The changing landscape of NCDs & risk factors

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United Nations Expert Group Meeting
On Priorities For Improved Survival:
ICPD Beyond 2014

Outline

- Focus on dominant causes of death: cardiometabolic disease
- What is changing about NCD prevalence and risk?
- How do we "know"?
- Which aspects of changing risk are particularly relevant for ICPD?

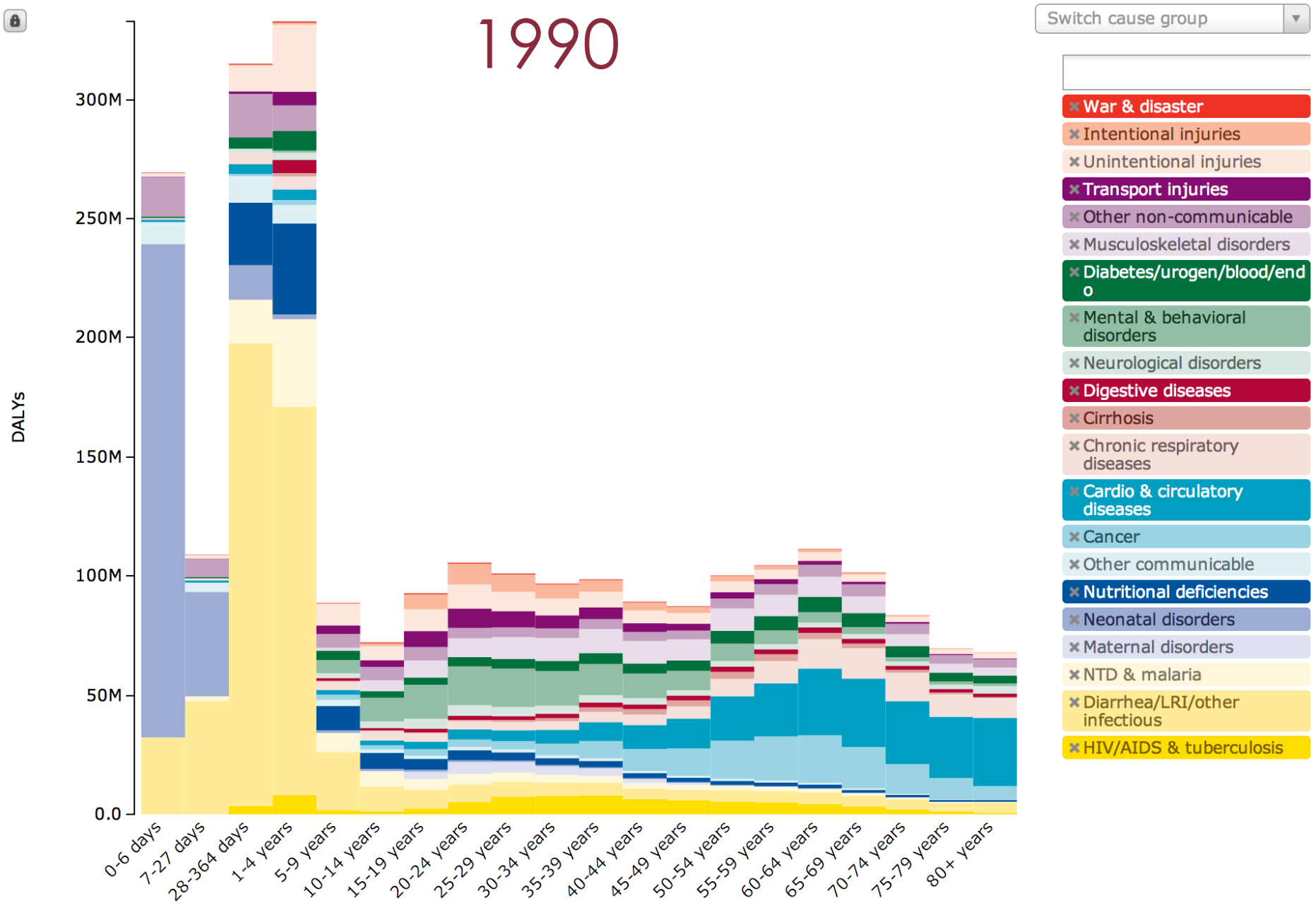
Dilemmas

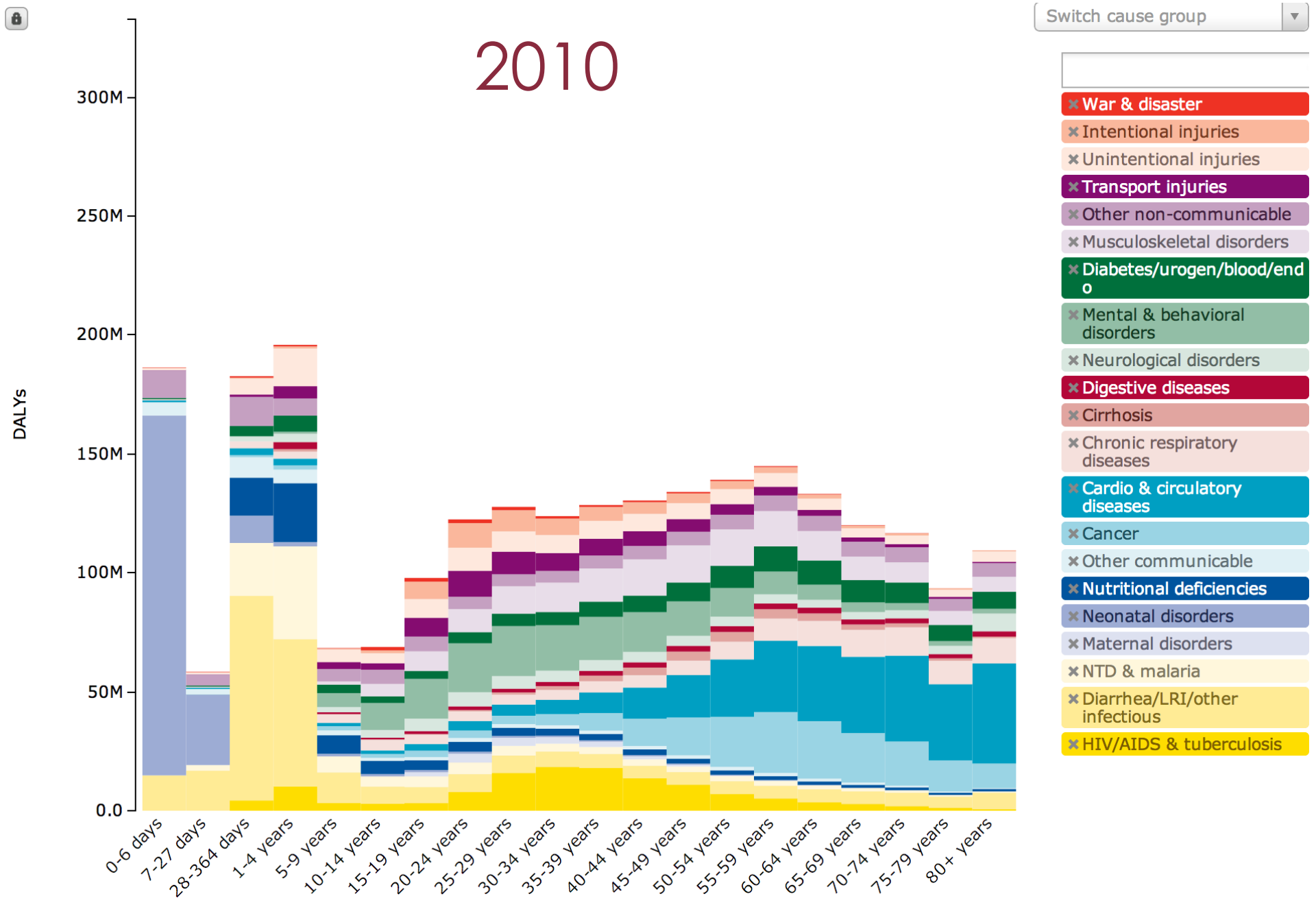
- Surveillance bias or true change?
- Among whom?
- Sources:
  - GYTS/GATS
  - GSAH
  - SAGE
  - GBD

N Engl J Med 2013; 369:448-457

Table 2. Global DALYs Caused by the 25 Leading Diseases and Injuries in 1990 and 2010.

Cause	2010		1990	
	Rank	DALYs (95% UI) *in thousands*	Rank	DALYs (95% UI) *in thousands*
Ischemic heart disease	1	129,795 (119,218–137,398)	4	100,455 (96,669–108,702)
Lower respiratory tract infections	2	115,227 (102,255–126,972)	1	206,461 (183,354–222,979)
Stroke	3	102,239 (90,472–108,003)	5	86,012 (81,033–94,802)
Diarrhea	4	89,524 (77,595–99,193)	2	183,543 (168,791–197,655)
HIV–AIDS	5	81,549 (74,698–88,371)	33	18,118 (14,996–22,269)
Malaria	6	82,689 (63,465–109,846)	7	69,141 (54,547–85,589)
Low back pain	7	80,667 (56,066–108,723)	12	56,384 (38,773–76,233)
Preterm birth complications	8	76,980 (66,210–88,132)	3	105,965 (88,144–120,894)
Chronic obstructive pulmonary disease	9	76,779 (66,000–89,147)	6	78,298 (70,407–86,849)
Road-traffic injury	10	75,487 (61,555–94,777)	11	56,651 (49,633–68,046)
Major depressive disorder	11	63,239 (47,894–80,784)	15	46,177 (34,524–58,436)
Neonatal encephalopathy*	12	50,163 (40,351–59,810)	10	60,604 (50,209–74,826)
Tuberculosis	13	49,399 (40,027–56,009)	8	61,256 (55,465–71,083)
Diabetes mellitus	14	46,857 (40,212–55,252)	21	27,719 (23,668–32,925)
Iron-deficiency anemia	15	45,350 (31,046–64,616)	14	46,803 (32,604–66,097)
Sepsis and other infectious disorders in newborns	16	44,236 (27,349–72,418)	17	46,029 (25,147–70,357)
Congenital anomalies	17	38,890 (31,891–45,739)	13	54,245 (45,491–69,057)
Self-harm	18	36,655 (26,894–44,652)	19	29,605 (23,039–37,333)
Falls	19	35,406 (28,583–44,052)	22	25,900 (21,252–31,656)
Protein-energy malnutrition	20	34,874 (27,957–41,662)	9	60,542 (50,378–71,639)
Neck pain	21	32,651 (22,783–44,857)	25	23,107 (16,031–31,890)


1990
DALYs
300M
250M
200M
150M
100M
50M
0.0
0-6 days
7-27 days
28-364 days
1-4 years
5-9 years
10-14 years
15-19 years
20-24 years
25-29 years
30-34 years
35-39 years
40-44 years
45-49 years
50-54 years
55-59 years
60-64 years
65-69 years
70-74 years
75-79 years
80+ years
Switch cause group
War & disaster
Intentional injuries
Unintentional injuries
Transport injuries
Other non-communicable
Musculoskeletal disorders
Diabetes/urogen/blood/endo
Mental & behavioral disorders
Neurological disorders
Digestive diseases
Cirrhosis
Chronic respiratory diseases
Cardio & circulatory diseases
Cancer
Other communicable
Nutritional deficiencies
Neonatal disorders
Maternal disorders
NTD & malaria
Diarrhea/LRI/other infectious
HIV/AIDS & tuberculosis


2010
DALYs
300M
250M
200M
150M
100M
50M
0.0
0-6 days
7-27 days
28-364 days
1-4 years
5-9 years
10-14 years
15-19 years
20-24 years
25-29 years
30-34 years
35-39 years
40-44 years
45-49 years
50-54 years
55-59 years
60-64 years
65-69 years
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Digestive diseases
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Chronic respiratory diseases
Cardio & circulatory diseases
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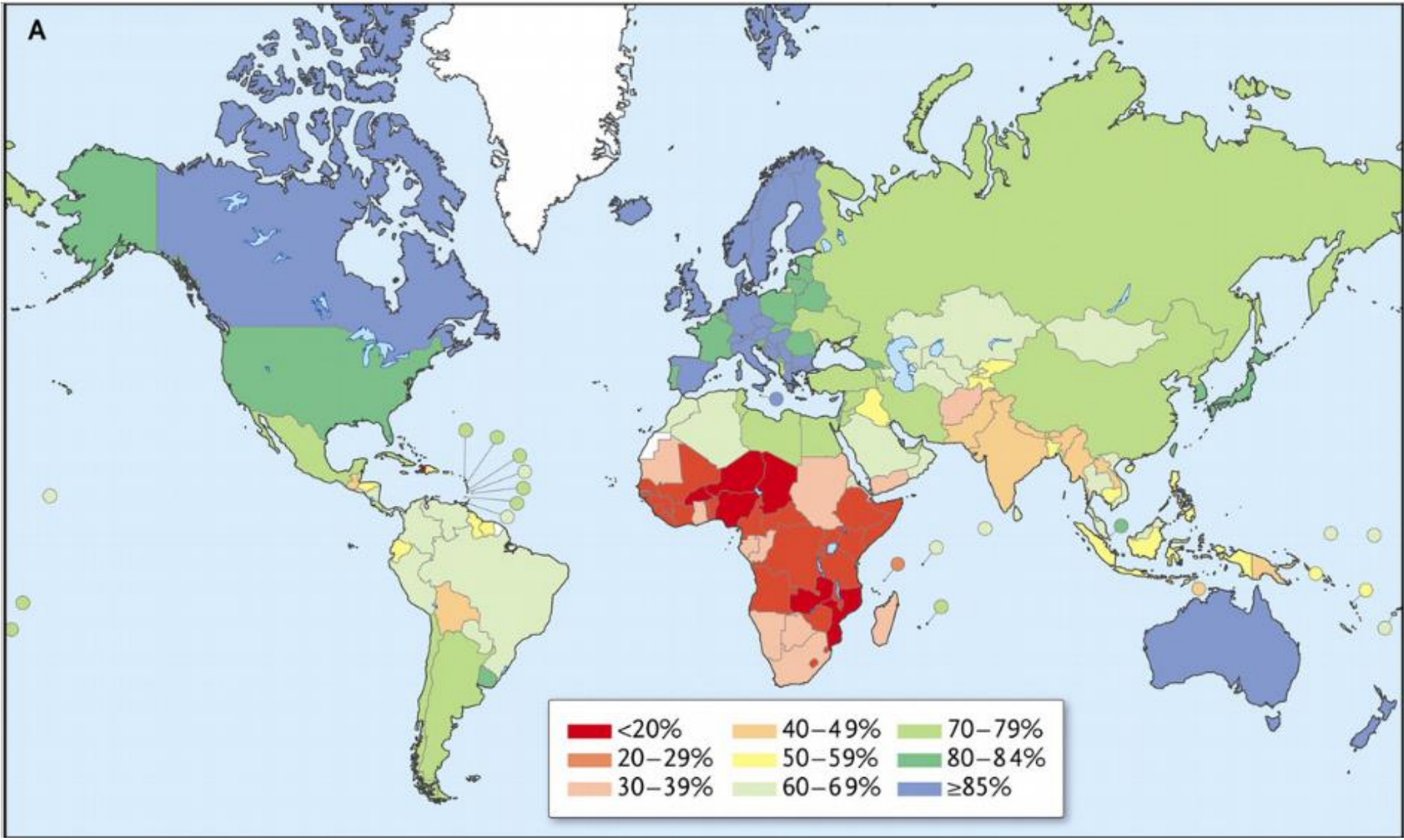
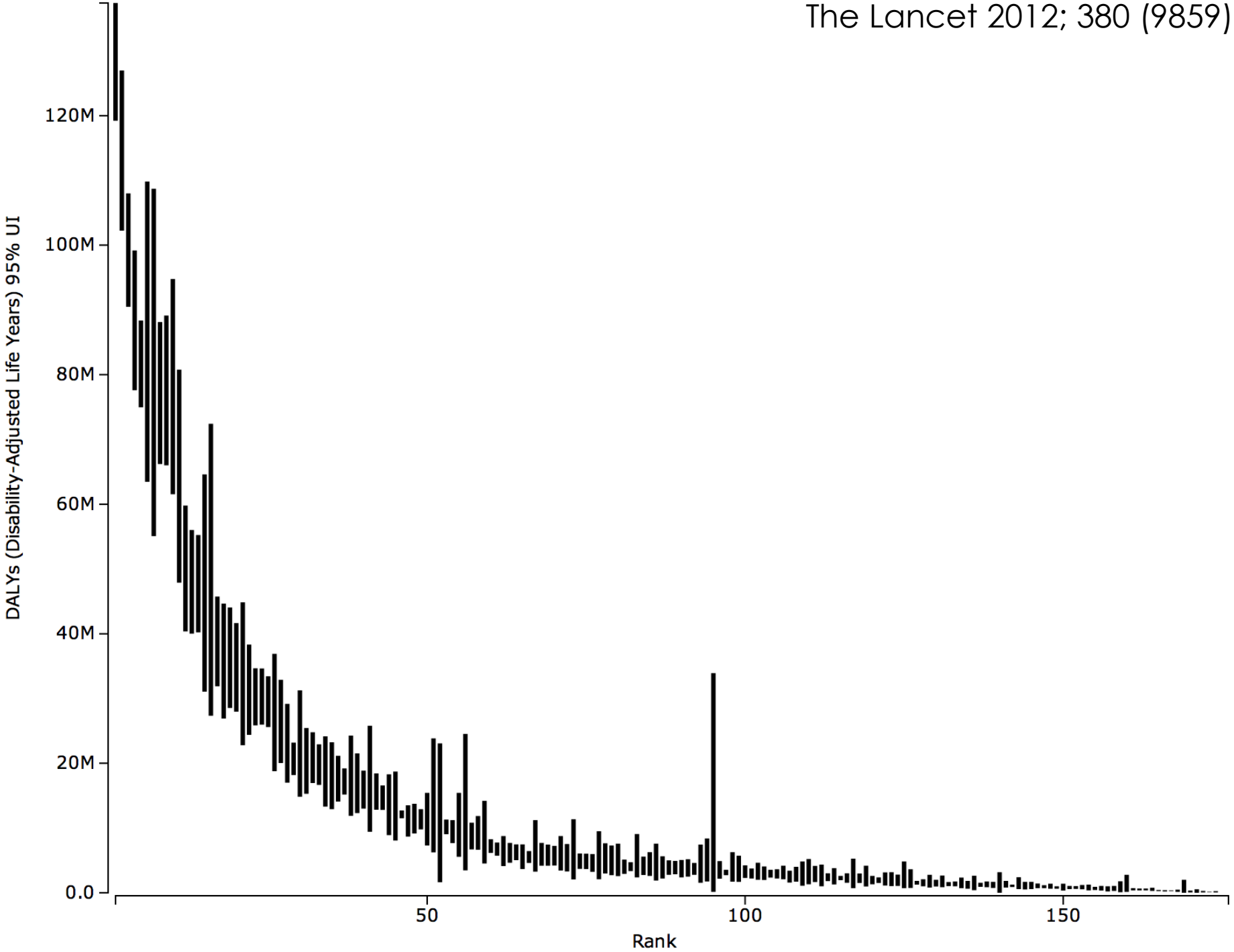
Maternal disorders
NTD & malaria
Diarrhea/LRI/other infectious
HIV/AIDS & tuberculosis

N Engl J Med 2013; 369:448-457

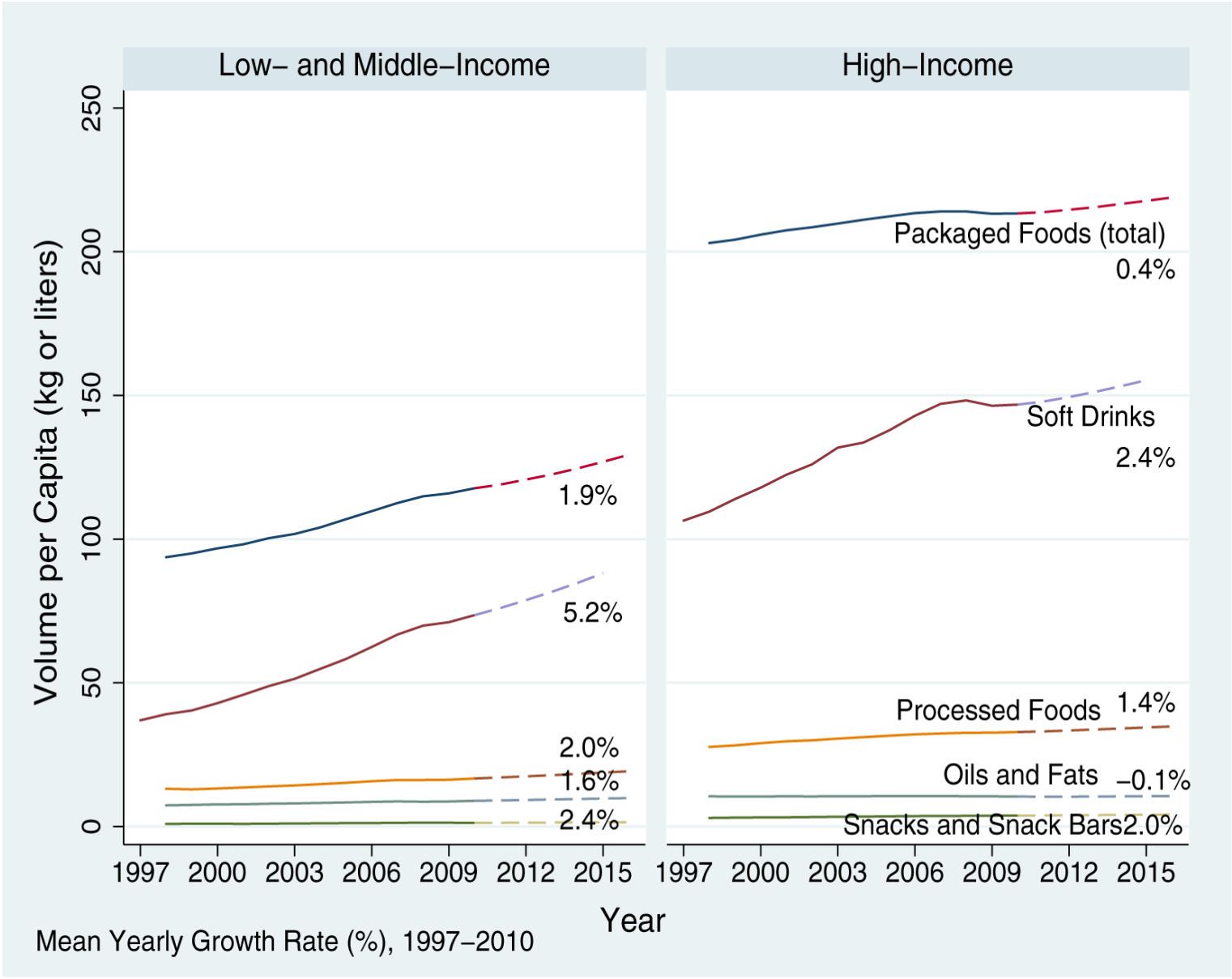


The Lancet 2012; 380 (9859)

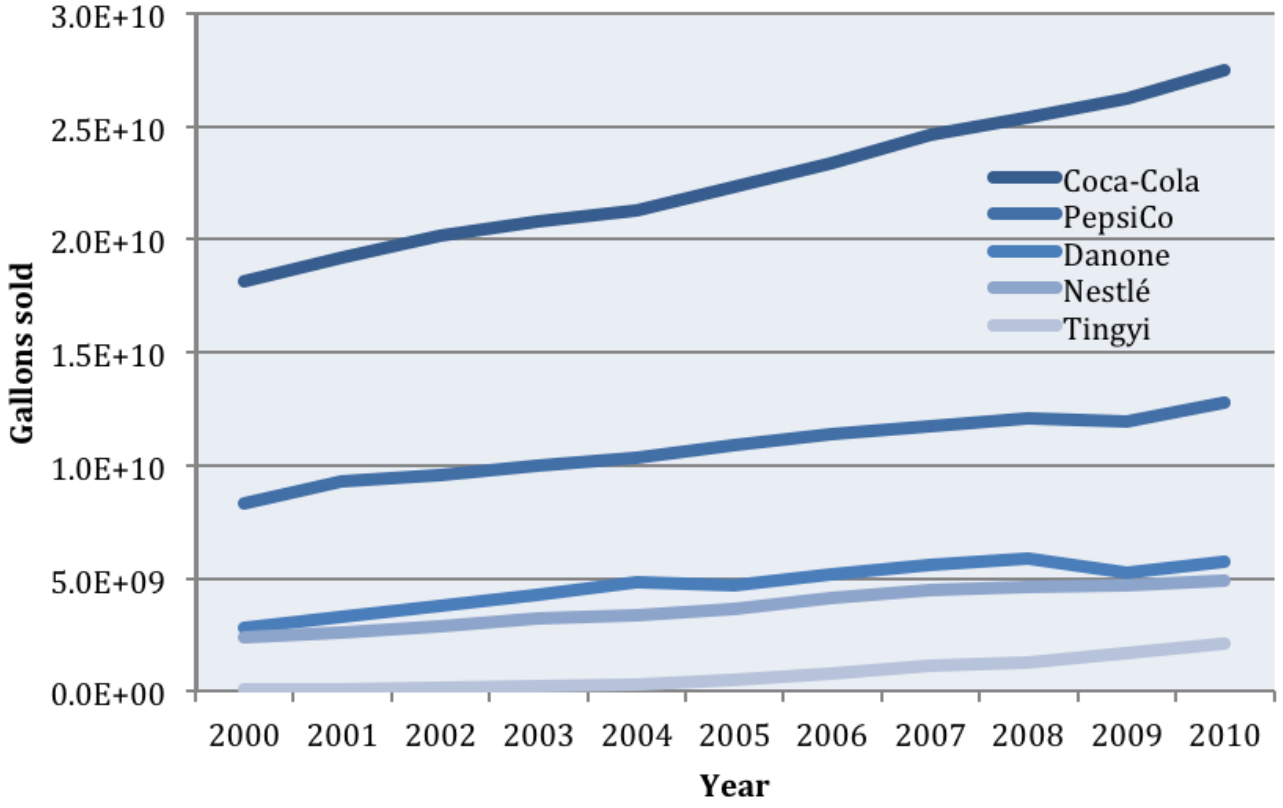


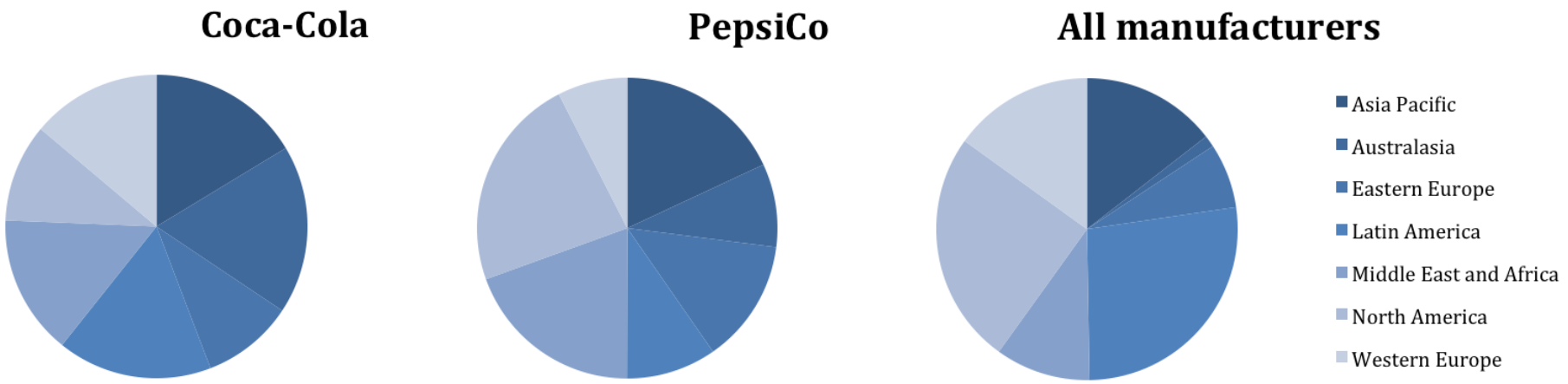
Other ways of "knowing"

- From the medical literature, a few key commodities are key to risk:
  - Tobacco
  - Alcohol
  - Foods high in sodium, unhealthy fats, sugars
- Who keeps track of these?


Low– and Middle–Income
High–Income
Volume per Capita (kg or liters)
0
50
100
150
200
250
1997
2000
2003
2006
2009
2012
2015
Year
Packaged Foods (total)
0.4%
Soft Drinks
2.4%
Processed Foods
1.4%
Oils and Fats
–0.1%
Snacks and Snack Bars
2.0%
1.9%
5.2%
2.0%
1.6%
2.4%
Mean Yearly Growth Rate (%), 1997–2010

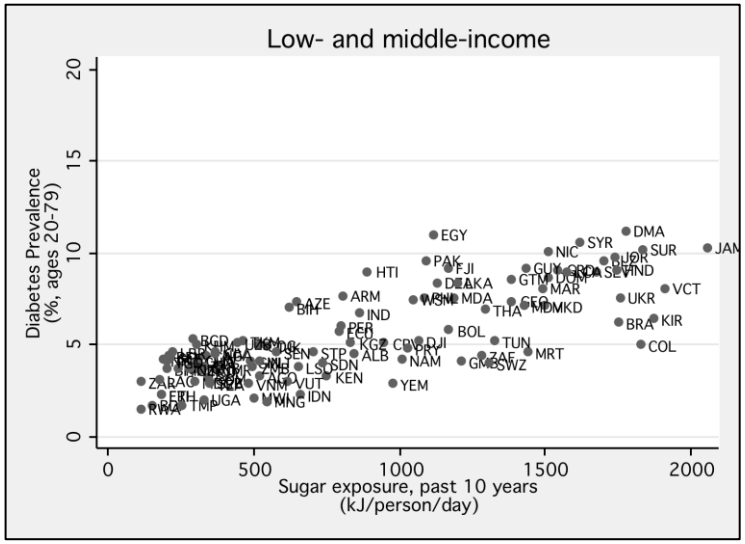
Am J Public Health 2013;103(11):2071-7

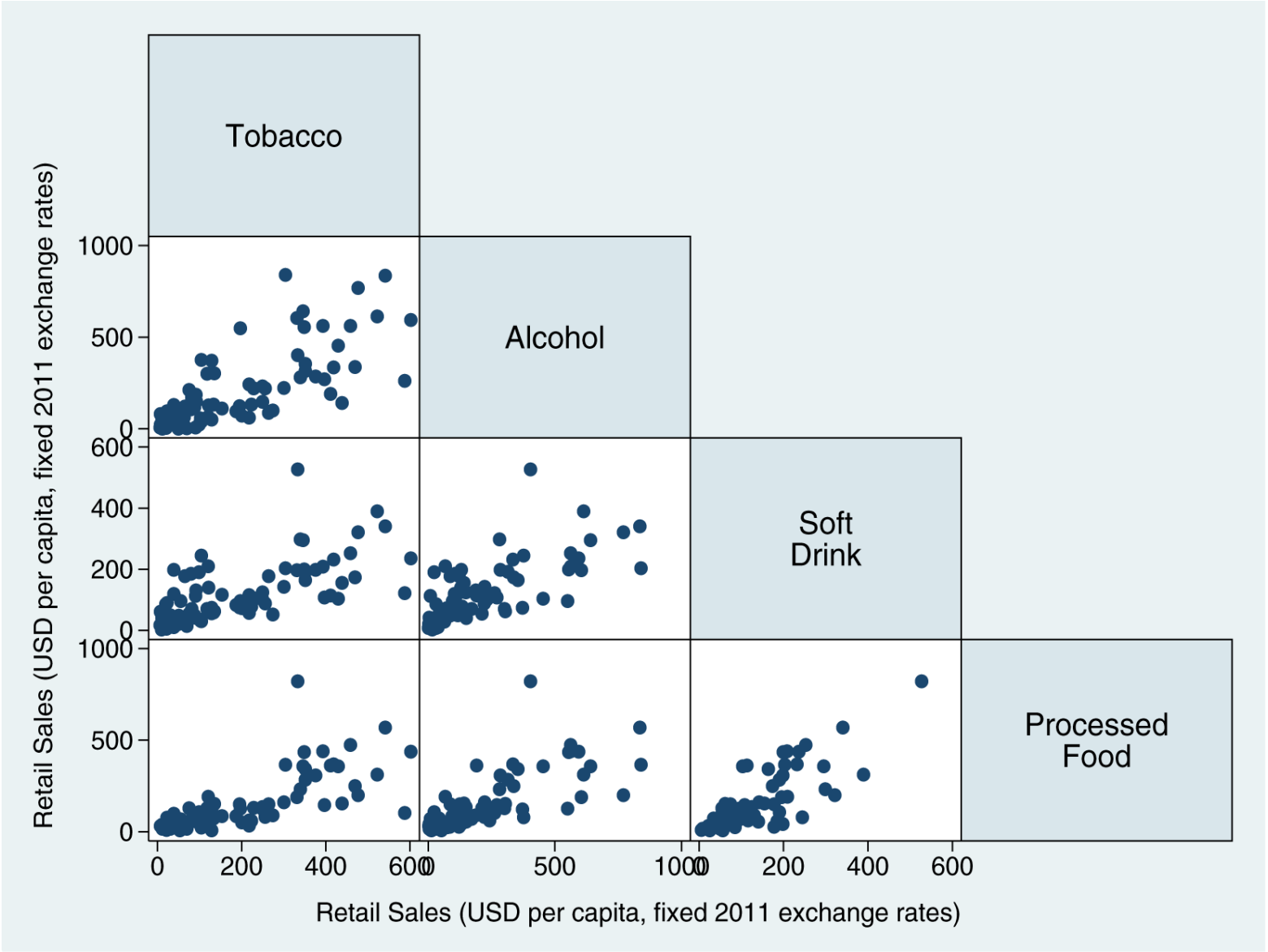


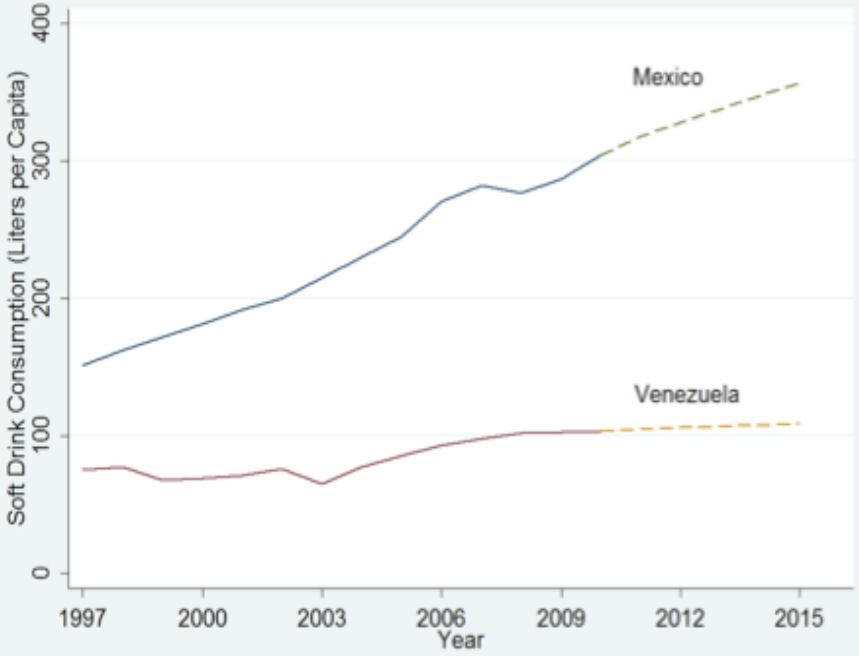


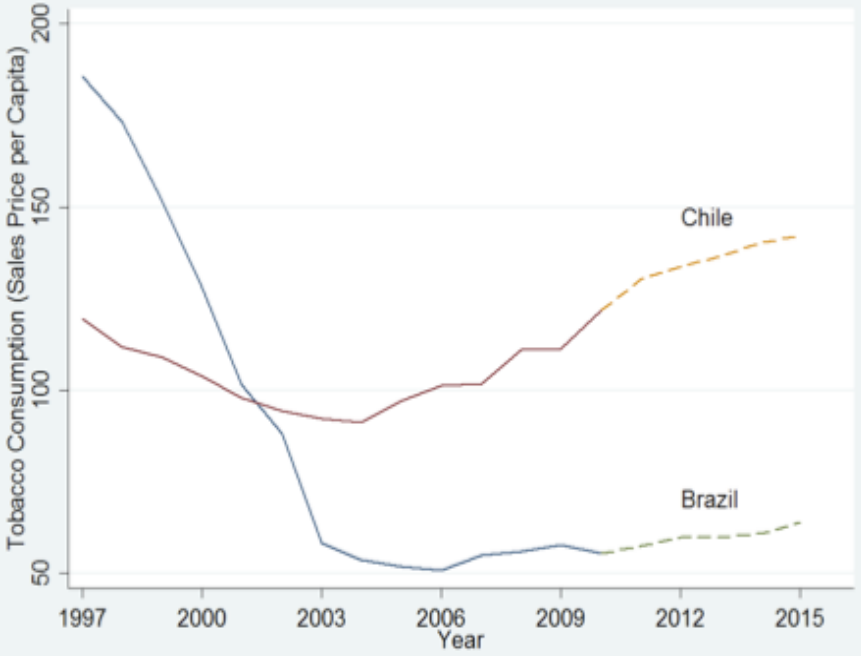
Public Health Nutr 2013;16(1):179-86
PLoS One 2013;8(2):e57873

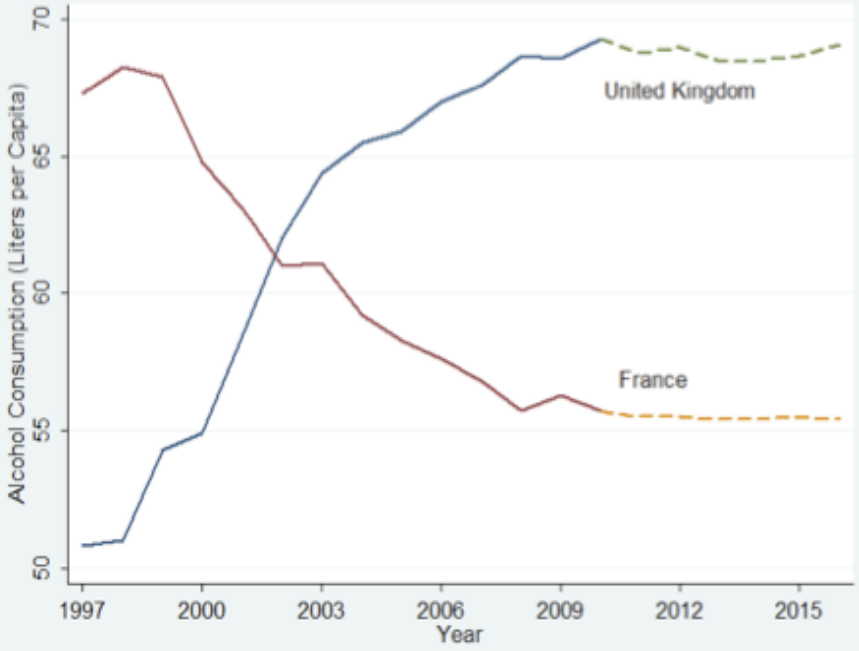
	(1) Diabetes prevalence (%)	(2) Diabetes prevalence (%)	(3) Diabetes prevalence (%)	(4) Diabetes prevalence (%)	(5) Diabetes prevalence (%)
Log GDP per capita	0.94**	0.86*	0.95*	1.00*	1.07*
	(0.33)	(0.37)	(0.37)	(0.40)	(0.48)
Change in log GDP	1.02	2.08	1.77	0.46	1.88
	(0.97)	(1.26)	(2.39)	(2.59)	(2.54)
Urbanization	0.048**	0.022	0.0048		0.016
	(0.015)	(0.013)	(0.011)		(0.011)
Aging	0.17*	0.11	0.039		0.049
	(0.067)	(0.081)	(0.075)		(0.085)
Total kilocalories		0.0010	0.00031	0.00079	0.00075
		(0.00056)	(0.00052)	(0.0012)	(0.0011)
Obesity			0.10***	0.094***	0.081***
			(0.024)	(0.022)	(0.021)
Sugar				0.0058**	0.0072***
				(0.0019)	(0.0020)
Fiber				0.00042	0.0011
				(0.0015)	(0.0014)
Fruit				0.00053	0.00011
				(0.0023)	(0.0024)
Meat				-0.0032	-0.0015
				(0.0023)	(0.0022)
Cereal				0.0014	0.0017
				(0.0013)	(0.0012)
Oils				0.00060	0.0018
				(0.0016)	(0.0018)
Countries	173	160	152	141	137
R^2	0.27	0.31	0.44	0.54	0.55




Tobacco
Alcohol
Soft Drink
Processed Food
Retail Sales (USD per capita, fixed 2011 exchange rates)
Retail Sales (USD per capita, fixed 2011 exchange rates)
0
500
1000
0
200
400
600
0
200
400
600
0
500
1000
0
200
400
600
0
500
1000





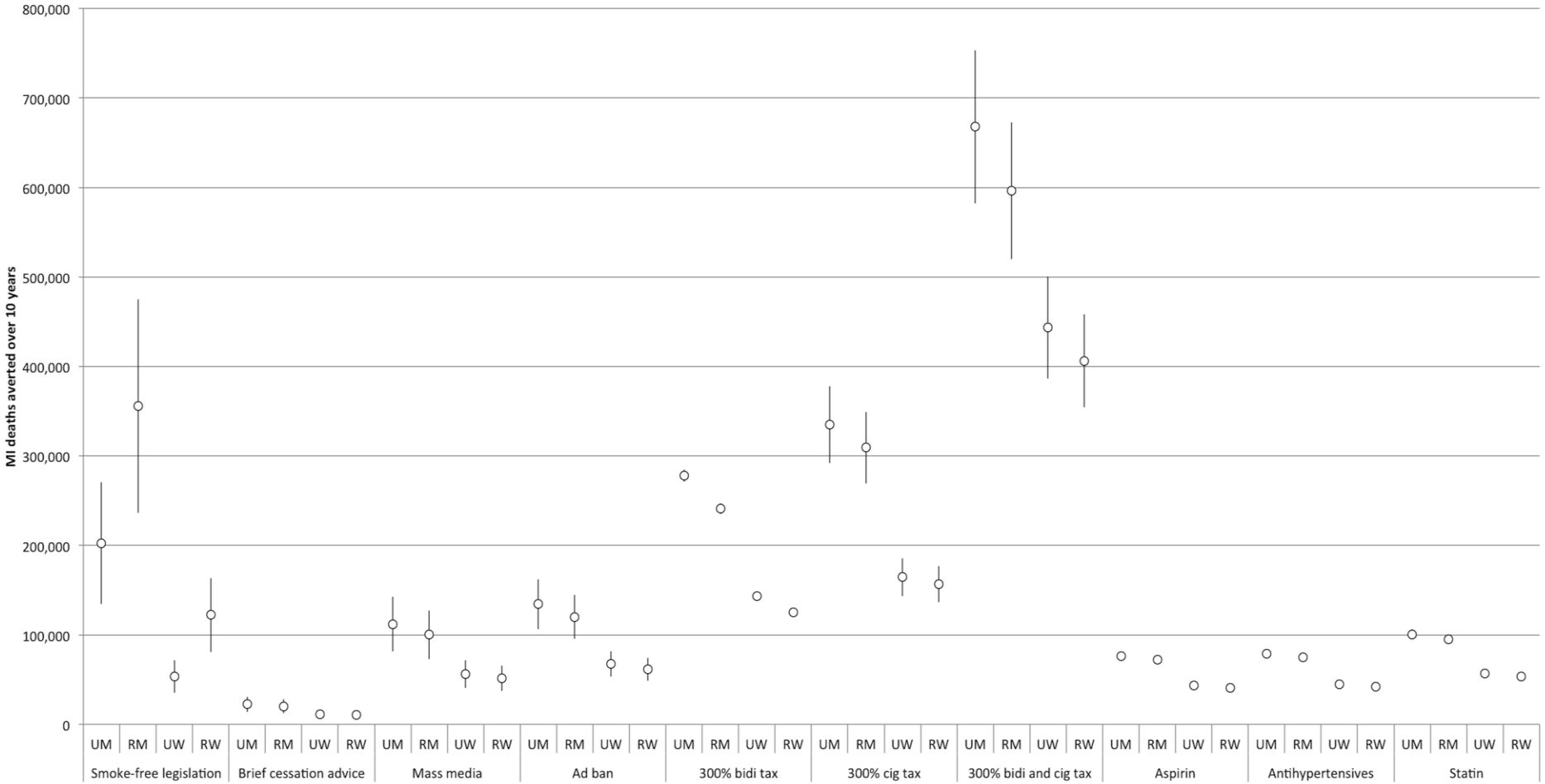


PLoS Med 2012; 9(6): e1001235

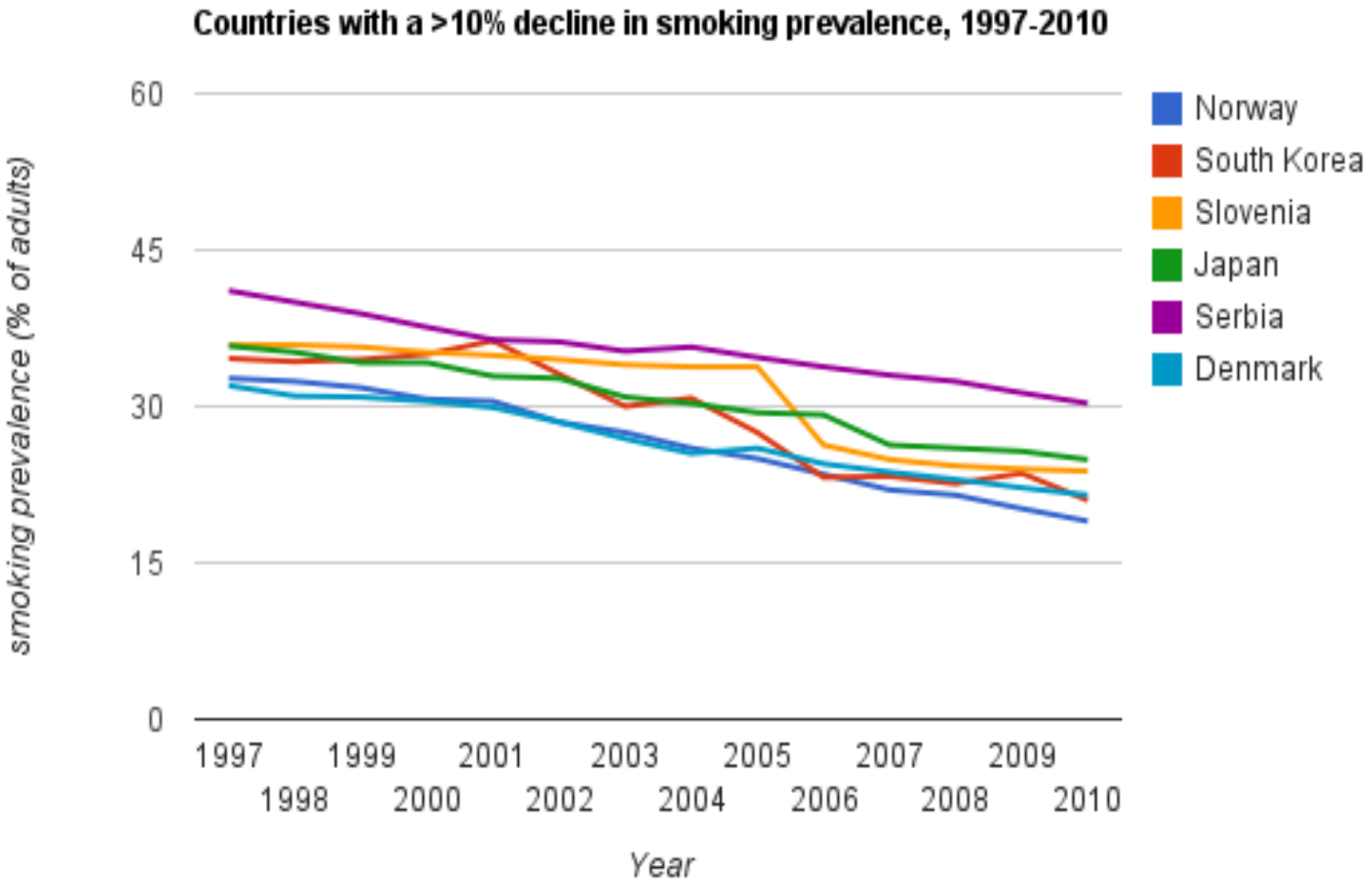
Covariate	Snacks (kg per capita)	Confections (kg per capita)	Soft drinks (litre per capita)	Ice cream (kg per capita)	Oils and fats (kg per capita)	Ready meals (kg per capita)	Processed foods (kg per capita)	Packaged foods (kg per capita)	Tobacco (USD sales per capita)	Alcohol (USD sales per capita)
Log GDP per capita (constant USD, purchasing power parity)	0.81* (0.31)	1.60*** (0.28)	42.8*** (11.4)	0.82** (0.26)	2.89*** (0.78)	0.76** (0.22)	6.94*** (1.34)	26.9** (8.61)	63.8*** (13.5)	23.0** (6.73)
Foreign Direct Investment as a % of GDP	0.0085* (0.0036)	0.0085 (0.0046)	0.71** (0.21)	0.0011 (0.0034)	−0.013 (0.019)	0.0017 (0.0039)	0.061** (0.019)	0.27 (0.15)	1.34 (0.68)	0.24* (0.10)
Percentage of Population Living in Urban Settings	0.024 (0.021)	−0.025 (0.019)	2.20* (0.84)	−0.0087 (0.014)	0.043 (0.077)	−0.027* (0.012)	0.16 (0.21)	1.78 (1.17)	−2.21 (1.22)	−0.41 (0.34)
Number of Country-Years	341	560	609	560	560	489	472	560	609	609
Number of Countries	40	49	50	49	49	45	43	49	50	50
R^2	0.369	0.495	0.483	0.235	0.278	0.345	0.509	0.311	0.216	0.411

Notes: Robust-clustered errors in parentheses to reflect non-independence of country sampling.
*$p<0.05$,
**$p<0.01$,
***$p<0.001$.
doi:10.1371/journal.pmed.1001235.t002

PLoS Med 2013; 10(7): e1001480

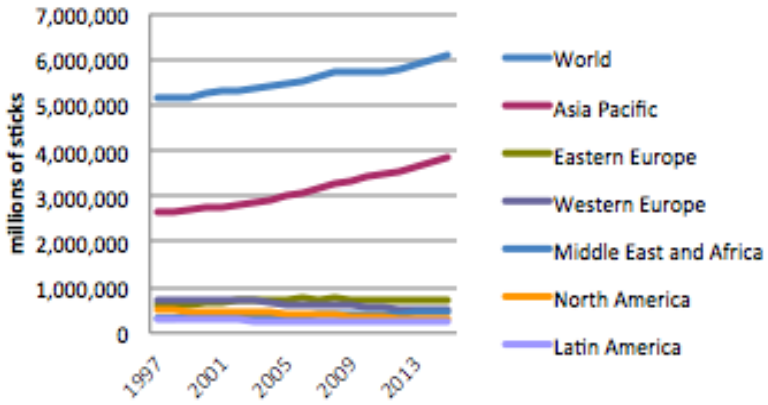


Euromonitor, 2013

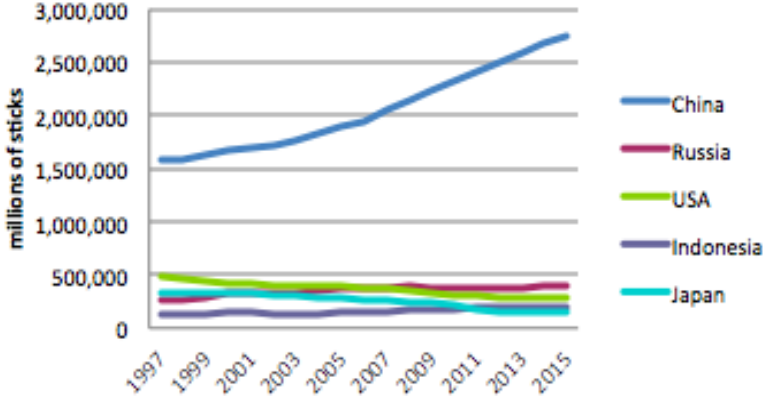


Euromonitor, 2013

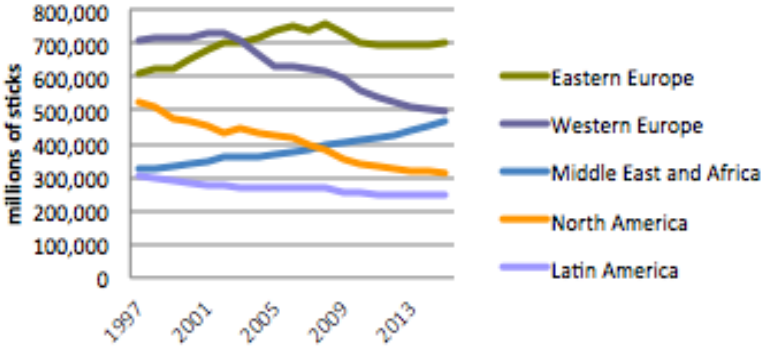
Cigarettes sold by region



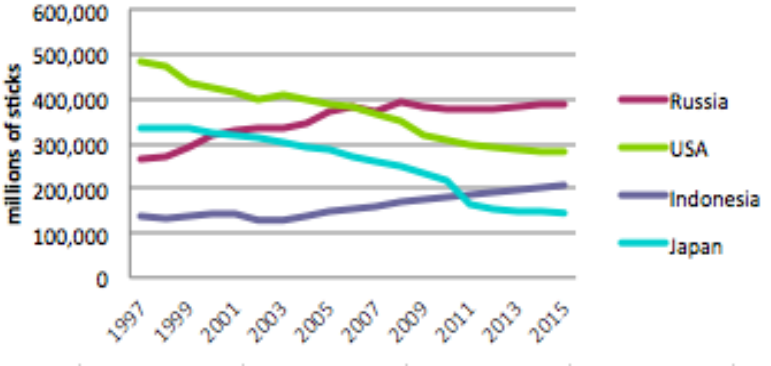
Cigarettes sold, top 5 countries



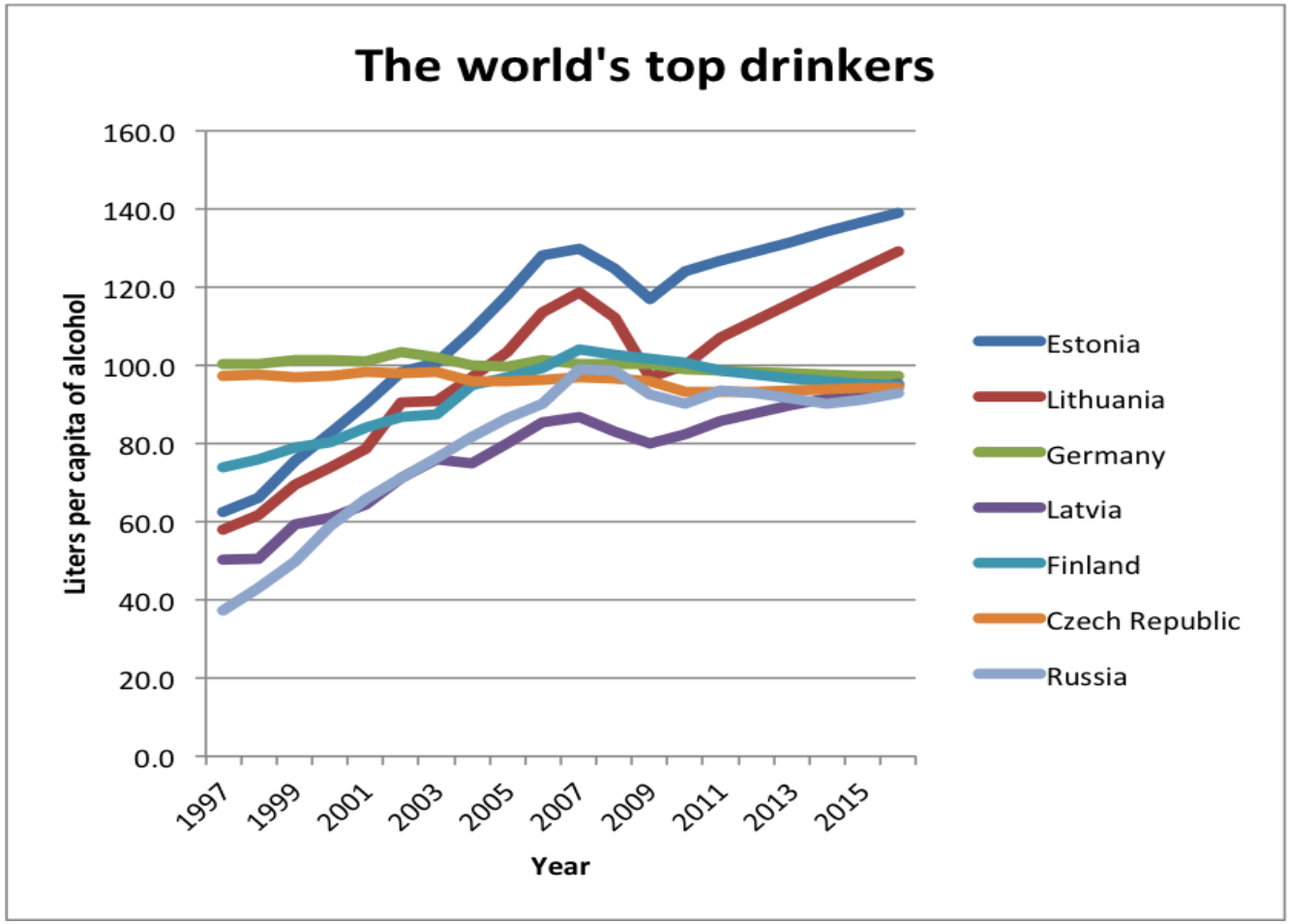
Cigarettes sold by region, excluding China



Cigarettes sold, top 4 countries after China



Euromonitor, 2013



‘Risky’ alcohol use

- Profound risk in CEE/CIS
- High use but low ‘risk’ in Cyprus, Italy, Portugal, Spain
- Emerging worrisome data from SSA

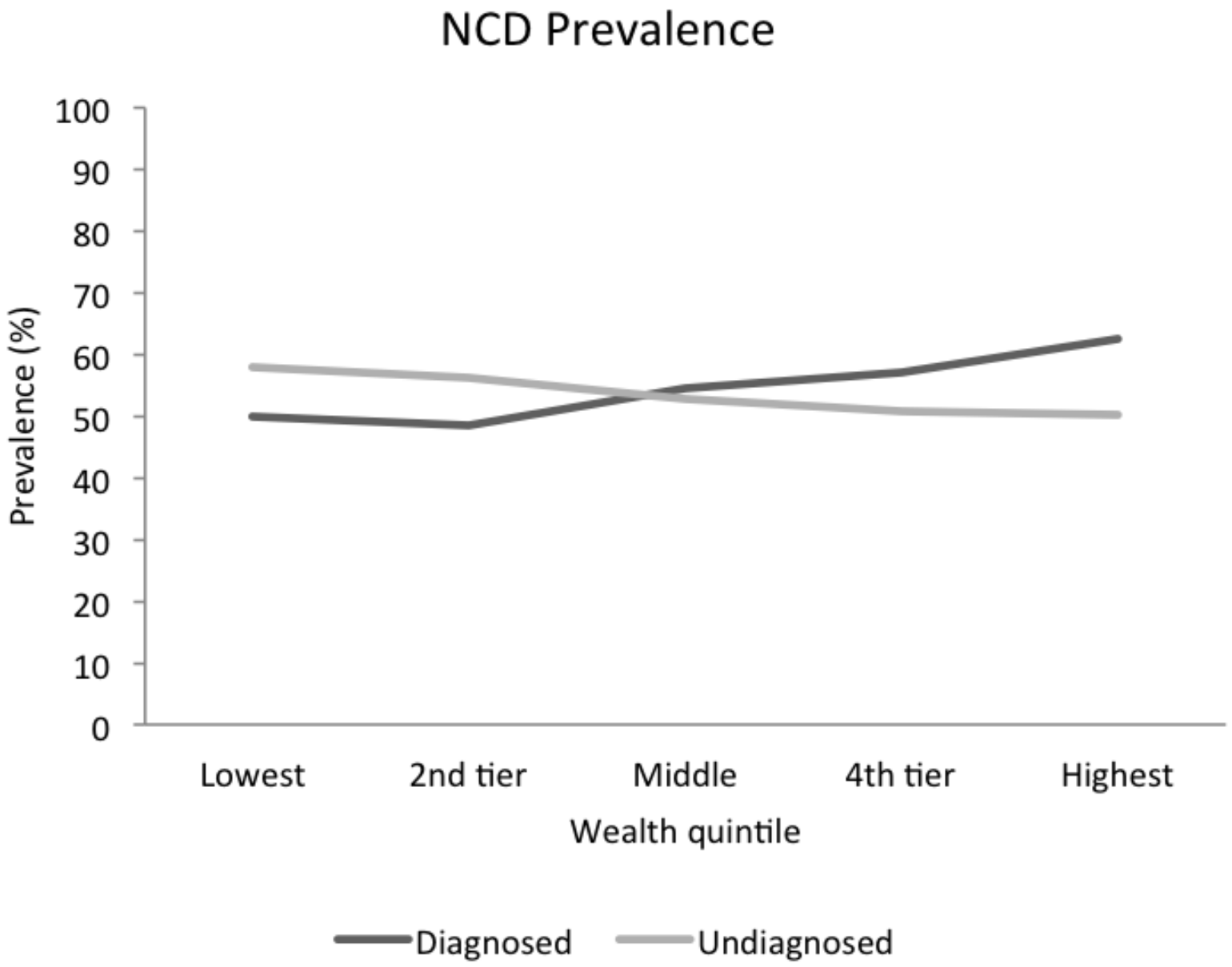
Non-commodity risk

- Physical activity
  - Major decline in occupational activity
  - Not just urban, and often before motorization
  - Much higher inactivity in women, even age-adjusted
  - Unsafe public health interventions
- Activity vs sedentary as separate risks

Distribution of risk

- Persistent debates on distribution
- Longitudinal data limitations
- Inconsistencies across space and disease

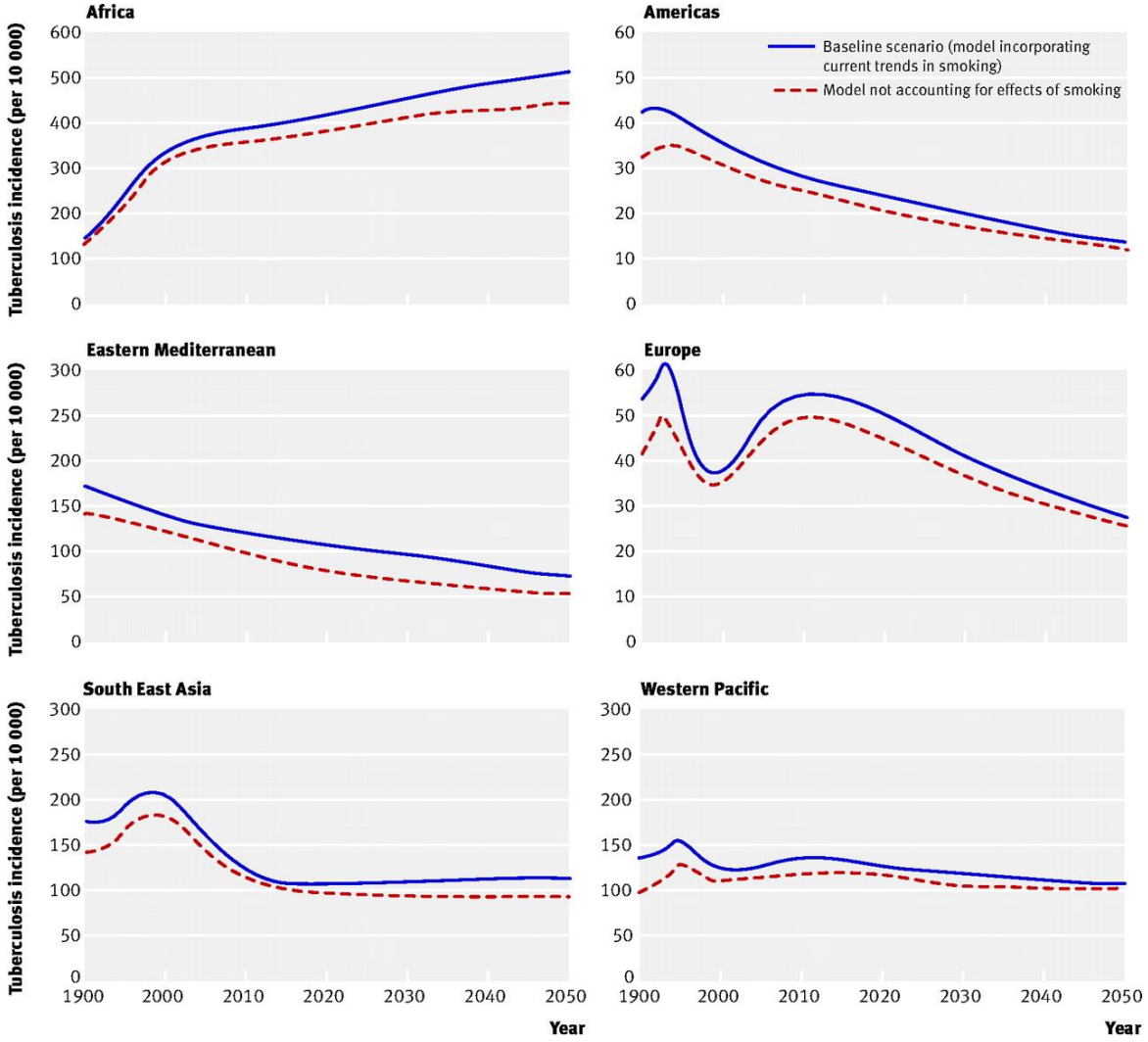
PLoS ONE 2013; 8(7): e68219



BMJ 2011;343:d5506

Dual burdens

- Within-household?
- Multiplicative risk
  - Diabetes and TB
  - Smoking and TB



Are high-income data sufficient?

References

- Basu, Sanjay, and Abby King. (2013). Disability and Chronic Disease Among Older Adults in India: Detecting Vulnerable Populations through the WHO SAGE Study. *American Journal of Epidemiology:* epub ahead of print.
- Basu, Sanjay, Martin McKee, Gauden Galea, and David Stuckler. (2013). Relationship of Soft Drink Consumption to Global Overweight, Obesity, and Diabetes: A Cross-National Analysis of 75 Countries. *American Journal of Public Health* issue 0, pp. e1–e7.
- Basu, Sanjay, David Stuckler, Asaf Bitton, and Stanton A. Glantz. (2011). Projected Effects of Tobacco Smoking on Worldwide Tuberculosis Control: Mathematical Modelling Analysis. *BMJ* vol. 343, issue, d5506.
- Basu, Sanjay, David Stuckler, Martin McKee, and Gauden Galea. (2012). Nutritional Determinants of Worldwide Diabetes: An Econometric Study of Food Markets and Diabetes Prevalence in 173 Countries. *Public Health Nut* vol. 16, issue 1, pp. 1–8.
- Basu, Sanjay, Paula Yoffe, Nancy Hills, and Robert H. Lustig. (2013). The Relationship of Sugar to Population-level Diabetes Prevalence: An Econometric Analysis of Repeated Cross-sectional Data. *PloS One* vol. 8, issue 2, pp. e57873.
- Ebrahim, Shah, Neil Pearce, Liam Smeeth, Juan P Casas, Shabbar Jaffar, and Peter Piot. (2013). Tackling Non-communicable Diseases in Low- and Middle-income Countries: Is the Evidence from High-income Countries All We Need? *PLoS Medicine* vol. 10, issue 1, pp. e1001377.
- Institute of Medicine. (2010). Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health. National Academy Press.
- Stuckler, D., M. McKee, S. Ebrahim, and S. Basu. (2012). Manufacturing Epidemics: The Role of Global Producers in Increased Consumption of Unhealthy Commodities Including Processed Foods, Alcohol, and Tobacco. *PLoS Medicine,* vol. 9, issue 6, pp. e1001235.
- Vellakkal, Sukumar, S. V. Subramanian, Christopher Millett, Sanjay Basu, David Stuckler, and Shah Ebrahim. (2013). Socioeconomic Inequalities in Non-Communicable Diseases Prevalence in India: Disparities Between Self-Reported Diagnoses and Standardized Measures. *PloS One,* vol. 8, issue 7, pp. e68219.