DVM2110A-Health, Education Perspectives in International Development

Health Indicators

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(centre of the world)

The nation of Deonandia needs data!

Top diseases:
-Cooties
-Malaria
-Diabetes

What Is An “Indicator”?

- “A statistical value that provides an indication of the condition or direction over time of performance of a defined process or achievement of a defined outcome.”
- Blah blah blah
- It’s just a number

Why Do We Have Indicators in Population Health?

- To monitor the extent to which certain diseases, etc, are affecting the population
- To monitor the extent to which programs are succeeding
- To best inform decision making

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Global health indicators: an overview

Charles Larson and Alec Mercer

The health of people living in developing countries around the world has improved considerably over the past 2 decades. For example, the total number of deaths annually among children less than 5 years of age has been halved over the past 40 years.[1] Unfortunately, in most of sub-Saharan Africa and some parts of South Asia, these reductions in mortality have stagnated or even reversed over the past decade.[2] At the same time, disease patterns and causes of death in less developed countries have changed markedly. The most obvious example of such change relates to HIV/AIDS, but others include the re-emergence of tuberculosis as a global health problem, the emergence of new infectious diseases, the increase in violence and the occurrence of chronic diseases formerly thought to be of concern only in developed countries, such as coronary artery disease and cerebrovascular accidents.[3] **Global monitoring of changes in the health of various populations requires the use of "tried and true" global health indicators. However, we also need indicators that are relevant to contemporary patterns of disease and their determinants.**

Pitfalls of Indicators?

- How do you know which one to use when?

In Deonandia, last year's mortality rates:
-Cooties: 8% of all fatalities
-Malaria: 2% of all fatalities
-Diabetes: 0.1% of all fatalities

(PMR)

This year in Deonandia, we have something new called "Old Fart Disease":
-100% fatal to people over 65
-1% fatal to those under 65
-accounts for 10% of all fatalities

(CFR)

Indicator Selection Depends on….

- What you are trying to measure

-how many people are dying?

-how many people are suffering?

-what's it costing?

-which is the fastest growing?

-etc

Pragmatic Aspects of Indicator Use

- Few regularly used indicators meet the following criteria:

1. **Definition.** The indicator must be well defined, and the definition must be uniformly applied internationally.
2. **Validity.** The indicator must be valid (it must actually measure what it is supposed to measure), reliable (replicable and consistent between settings) and readily interpretable.
3. **Feasibility**. The gathering of the required information must be technologically feasible and affordable and must not overburden the system.
4. **Utility**. The indicator should provide information that is useful to decision-makers and can be acted upon at various levels (local, national and international).

The Politics of Indicator Selection

- There are ENDLESS frameworks for defining and selecting health indicators
- Here is an official federal report for how Canada chooses to employ indicators:
  - http://www.hc-sc.gc.ca/hcs-sss/pubs/system-regime/2010-fed-comp-indicat/index-eng.php

Canada's Approach

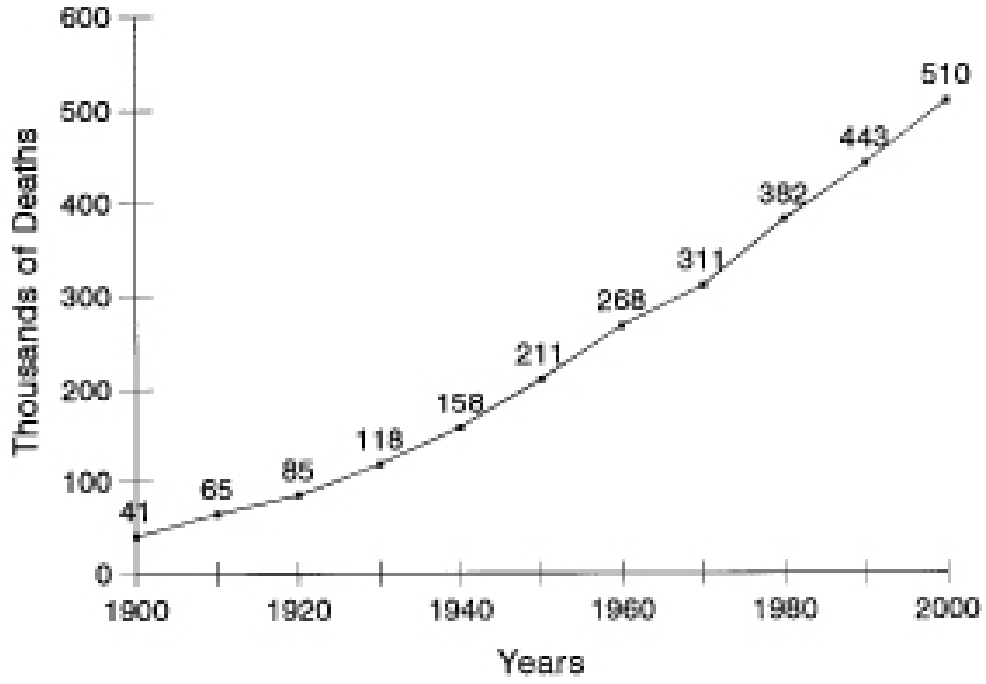
- According to Stats Canada, our indicators tend to fall into five categories:
  1. **Health status** —provides information about the health of Canadians, including well-being, human function and selected health conditions.
  2. **Non-medical determinants of health** —reflects factors outside of the health system that affect health.
  3. **Health system performance** —provides insight into the quality of health services, including accessibility, appropriateness, effectiveness and patient safety.
  4. **Community and health system characteristics** —provides contextual information, not direct measures of health status or quality of care.
  5. **Equity** —a cross-cutting dimension for the four above.

EXAMPLES

1. **Health status** — prevalence rate of breast cancer (http://www.statcan.gc.ca/pub/82-221-x/2011002/quality-qualite/qua2-eng.htm)
2. **Non-medical determinants of health** —smoking rate (http://www.statcan.gc.ca/pub/82-221-x/00601/4061272-eng.htm).
3. **Health system performance** —Wait times for knee replacement surgery (http://www.cihi.ca/cihi-ext-portal/internet/en/document/health+system+performance/indicators/prtwg_2009).
4. **Community and health system characteristics** —population density (http://www.statcan.gc.ca/pub/82-221-x/2011002/def/def4-eng.htm).
5. **Equity** —potential rate reduction, "Potential reduction in a health indicator rate that would occur in the hypothetical scenario that each socio-economic group in the jurisdiction experienced the rate of the most affluent socio-economic group" (http://www.statcan.gc.ca/pub/82-221-x/2012001/def/def5-eng.htm).

Mortality

Cancer related deaths



What is the trend in the number of deaths from 1900 to 2000?
What is the trend in the risk of death from 1900 to 2000?

Traditional Indicators in Pop Health

Mortality Rate

- The number of people who died, divided by the total number of people who were at risk of dying
- Usually given as a percent or as a rate per 100,000
- E.g., In 2000, the Malaria **mortality rate** in Djibouti was 119 people per 100,000

More on Mortality Rate

- Mortality rate can be broken down in a hundred different types:
  - Eg, standardized mortality ratio or case fatality rate or age-specific mortality rate
  - This can go on forever, so just be aware that this is not the end of the story, where mortality is concerned

The **crude death rate**, the total number of deaths per year per 1000 people. The crude death rate for the whole world is currently about 8.24 per 1000 per year (according to the current CIA World Factbook.)

The **perinatal mortality rate**, the sum of neonatal deaths and fetal deaths (stillbirths) per 1000 births. (WHO -> 22 weeks pregnancy until 7 days of life)

The **maternal mortality rate**, the number of maternal deaths due to childbearing per 100,000 live births.

The **infant mortality rate**, the number of deaths of children less than 1 year old per 1000 live births.

The **child mortality rate**, the number of deaths of children less than 5 years old per 1000 live births.

The **standardised mortality rate** (SMR)- This represents a proportional comparison to the numbers of deaths that would have been expected if the population had been of a standard composition in terms of age, gender, etc.

Traditional Indicators in Pop Health

- **Poverty Line/Threshold**
  - One standard definition: "The minimum level of income deemed necessary to achieve an adequate standard of living"
  - Determining poverty line involves calculating the total cost of all the essential resources a person needs for one year (food, shelter, fuel, etc)
  - Varies between countries and over time
  - Sometimes defined relative to income
    - E.g. EU sometimes defines poverty as making below 60% of median income
  - In developing countries, the biggest cost is…..

Poverty Lines in Canada

Canada does not define a “poverty line”, but instead uses “Low Income Cut-Offs” or LICOs, which vary according to community size and size of household:

Before-Tax Low-Income Cut-Offs (LICOs), 2004					
	Population of Community of Residence				
Family Size	500,000 +	100,000-499,999	30,000-99,999	Less than 30,000*	Rural
1	$20,337	$17,515	$17,407	$15,928	$14,000
2	$25,319	$21,804	$21,669	$19,828	$17,429
3	$31,126	$26,805	$26,639	$24,375	$21,426
4	$37,791	$32,546	$32,345	$29,596	$26,015
5	$42,862	$36,912	$36,685	$33,567	$29,505
6	$48,341	$41,631	$41,375	$37,858	$33,278
7 +	$53,821	$46,350	$46,065	$42,150	$37,050

Source: Prepared by the Canadian Council on Social Development using Statistics Canada's Low Income Cut-Offs, from *Low income cut-offs for 2004 and low income measures for 2002* Catalogue # 75F0002MIE2005003.

More info on how to measure poverty in Canada:
http://intraspec.ca/A_measure_of_poverty.pdf

How is the new Multidimensional Poverty Index or MPI significantly different from the Human Poverty Index (HPI) that the U.N. uses for its Human Development Report? Doesn't that also take social indicators as the basis for measuring poverty?

The indices share the same motivation, but are totally different. The MPI starts with each person, and looks at their lives and that of their household members, and identifies a person as poor only if they have multiple deprivations.

The MPI reflects the intensity of deprivation each person experiences as well as the percentage of people who are poor.

The HPI aggregates percentages of people who are deprived in different things. So it cannot see if all of the HPI indicators affect the same person simultaneously, or if each person only has one deprivation.

This is understandable, because in 1997 when the HPI was developed we did not have the data that is required to construct the MPI. Only recently has it become possible to focus first on each person's life, and build a multidimensional poverty measure from that.

(*The Hindu*, July 20, 2010)

Relevance: there are ongoing attempts to refine our ability to measure poverty

Relative Poverty vs Absolute Poverty

- A measure of ***relative poverty*** defines "poverty" as being below some relative poverty threshold
- **Absolute poverty** is a level of poverty as defined in terms of the minimal requirements necessary to afford minimal standards of food, clothing, health care and shelter

Relative Poverty

- "households with an accumulated income less than 60% of the median equivalized household disposable income are living in poverty“ (example from Wikipedia)
- By definition, regardless of overall wealth of the society, there will always be someone living in poverty

Absolute poverty

- (Sometimes used to mean “extreme poverty”, which is not how I’m using it here)
- Functionally, it’s the absence of enough resources (money) to secure basic resources of life
- According to 1995 World Summit on Social Development, “absolute poverty” means "a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to services."

But how do you operationalize that?

Absolute Poverty

- *One UN definition (http://bit.ly/mSwSIe) defines absolute poverty as having any two of*:

1. ***Food**:* BMI must be above a certain threshold (usually 16).
2. ***Safe drinking water**:* Water must not come solely from rivers and ponds, and must be available nearby (less than 15 minutes' walk each way).
3. ***Sanitation facilities**:* Toilets must be near and accessible
4. ***Health**:* Treatment must be received for serious illnesses and pregnancy.
5. ***Shelter**:* Homes must have fewer than four people living in each room. Floors must not be made of dirt, mud, or clay.
6. ***Education**:* Everyone attends school or learns to read.
7. ***Information**:* Everyone must have access to newspapers, radios, televisions, computers, or telephones at home.
8. ***Access to services**:* vague access to education, health, legal, social, and financial services.

Final Thoughts on Poverty

- There are many ways to define poverty
- There is no real consistency across or between nations
- All methods are flawed or somehow biased
- Beware blanket statements like, country A is more impoverished than country B

Traditional Indicators in Pop Health

Prevalence

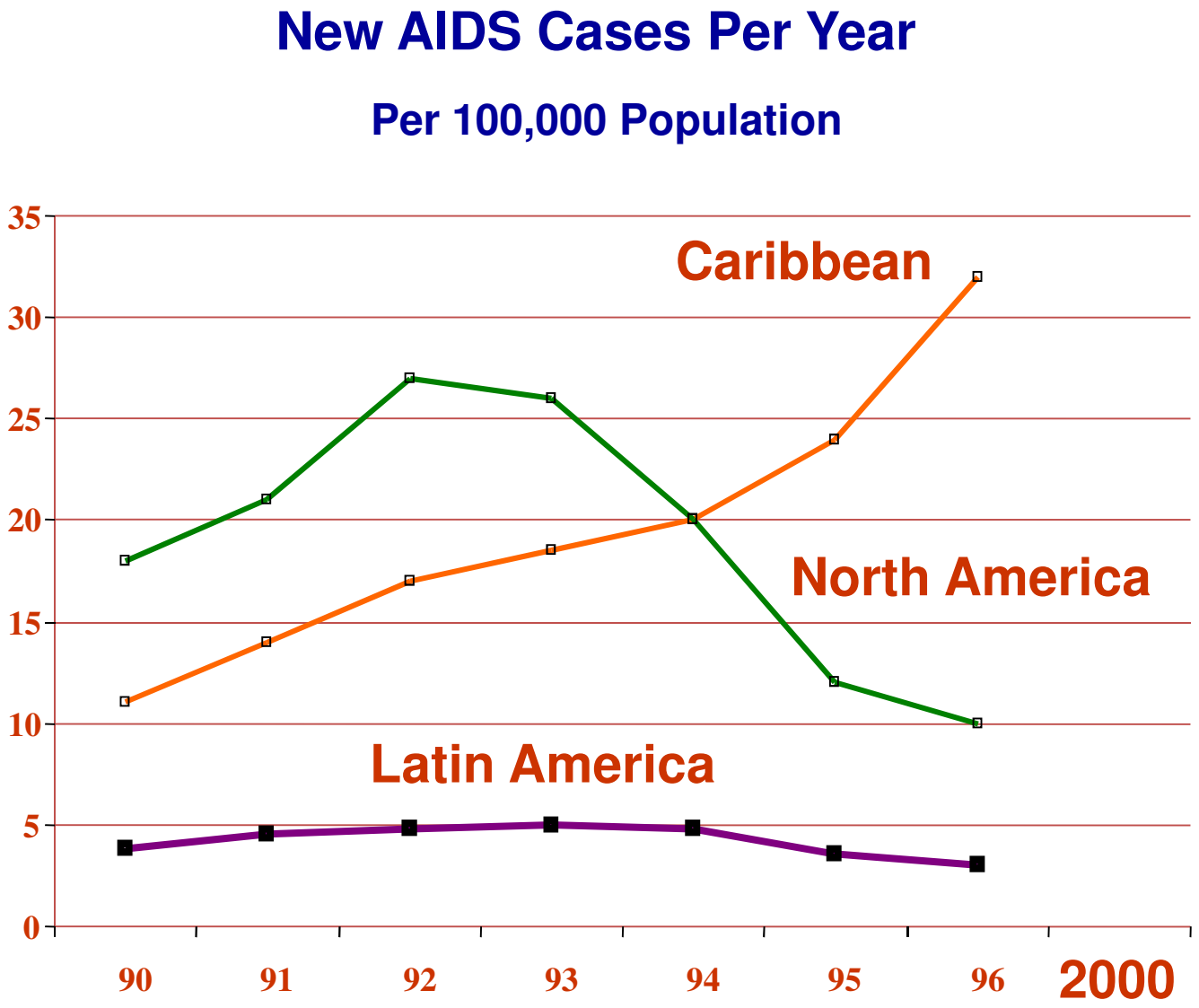
- The percentage of people who have a certain disease
- Considered to be a measure of “morbidity”
- Usually given as a percent
- Be specific: prevalence of WHAT among WHOM, WHERE and WHEN?
- e.g. In Panama in 1995, the **prevalence** of HIV was 0.9% of the adult population over 15 years

Traditional Indicators in Pop Health

Incidence

- The rate of *new* infections of a given diseases over a period of time
- Considered to be a measure of "morbidity"
- Can be given as a percent, but usually reported as a rate per 1000 people
- E.g., In Uganda, the **incidence** of HIV among adults fell from 7.6 per 1000 in 1990 to 3.2 per 1000 in 1998

*detection bias?



Child Health

- **“neonatal”** – having to do with newborns (first 28 days of life)
- **“perinatal”** – having to do with the time around birth (5 months before and 1 month after)
- **Infant Mortality** – the proportion of infants who die before 1st birthday
- **Child Mortality** – the proportion of children who die before 5th birthday
  - Reduction of child mortality is one of the “Millennium Development Goals”

Child Health

What are the biggest killers of children?

Source: WHO, The World Health Report, 2005 www.who.int/whr/2005/en/index.html

1. acute neonatal conditions, mainly preterm birth, birth asphyxia and infections (37%)
2. lower respiratory infections, mostly pneumonia (19%)
3. diarhea (18%)
4. malaria (8%)
5. measles (4%)
6. HIV/AIDS (3%)

30,000 children die every day from preventable or treatable maladies

49% (4.294 million) of child deaths occurred in five countries:

India, Nigeria, Democratic Republic of the Congo, Pakistan, and China

Lancet. 2010 Jun 5;375(9730):1969-8

Child Health

New data for 2012 shows a change in numbers but not ranks

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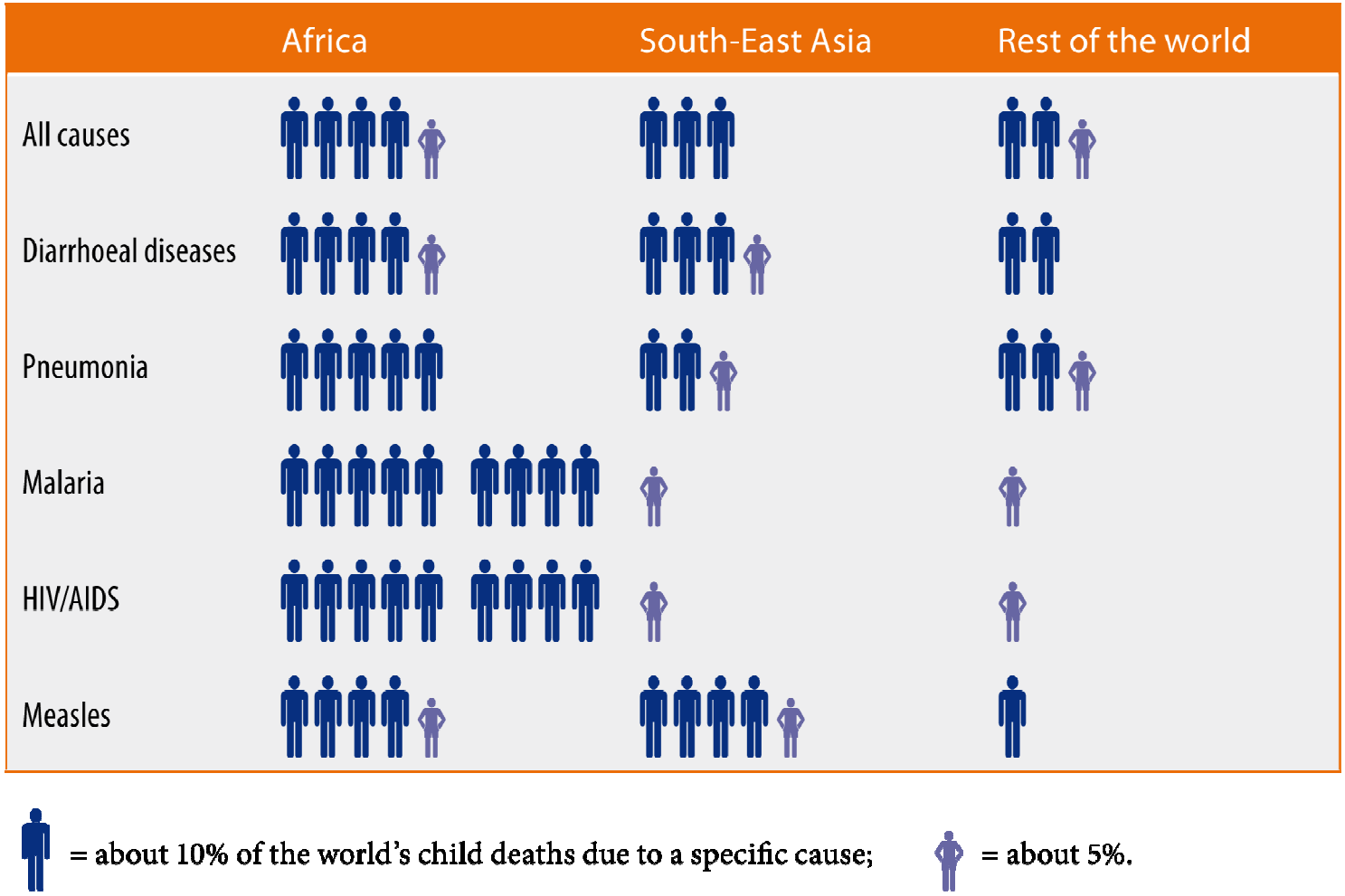
Distribution of child deaths for selected causes by selected WHO region, 2004

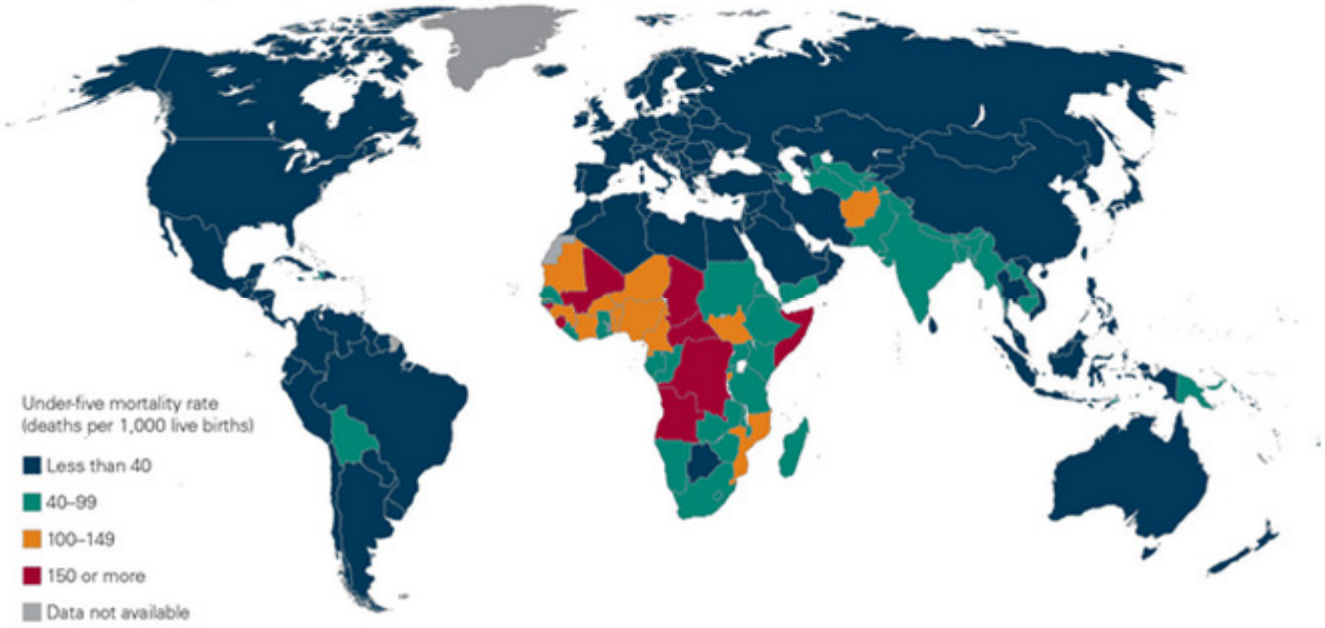


Child Health

- Gender split
  - In 2011, child mortality rates per 1000 live births were 53 (boys) and 50 (girls)
  - Down from 1990 (89 boys, 85 girls)

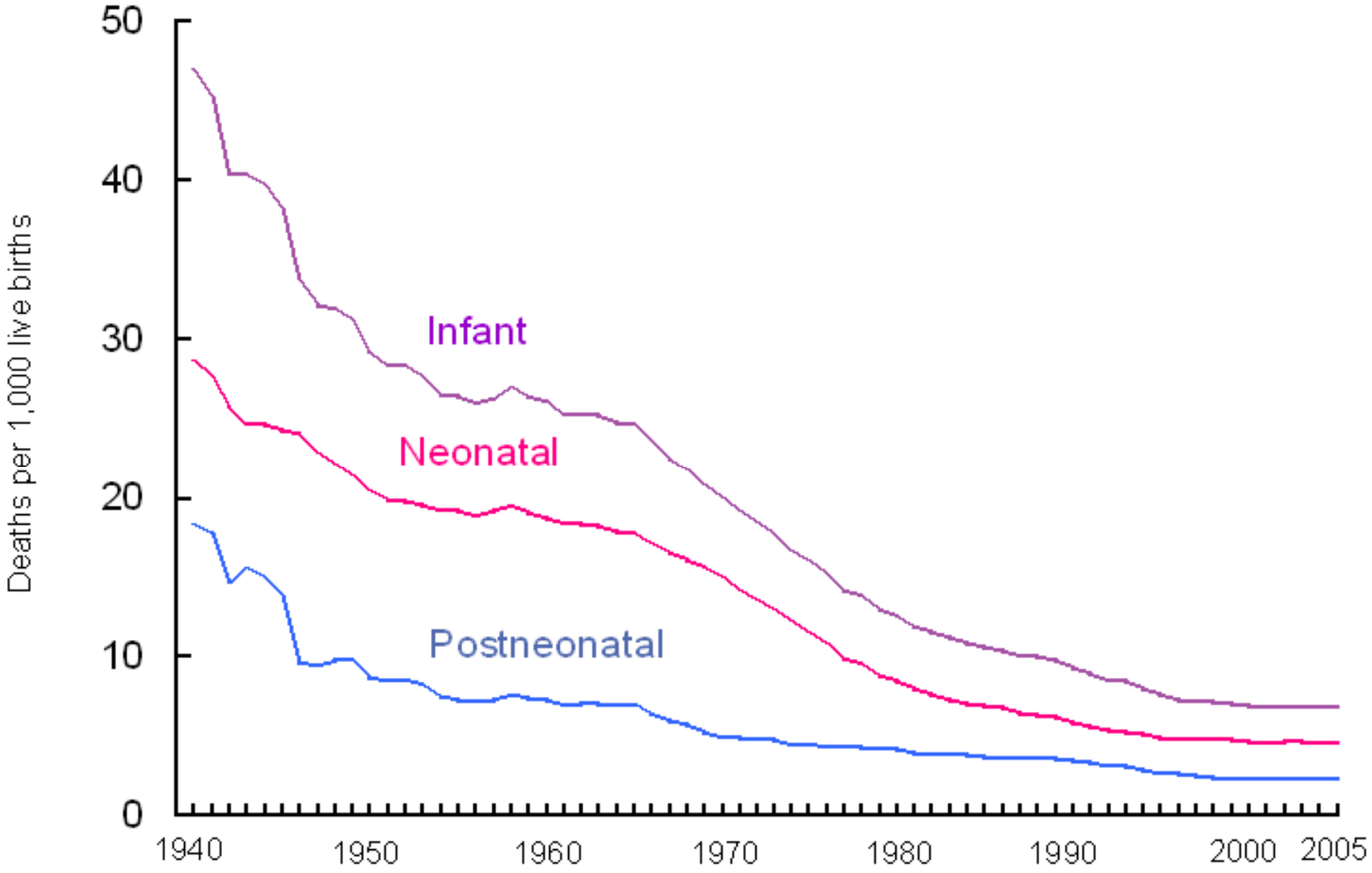
Figure 5. Children in sub-Saharan Africa and South Asia face a higher risk of dying before their fifth birthday

Under-five mortality rate (per 1,000 live births), 2011, by country

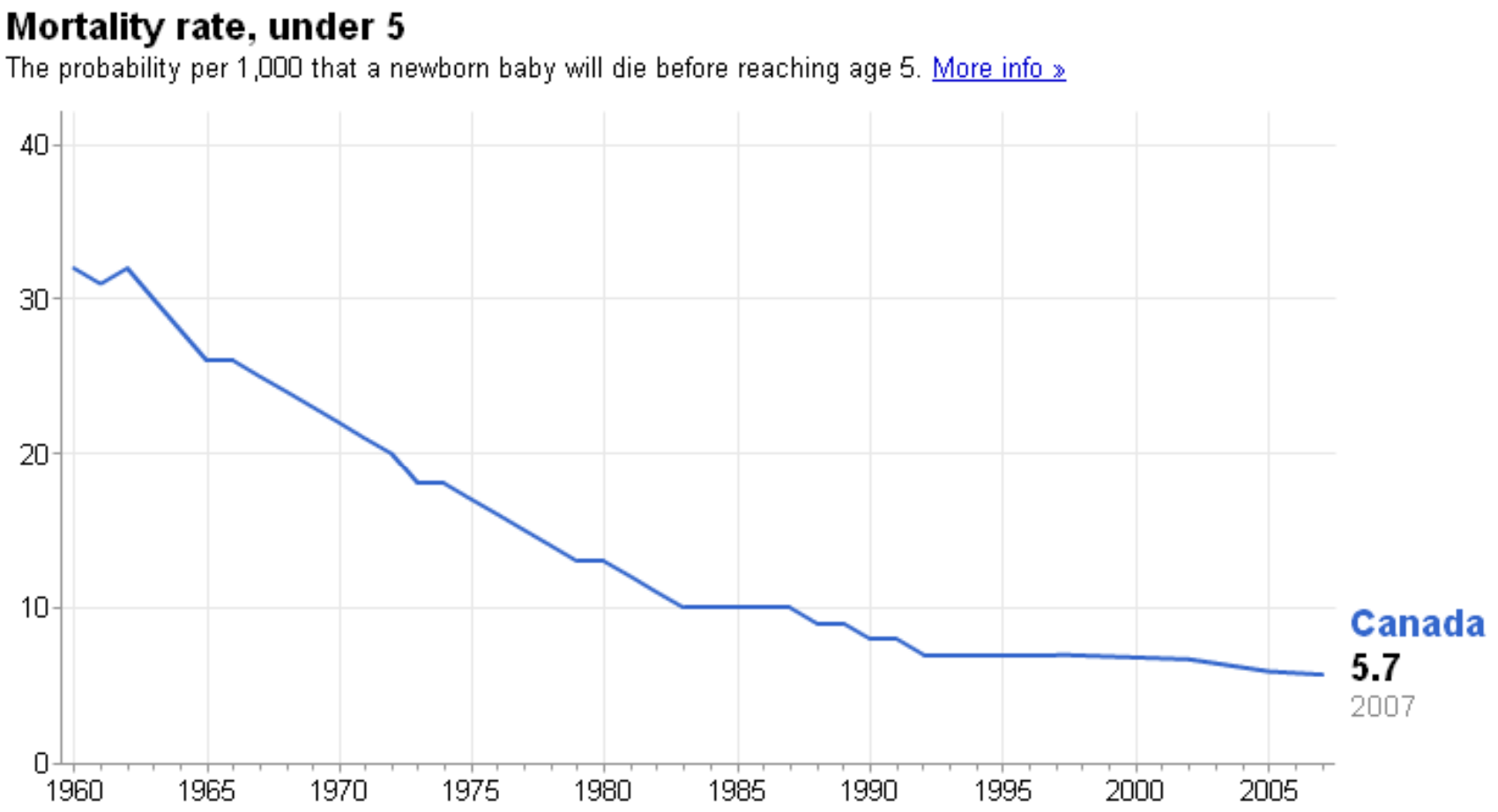


Note: This map is stylized and not to scale. It does not reflect a position by UN IGME agencies on the legal status of any country or territory or the delimitation of any frontiers.

UNICEF



Infant, neonatal, and postneonatal mortality rates: United States, 1940-2005 (Wikipedia)



Google public data.

Traditional Indicators in Pop Health

Maternal Mortality Ratio (MMR)

- Also called "obstetrical death rate"
- Proportion of women giving birth who die during or shortly after pregnancy
- Usually given as number of deaths per 100,000 live births
- E.g., In 2000, there were approximately 400 maternal deaths per 100,000 live births, worldwide
  - 99% of maternal deaths occur in low income countries
  - www.who.int/reproductive-health/publications/maternal_mortality_2000

Traditional Indicators in Pop Health

Deaths are usually preventable

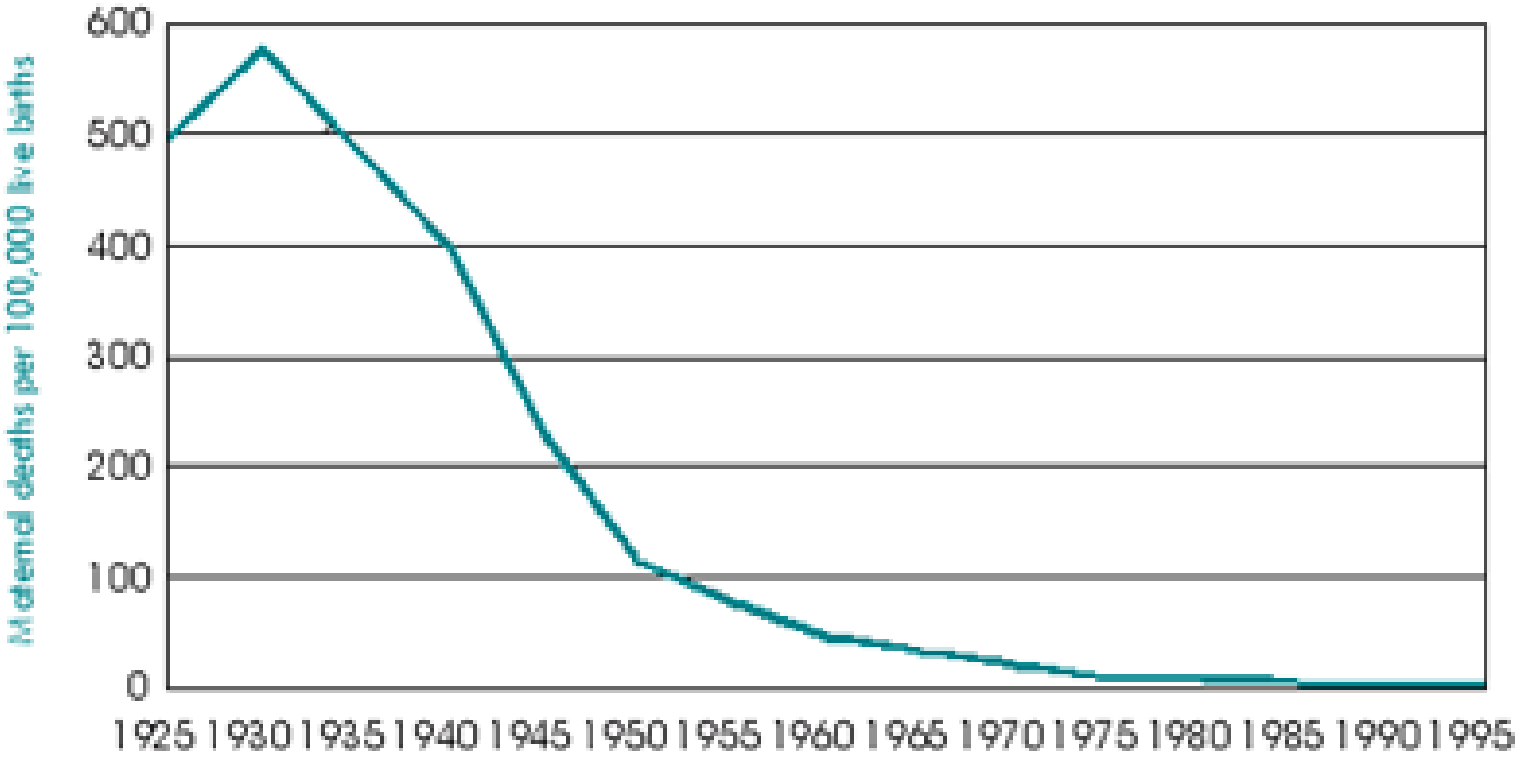
- Infant/Child Mortality Rate and Maternal Mortality Ratio are considered to be key indicators for assessing the quality of a health care system. **WHY?**

In high-income countries, virtually all women have at least four antenatal care visits, are attended by a skilled health worker during childbirth and receive postpartum care. In low-income countries, just over a third of all pregnant women have the recommended four antenatal care visits.

Other factors that prevent women from receiving or seeking care during pregnancy and childbirth are:

- poverty
- distance
- lack of information
- inadequate services
- cultural practices.

Maternal Mortality Ratios in Canada, 1925 to 1995



Source: Statistics Canada. *Selected mortality statistics, Canada, 1921-1990*.

IMR and MMR

- *Canada:* infant mortality rate is 4.63 deaths per 1000 live births
- *Canada*: MMR is 5 maternal deaths per 100,000 live births

- *Haiti*: infant mortality rate is 63.83 deaths per 1000 live births
- *Haiti:* MMR is 520 maternal deaths per 100,000 live births

Source: UNICEF and CIA World Factbook

Table 2. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, and lifetime risk by United Nations Millennium Development Goal region, 2010

Region	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death,[a] 1 in:
		Lower estimate	Upper estimate		
World	210	170	300	287 000	180
Developed regions[b]	16	14	18	2200	3800
Developing regions	240	190	330	284 000	150
Northern Africa[c]	78	52	120	2800	470
Sub-Saharan Africa[d]	500	400	750	162 000	39
Eastern Asia[e]	37	24	58	6400	1700
Eastern Asia excluding China	45	27	85	400	1500
Southern Asia[f]	220	150	310	83 000	160
Southern Asia excluding India	240	160	380	28 000	140
South-eastern Asia[g]	150	100	220	17 000	290
Western Asia[h]	71	48	110	3500	430
Caucasus and Central Asia[i]	46	37	62	750	850
Latin America and the Caribbean	80	68	99	8800	520
Latin America[j]	72	61	88	7400	580
Caribbean[k]	190	140	290	1400	220
Oceania	200	98	430	510	130

UNFPA

Region	MMR[a]	Number of maternal deaths[a]	HIV-attributed MMR	Number of AIDS-related indirect maternal deaths attributed to HIV[a]	Percentage of AIDS-related indirect maternal deaths[a]
World	210	287 000	14	19 000	6.5
Developed regions[b]	16	2200	2	220	10.0
Developing regions	240	284 000	15	18 000	6.4
Northern Africa[c]	78	2800	0	9	0.3
Sub-Saharan Africa[d]	500	162 000	52	17 000	10.4
Eastern Asia[e]	37	6400	0	69	1.1
Eastern Asia excluding China	45	400	0	0	0.1
Southern Asia[f]	220	83 000	2	920	1.1
Southern Asia excluding India	240	28 000	1	68	0.2
South-eastern Asia[g]	150	17 000	2	230	1.4
Western Asia[h]	71	3500	0	1	0
Caucasus and Central Asia[i]	46	750	1	9	1.2
Latin America and the Caribbean	80	8800	2	260	3.0
Latin America[j]	72	7400	2	180	2.4
Caribbean[k]	190	1400	11	84	5.9
Oceania[l]	200	510	5	14	2.7

UNFPA

Table 4. Comparison of 1990 and 2010 maternal mortality ratio (MMR, maternal deaths per 100 000 live births) and number of maternal deaths, by United Nations Millennium Development Goal region

Region	1990[a]		2010[a]		% change in MMR between 1990 and 2010[a]	Average annual % change in MMR between 1990 and 2010[a]
	MMR	Maternal deaths	MMR	Maternal deaths		
World	400	543 000	210	287 000	–47	–3.1
Developed regions[b]	26	4000	16	2200	–39	–2.5
Developing regions	440	539 000	240	284 000	–47	–3.1
Northern Africa[c]	230	8500	78	2800	–66	–5.3
Sub-Saharan Africa[d]	850	192 000	500	162 000	–41	–2.6
Eastern Asia[e]	120	30 000	37	6400	–69	–5.7
Eastern Asia excluding China	53	610	45	400	–15	–0.8
Southern Asia[f]	590	233 000	220	83 000	–64	–4.9
Southern Asia excluding India	590	70 000	240	28 000	–59	–4.4
South-eastern Asia[g]	410	50 000	150	17 000	–63	–4.9
Western Asia[h]	170	7000	71	3500	–57	–4.2
Caucasus and Central Asia[i]	71	1400	46	750	–35	–2.1
Latin America and the Caribbean	140	16 000	80	8800	–41	–2.6
Latin America[j]	130	14 000	72	7400	–43	–2.8
Caribbean[k]	280	2300	190	1400	–30	–1.8
Oceania[l]	320	620	200	510	–38	–2.4

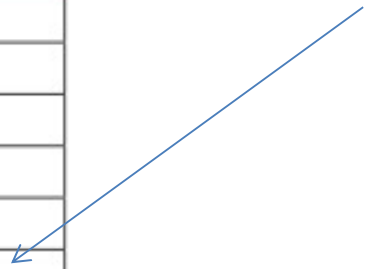
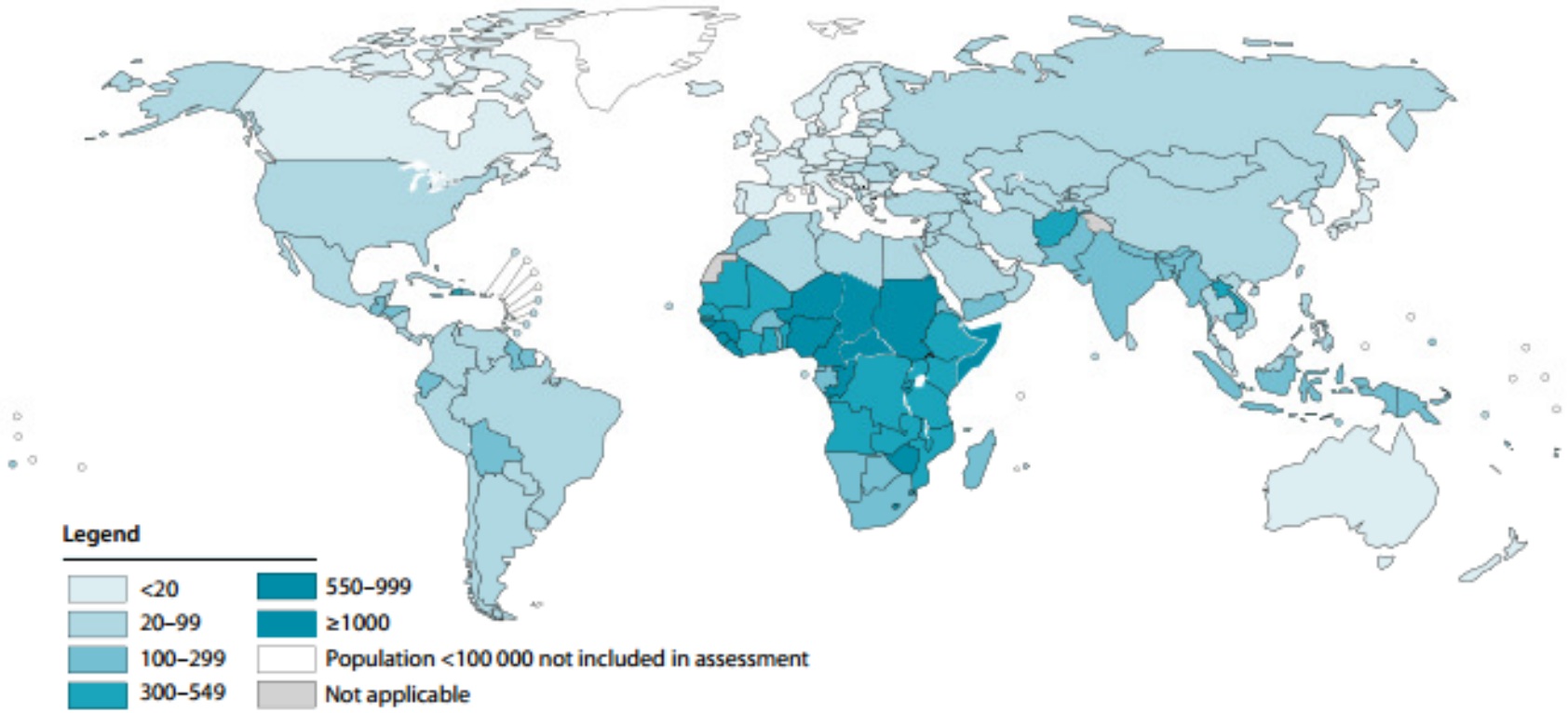


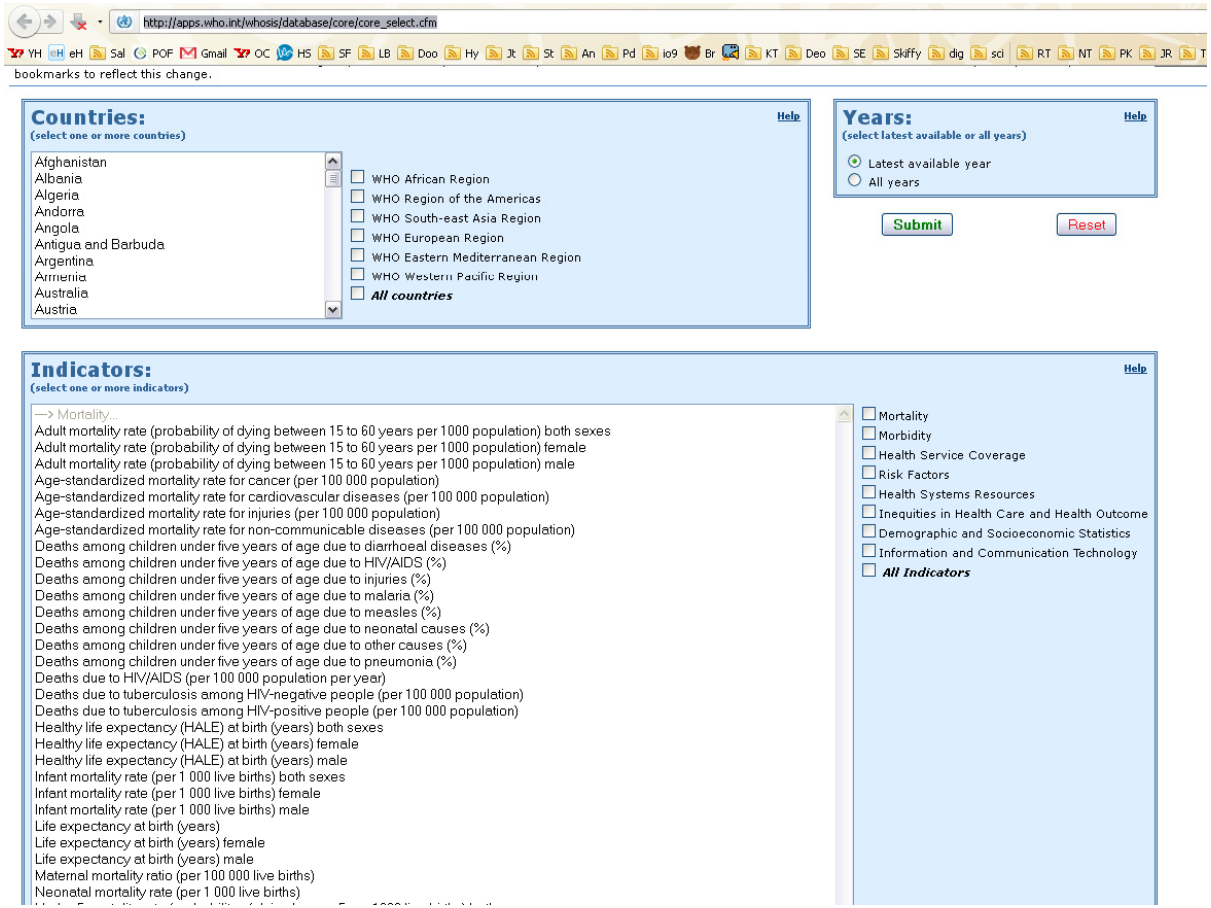
Figure 1. Map with countries by category according to their maternal mortality ratio (MMR, death per 100 000 live births), 2010



UNFPA

Core Health Indicators

- WHO collects an shares “core” indicators
  - http://apps.who.int/whosis/database/core/core_select.cfm



More Core Indicators

- Center for Global Development
  - http://www.cgdev.org/section/initiatives/_archive/ghprn/workinggroups/indicators
  - 2006 working group decided to identify the most important global health indicators:
    - http://www.cgdev.org/doc/ghprn/Measuring_Commitment_to_Health,final.pdf
    - You can also download an Excel sheet with the whole list from the top link

More Core Indicators

- Center for Global Development
- Their list includes:
  - Total fertility rate, low birthweight rate, contraceptive prevalence rate, out-of-pocket expenditures on health care, hospital bed density, etc

More interesting indicators

- Female empowerment:
  - Proportion of women in government
  - Women in workforce
  - Female education rate
    - Relative to male rate
  - Age at marriage
  - Age at first pregnancy
  - Etc.

Example of use of indicators for strange purposes: Our paper on the Arab Spring

- http://www.ruor.uottawa.ca/fr/handle/10393/22750

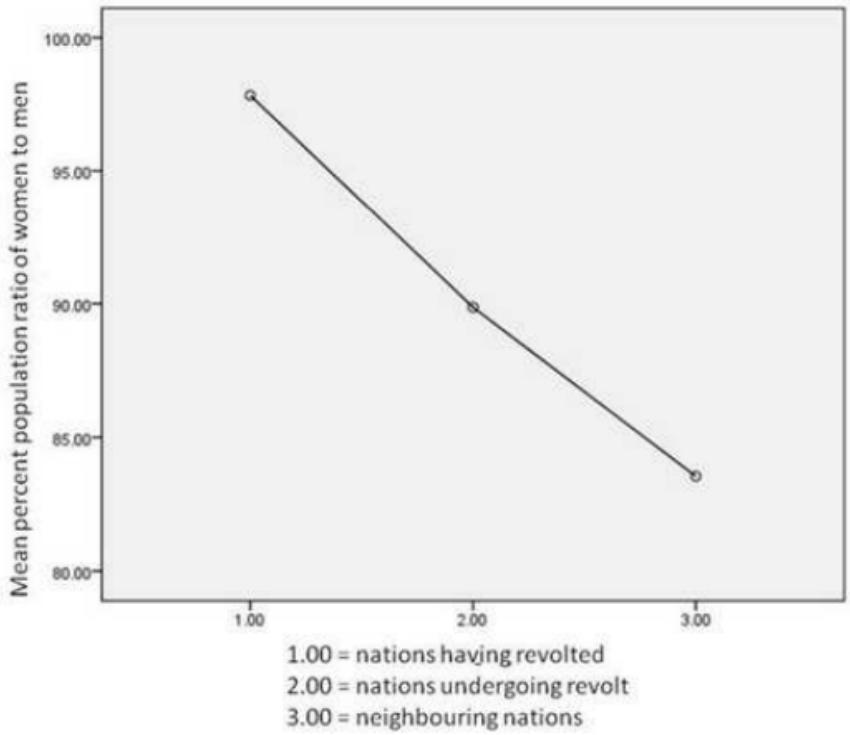


FIGURE 1 – The mean population ratio of women to men in three categories of Arab nations.

A Word About Numbers

- Keep in mind “relative” vs “absolute” measures
  - Relative = ratio or proportion
    - Eg, MMR in Deonandia was 620 deaths per 100,000 births
  - Absolute = pure number
    - Eg, Number of maternal deaths in Deonandia this year was 2 (based on 323 births)

Which to use?

Aside…

- Professor Donna Stewart at U of T argues that Canada's low MMR is an *underestimate* that does not serve our policy needs
- Why?

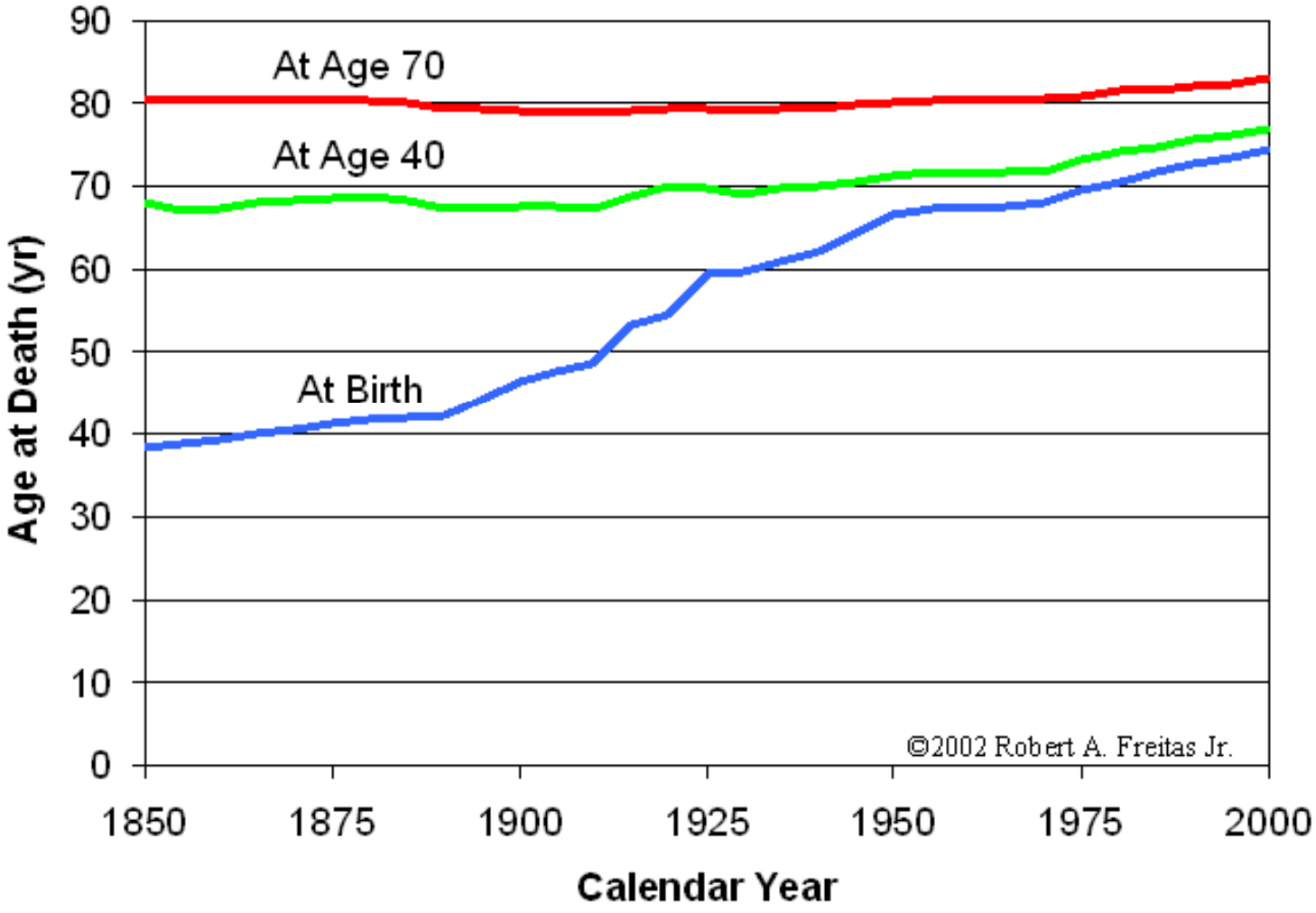
Does not consider deaths attributed to domestic violence or mental illness

Traditional Indicators in Pop Health

Life Expectancy

- The expected time remaining to live
- Usually given relative to birth
- E.g., Presently, life expectancy at birth is 32.6 years in Swaziland and 81 years in Japan
- Life expectancy is computed using “life tables”, which means that it will vary depending on what age it is calculated for….

Life Expectancy



Life expectancy in the USA,
stolen from www.imminst.org

Life Expectancy

What's the problem with using life expectancy as a gauge of population health?

- More ill-health and disabilities, and greater suffering?
- Longer period of life in good health?
- Does long life = productive life? →economics
- Some have proposed using "healthy life expectancy" or HLE (meanwhile, TLE="total life expectancy")
  - The expected number of years to be spent in *good health*
  - Need to weight different disabilities based on severity

Traditional Indicators in Pop Health

QALYs

- "Quality Adjusted Life Years"
- www.jr2.ox.ac.uk/bandolier/booth/glossary/QALY.htm
- Used to measure both the quality and quantity of life years lived as a result of a medical intervention
- QALY = (year lived) x (index)
  - Index = 0 → 1
  - 0 = death, 1 = perfect health
- E.g., new heart valve saves your life, but hinders your quality of life

Traditional Indicators in Pop Health

DALYs

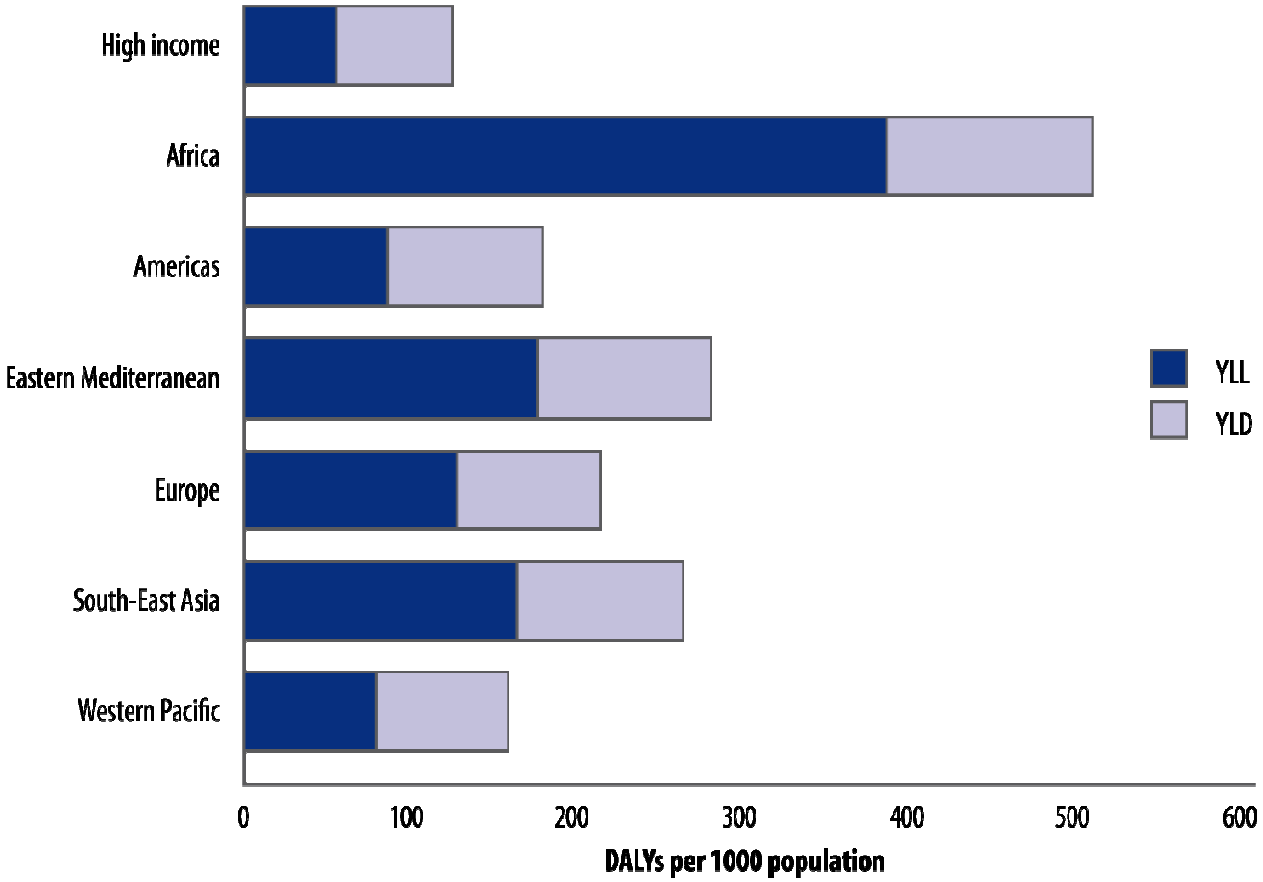
- "Disability Adjusted Life Year" invented in 1996
- Measure of overall disease burden in a population
- www.who.int/healthinfo/boddaly
- DALY = **YLL** + **YLD**
  - YLL = years of life lost in the population due to death from a specific health concern (eg, because of Cooties, Deonandia lost a total of 120 years of person-years due to premature death)
  - YLD = years of productive life lost due to disability, rather than death
- Similar construct: "Disability Adjusted Life Expectancy" or **DALE**
  - E.g., Japan has a disability adjusted life expectancy of 74.5 years

The Value of DALYs

- Now that we can include a measure of suffering, non-lethal diseases begin to take on prominence
- According to WHO, by 2020 the 2nd most costly disease in the world, in terms of DALYs, will be…

DEPRESSION

YLL, YLD and DALYs by region, 2004



5 of the 10 leading causes of global disability are psychiatric conditions.

Psychiatric and neurologic conditions account for 28% of all years lived with disability, but only 1.4% of all deaths and 1.1% of years of life lost

-WHO, 1990

Current Global Burden of Disease (DALYs, 1999)

1. Acute lower respiratory infections
2. HIV/AIDS
3. Perinatal conditions
4. Diarrhea
5. Unipolar major depression
6. Ischemic heart disease
7. Cerebrovascular disease
8. Malaria
9. Traffic injuries
10. COPD
11. Congenital abnormalities
12. TB
13. Falls
14. Measles
15. Anemia

Source: WHO, Evidence, Information and Policy, 2000

Leading Causes of Mortality and Burden of Disease world, 2004

Mortality

		%
1.	Ischaemic heart disease	12.2
2.	Cerebrovascular disease	9.7
3.	Lower respiratory infections	7.1
4.	COPD	5.1
5.	Diarrhoeal diseases	3.7
6.	HIV/AIDS	3.5
7.	Tuberculosis	2.5
8.	Trachea, bronchus, lung cancers	2.3
9.	Road traffic accidents	2.2
10.	Prematurity, low birth weight	2.0

DALYs

		%
1.	Lower respiratory infections	6.2
2.	Diarrhoeal diseases	4.8
3.	Depression	4.3
4.	Ischaemic heart disease	4.1
5.	HIV/AIDS	3.8
6.	Cerebrovascular disease	3.1
7.	Prematurity, low birth weight	2.9
8.	Birth asphyxia, birth trauma	2.7
9.	Road traffic accidents	2.7
10.	Neonatal infections and other	2.7

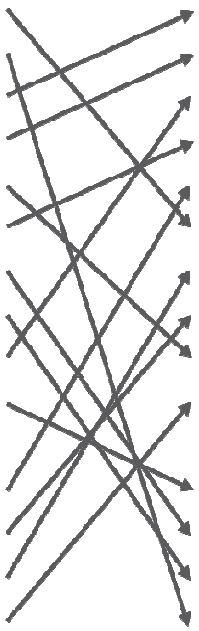
Projected Global Burden of Disease (DALYs, 2020)

1. Ischemic heart disease
2. Unipolar major depression
3. Traffic injuries
4. Cerebrovascular disease
5. COPD
6. Lower respiratory infections
7. TB
8. War
9. Diarrhea
10. HIV
11. Perinatal conditions
12. Violence
13. Congenital abnormalities
14. Self-inflicted injuries
15. Trachea, bronchus and lung cancers

Source: WHO, Evidence, Information and Policy, 2000

Ten leading causes of burden of disease, world, 2004 and 2030

2004 Disease or injury	As % of total DALYs	Rank		Rank	As % of total DALYs	2030 Disease or injury
Lower respiratory infections	6.2	1		1	6.2	Unipolar depressive disorders
Diarrhoeal diseases	4.8	2		2	5.5	Ischaemic heart disease
Unipolar depressive disorders	4.3	3		3	4.9	Road traffic accidents
Ischaemic heart disease	4.1	4		4	4.3	Cerebrovascular disease
HIV/AIDS	3.8	5		5	3.8	COPD
Cerebrovascular disease	3.1	6		6	3.2	Lower respiratory infections
Prematurity and low birth weight	2.9	7		7	2.9	Hearing loss, adult onset
Birth asphyxia and birth trauma	2.7	8		8	2.7	Refractive errors
Road traffic accidents	2.7	9		9	2.5	HIV/AIDS
Neonatal infections and other[a]	2.7	10		10	2.3	Diabetes mellitus
COPD	2.0	13		11	1.9	Neonatal infections and other[a]
Refractive errors	1.8	14		12	1.9	Prematurity and low birth weight
Hearing loss, adult onset	1.8	15		15	1.9	Birth asphyxia and birth trauma
Diabetes mellitus	1.3	19		18	1.6	Diarrhoeal diseases



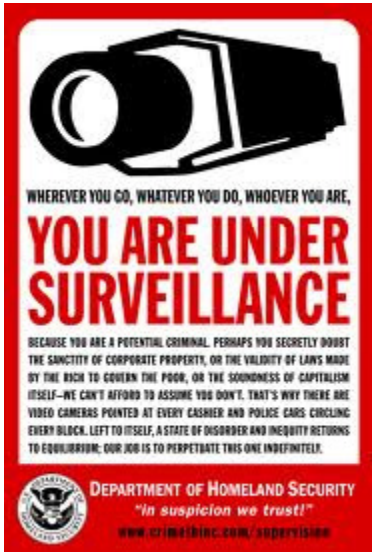
Challenges

- Consistent definition and use of indicators
- Choosing the right indicator to tell the right story
- Numbers are collected in different ways by different people in different countries in different years
- Many (most) countries do not have infrastructure to collect numbers accurately or routinely…

→SURVEILLANCE

-the practice of monitoring the spread of disease in order to establish patterns of progression

In epidemiology, we don't mean this:



Epidemiological Surveillance Systems

"The systematic collection of data pertaining to the occurrence of specific diseases, the analysis and interpretation of these data, and the dissemination of consolidated and processed information to contributors to the program and other interested persons."

Raska, K. 1966. "National and international surveillance in the control of infectious diseases." WHO Chronicles. 20:313-321

Some Sources of Surveillance Data

- Health Canada
- CDC
- WHO
- World Bank

The Data Flow Model for TB Surveillance in Guyana