrospective
- Misses out many deaths
- Misses out many morbidities (dry season surveys)
- No longitudinality
- Very costly

Tanzania national child mortality

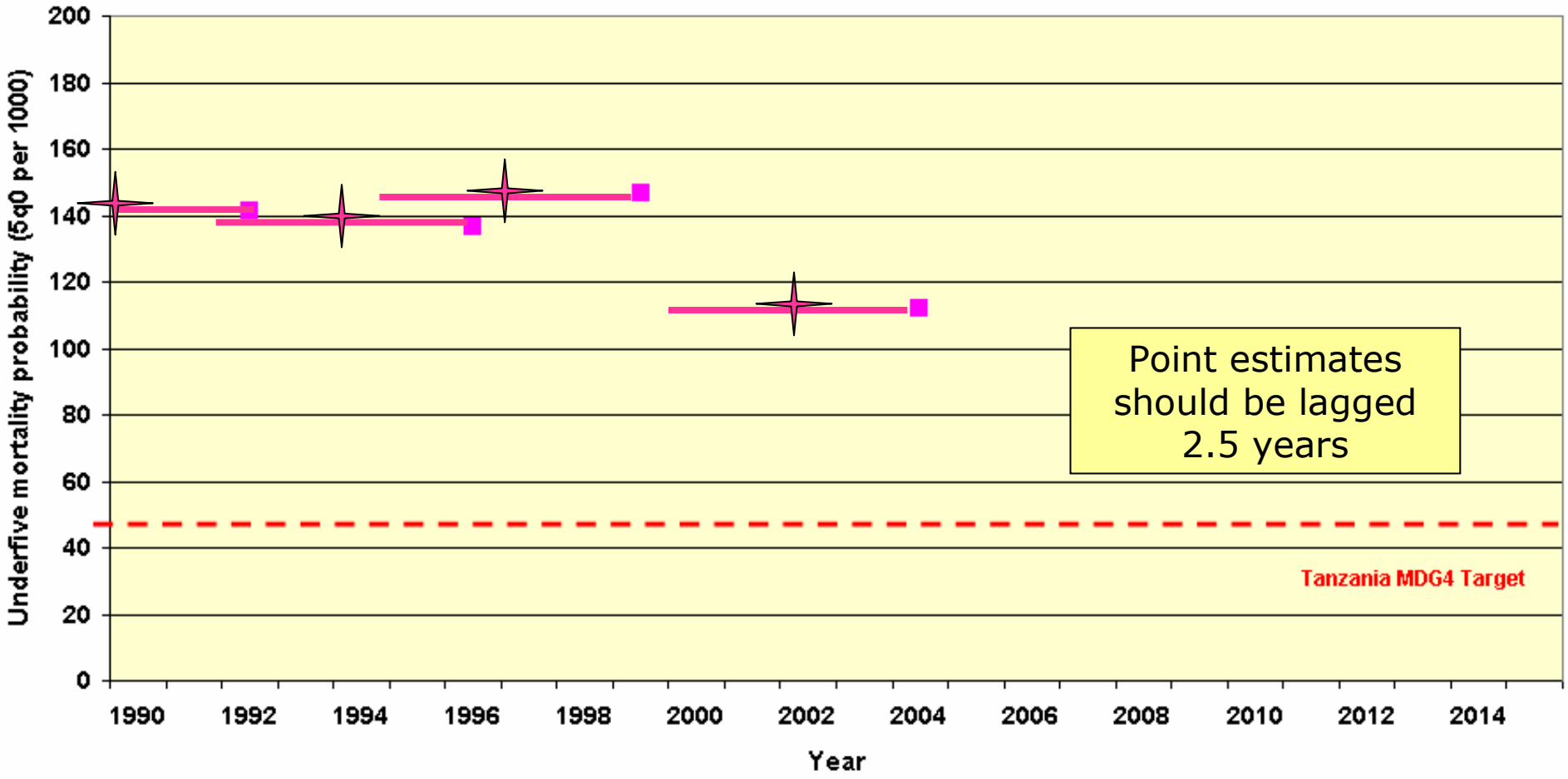
DHS 5year period data 1992, 1996, 1999, 2004



Source data: Tanzania DHS All Surveys, Tanzania National Bureau of Statistics & ORC Macro.

Under five mortality 1990-2004

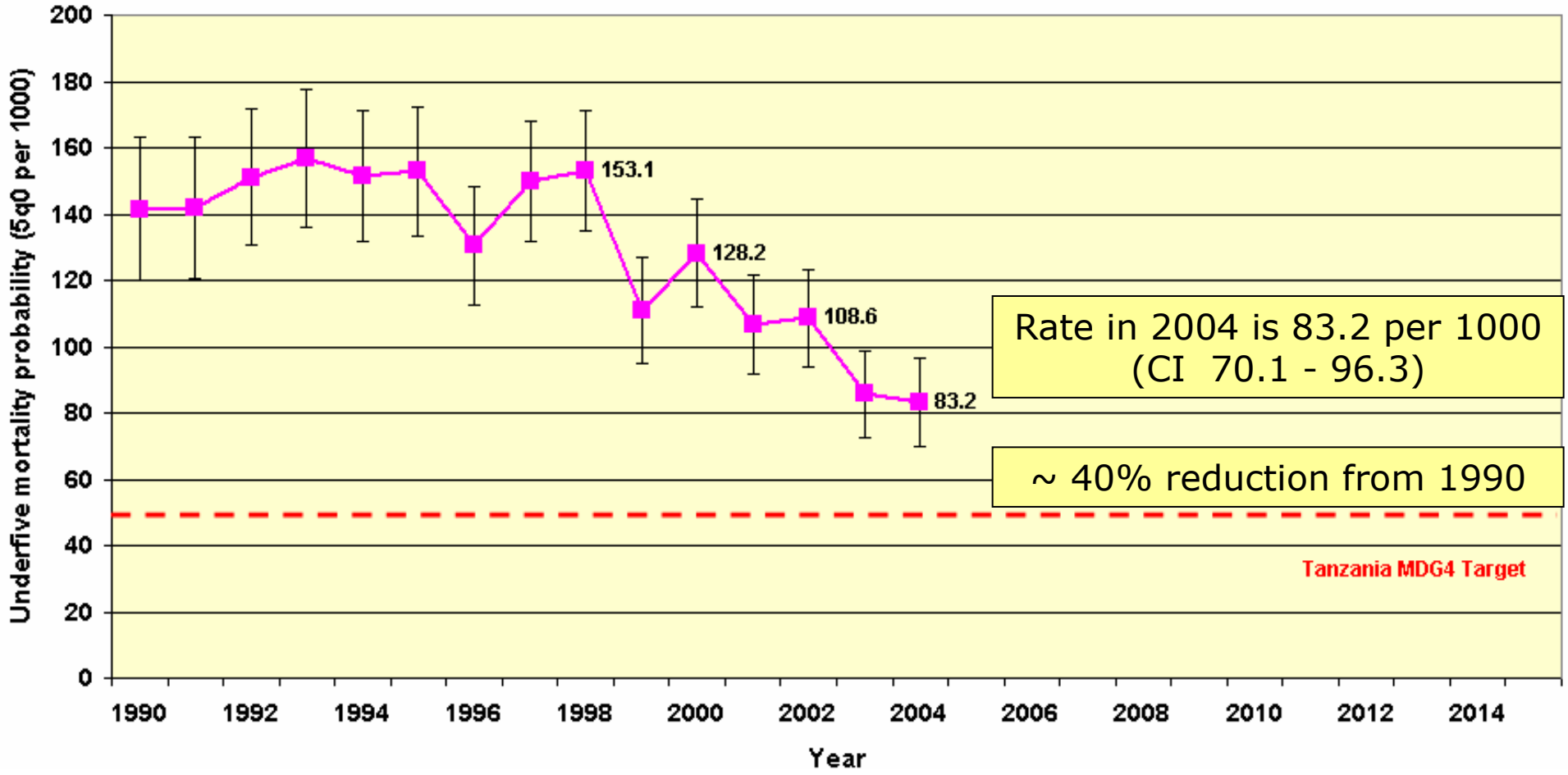
These estimates are five year retrospective averages



Source data: Tanzania DHS All Surveys, Tanzania National Bureau of Statistics & ORC Macro.

Under five mortality 1990-2004

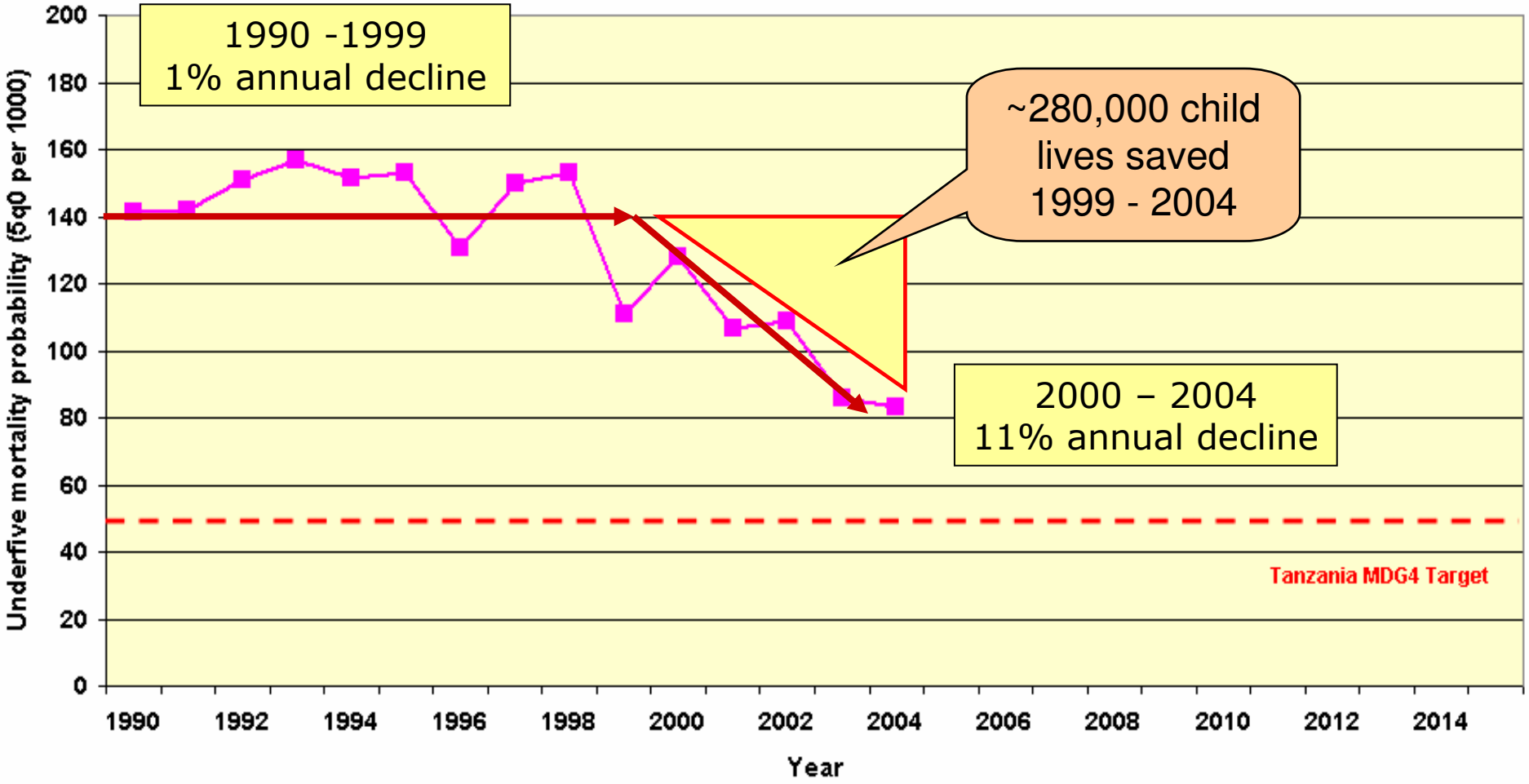
DHS 2004 data re-analyzed by year



Source data: Tanzania DHS 2004, Tanzania National Bureau of Statistics & ORC Macro.

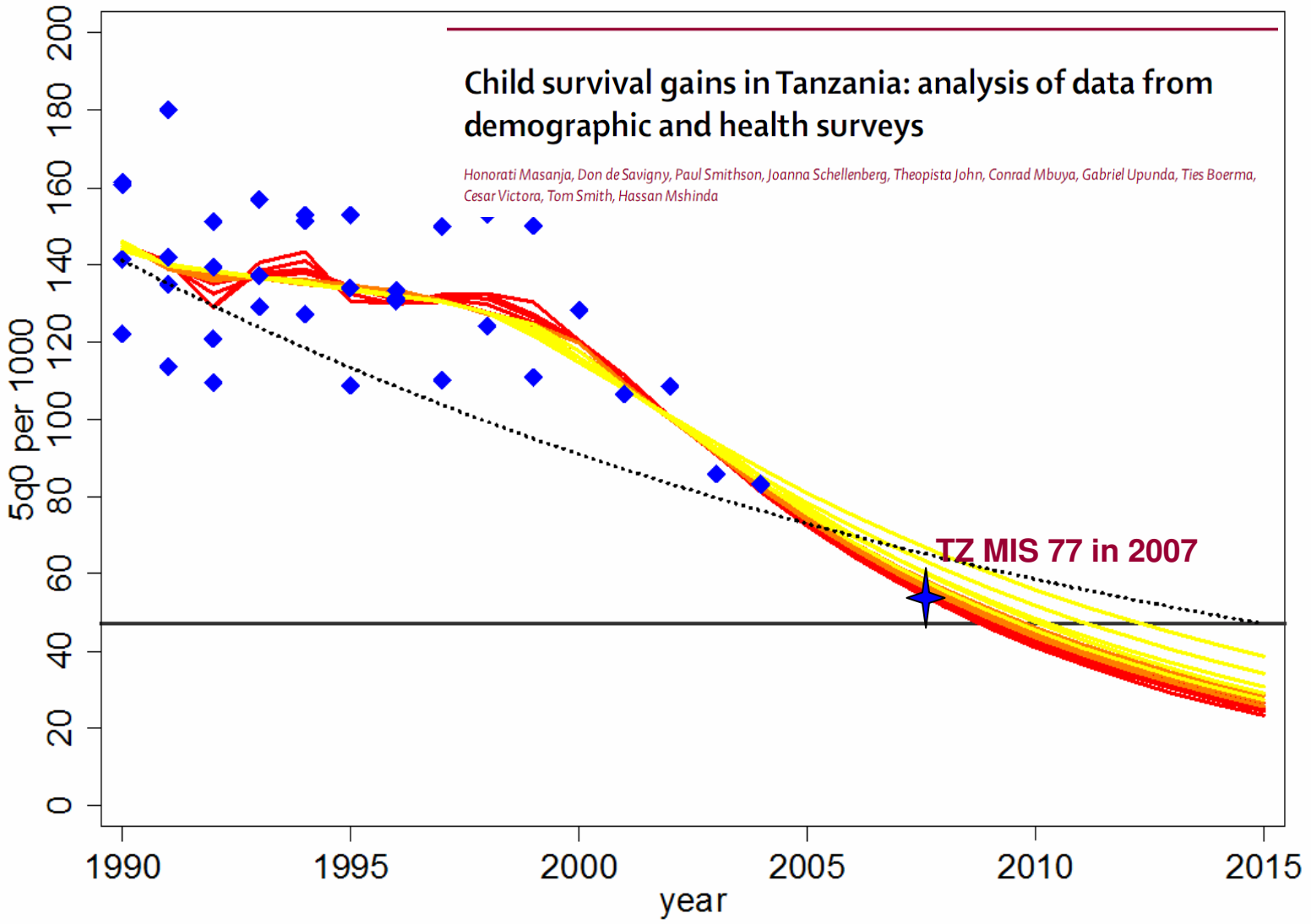
Under five mortality 1990-2004

Acceleration towards MDG 4 in Tanzania



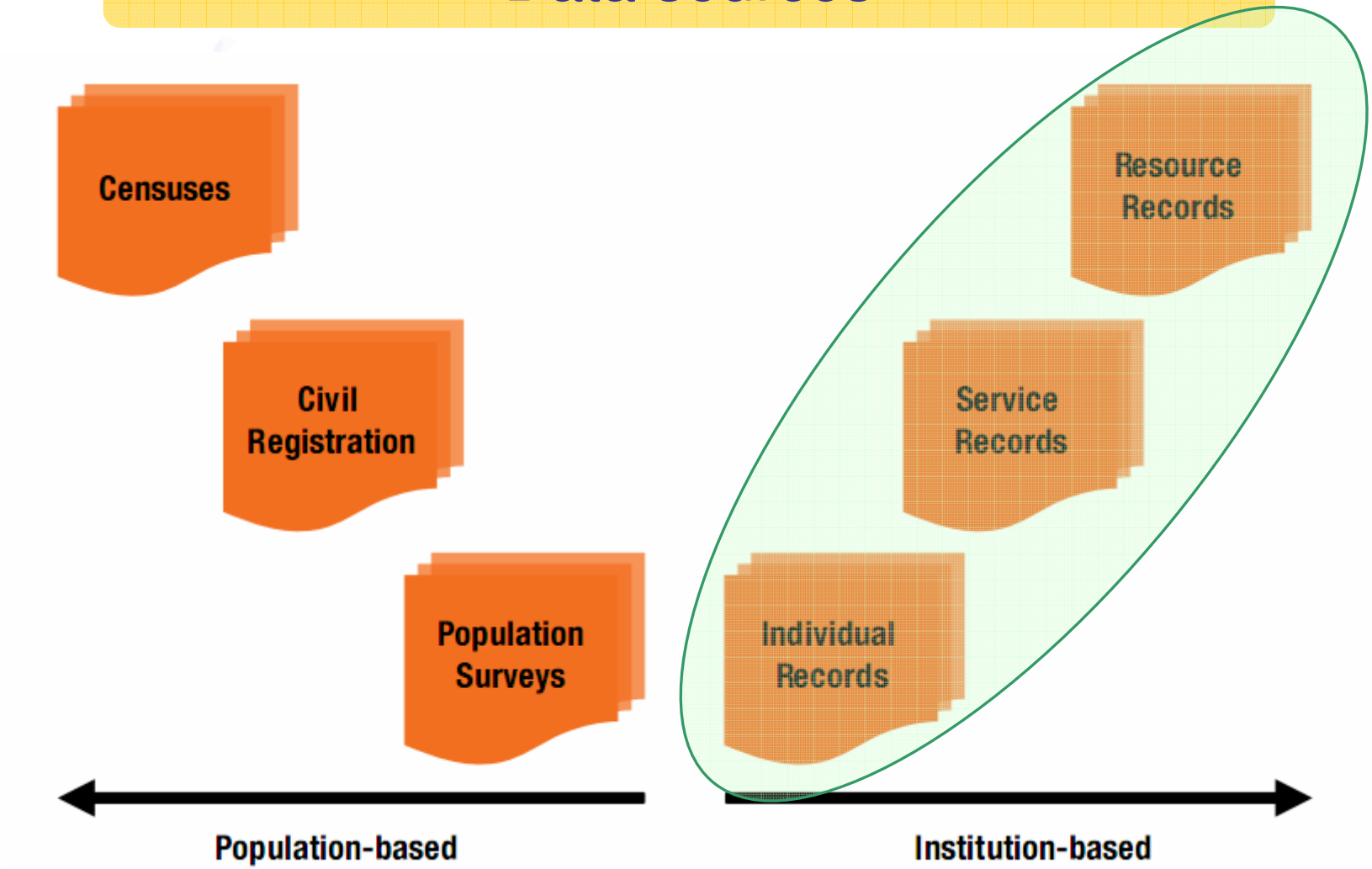
Source data: Tanzania DHS 2004, Tanzania National Bureau of Statistics & ORC Macro.

Tanzania on track for MDG-4



Masanja, de Savigny, et al. Lancet 371: 1266-1283 (2008)

Data sources



Source: Health Metrics Network

Service records systems

(Health Management Information System)

Advantages

- Health facility-based
- Broad coverage
- Relatively representative
- Could detect emerging diseases and epidemics

Disadvantages

- Health facility-based
- Limited use for understanding health needs
- Fails to provide useful management information
- Not yet cost-effective
- Many short comings

Data Collected But Not Used

Data rich but information poor

HMIS: common complaints

- Routine HMIS data usually……
  - Incomplete
  - Inaccurate
  - Irrelevant
  - Redundant
  - Unanalyzed
  - Unused
  - Obsolete
  - Untimely
  - Biased
  - Parallel systems
- Other characteristics
  - Neglects equity concerns
  - Underestimates the poor
  - Too aggregated
  - Not integrated
  - Unexploited synergies
  - Not population-based
  - High but unknown costs
  - Ignored in sector reforms
- But considered representative

HMIS: radical reform required

- Use **sentinel community / household data** for health determinants and health system outcomes
  - Setting priorities
  - Monitoring impact

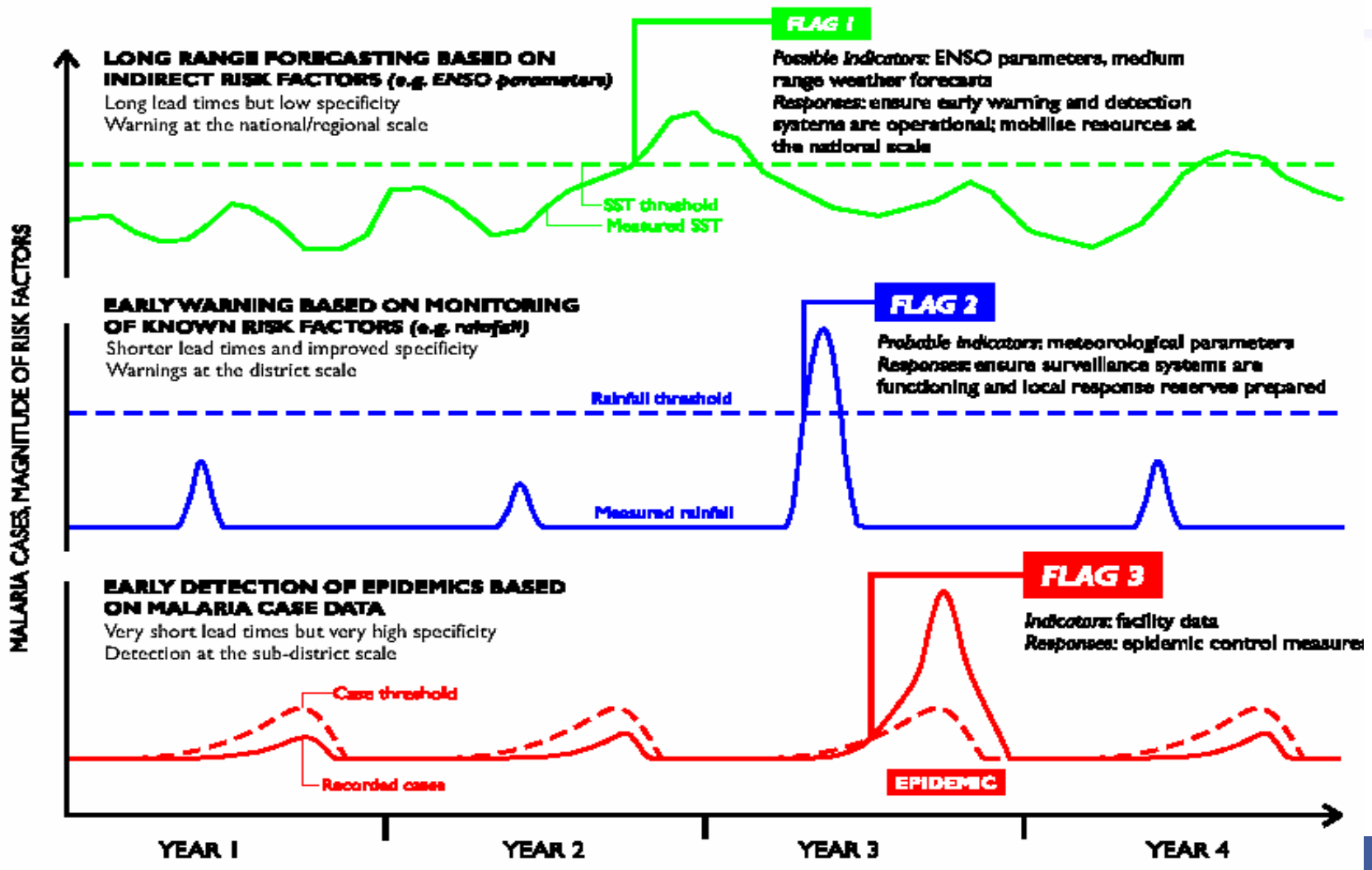
- Use **health facility data** for management of process inputs & outputs
  - Coverage
  - Costs
  - Compliance
  - Quality

How can we get household sentinel data? DSS

Other sources

Level	Type	
	X-Sectional Retrospective	Longitudinal Prospective
Individual & Household	Population Surveys (Census, DHS, MICS)	Prospective Surveillance (Vital Events and DSS)
Health Facility	HF Surveys	Routine Reporting (HMIS, IDS)
Modeling	Risk Mapping (GIS)	Remote Sensing & Early Warning Systems

Forecasting, warning and detecting malaria epidemics…



Source: Jon Cox, LSHTM

Other sources

Level	Type	
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Modeling	Risk Mapping (GIS)	Remote Sensing & Early Warning Systems

Geographic Information Systems

Advantages

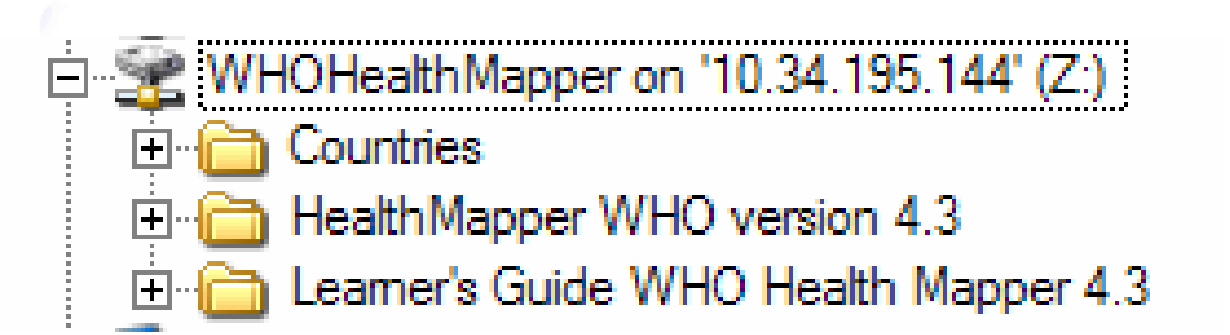
- All health data is spatial
- All health databases can be communicated more effectively through maps
- Integration of data is facilitated
- Spatial temporal analysis will be important in understanding health and poverty

Disadvantages

- Higher level skills required
- Simplified “front end” distributions required
- Basic mapping of geographic features, administrative features and health facilities required.

Switch to GIS
HealthMapper Demonstration

How can you get Health Mapper?



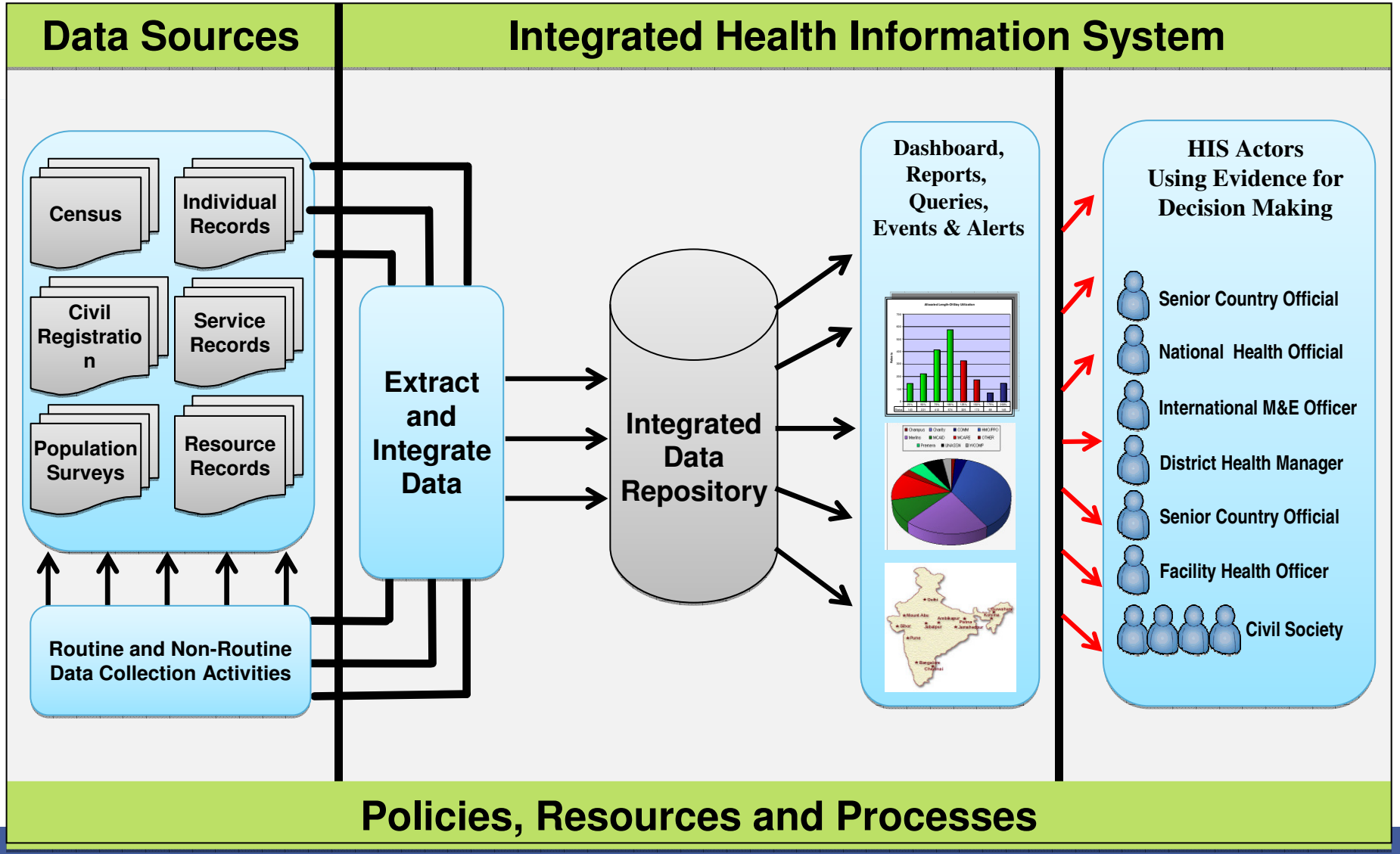
STI Share Drive:

Install over network:

All Countries for Africa, Asia plus Bolivia and Brazil

Way forward to integration in Health Information Systems

Towards an integrated HIS



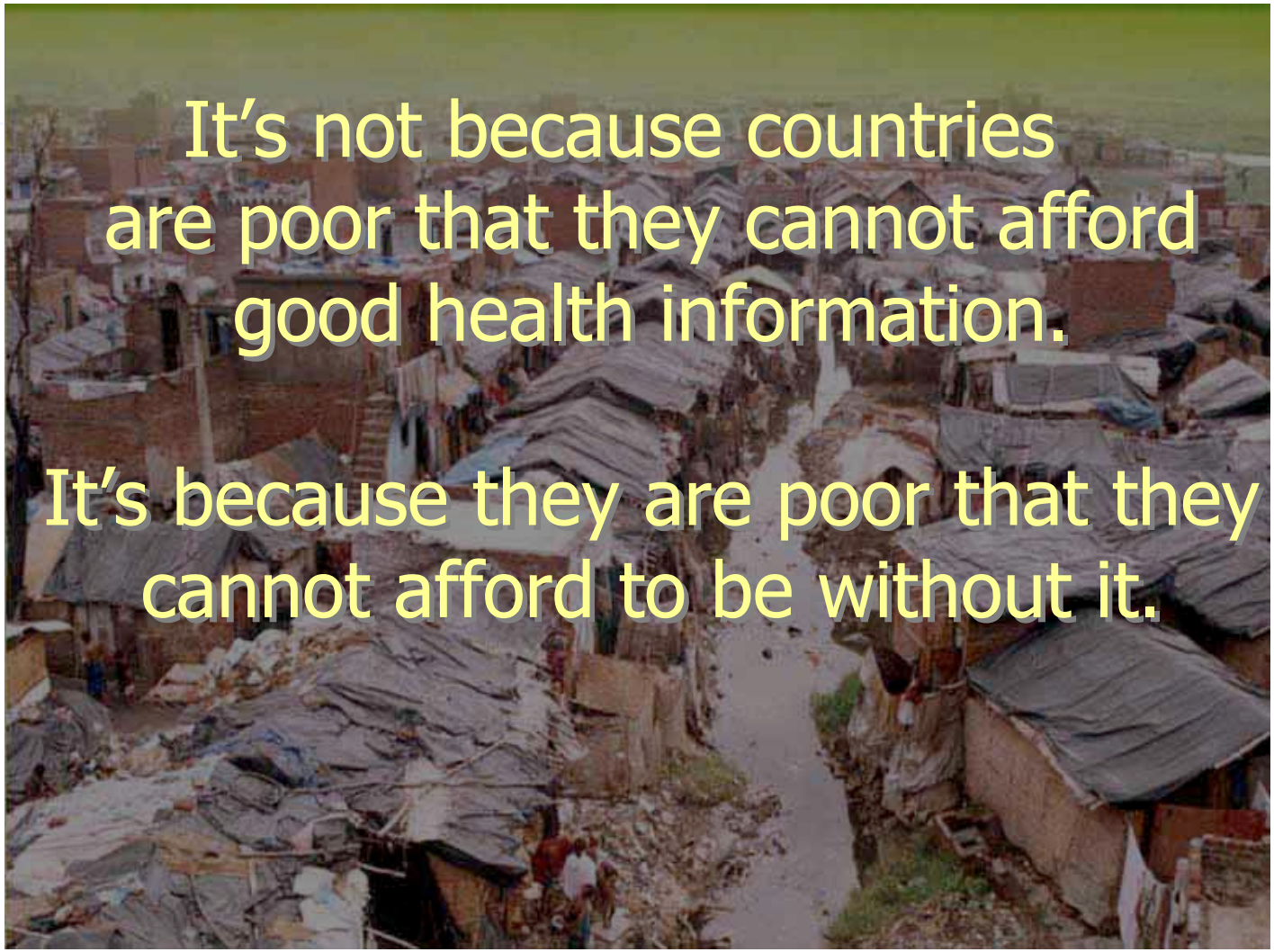
Other useful resources

- WHO World Statistical System
  - http://www.who.int/whosis/en/index.html
- WHO World Health Statistics
  - http://www.who.int/whosis/whostat2006/en/index.html
- WHO Health Metrics Network (HMN)
  - http://www.who.int/healthmetrics/en/
- Health Information System Program (HISP)
  - http://www.hisp.org/
- Routine Health Information (RHINO)
  - http://www.rhinonet.org/

Summing up on Health Information Systems

- Everyone counts
- Health informatics is a foundation for effective health systems and health impacts
- Currently little coherence and integration among information systems
- We are data rich but information poor
- Health reforms need to deal with HIS reform
- The new WHO Health Systems Framework provides a basis for systems thinking in HIS design

A new perspective



Source: Health Metrics Network


EVERYONE COUNTS
Better Information. Better Decisions. Better Health.

Thank you