

CHRONIC DISEASES

An International Epidemic

Prof K Srinath Reddy
President, Public Health Foundation of India
President, World Heart Federation

GBD 2010

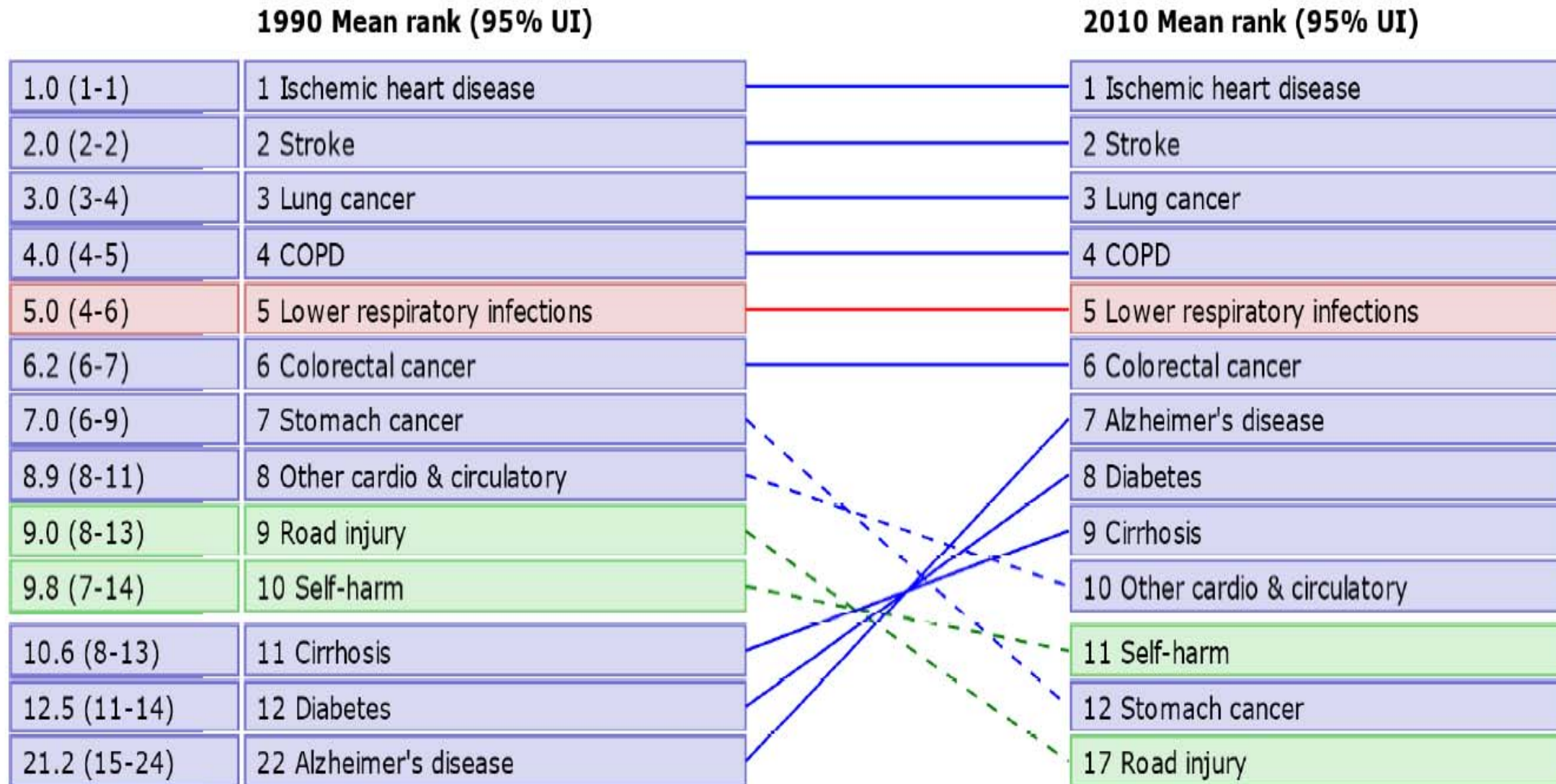
Mortality

- **Total = 52.8 Million Deaths**
NCDs = 34.5 Million
- **Communicable, Maternal, Neonatal and Nutritional causes = 24.9%**
(Down From 34.1% in 1990)
- **Non-Communicable Diseases = 65.3%**
(Up From 57% in 1990)

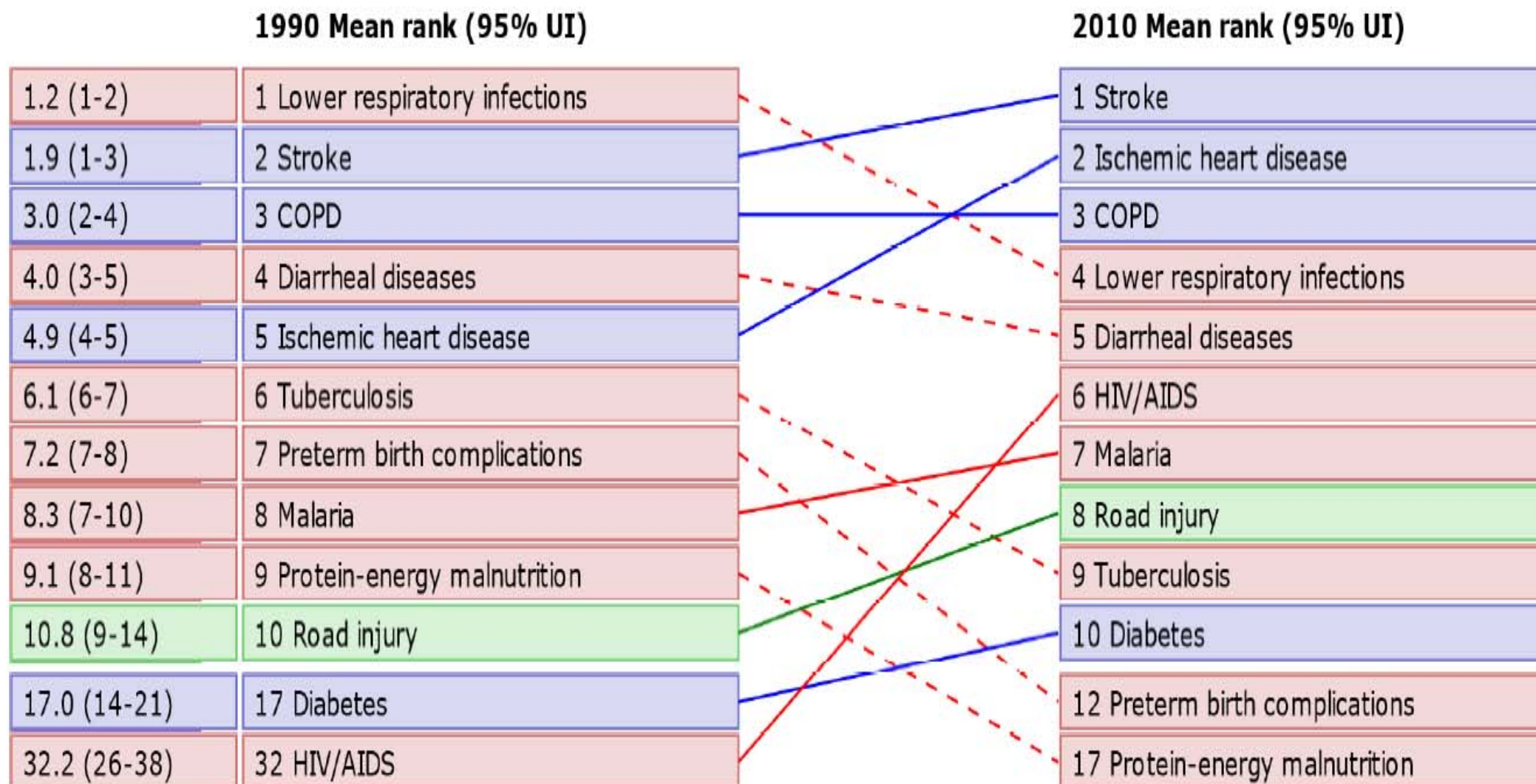
Lancet 2012

Causes of death (GBD 2010)

Developed Countries

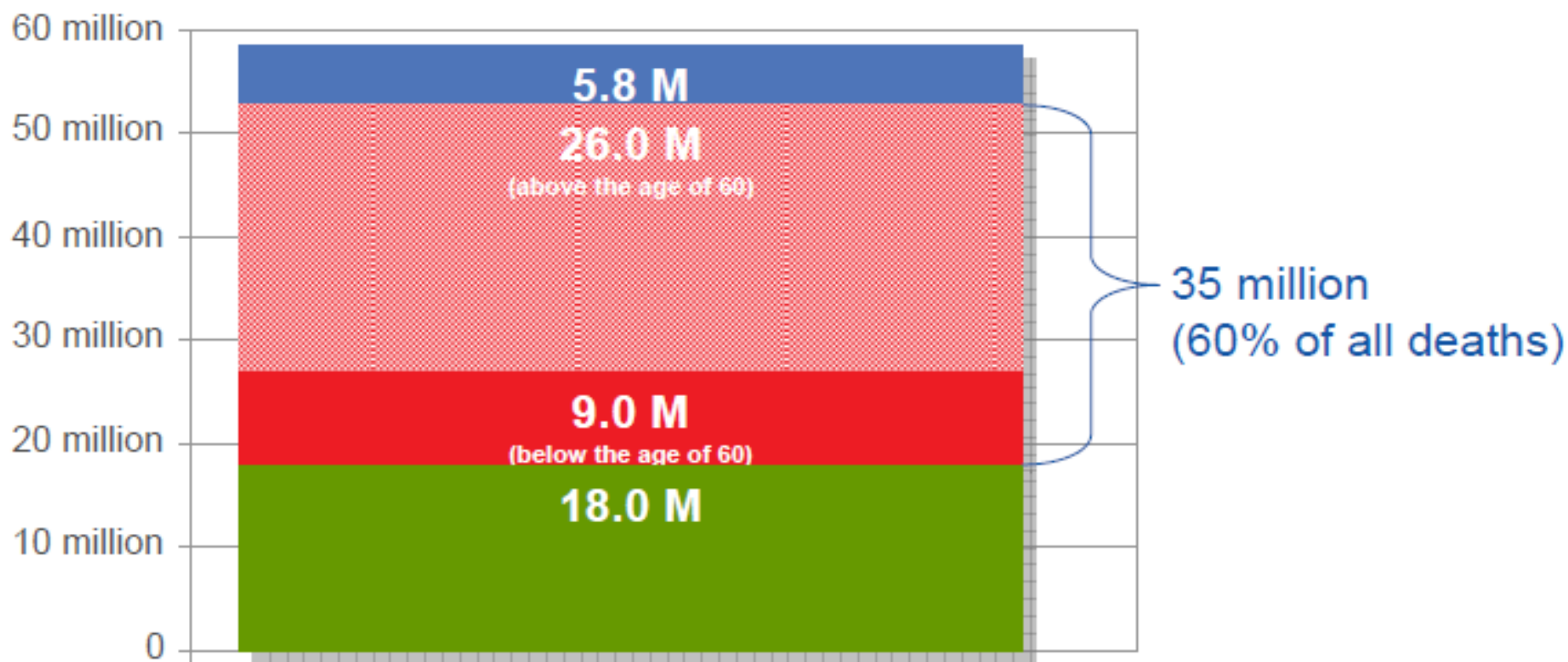


Causes of death (GBD 2010) Developing Countries



NCDs are the single biggest cause of death

Total number of deaths in the world



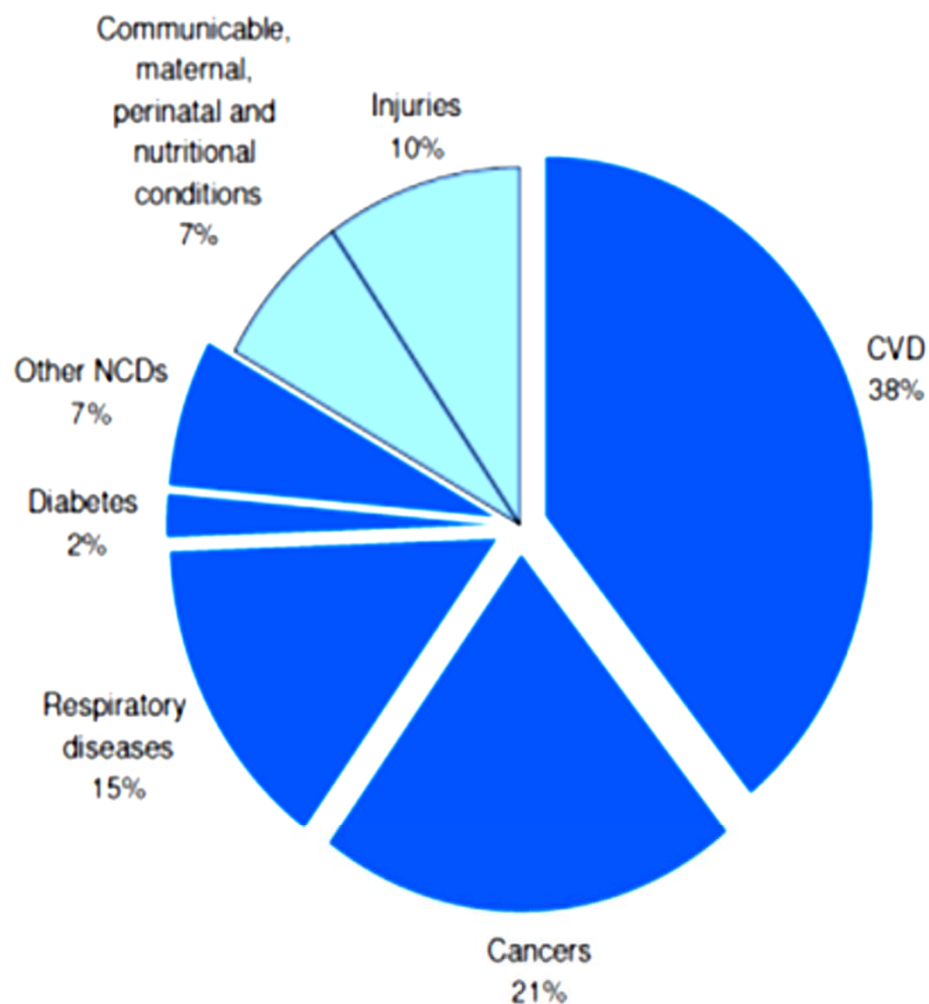
■ Group III - Injuries

▨ Group II – Other deaths from noncommunicable diseases

■ Group II – Premature deaths from noncommunicable diseases (below the age of 60), which are preventable

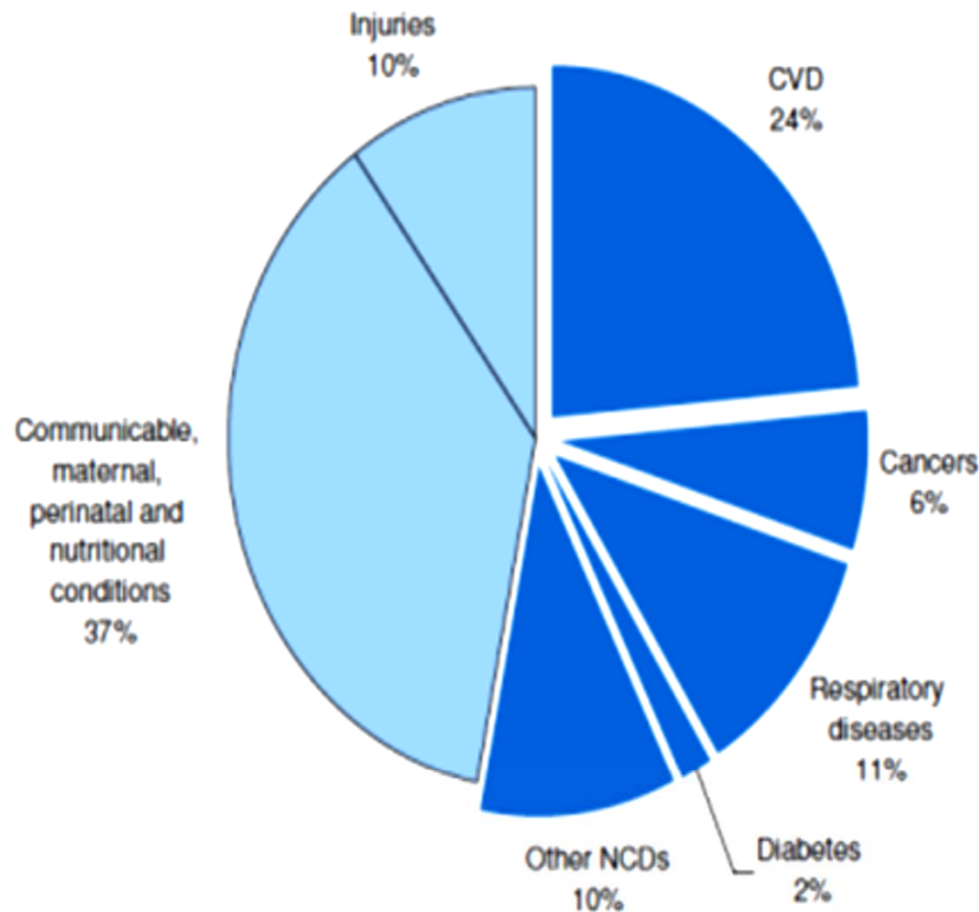
■ Group I – Communicable diseases, maternal, perinatal and nutritional conditions

CHINA: proportional mortality (% of total deaths, all ages, 2010)



**NCD's = 83%
of all deaths**

INDIA: proportional mortality (% of total deaths, all ages, 2010)



**NCD's = 53%
of all deaths**

NCDs & ECONOMIC DEVELOPMENT (HIC vs LMIC)

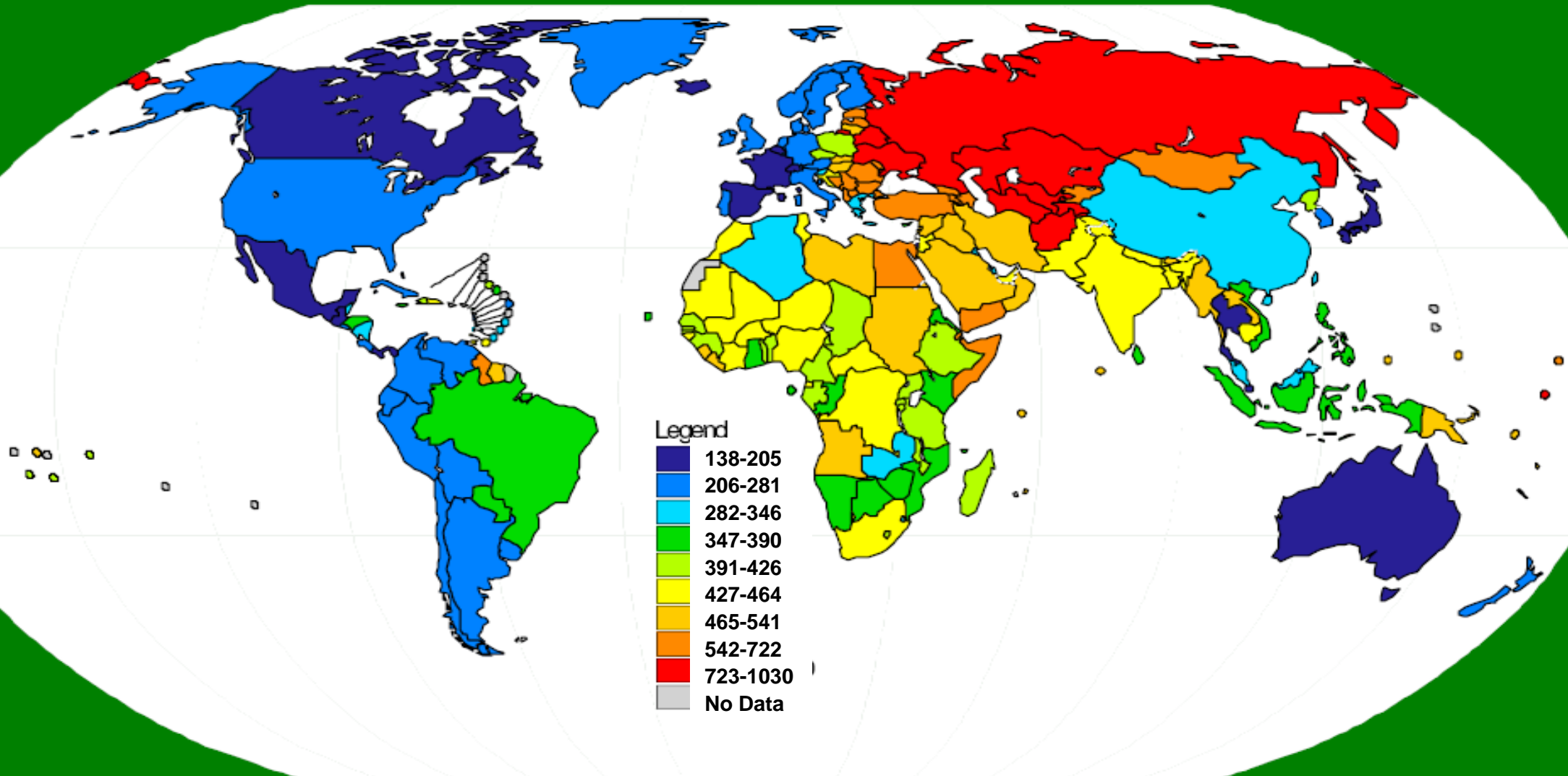
- ❑ **Proportional Mortality Is Higher in HIC**
- ❑ **Absolute Mortality Is Higher in LMIC**

BUT

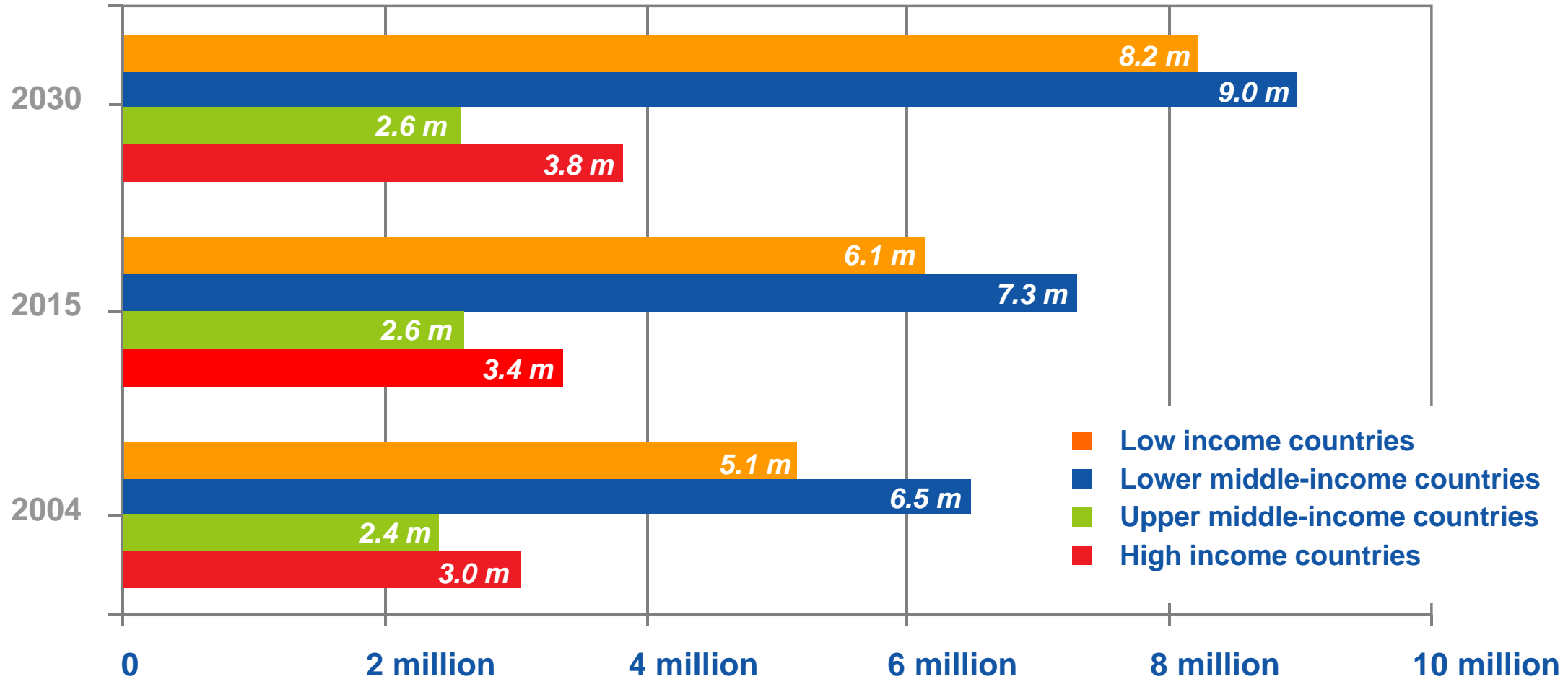
- ❑ **Age Standardised Mortality Rates Are
Also Higher In LMIC!**

Cardiovascular disease

(Age-standardized death rate per 100 000, males)



More people die from heart diseases and strokes in the poorest developing countries than in the richest industrialized countries



Estimated deaths from cardiovascular diseases (2004)

Global Burden of Cancer

- **14 million new cases in 2012; expected to rise to 22 million cases in next two decades**
- **More than 60% of the world's total cases occur in Africa, Asia, and Central and South America, and these regions account for about 70% of the world's cancer deaths**
- **Total annual economic cost of cancer in 2010 was estimated at approximately US\$ 1.16 trillion**

World Cancer Report; 2014

Is NCD an issue for poor countries? YES!

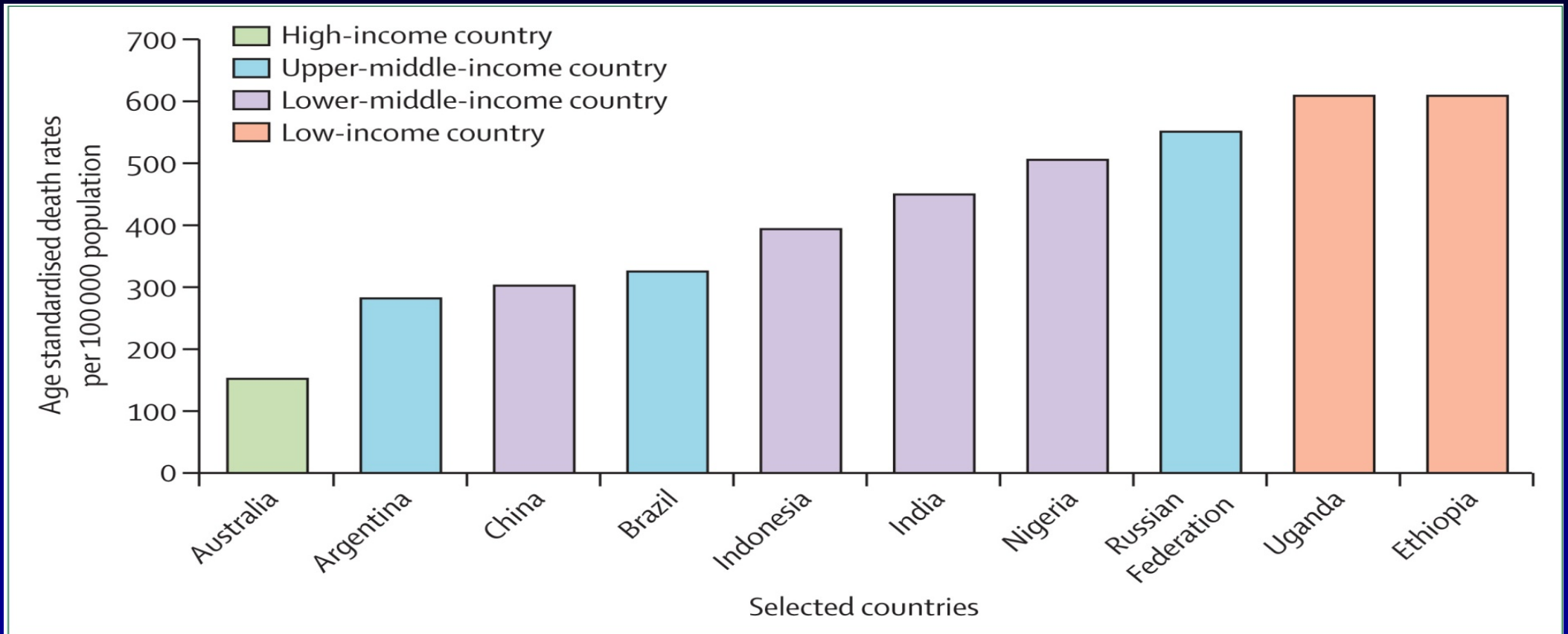


Figure 2: NCD death rates in people aged 15–69 years, by World Bank income groups, 2008⁴
NCD=non-communicable disease.

Source: Beaglehole R, Bonita R, Alleyne G, et al for the Lancet NCD Action group UN HLM on NCDs: Addressing four questions. Lancet 2011; POL June 13 2011

The Rising NCD Challenge In Developing Regions Including Younger Populations

Deaths from NCDs as a share of total deaths, 2008–2030*

High-income countries

All ages, percent

Ages 15–59, percent

Middle- and low-income countries by region

Europe and Central Asia

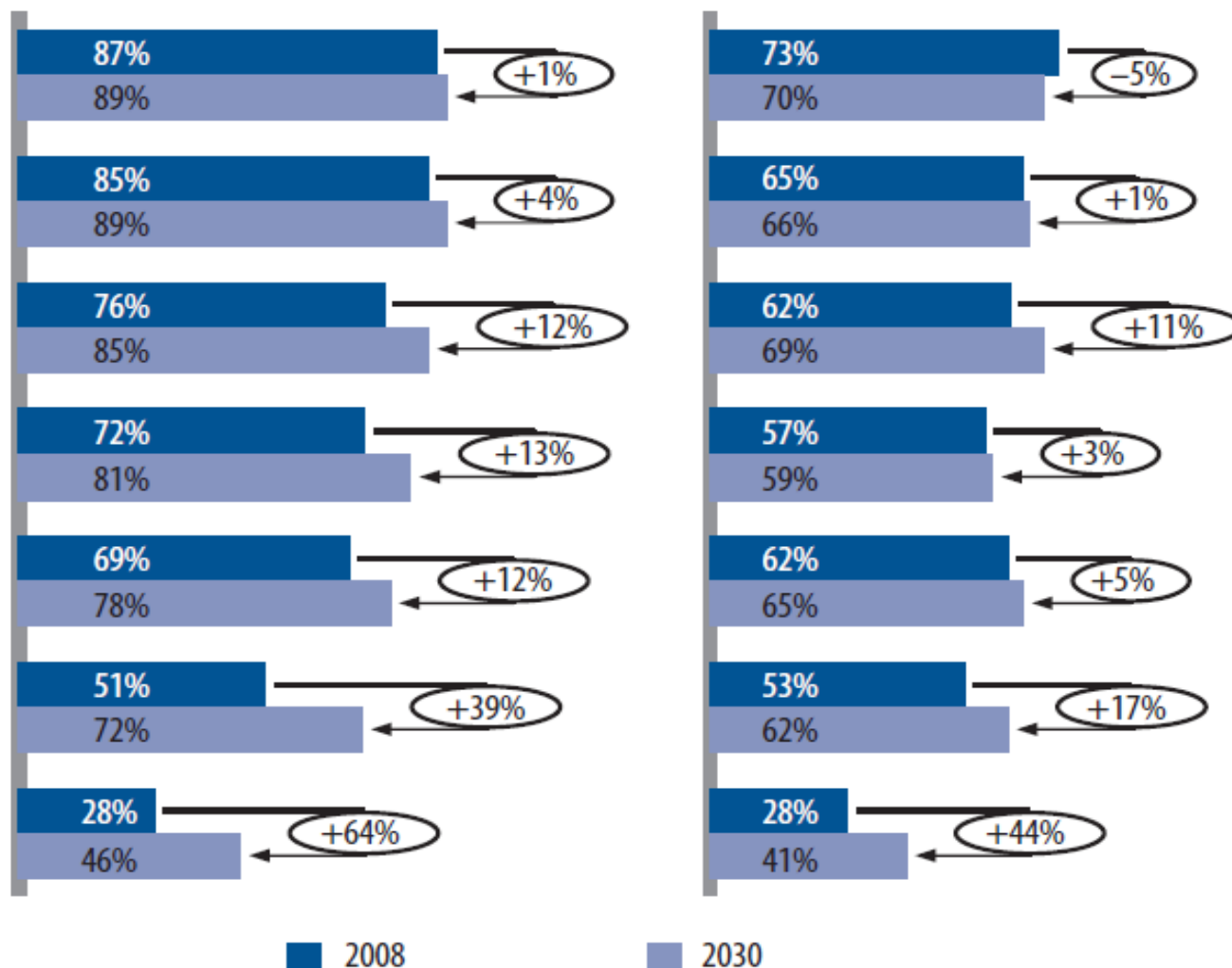
East Asia and Pacific

Latin America and the Caribbean

Middle East and North Africa

South Asia

Sub-Saharan Africa







GLOBAL VARIATION IN STROKE AND CHD

- **Stroke burden disproportionately higher in China, Africa and South America**
- **CHD mortality higher in Middle East, North America, Australia and much of Europe**
- **Lower national income was associated with higher relative mortality and burden of disease from stroke.**
- **Diabetes mellitus and mean serum cholesterol associated with higher relative burden of CHD, even after adjustment for national income**

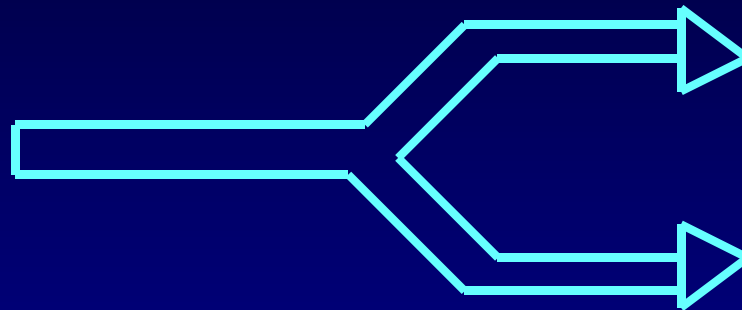
Why are different countries showing different patterns of CVD?

- **Rise/Fall of Mortality Rates**
- **CHD/Stroke As Dominant CVD**

Stages of Health Transition

| Stage I Age of Pestilence and Famine | Stage II Age of Receding Pandemics | Stage III Age of 'Man Made' Degenerative Diseases | Stage IV Age of Delayed Degenerative Diseases | Stage V Age of Social Upheaval and Health Regression | Stage VI Era of Environmental Degradation | |
|---|---|--|---|---|--|---|
| <p>Sub Saharan Africa</p>  | | <p>Rural India</p>  | | <p>Russia</p>  | |  |
| <p>Omran (1971)</p> | | | <p>Olshansky and Ault (1986)</p> | | <p>Yusuf and Reddy (2001)</p> | <p>Thakker and Reddy (2008)</p> |

**HIGH BLOOD
PRESSURE**



HEMORRAGIC STROKE

**HYPERTENSIVE HEART
FAILURE**

THROMBOTIC STROKE

CORONARY HEART DISEASE



OTHER RISK FACTORS
(↑ Lipids; Smoking; Diabetes)

VALUE?

- **Health Transition Model Provides An Evolving Perspective Instead Of A Limited Cross-Sectional View**
- **It Helps To Anticipate The Epidemic And Provide A Proactive Preventive Response**

BUT

- **It Is Dominated By Proportional Mortality And Ignores Age Standardised Mortality Rates**
- **It Is Not Likely To Be A Simple Linear Model. Complex Systems Are Non-Linear**

Transitions That Shape Public Health

| | |
|------------------------|---------------------------------|
| 1.Demographic | 5.Economic |
| 2.Epidemiologic | 6.Energy |
| 3.Urban | 7.Biological, Ecological |
| 4.Nutritional | 8.Cultural |
| | 9.Democratic |

“ Do we not always find the diseases of the populace traceable to defects in society?”

“If disease is an expression of individual life under unfavorable circumstances, then epidemics must be indicative of mass disturbances.”

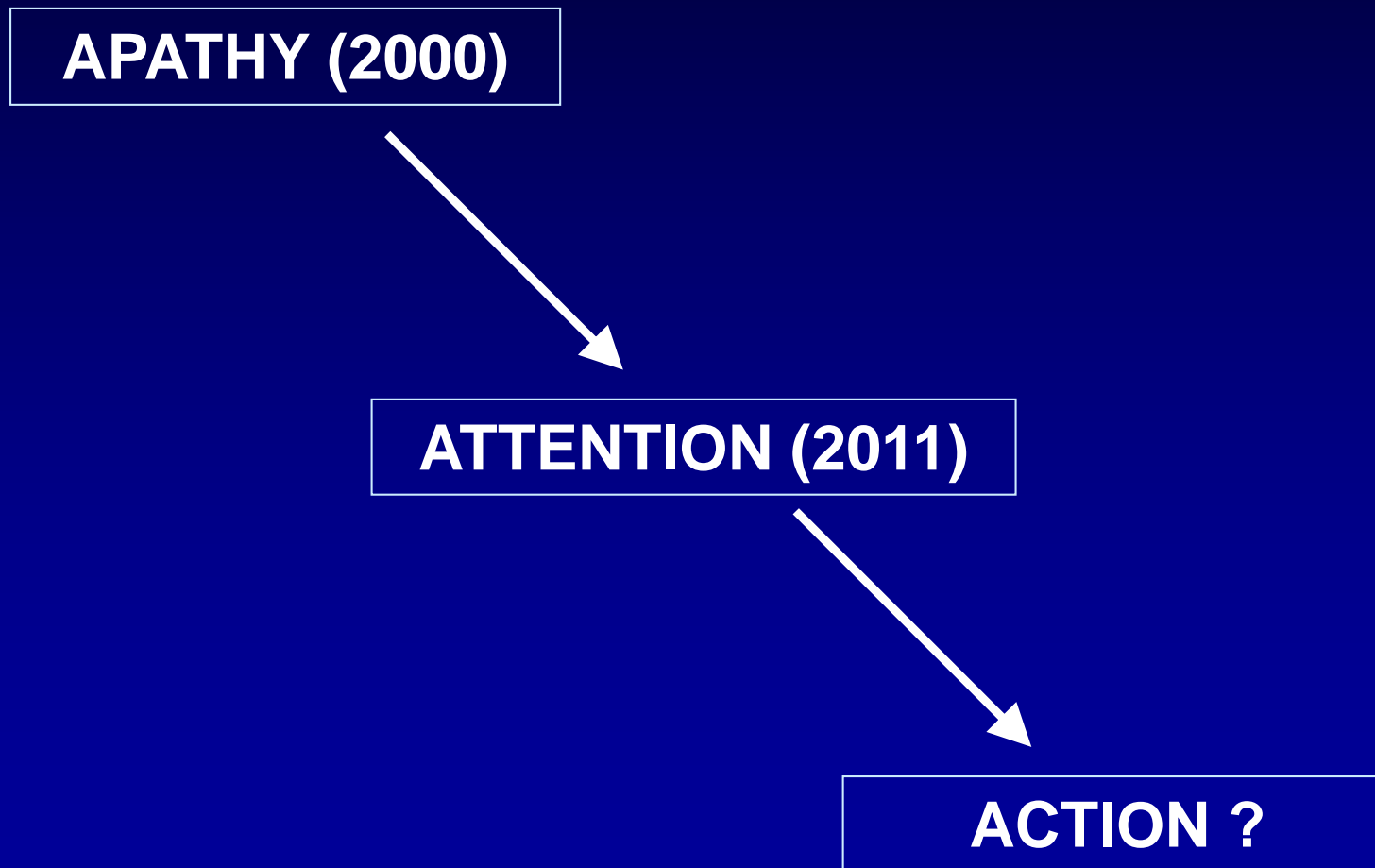
- Rudolf Virchow

DETERMINANTS

- Demographic Shifts (Aging)
 - Urbanization
 - Industrialisation
 - Globalization
 - Education
 - Culture
 - Poverty
 - Built Environment
- (Living Habits)
- (Marketing)
- (Beliefs)
- (Access to Health)
- (Barrier/Enabler)

Vectors : Tobacco; Unhealthy Food; Alcohol

Global Challenge of NCDs

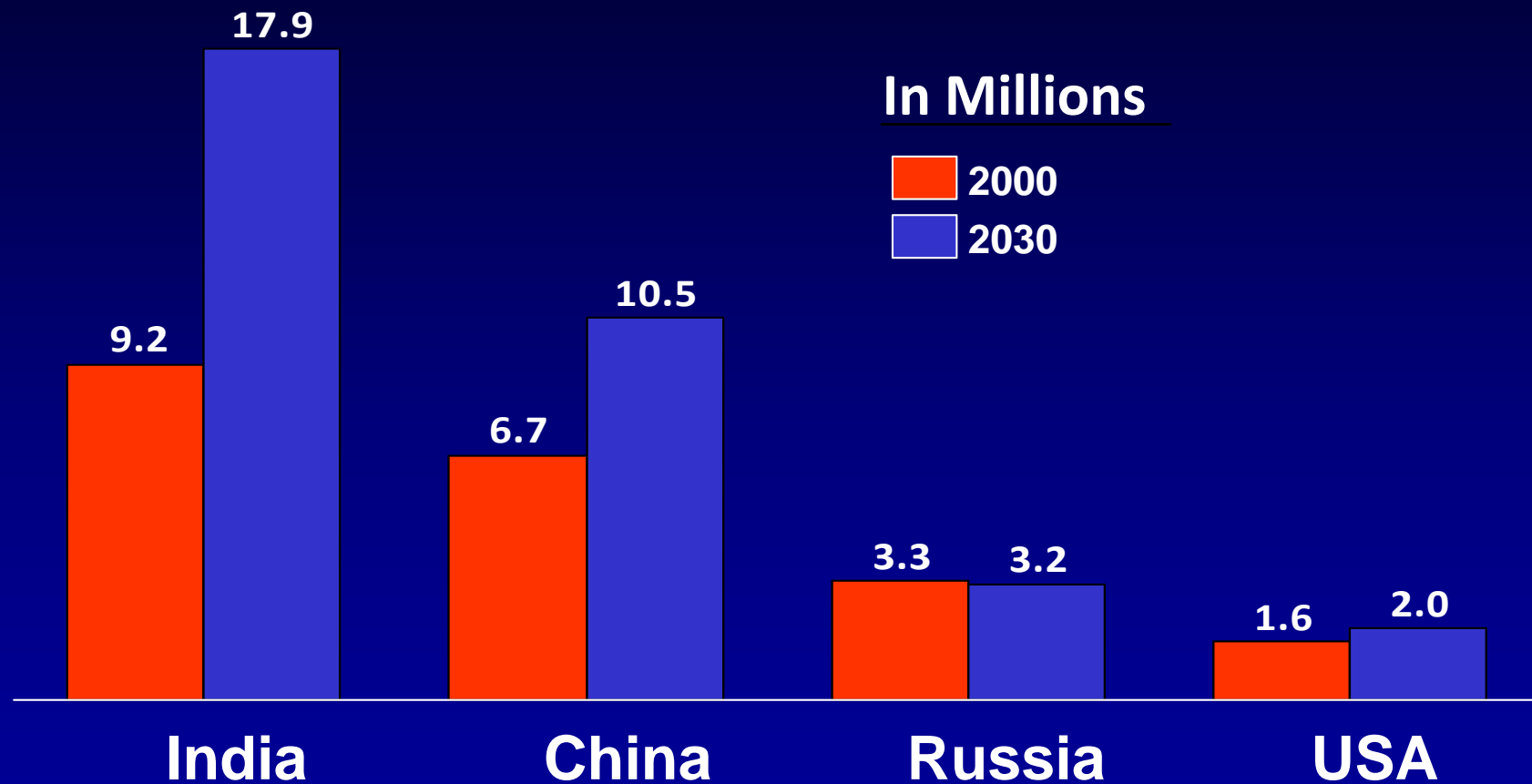


MYTHS DISPELLED; EVIDENCE AUGMENTED NOW IS THE TIME FOR ACTION

- NCDs are **NOT** the problem of only rich countries
- NCDs are **NOT** the problem of only the elderly
- NCDs also impose a huge economic burden in all regions of the world
- Risk factors of NCDs are rising across the world. To contain them is...



POTENTIALLY PRODUCTIVE YEARS OF LIFE LOST DUE TO CARDIOVASCULAR DEATHS (AGE GROUP : 35-64 YEARS)



Estimated Economic Loss for India due to
Heart Disease, Stroke and Diabetes (2005-2015) : US \$ 237 Billion - WHO

The World Bank Stand on NCDs (1999)

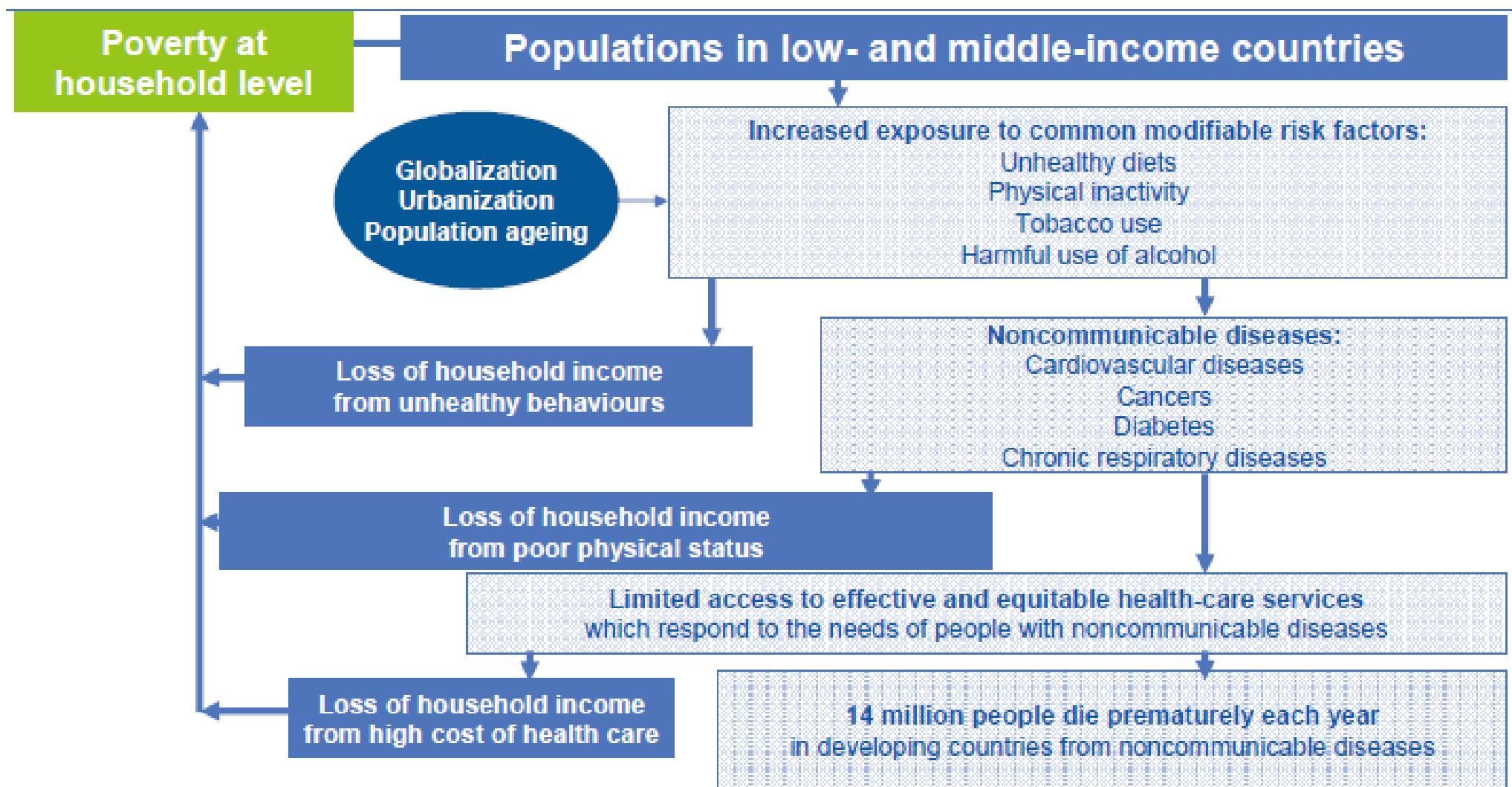
Article Title: The burden of disease among the global poor
Authors: Gwatkin DR, Guillot M, Heuveline P
Publication: Lancet 1999; 354: 586-89
Method: Comparison of disease burdens in the richest 20% and poorest 20%

“A faster decline in communicable diseases would decrease the poor-rich gap in 2020, but under an accelerated rate of overall decline in non-communicable diseases, the poor-rich gap would widen”

The World Bank on NCDs (2007)

“To what extent do NCDs affect the poor? The answer depends to some extent on the country and the indicator of the NCD burden that is considered. However, in all countries and by any metric, NCDs account for a large enough share of the disease burden of the poor to merit a serious policy response.”

At household level, noncommunicable diseases are affecting the poorest people in developing countries disproportionately



Poverty contributes to noncommunicable diseases and noncommunicable diseases contribute to poverty

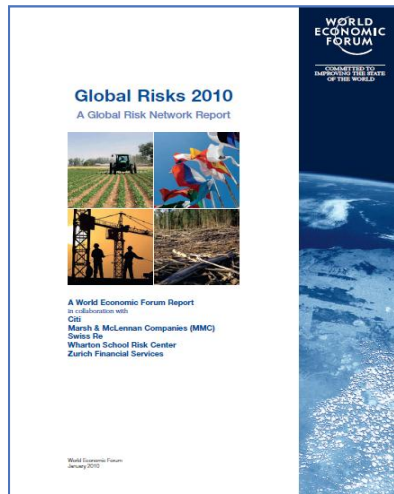
NCDs: Economic Impact

- NCDs accounted for five of the six top causes of economic loss in 2008
 - Heart disease : \$752bn
 - Stroke: \$298bn
 - Diabetes: \$204bn

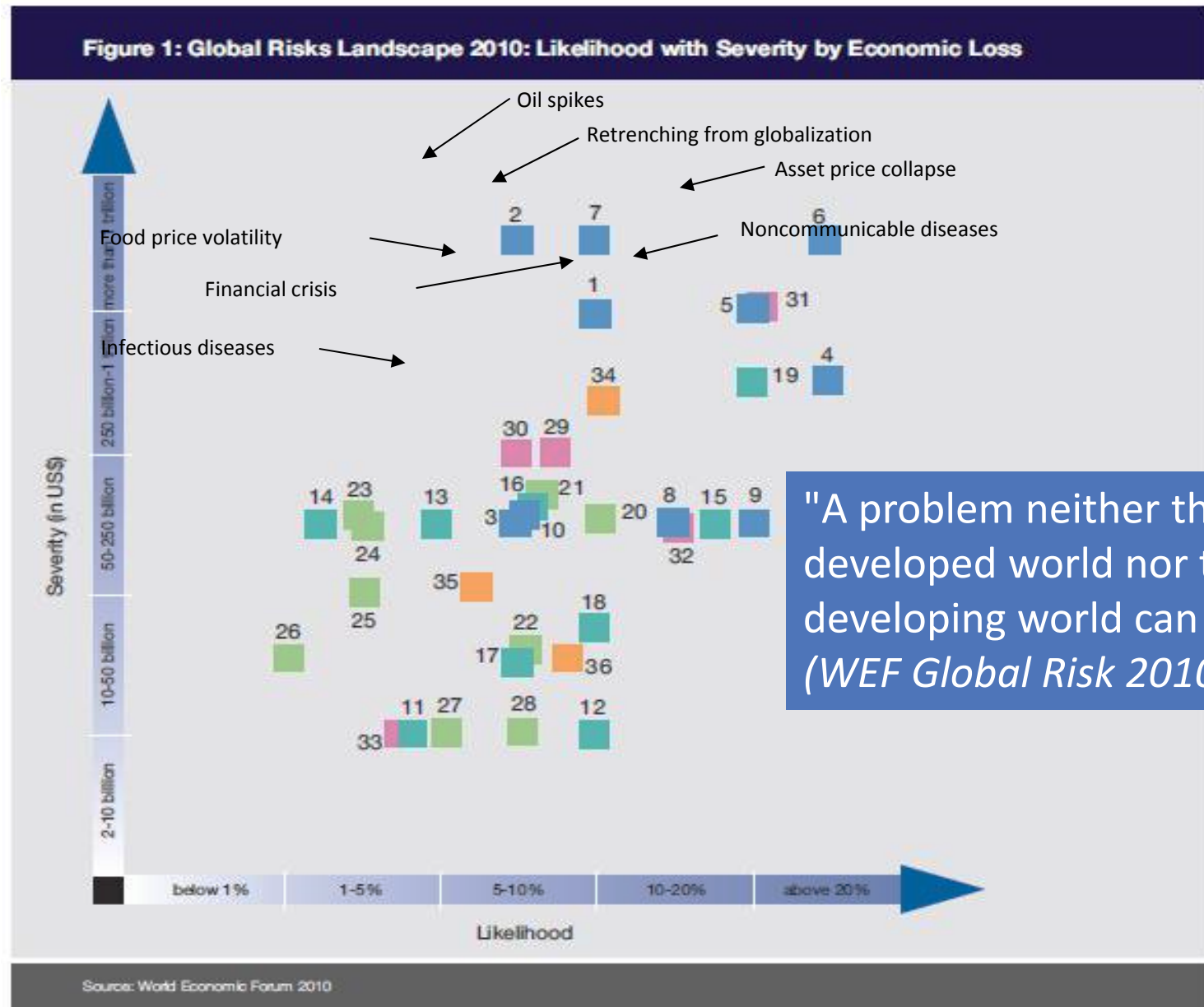
NCDs cost developing countries between 0.02% to 6.77% of GDP; this economic burden is more than that caused by Malaria (1960's) or AIDS (1990's) - IOM Report 2010

NCDs will lead to a loss of **30 Trillion Dollars** globally up to 2030 representing 48% of global GDP in 2010; with mental health added loss rises to **47 trillion dollars** – Harvard + WEF Study 2011

NCDs are the third largest global risk in terms of likelihood and the fourth largest global risk in terms of economic severity



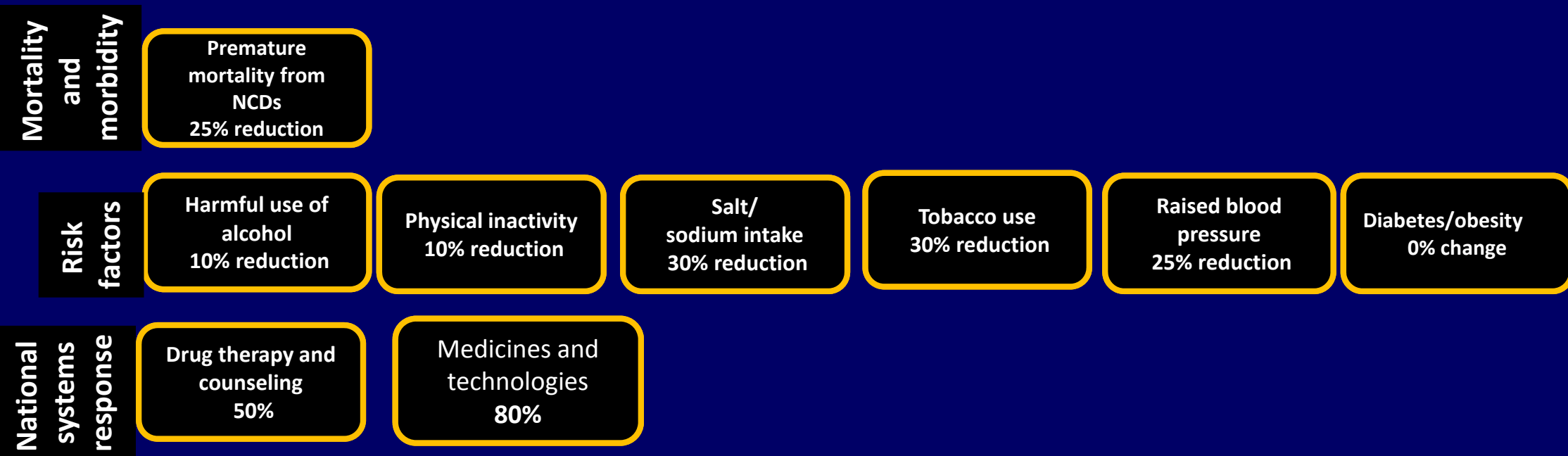
World Economic Forum:
Global Risk 2010 Report



"A problem neither the developed world nor the developing world can afford"
(*WEF Global Risk 2010 Report*)

UN-WHO Targets For NCDs

25 by 25



Most are related to risk factors of NCDs

GBD 2010

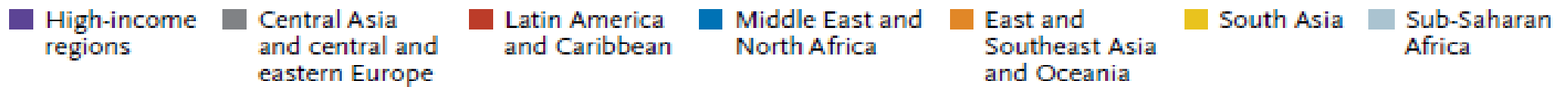
Risk Factors

(Top Contributors to DALYs)

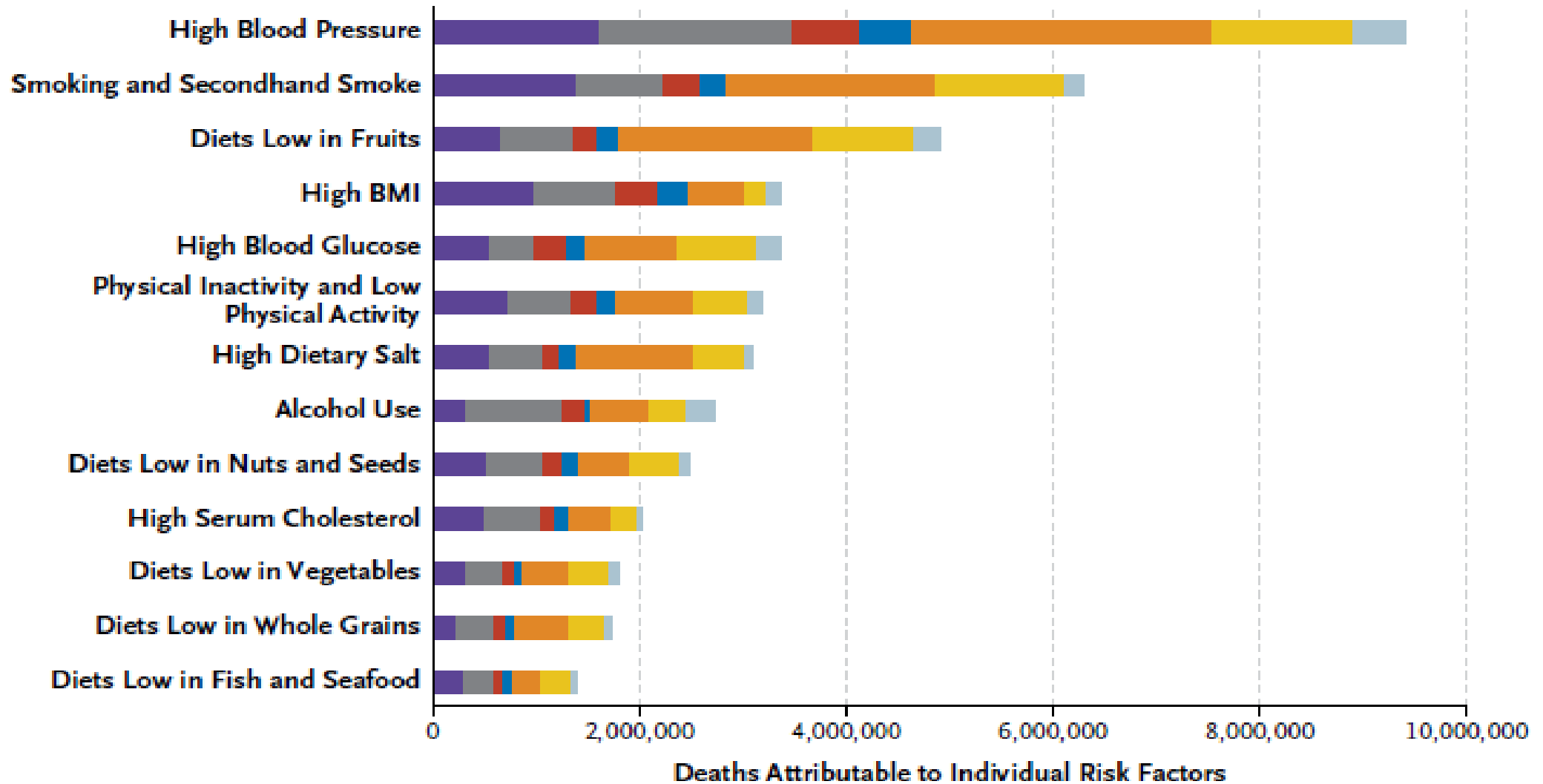
1. High Blood Pressure
2. Smoking (excluding SHS)
3. Alcohol Use
4. Household Air Pollution
5. Low Fruit
6. High Body Mass Index
7. High Fasting Plasma Glucose
8. Childhood Underweight
9. Ambient PM Pollution
- 10 Physical Inactivity

**Diet & Physical
Inactivity Cluster
Responsible For
Largest Global
Disease Burden**

Lancet 2012



A Deaths



RISK FACTORS FOR NCDs

(Ezzati & Riboli, NEJM 2013)

RISK FACTOR CHANGE: EZZATI ESTIMATES (1980-2008)

Blood Pressure

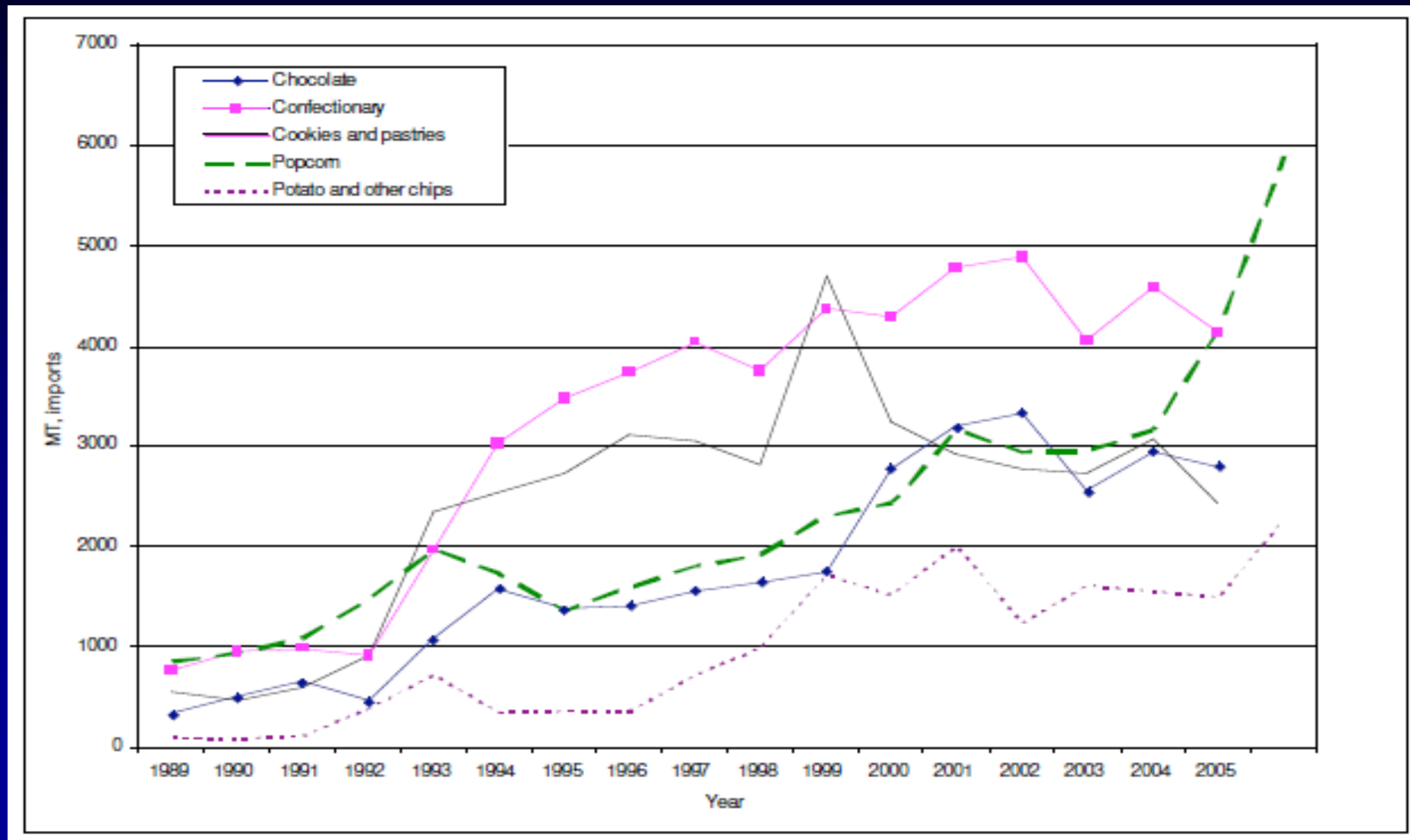
- **Fell in North America, Australasia, Western Europe**
- **Rose in Oceania, East Africa, South Asia, South East Asia (and West African Women)**
- **SBP is currently highest in low and middle income countries**

Source : Danaei G et al. Lancet, 2011

Changes in socio-economic structures underlie the physical activity-nutrition transition

- **Shift from preindustrial agrarian economy to industrialization**
 - Less active physical activity for individuals (sedentary habits)
 - Higher availability of cheap processed foods (high fat, high sugar)
 - **Profound changes in household technology** (*leads to less PA*)
 - Food availability: canning, refrigeration, freezing, radiation, packaging
 - Food preparation: fossil fuels, electricity, appliances (cooker, mixers)
 - **Dramatic shift in leisure activities for adults and children**
 - Time spent for viewing television, computers (sedentary habits)
 - Images/marketing brought to each household (alters consumption)
- *“Pedestrian-hostile, activity-discouraging, fast food-intensive environment”*

Snack imports from the United States into Central America, 1989-2006



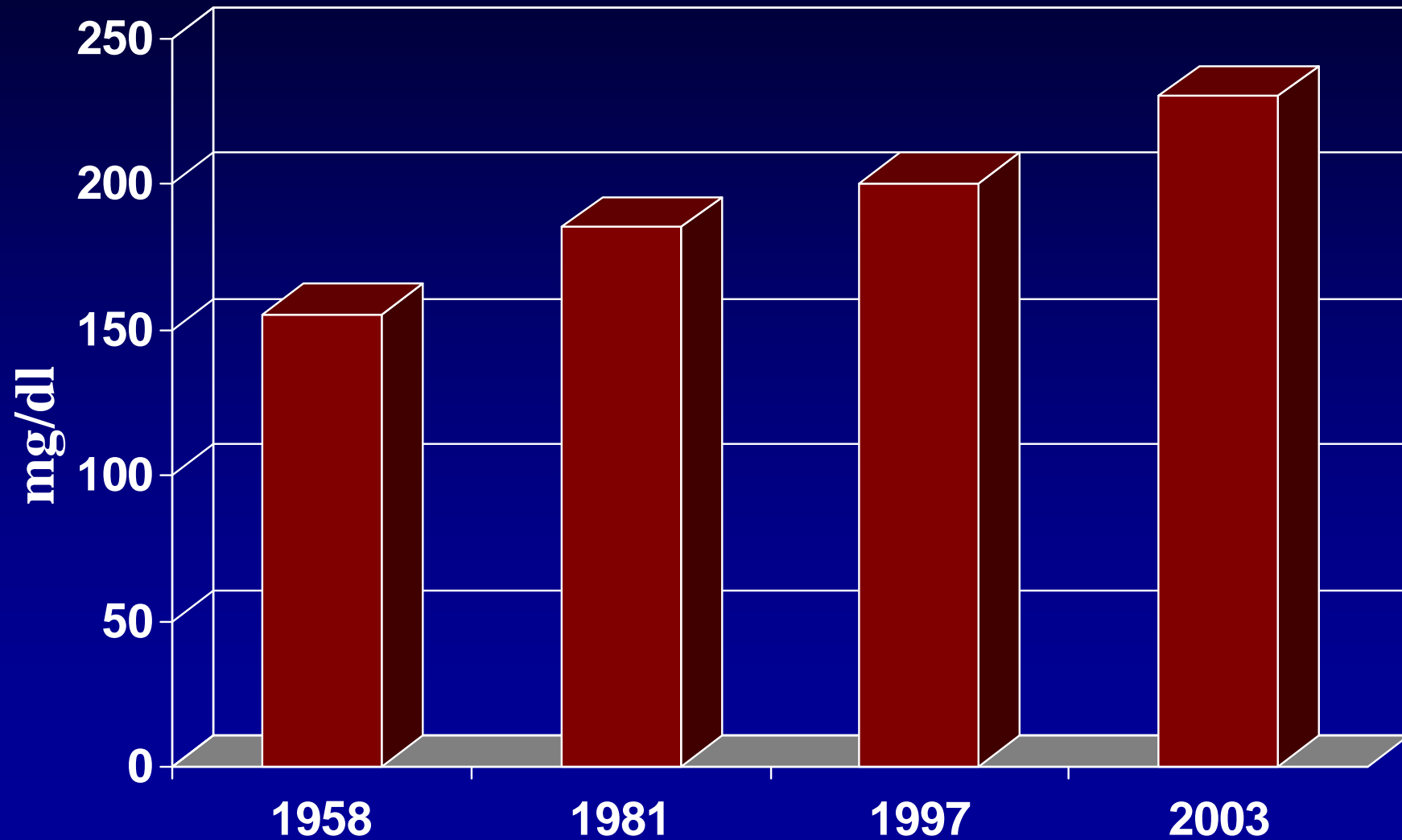
Source: FAO 2007

RISK FACTOR CHANGE: EZZATI ESTIMATES (1980-2008)

Cholesterol

- **Fall in Australasia, North America, Western Europe, Central and Eastern Europe**
- **Increase in East and South East Asia and Pacific**
- **Highest in high income countries**
- **Lowest in Sub-Saharan Africa**

Mean Plasma Cholesterol Values in China

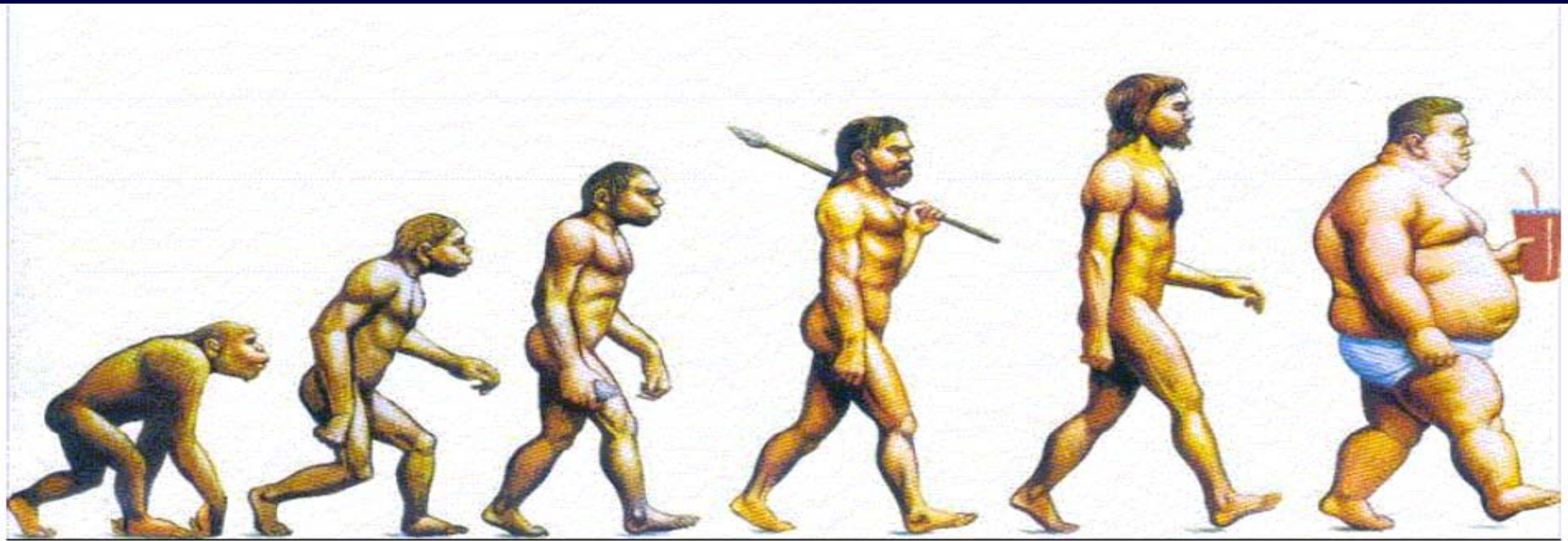


The "TOP 10"

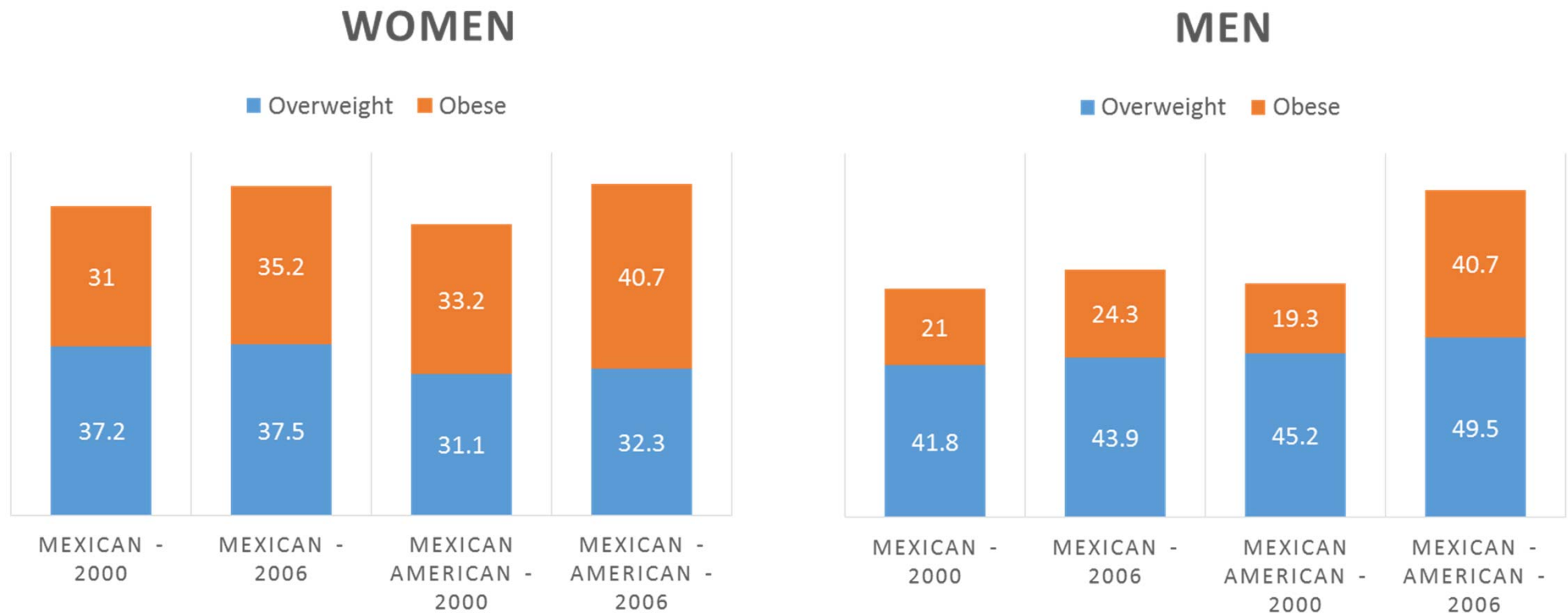
Top 10: Countries/territories of number of people with diabetes (20-79 years), 2011 and 2030

| COUNTRY /TERRITORY | 2011 MILLIONS | COUNTRY /TERRITORY | 2030 MILLIONS |
|----------------------------|------------------|----------------------------|------------------|
| → 1 China | 90.0 | 1 China | 129.7 ← |
| → 2 India | 61.3 | 2 India | 101.2 ← |
| 3 United States of America | 23.7 | 3 United States of America | 29.6 |
| 4 Russian Federation | 12.6 | 4 Brazil | 19.6 ← |
| → 5 Brazil | 12.4 | 5 Bangladesh | 16.8 ← |
| 6 Japan | 10.7 | 6 Mexico | 16.4 ← |
| → 7 Mexico | 10.3 | 7 Russian Federation | 14.1 |
| → 8 Bangladesh | 8.4 | 8 Egypt | 12.4 ← |
| → 9 Egypt | 7.3 | 9 Indonesia | 11.8 ← |
| → 10 Indonesia | 7.3 | 10 Pakistan | 11.4 ← |

EVOLUTION OF HOMO ROTUNDUS!



Changes in the Prevalence (%) of Overweight and Obesity in Mexican Adults



Source: Barquera et al; 2009

Obesity: Ezzati Estimates

- Globally: **10 % of men were obese in 2008**
4.8% in 1980
- Globally: **14 % of women were obese in 2008**
7.9 % in 1980
- Pacific islands has the highest mean BMI
Men: 34; Women: 35
- Lowest mean BMI among DR Congo Men (19.9)
and Bangladesh Women (20.5)
- USA
 - highest average BMI among high-income countries,
 - most rapid increase in BMI in the last 30 yrs
 - Increase in 1 BMI point per decade

Low birth weight and its consequences



Rebound
Adiposity

Hypertension
Coronary
heart disease

Atherosclerosis,
Stroke

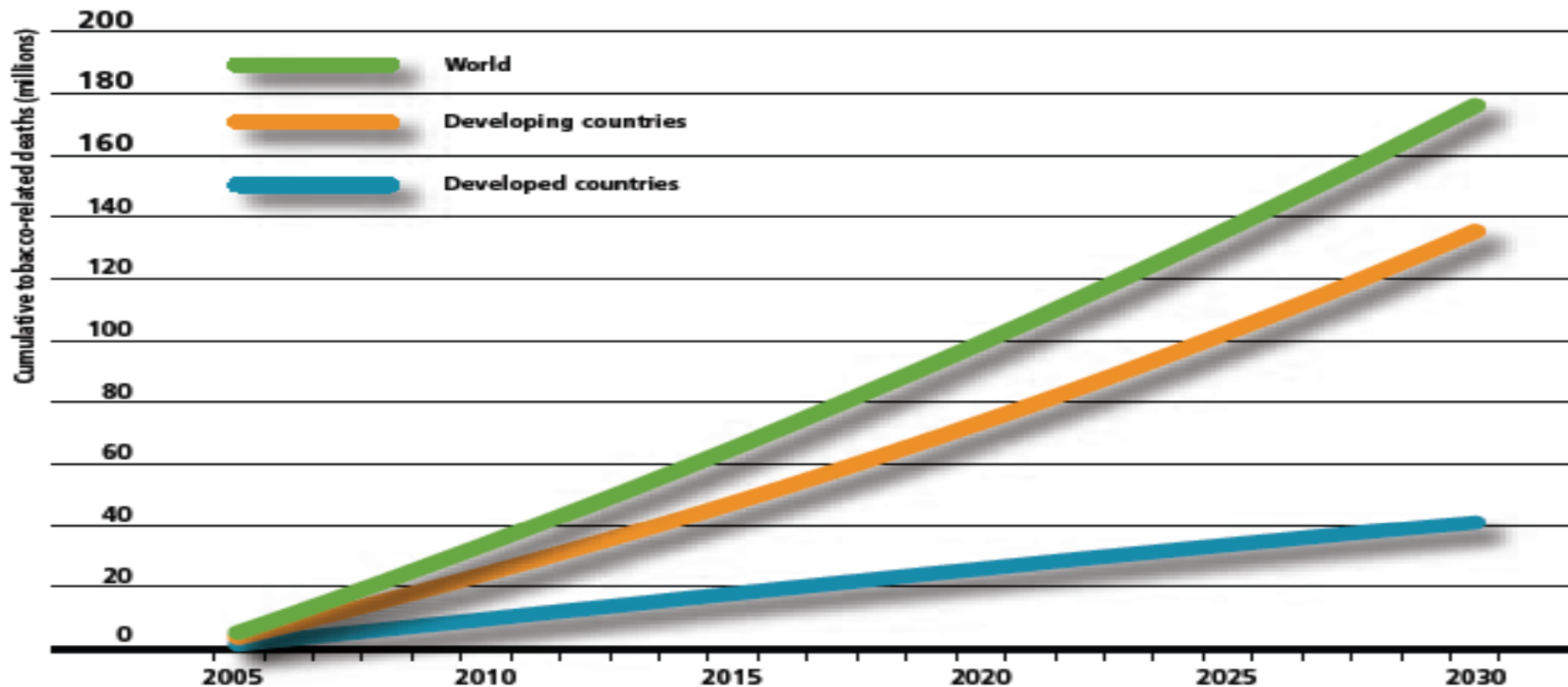
Type II Diabetes,
Insulin resistance

Adult lung
function

? Cancer

Risk factors: tobacco use on the rise in developing countries

Cumulative tobacco-related deaths, 2005–2030



Source: Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Medicine*, 2006, 3(11):e442.

Does Ethnicity Matter?

While ethnic comparison studies do suggest that some ethnic groups are at a higher risk of manifesting CHD (e.g; South Asians) or Stroke (East Asians; Africans),

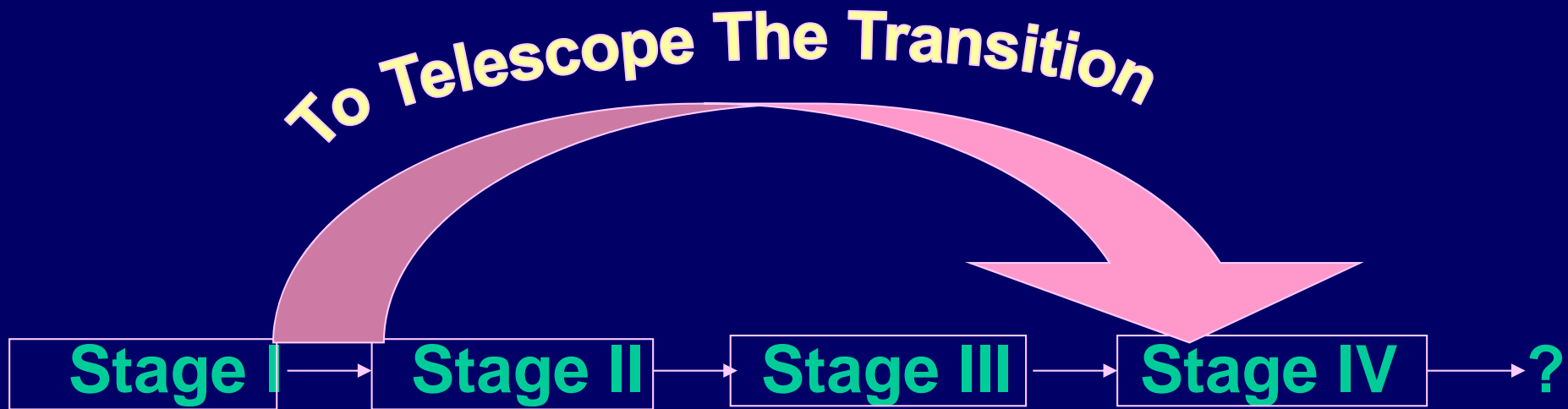
MIGRANT STUDIES SUGGEST THAT ENVIRONMENT IS THE DOMINANT FACTOR IN THE EXPRESSION OF RISK

INTERHEART Study

• About 90% of CHD Risk (“PAR”) can be explained by 9 Risk Factors:

- Smoking
- Diabetes
- Hypertension
- Abdominal Obesity
- Psychosocial Factors
- Fruits & Vegetables
- Exercise
- Alcohol
- Apo B/Apo A1 ratio

THE TASK BEFORE US



Avoid /Abbreviate the Stage of Mid-Life Death and Disability

RESPONSE TO HEALTH TRANSITION

POPULATIONS

Demographic and Social Determinants

Low Risk

High Risk

Public Health Interventions

INDIVIDUALS

Biology + Beliefs + Behaviors

Low Risk

High Risk

Clinical + Behavioral Interventions

CVD PREVENTION

POPULATION BASED

Address the bulk of the distribution through small shifts
(Population Attributable Risk)

Widespread Effect = Large Benefits

HIGH RISK

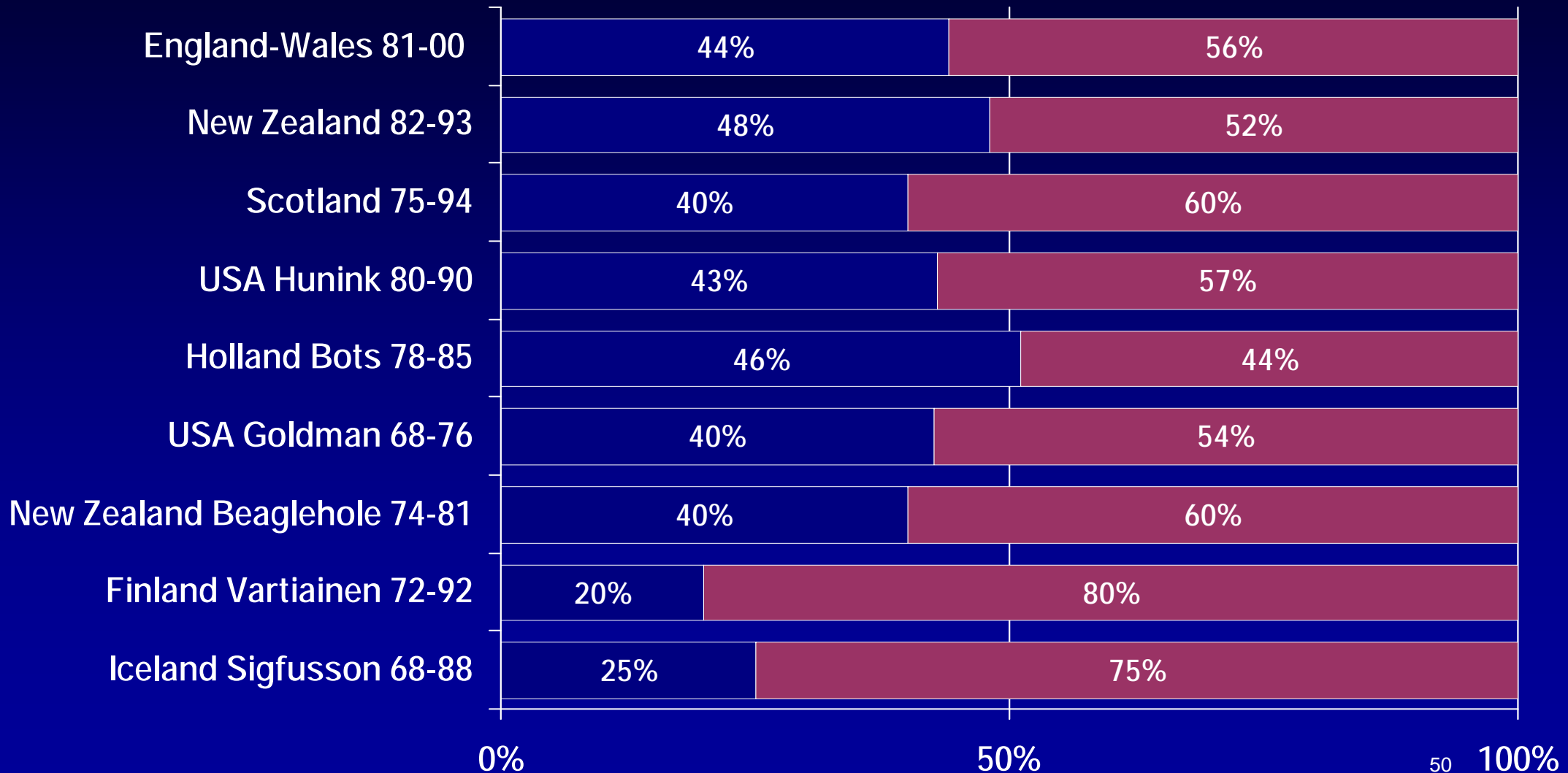
Address the individuals at the highest 'absolute' risk of a CVD event
(Comprehensive Cardiovascular Risk)

High Impact = Cost-Effective use of resources

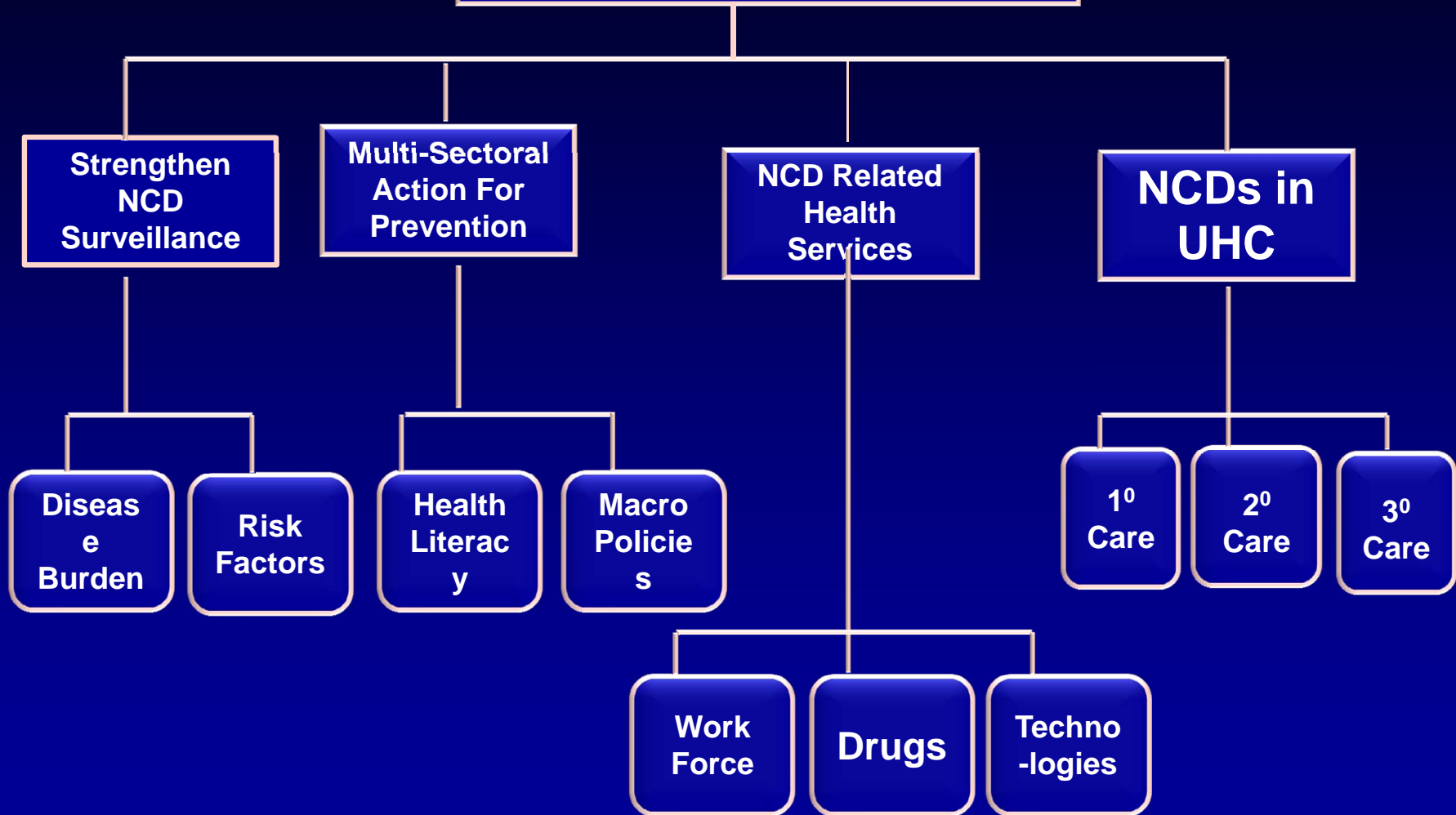
% Decline in CHD Deaths Attributed to Interventions

Treatments

Risk factors



GLOBAL RESPONSE



Power of Policy

- **Modifies social and economic determinants of behaviours**
 - **Influences how people Eat, Smoke, Drink, Move**
- **Creates enabling environment to initiate & maintain behaviour change in communities and individuals**
- **Can impact on multiple risk factors simultaneously**
- **Reduces population risk in short time**
- **Cost effective**
- **Relatively easy to implement**
- **Has intergenerational benefit**

POWER OF POLICY FOR CHRONIC DISEASE PREVENTION

TOBACCO

Evidence is available from many countries
(including LMIC) that

- **Taxation**
- **Ad Bans**
- **Smoke Free Policies**
- **Health Warnings**

ARE EFFECTIVE

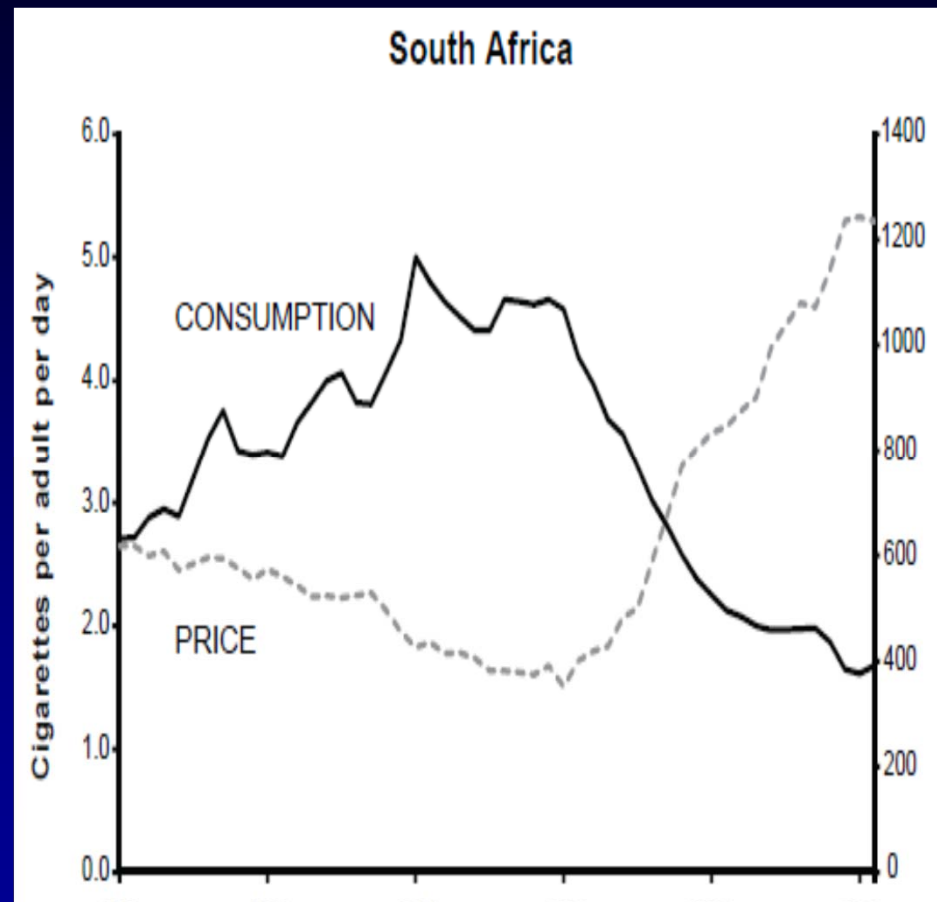
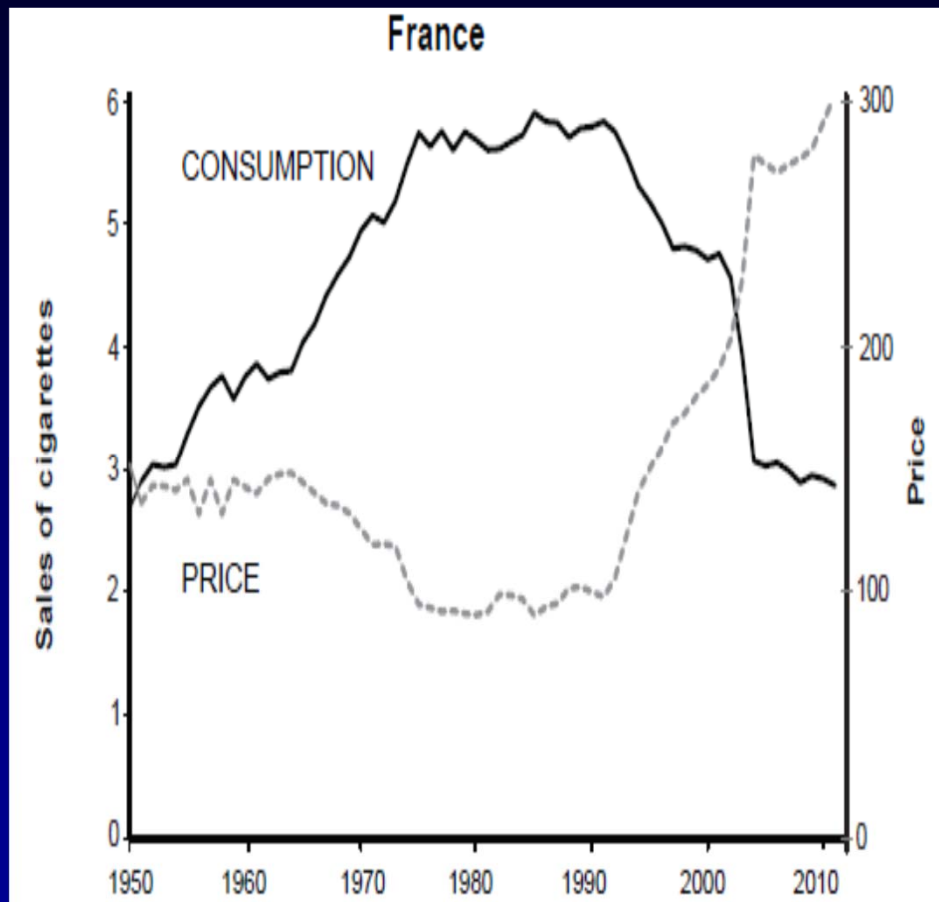
48.1% of mortality averted in UK (1981-2000) is attributable to reduced smoking

(Unal B et al. Circulation 2004)

Smoke Free Policies and Myocardial Infarction (MI)

| Study and location | % decrease in MI admission rates |
|--|----------------------------------|
| Sargent et al, 2004, Helena, USA | 40 |
| Bartecchi et al, 2006, Pueblo, USA | 27 |
| Barone –Adesi et al, 2006, Piedmont, Italy | 11 |
| Seo et al, 2007, Monroe, Indiana, USA | 29 |
| Khuder et al, 2007, Bowling Green, Ohio, USA | 47 |
| Juster et al, 2007, New York, USA | 8 |
| Lemstra et al, 2008, Saskatoon, Canada | 13 |
| Cesaroni et al, 2008, Rome, Italy | 8 |
| Pell et al, 2008, Scotland | 17 |
| Edwards et al, 2008, New Zealand | No change |
| Vasseli et al, 2008, Four regions of Italy | 13 |
| CDC, 2009, Pueblo, USA | 41 |
| Meyers et al., 2009, Meta-analysis | 17 |

Impact of Taxation on Cigarette Sales; France & South Africa



“Triple-Halve-Double”; Tripling of cigarette prices halved the consumption and doubled the inflation adjusted Government revenue.

- Source: Hill et al, 2010 & Van Walbeek, 2006

POWER OF POLICY FOR CHRONIC DISEASE PREVENTION

DIET

- Evidence of preventive potential of policy interventions available from
 - Mauritius (Price of Edible Oils)
 - Poland (Import of F-V and Healthy Fats)
 - Finland (Farming; Marketing; Community Education)

New Initiatives

- Food Labeling
- Reduced Salt in Processed Foods
- Ban on Trans-Fats
- Advertising Restrictions

Mauritius

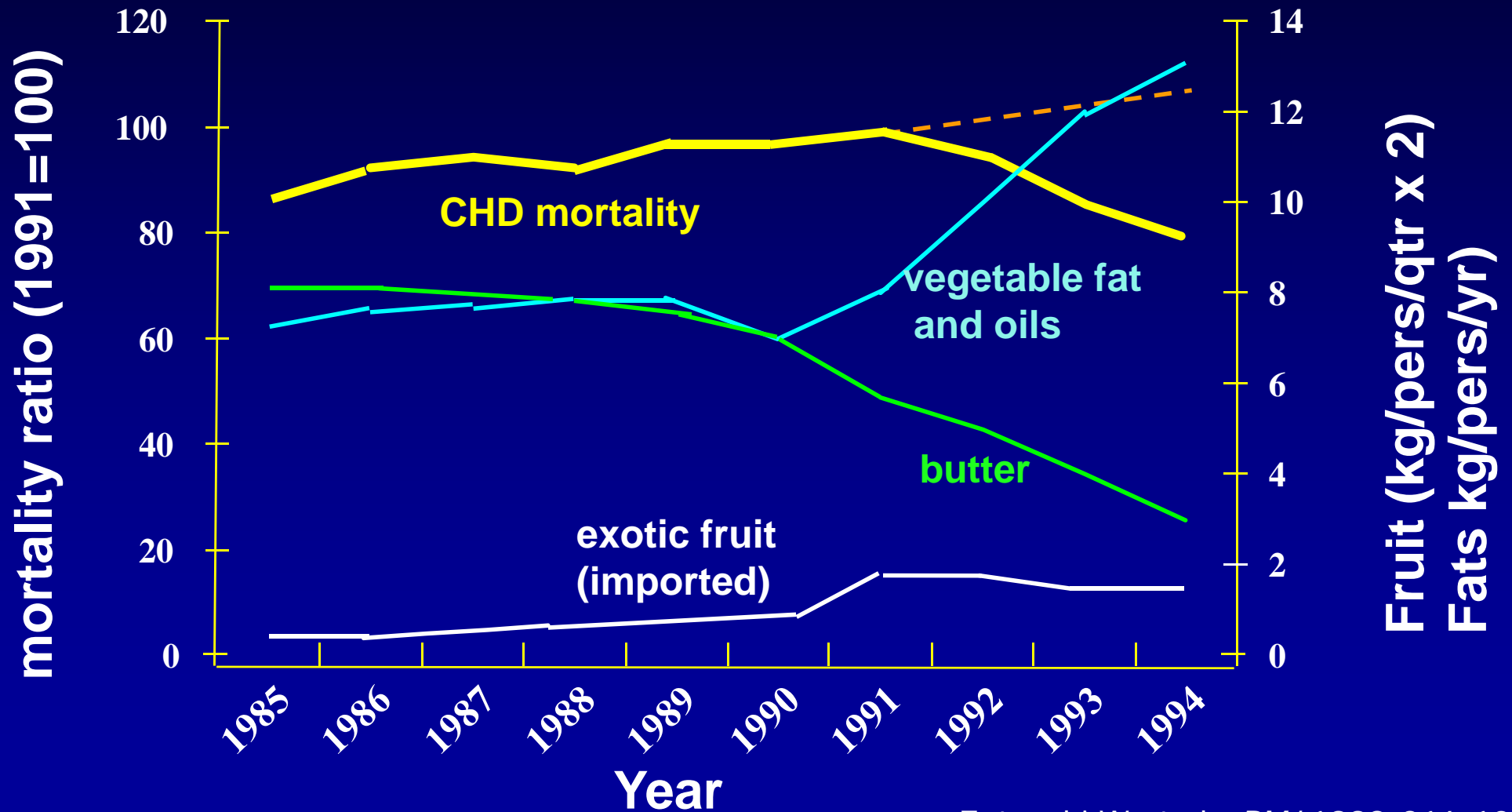
- ↑↑ CVD & risk factors
- Intensive national CVD intervention programme to reduce risk factors
 - extensive mass media
 - fiscal & legislative measures
 - diverse settings: community, school & workplace

Government intervention: Subsidized cooking oil

(unsaturated) Soya bean oil *instead of* (saturated) fat rich palm oil

- Adult mean total cholesterol level decreased during 1987-1992 from 5.5 to 4.7 mmol/l (↓15%)

Dietary Change and CHD Mortality in Poland



Policy Measures (Usually) Do Not Cost The Government Money

- **Tobacco Taxes**
- **Ad Bans**
- **Public Smoking Bans**
- **Regulation of Processed Food (eg., Salt, Trans Fats)**
- **Food Labeling**

Access to Drugs

36 country WHO study:

- Availability of CVD (atenolol, captopril, hydrochlorothiazide, losartan, nifedipine) drugs varied considerably across countries
- **Overall availability was poor-**
26% in public sector, 57% private sector
- Cost fluctuation between countries, with patient prices generally higher than international references prices

Improving Access to Drugs

1. Enhancing capacity for generic substitution
2. Expediting generic availability by overcoming legal barriers related to patents licenses
3. Optimizing local procurement practices in the public sector
4. Broadening global procurement via third-party price negotiations
5. Engaging the private sector to differentially price CVD medicines in LMICs
6. Regulating retail mark-ups in the supply chain
7. Eliminating tariffs on medicines
8. Developing a fixed-dose combination (FDC) for CVD (the 'Polypill')

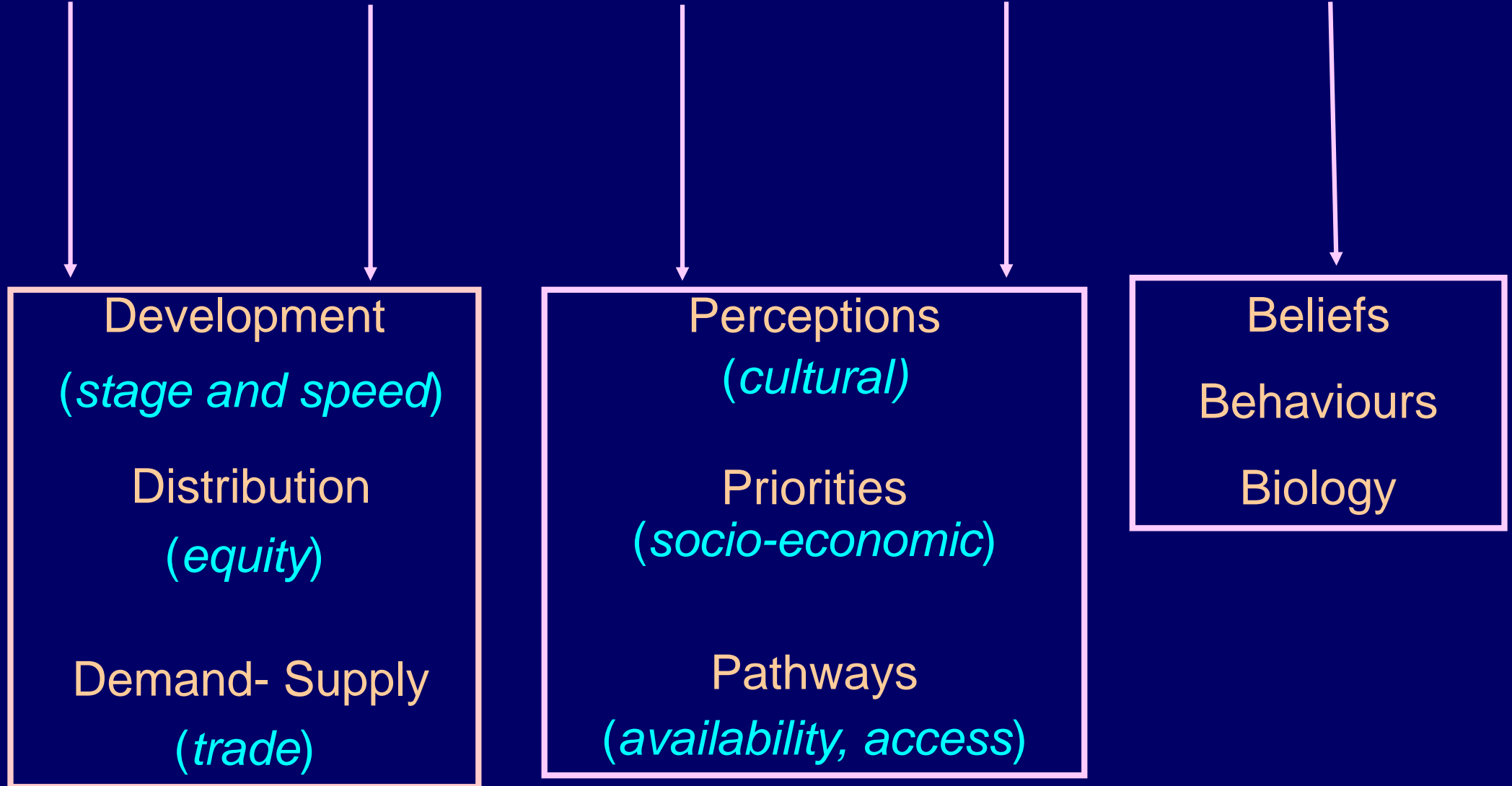
MOVING BEYOND NCDs

- ❑ CCI = Chronic Conditions & Injuries
- ❑ Health Systems Strengthening
- ❑ Universal Health Coverage
- ❑ Sustainable Development (post 2015)

Global action on NCDs calls for stronger partnerships and wider arena of action

RISK CASCADE OF NCDs

GLOBAL → NATIONAL → COMMUNITY → FAMILY → INDIVIDUAL



HEALTH BEYOND HEALTH CARE

“ Health leaps out of Science and draws nourishment from the Society around it”

- Gunnar Myrdal

(Swedish Economist, Nobel Laureate)

POLICIES AND PROGRAMMES IN

- Finance • Water • Sanitation • Agriculture • Food Processing
- Education • Rural Development • Urban Design • Transport
- Communications • Trade • Environment

**NEED TO BECOME SENSITIVE AND RESPONSIVE TO
PUBLIC HEALTH CONCERNS !**

