Health Systems

Measuring and understanding health equity

MSc IBE
Key Issues in International Health 2009

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Session objectives

- Introduce concepts of inequality and inequity
- Discuss practical means for measuring equity in epidemiologic studies
- Discuss the tensions in maximizing health system efficiency and equity
- Lecture, demonstrations, resources and discussion

The rich get richer, and the poor get ….

"…Researchers have already thrown much darkness on this subject,

and it is probable that, if they continue, we shall soon know nothing about it at all."

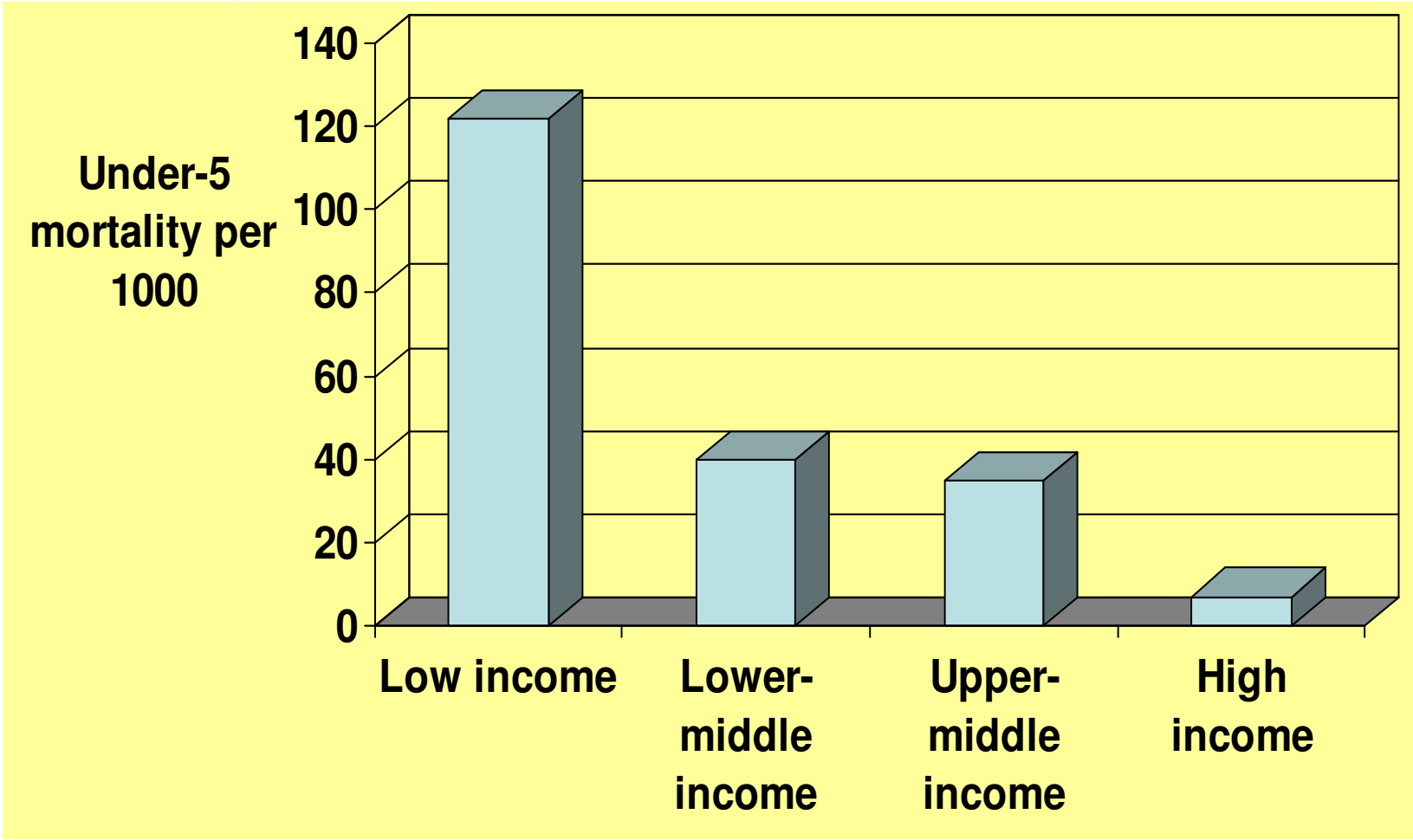
Mark Twain, 1885

The Economist

JUNE 16TH–22ND 2001

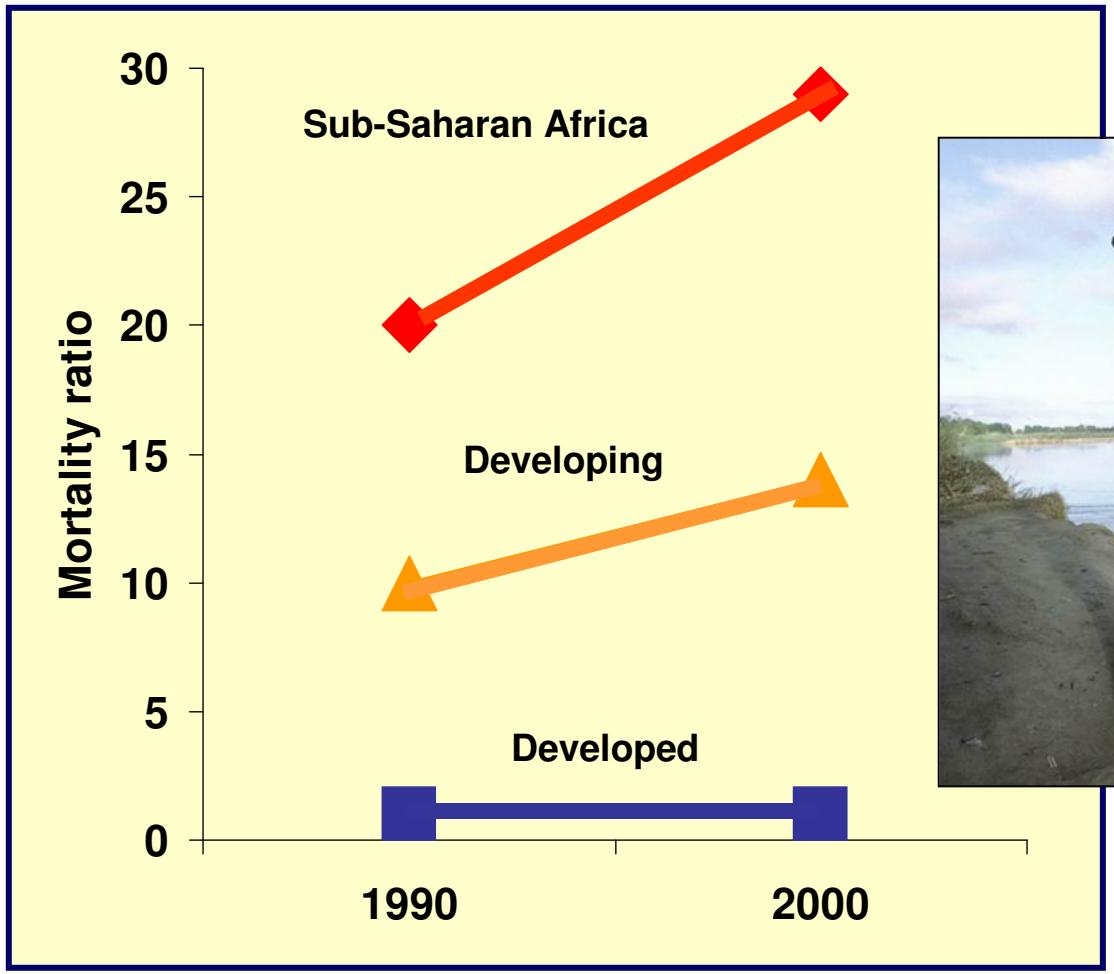
Does inequality matter?

Under-5 mortality rates worldwide by income groups of countries



Source: Victora et al. Lancet 2003, 362: 233-241

Mortality gaps between rich and poor countries are increasing

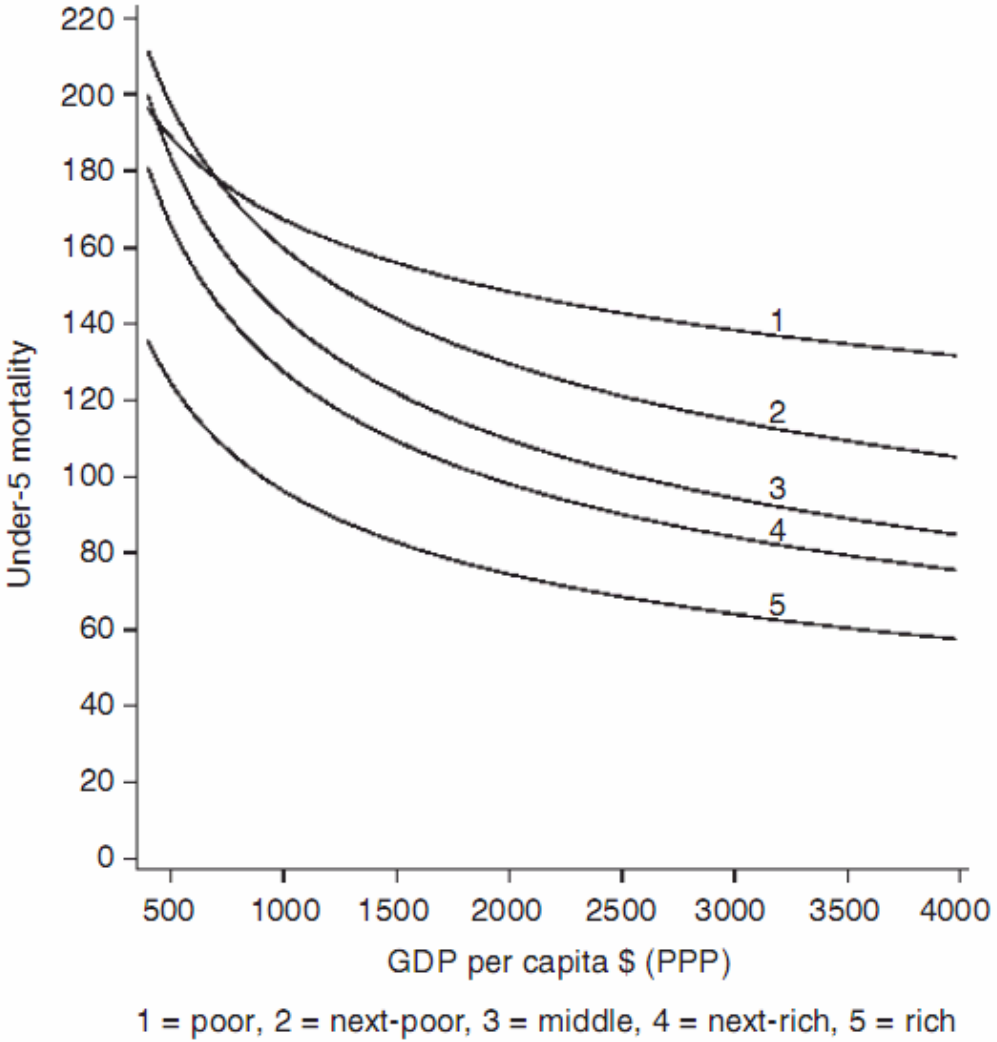


Gaps widen even across poor countries …

Inequality increases as wealth increases

Among 43 developing countries:

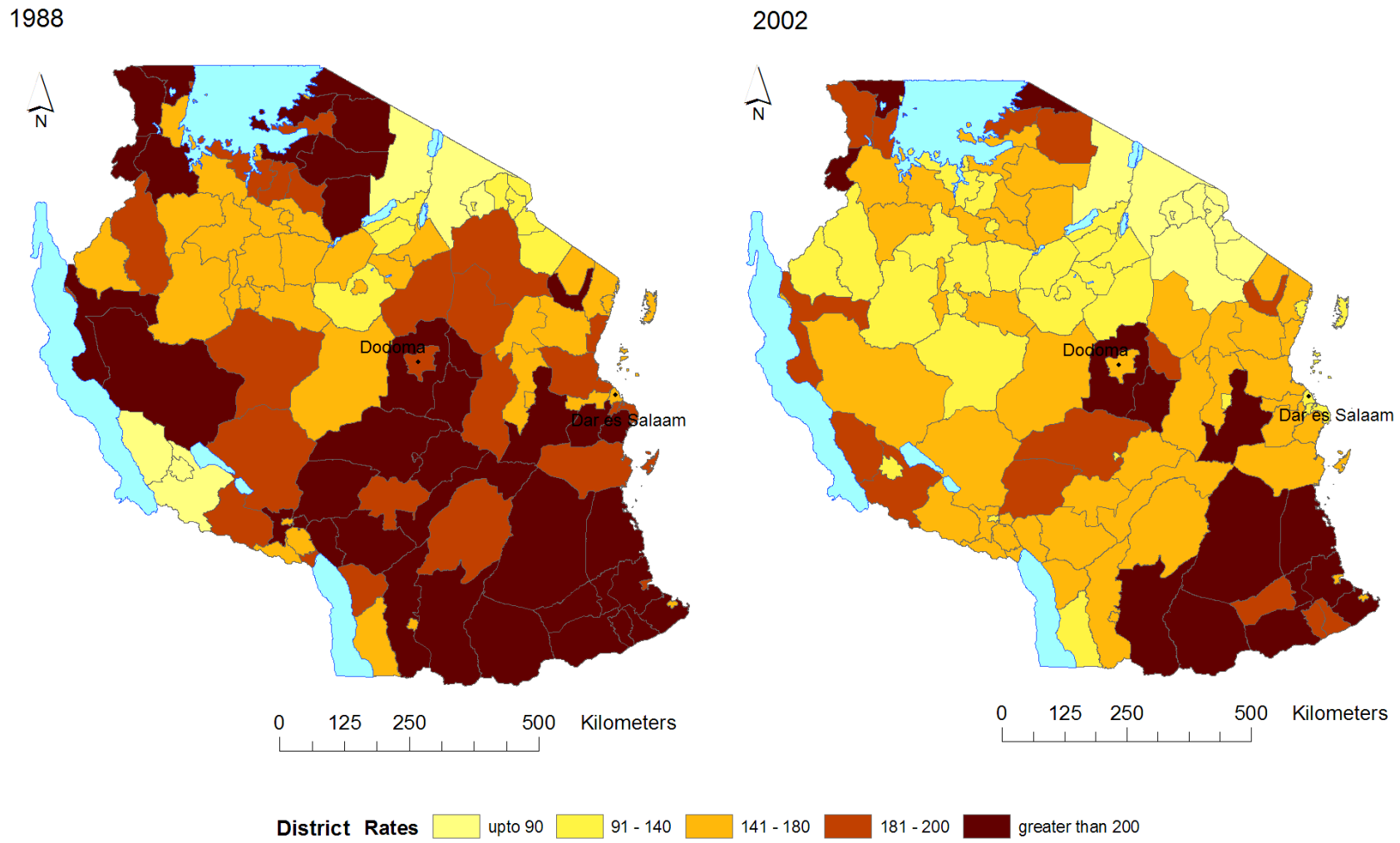
- **Child survival improves with increasing national wealth.**
- **But gains are slower for the poorest.**
- **Therefore gaps between rich and poor continue to increase.**



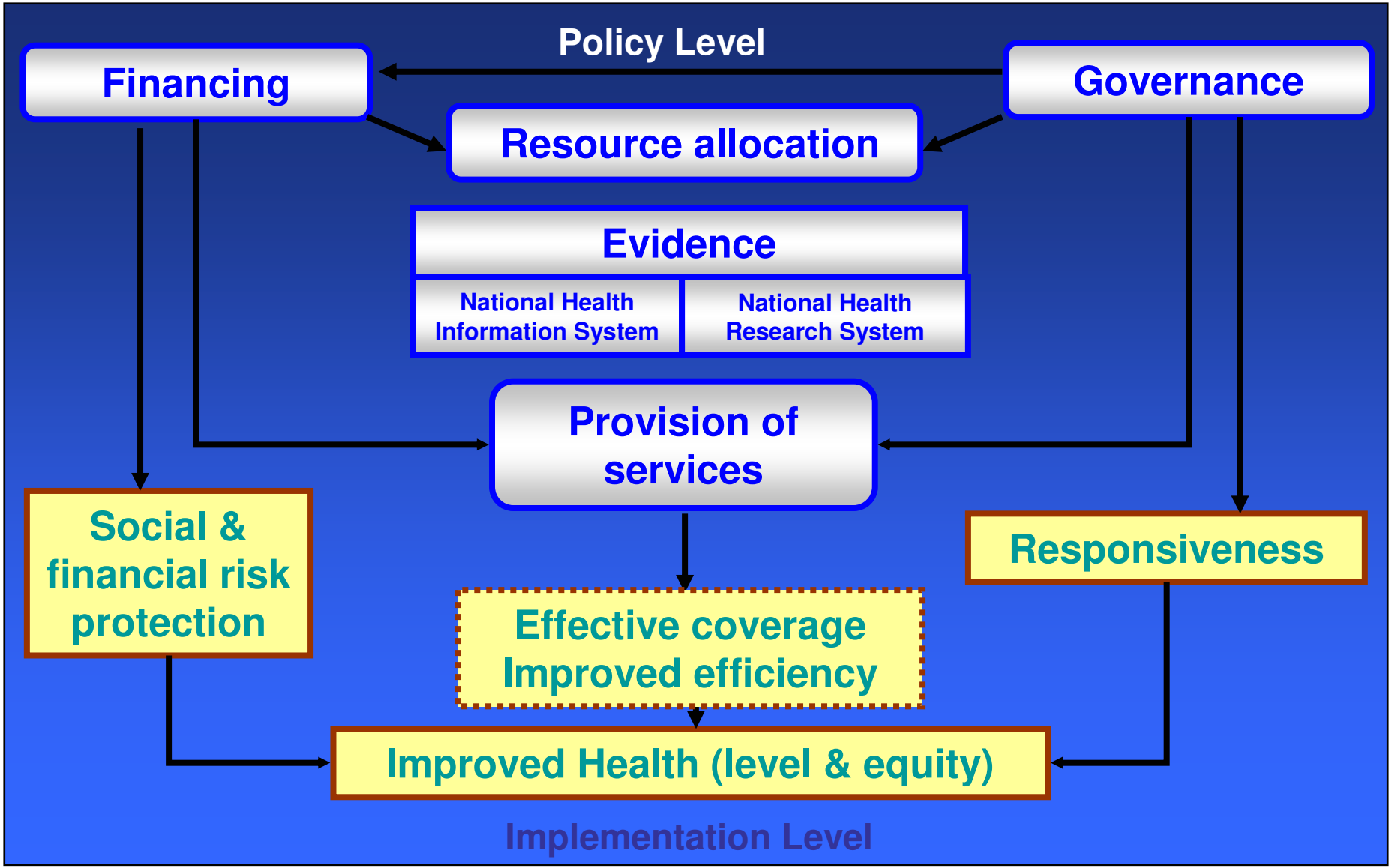
Source: Houweling et al. (2005). Int. J. Epi. 34: 1257-1265

… and within countries

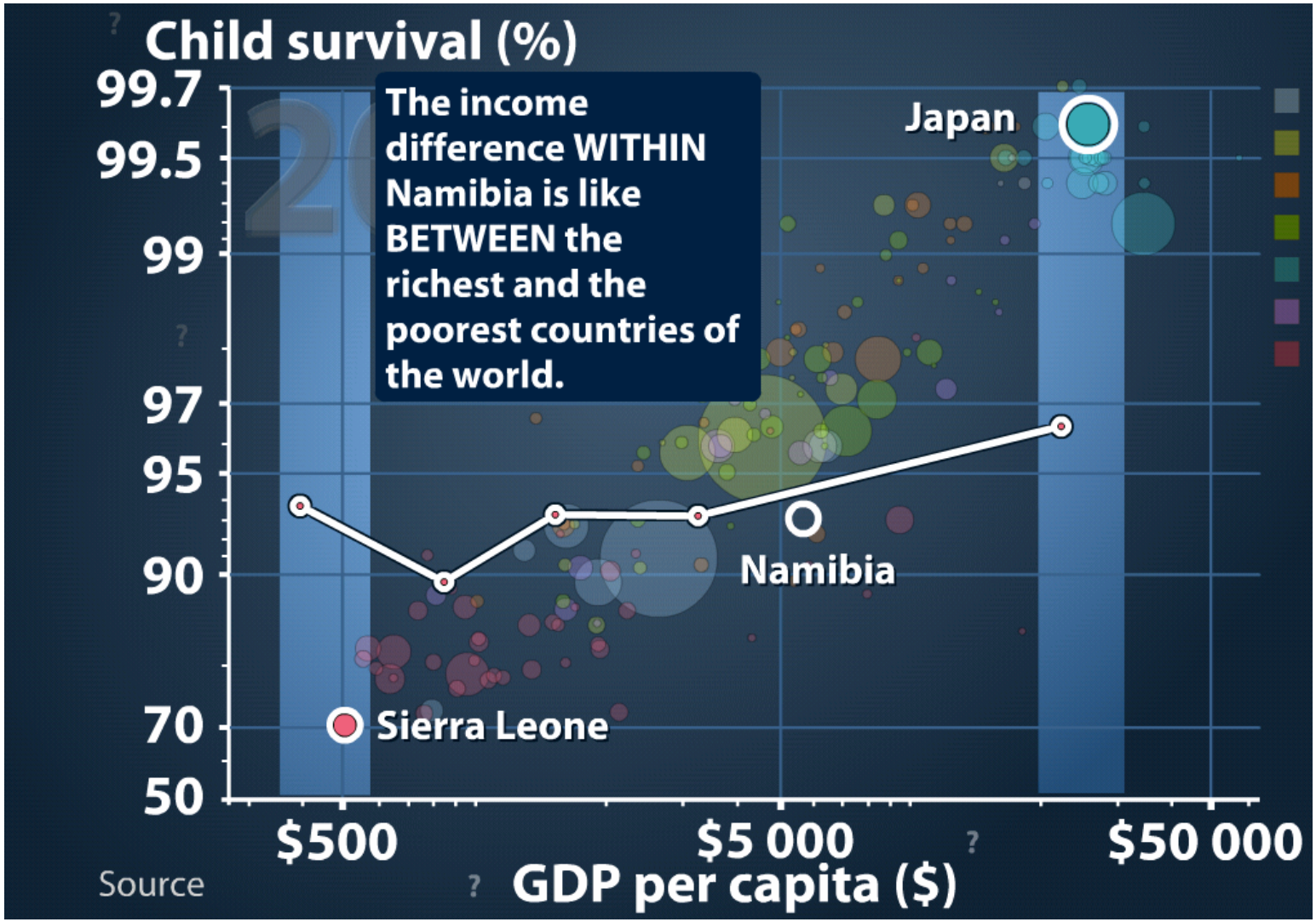
UNDERFIVE MORTALITY RATES, 1988 AND 2002



Reminder of health systems health equity goals



Interactive demo of within country inequalities



http://tools.google.com/gapminder

Millennium Development Goals for Poverty Reduction

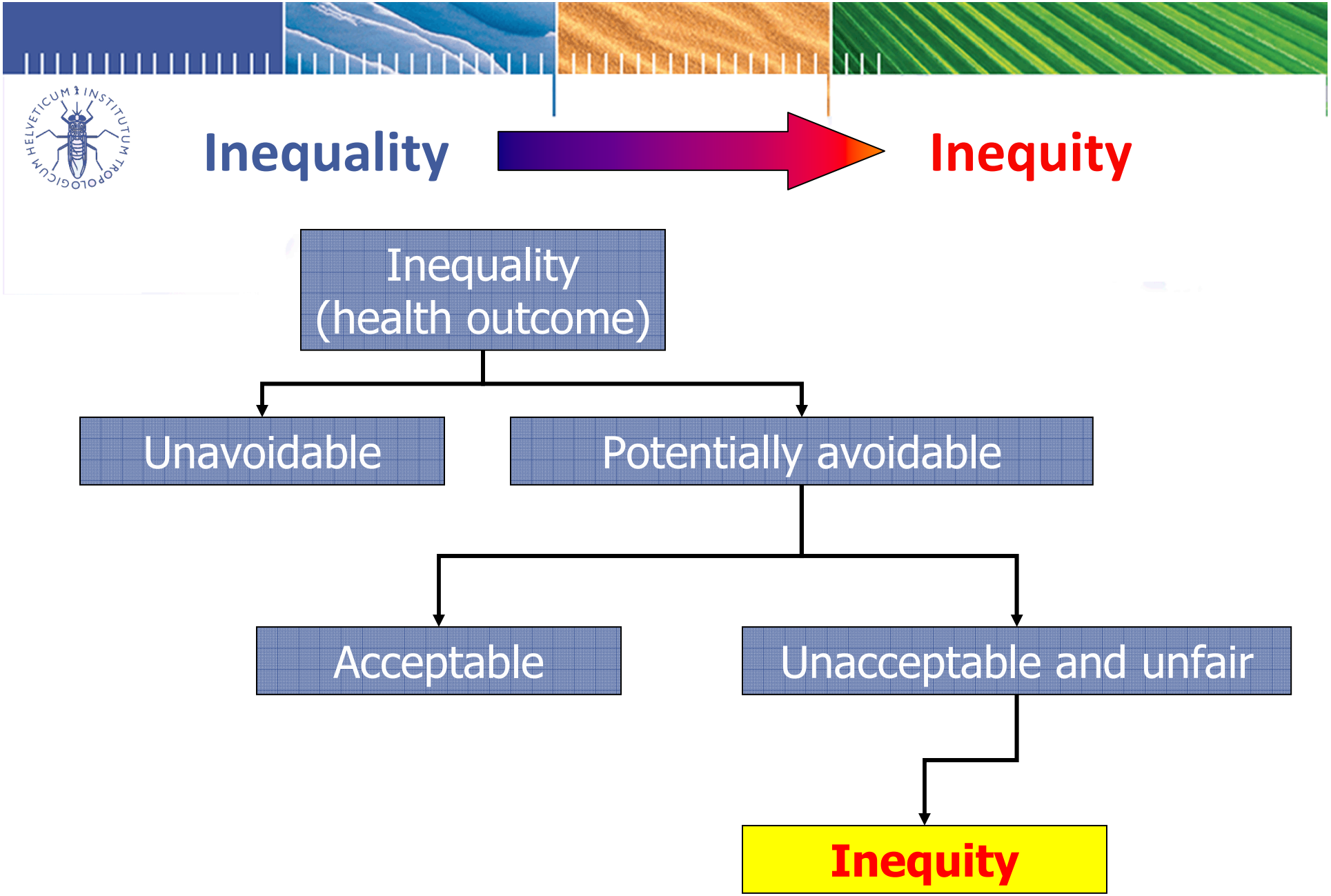
MDG health targets do not specifically focus on the poor

"Aiming above the poverty line could achieve MDG targets, but widen the gap"

Gwatkin, D. (2002) World Bank.

Health Disparities

What is the difference between inequality and inequity?


Inequality
Inequity
Inequality (health outcome)
Unavoidable
Potentially avoidable
Acceptable
Unacceptable and unfair
Inequity

Health equity defined

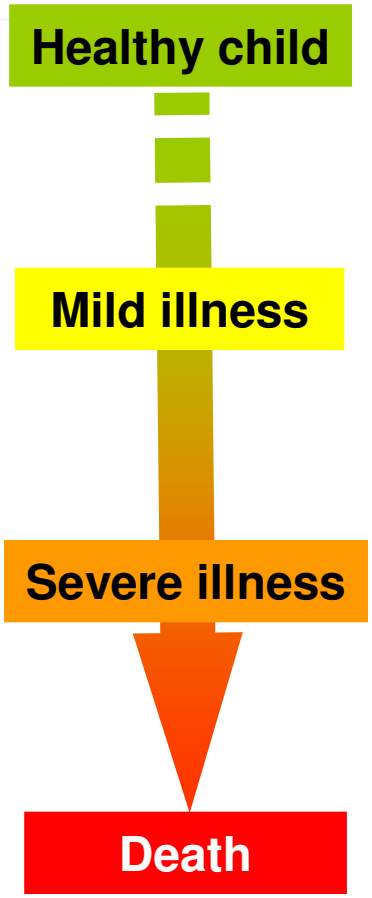
"….the absence of systematic (and potentially remediable) differences in one or more aspects of health status across socially, demographically, or geographically defined populations, or population sub-groups."

International Society for Equity in Health (ISEqH)

"…differences in health status which are unnecessary and avoidable, but in addition, are considered unfair and unjust."

WHO

Why are the poor more likely to die?



- More likely to be exposed to risk & disease
- **Less likely to receive preventive interventions**
- Lower resistance to disease
- More likely to acquire disease
- **Lower access to health facilities**
- **Less likely to be managed appropriately in health facilities**
- **Less likely to get life-saving interventions**
- **Lower access to secondary and tertiary care**

Issues more concerned with effective coverage & health systems effectiveness

Some terms

Socio-economic status (SES)

- An individual's or family's relative position in society, usually expressed in terms of income, education or occupation

Effective coverage

- the proportion of potential health gain that can be delivered through an intervention by the health system that is actually delivered

Understanding poverty measures for health system managers

Basis	Advantage	Disadvantage	Source
Income	• Strongest theoretical basis	• Variable • Temporary • Under-estimated • Difficult to get	Census
Expenditure	• Proxy for recent income and consumption • Less volatile • Easier to measure	• Needs valuation (cash/in kind) • Savings • Big ticket items • Needs diary	Census LSMS HBS
Wealth index	• Proxy for long-term income • No valuation needed • Least volatile • Easiest to measure	•Household size •Number of items in asset	Census LSMS HBS DHS DSS HHS

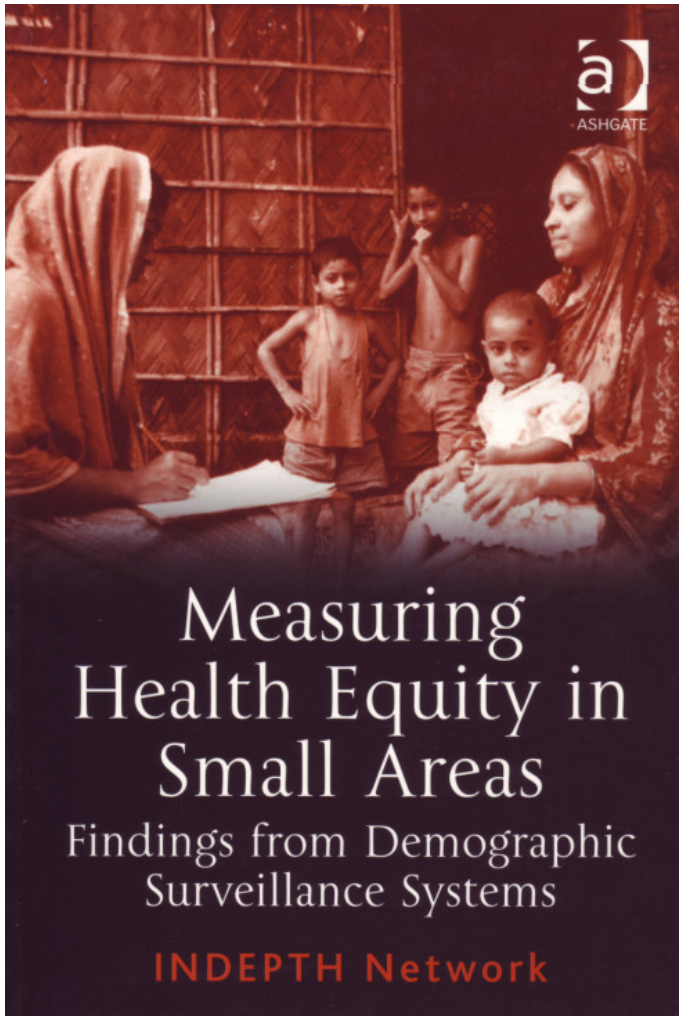
Which measure is best for health equity?

Health Service	Post-pone?	Determinant
Preventive **EPI, ANC, ITNs**	Yes	•Current income •Wealth (assets or ability to pay)
Curative **IMCI, Maternity Care**	No	•Long run income (expenditure) •Wealth (assets or ability to pay)
Catastrophic **Injuries**	No	•Social capital •Wealth (assets or ability to pay)

Constructing a wealth index…

- Asset approach
  - Households can be distributed along a wealth scale
  - Observable assets, HH construction, and utilities are correlated with the wealth scale
  - Can be combined to predict HH position on relative wealth scale
  - Uses weighted sum of indicators by PCA factor analysis or MCA multiple correspondence analysis
  - Correlations among items provides factor scores (weights)
  - HH index assigned to each HH member
  - Population divided to quintiles
  - Analyses done on quintiles.

www.indepth-network.org



Poverty monitoring:
Example components of a household wealth index

Assets

Hoe

Cupboard

Watch / Clock

Bicycle

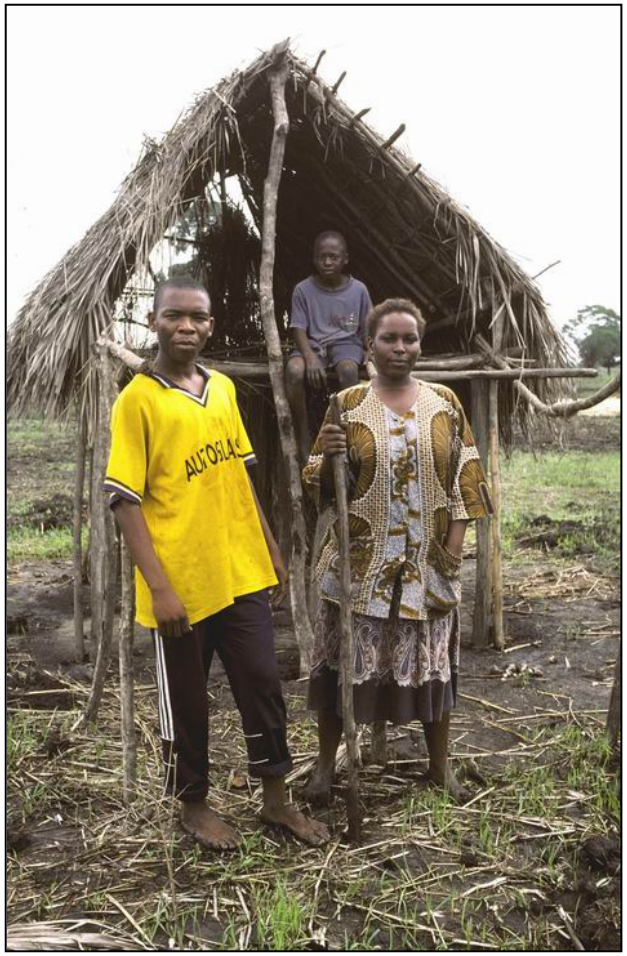
Mobile phone

Radio

Refrigerator / freezer

Livestock

Etc.



Housing features

Roof material

Wall material

Floor material

Sleeping rooms

Water source

Sanitation means

Fuel source

Home / land ownership

Etc.

Constructing an index with Principal Components Analysis

$$A_i = f_1(a_{i1}-a_1)/(s_1) +\ldots+ f_N(a_{iN}-a_N)/(s_N)$$

A_i = wealth index of the ith household

f_1 = PCA scoring factor (weight) of first indicator

a_{i1} = ith household's value of the first indicator

a_1 = mean of the indicator's values

s_1 = standard deviation of indicator's values

Source: Filmer and Pritchett, (1998)

Example

$$\text{Wealth Index} = Ai = f1(ai1-a1)/(s1) + \ldots + fN(aiN-aN)/(sN)$$

- Suppose household i has the following characteristics;
  - 1 Tinroof, 2 Beds, No Bike, 1 Radio, No livestock, 1 chicken

- The HH wealth index is constructed as follows:

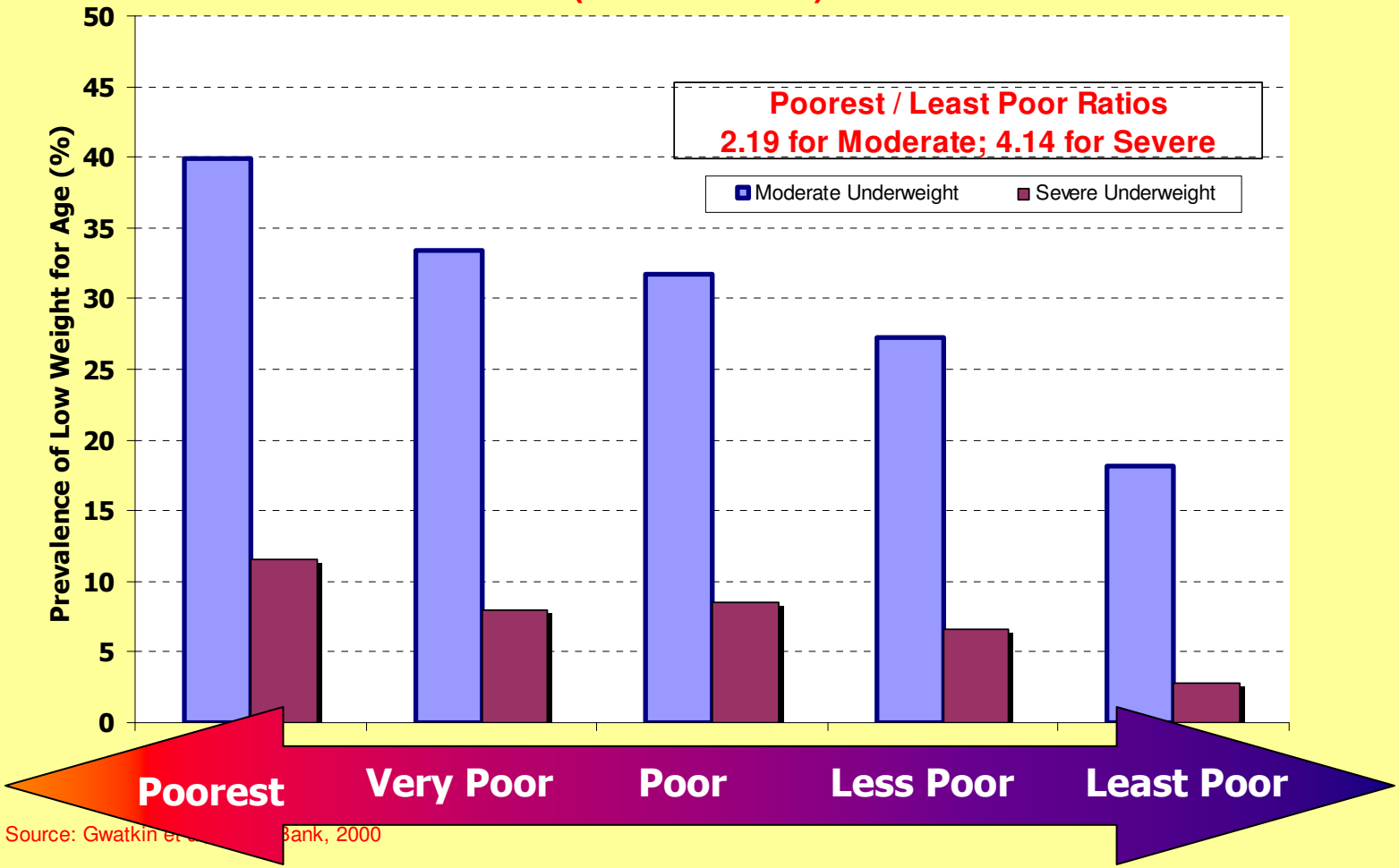
$$Ai = 0.36(1-0.13)/0.34 + 0.42(2-2.89)/1.91 + 0.55(0-0.34)/0.47 + 0.56(1-0.33)/0.47 + 0.12(0-0.01)/0.07 + 0.25(1-0.49)/0.49 = \mathbf{1.37}$$

Mwageni, E. & de Savigny (2005). *Measuring Health Equity in Small Areas*, INDEPTH, Ashgate Publishing Ltd., London.

Asset-based wealth ranking applied to health data

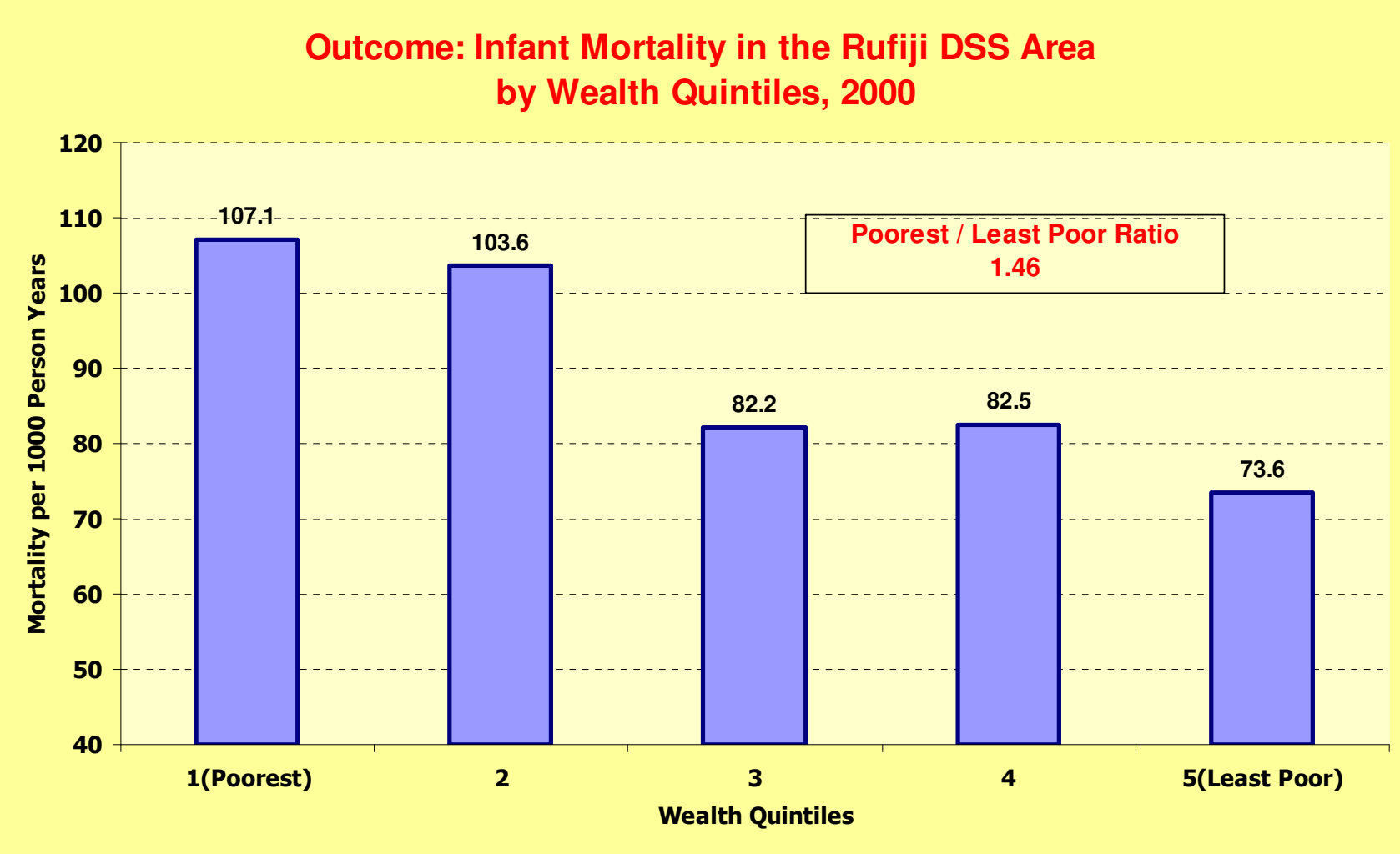
Inequities in health outcome: Malnutrition

Prevalence of Underweight in U5s by Wealth Quintiles (DHS TZ 1996)

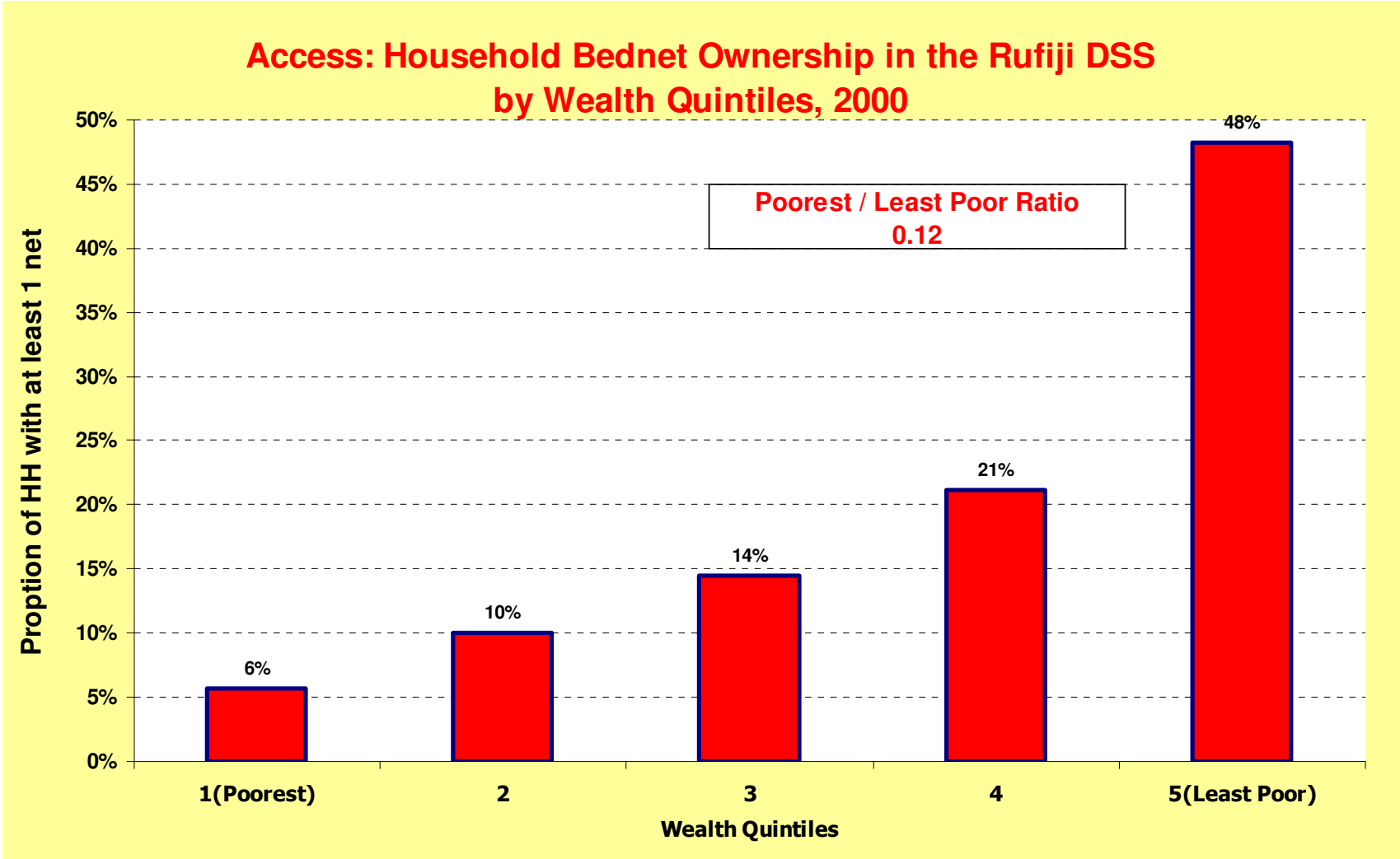


Source: Gwatkin et [illegible] Bank, 2000

Inequities in health outcome: Infant mortality



Inequities in health system access – Malaria prevention

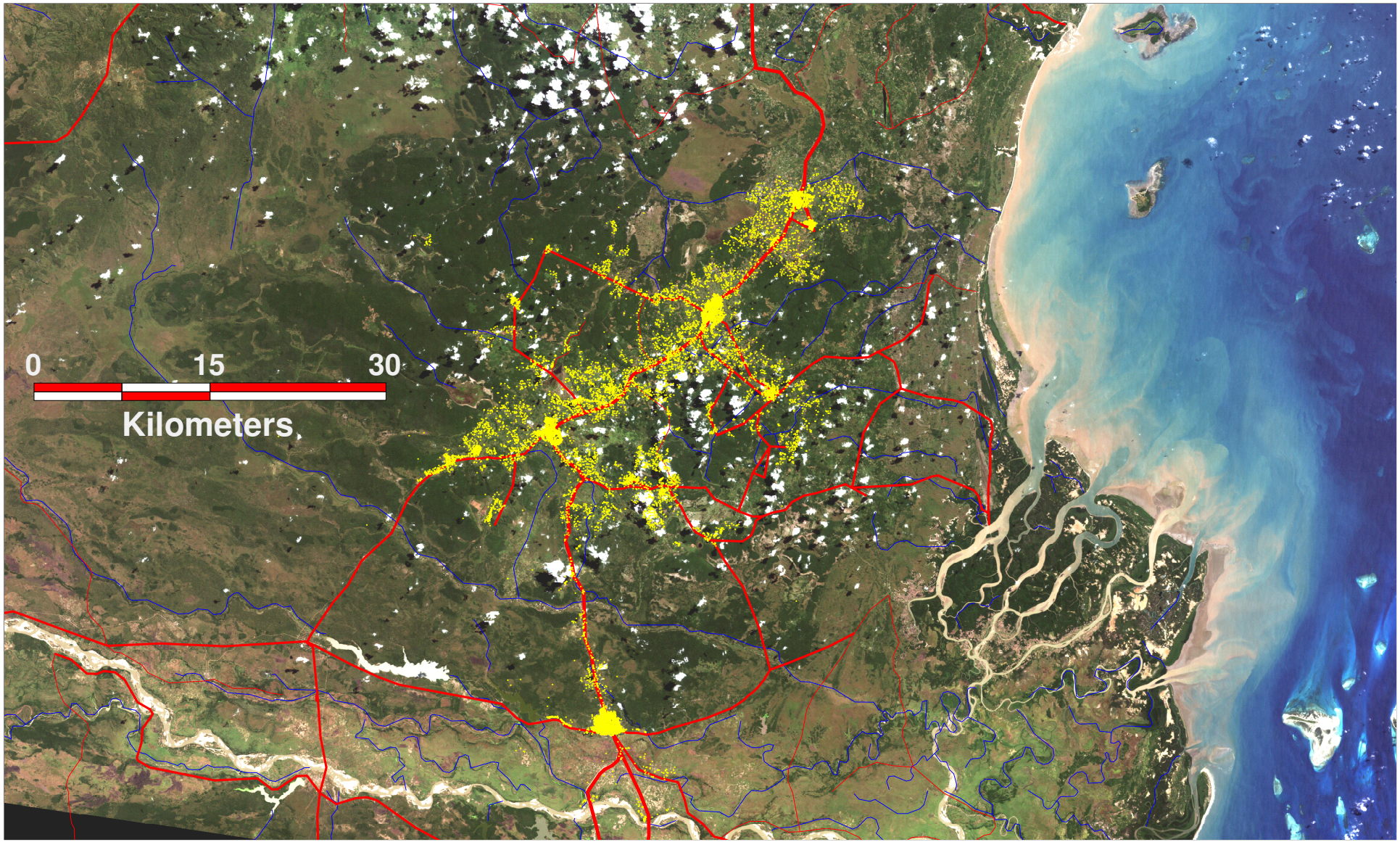


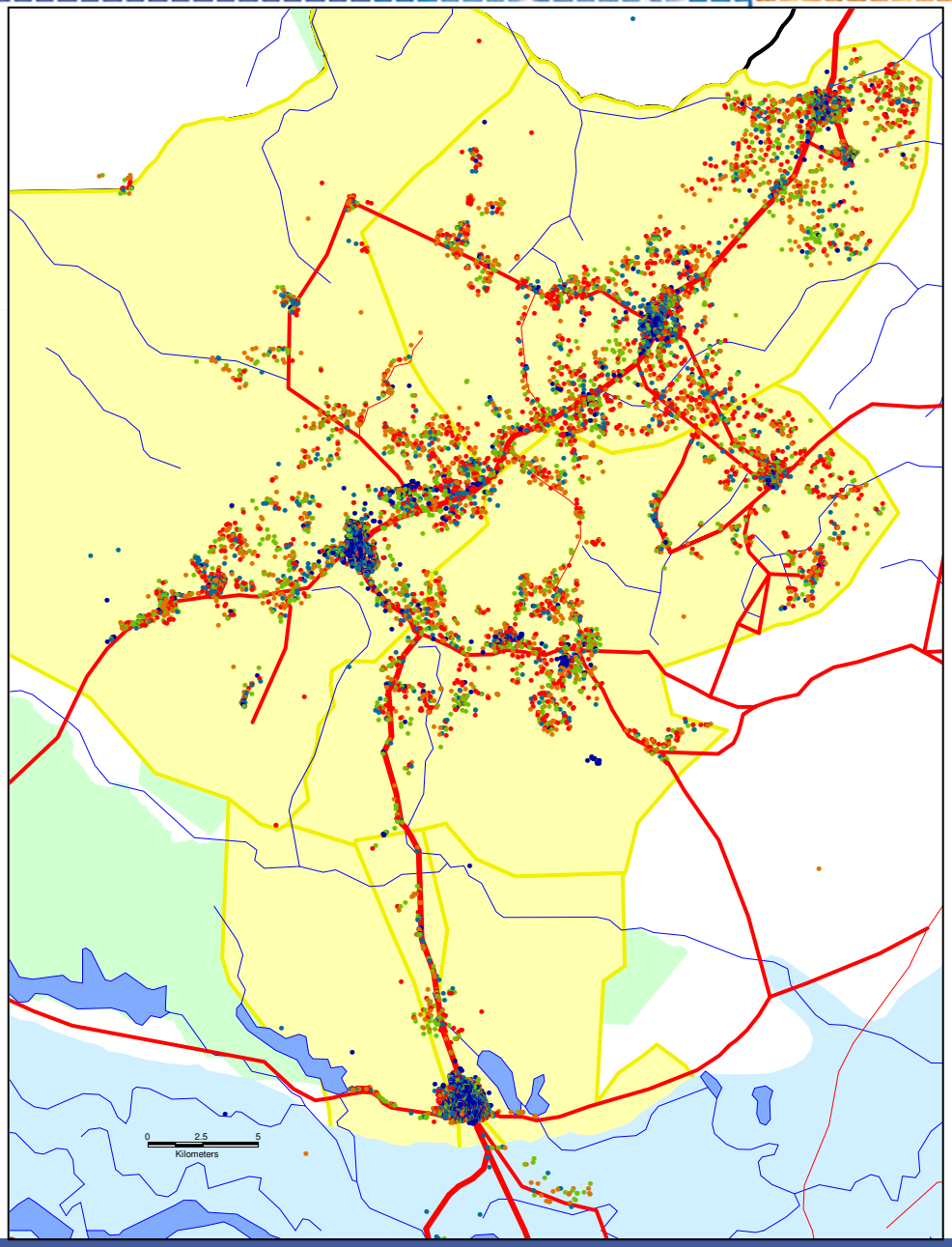
Do inequities exist across small rural areas?

E.g. Catchment areas of rural health facilities

32 “villages” in coastal Tanzania

GPS Locations for 20,000 rural households





Where are the poorest?

Household Wealth Quintiles

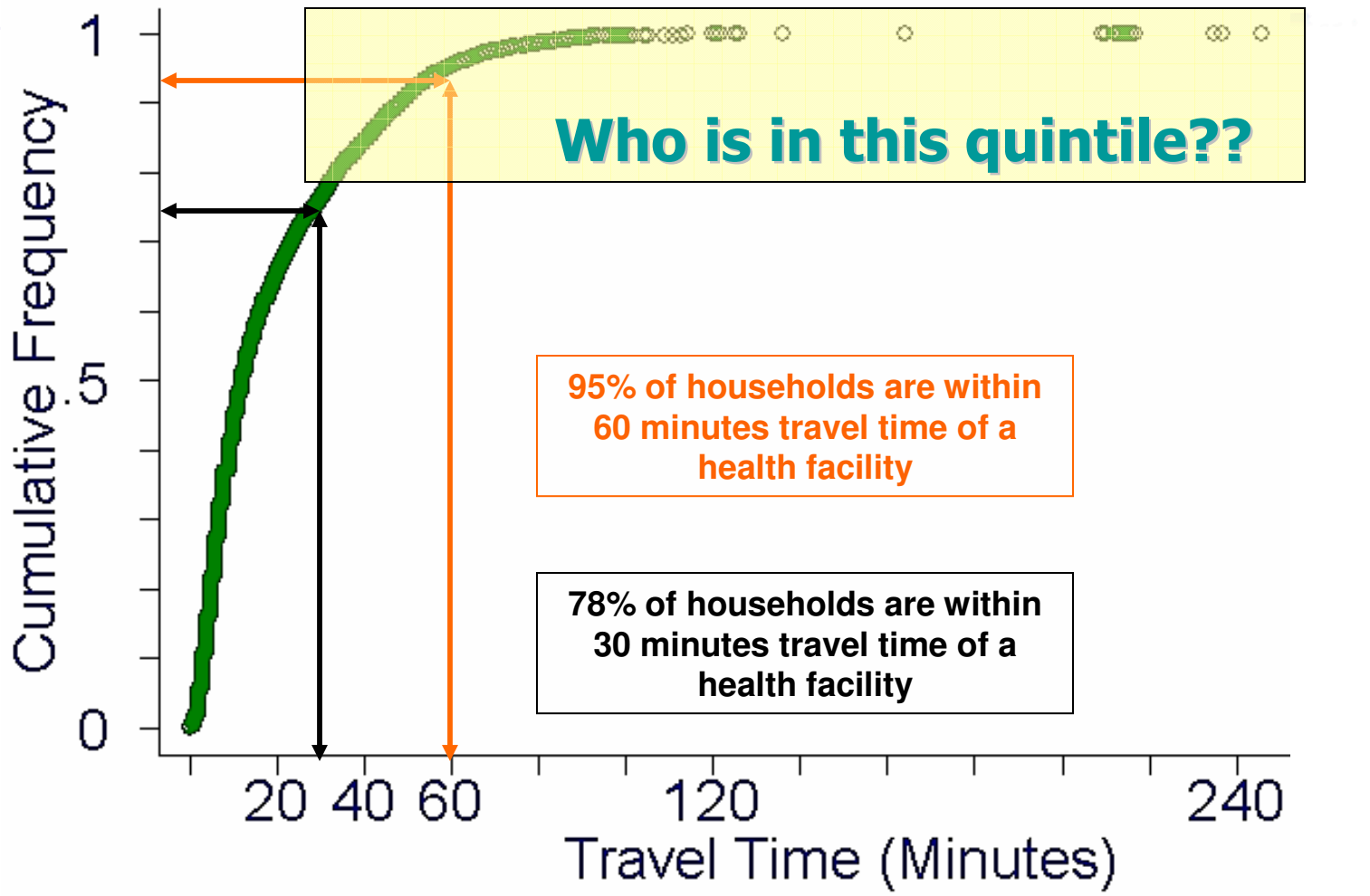
- 1 Poorest
- 2
- 3
- 4
- 5 Least Poor

Picture emerges…

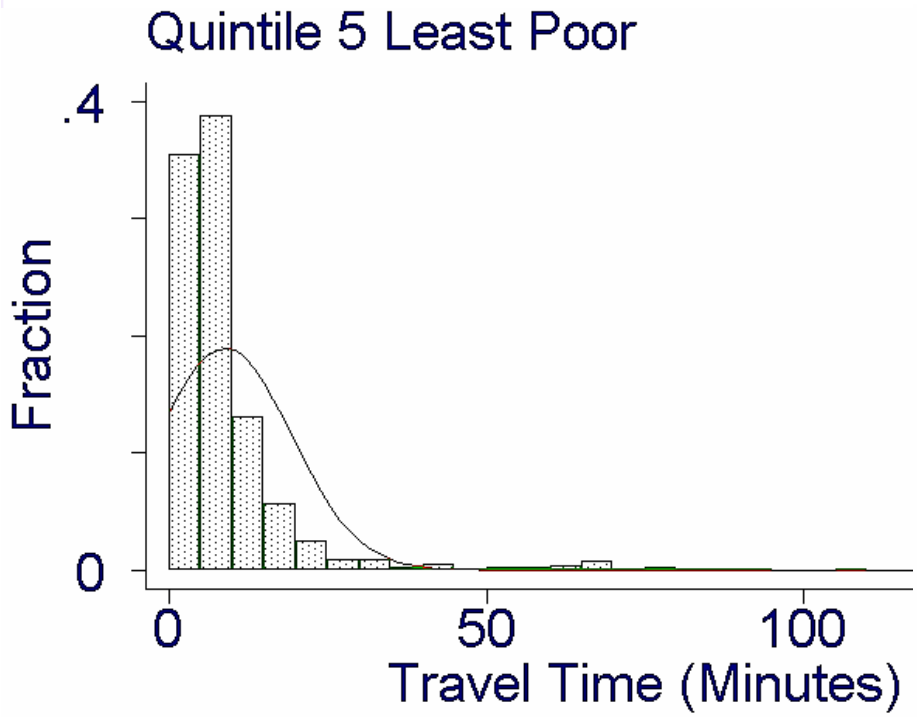
- richer quintiles mostly clustered in the centres of three large villages
- poorer quintiles widely dispersed

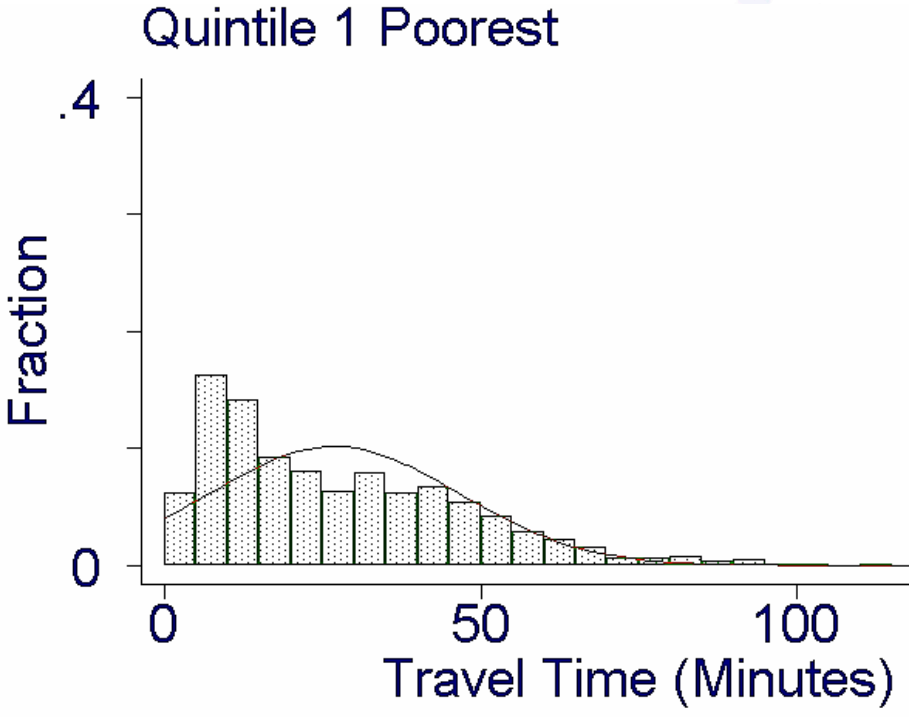
Source: TEHIP Rufiji DSS

Travel times to health facilities in the Rufiji DSS, Tanzania

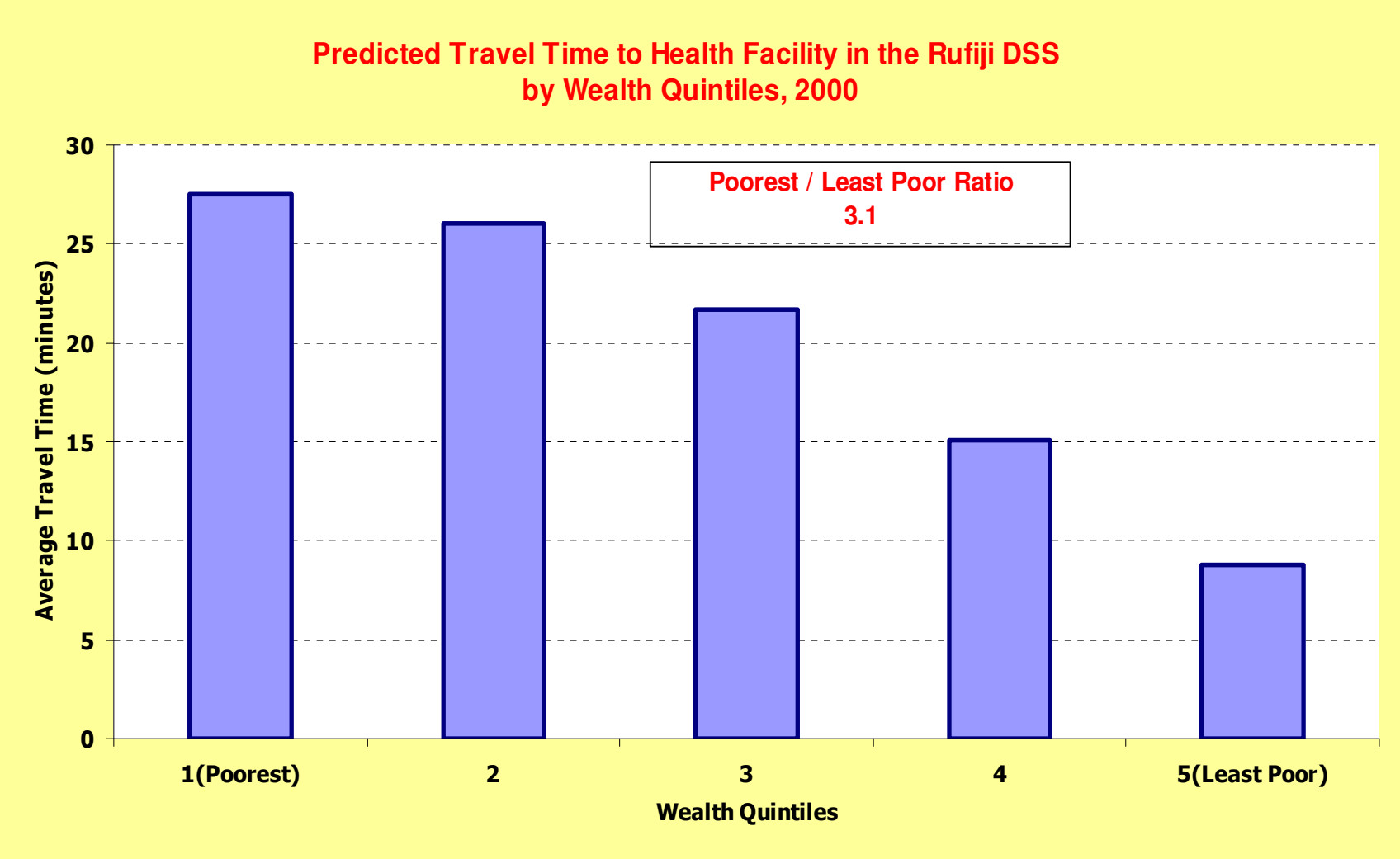


Travel times to health facilities in the Rufiji DSS, Tanzania





Access: travel time to health facilities

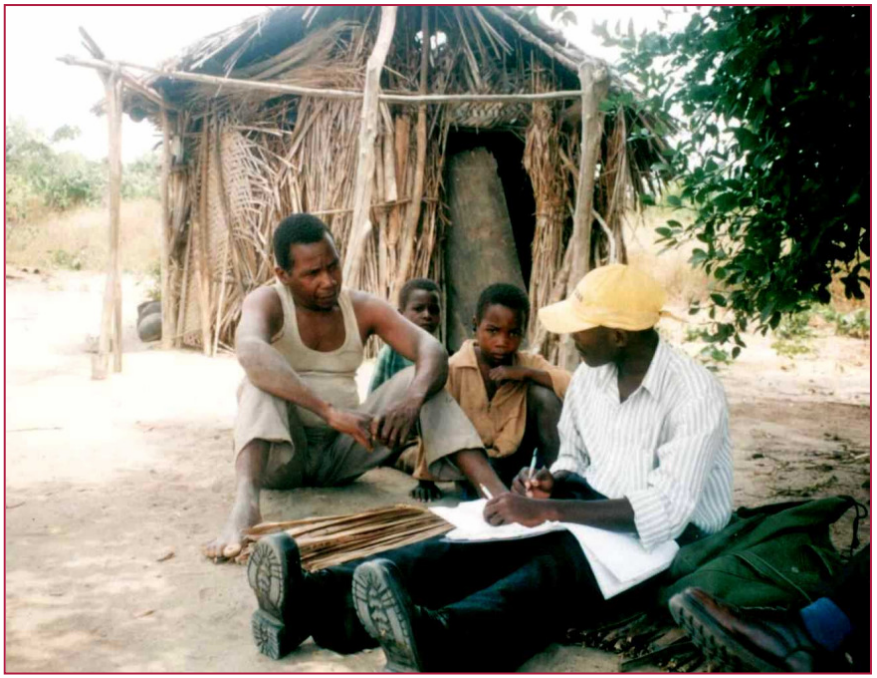


Three common errors in applying wealth (asset) indexing

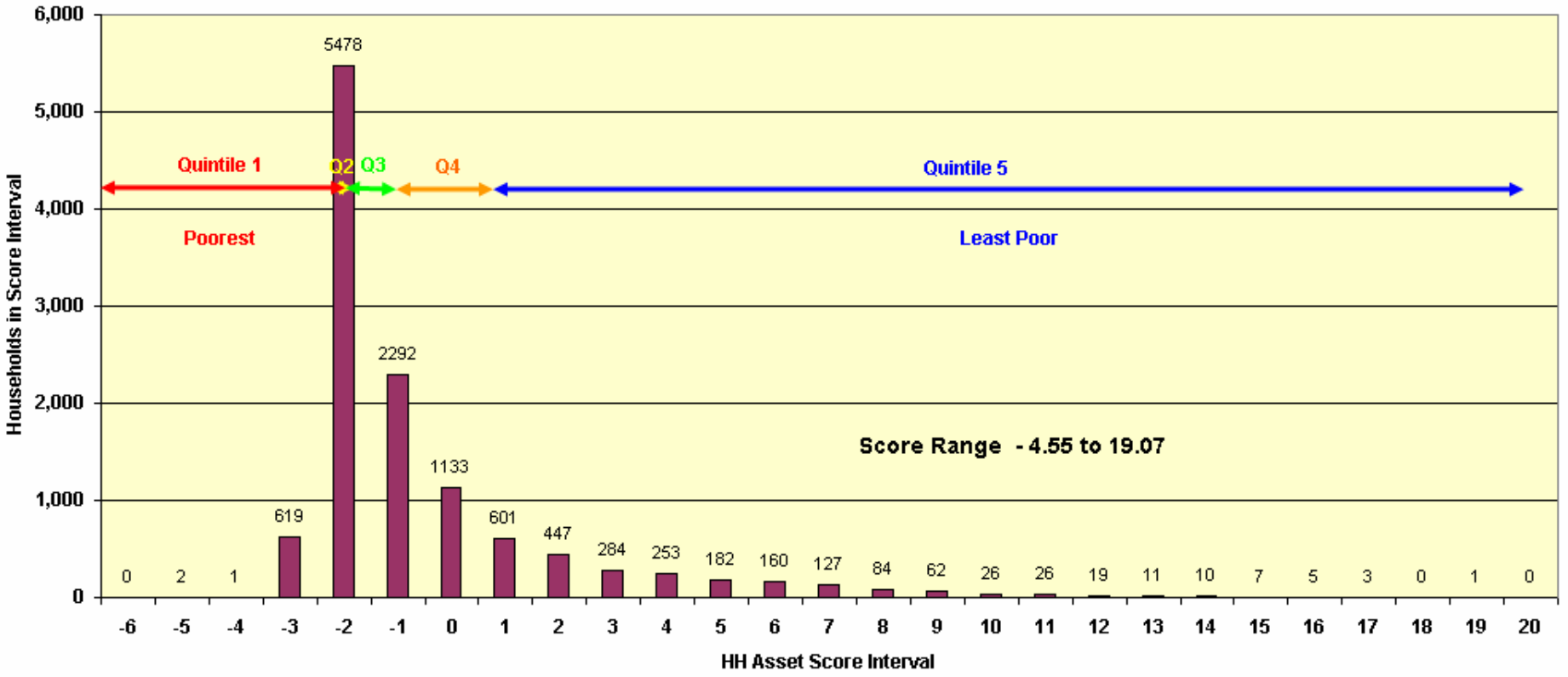
1. Don't divide study population into households; divide into individuals (e.g. poor quintile houses have more children than rich quintile houses)

2. Don't include public goods or health goods in the asset survey (e.g. mosquito nets)

3. Don't compare variables in different directions: (mortality with intervention coverage; do survival with coverage)



Problems with PCA for assets
It works: but we could use better methods



Measuring inequality

Across individuals?

Pro:

- Concerned with inequality in health whether or not correlated with inequality in other dimensions.
- Avoids hiding in the average.

Con:

- ignores social determinants.
- Policy relevance difficult.

or across social groups?

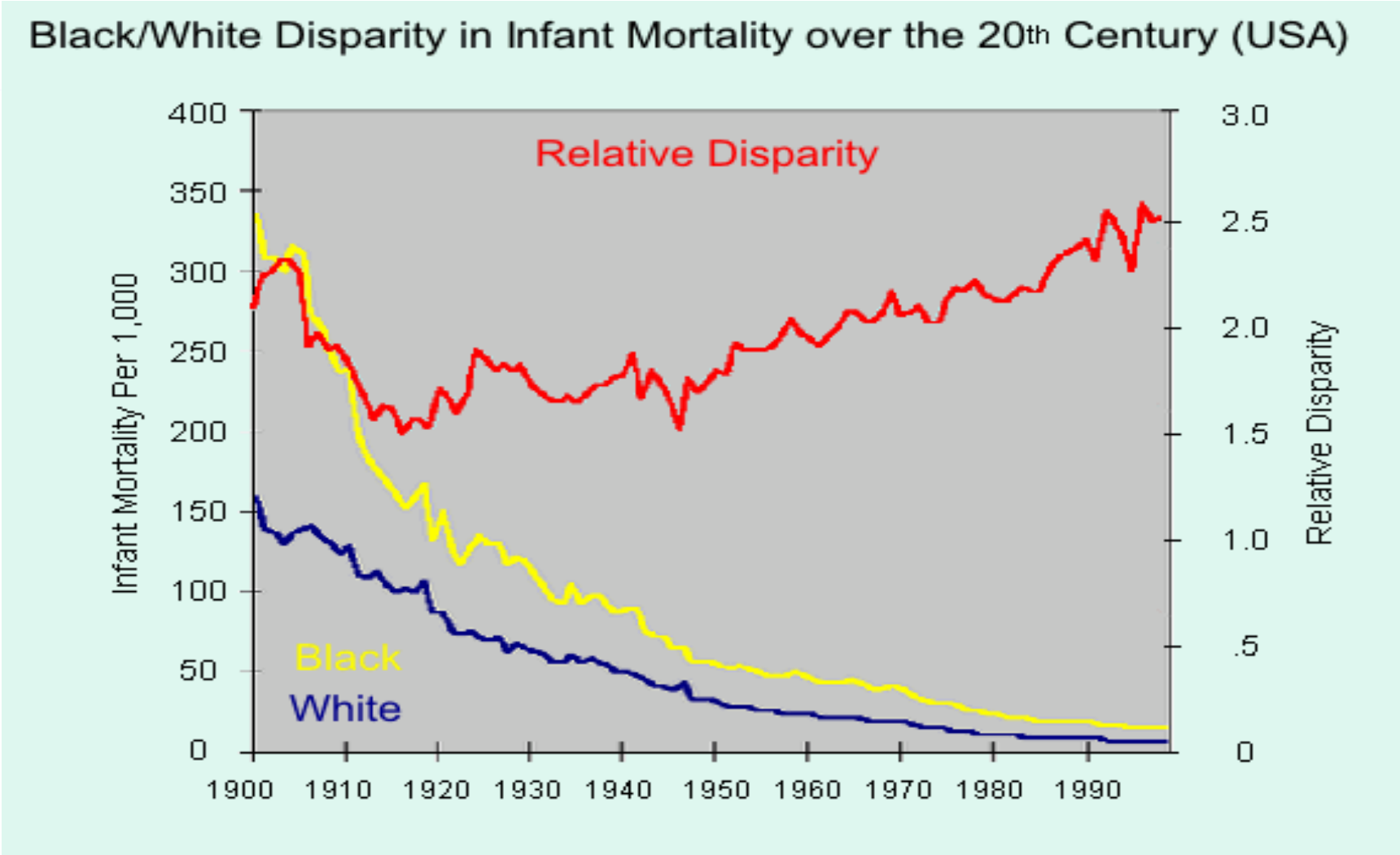
Pro:

- Traditional.
- Easy to understand.

Con:

- Group results are always averages.
- Cannot measure a health disparity that is not associated with a social group difference.

Measure relative or absolute disparities?



Source: Lynch & Harper. Measuring Health Disparities

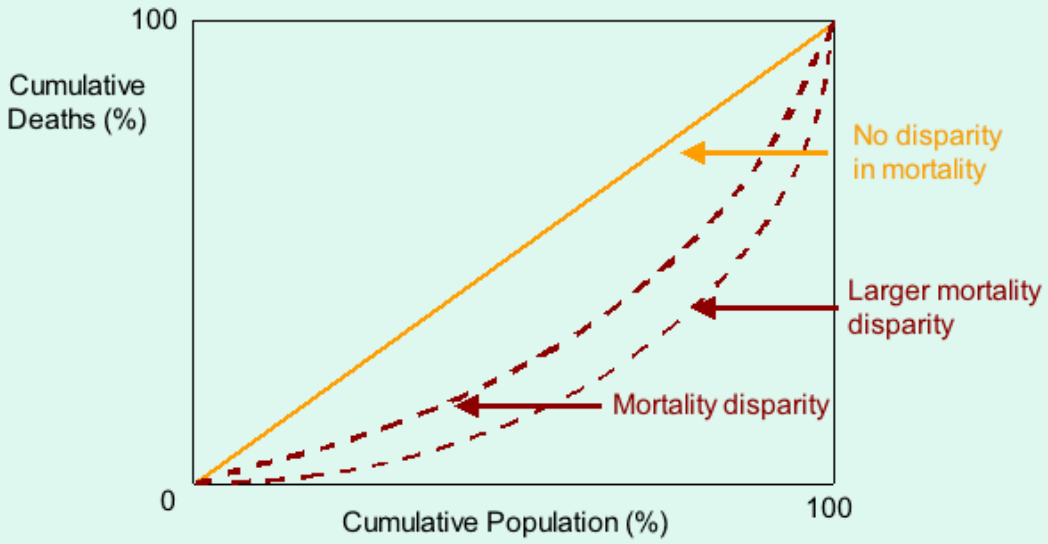
Quantifying health disparities

Lots of choice…

- Range measures (relative risk, risk difference)
- Regression-based measures (population weighted or unweighted)
  - Slope index of inequality
  - Relative index of inequality
- Index of disparity (from reference group)
- Disproportionality measures
  - Concentration index, Theil, Mean log deviation, Gini

One way to quantify health disparities

Health concentration index



- Rank people by SES (here, richest first)
- Plot cumulative proportion of population vs. cumulative proportion of health outcome
- CI = 2 x area between diagonal & plot line
  CI = 0 if no disparity; = 1 if total inequality

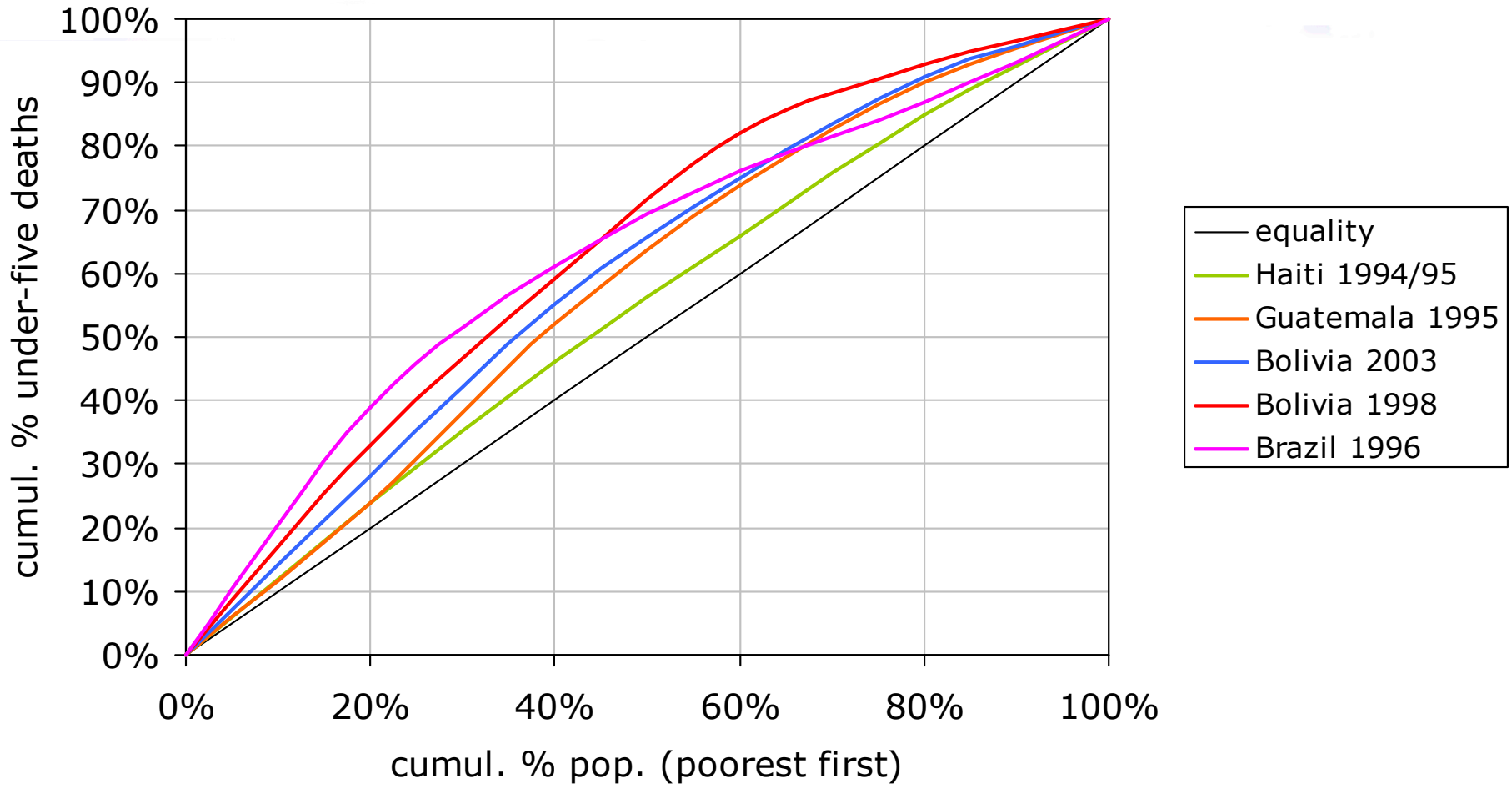
Advantages

- Uses information from all socio-economic groups (quintiles)
- Valid for use over time
- Allows graphical depiction
- Reflects the socio-economic dimension of health disparities

Disadvantages

- Difficult to calculate
- No intuitive interpretation of scale (like GINI coefficient)
- Requires social groups to be ordered (usually poorest first)

National concentration curves for U5M



"Analyzing Health Equity Using Household Survey Data" Owen O'Donnell, Eddy van Doorslaer, Adam Wagstaff and Magnus Lindelow,

Equity in health systems

Horizontal equity

- Equal services for equal needs

  Distributive justice (based on outcomes)

Vertical equity

- Enhanced services for those with greatest health needs

  Procedural justice (fairness in process such as access and financing vs. outcomes)

Expanding concepts

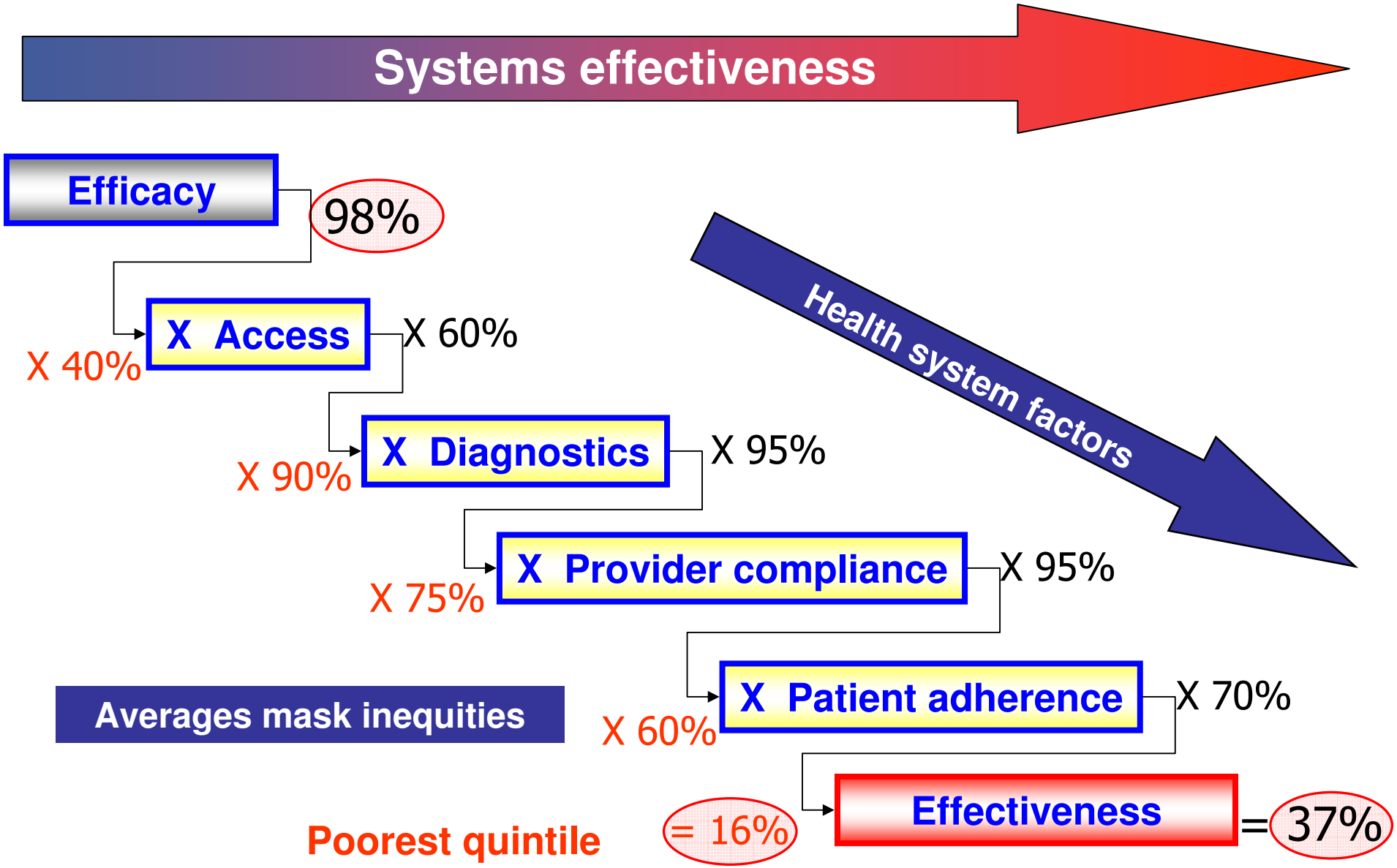
Systems effectiveness

- How well an intervention works on average in the real world
  - i.e. in health systems

Equity effectiveness

- How well an intervention works in real world (systems effectiveness) across equity quintiles (socio-economic sub-groups)

Adding the equity dimension



What does this mean for achieving better health & health equity?

- More traction to be gained by removing health system bottlenecks than by improving efficacy.

- Which bottlenecks need most attention?
  - ✓ for health system efficiency?
  - ✓ For health equity?

- Few health systems or researchers measure across all these dimensions?

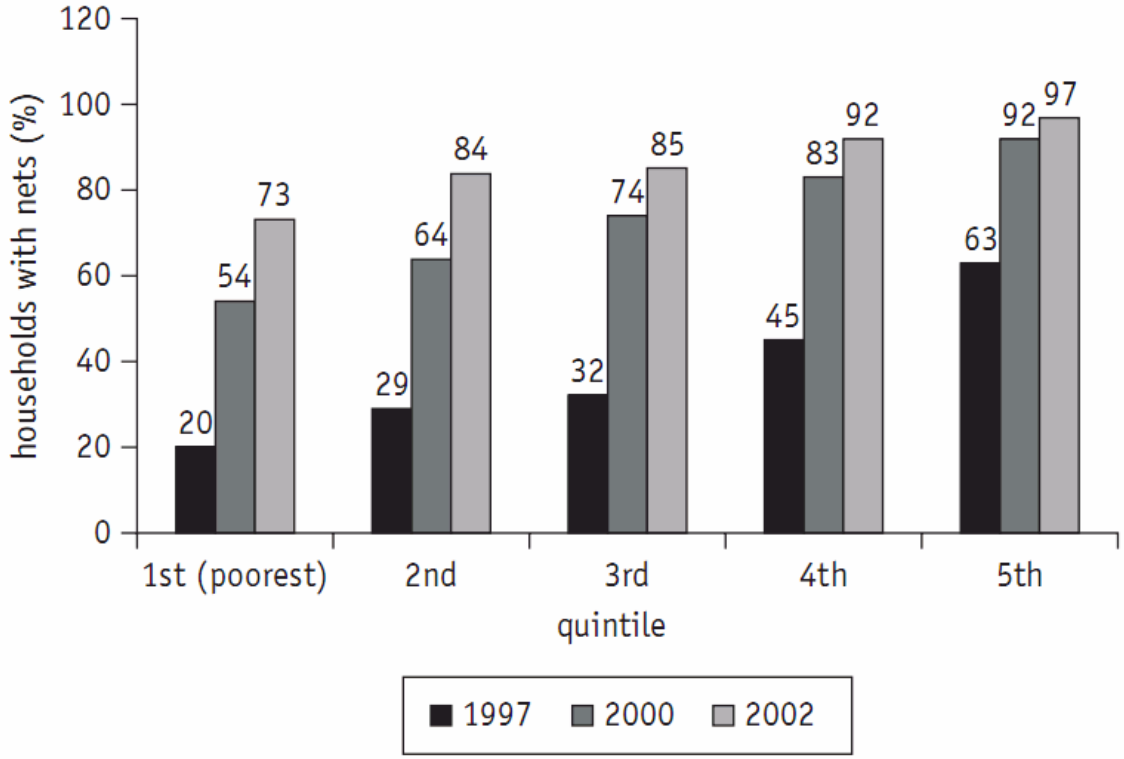
From efficacy to equity effectiveness: An example

Intervention for All-cause Mortality Reduction	Expected Efficacy	Access	Diagnostic Accuracy	Provider Compliance	Patient Adherence	Actual Effectiveness	Least Poor : Poor Ratio
Poorest	20%	30%	75%	70%	90%	2.8%	4.1
Least Poor	20%	90%	95%	95%	70%	11.4%	

Equity & effective coverage

Making service provision more pro-poor requires more strategic entry points

Closing the gap at district level:
Trend in ITN coverage with social marketing & vouchers



Rich Poor ratio

1997 = 3.2 x higher coverage

2002 = 1.3 x higher coverage

Improvement 2.5 fold

Rich Poor difference

1997 = 43% points different

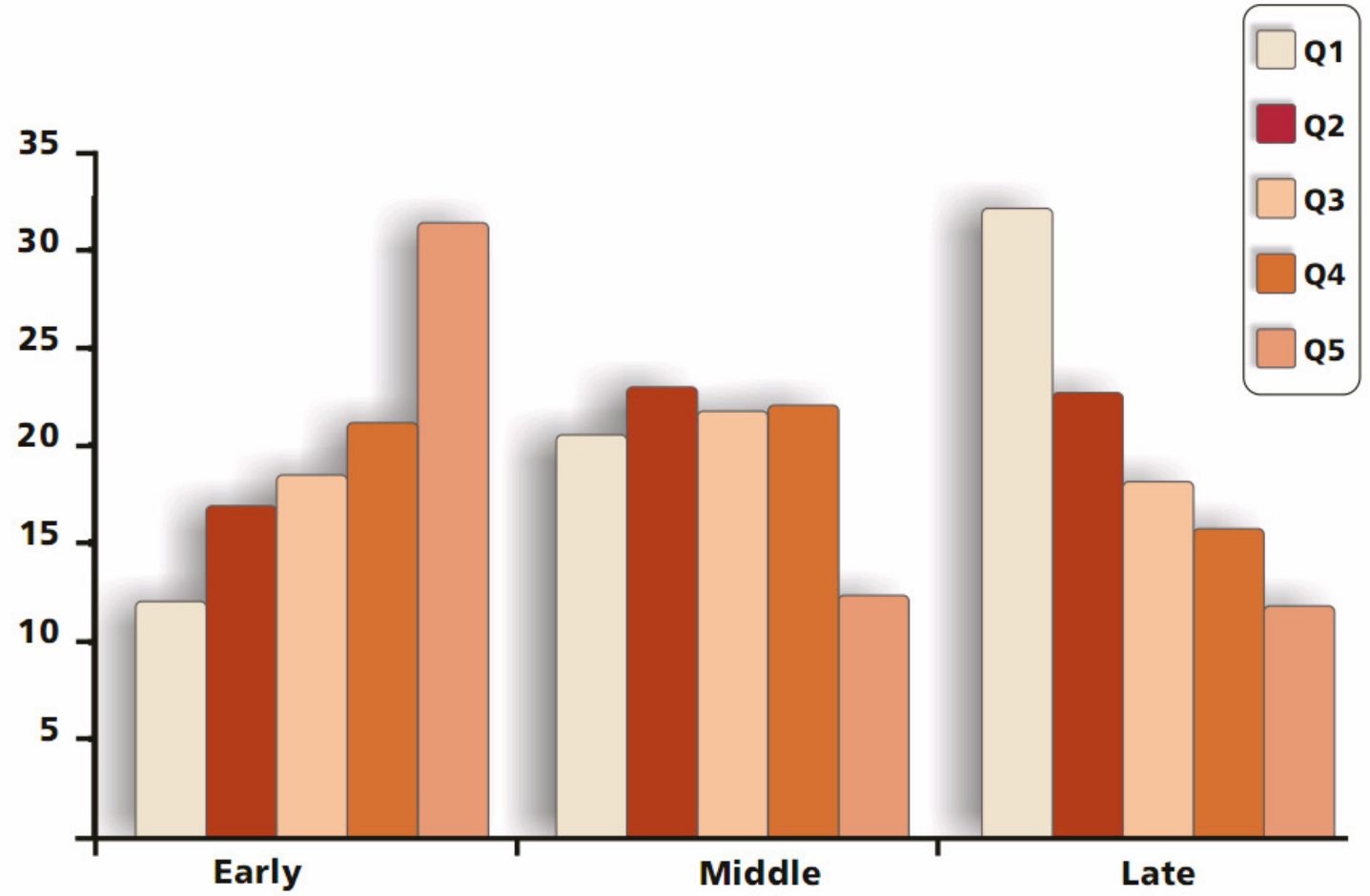
2002 = 24% points different

Improvement 1.8 fold

Nathan et al (2004)

Moving toward a more pro-poor system: Closing the gap at national level

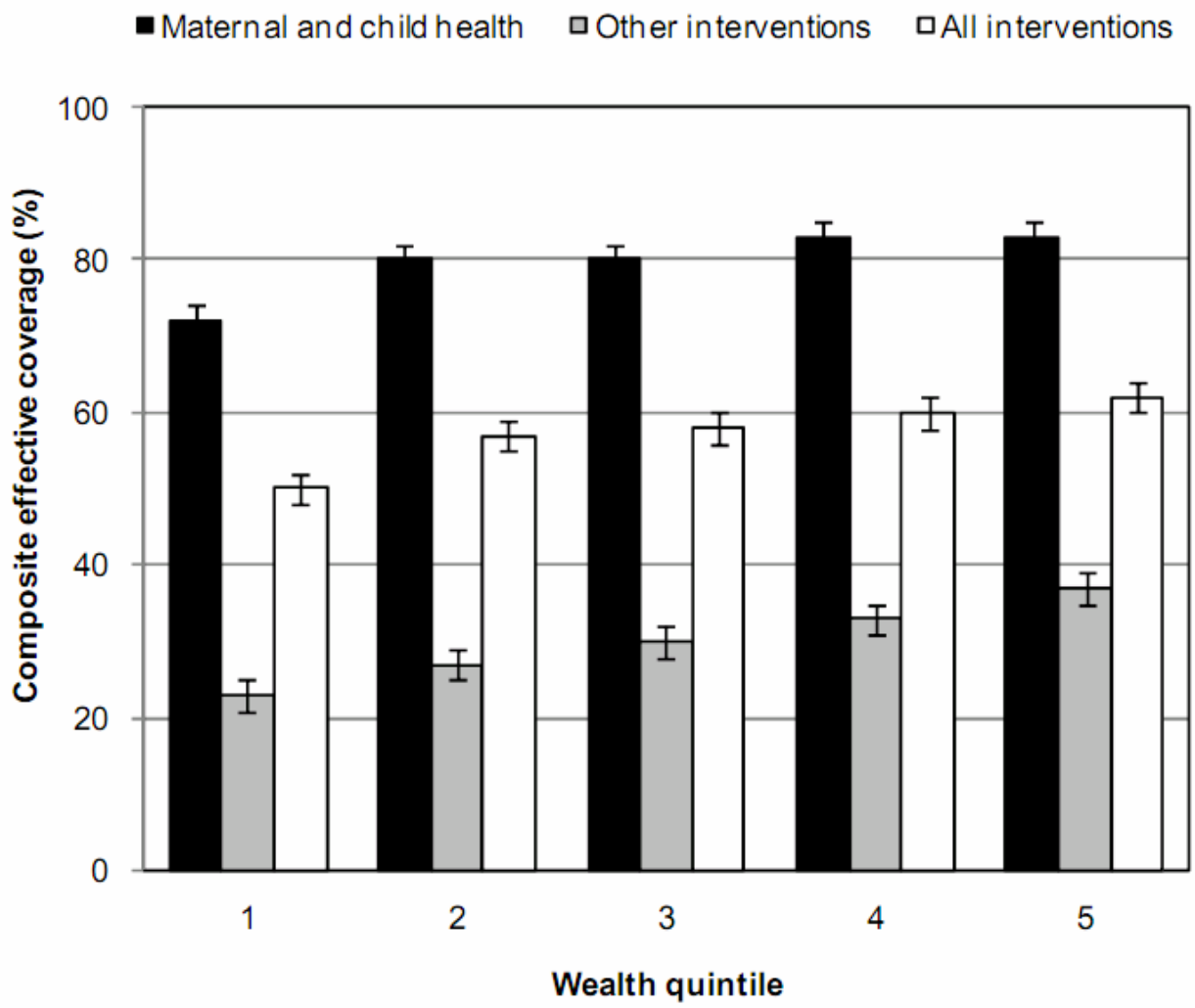
Equity of ITNs coverage during voucher scheme rollout in TZ



Hanson et al (2009) in Systems Thinking for Health Systems Strengthening.

Effective coverage by household quintile

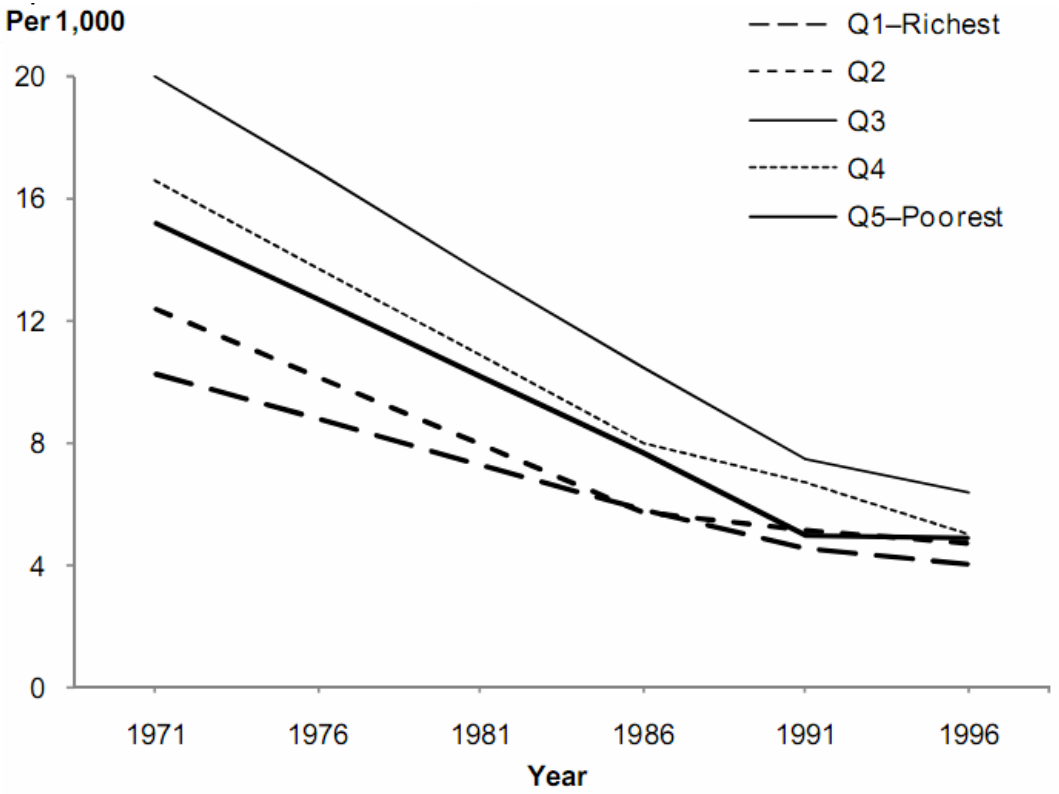
14 interventions - Mexico 2005



Lozano et al, 2006

Even rich countries struggle to close the gap

Infant mortality rates in Canada by quintile



Rich Poor ratio

1971 = 1.9 x higher mortality

1996 = 1.4 x higher coverage

Improvement 1.4 fold

Rich Poor difference

1971 = 10 per 1000 different

1996 = 2 per 1000 different

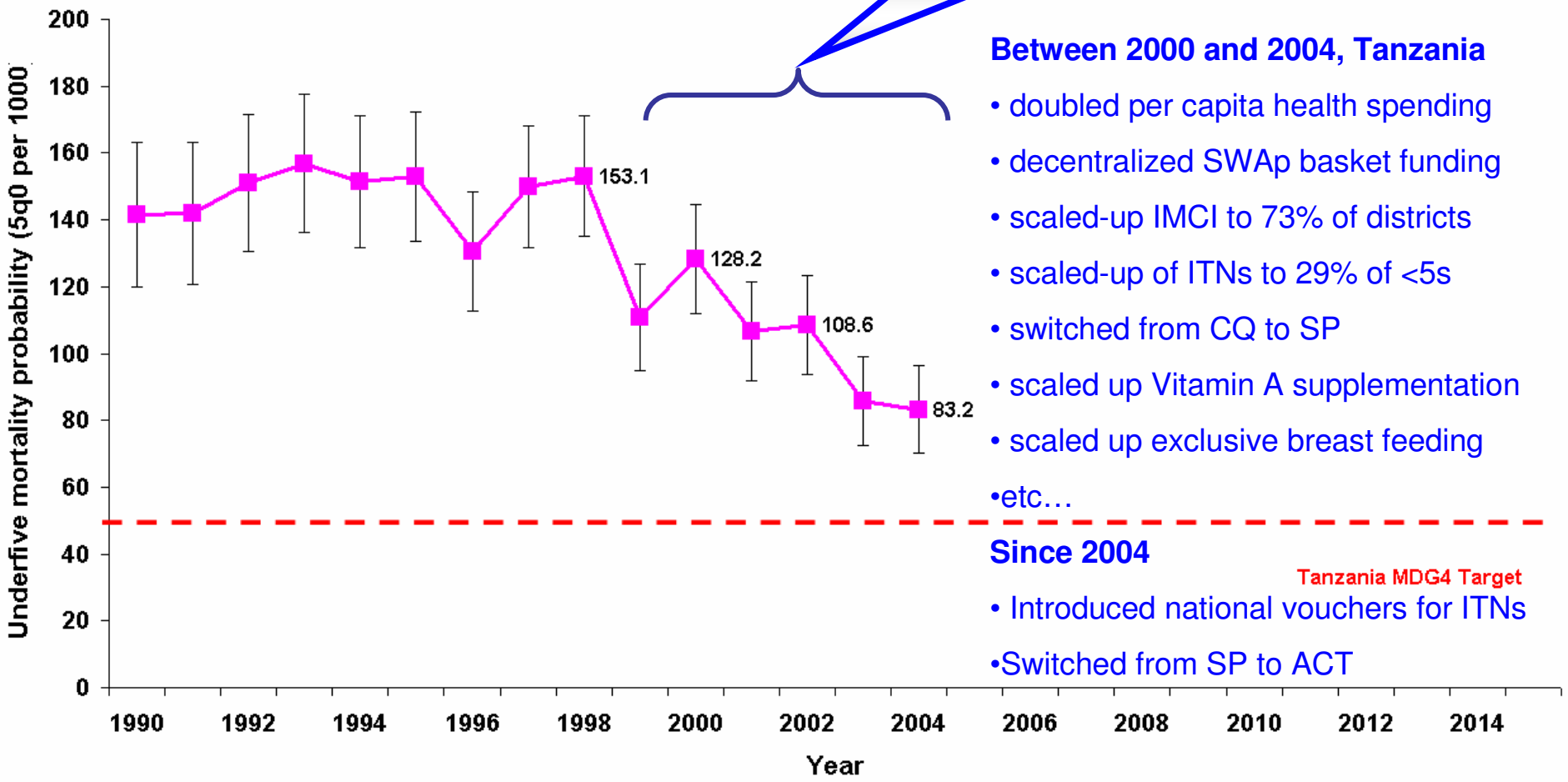
Improvement 5 fold

Inverse Care Law

“access to good health care tends to vary inversely with the need for it in the population served."

Tudor Hart (1971)

TZ national level: 40% less child mortality (avg)



Good progress on average - but inverse care law is in action

Compared to poorest quintile, the top quintile in TZ are:

- **2.8 times** more likely to have skilled attendance at delivery
- **3.4 times** more likely to use modern contraception
- **7.0 times** less likely to give birth at home AND have no post-natal care
- **8.7 times** more likely to have a C-Section
- **14 times** more likely to have slept under an ITN the previous night
- **40%** more likely to have measles vaccination
- **40%** more likely to receive treatment for fever at a health facility
- **20%** more likely to receive any ORS for diarrhoea

Constraints preventing the poor from benefiting must be understood…

The hidden trade-off…

Equity  **Efficiency**

- Different equity principles are often compromised by efficiency when prioritizing health care allocations.
- But we must deal with **gross** inefficiencies before tackling inequities.
- As a politician or a manager, how many preventable deaths would you trade-off between a population health maximization program versus a program that is less efficient but reduces health inequities?
- Beware (and be aware) of the inverse care law.
- Let's discuss this….

A final thought:
The mortality paradox

If a poor person dies…..

→ average poverty decreases

→ average health improves

And everywhere, the poor suffer higher mortality

Can we develop poverty measures not influenced by the mortality paradox?

"A nation's health inequities may be seen as a barometer of its citizen's experiences of social justice and human rights."

Tim Evans, 2002

Some health equity resources

An equity analysis tool kit:

www.worldbank.org/analyzinghealthequity

Software for automated economic analysis for poverty and inequality research on national household surveys

http://go.worldbank.org/CXMO0VQ9D0

Practical field survey and analysis methods:

www.indepth-network.org

UNIBAS Eva - Health Systems Teaching Module for excel tool for calculating concentration indices

https://eva.unibas.ch/

International Society for Equity in Health:

www.iseqh.org/

And any publication by Davidson Gwatkin !