DCP3 Disease Control Priorities

economic evaluation for health

www.dcp-3.org
info@dcp-3.org

State of the Art and Case Studies of Economic Analysis for Policy Action on NCDs

Rachel Nugent, Director

Disease Control Priorities Network

Department of Global Health, University of Washington

Acknowledgements: David Watkins, MD, Zachary Olson, MA, Stephane Verguet, PhD, Dean Jamison, PhD

We are grateful to the Bill & Melinda Gates Foundation for support of the Disease Control Priorities Network

DCP3 Disease Control Priorities

economic evaluation for health

An economics & policy discussion in 3 parts

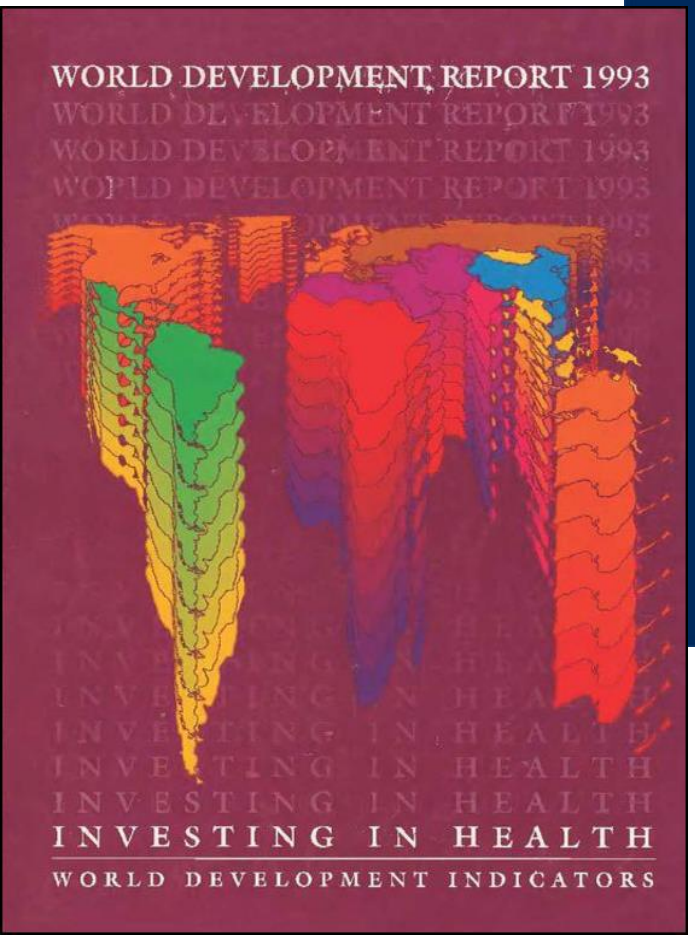
Part 1: What is DCPN?

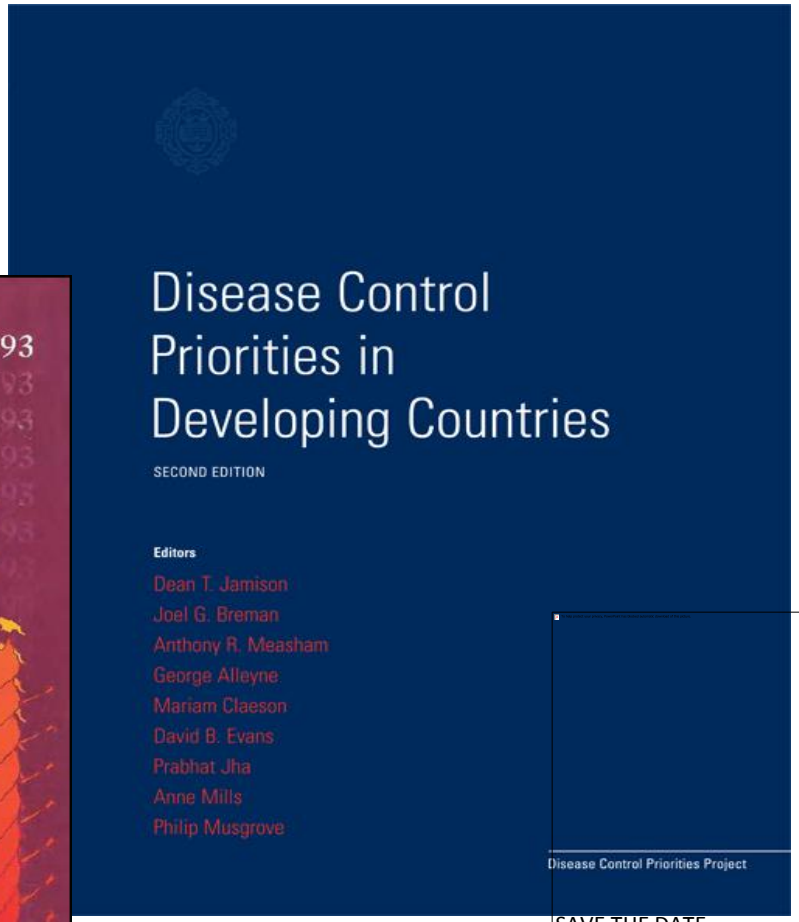
Part 2: Salt reduction in South Africa

Part 3: Tobacco taxation in China

DCP3 Disease Control Priorities

economic evaluation for health





SAVE THE DATE

Launch of the report by *The Lancet* Commission on Investing in Health Global Health 2035: A World Converging within a Generation

On December 3, *The Lancet* will publish Global Health 2035: A World Converging within a Generation, a major new report by the Commission on Investing in Health. The Commission is chaired by Lawrence H. Summers, President Emeritus and Charles W. Eliot University Professor of Harvard University and co-chaired by Dean T. Jamison, Professor at the University of Washington. The report is being released on the 20th anniversary of the 1993 World Development Report. The Commission,

DCP3 Disease Control Priorities

economic evaluation for health

Disease Control Priorities, 3rd Edition

DCP3 Volume Topics
1. Disease Control Priorities in Developing Countries
2. Reproductive, Maternal, Newborn and Child Health
3. Child and Adolescent Development
4. AIDS, STIs, TB and Malaria
5. Cardio-metabolic and Respiratory Diseases
6. Cancer
7. Environmental Health and Injury Prevention
8. Mental, Neurological and Substance Use Disorders
9. Essential Surgery

DCP3 Disease Control Priorities

economic evaluation for health

Objectives of DCP3

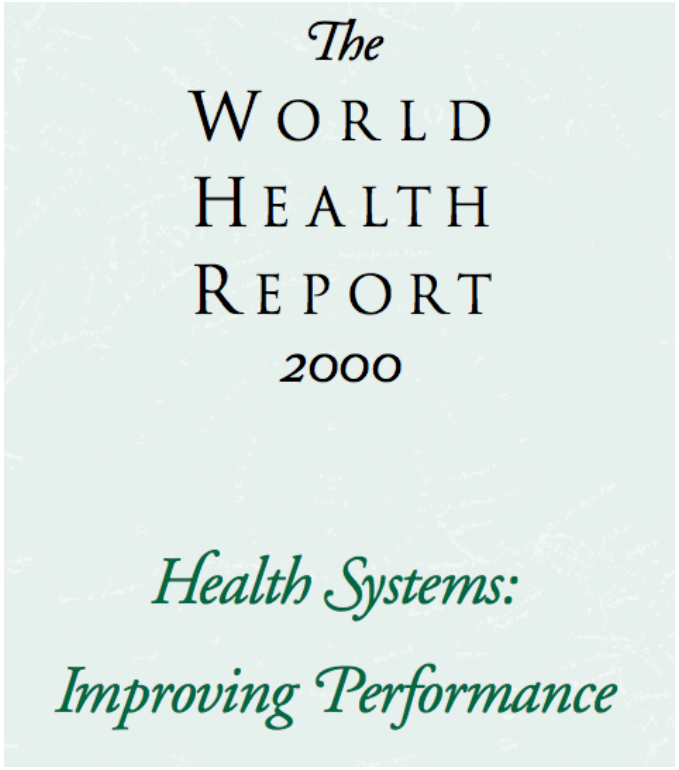
- Inform allocation of resources across interventions and health service delivery platforms.
- Provide a comprehensive review of the efficacy and effectiveness of priority health interventions.
- Advance knowledge and practice of analytical methods for economic evaluation of health interventions.

DCP3 Disease Control Priorities

economic evaluation for health

Health system objectives

- **Improving health and the distribution of health in the population**
- **Prevention of medical impoverishment**
- **Fairness in the financial contribution toward health**



DCP3 Disease Control Priorities

economic evaluation for health

Overview of Economic Analysis for Health

Background

- Health spending decisions are about packages, platforms, policies
- Need to broaden the results of economic evaluation
- CEA …….ECEA……CBA

Multiple Health System Outcomes

- Equity

  Definitions
- Financial risk protection

  Definitions

Examples

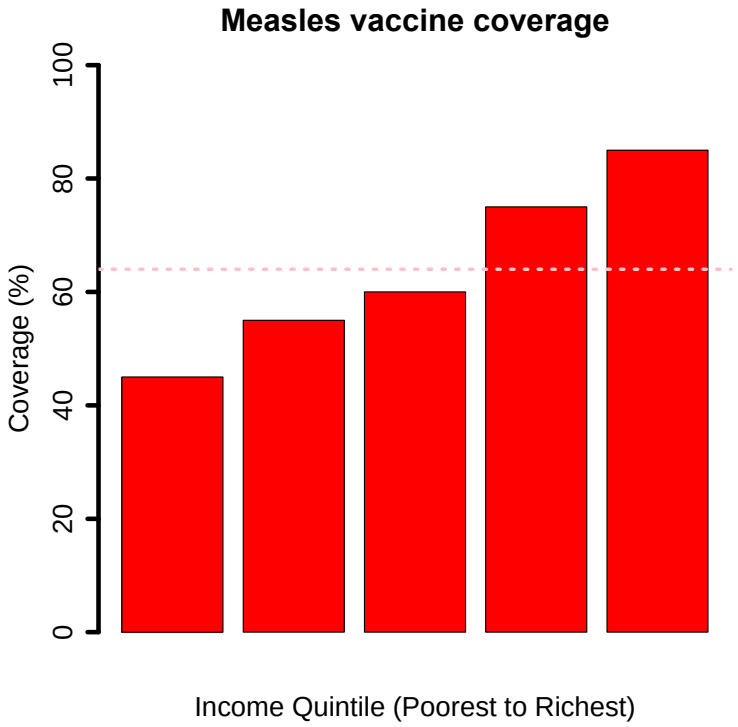
- Salt reduction policy in South Africa
- Tobacco taxation in China

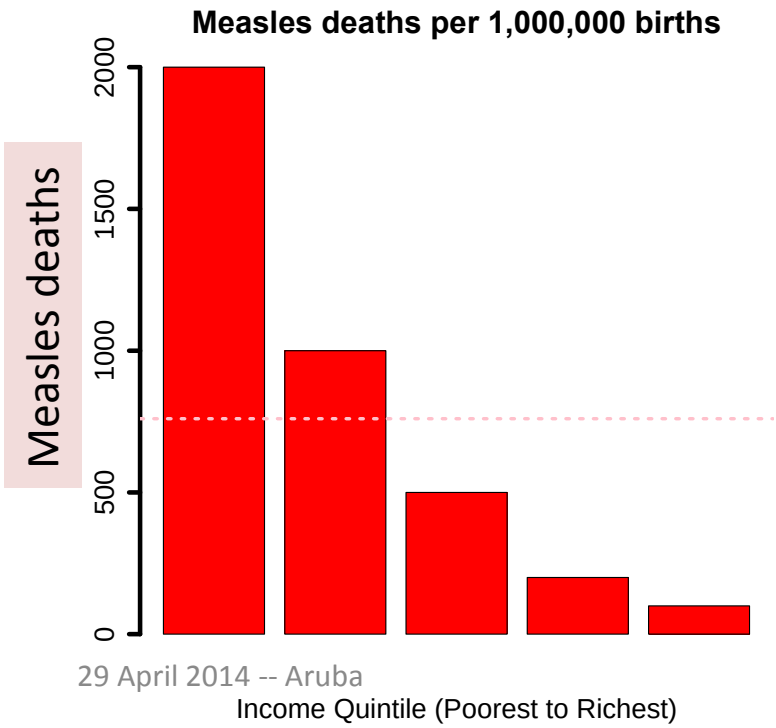
DCP3 Disease Control Priorities

economic evaluation for health

Measures of equity

- Fairness in the distribution of health coverage (ex: measles vaccine coverage)





- Fairness in the distribution of health outcomes (ex: measles deaths)

DCP3 Disease Control Priorities

economic evaluation for health

Measures of medical impoverishment

- When confronted with medical expenditures and inadequate financial protection, people can face high out-of-pocket (OOP) payments and fall into poverty
  - Threshold-base approach
  - Poverty cases averted
  - Forced Borrowing and Asset Sales
  - Money-metric value of insurance

DCP3 Disease Control Priorities

economic evaluation for health

Mechanisms of financial risk protection

- **Moving from out-of-pocket payments to prepayment mechanisms reduces catastrophic expenditures**

  (Xu et al. 2007; cross-country study)

- **Public finance & social insurance packages bring significant risk reductions**

  México's Seguro Popular in 2004 (Knaul et al. 2006)

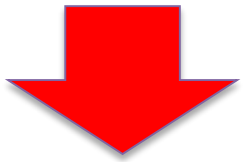
  Medicare in the US (Finkelstein and McKnight 2008)

DCP3 Disease Control Priorities

economic evaluation for health

From CEA to ECEA

Cost Effectiveness Analysis (CEA)



Extended Cost Effectiveness Analysis (ECEA)

(1) Distributional consequences across wealth strata of populations

(2) Financial risk protection benefits for households

Verguet, Laxminarayan & Jamison, *Health Economics* (in press)

DCP3 Disease Control Priorities

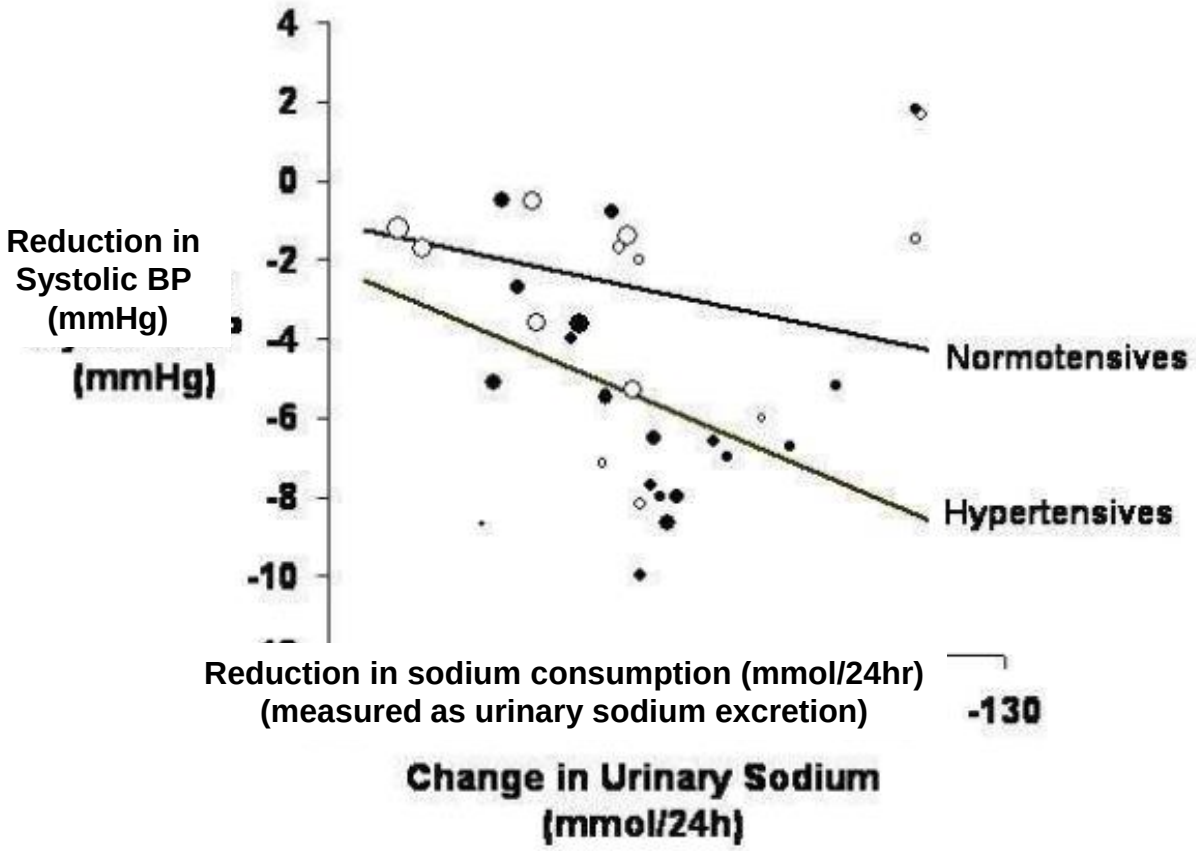
economic evaluation for health

Economic Evaluation of Salt Reduction in South Africa

- Burden of heart disease and stroke is increasing in low- and middle-income countries, due in part to spread of "Western" dietary habits (e.g., salty foods)
- South Africa is developing legislation to curb salt intake by regulating content in certain processed foods and educating public about discretionary salt use
- Policy will not only have health impacts, but financial and distributional effects
- Economic analysis is necessary to provide insight into how the policy will function in the context of the South African healthcare system

Lower salt intake means lower BP

(By inference, this means a lower risk of long-term CVD)



He FJ, MacGregor GA. Effect of longer-term modest salt reduction on blood pressure. *Cochrane database of systematic reviews* 2004. CD004937.

DCP3 Disease Control Priorities
economic evaluation for health

Extended Cost-Effectiveness Analysis (ECEA) Outcomes

Effects of Salt Reduction Policy

- Health gains (burden of disease averted)
- Financial consequences for household expenditures
  - Reduced private expenditures on health
  - Financial protection from lower catastrophic expenditures or greater cases of poverty averted
- Where applicable, reduced public sector spending
- Distributional consequences (across income groups)

DCP3 Disease Control Priorities
economic evaluation for health

Salt reduction ECEA in South Africa: Methods

Baseline Salt Consumption, Blood Pressure

- Hypothetical cohort with diet, health, and income status from literature and National Income Dynamics Survey (NiDS)

Impact of Salt Reduction on Blood Pressure

- Linear relationship between lower salt consumption and lower blood pressure, based on recent meta-analysis, estimated at the individual level and aggregated by income group

Impact of Reduced Blood Pressure on CVD

- Published hazard ratios describe the impact of lower blood pressure on mortality from stroke and ischemic heart disease (CVD)

Impact of Reduced CVD on Treatment Costs

- Calculated the amount of reduced expenditures on CVD hospitalization and chronic care

Disaggregation of Results by Income Group

The South African health system structure influences cost of treatment

	Stroke	IHD
PUBLIC H0	10	11
PUBLIC H1	24	26
PUBLIC H2	356	512
PUBLIC H3	1996	2184
PRIVATE INSURED	831	1161
PRIVATE UNINSURED	5775	7946

Average out-of-pocket costs on acute CVD events (2012 USD)

DCP3 Disease Control Priorities

economic evaluation for health

Salt reduction ECEA in South Africa: Results

Estimates for a cohort of 1,000,000 South Africans over the age of 40

	Quintile I	Quintile II	Quintile III	Quintile IV	Quintile V
Deaths Averted	39	60	65	54	61
Aggregate Private Expenditures Averted (2012 USD)	1641	5109	65,535	136,679	202,493
# Cases of Catastrophic Expenditures Averted	3	6	17	40	26

DCP3 Disease Control Priorities

economic evaluation for health

Findings

- Health gains relatively evenly distributed across income groups
- Because of South Africa's dual public-private healthcare system, Quintiles I-III receive less financial protection; private expenditures averted are concentrated in the uninsured and underinsured in Quintiles IV-V
- Reduction in catastrophic expenditures skews toward the wealthy

- For the entire SA population, during **each year** of the policy:
  - **3696 deaths** averted
  - **$11.45 million in govt subsidies** and **$5.57 million in private expenditures** averted
  - **3038 cases of poverty** and **750 cases of catastrophic health expenditure** averted

DCP3 Disease Control Priorities

economic evaluation for health

Case study

Tobacco taxation in China: an extended cost-effectiveness analysis*

*From: Verguet, Gauvreau, Mishra, et al. DCP3 Working Paper No.4. Available at: www.dcp-3.org

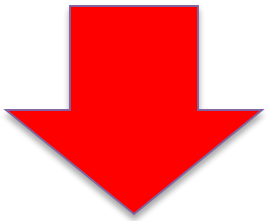
DCP3 Disease Control Priorities

economic evaluation for health

Important policy issue with tobacco tax: equity

Tobacco taxation is often regarded as regressive

Though most assessments to date assume individuals with different income to be responsive to tax increase in the same way!



Objective: use ECEA to examine regressivity of tobacco tax

DCP3 Disease Control Priorities

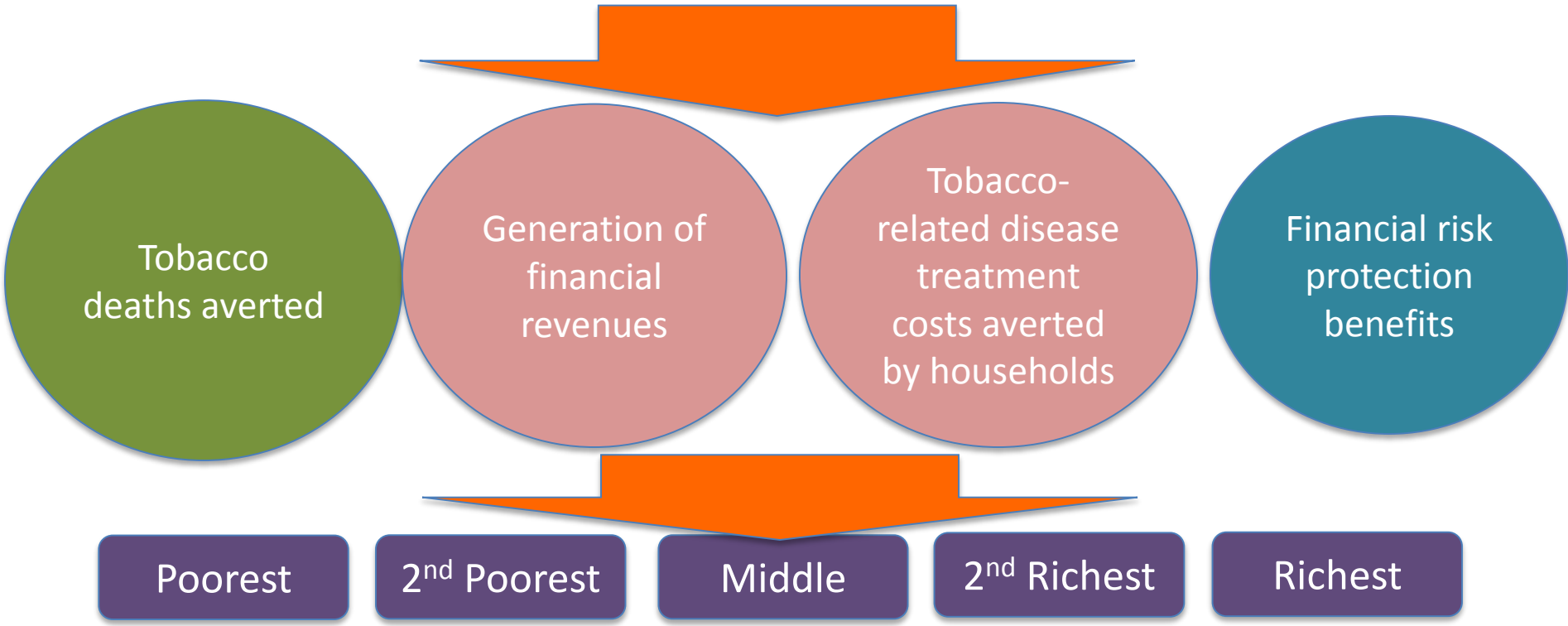
economic evaluation for health

Background: tobacco in China

- **Tobacco consumption prevalence (males)** (GATS 2010)**:**
  - 34% (15-24 year-olds); 59% (25-44); 63% (45-64); 40% (above 65)
- **Cigarette consumption** (GATS 2010)**:**
  - About 15 cigarettes per day
- **Tobacco-related mortality:**
  - 1M annual deaths (out of 6M globally)
- **Distribution of tobacco-related disease mortality, per cause (%):**
  - COPD (11%); stroke (46%); heart disease (23%); neoplasm (20%)
- **Price of cigarette /pack:** $0.74
- **Out-of-pocket expenditures** (Yip et al. 2012)**:**
  - Only 50% of inpatient healthcare costs (e.g. cancer, stroke treatment) reimbursed by insurance schemes

50% increase in tobacco price in China

Policy instrument: increase of price of cigarette pack of 50% through taxation
Follow-up of Chinese male population (current and newborns) over 50 years



DCP3 Disease Control Priorities

economic evaluation for health

Tax hike scenario

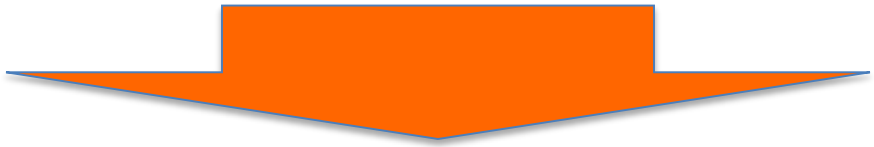
- **50% price increase in cigarette pack**:
  - From $0.74 to $1.11
- **Price elasticity of cigarette consumption** (Hu et al. 2010):
  - About - 0.4
  - Assume variation from - 0.6 (poorest) to - 0.1 (richest)
  - Assume < 25 year-olds are twice as price elastic (Jha et al. 2012)
- **Tobacco-related disease treatment costs** (Le et al. 2012; Lee et al. 2005; Wei et al. 2010; Ma et al. 2010):
  - COPD =$2,000, stroke = $2,000, heart disease = $11,000, neoplasm = $14,000
- **Average annual individual income** (by income quintile):
  - Q1 < $,1600 < Q2 < $3,100 < Q3 < $4,900 < Q4 < $7,600 < Q5

DCP3 Disease Control Priorities

economic evaluation for health

Before and after tax hike

1. **Before tax hike:**
   - **Price of cigarette pack = $0.74**
2. **After tax hike:**
   - **Price of cigarette pack = $1.11**

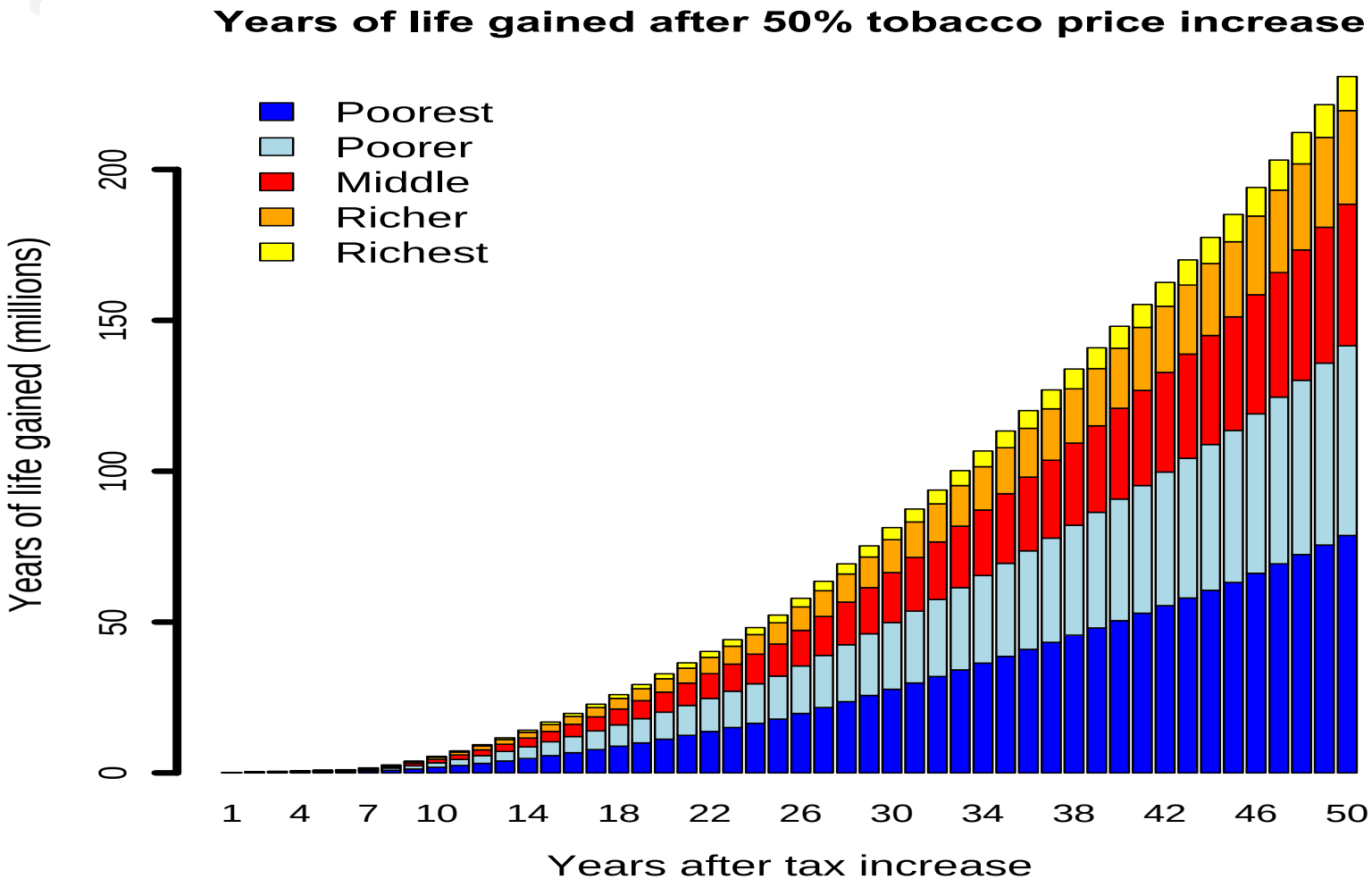


1. **Decrease of number of smokers = life years saved** depending on age at quitting (10 years at 15-24; 3 years above 65) (Doll et al. 2004; Jha et al. 2014)
2. **Decrease in cigarette expenditures**
3. **Decrease in tobacco-related disease expenditures**
4. **Generation of financial revenues for the government**

DCP3 Disease Control Priorities

economic evaluation for health

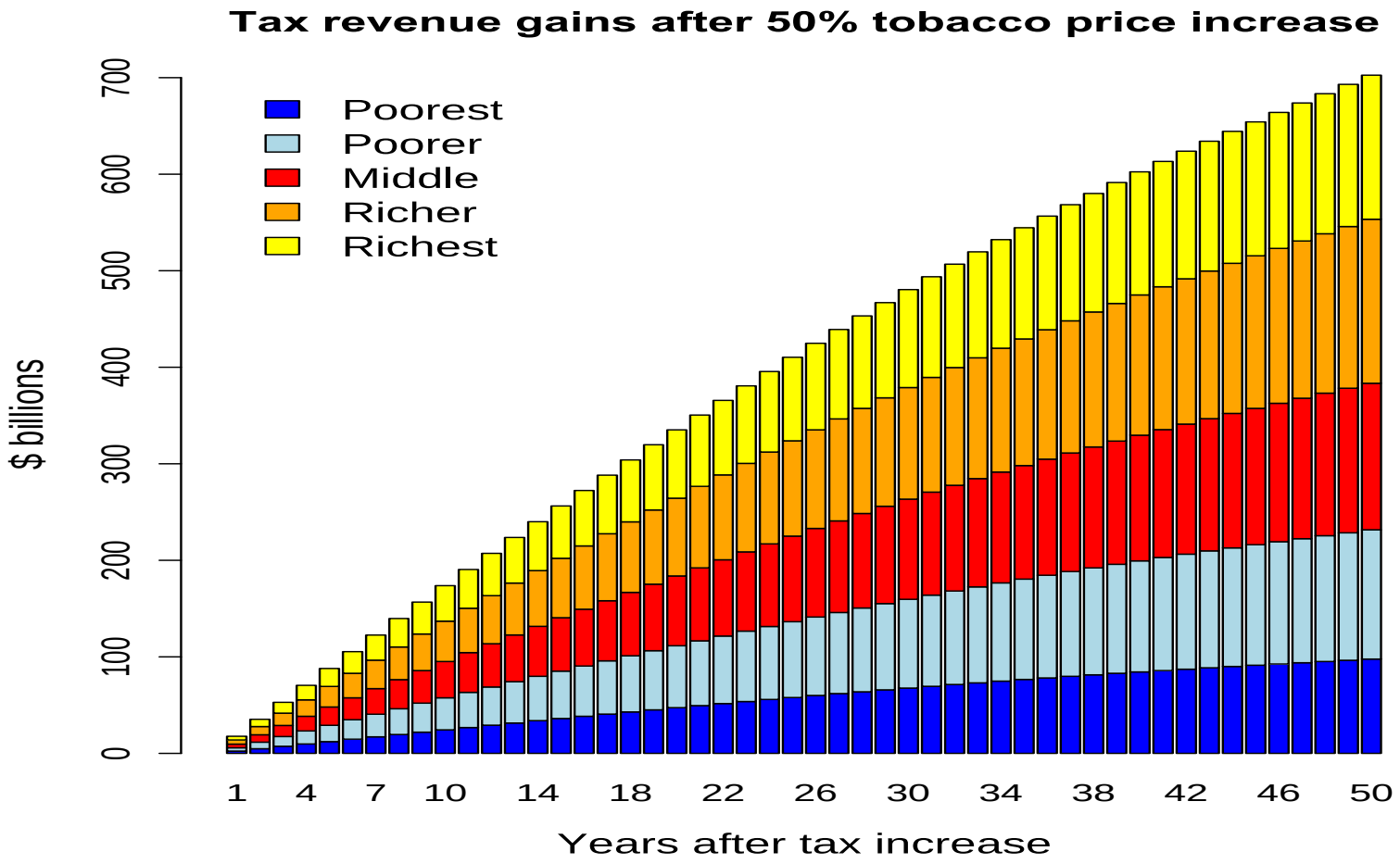
Life years gained



DCP3 Disease Control Priorities

economic evaluation for health

Additional tax revenues gained



DCP3 Disease Control Priorities

economic evaluation for health

Summary of the ECEA findings

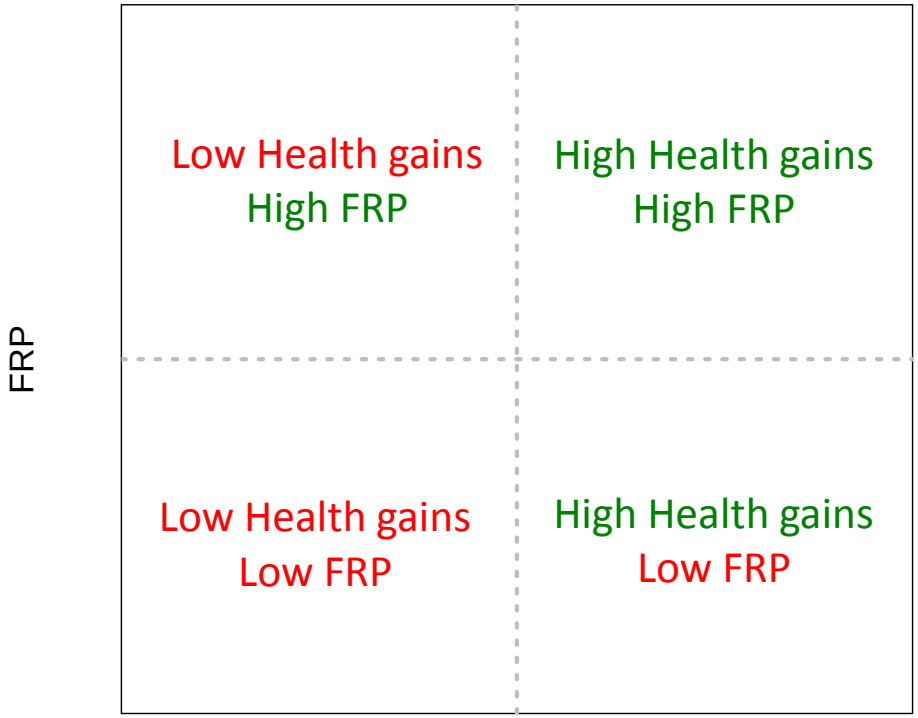
Outcome	Total	Quintile I	Quintile II	Quintile III	Quintile IV	Quintile V
Years of life gained (millions)	231	79	63	47	31	11
Revenues raised ($ billion)	703	98	134	152	170	149
Change in tobacco expenditures	376	- 21	40	89	132	135
Expenditures on tobacco-disease averted ($ billion)	24	7	7	5	4	2
Financial risk protection ($ billion)	1.8	1.3	0.3	0.1	0.1	< 0.1

DCP3 Disease Control Priorities

economic evaluation for health

Priority setting & UHC

Goal: Design basic insurance packages, taking into account burden, costs, equity, medical impoverishment



FRP = financial risk protection (prevention of medical impoverishment)

DCP3 Disease Control Priorities

economic evaluation for health

Summative observations

- Comparable quantitative measures are very powerful
- Precarious tension between complex contextualized model and generalized analysis
- Difficult to get data sufficiently broadly across disease/health topics, levels of health system, and population characteristics in a given country
- Importance of working with people who **know** their health systems, population, and policy priorities

DCP3 Disease Control Priorities

economic evaluation for health

THANK YOU

RNugent2@uw.edu
www.dcp-3.org

Acknowledgements

DCPN-UW Team

- Dean Jamison
- Stéphane Verguet
- Rachel Nugent
- Carol Levin
- Elizabeth Brouwer
- Zach Olson
- Shane Murphy

ECEA Collaborators

- Jane Kim
- Monisha Sharma
- Rick Rheingans
- Roger Glass
- Ben Anderson
- Kjell Arne Johansson
- Clint Pecenka