Integrating tobacco control into the NCD and Human Capital Agenda

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CONCLUSIONS

- **Human capital (health, education, skills) can be substantially improved in Mexico with investments particularly in NCD control**

- **NCDs have unexpectedly large effects on Human capital (especially CVD), and tobacco is key risk factor for NCD**

- **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**

Source: Jha and Peto, NEJM 2014

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Comparison of World Bank Human Capital Index for Mexico and Canada

Mexico

0.61 **Human Capital Index**

Gender Distribution

Both | 0.00 ─────────────●───── 1.00
0.61

Girls | 0.00 ─────────────●───── 1.00
0.62

Boys | 0.00 ─────────────●───── 1.00
0.59

> | 0.99 | Probability of Survival to Age 5
> | 12.6 | Expected Years of School
> | 430 | Harmonized Test Scores
> | 8.6 | Learning-Adjusted Years of School
> | 0.88 | Fraction of Children Under 5 Not Stunted
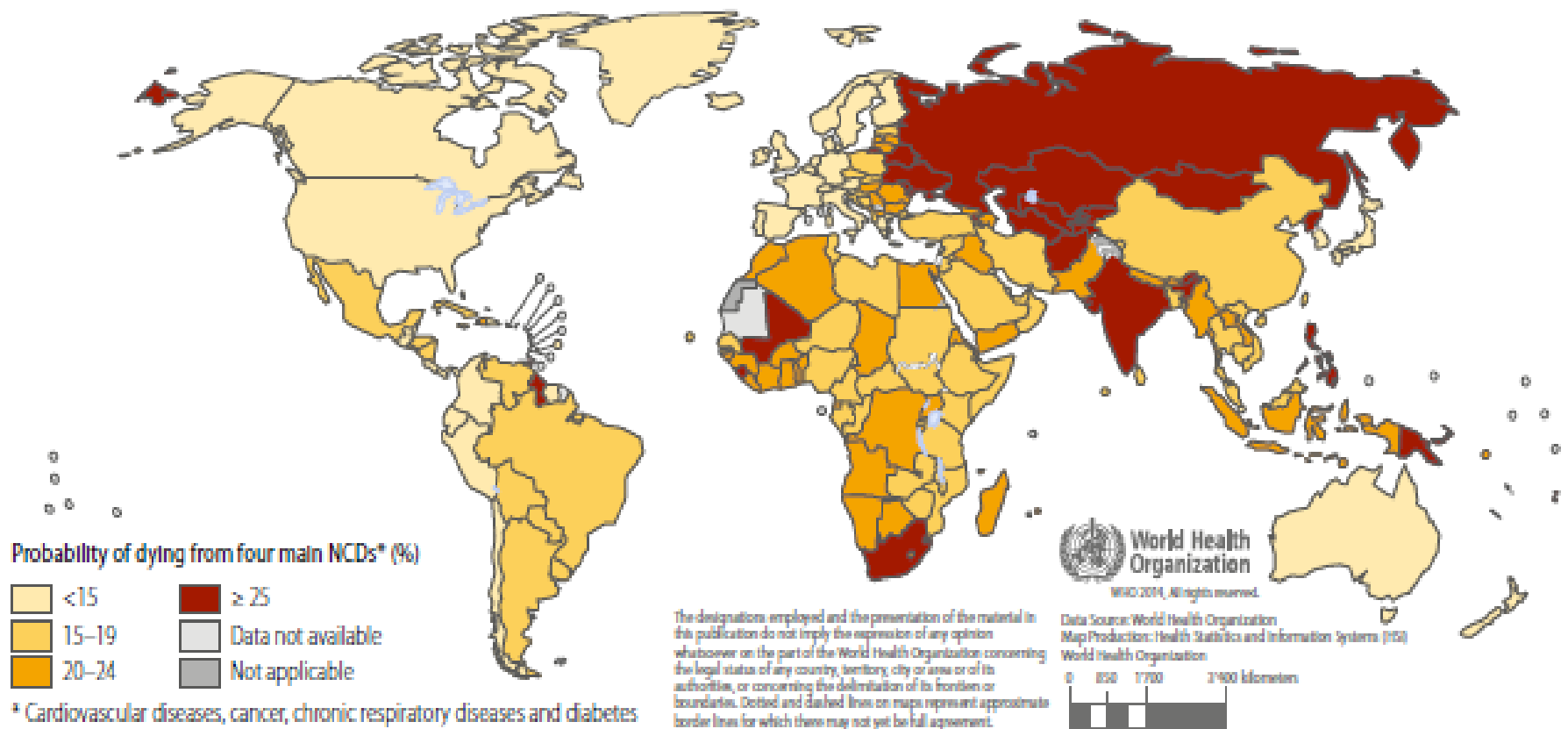> | 0.89 | Adult Survival Rate

Canada

0.80 **Human Capital Index**

Gender Distribution

Both | 0.00 ─────────────●───── 1.00
0.80

Girls | 0.00 ─────────────●───── 1.00
0.81

Boys | 0.00 ─────────────●───── 1.00
0.79

> | 0.99 | Probability of Survival to Age 5
> | 13.7 | Expected Years of School
> | 537 | Harmonized Test Scores
> | 11.7 | Learning-Adjusted Years of School
> | no data | Fraction of Children Under 5 Not Stunted
> | 0.94 | Adult Survival Rate

Male mortality 1970-2010

% of 15 year old males dead by age 60

Country	1970	1990	2010	Change	Rank 2010
Russia	31	32	41	+34%	159
South Africa	42	38	53	+28%	177
Brazil	27	24	19	-29%	84
India	33	27	23	-31%	106
China	24	20	15	-35%	59
Mexico	**27**	**21**	**16**	**-42%**	**62**
United States	23	17	13	-43%	45
Canada	19	13	8	-55%	11
Chile	29	19	12	-61%	33
Korea (Rep)	38	23	11	-71%	31

NCD Mortality Risks

Fig. 1.5a Probability of dying from the four main noncommunicable diseases between the ages of 30 and 70 years, comparable estimates, 2012

Probability of dying from four main NCDs* (%)
- <15
- 15–19
- 20–24
- ≥ 25
- Data not available
- Not applicable

* Cardiovascular diseases, cancer, chronic respiratory diseases and diabetes

Source: WHO, 2014

Total Deaths by Income
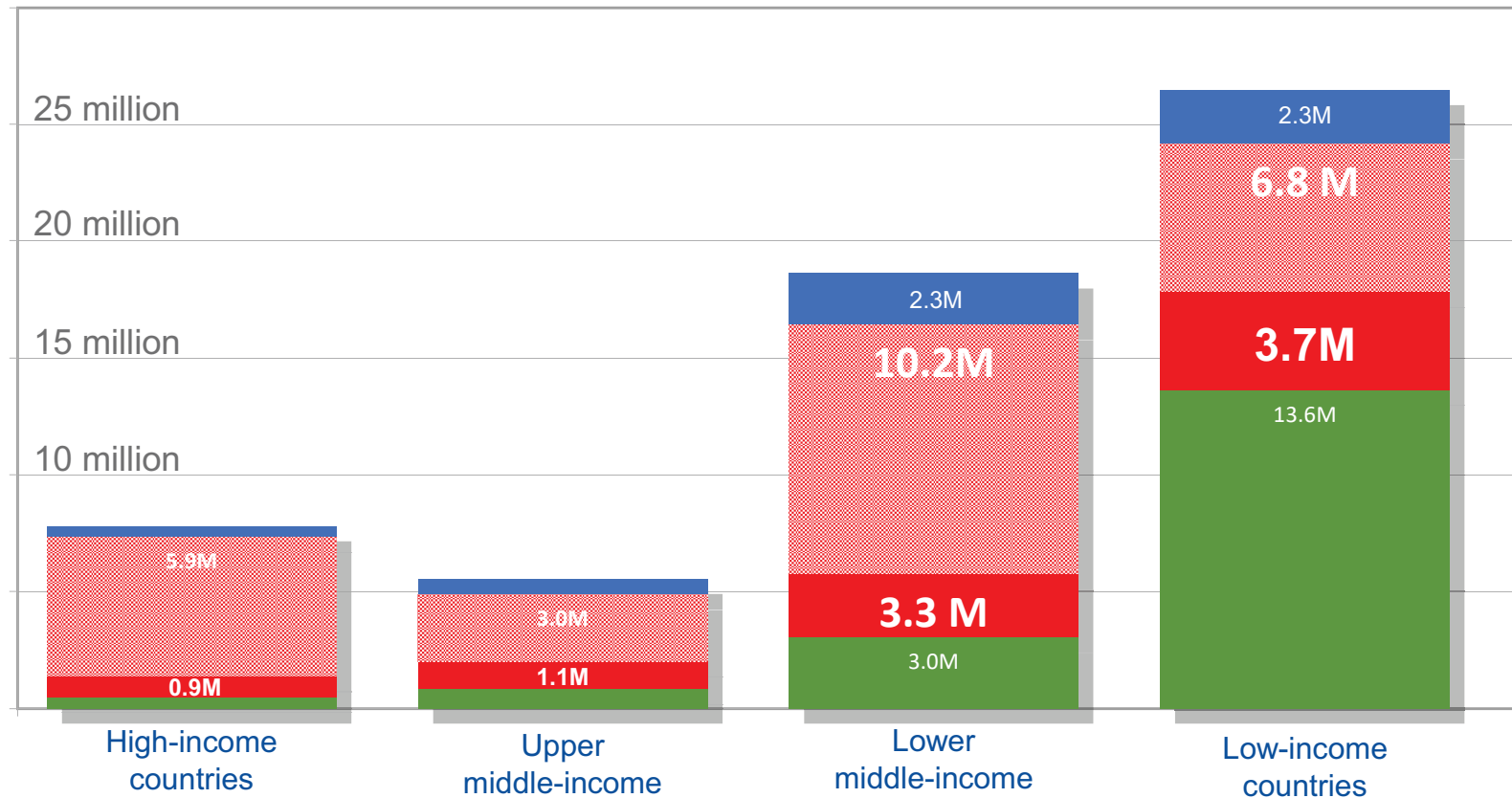
Source: WHO 2010

Economic Consequences of NCDs

- **Large economic burden from NCDs:**

  - Considerable, growing health care costs from treating NCDs

  - Significant lost productivity

  - Cause of poverty

  - Account for much of inequalities in health

Growing Economic Costs

Figure 2: Cumulative NCD loss, beginning in 2011
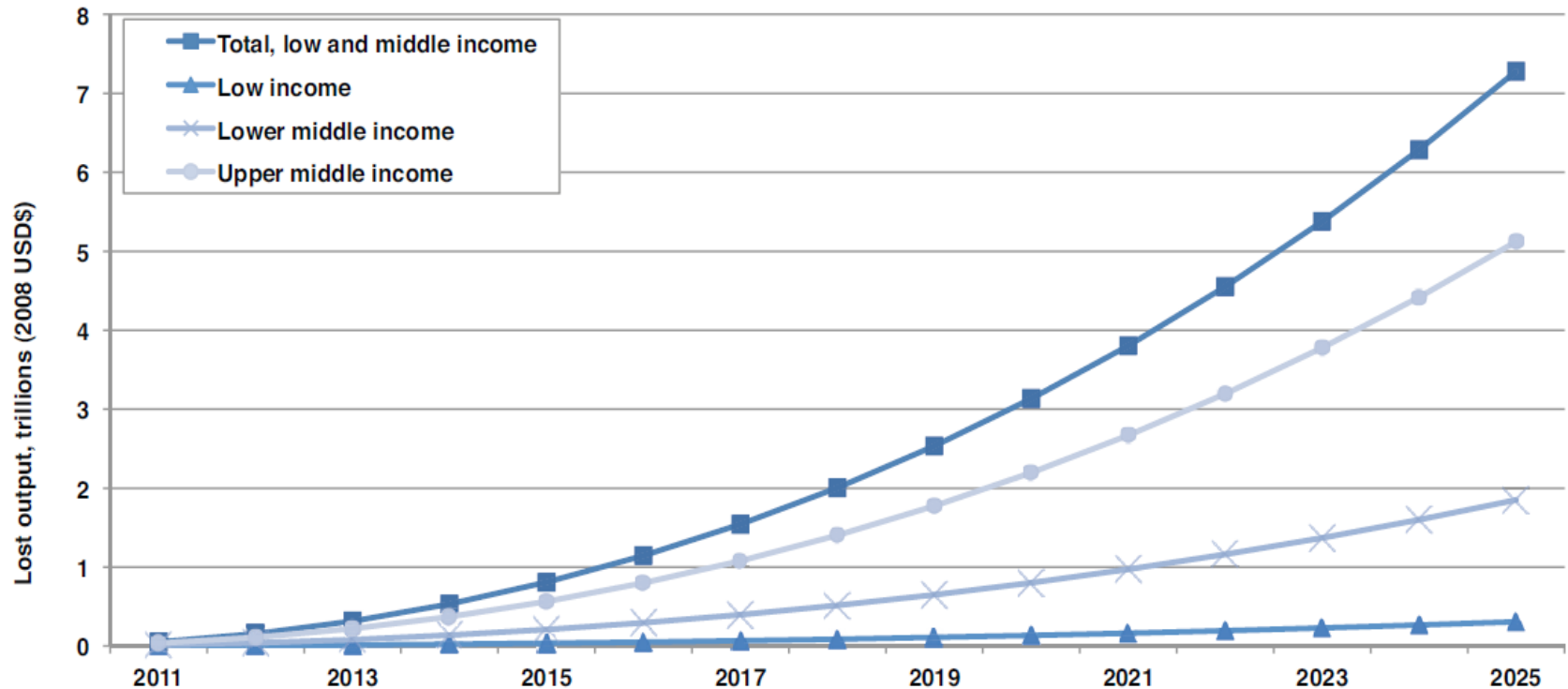
Source: Based on The Global Economic Burden of Non-communicable Diseases – Prepared by the World Economic Forum and the Harvard School of Public Health (2011)

Source: World Economic Forum & Harvard School of Public Health, 2011

NCD impact on Human Capital Preliminary evidence (World Bank)

- **NCD interventions (WHO package) would generate 0.7% GDP per capita gains over 5 years**
- **CVD control (optimal 10%) increases life expectancy by 1.4 years for males, 1.1 years for females**
  - **CVD control yields $970-2130 per capita**
- **Cross country analyses finds that NCD (40q30) fell from 2000-16 with higher income, greater health spending, and reduced out of pocket expenditure**
- **Childhood NCDs predict educational gains and adult height**

Source: World Bank pending

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# Household mechanisms for risk factors (notably tobacco) to impact HCI

- **Reduced adult survival (40q13 or 45q15)**
- **Female smoking/chewing and neonatal mortality or low birth weight (reduced breastfeeding?)**
- **Crowding out household expenditures on child health, nutrition/stunting (and education?)**
- **Catastrophic health expenditures**
- **Worker productivity, health shocks and absenteeism** (De Nardi, NBER 2017)

1970-2010 trends in risk of death, 25 countries, age 0-4 years
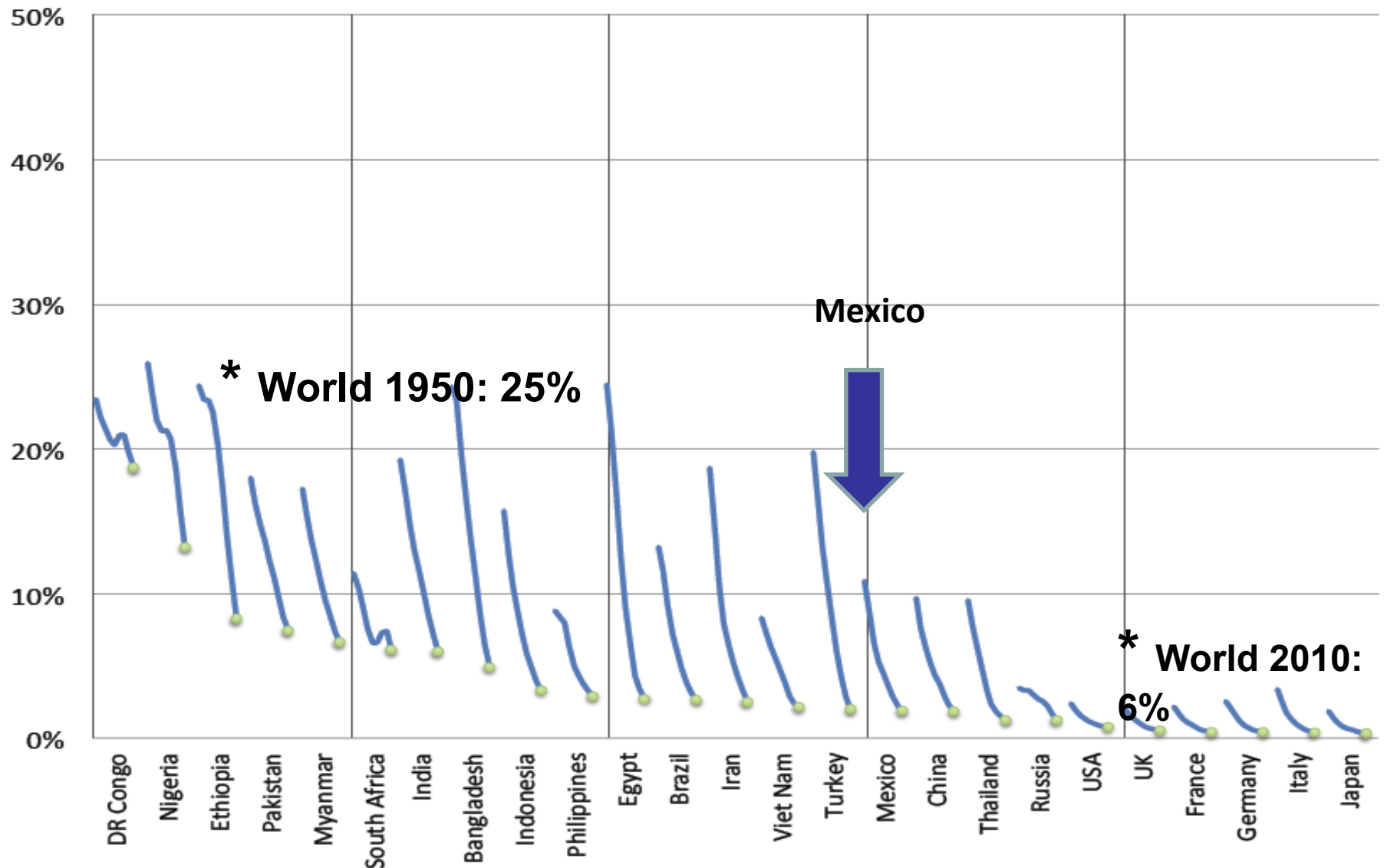
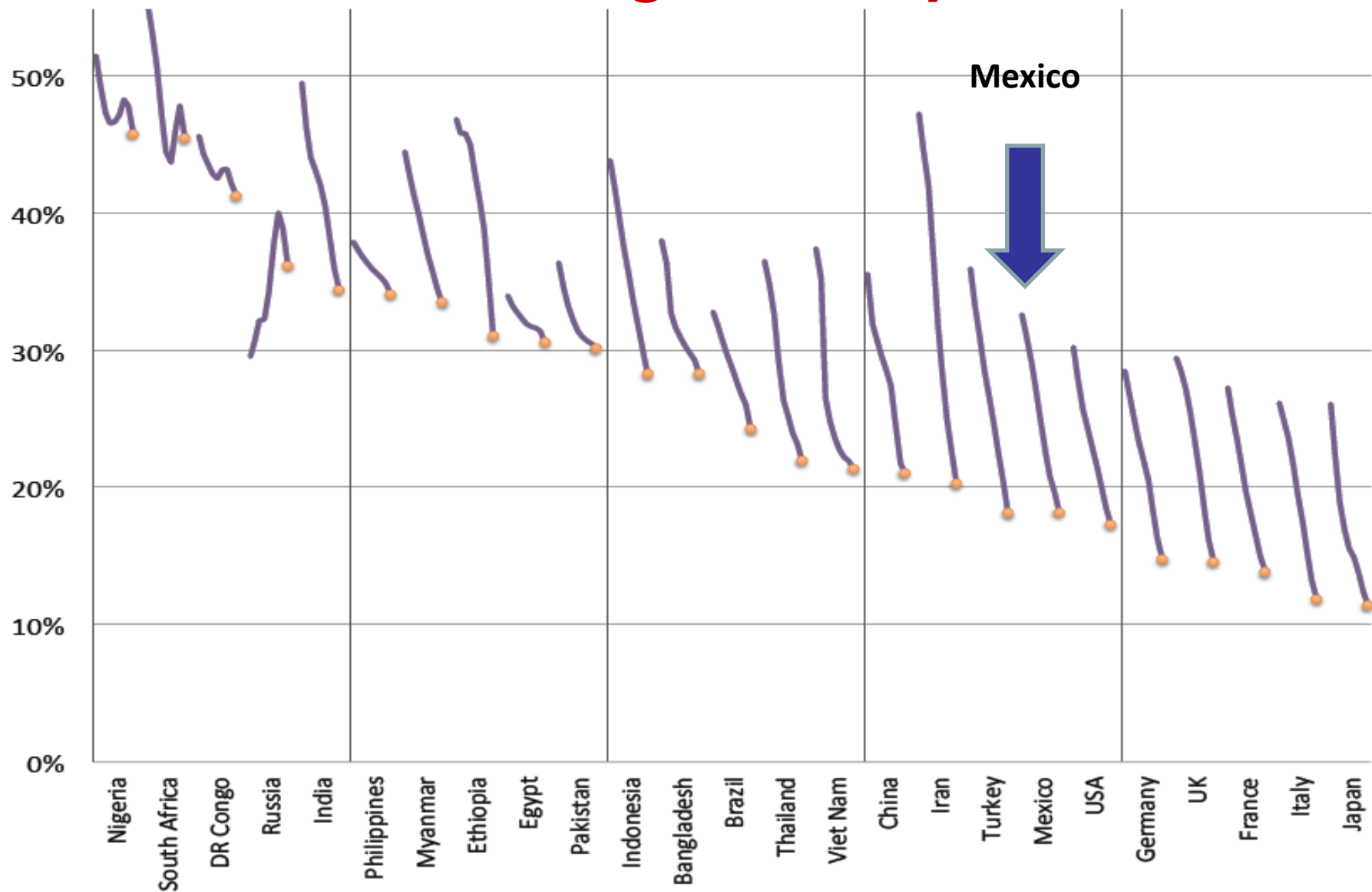* **World 1950: 25%**

Mexico

* **World 2010: 6%**

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

1970-2010 trends in risk of death, 25 countries, age 5-49 years
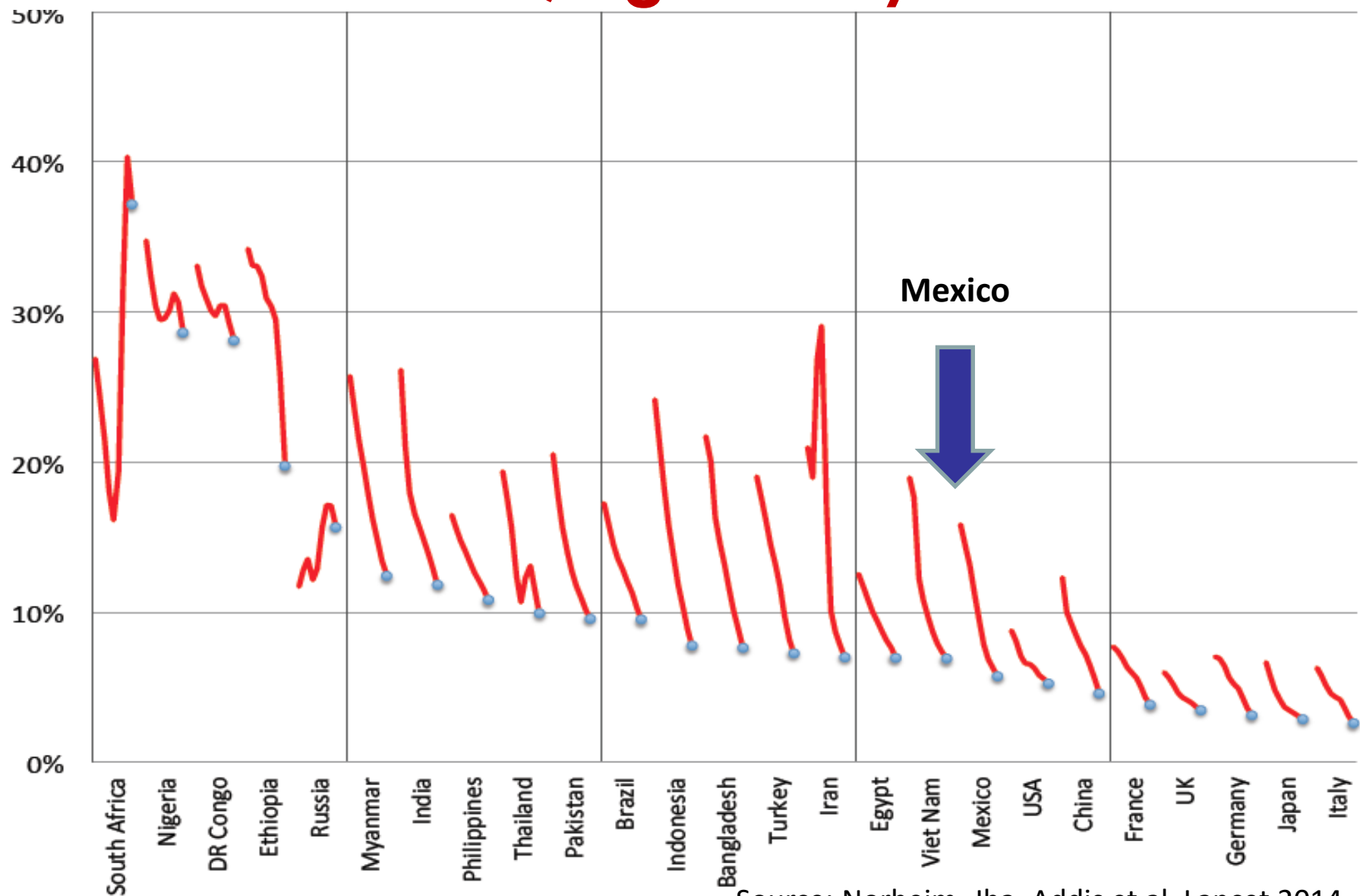
Source: Norheim, Jha, Addis et al, Lancet 2014

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

Mexico

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

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

	2000	2015
Ischemic Heart Disease		
Men	10%	13%
Women	5%	7%
Stroke		
Men	6%	5%
Women	5%	4%

Ke et al, Lancet GH 2018

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

Ke et al, Lancet GH 2018
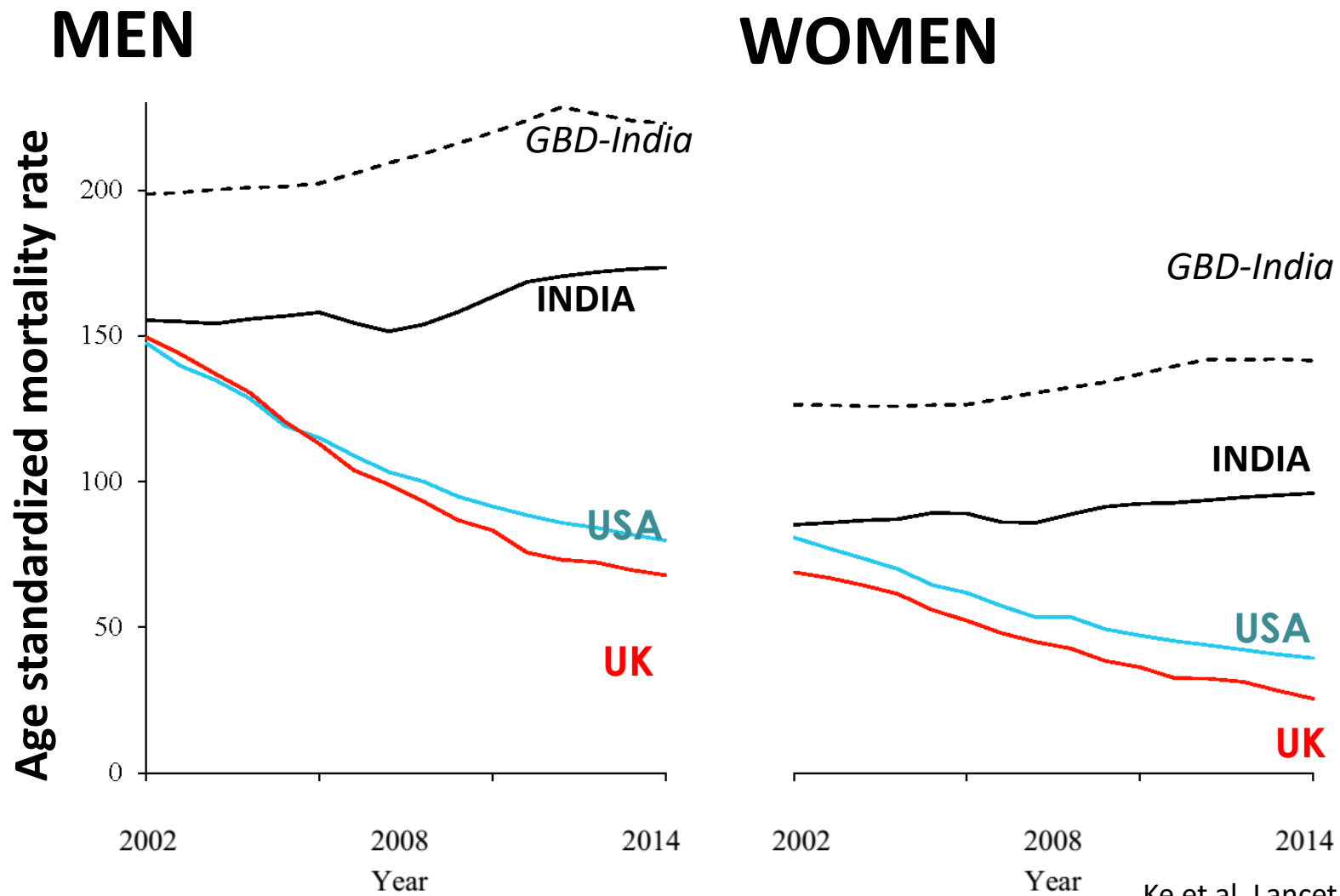
Trends in vascular, cancer and respiratory mortality in Mexico by sex, 1995-2015

Reynales-Shigematsu et al, IJE, 2017
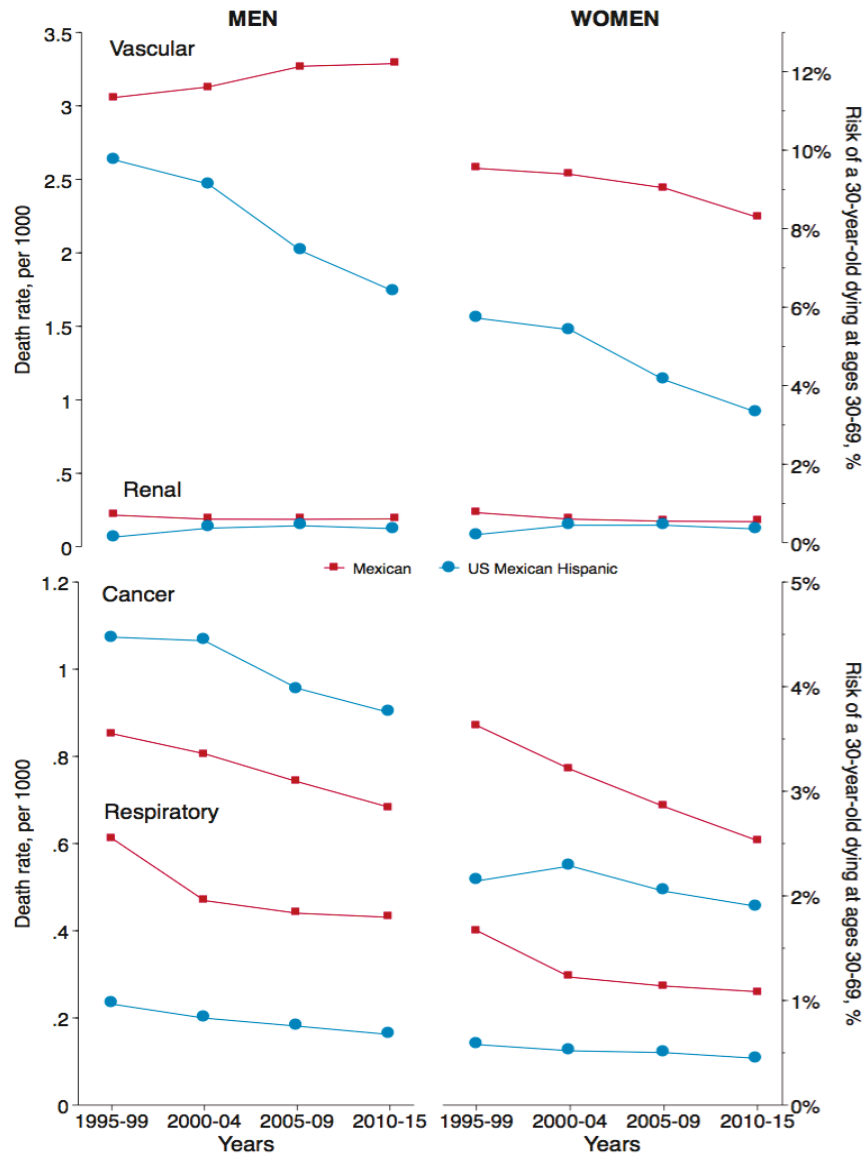
Cancer deaths and change in death rates <70 years, 2000 and 2010, LMICs

	Deaths in 2010 (millions)	Change between 2000-10
All cancer	**3.4**	**-9% ***
Tobacco-attributable *(lung, esophagus)*	0.9	-9%
Infection-attributable *(liver, cervix, stomach)*	0.9	-15%
Other cancers	1.6	-8%

* Decline of 13% in high-income countries

Gelband et al, DCP 3 and Lancet 2016

NCDs: Major Risk Factors

Major NCD	Major modifiable causative Risk Factors			
	Tobacco Use	Unhealthy Diet	Physical Inactivity	Harmful Use of Alcohol
Heart Disease & Stroke	√	√	√	√
Diabetes	√	√	√	√
Cancer	√	√	√	√
Chronic Lung Disease	√			

Source: WHO, 2010; Mackay, 2012

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

Exposure	No.	Annual deaths
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

40−year risk¶

USSR restricts alcohol mid-1985; use decreases by around 25%

USSR collapses late in 1991

Rouble collapses late in 1998

2006 alcohol regulations: spirits down 33%, 2005-11

Russia

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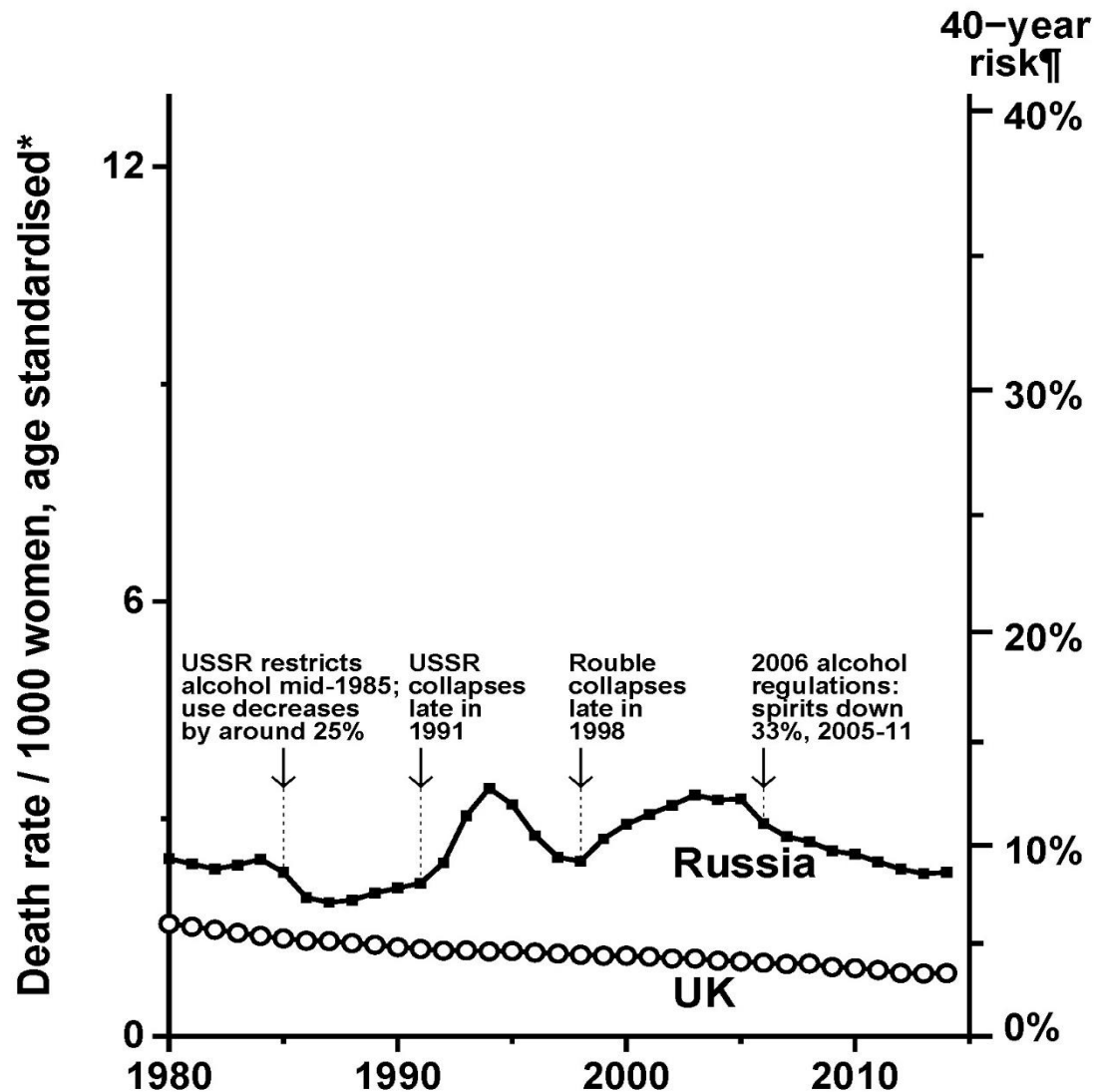
* Mean of the age-specific death rates in
8 component 5-year age groups of 15-54.
WHO/Eurostat deaths, UNPD populations

¶ 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

Russian 1990s male death rate ratios ~1 bottle of vodka/day vs <1 bottle/week
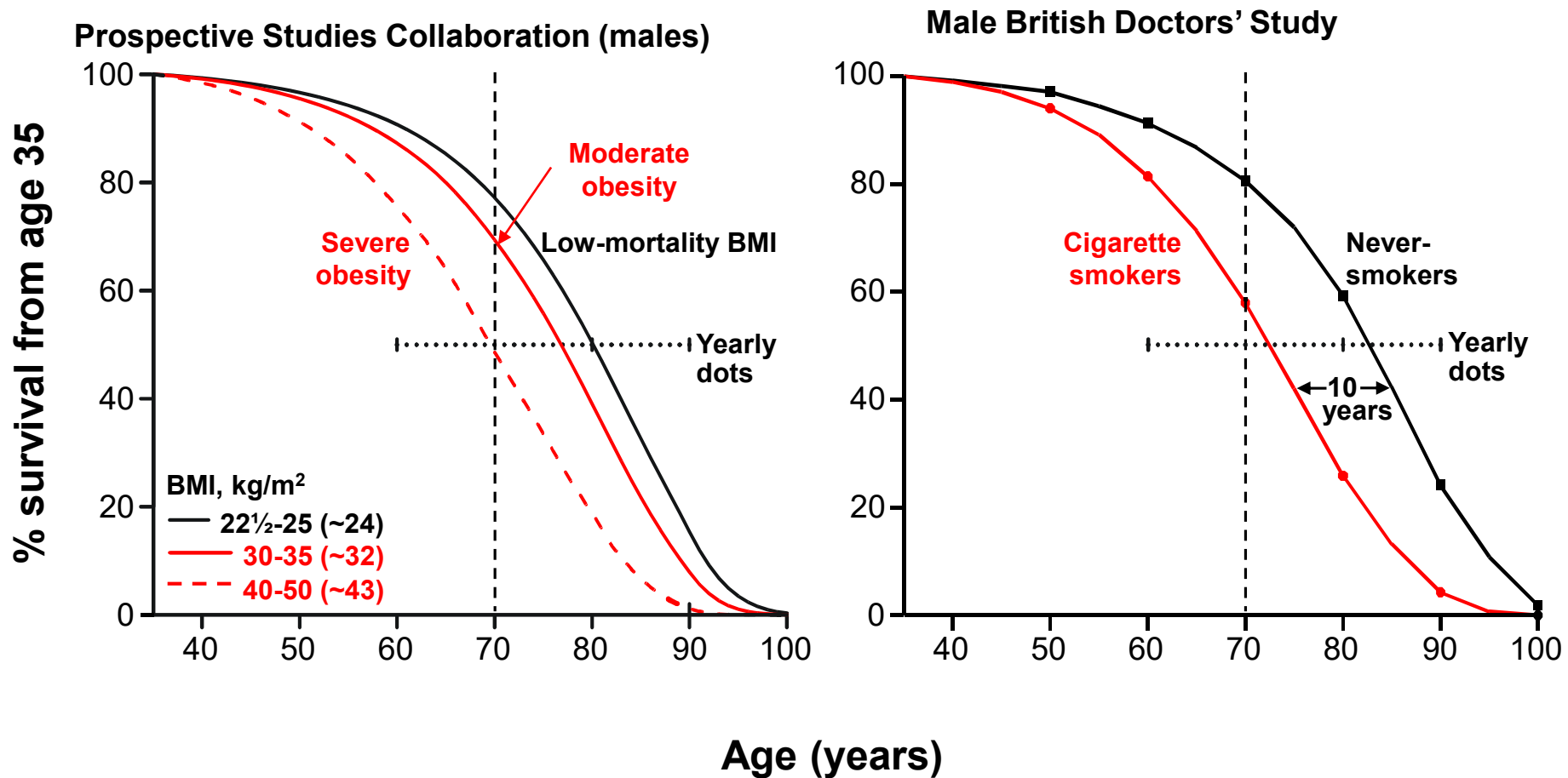
2 x any medical cause

4 x road traffic accident
6 x any other accident

8 x suicide
10 x murder

Zaridze et al, Lancet 2009

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

Peto, Whitlock, Jha NEJM 2010

# Adiposity → BP, lipids, DIABETES

Mexico: more diabetes than in the US, & MUCH greater mortality per diabetic
(diabetic vs not: under-70 mortality <u>RR=4</u>, probably reflecting inadequate treatment)

BUT, total adult mortality rates are still falling rapidly in Mexico & US

Alegre-Diaz, NEJM, 2016

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
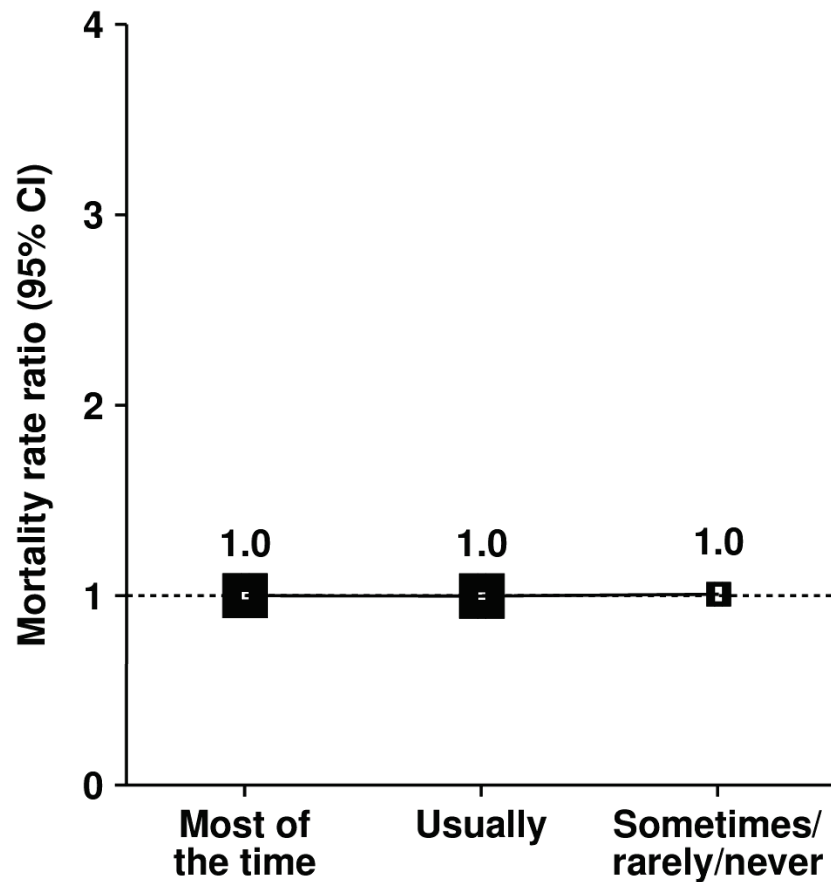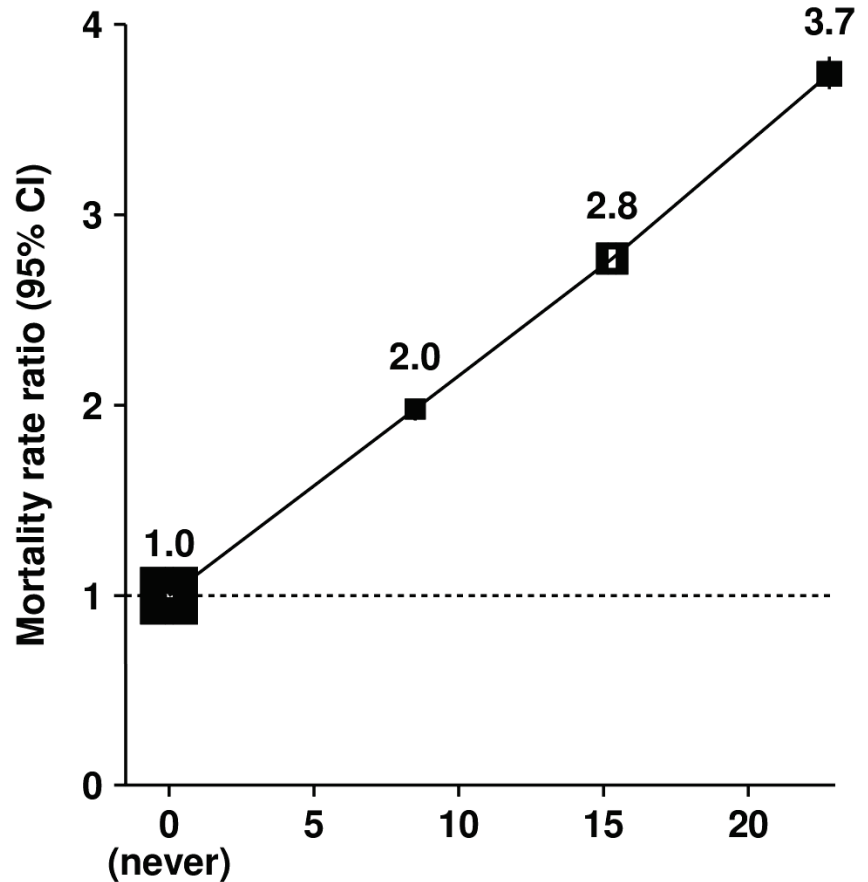
# Three main messages for the individual smoker

1. **Risk is BIG: 1/2 are killed (cancer <u>&</u> vascular <u>&</u> 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**

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Source: Peto et al, 1994, Jha and Peto, NEJM 2014

21st century hazards of cigarette smoking in 6 distinct populations
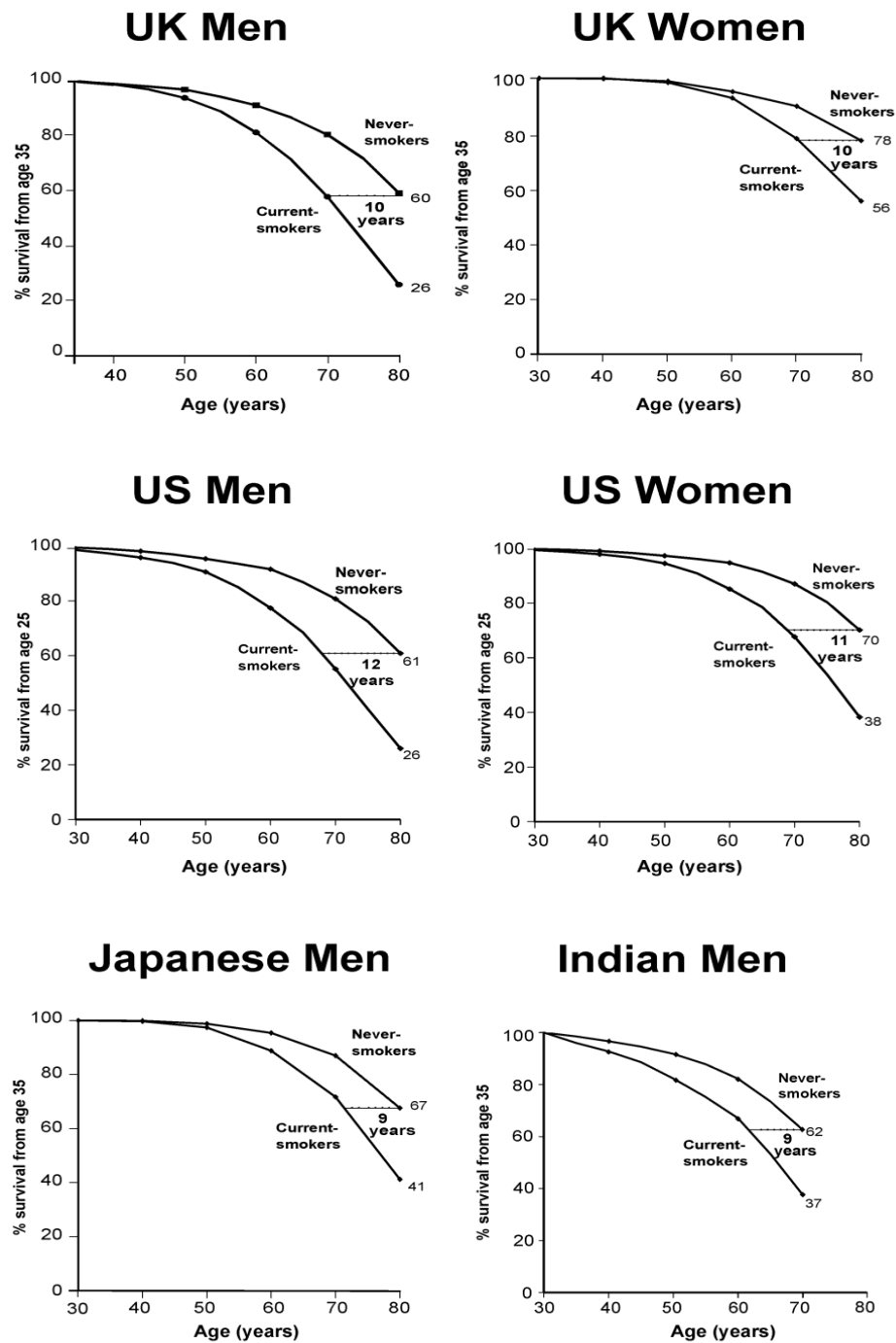
Jha and Peto, NEJM 2014

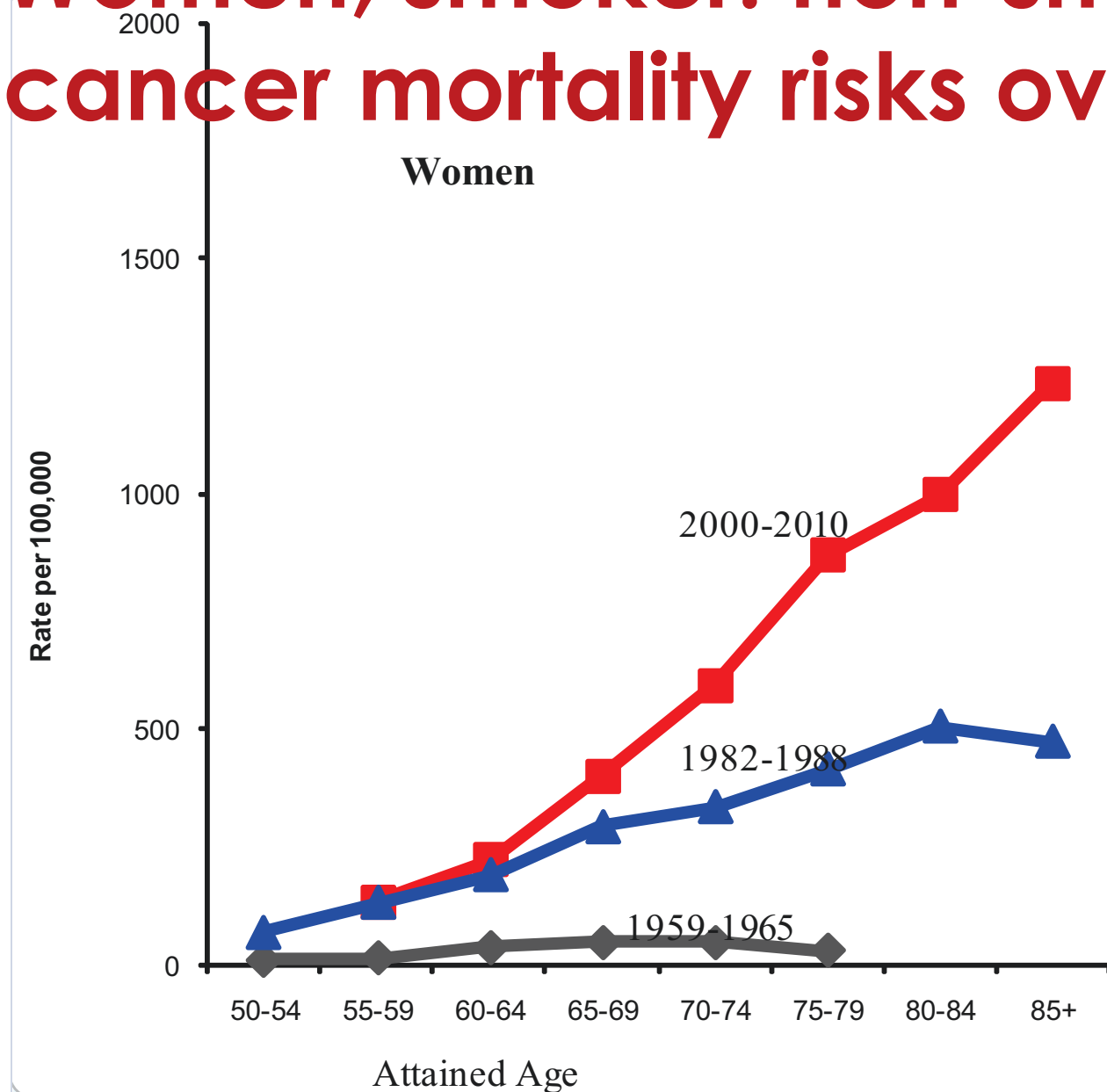# Survey US women and men & link them to the National Death Index *"Facebook of death"*

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
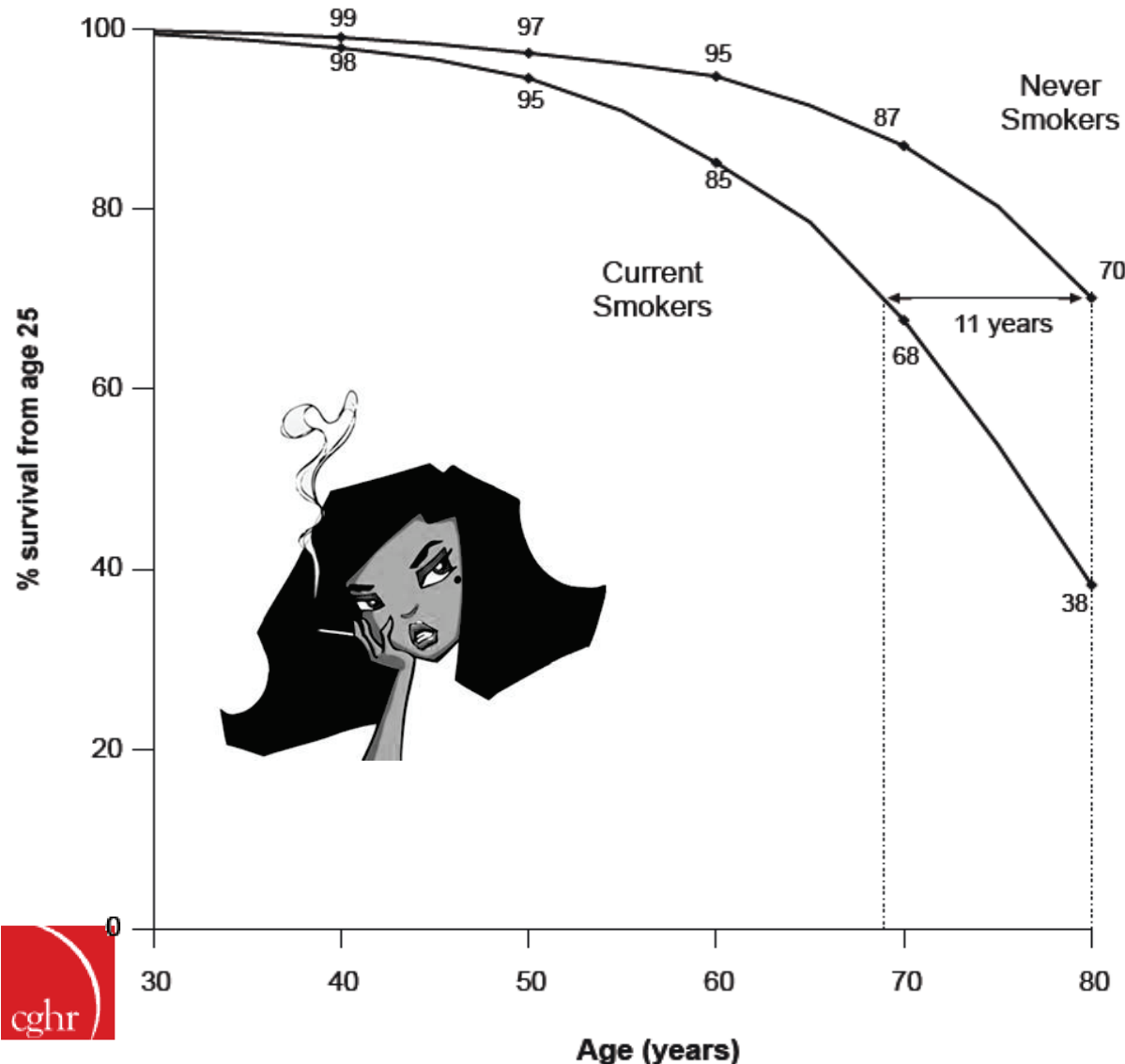
Source: Jha et al, NEJM, 2013

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

Source: Thun et al, NEJM 2013

FEMALES: Survival probabilities
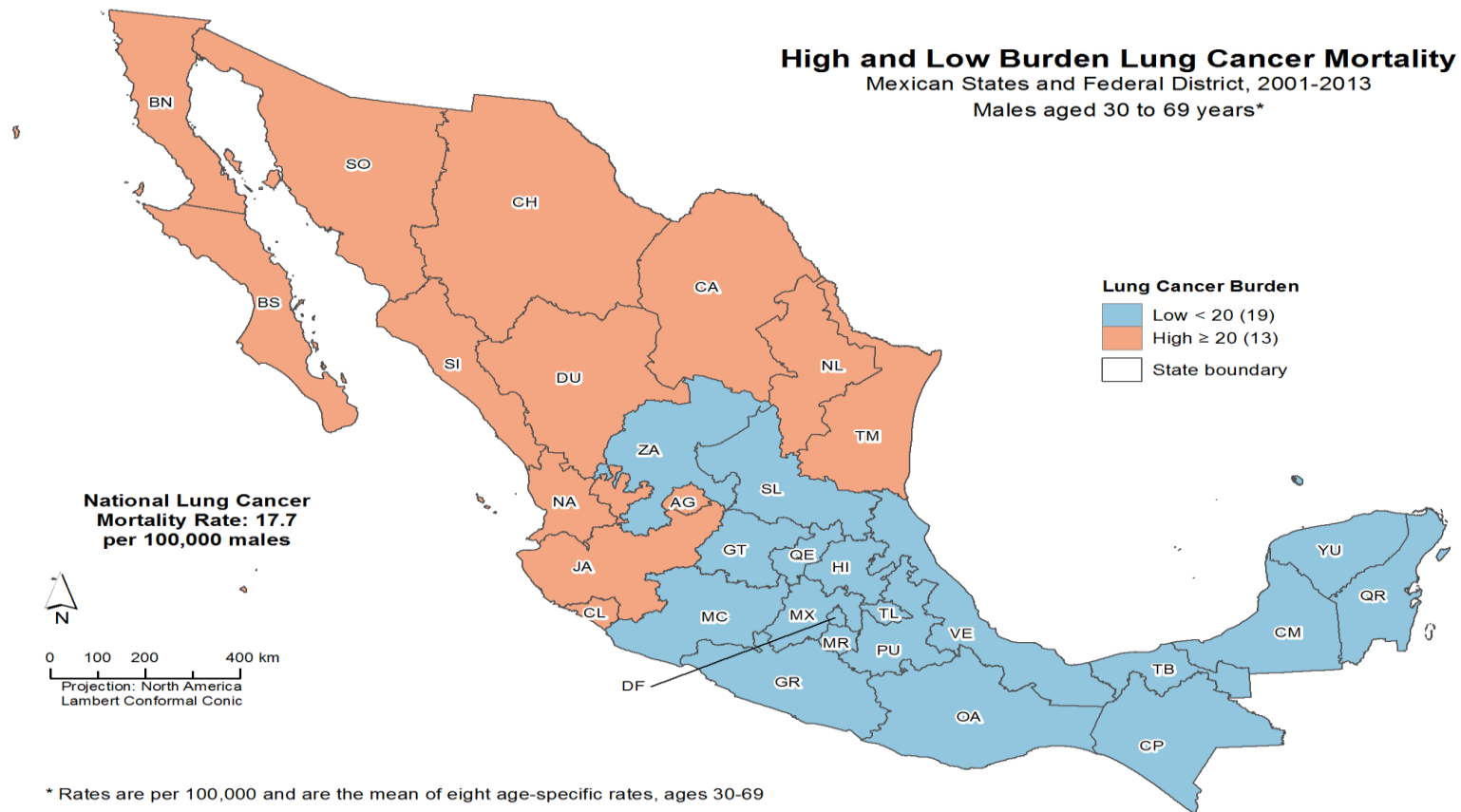## between ages 25 and 80 years among current and never-smokers in the US

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

Jha et al, NEJM 2013

Mexican smoking patterns age 15+

| Group	% M / F	No (millions)
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)

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

High and Low Burden Lung Cancer Mortality
Mexican States and Federal District, 2001-2013
Males aged 30 to 69 years*

National Lung Cancer Mortality Rate: 17.7 per 100,000 males

Lung Cancer Burden
- Low < 20 (19)
- High ≥ 20 (13)
- State boundary

0   100   200   400 km
Projection: North America
Lambert Conformal Conic

N

* Rates are per 100,000 and are the mean of eight age-specific rates, ages 30-69
Data Source: National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía: INEGI), 2001-13)

Reynales-Shigematsu et al, IJE, 2017

Death rates attributable to smoking and not attributable to smoking and from homicide in Mexico and US Hispanics, 1995-2015
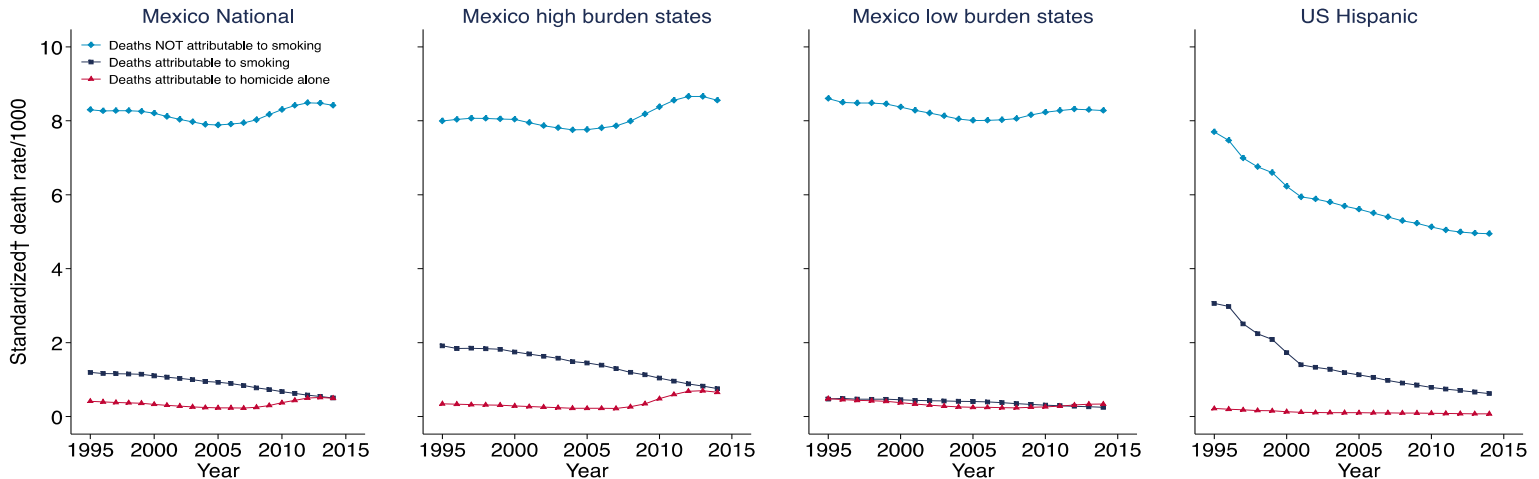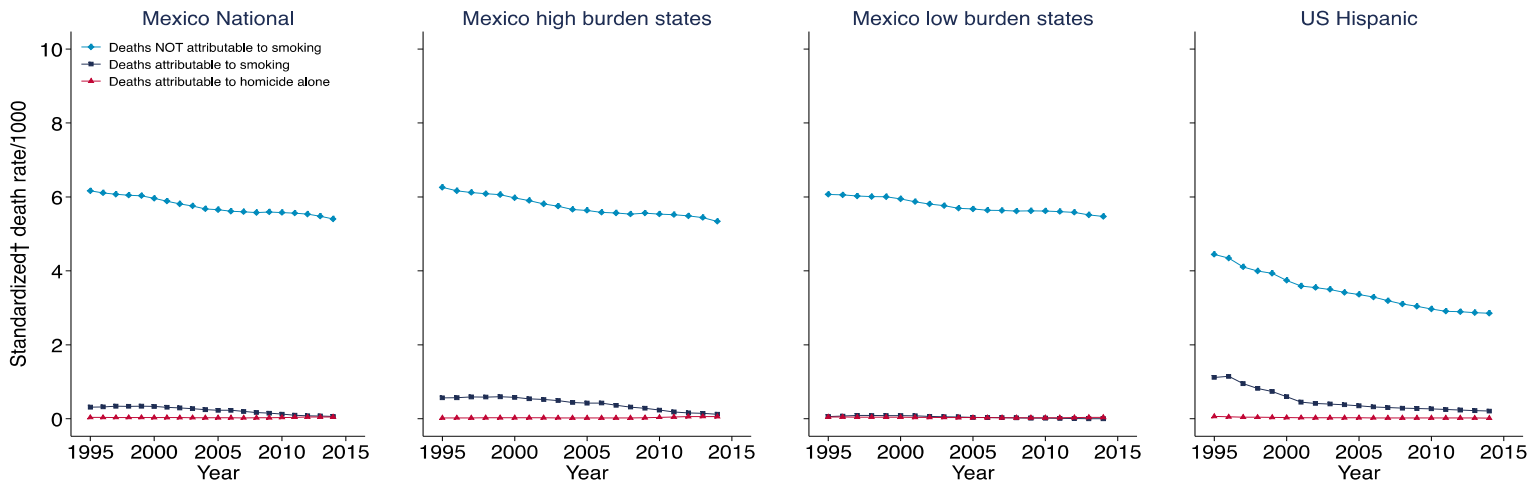
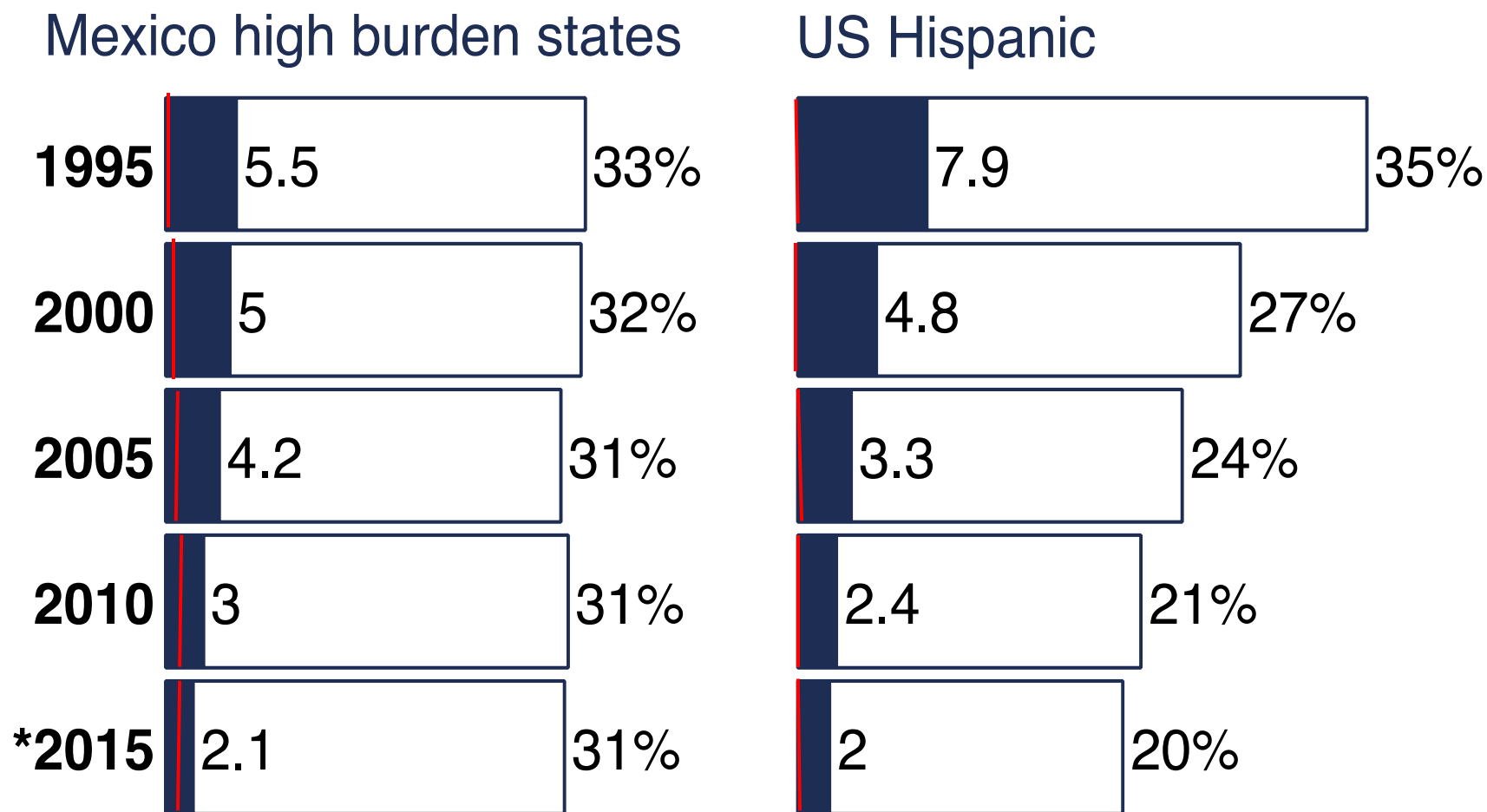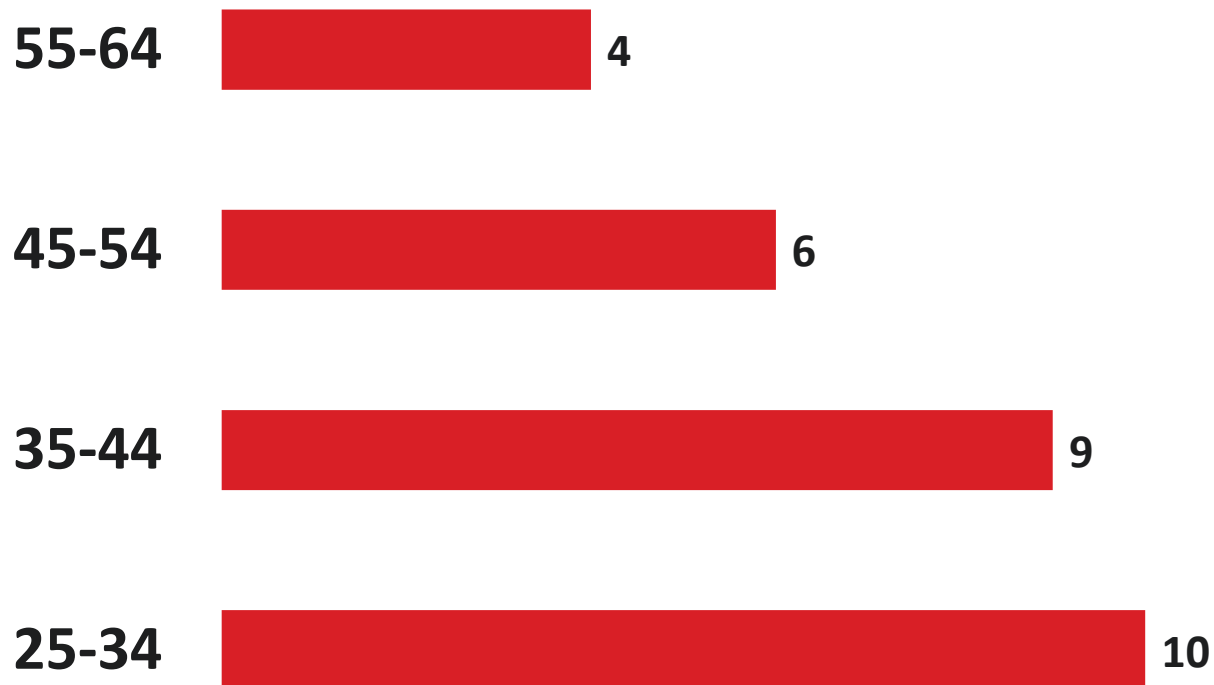# Population risk of a 30-year-old man dying at ages 30–69 from smoking (shaded) or from any cause (shaded and white) in Mexico and USA, 1995-2014
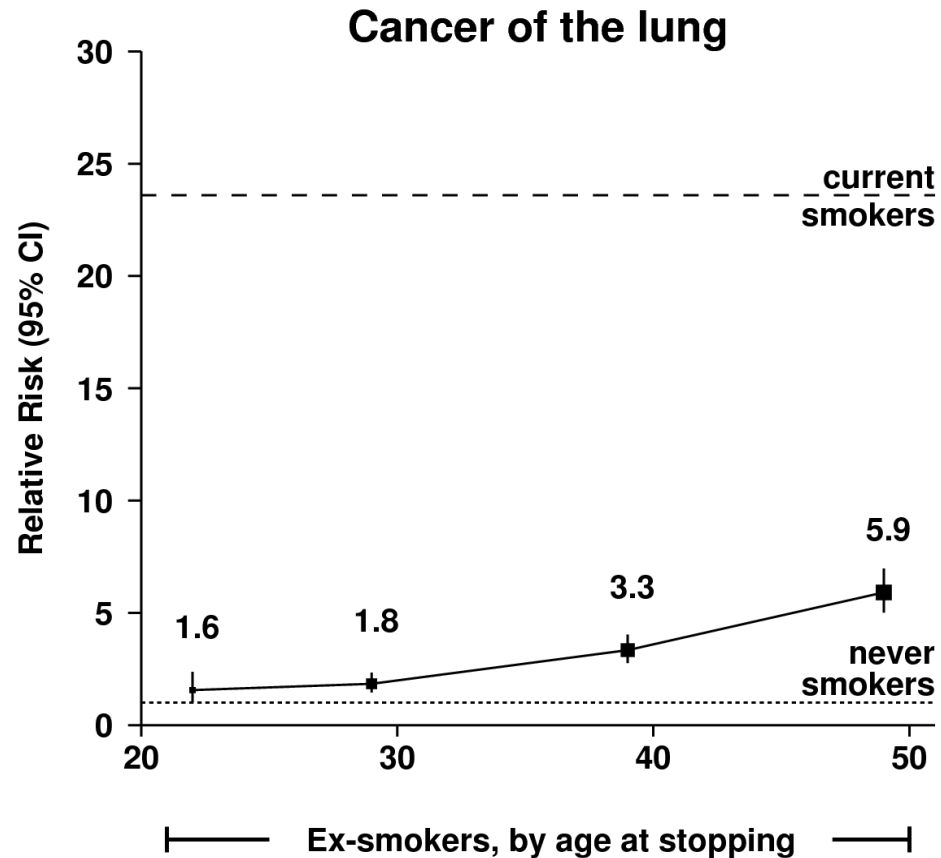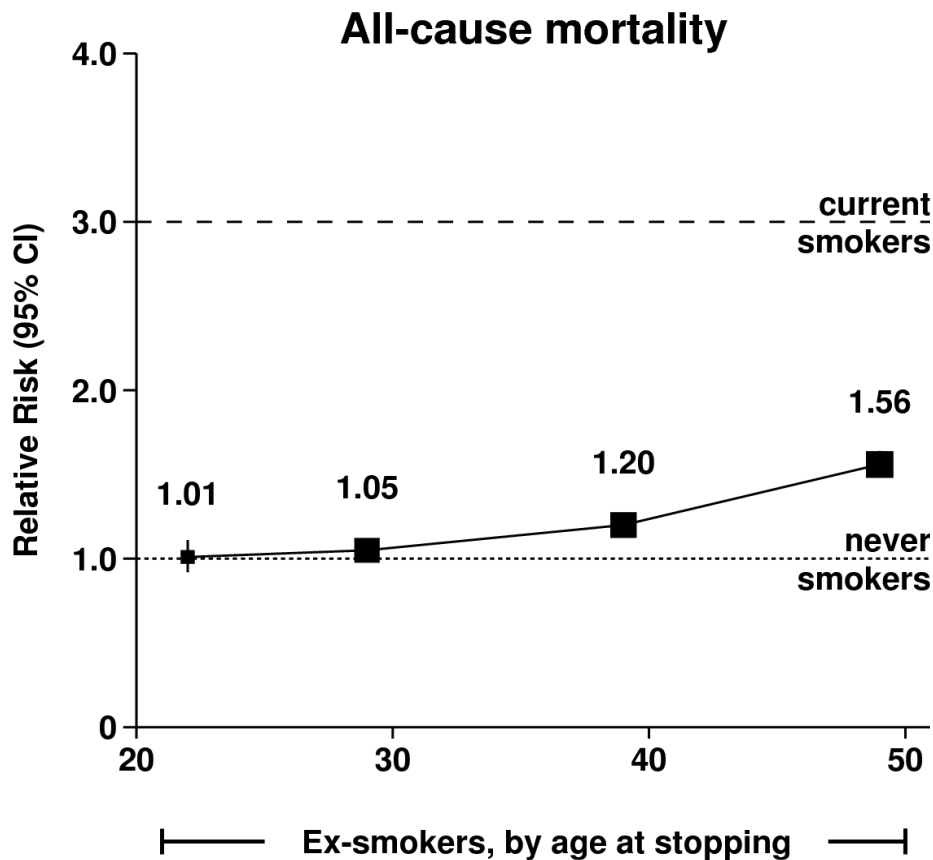
Mexico high burden states

Year	Smoking	Any cause
1995	5.5	33%
2000	5	32%
2005	4.2	31%
2010	3	31%
*2015	2.1	31%

US Hispanic

Year	Smoking	Any cause
1995	7.9	35%
2000	4.8	27%
2005	3.3	24%
2010	2.4	21%
*2015	2	20%

Red line represents deaths attributable to homicide

* Data up to 2014 are represented in 2015.

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Reynales-Shigematsu et al, IJE, 2017

Years gained by quitting smoking by age

Age	Years gained
55-64	4
45-54	6
35-44	9
25-34	10

Jha et al NEJM, 2013

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

All-cause mortality

Relative Risk (95% CI)

1.01 1.05 1.20 1.56

current smokers

never smokers

Ex-smokers, by age at stopping

Cancer of the lung

Relative Risk (95% CI)

1.6 1.8 3.3 5.9

current smokers

never smokers

Ex-smokers, by age at stopping

Source: Pirie et al, Lancet 2012

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

Year	Smoking	Any cause
1950	7	39%
1955	9	38%
1960	10	38%
1965	12	38%
1970	14	38%
1975	14	36%
1980	14	34%
1985	13	30%
1990	11	28%
1995	10	25%
2000	8	22%
2005	6	20%
2010*	5*	18%*
2015 proj.	4	16%
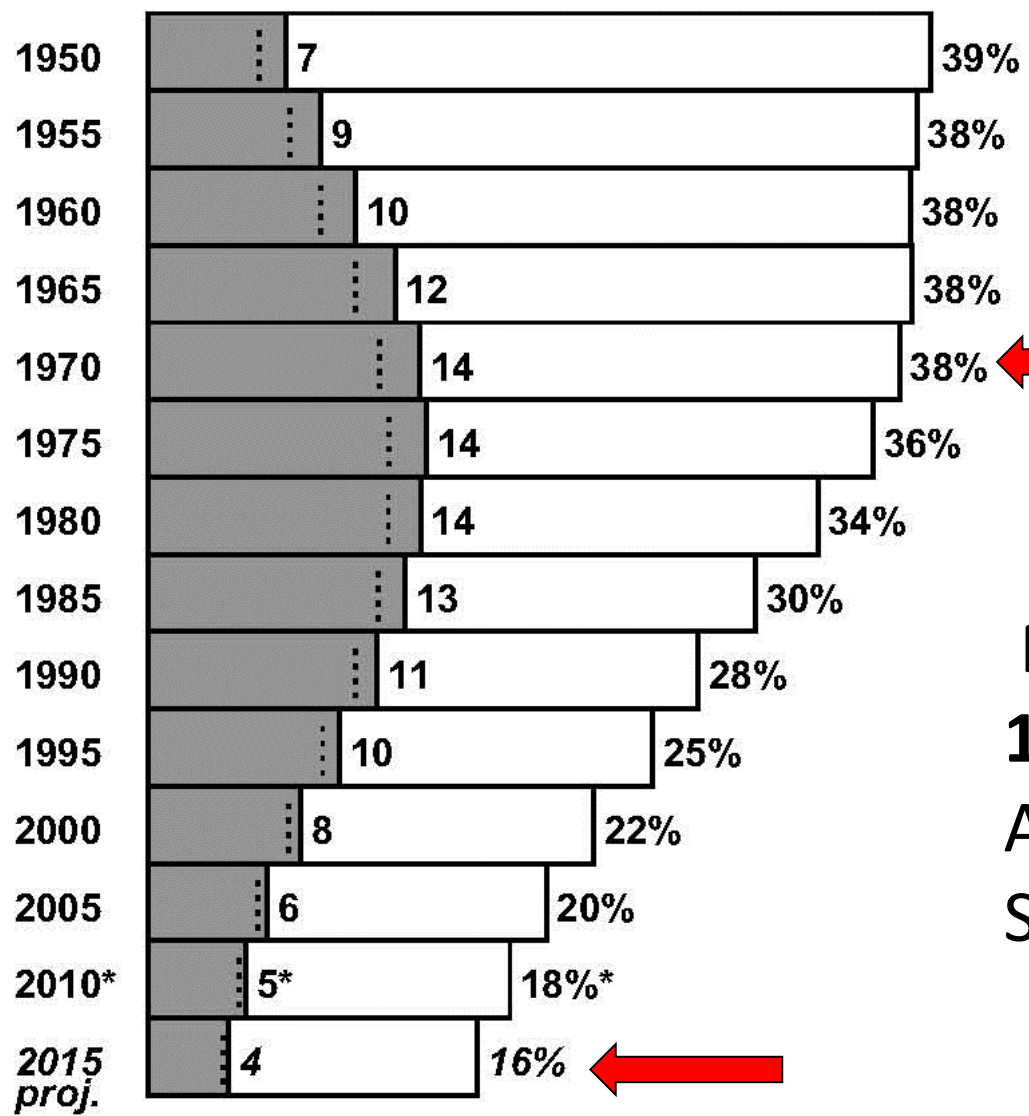
Mortality change: 1970 to 2015:
ANY CAUSE: ↓ 60%
SMOKING: ↓ 70%

Source: Peto et al, CTSU, 2016

Evidence for tobacco control

DEVELOPMENT IN PRACTICE

Curbing the Epidemic

Governments and the
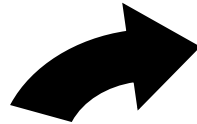
Economics of Tobacco Control

A WORLD BANK PUBLICATION

Tobacco control in developing countries

editors | Prabhat Jha | Frank Chaloupka
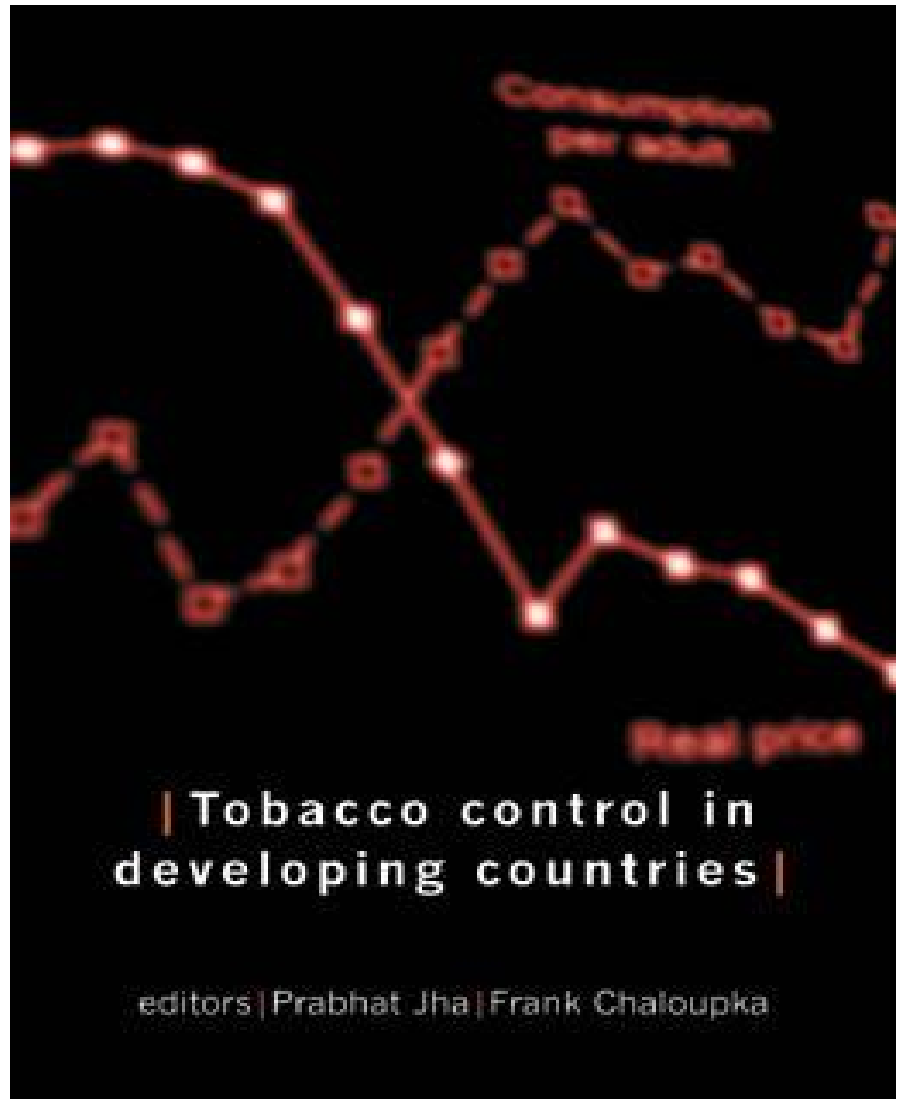
Low Specific Excise taxes in LMICs
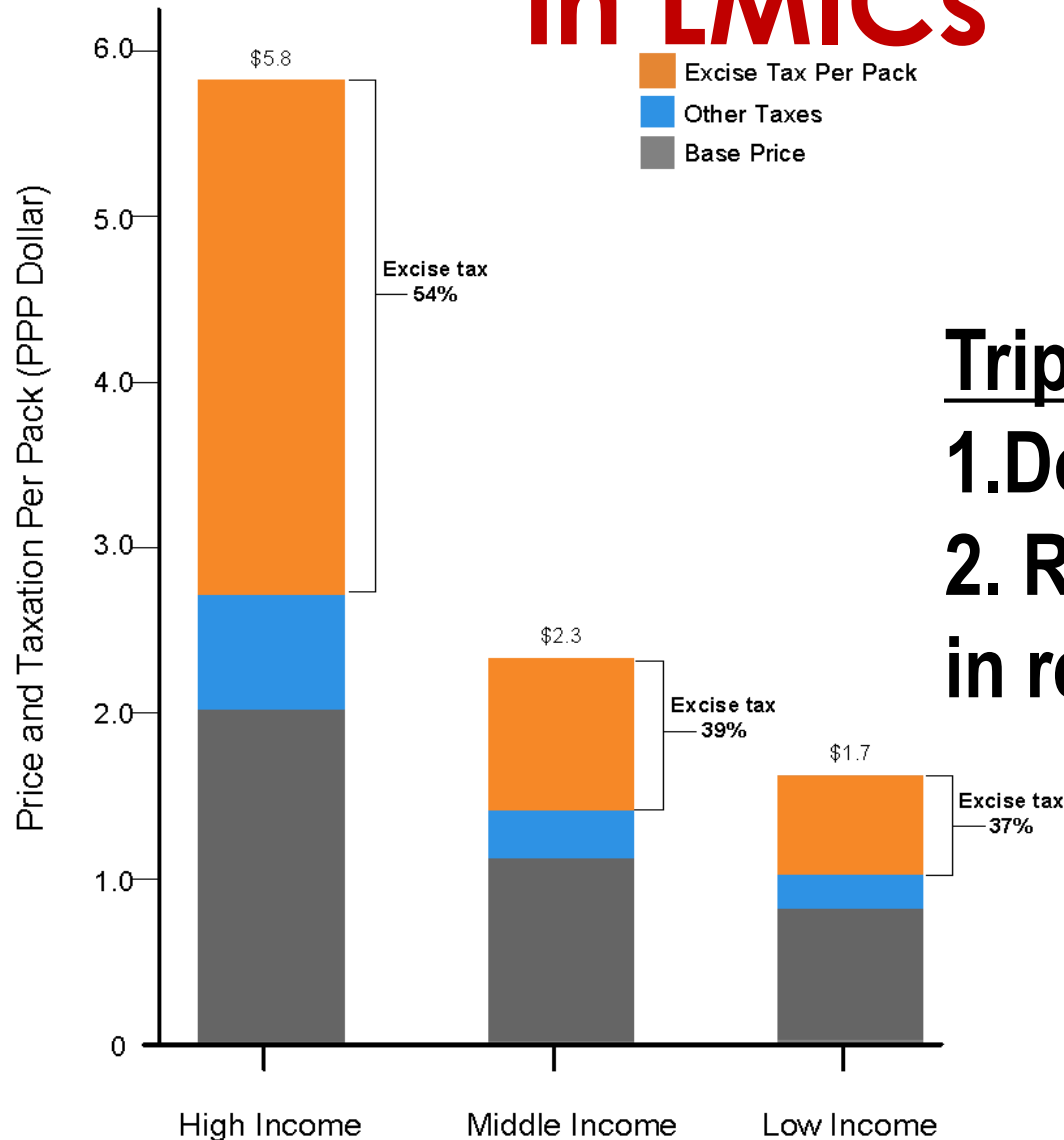
Tripling excise would:
1. **Double street price**
2. **Raise $100 B more in revenue**

Source: Jha and Peto, NEJM 2014,

Tobacco & Poverty

Family falls into poverty

Foregone income 3:
Breadwinner dies prematurely

Foregone income 2:
Treatment cost & Lost working days & income

Poor men smoke

Cycle of tobacco and poverty

Breadwinner gets sick due to tobacco use

Foregone income 1:
More money spent on tobacco: **Less money spent on Education, nutrition etc**
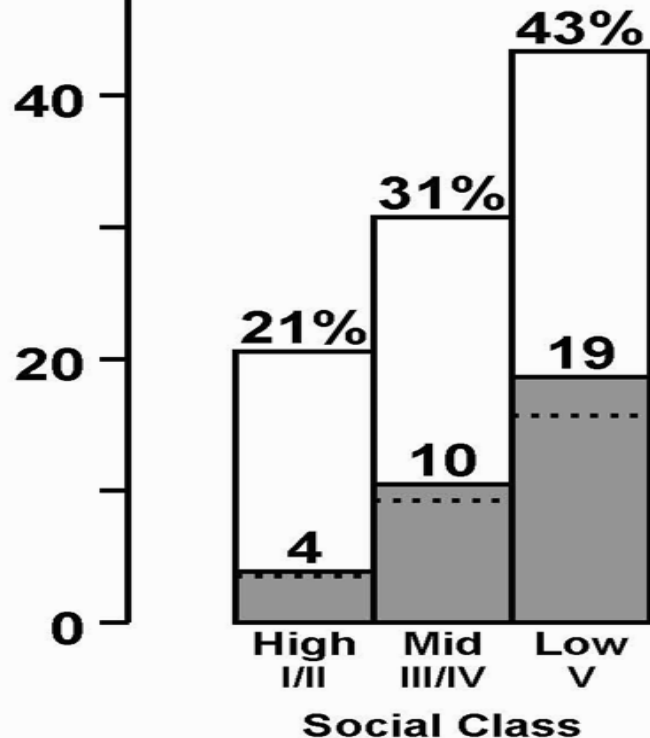*High opportunity cost*

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

Source: Jha et al, Lancet 2006
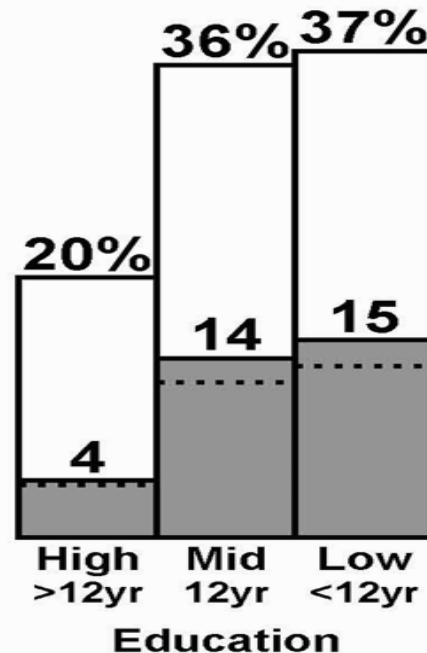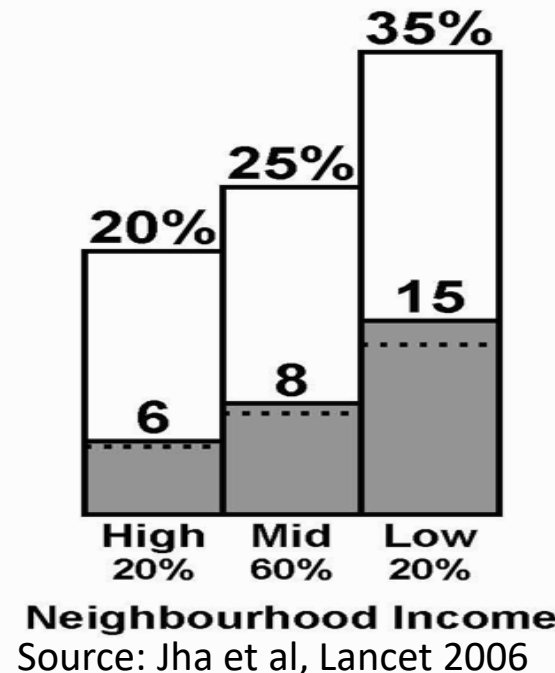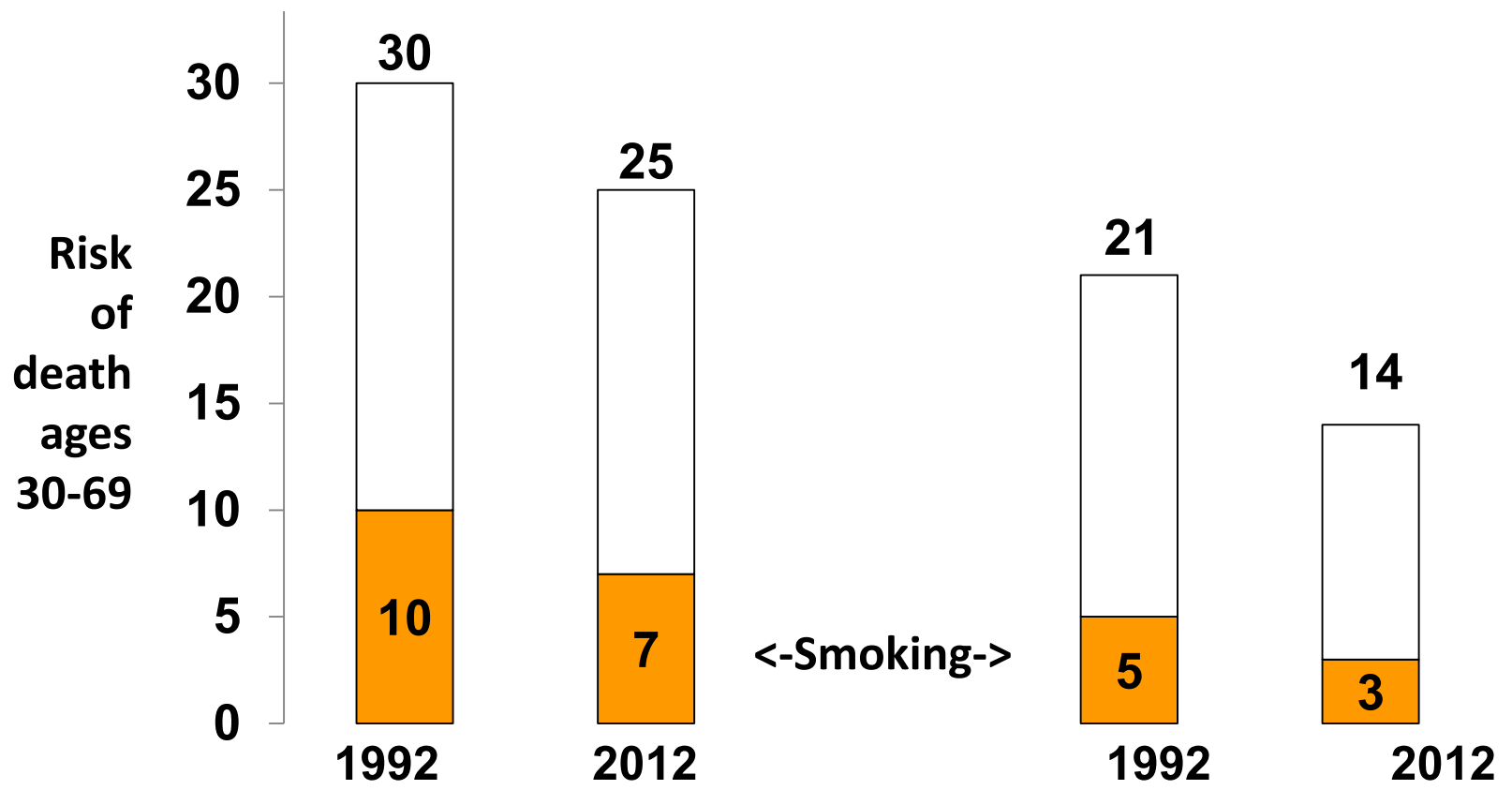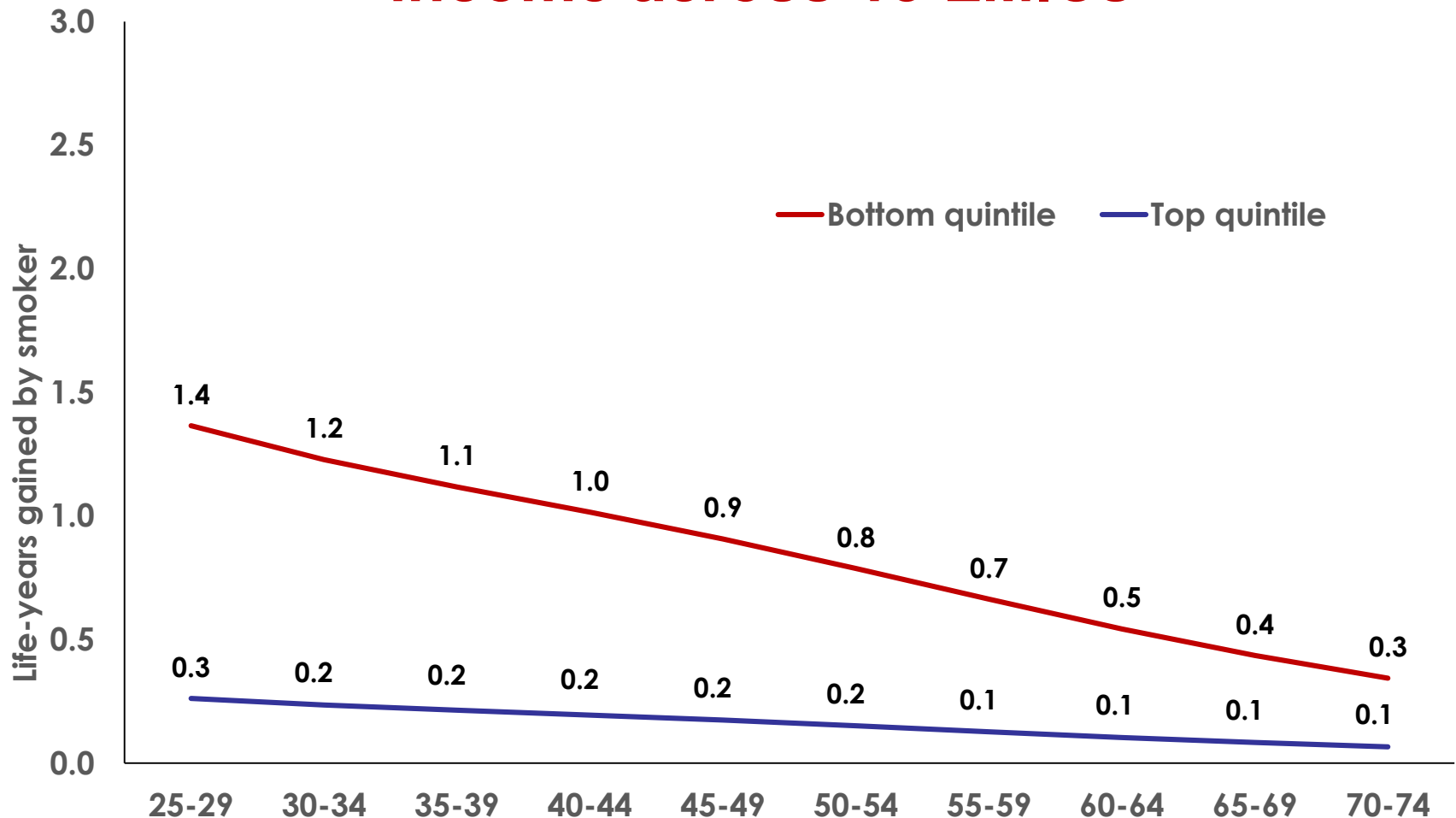
Mortality decline in the poorest and richest quintile of Ontario men ages 30-69, all causes and smoking 1992 to 2012

Cause	Poorest men	Richest men
All causes	-5	-7
Smoking	3 (60%)	2 (29%)

Life-years gained per male smoker by age and income across 13 LMICs

Life-years gained by smoker

3.0

2.5

2.0 ——— Bottom quintile ——— Top quintile

1.5

1.0

0.5

0.0

Bottom quintile values: 1.4, 1.2, 1.1, 1.0, 0.9, 0.8, 0.7, 0.5, 0.4, 0.3

Top quintile values: 0.3, 0.2, 0.2, 0.2, 0.2, 0.2, 0.1, 0.1, 0.1, 0.1

Age groups: 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74

Bottom and top quintiles refer to the poorest 20% and richest 20% of the population

Jha for GTEC, BMJ 2018

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

Legend: Catastrophic events averted (red); Impoverishments averted (black)
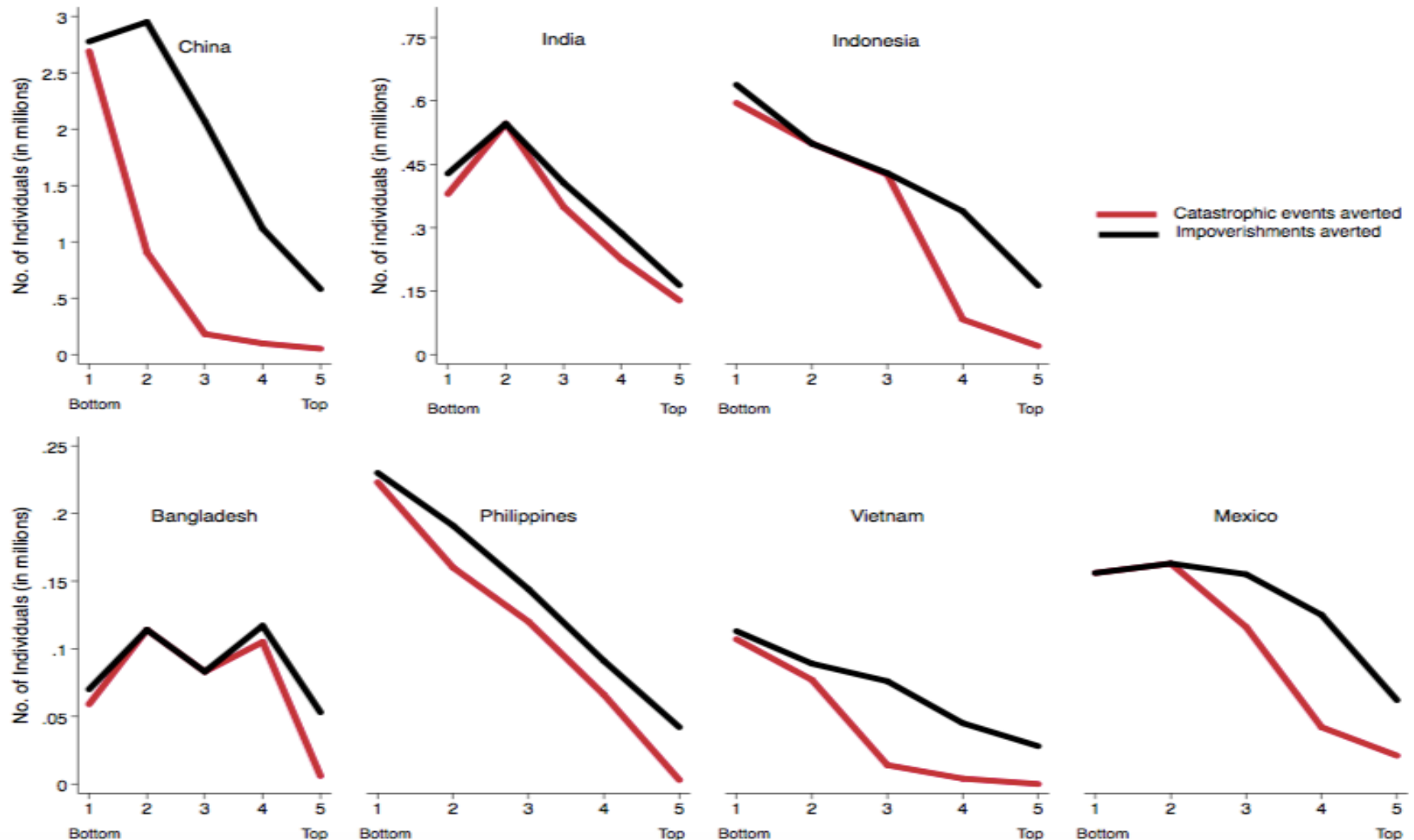
Key messages (2 of 2)

Relevance of Large tax hike to SDGs is high

- NCD goal of 1/3 reduction unlikely to be met without large tobacco tax hike

- Poverty goal has a powerful weapon- avoid catastrophic health care expenditures from tobacco-related diseases

- Universal Health Coverage goal more complex-revenue gains from tobacco helpful but insufficient to meet UHC funding needs
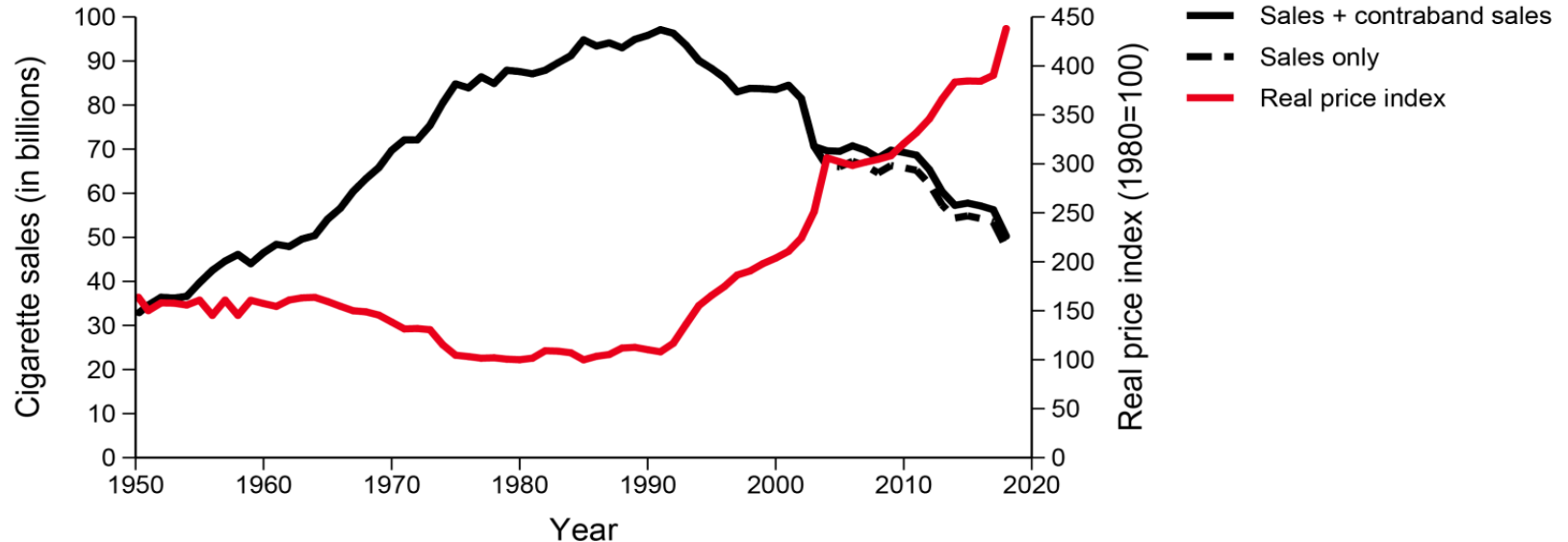
GTEC, BMJ 2018

Cigarette sales and prices 1950-2015 FRANCE vs CANADA

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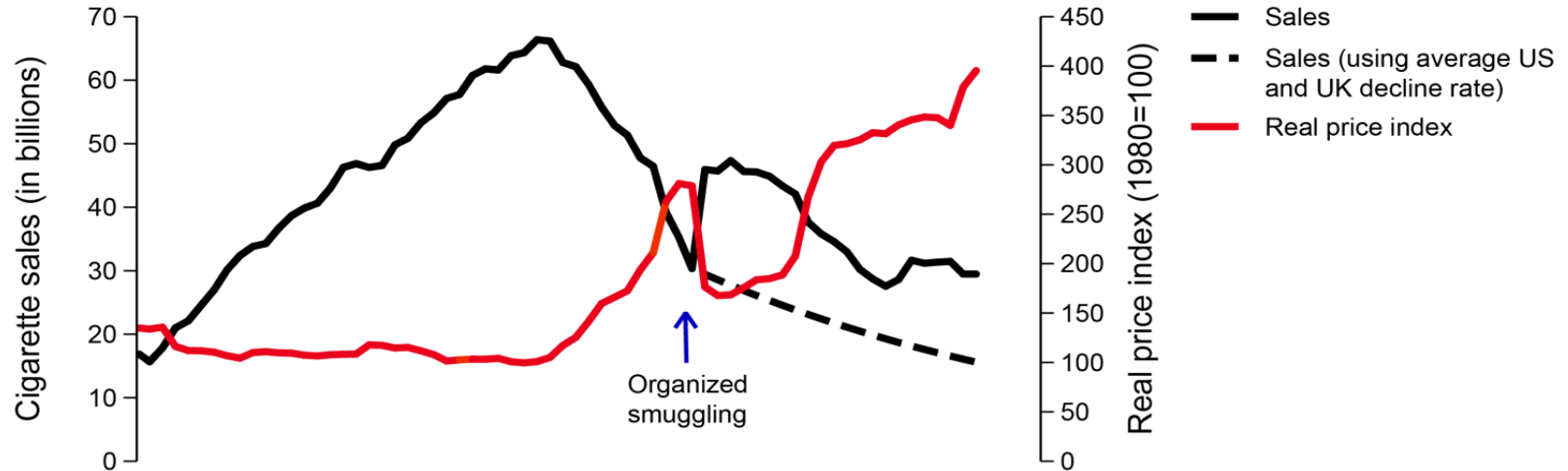
A tripling of excise tax in every country would reduce consumption by 1/3 and avoid ~200M deaths this century (and at least 2 M in Mexico)

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

Alcohol Prices & Consequences

- Recent systematic review concluded:

  - Doubling of alcohol taxes would reduce:

    - Alcohol-related mortality by 35%

    - Traffic crash deaths by 11%

    - Sexually transmitted disease by 6%

    - Violence by 2%

    - Crime by 1.4%

Source: Wagenaar et al., 2010

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Soda Taxes in Mexico
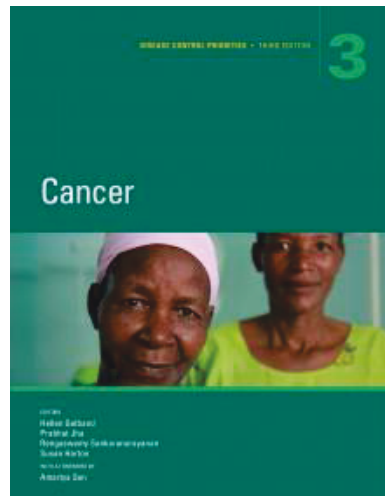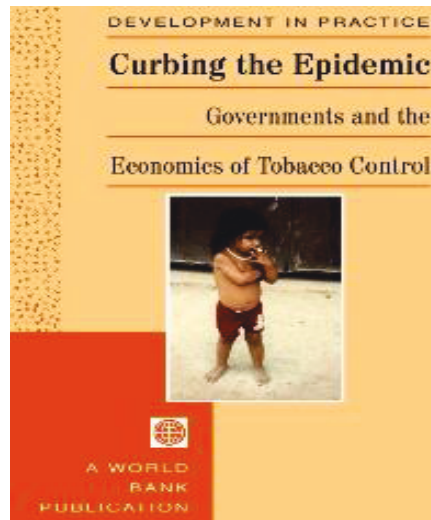
Evidence from Mexico's peso per liter SSB tax;

- Increased prices for SSBs relative to non-taxed beverages

  - pass through varies by type, size, location

- Significant reduction in SSB sales, consumption

  - growing over time

- Significant increase in bottled water consumption

- Greater impact on heavier consumers, low-income population

Sources: Colchero, et al., 2015; Colchero, et al., 2016; Colchero, et al., 2015; Ng, et al., under review

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CONCLUSIONS

- **Human capital (health, education, skills) can be substantially improved in Mexico with investments particularly in NCD control**

- **NCDs have unexpectedly large effects on Human capital (especially CVD), and tobacco is key risk factor for NCD**

- **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**

Source: Jha and Peto, NEJM 2014

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www.cghr.org
(Don't pay for my books)

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