

Death and Taxes: Global Effects of Smoking, of Quitting, and of Taxing Tobacco

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Thanks to Richard Peto



St. Michael's

Inspired Care.
Inspiring Science.



UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH

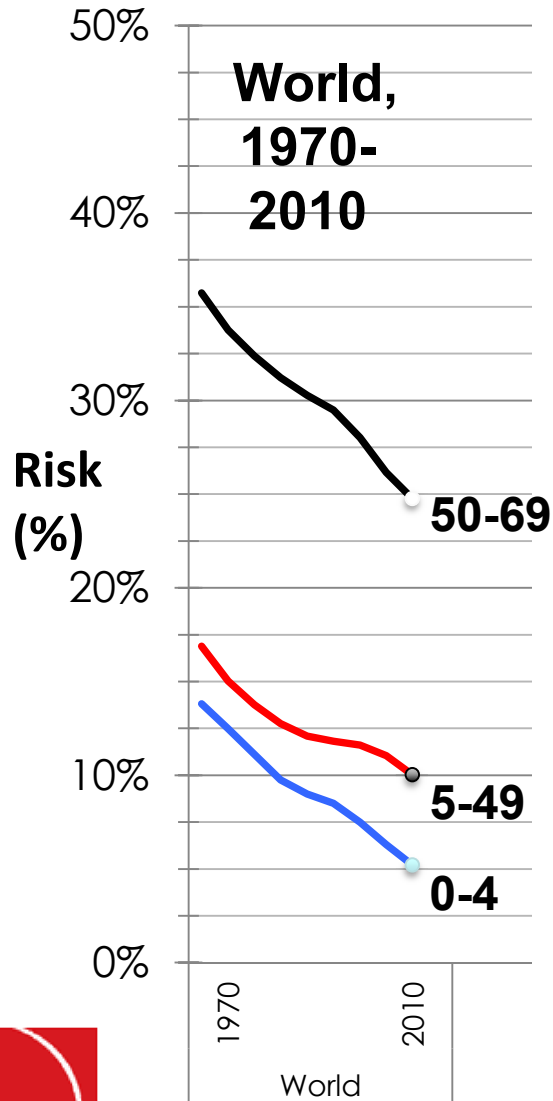
CONCLUSIONS

- **Prolonged smokers lose a decade of life**
- **Cessation by age 40 (and preferably earlier) avoids 90% of the excess risk of continued smoking**
- **Tobacco is a big cause of poverty and tobacco control reduces poverty**
- **A tripling of the excise tax on cigarettes worldwide would cut consumption by 1/3 and avoid ~200 M deaths**

Global survival to age 70 years

- at 1970 rates: 40% male, 50% female
- at 2010 rates: 60% male, 70% female
- at 2030 rates: 75% male, 80% female?
(proposed “Sustainable development goal”
of 40% cut in death rates in 2030 vs 2010)

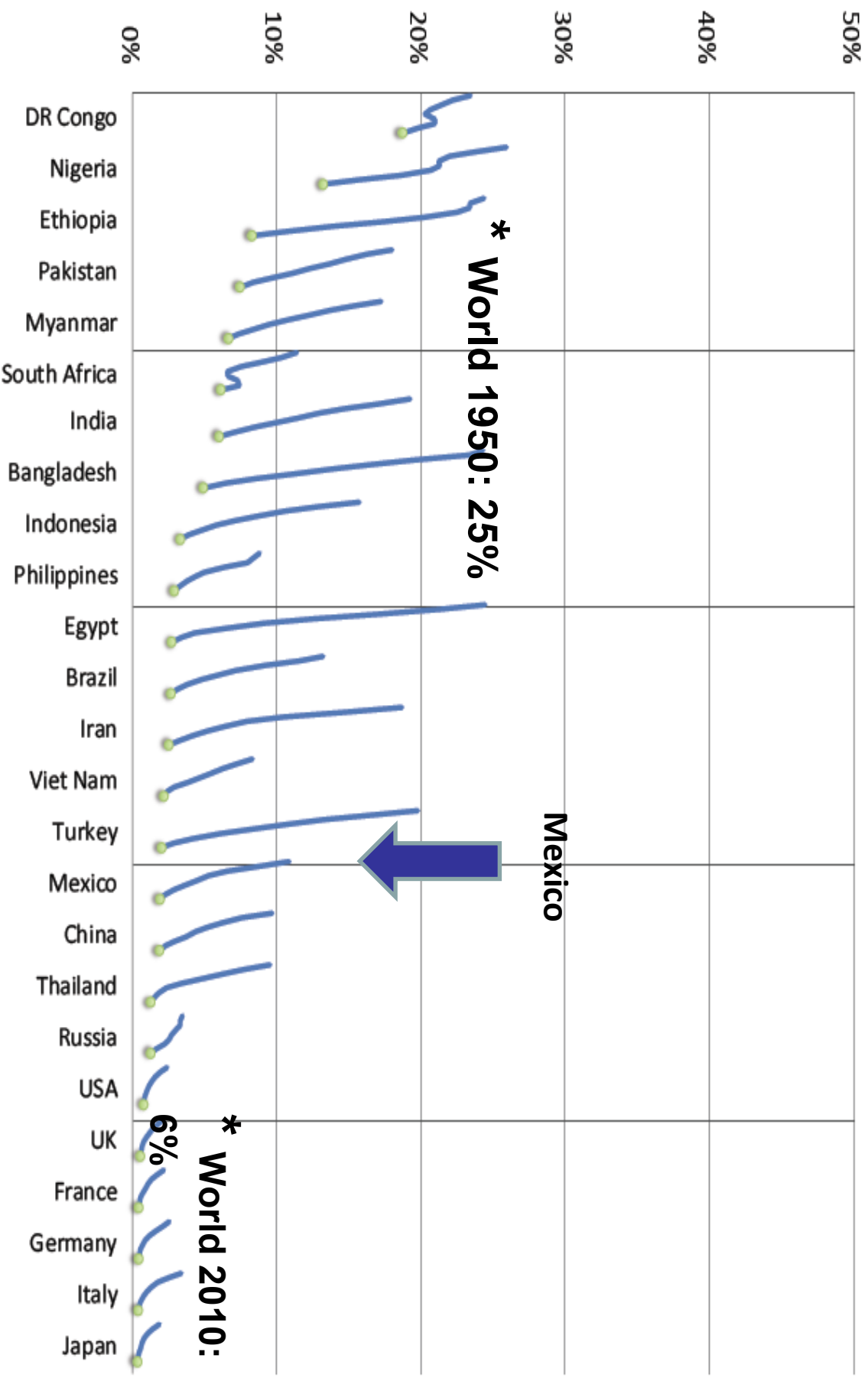
World mortality trends, 1970-2010: risks of dying in selected age ranges



Lines give trends from 1970* (left) to 2010 (circles●)

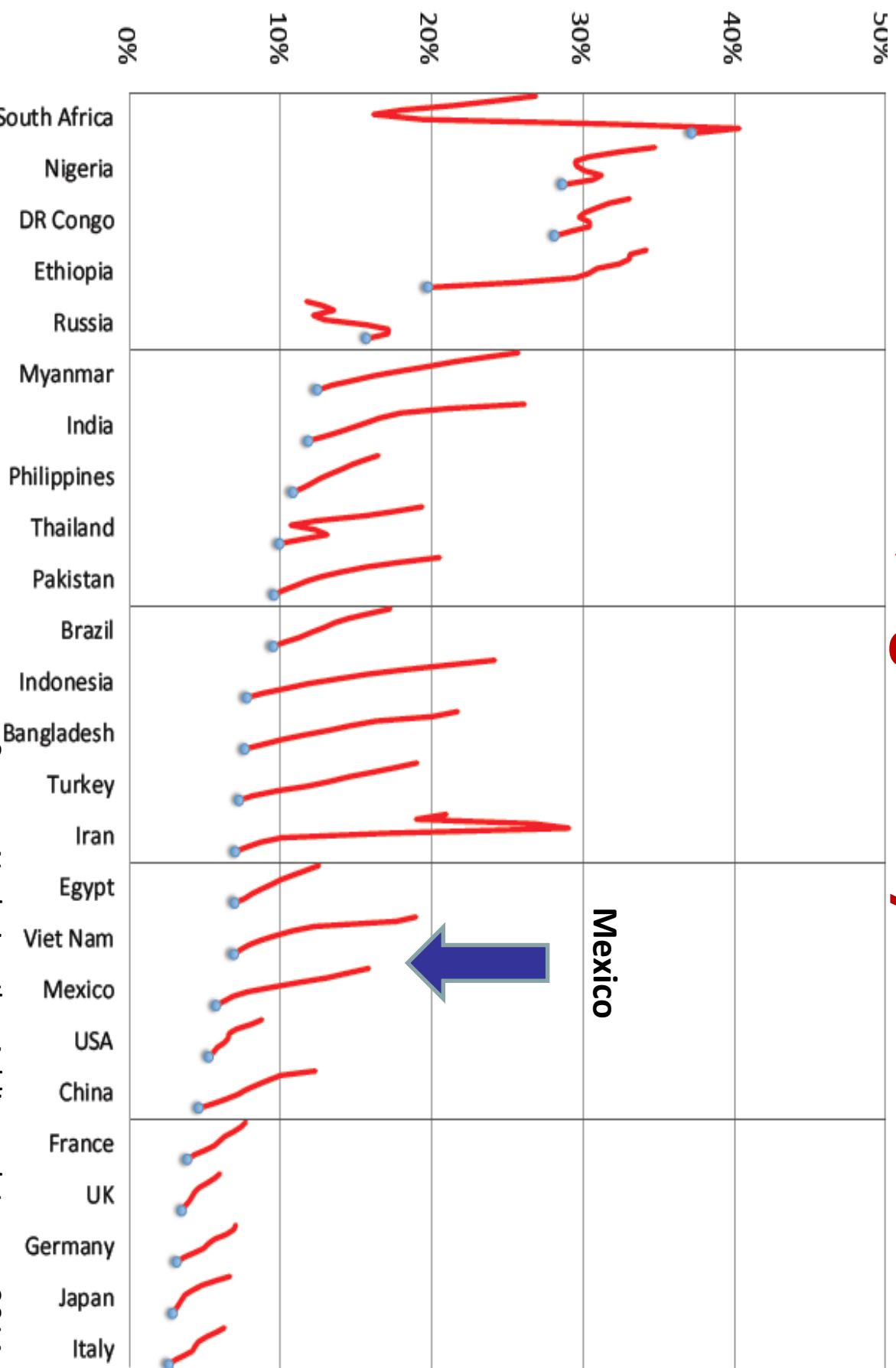
* Mean, 1965-69 & 1970-74

1970-2010 trends in risk of death, 25 countries, age 0-4 years



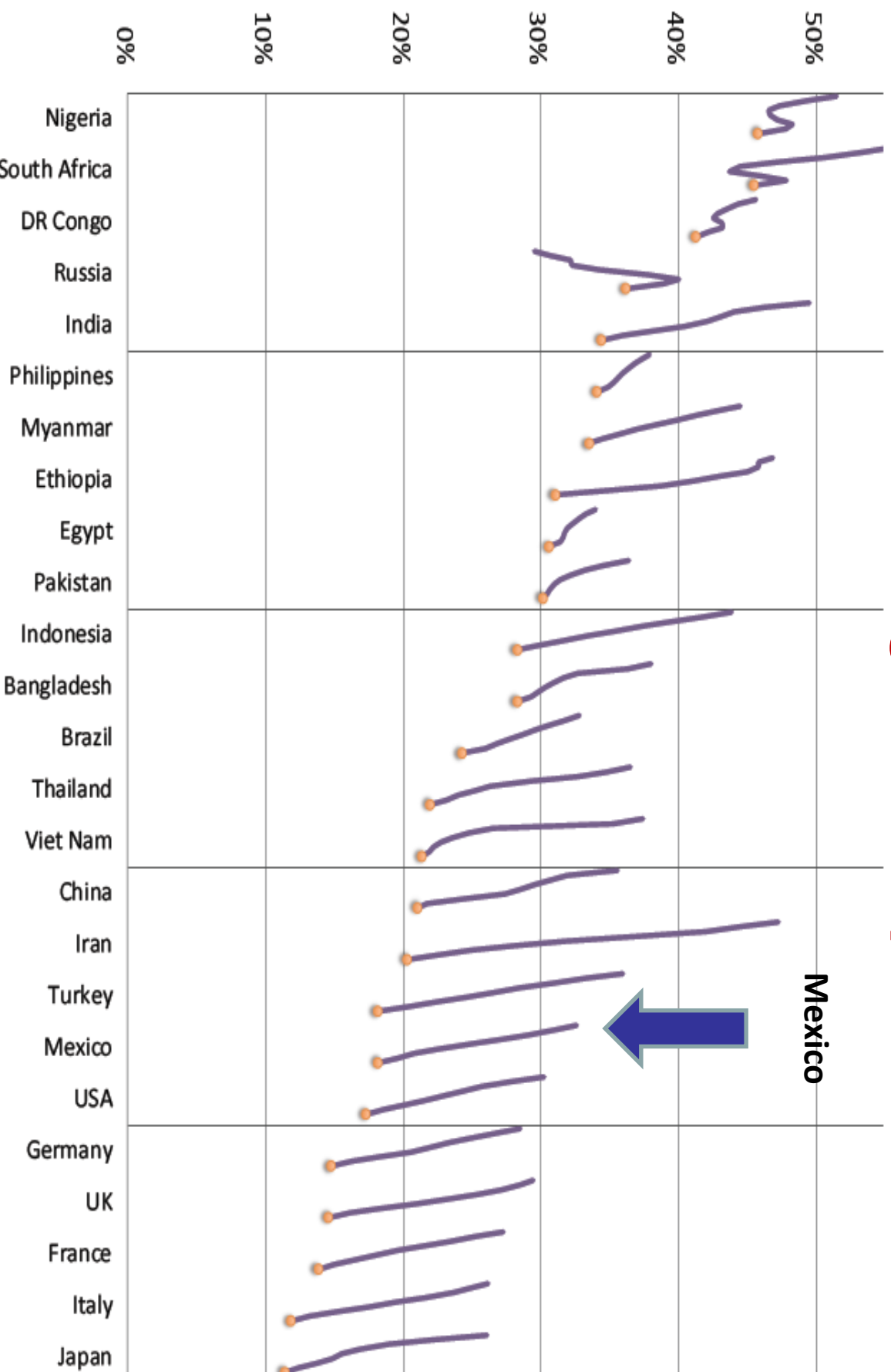
Source: Norheim, Jha, Addis et al, Lancet 2014

1970-2010 trends in risk of death, 25 countries, age 5-49 years



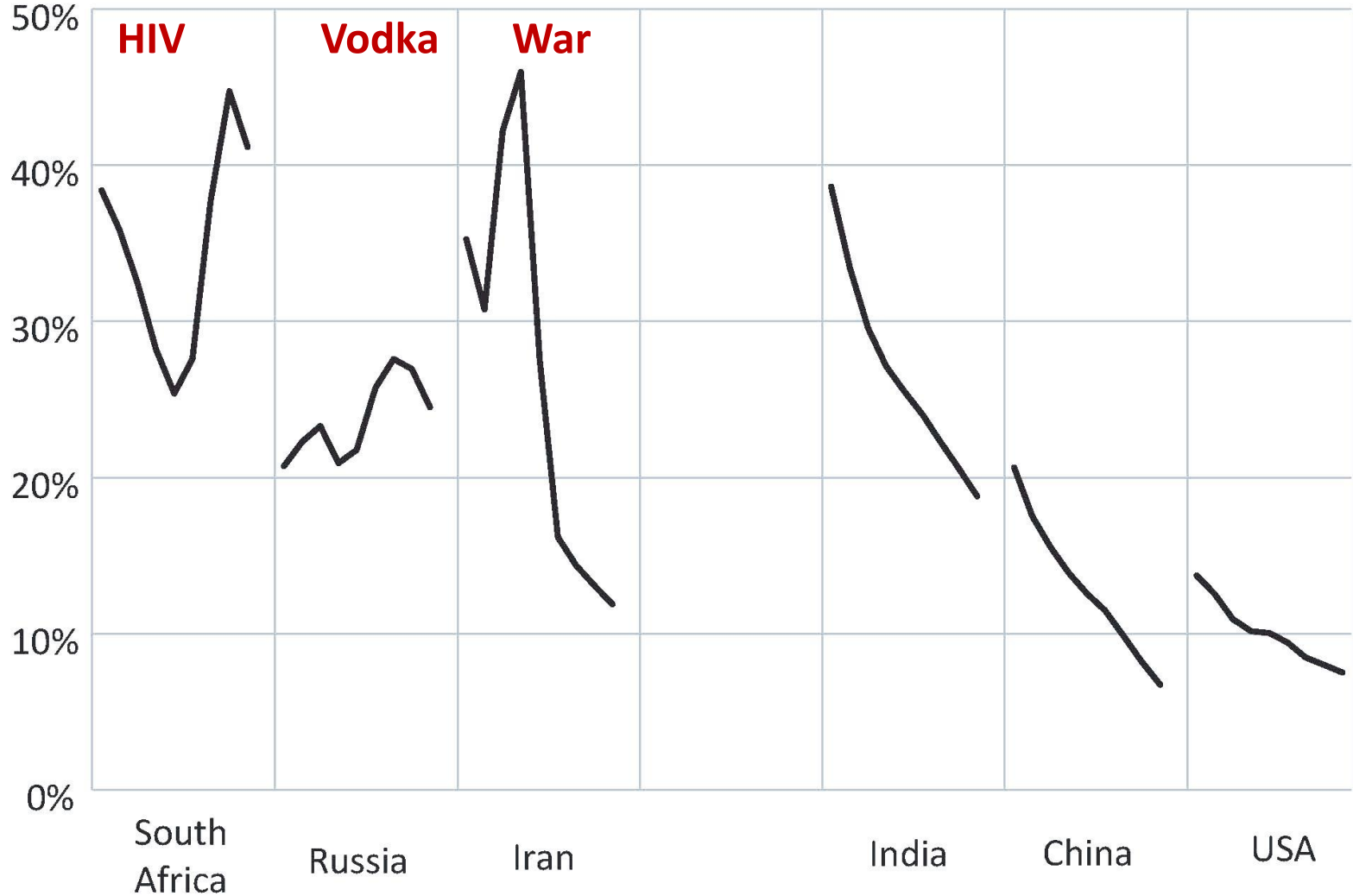
Source: Norheim, Jha, Addis et al, Lancet 2014

1970-2010 trends in risk of death, 25 countries, age 50-69 years



Source: Norheim, Jha, Addis et al, Lancet 2014

MALE under-50 mortality 1970-2010: 6 countries



Source: Norheim, Jha, Addis et al, Lancet 2014

Global deaths: approximate totals for selected causes

Ebola in West Africa

total deaths in 2015/16 ~10,000

Deaths per week

Malaria (mostly <5 years) ~10,000

Smoking ~100,000

Vascular disease <70 years ~200,000

World, 2015 and 2030: Deaths before age 70/year

Age range	<u>Deaths per year</u>	
	2015	2030 (at 2010 rates)
0-49	~16 M	~22 M
50-69	~14 M	~22 M

M = Million

Large gaps in mortality evidence

- **48 million** infants are not registered each year (~ 40%)
- **38 million** deaths are not registered (2/3 of all deaths globally)
- **85 countries** have zero or unreliable cause of death information
 - an additional 52 countries have low-quality data

Nationwide Mortality Studies: Indian Million Death Study (MDS)

1. Visit 1.4 M homes (“true snapshot” of India) in the “SRS” with a recent death & ask standard questions **and** get a local language narrative (*adapted* WHO tool)
2. 900 non-medical surveyors (now electronic entry + GPS)
3. Web-based double coding by 400 doctors (guidelines, anonymously reconciled + adjudicated + strict quality control)
4. Study all diseases, work with RGI/census dept, keep costs <\$1 per home
5. To date: ~0.8M deaths

Statistical Alliance for Vital Events (SAVE) to expand to Sierra Leone, Ethiopia, Mozambique and elsewhere



INDIA: 1.3 M vascular disease deaths at ages 30-69 years in 2015

MEN

- Ischemic heart :0.58M
 - 73% had prior history
- Stroke: 0.20M

WOMEN

- Ischemic heart: 0.27M
 - 73% had prior history
- Stroke: 0.15

Deaths from: heart failure (50,000), Rheumatic (10,000)

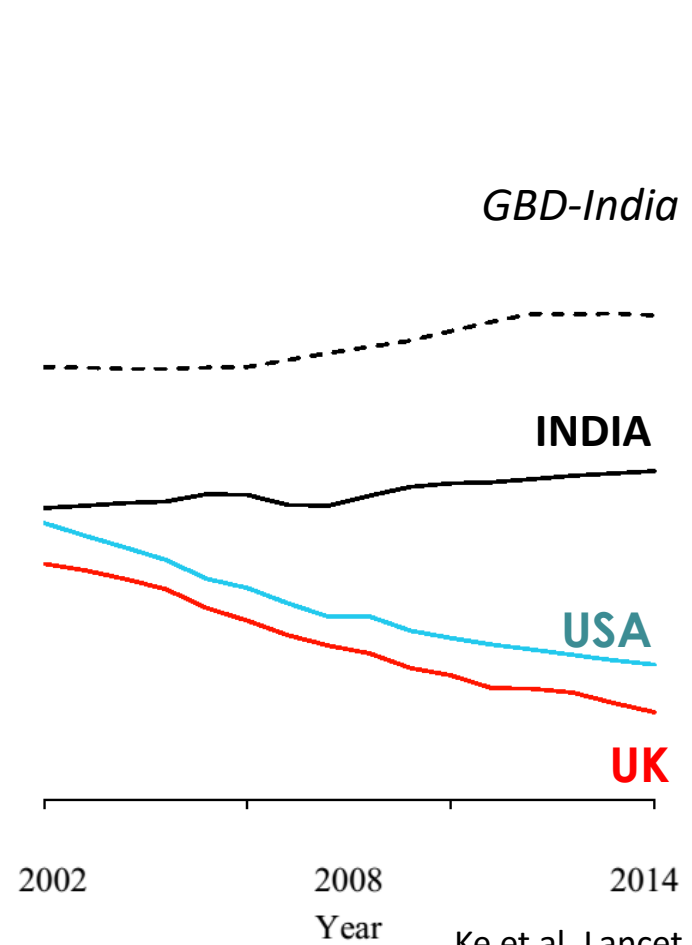
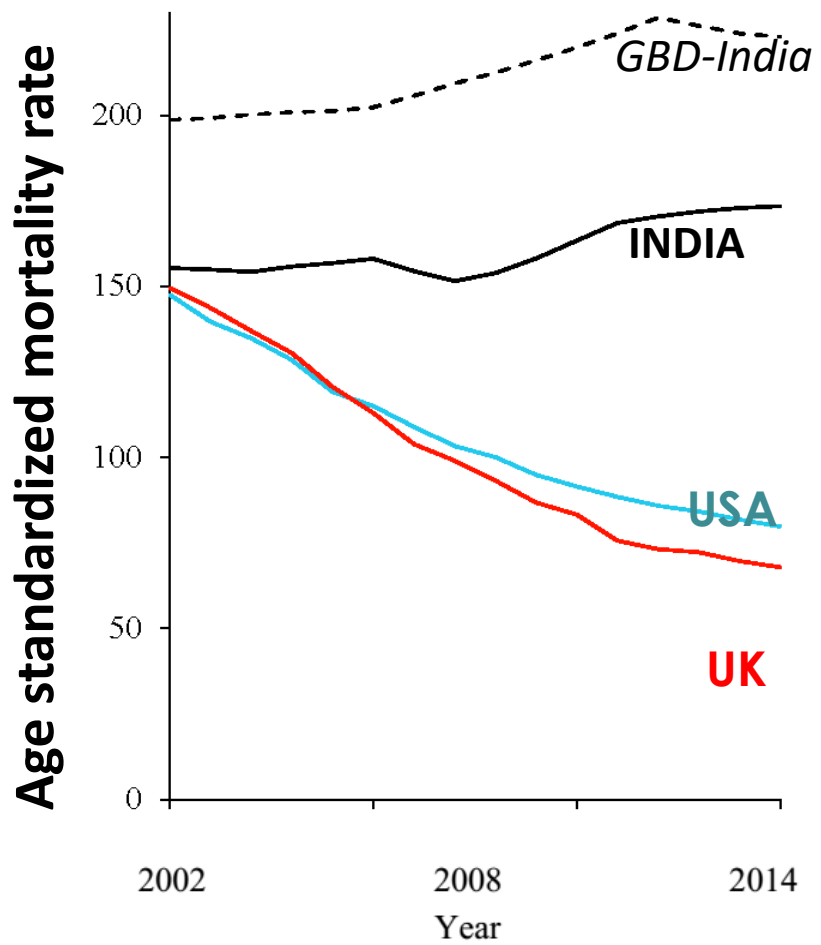
VASCULAR DISEASE: Risk of death at ages 30-69, 2000 and 2015, India

	<u>2000</u>	<u>2015</u>
<u>Ischemic Heart Disease</u>		
Men	10%	13%
Women	5%	7%
<u>Stroke</u>		
Men	6%	5%
Women	5%	4%

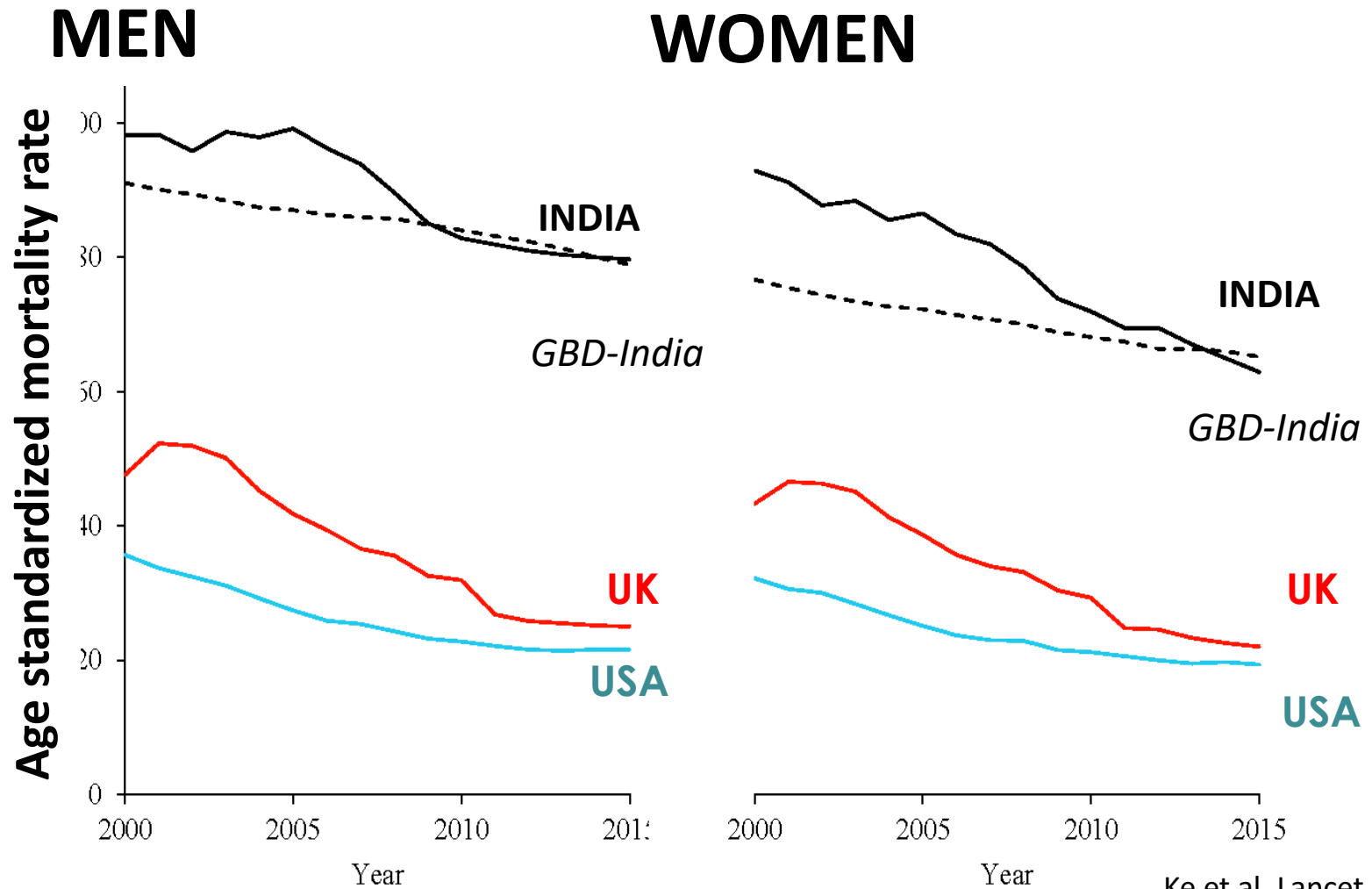
Trends in age-standardized mortality rates, all ages: ISCHEMIC HEART DISEASE (IHD), India, UK, USA, GBD- India

MEN

WOMEN

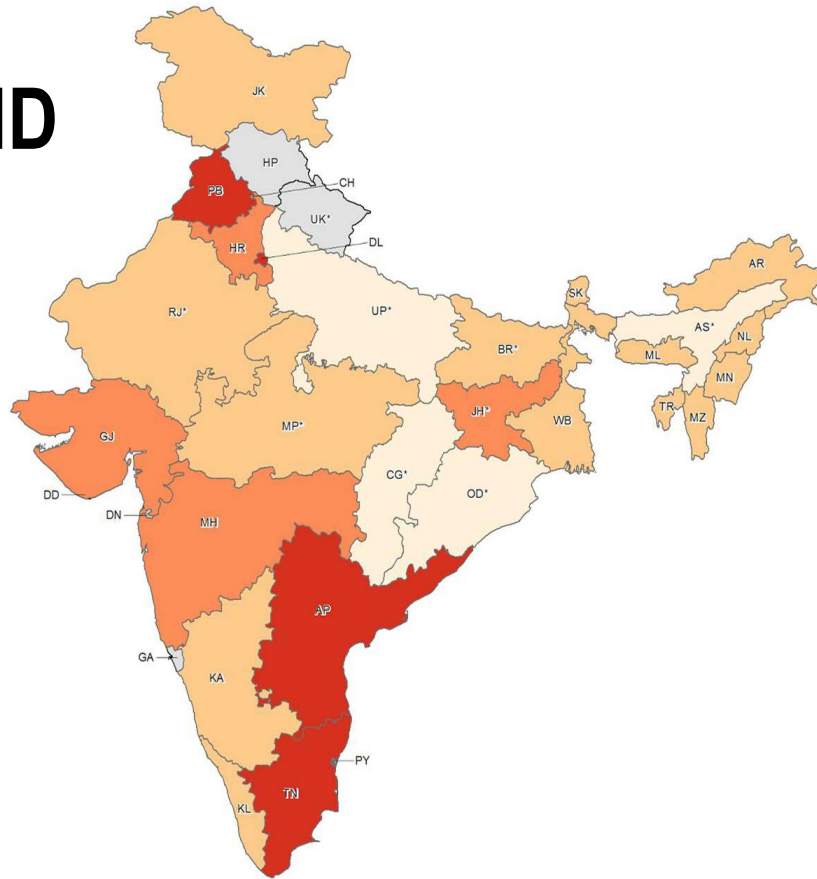


Trends in age-standardized mortality rates, all ages: STROKE, India, UK, USA, GBD- India

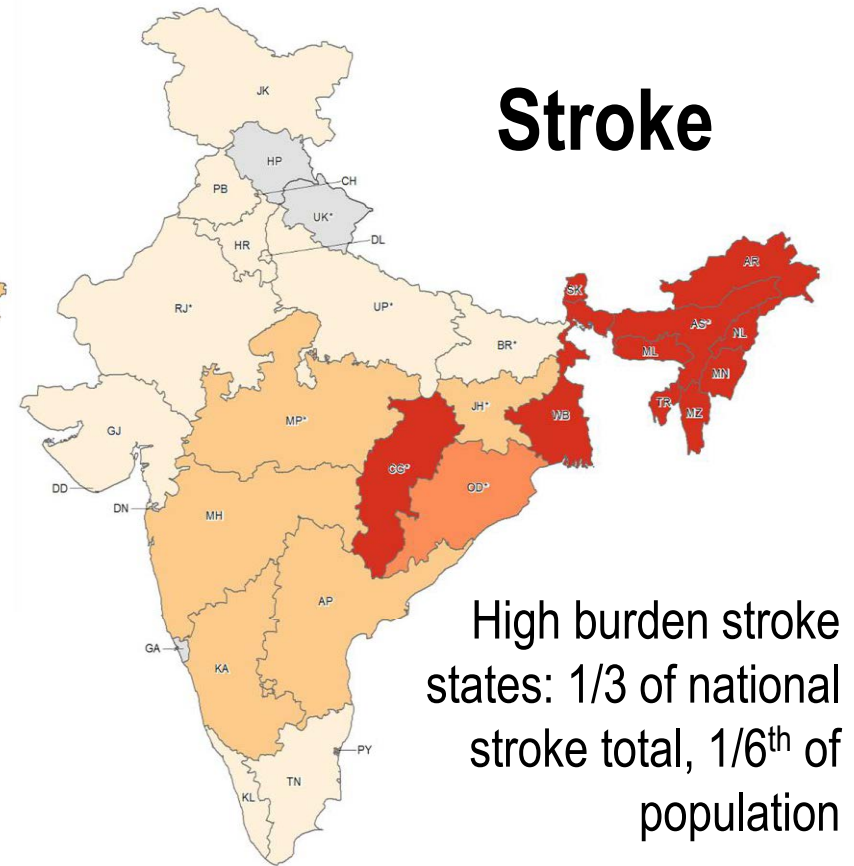


IHD vs. Stroke mortality ages 30-69, 2010-13: Distinctive patterns

IHD



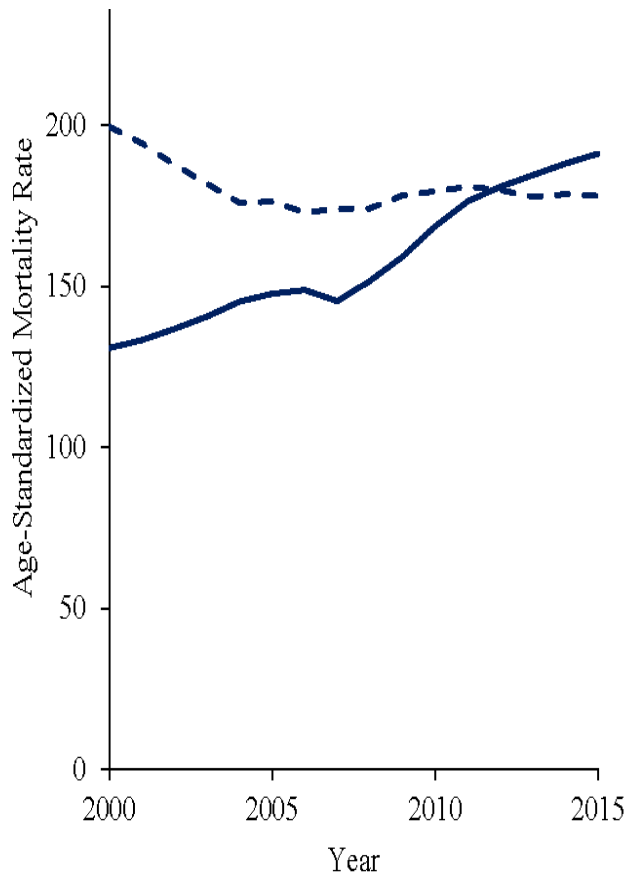
Stroke



High burden stroke states: 1/3 of national stroke total, 1/6th of population

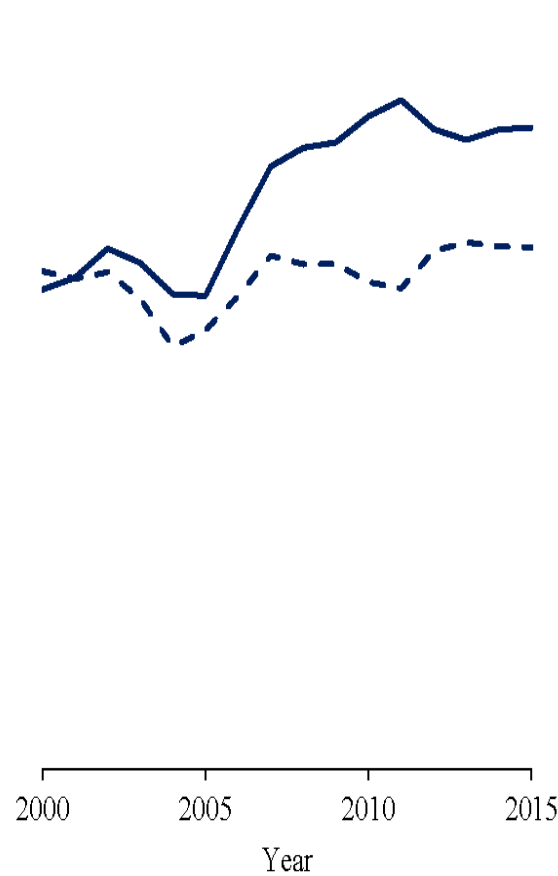
INDIA: Trends in age-standardized mortality rates by residence, 2000-2015, ages 30-69

IHD

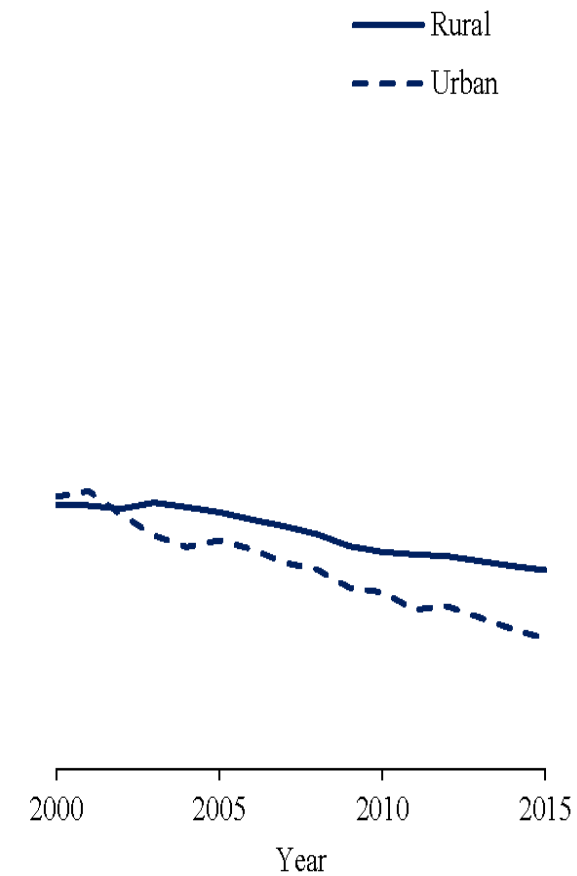


STROKE:

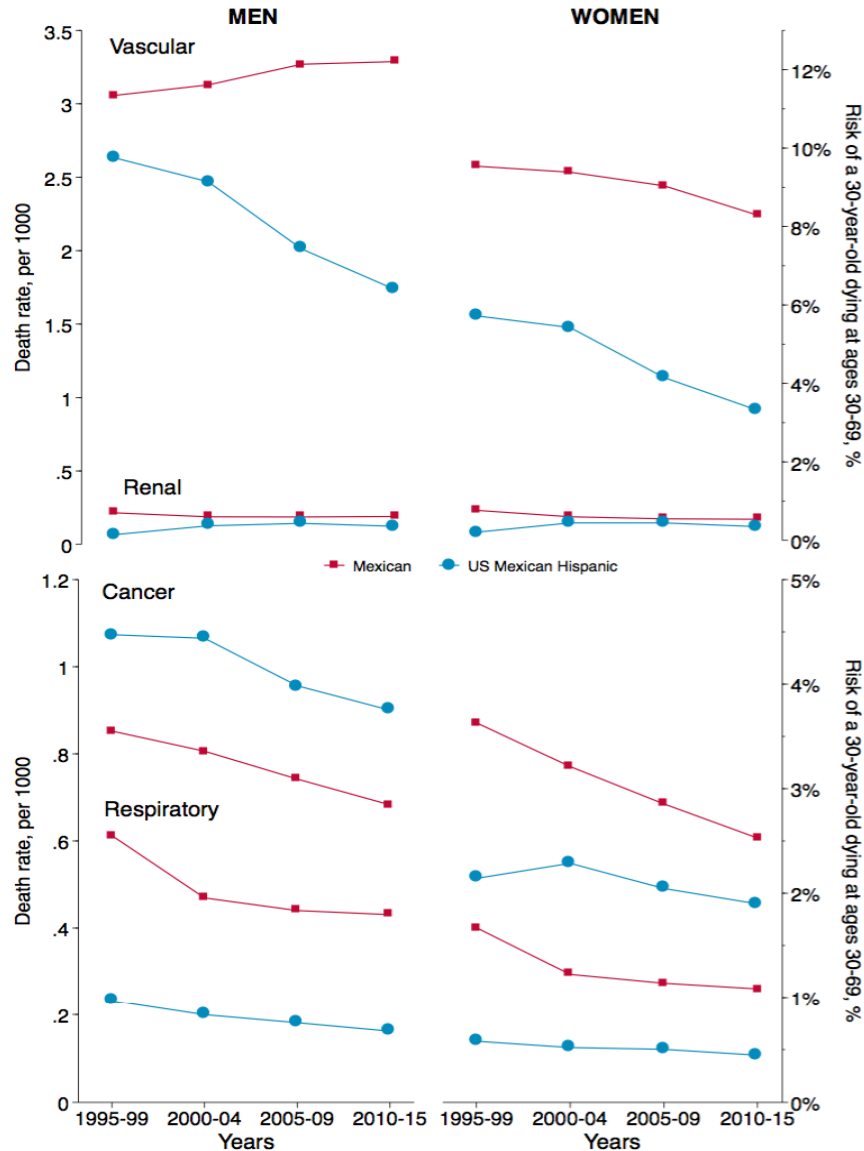
high burden states



low burden states



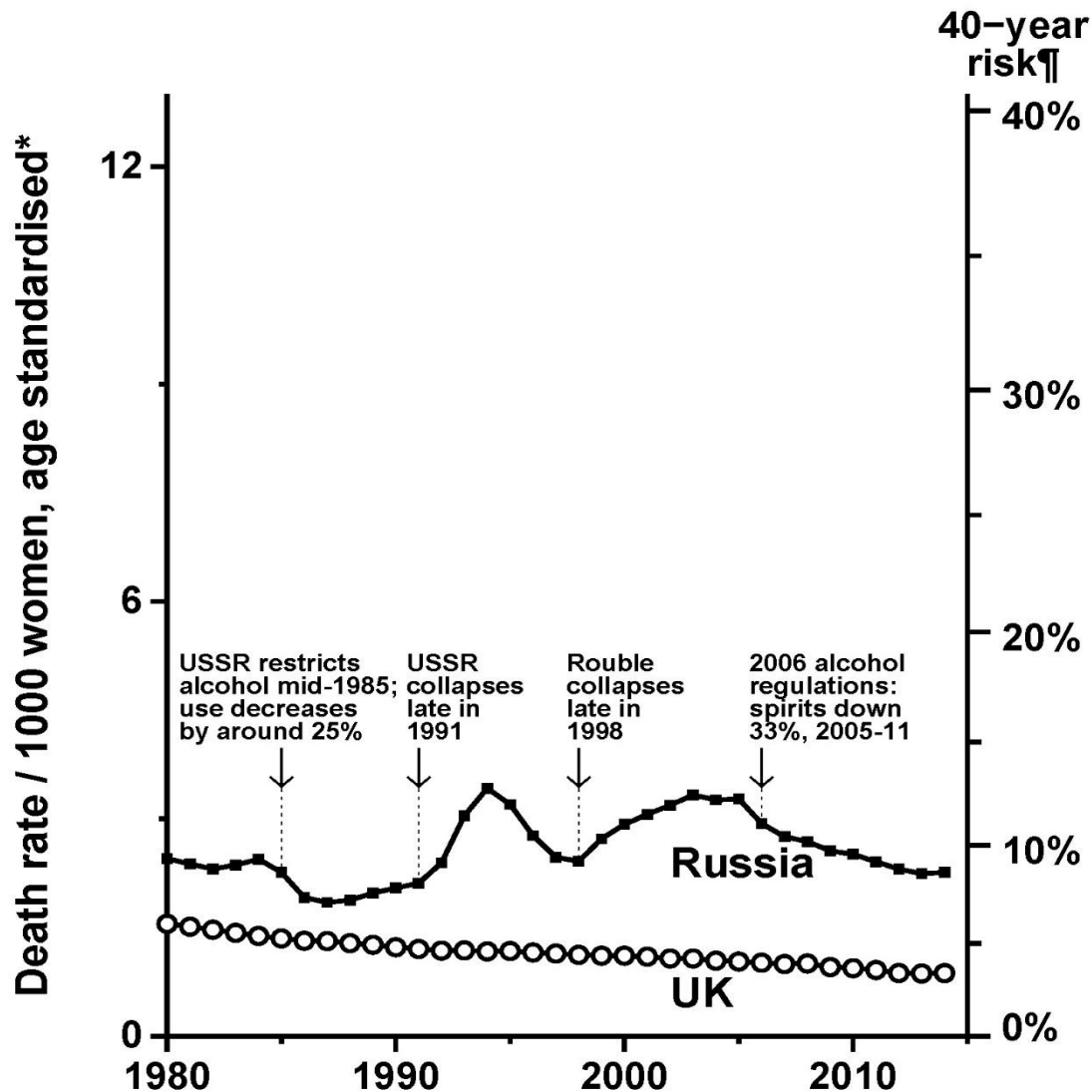
Trends in vascular, cancer and respiratory mortality in Mexico by sex, 1995-2015



Worldwide no of smokers, drinkers and obese (B=billions, M=millions)

<u>Exposure</u>	<u>No.</u>	<u>Annual deaths</u>
Smoking	1.3 B	5-6 M
Drinking	2.0 B	2 M
Obese (BMI>30)	0.6 B	~ 1.5 M

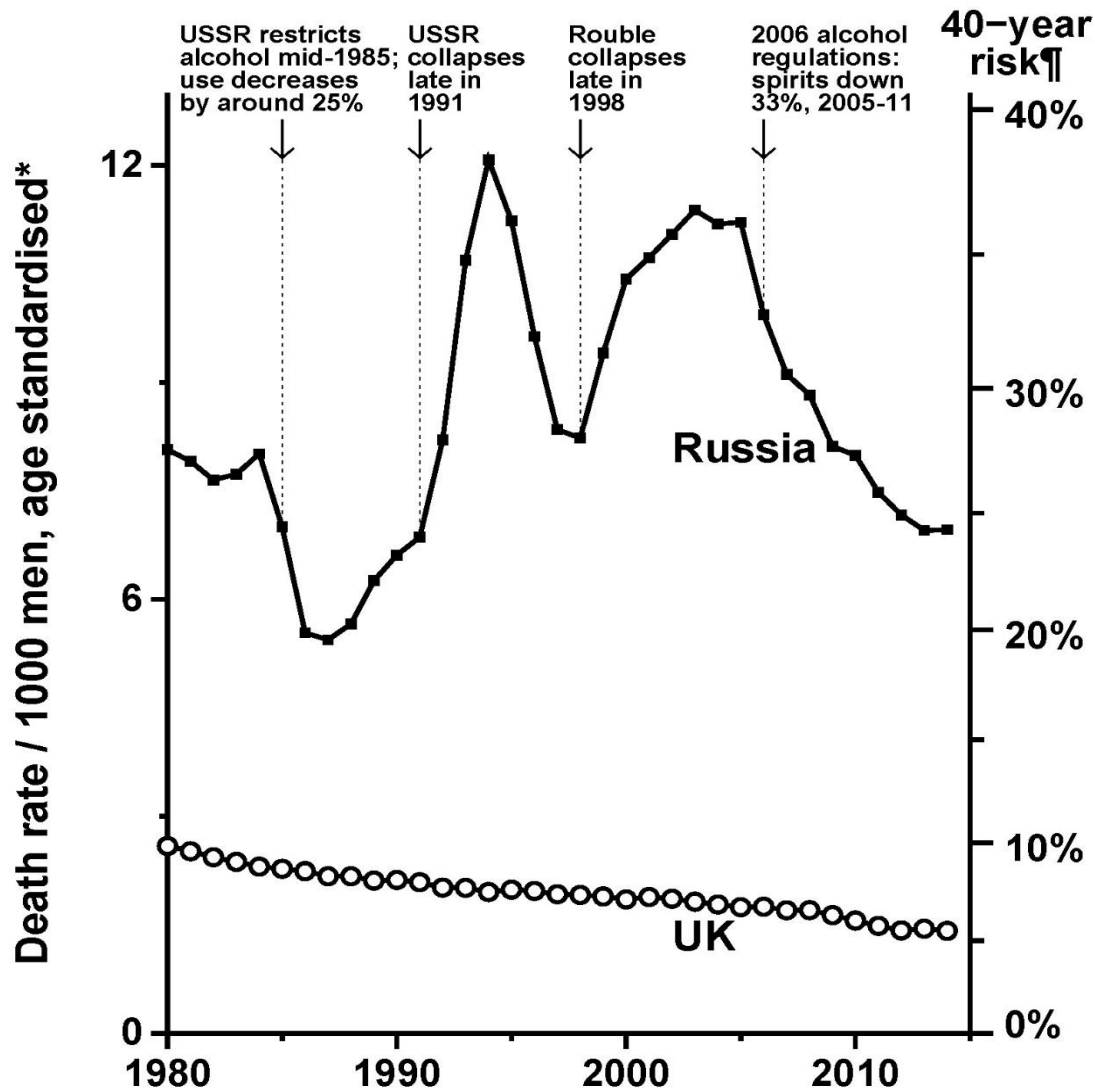
Russia and UK, 1980-2014, FEMALE: All-cause mortality at ages 15-54



* Mean of the age-specific death rates in 8 component 5-year age groups of 15-54. WHO/Eurostat deaths, UNPD populations

¶ Probability 15-year-old dies before age 55, at death rates of a particular calendar year. Courtesy of H Pan, CTSU, Oxford University

Russia and UK, 1980-2014, MALE: All-cause mortality at ages 15-54



* Mean of the age-specific death rates in 8 component 5-year age groups of 15-54. WHO/Eurostat deaths, UNPD populations

¶ Probability 15-year-old dies before age 55, at death rates of a particular calendar year. Courtesy of H Pan, CTSU, Oxford University

Russian 1990s male death rate ratios

**~1 bottle of vodka/day vs <1
bottle/week**

2 x any medical cause

4 x road traffic accident

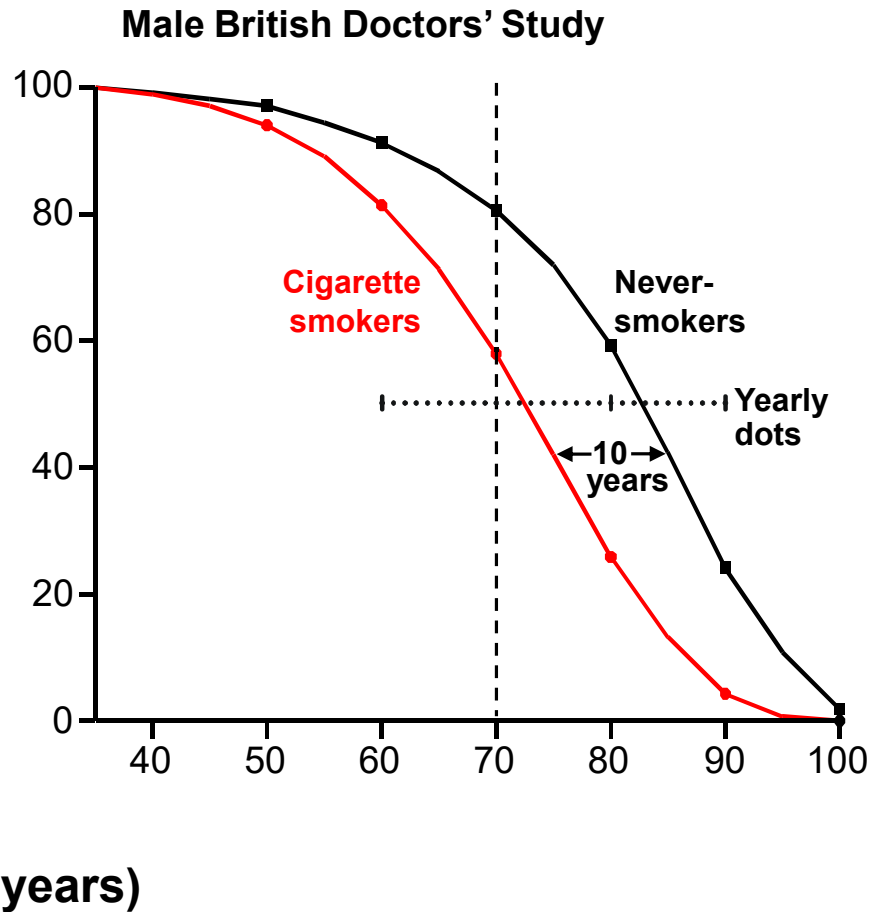
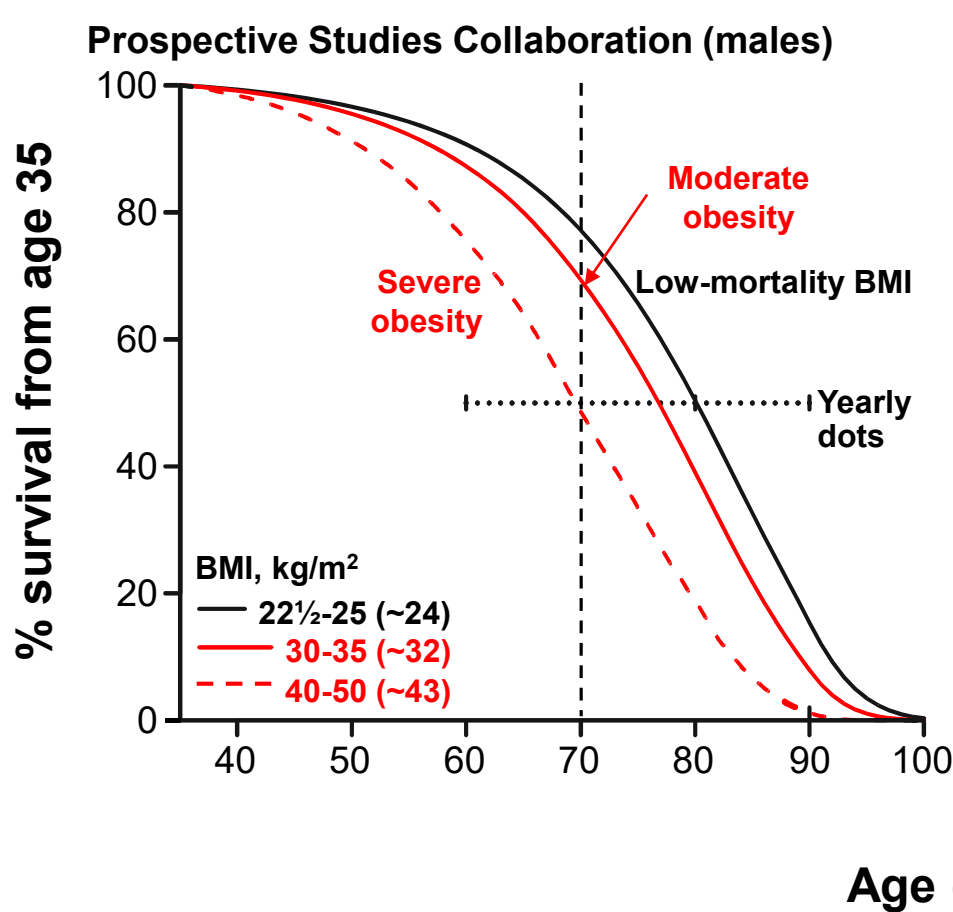
6 x any other accident

8 x suicide

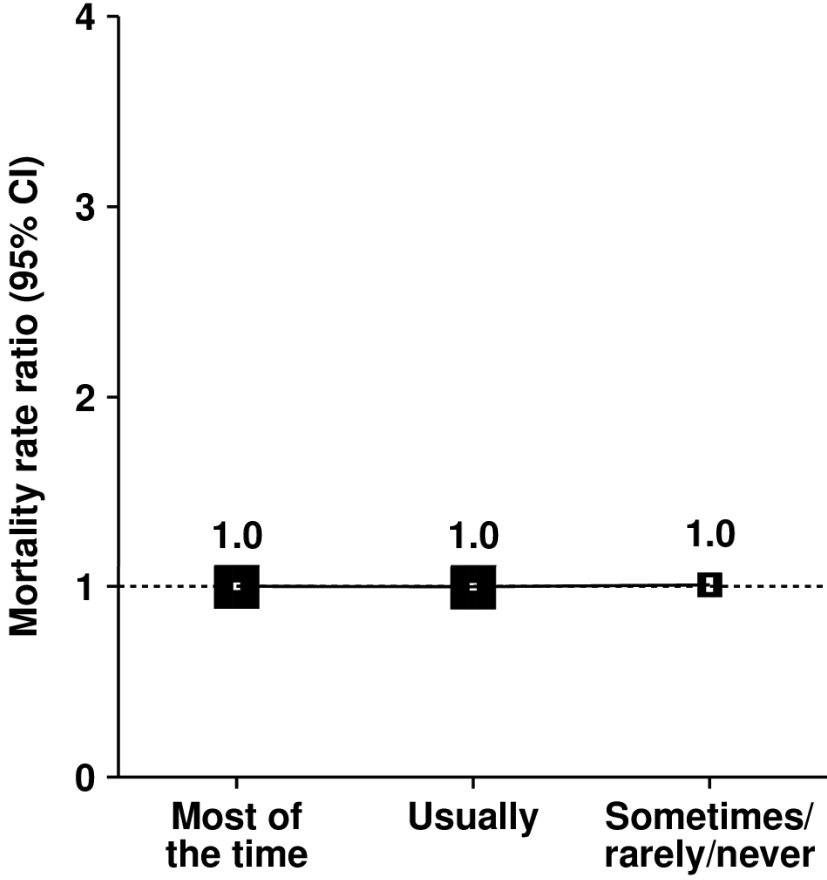
10 x murder

Life expectancy loss of 3 years with moderate obesity and 10 years with smoking

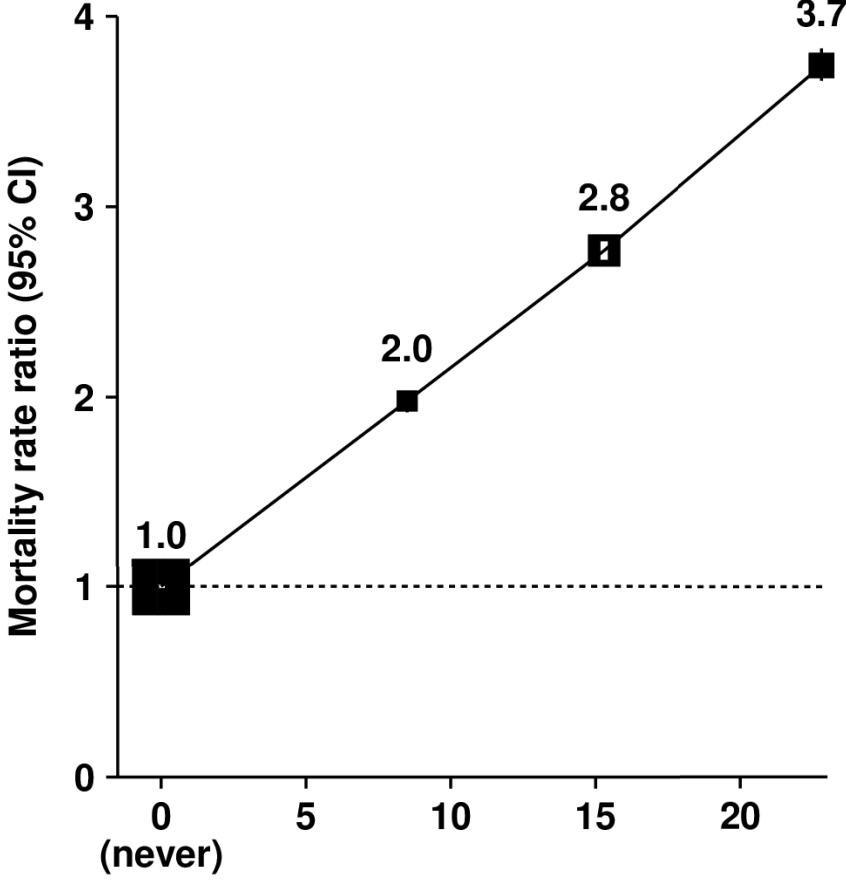
2 kg/m² extra BMI (if overweight) or 10% smoking prevalence shortens life by ~1 yr



UK Million Women Study: contrast between the relevance of happiness and of smoking to 10-year all-cause mortality among women who do not already have a chronic disease



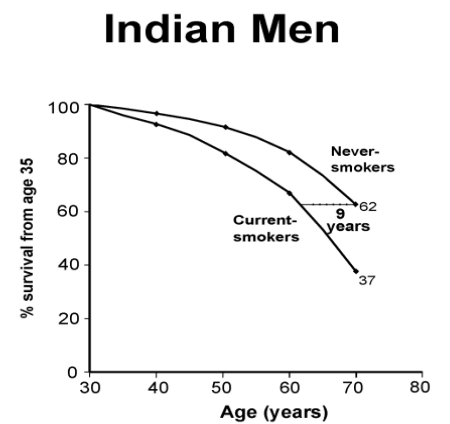
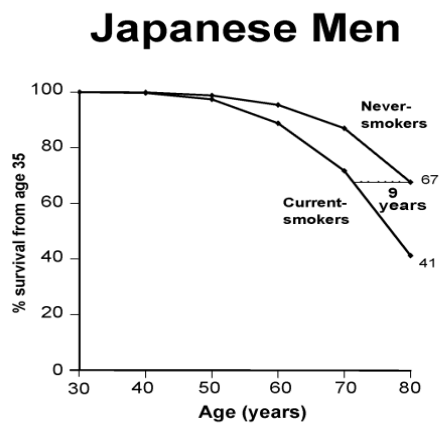
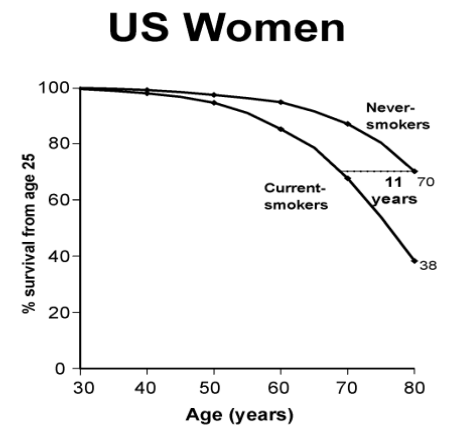
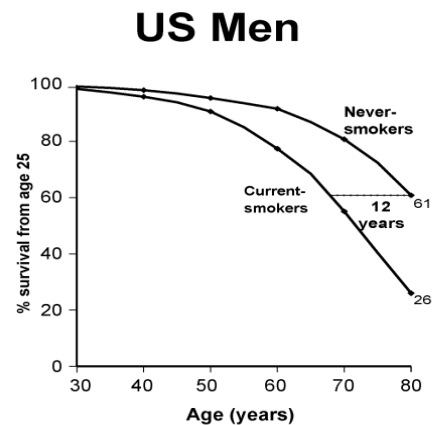
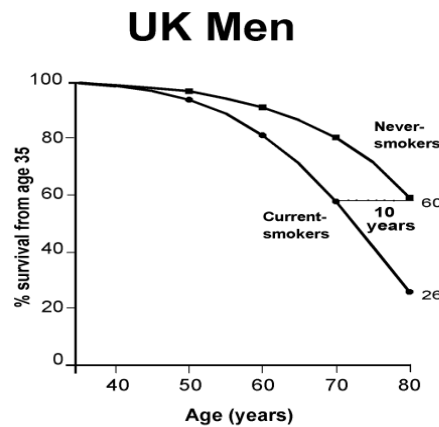
How often do you feel happy?



Usual daily cigarette consumption



21st century hazards of cigarette smoking in 6 distinct populations



Jha and Peto, NEJM 2014





Survey US women and men & link them to the National Death Index *“Facebook of death”*

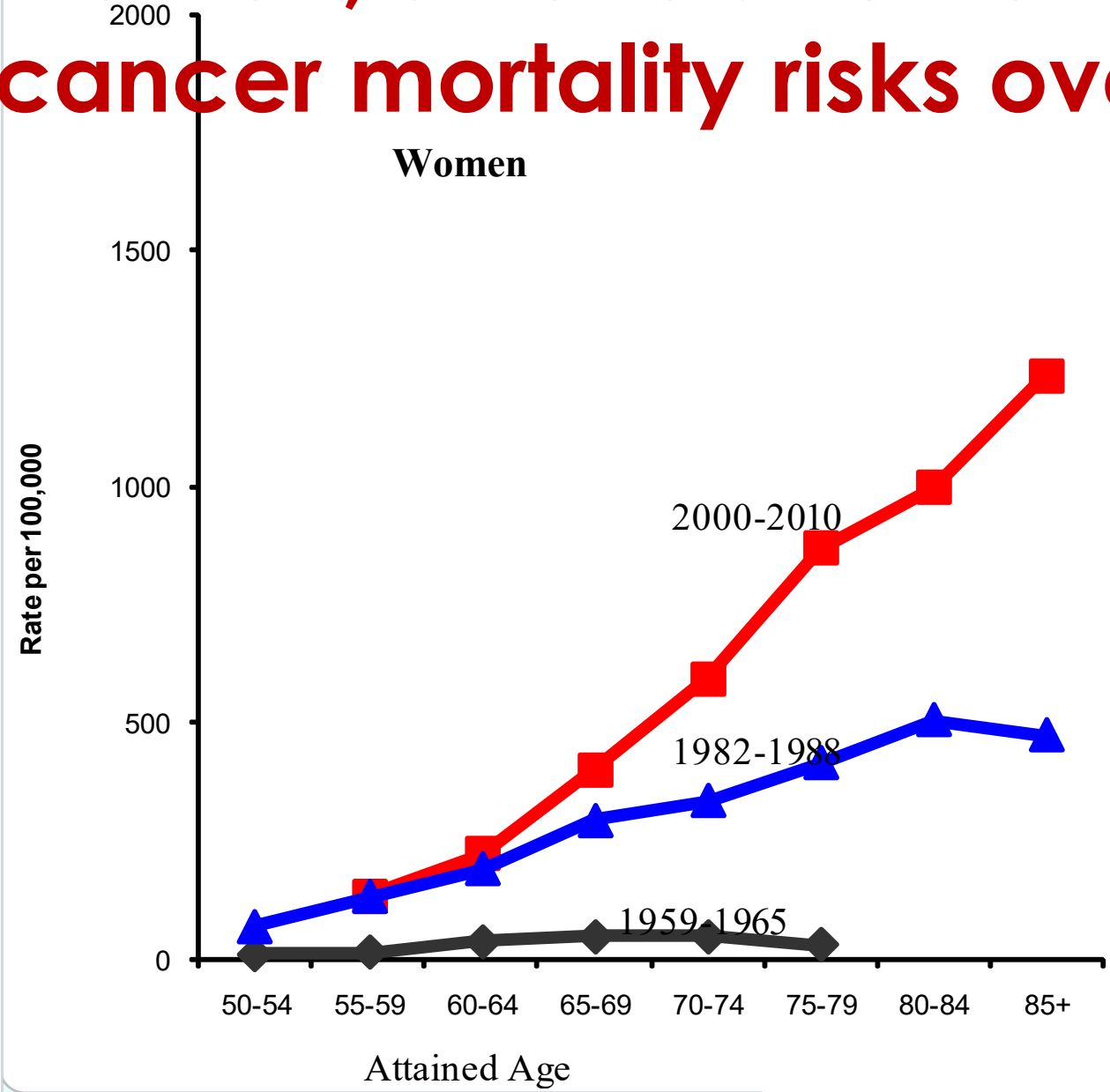
deathbook®

(Hazard ratios* current vs. never smokers,
ages 25-79, by gender)

**WOMEN WHO SMOKE: 3.0 times more likely
to die**

**MEN WHO SMOKE : 2.8 times more likely
to die**

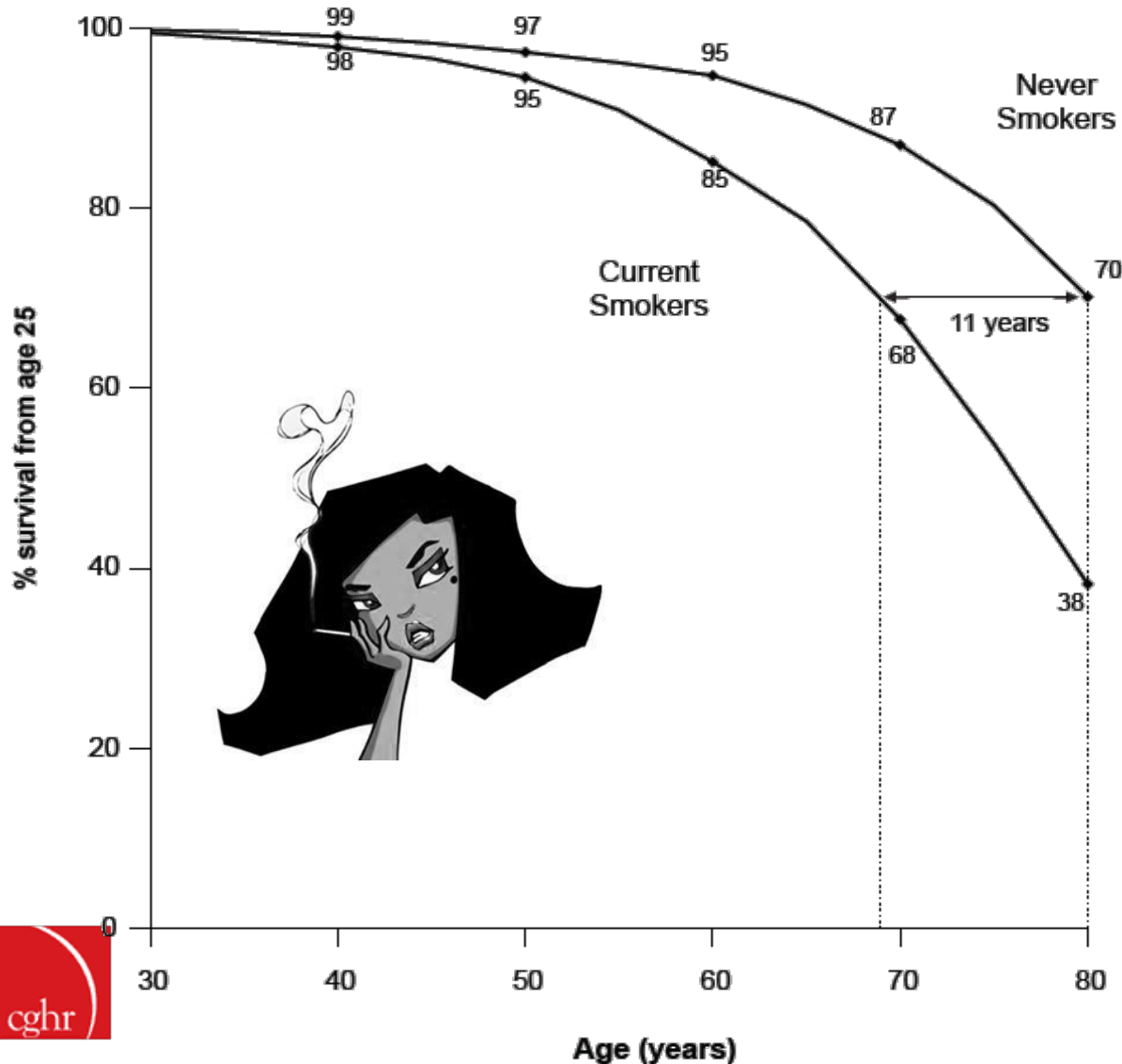
US Women, smoker: non-smoker lung cancer mortality risks over time



Source: Thun et al, NEJM 2013

FEMALES: Survival probabilities

between ages 25 and 80 years among current and never-smokers in the US



HR adjusted for age, education, alcohol, adiposity (BMI), scaled to 2004 national rates, but comparable results if only actual cohort used

Three main messages for the individual smoker

**1. Risk is BIG: 1/2 are killed
(cancer & vascular & respiratory)**

**Mexico: ~14 M smokers (about 8M <35 years, of whom
~4 M will die from smoking unless they quit)**

**2. 1/4 are killed in MIDDLE age
(30-69), losing many years**

3. STOPPING smoking works

World annual tobacco deaths

Developed countries ~2M

China ~1M

India ~1M

**World ~5-6M, rising
to 10M by mid-century**

*** Global sales ~6,000 B sticks (vs 5,000 B in 1990),
with \$10,000 profit per death**

1 ton of tobacco=1 M sticks=1 death



**CHINA and INDIA :
1 million tobacco
deaths each per year
during the 2010s**

Source: Chen et al, Lancet 2014; Jha et al, NEJM 2008

China: Proportion of deaths among middle-aged males from smoking

1990s

12%

2010

20%

(25% urban, 15% rural)

1998 Hong Kong +

33%

2030s China

33%

+ Hong Kong male smokers started smoking seriously 20 years before

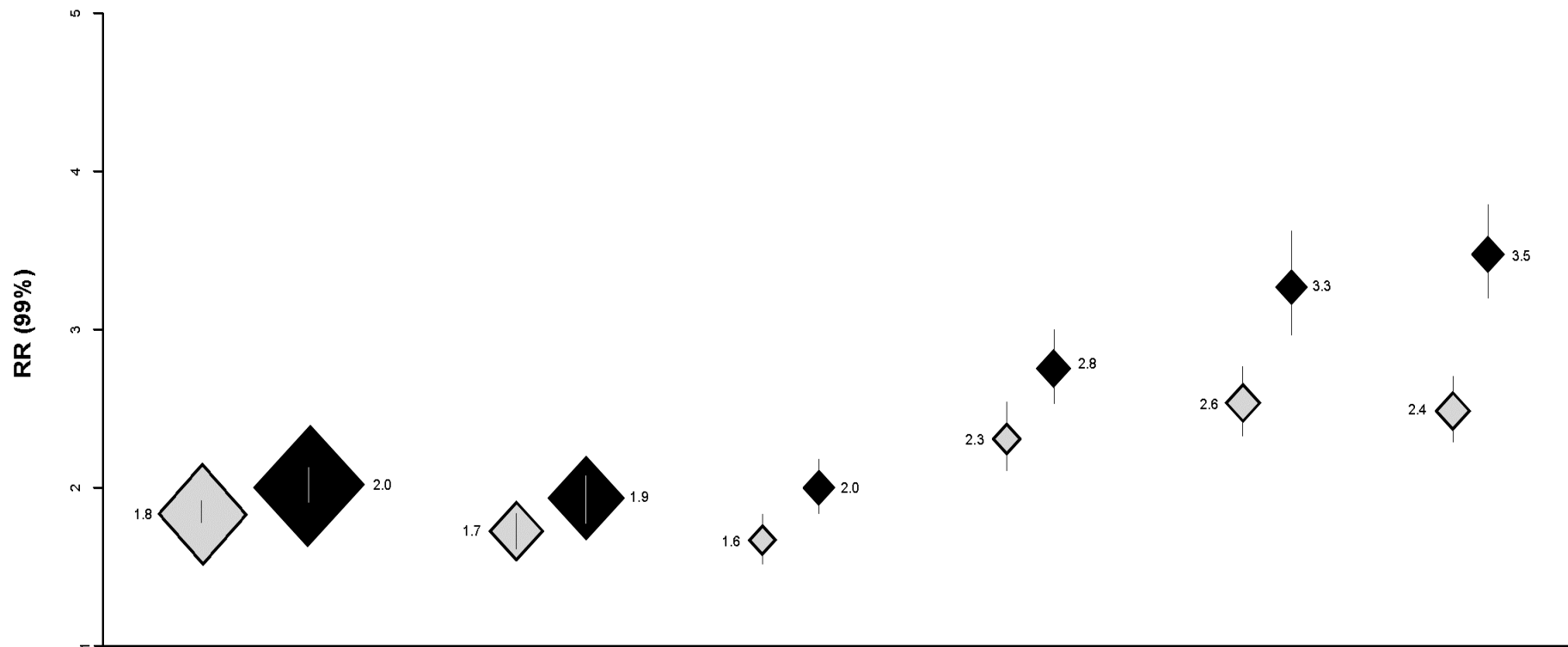
INDIA: Years of life lost among 30 year old smokers* (MDS results)



Men who smoke bidis	6 years
Women who smoke bidis	8 years
Men who smoke cigarettes	10 years

* At current risks of death versus non-smokers, adjusted for age, alcohol use and education
(note that currently, few females smoke cigarettes)

RR (smoker: nonsmoker), specific causes, ages 30-69, 2001-03 vs 2010-11: Men



All causes

No. of deaths in Women: 16 478 23 948
 No. of deaths in Men: 25 265 40 182

Heart diseases

2524 4717
 5409 10 007

Stroke

1733 2256
 2345 3379

Neoplastic

2264 3092
 2423 3483

Tuberculosis

1419 1194
 3125 2866

Respiratory

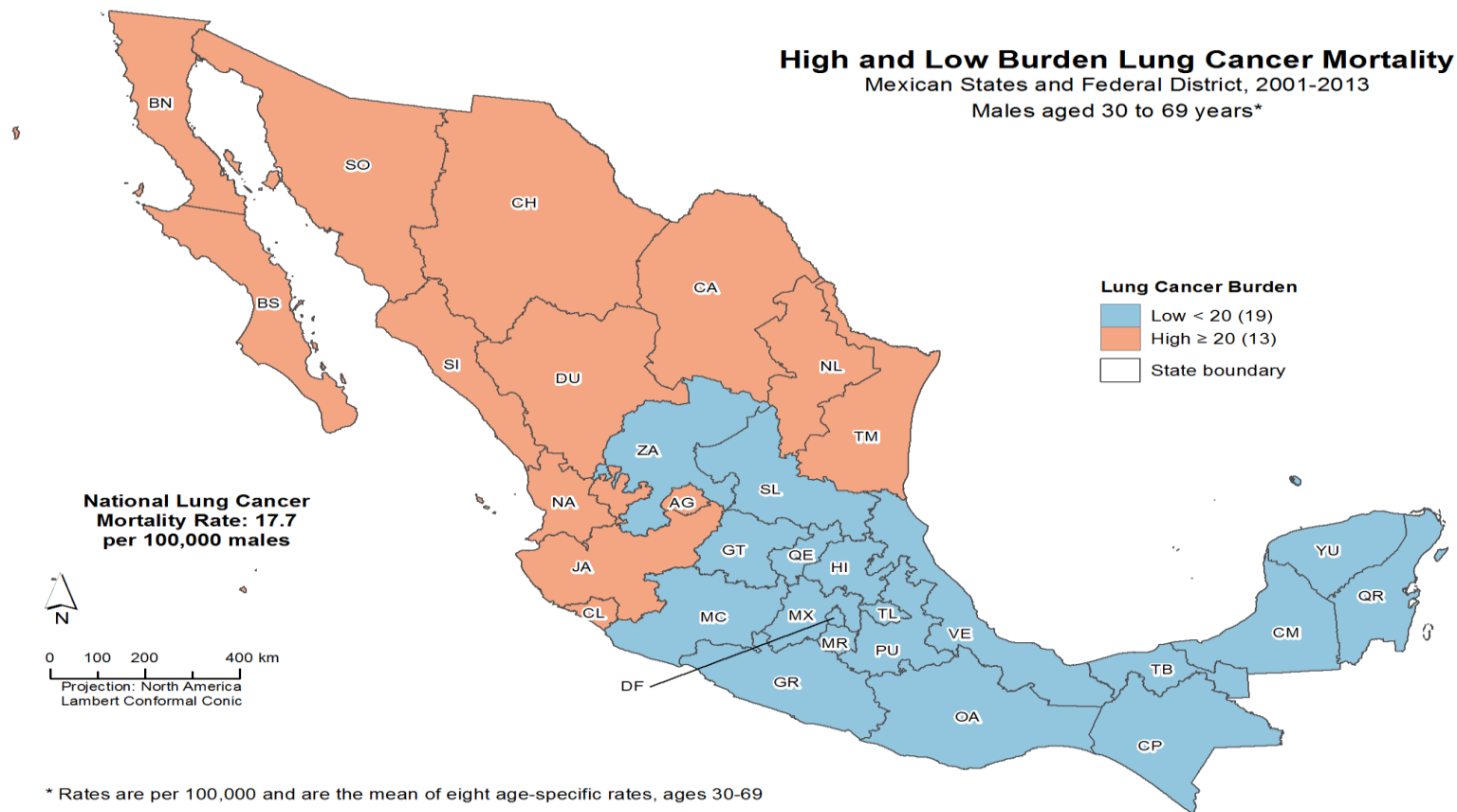
2329 2365
 3482 3525

Mexican smoking patterns age 15+

<u>Group</u>	<u>% M / F</u>	<u>No (millions)</u>
Current smoker	25 / 8	14
Ex-smoker	21 / 9	12
Never	54 / 83	49

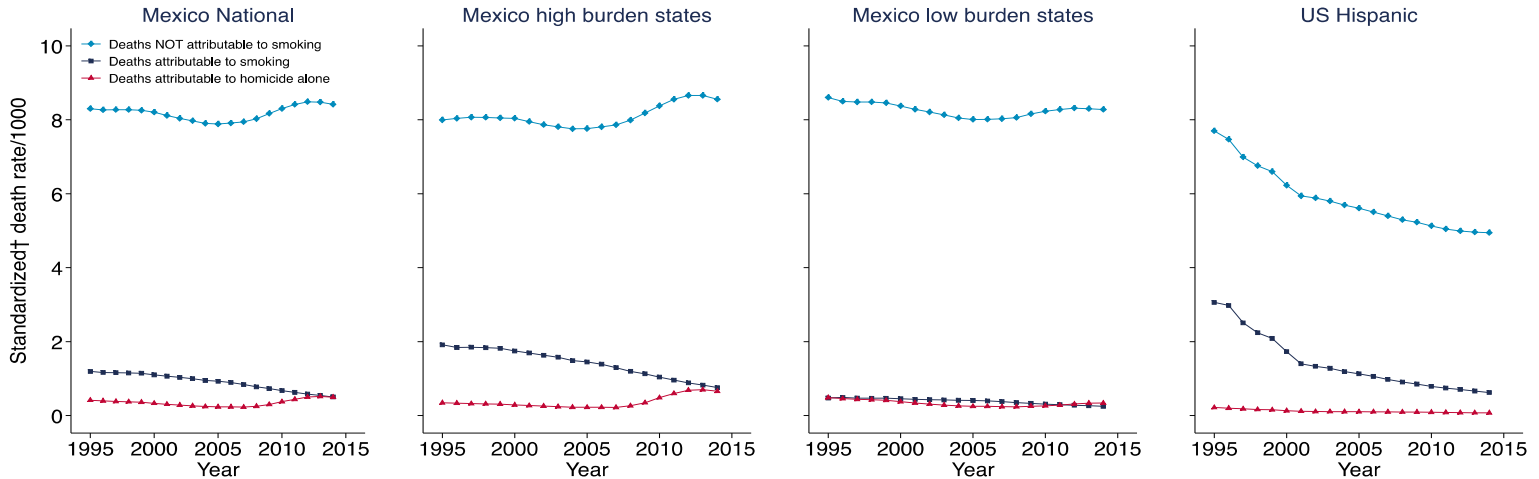
- About 49 billion cigarettes produced or about 2/per adult per day, vs US (about 5/adult/day)
- Early age of onset (most smokers start by age 20)
- Compare to ex-smoking rates of 30-40% in UK and Canada
- Rising rates in young? (each 10% increase, will reduce overall life expectancy by 1 year)

High and low burden lung cancer mortality (males), Mexican states, 2001-13

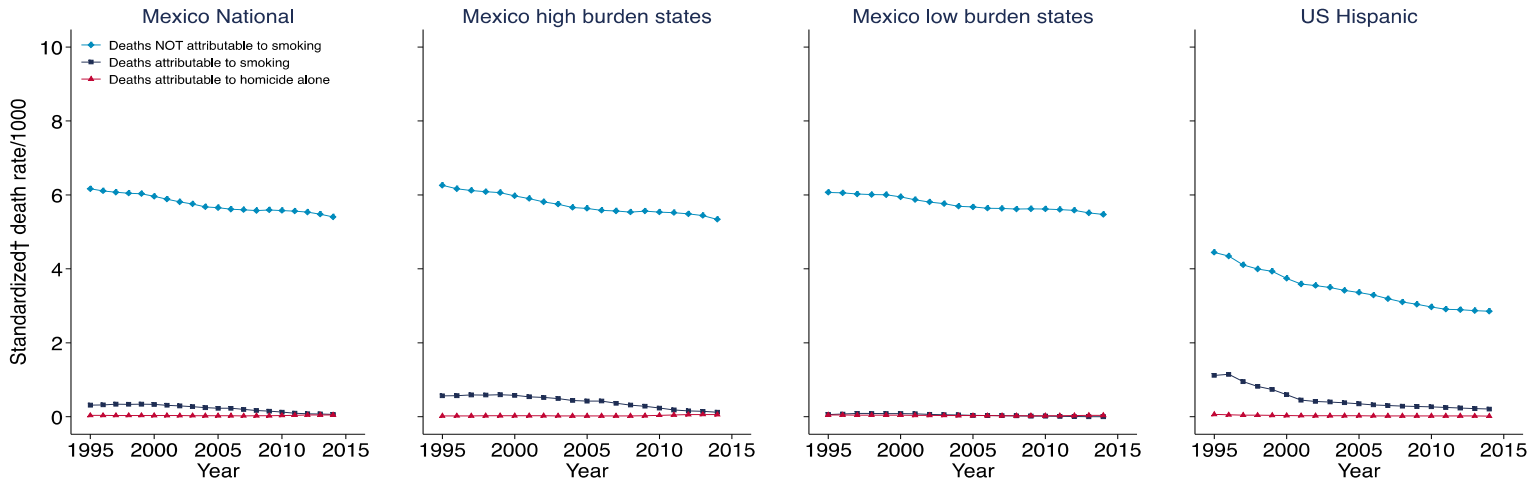


Death rates attributable to smoking and not attributable to smoking and from homicide in Mexico and US Hispanics, 1995-2015

A. Men

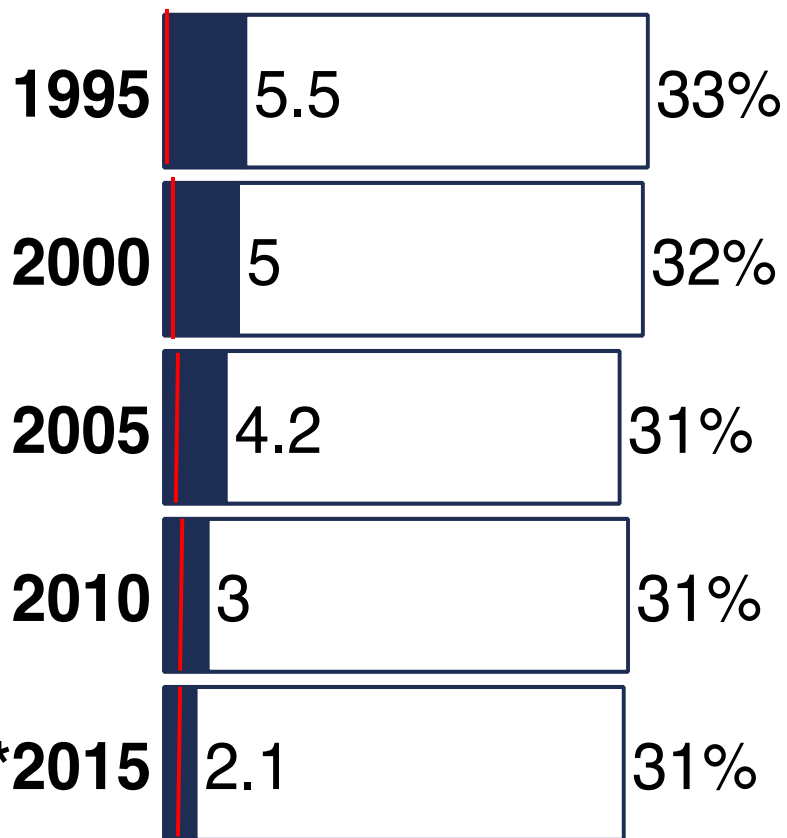


B. Women

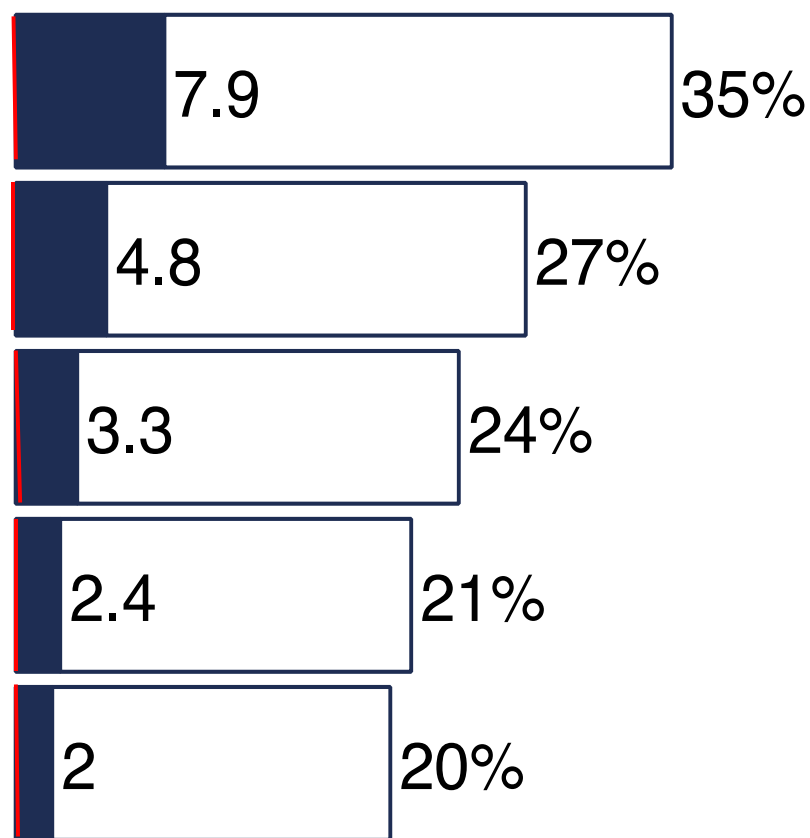


Population risk of a 30-year-old man dying at ages 30–69 from smoking (shaded) or from any cause (shaded and white) in Mexico and USA, 1995-2014

Mexico high burden states

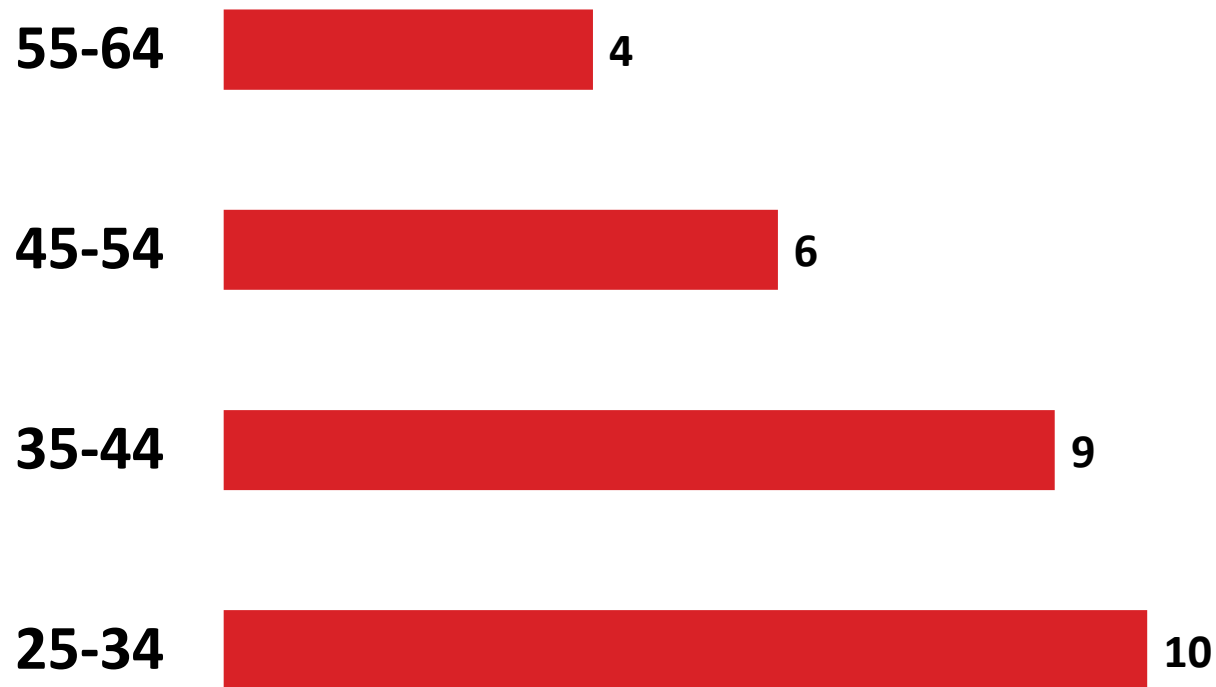


US Hispanic

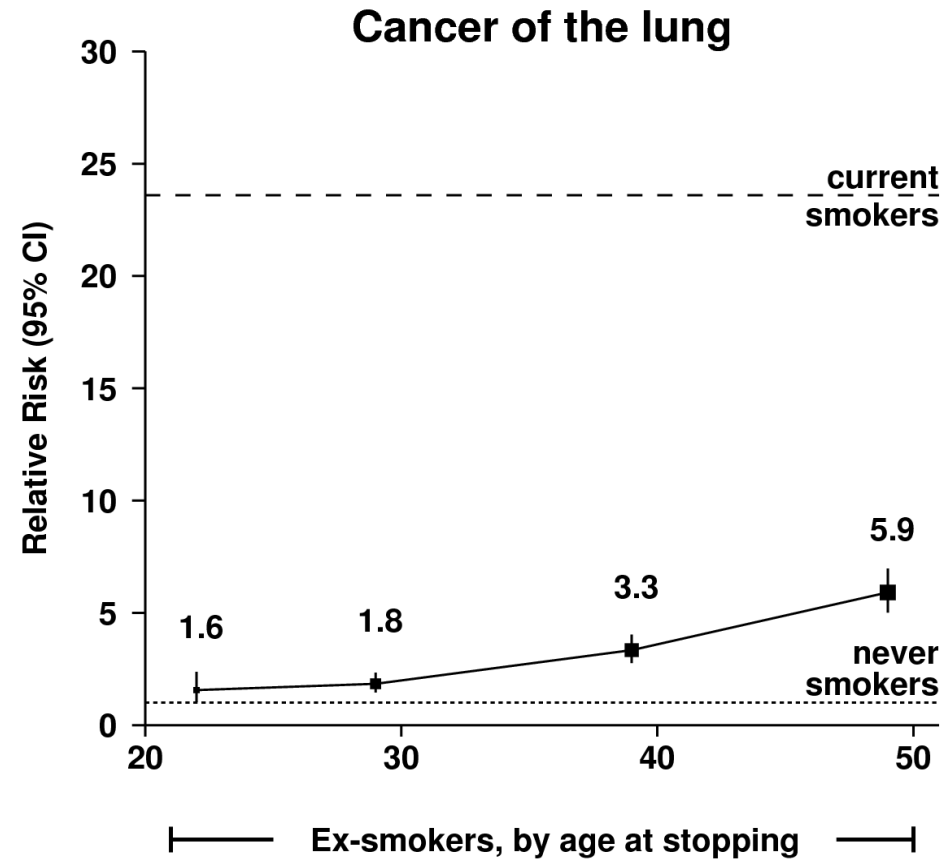
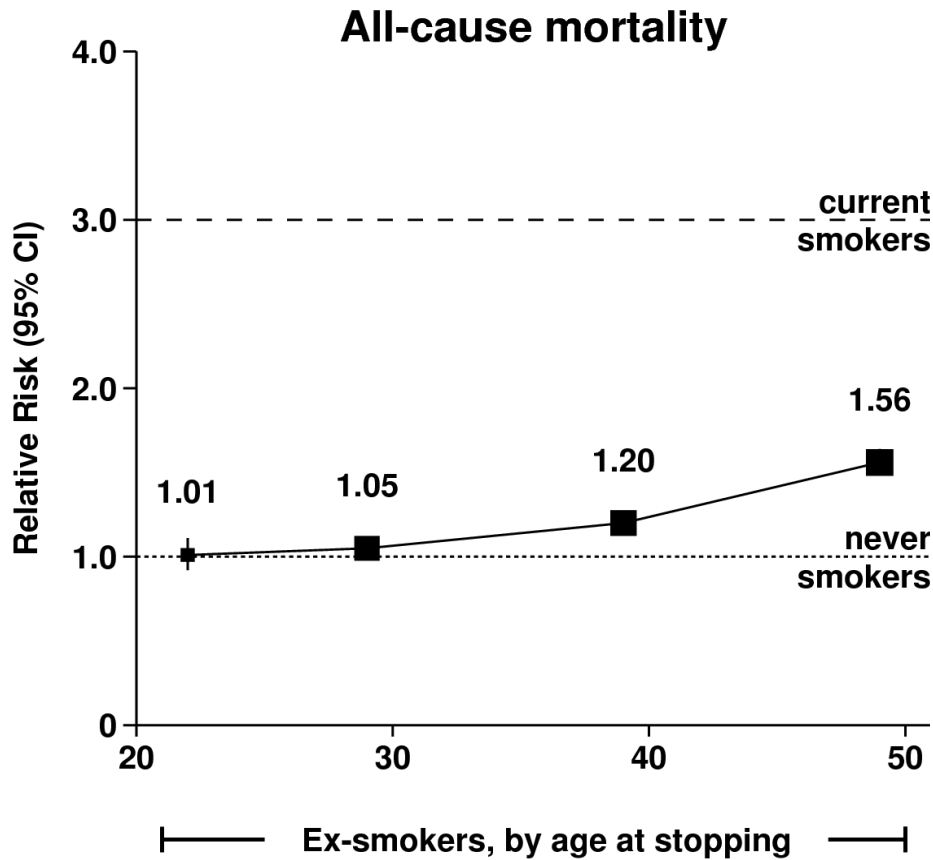


Red line represents deaths attributable to homicide

Years gained by quitting smoking by age



Reductions in risk by age stopped, UK Women (Million Women's Study)



Evidence for tobacco control

DEVELOPMENT IN PRACTICE

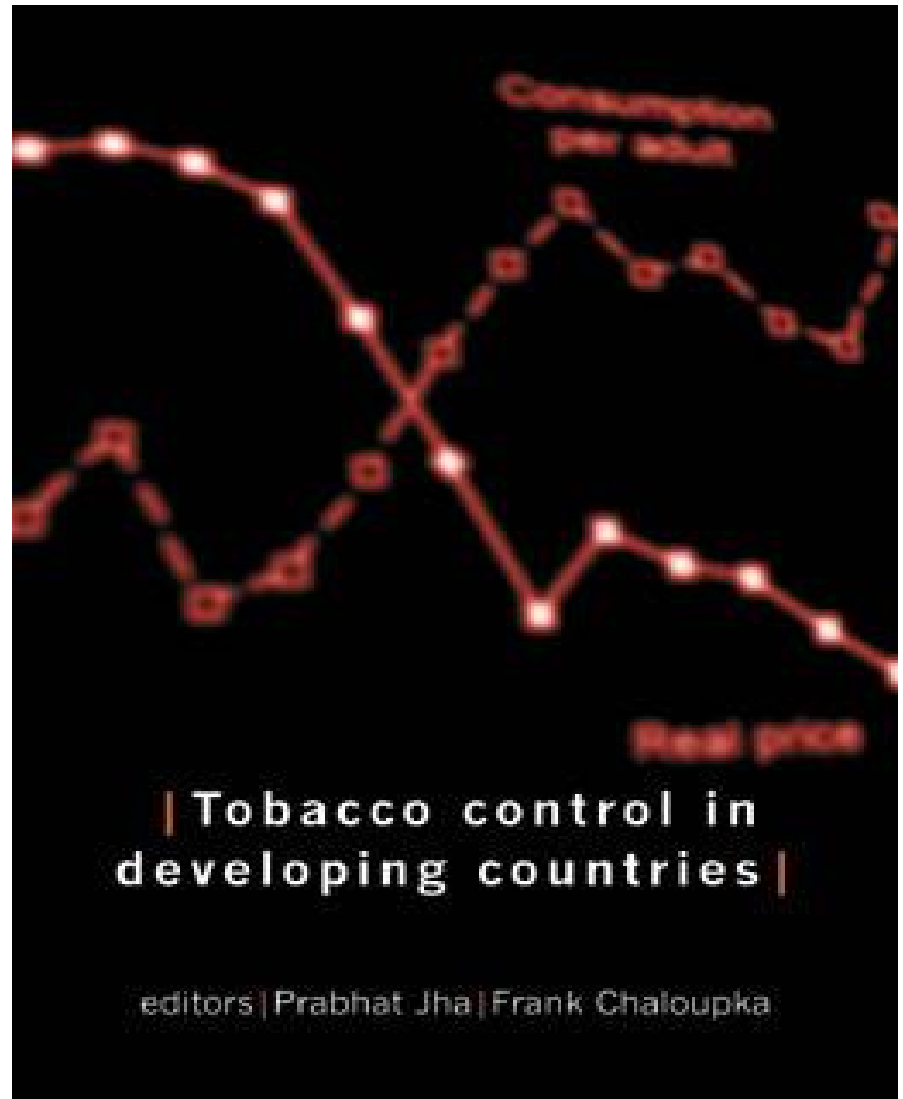
Curbing the Epidemic

Governments and the

Economics of Tobacco Control



A WORLD
BANK
PUBLICATION



June 1, 2017

Cough up

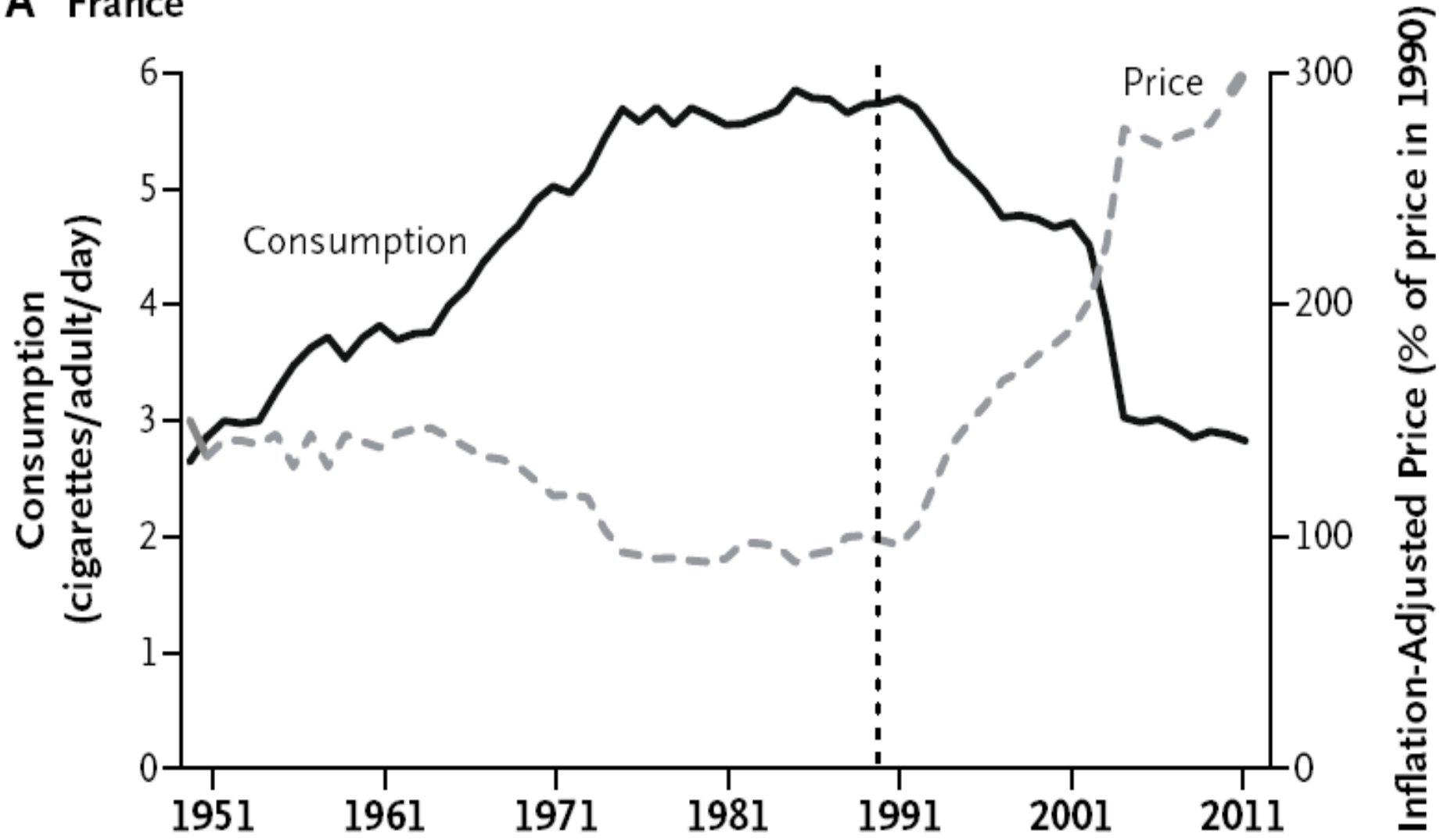
How to cut smoking in poor countries

The recipe to get people to quit is well-known. Why are so many governments ignoring it?



Cigarette prices tripled, consumption halved, tax revenue doubled: FRANCE

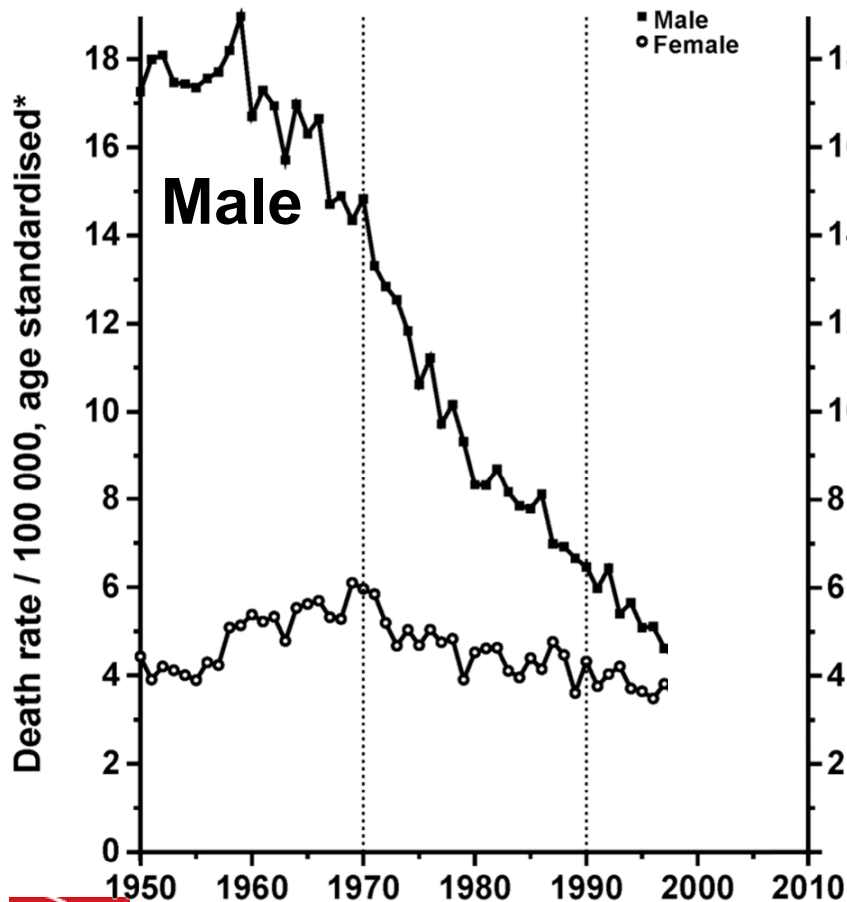
A France



UK & France, lung cancer mortality trends (35-44) to 1997, but not beyond

UNITED KINGDOM

Lung cancer mortality at ages 35-44

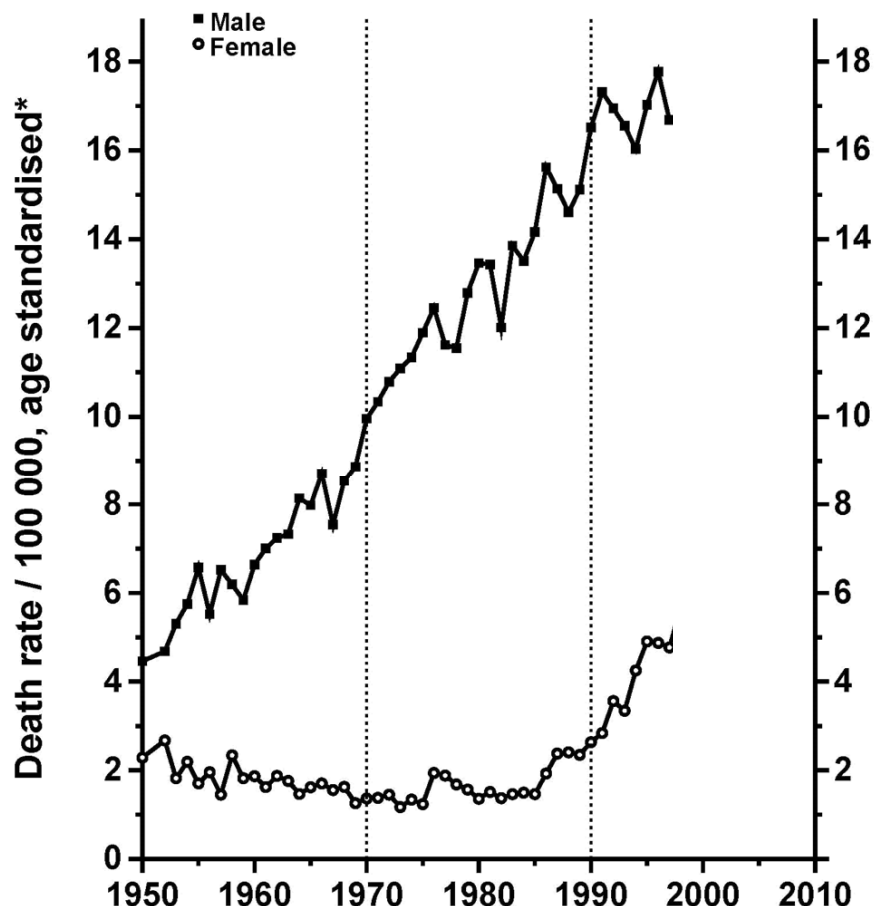


*Mean of annual rates in the two component 5-year age groups

Source: WHO mortality & UN population estimates

FRANCE

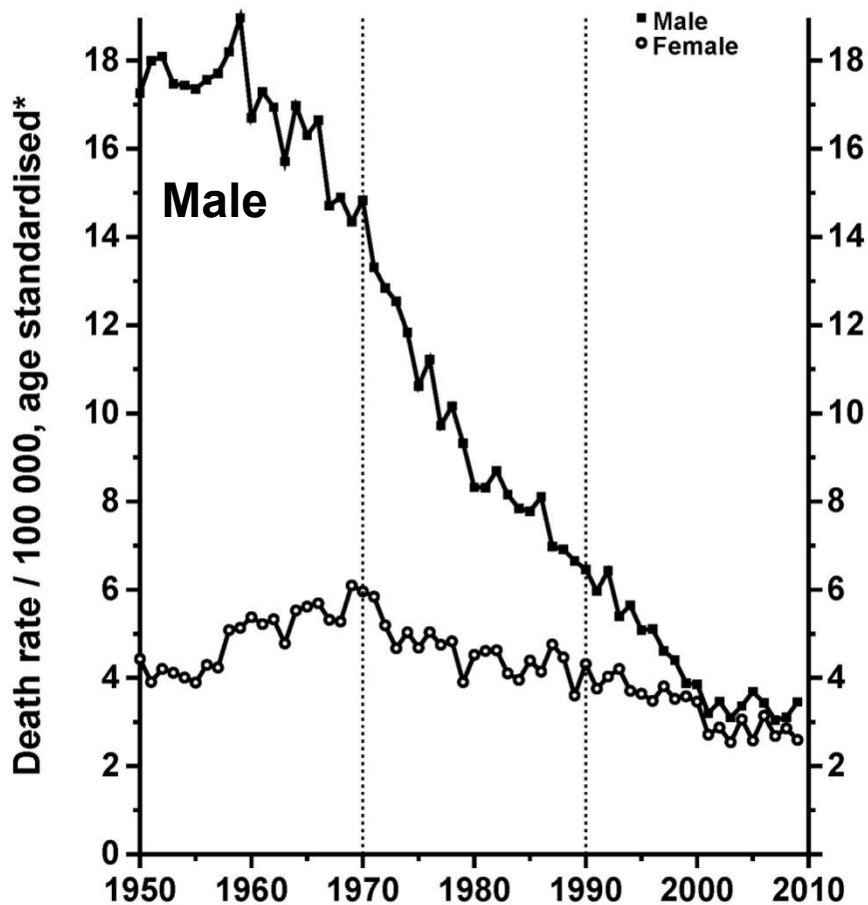
Lung cancer mortality at ages 35-44



*Mean of annual rates in the two component 5-year age groups

Source: WHO mortality & UN population estimates

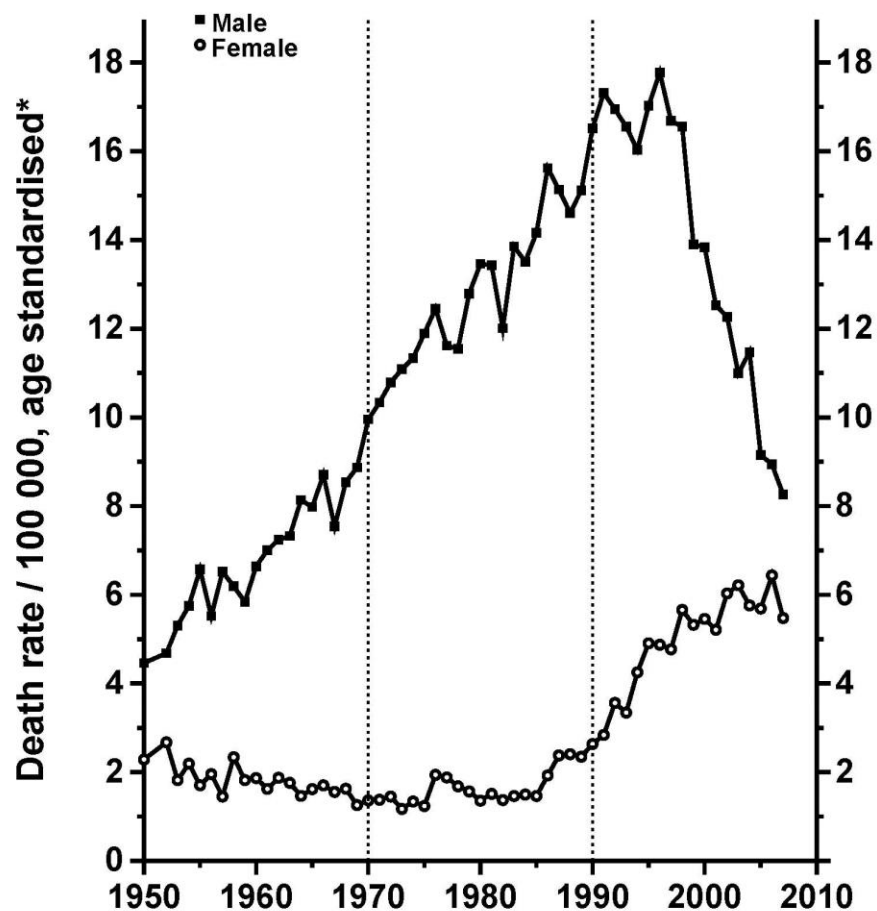
**UNITED KINGDOM 1950–2009: Males & Females
Lung cancer mortality at ages 35–44**



*Mean of annual rates in the two component 5-year age groups

Source: WHO mortality & UN population estimates

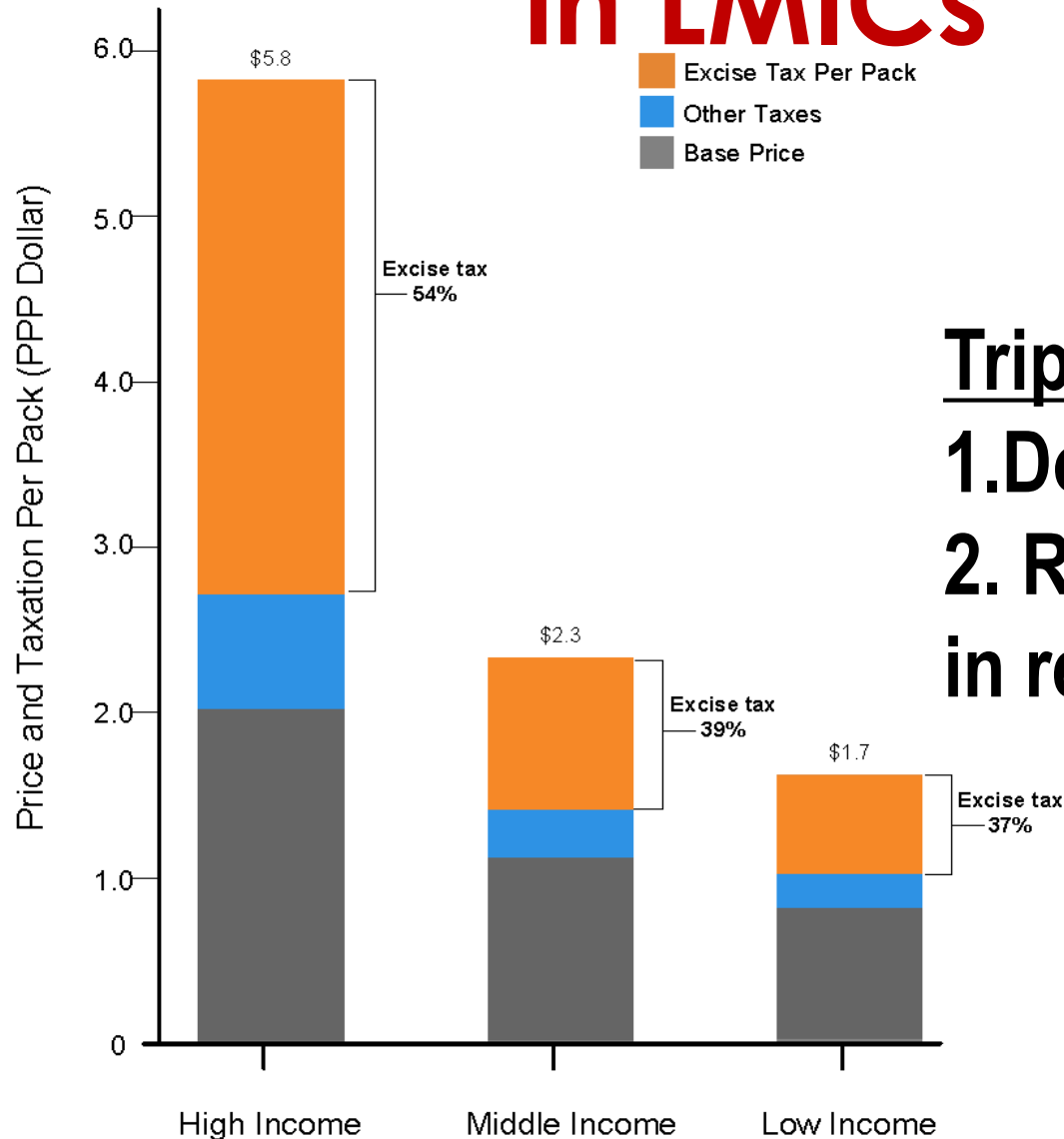
**FRANCE 1950–2007: Males & Females
Lung cancer mortality at ages 35–44**



*Mean of annual rates in the two component 5-year age groups

Source: WHO mortality & UN population estimates

Low Specific Excise taxes in LMICs



Tripling excise would:
1. Double street price
2. Raise \$100 B more
in revenue

BIG and SMART taxes: importance of excise tax

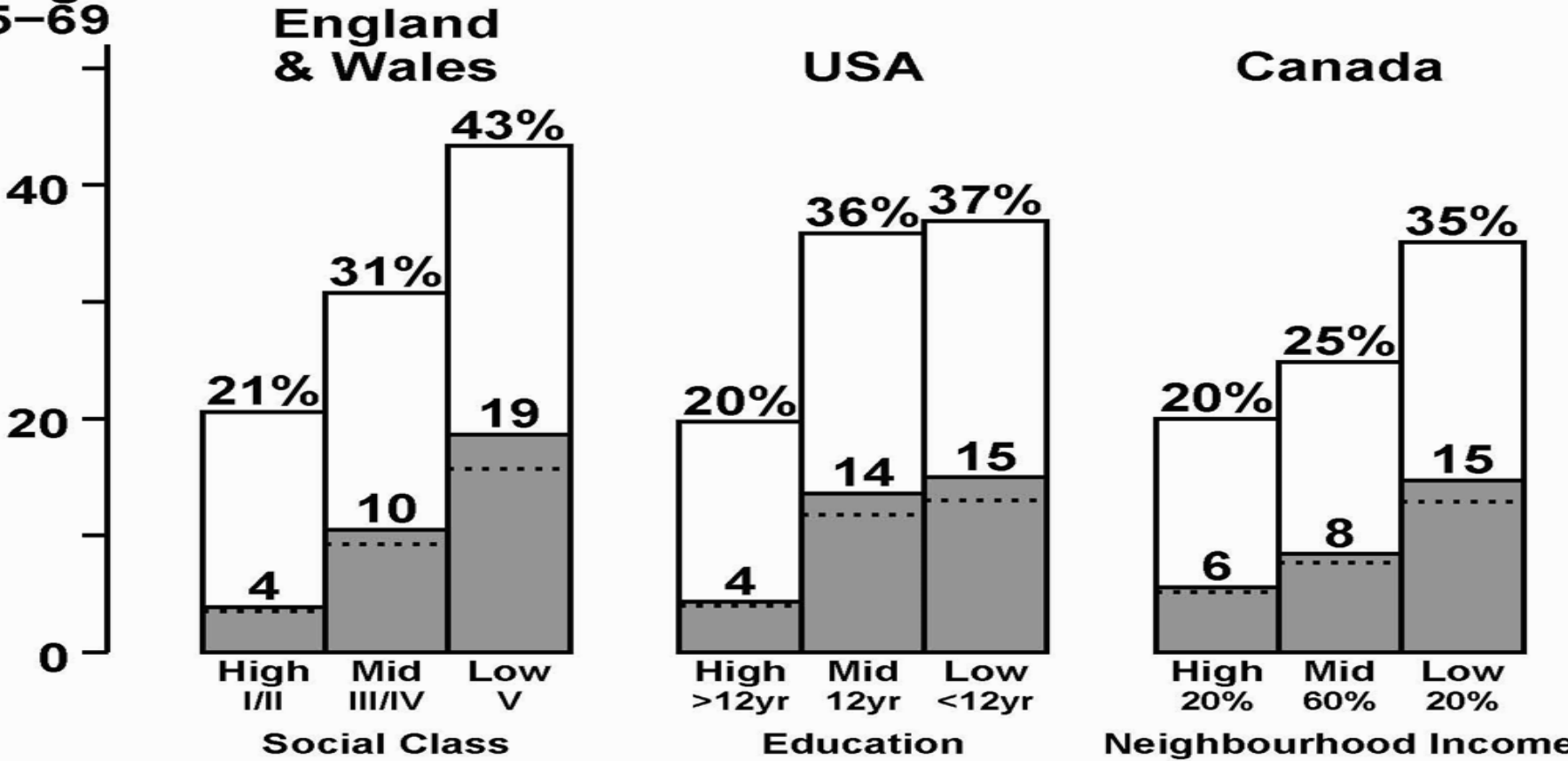
- Greater reliance on **specific tobacco excises** will:
 - Reduce gap in prices between high and low priced cigarette brands (ad valorem increases gap)
 - Produce more stable, predictable stream of cigarette excise tax revenues
 - Have greater impact on cigarette smoking
 - More easily counter smuggling
- India example: higher taxes on shorter, cheaper cigarettes have **narrowed top/bottom price difference from 4 fold to 1.6 fold**, BUT BIGGER increases needed

Objections to higher tobacco taxes

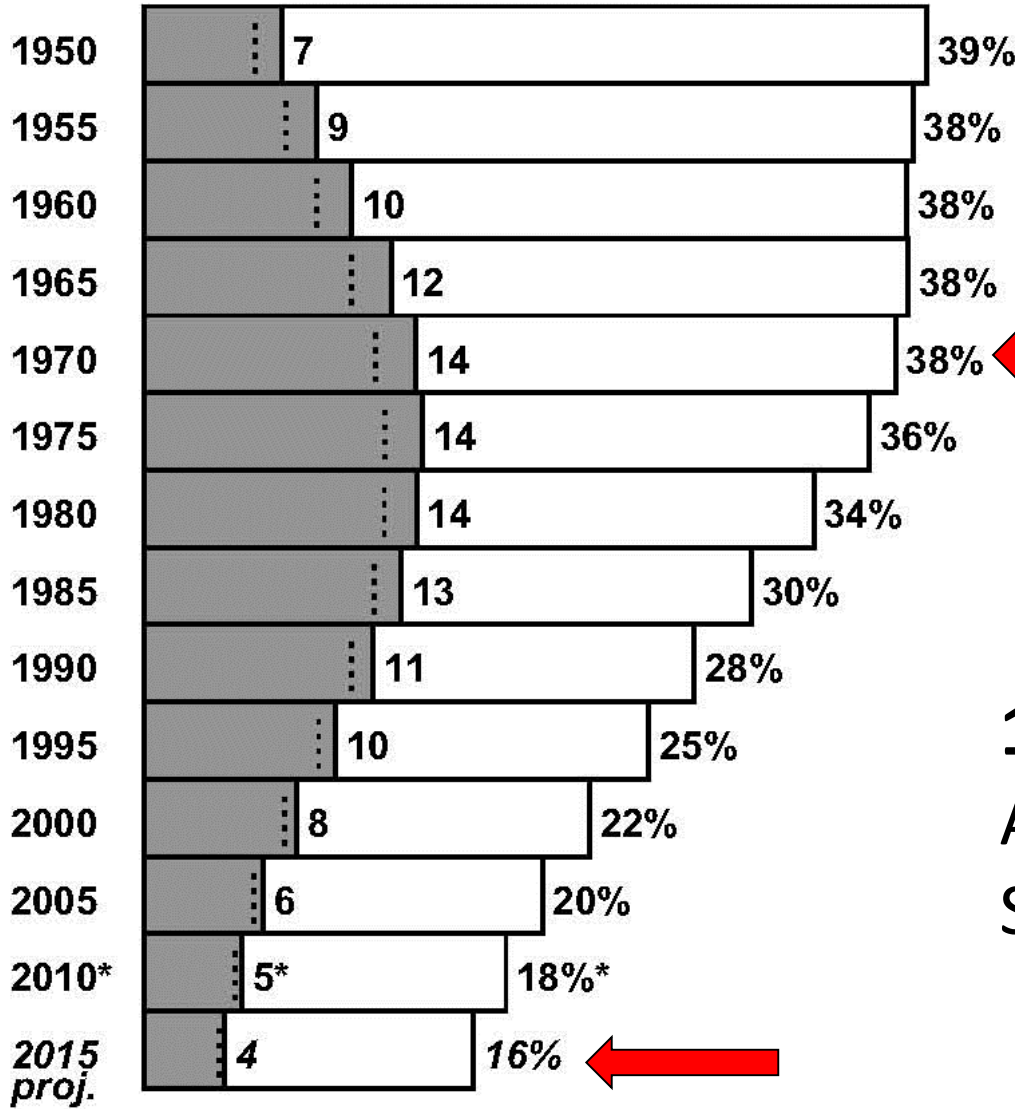
- **Job losses:** In most economies, no net impact (money not spent on tobacco is spent on other goods and services)
- **Revenue loss:** “Laffer curve”- revenue declines not seen in practice nearly anywhere
- **Hurts the poor:** poor more price responsive, and gain more of the health benefits than the rich
- **Smuggling:** legitimate concern but consumption falls, revenue increases even with smuggling, and *can counter with labels with tax stamp, smart labels, and coordination*

Social inequalities in male mortality in 1996 from smoking (shaded) and any cause

% risk of dying at ages 35-69



CANADA: Risk of a 35-year-old MAN dying by age 69 from smoking (shaded) or from any cause (shaded+white), 1950-2015



Mortality change:
1970 to 2015:
 ANY CAUSE: ↓ 60%
 SMOKING: ↓ 70%



Source: Peto et al, CTSU, 2016

Mortality decline in the poorest and richest quintile of Ontario men ages 30-69, all causes and smoking 1992 to 2012

Cause

All causes

Smoking

Poorest men

-5

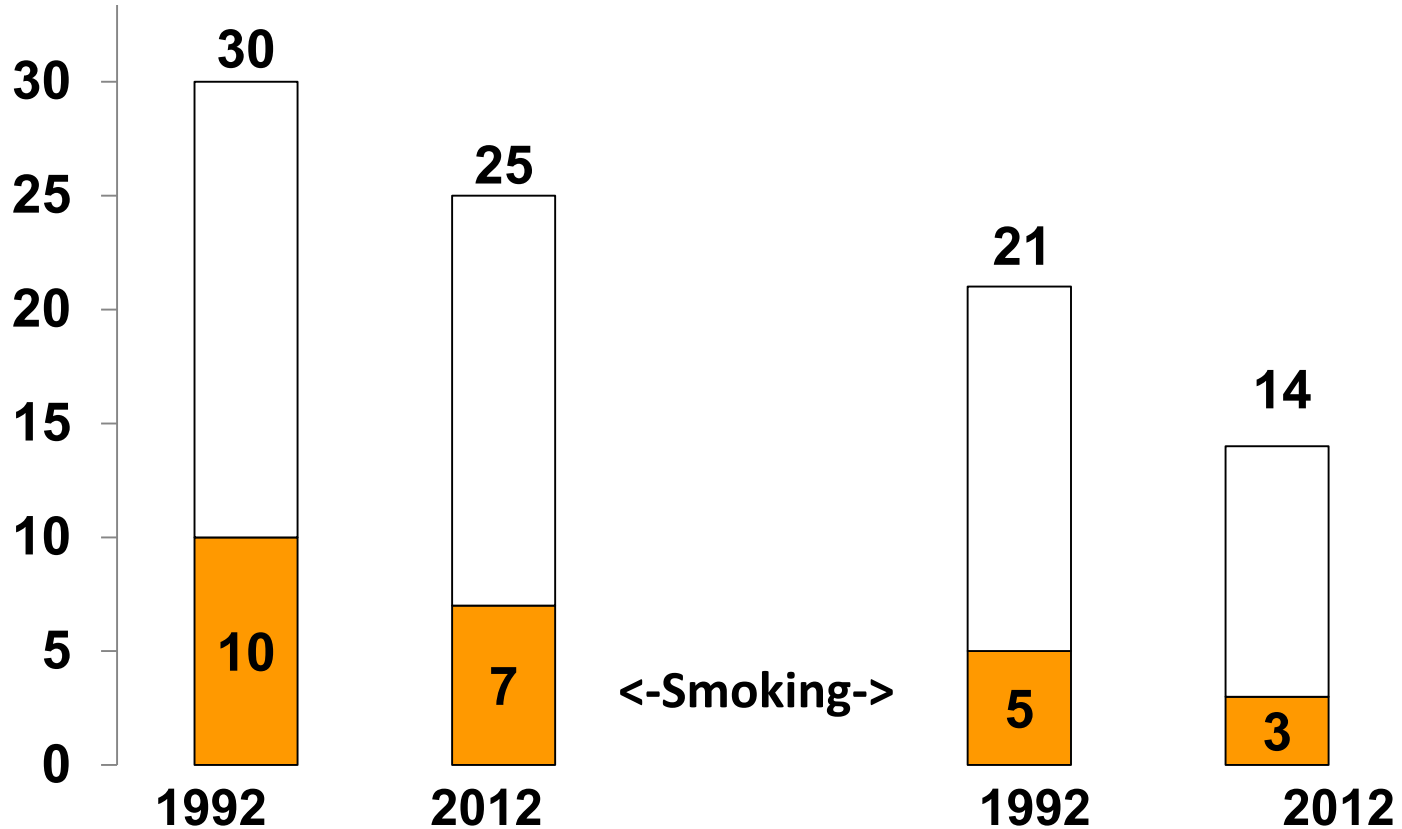
3 (60%)

Richest men

-7

2 (29%)

Risk of death ages 30-69



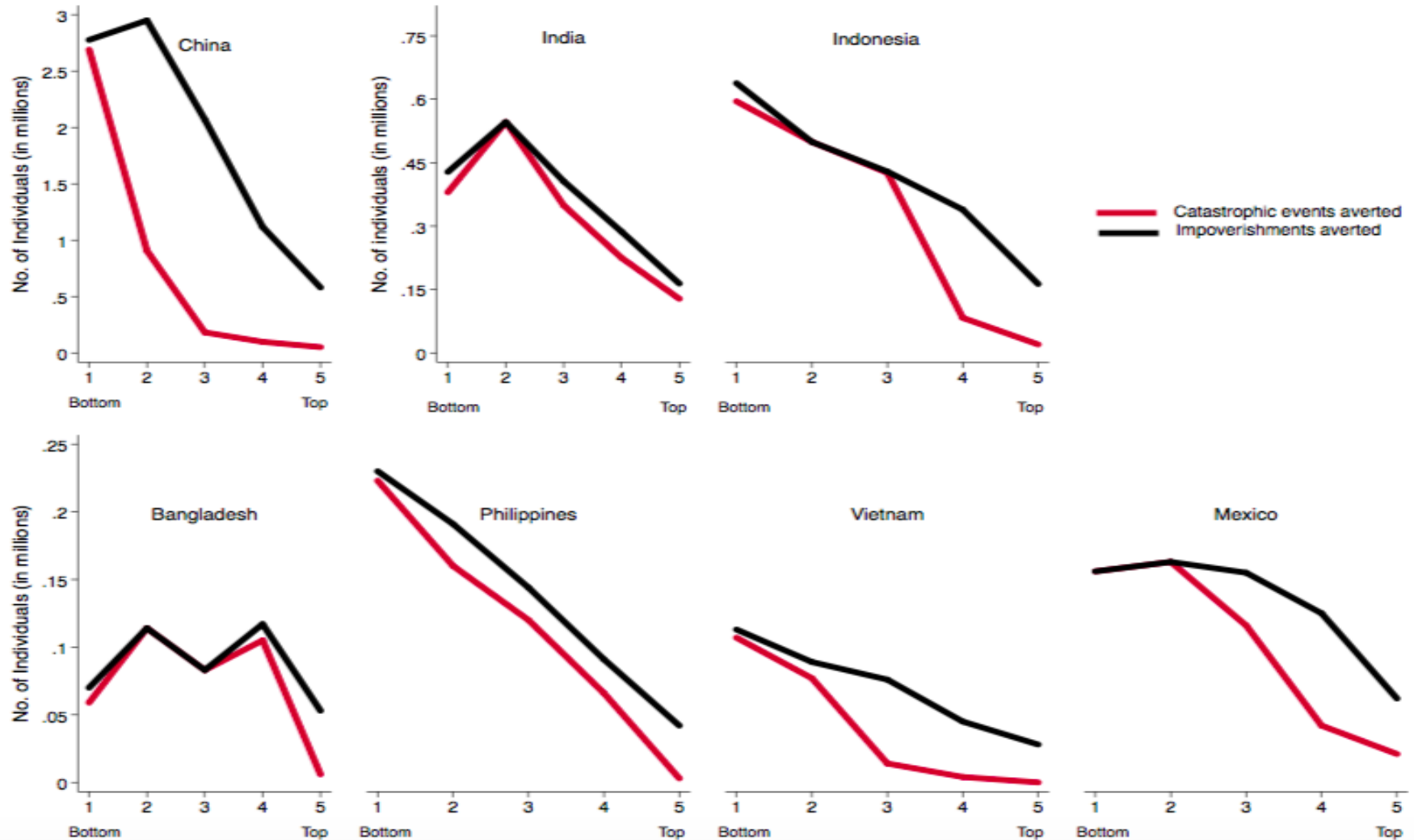
<-Smoking->



Background:

- 13 diverse low and middle income countries
 - Lower middle income countries: India, Bangladesh, Indonesia, Philippines, Vietnam and Armenia
 - Upper middle income countries: China, Mexico, Turkey, Brazil, Colombia, Thailand and Chile
- About 2B males of which and consisting of 500M are smokers
- 400M live below poverty line i.e. US\$ 1.9/day (PPP adjusted)
- Only 27% in LMICs and up to 97% in UMICs have UHC
- Their average out of pocket is 45% of the total expenditure
 - 60% in LMICs and 30% in UMICs

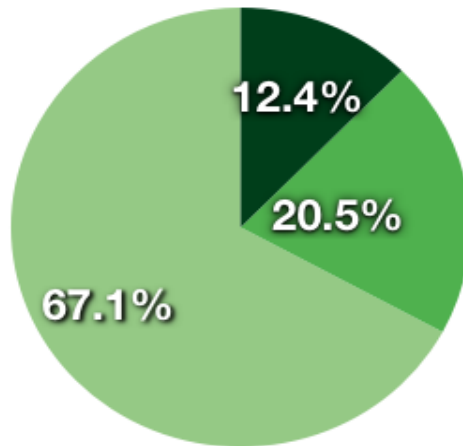
Men averting impoverishments and catastrophic healthcare spending with 50% price increase in 7 countries



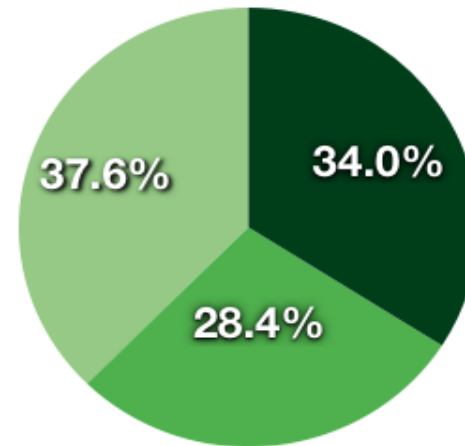
United States

Distribution of marginal taxes and health benefits by SES group

Marginal taxes paid by SES



Deaths averted by SES



● <poverty ● 1-2* poverty ● >2* poverty

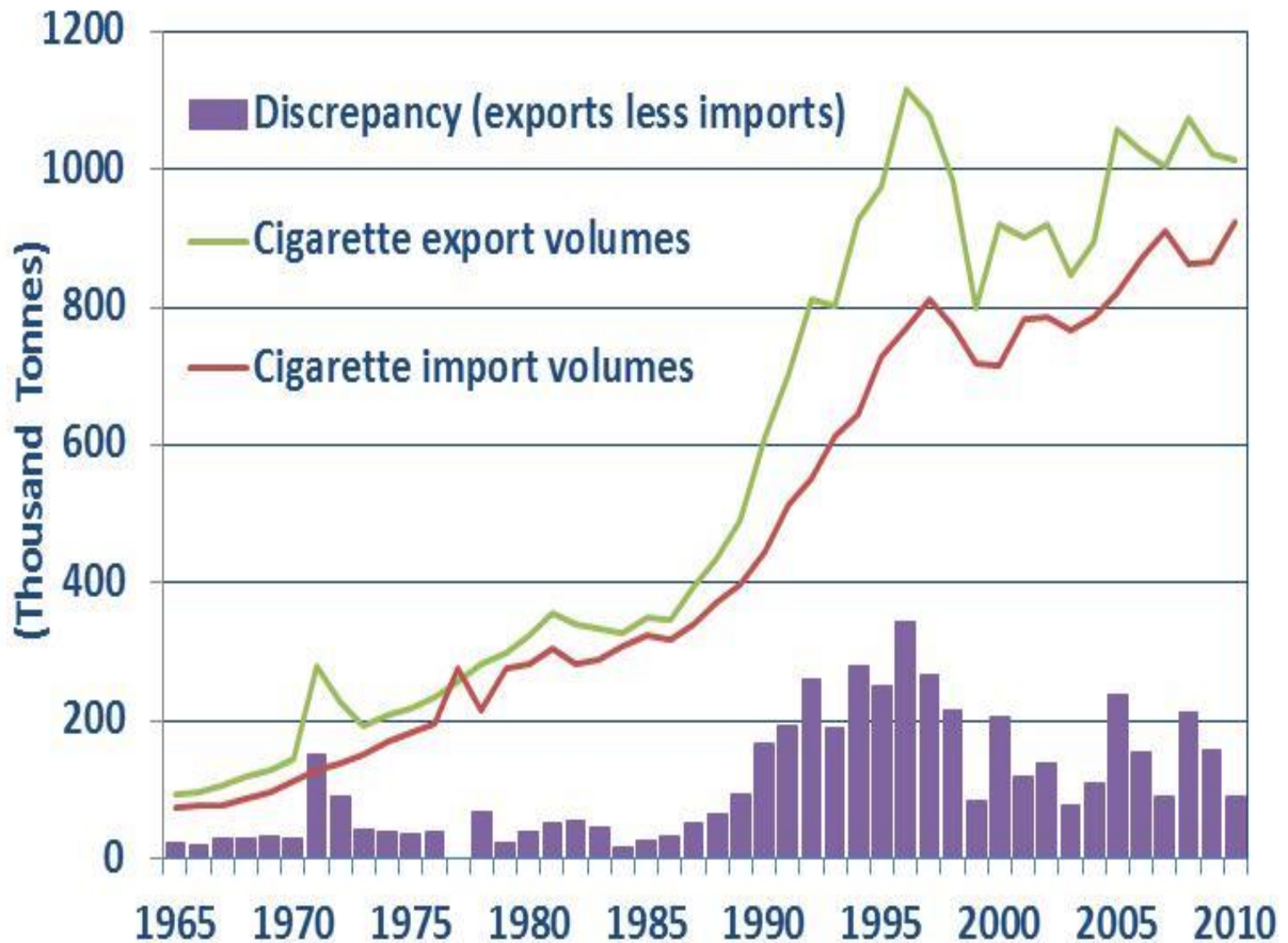
Low SES group:

Pays **12.4%** of increased taxes

Receives **34.0%** of health benefits

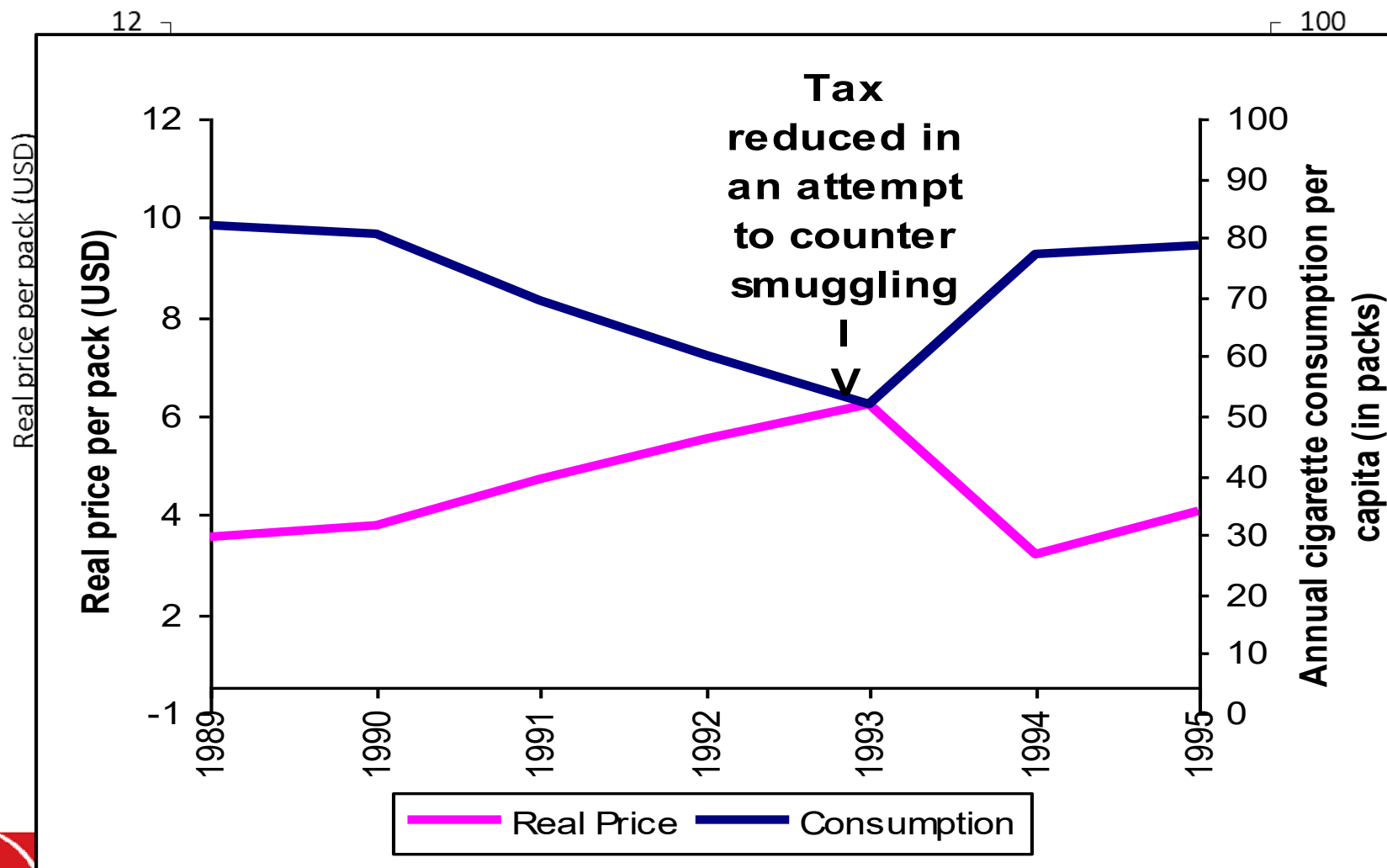
Health/tax ratio: **2.74**

Global smuggling estimates



Source: <http://faostat.fao.org>

Canada Sharply Reduced Taxes in 1993



A tripling of excise tax in every country would reduce consumption by 1/3 and avoid ~200M deaths this century (and at least 2 M in Mexico)

Example of South Asia: 1.8 B people, 30% adult men and 4% adult women currently smoke

- 140 M current and future smokers <35
- 100 M current smokers >35
- A 1/3 reduction would avoid ~35-45 M deaths
 - 25-35 M deaths in smokers <35
 - ~10 M deaths in smokers > 35

Plain packaging (Australia) and pictorial warning labels (Canada)



WARNING
TOBACCO USE
CAN MAKE YOU
IMPOTENT

Cigarettes may cause sexual impotence due to decreased blood flow to the penis. This can prevent you from having an erection.

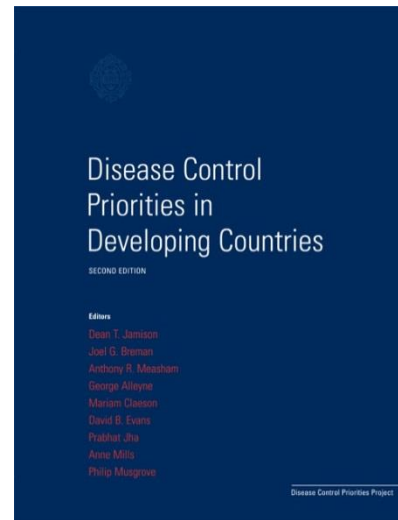
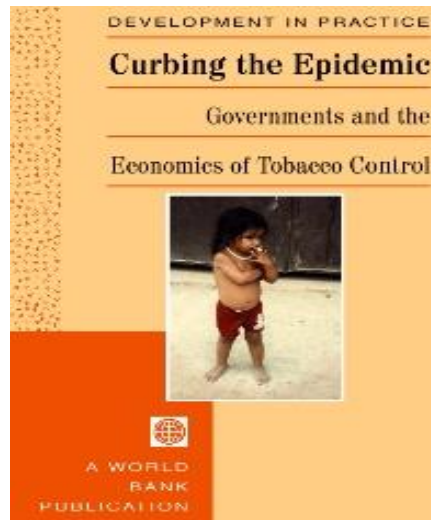
Health Canada

CONCLUSIONS

- **Prolonged smokers lose a decade of life**
- **Cessation by age 40 (and preferably earlier) avoids 90% of the excess risk of continued smoking**
- **Tobacco is a big cause of poverty and tobacco control reduces poverty**
- **A tripling of the excise tax on cigarettes worldwide would cut consumption by 1/3 and avoid ~200 M deaths**

www.cghr.org

(Don't pay for my books)



 @countthedeath

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