

Winter School on
Inequality & Social Welfare Theory

Socioeconomic Gradient in Health:
Description & Causes

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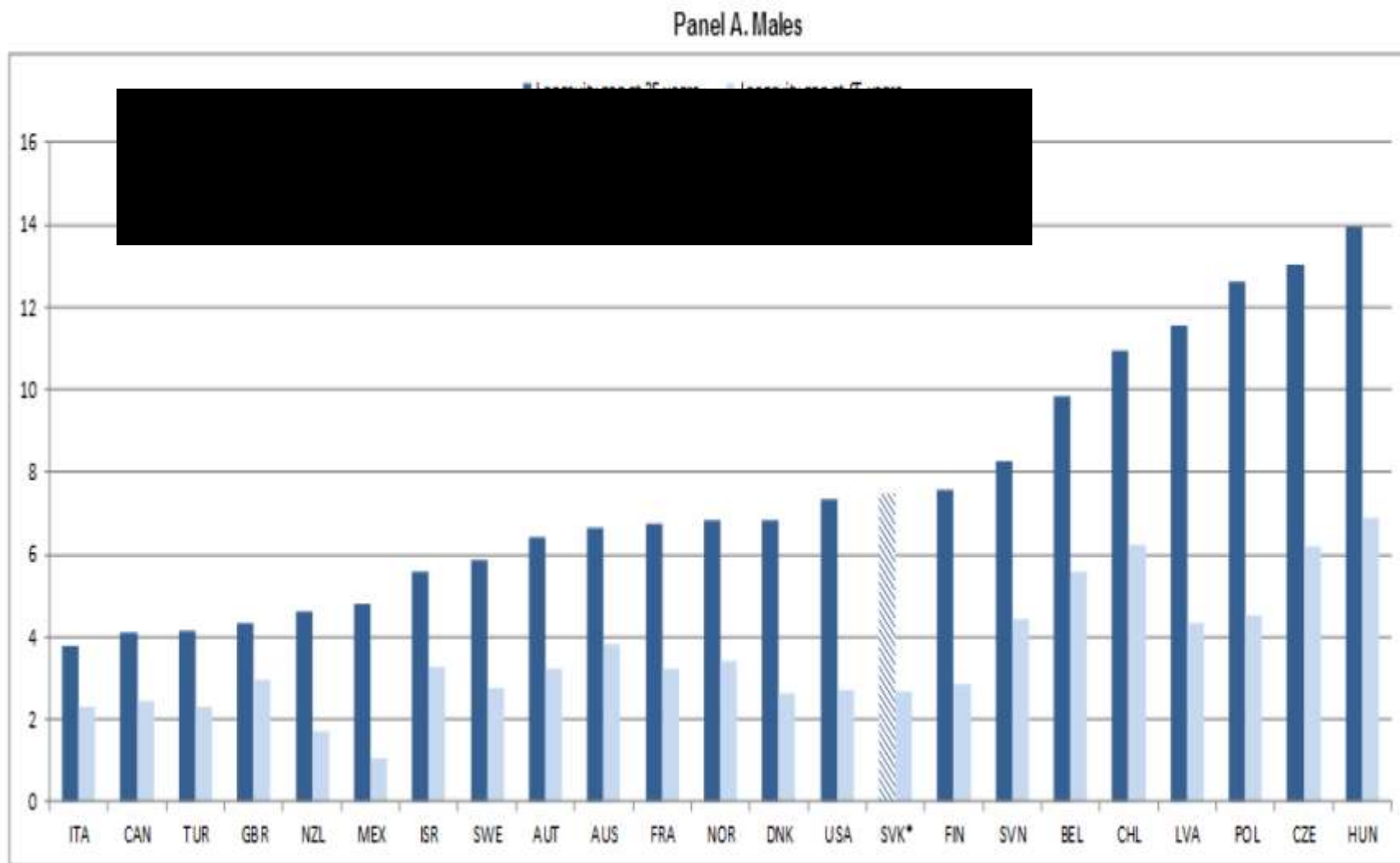
University of Lausanne

Outline

- Description of gradient
- Trends in gradient
- (Economic) Theory
- Causal evidence: SES \rightarrow health
- Causal evidence: Health \rightarrow SES

Description of the gradient

Figure 3. Life expectancy gap between the highest and lowest educational groups at the age of 25 and 65



Murtin, F. *et al.* (2017), "Inequalities in longevity by education in OECD countries: Insights from new OECD estimates", *OECD Statistics Working Papers*, 2017/02, OECD Publishing, Paris.
<http://dx.doi.org/10.1787/6b64d9cf-en>

Figure 3. Life expectancy gap between the highest and lowest educational groups at the age of 25 and 65

Panel B. Females

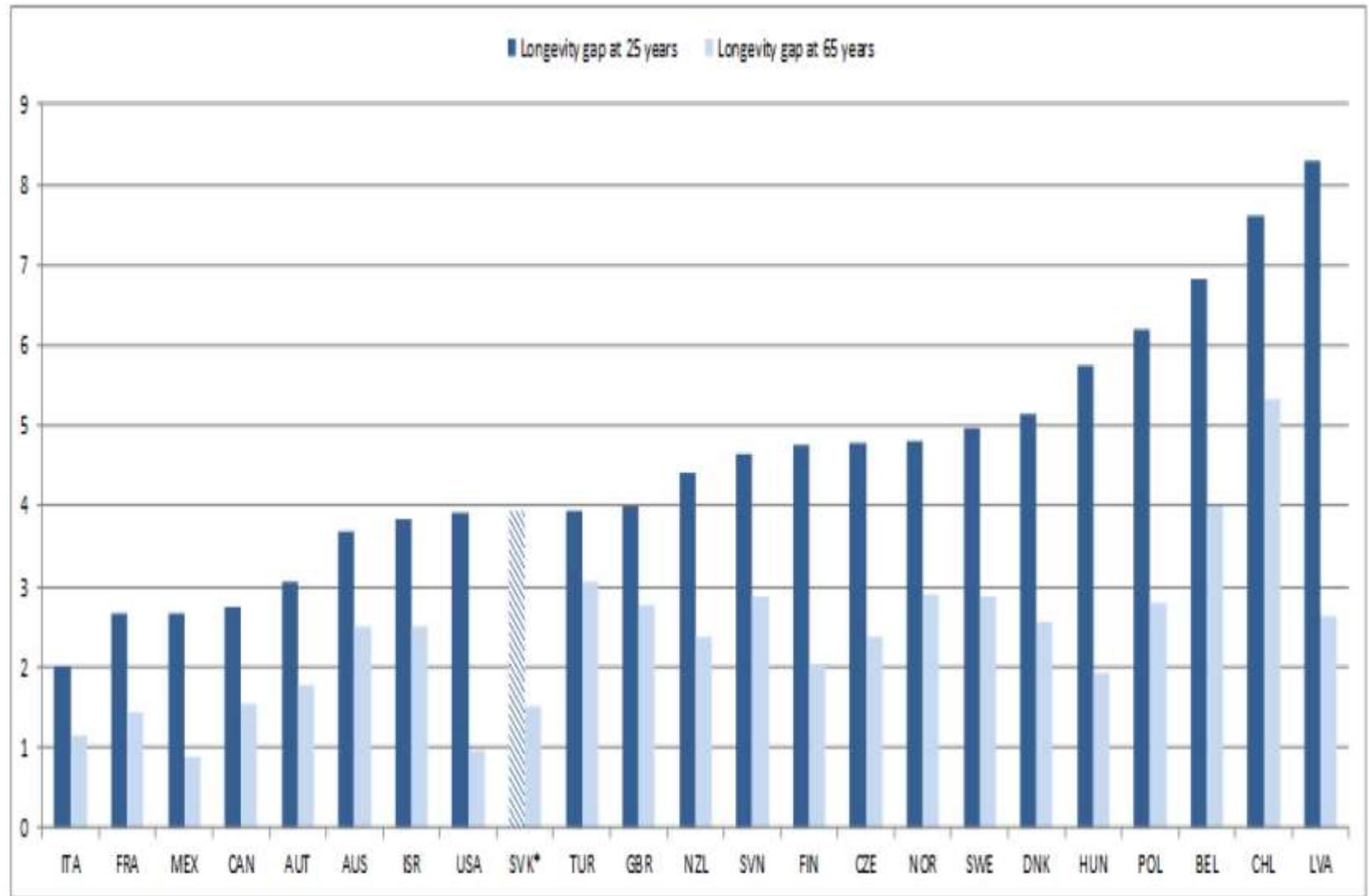
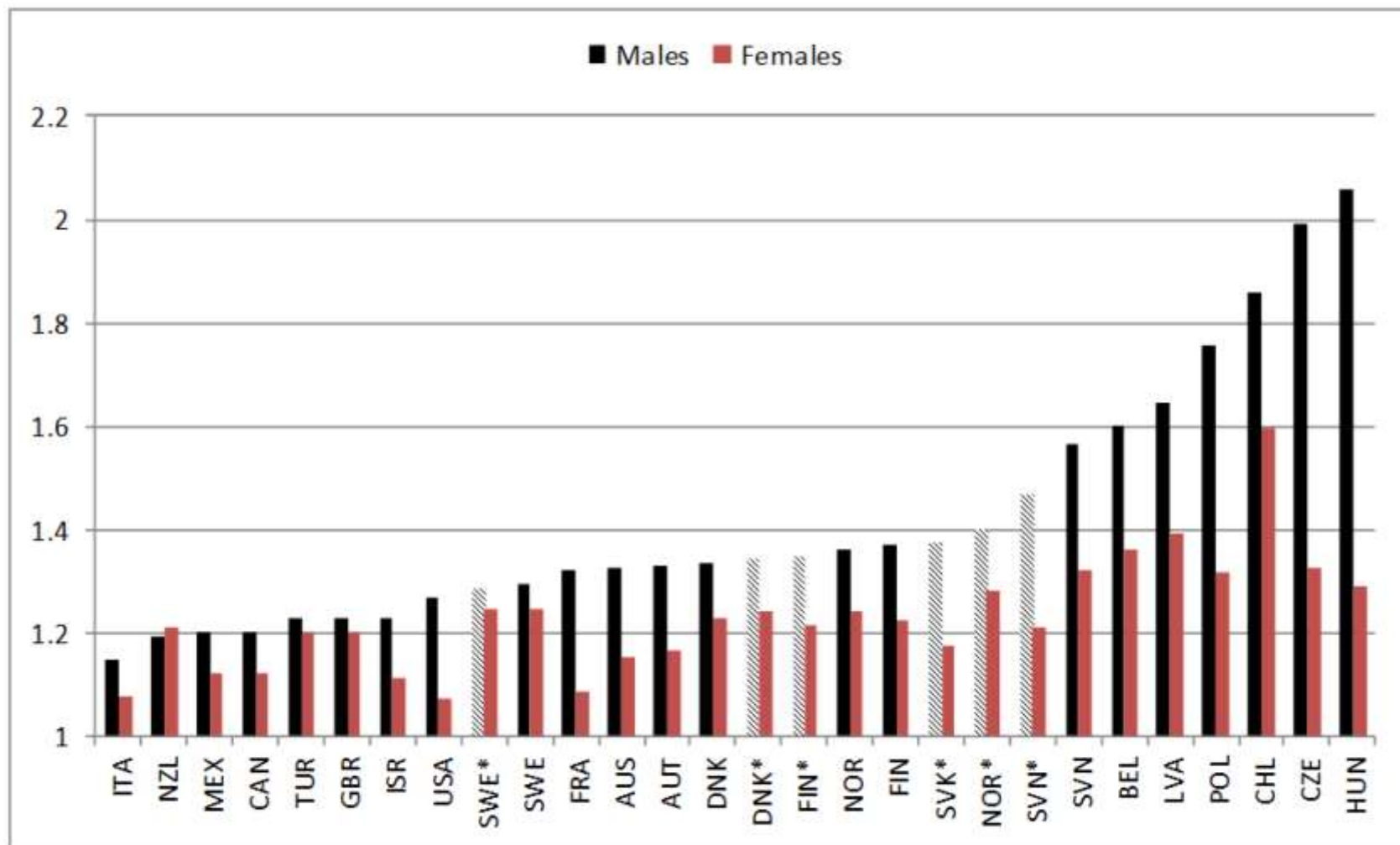


Figure 8. Ratios of age-standardised mortality rates between high and low education groups



Note: Mortality rates are age-standardised based on WHO European Population structure (old standard) and standardization method.

UNITED STATES

Socioeconomic gradient in health in US documented since Kitigawa & Hauser (1973)

Duleep (1989)

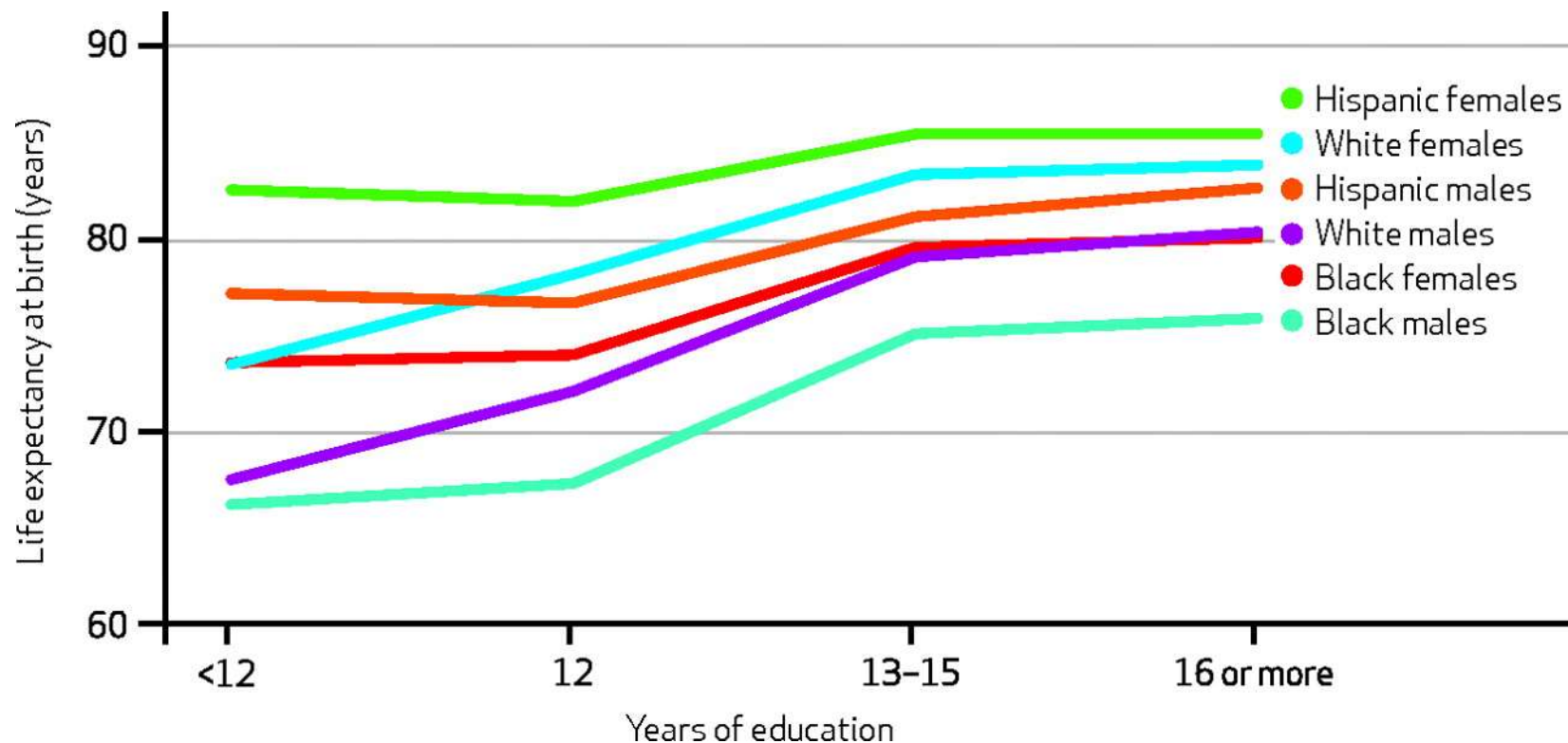
Table 1. Mortality Ratios by Years of School Completed and by Income Level for White Men, 25–64 Years Old

Variable	Census–death certificate data, May–August 1960	CPS–Social Security data, 1973–1978
Years of schooling		
All	1.00	1.00
0–11 years	1.07	1.19
High school, 4 years	0.92	0.88
College, 1 year or more	0.81	0.82
Total income (1959 dollars)		
All	1.00	1.00
Under \$2,000	1.51	1.59
\$2,000–3,999	1.20	1.79
\$4,000–5,999	0.99	1.04
\$6,000–7,999	0.88	0.90
\$8,000–9,999	0.93	0.87
\$10,000 or more	0.84	0.71

Notes: The 1960 mortality ratios are from tables 2.1 and 2.5 of Kitagawa and Hauser (1973:12, 18) They refer to white male family members (excluding persons in institutions). The 1973–1978 mortality ratios refer to noninstitutionalized white married men (spouse present) according to the definitions described in this article. Due to small sample considerations, the three lowest school categories used by Kitagawa and Hauser (0–7 years, 8 years, and high school, 1–3 years) were collapsed into the category 0–11 years.

United States

Life Expectancy At Birth, By Years Of Education At Age 25, By Race And Sex, 2008.



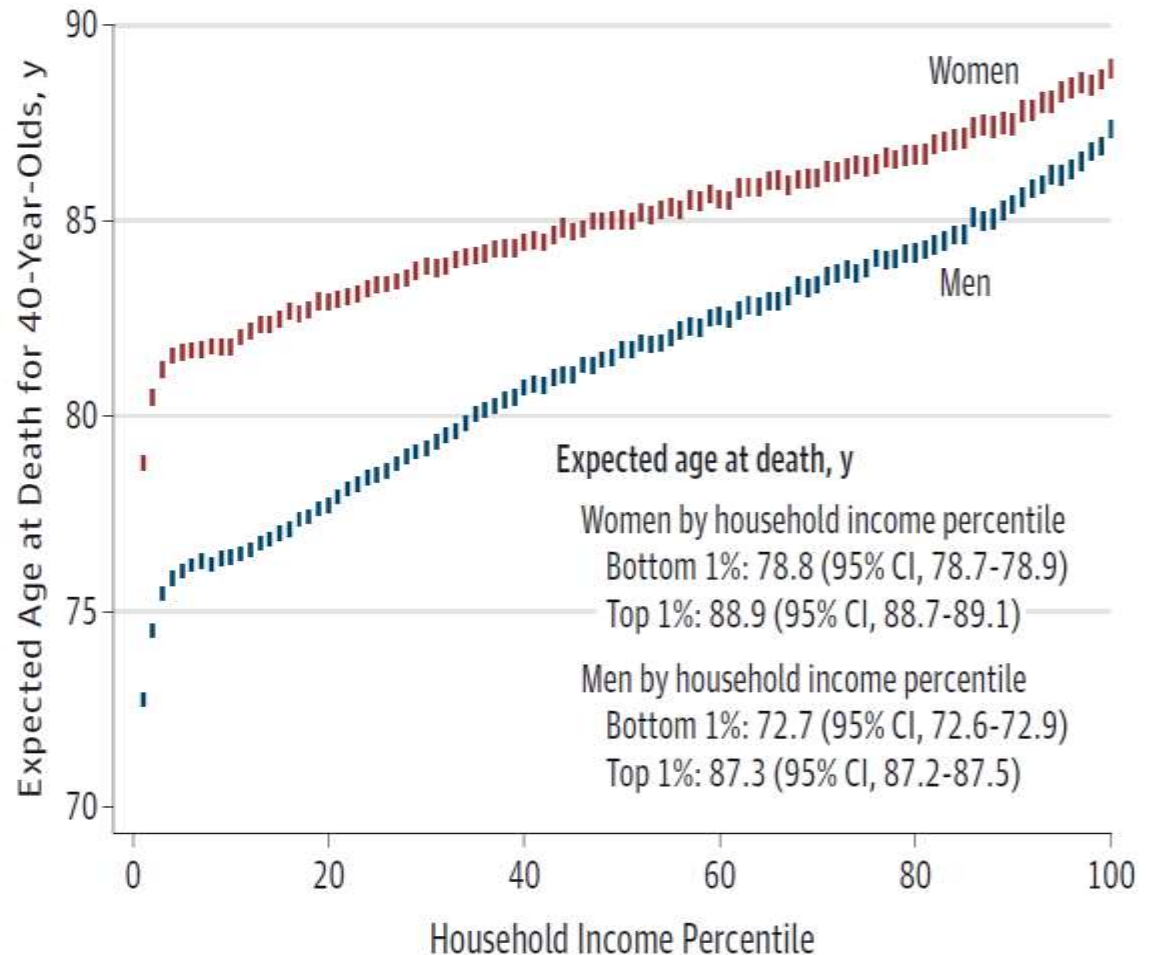
S. Jay Olshansky et al. *Health Affairs* 2012;31:1803-1813

HealthAffairs

Life expectancy increases with income across the whole distribution in US (Chetty et al *JAMA* 2016)

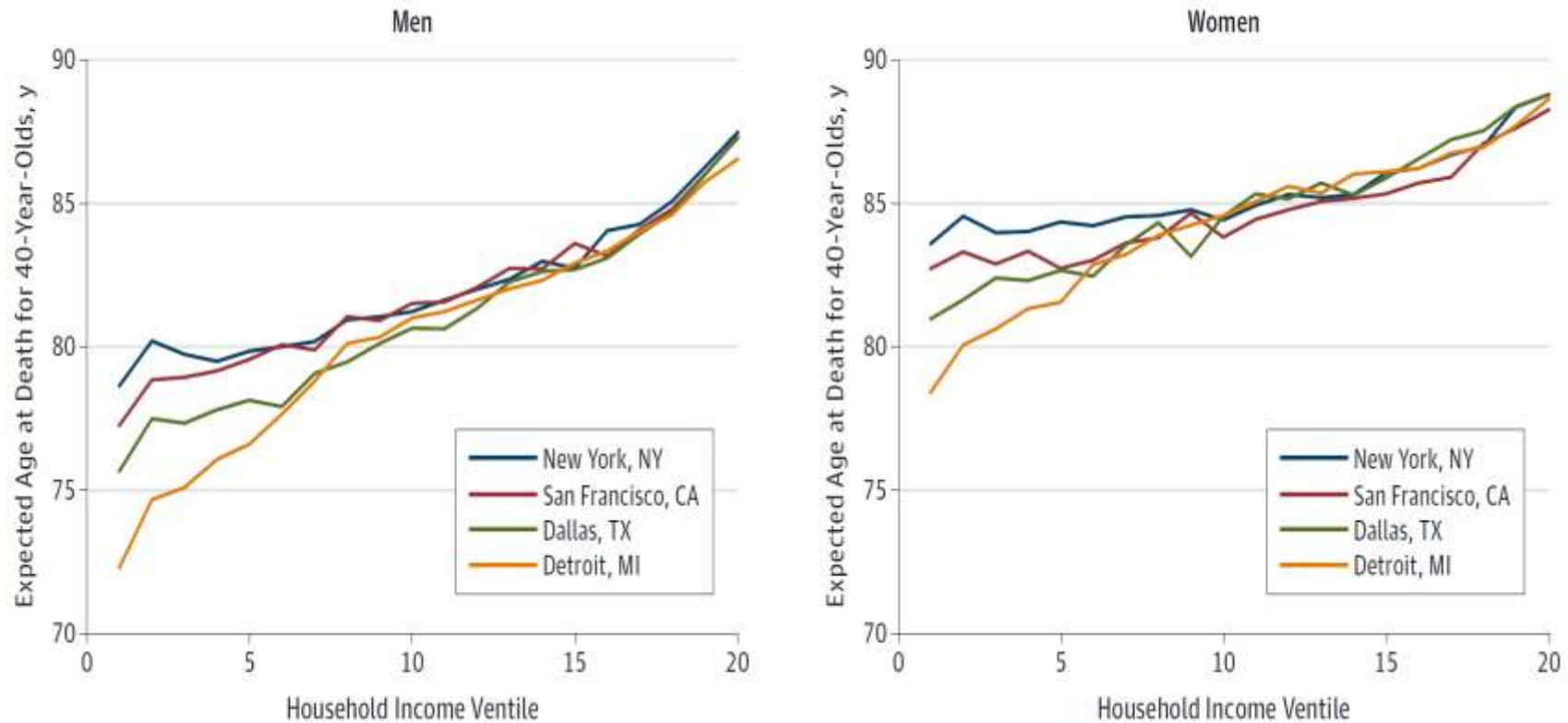
Figure 2. Race- and Ethnicity-Adjusted Life Expectancy for 40-Year-Olds by Household Income Percentile, 2001-2014

US male in poorest 1% has same life expectancy as average male in Sudan



Income gradient in US life expectancy varies geographically (Chetty et al 2016)

Figure 4. Race- and Ethnicity-Adjusted Life Expectancy by Income Ventile in Selected Commuting Zones, 2001-2014



Life expectancy varies more at bottom than at top of income distribution

Life expectancy in one Glasgow neighbourhood is lower than in India, while in another it is higher than in Japan!

Table 2.1

Male life expectancy, between- and within-country inequities, selected countries

Place	Life expectancy at birth
United Kingdom, Scotland, Glasgow (Calton) ^b	54
India ^a	62
United States, Washington DC (black) ^c	63
Philippines ^a	64
Lithuania ^a	65
Poland ^a	71
Mexico ^a	72
United States ^a	75
Cuba ^a	75
United Kingdom ^a	77
Japan ^a	79
Iceland ^a	79
United States, Montgomery County (white) ^c	80
United Kingdom, Scotland, Glasgow (Lenzie N.) ^b	82

a) Country data: 2005 data from World Health Statistics (WHO, 2007c).

b) Pooled data 1998-2002 (Hanlon, Walsh & Whyte, 2006).

c) Pooled data from 1997-2001 (Murray et al., 2006).

Source: WHO Commission on the Social Determinants of Health, 2008

Socioeconomic gradient in life expectancy did not always exist

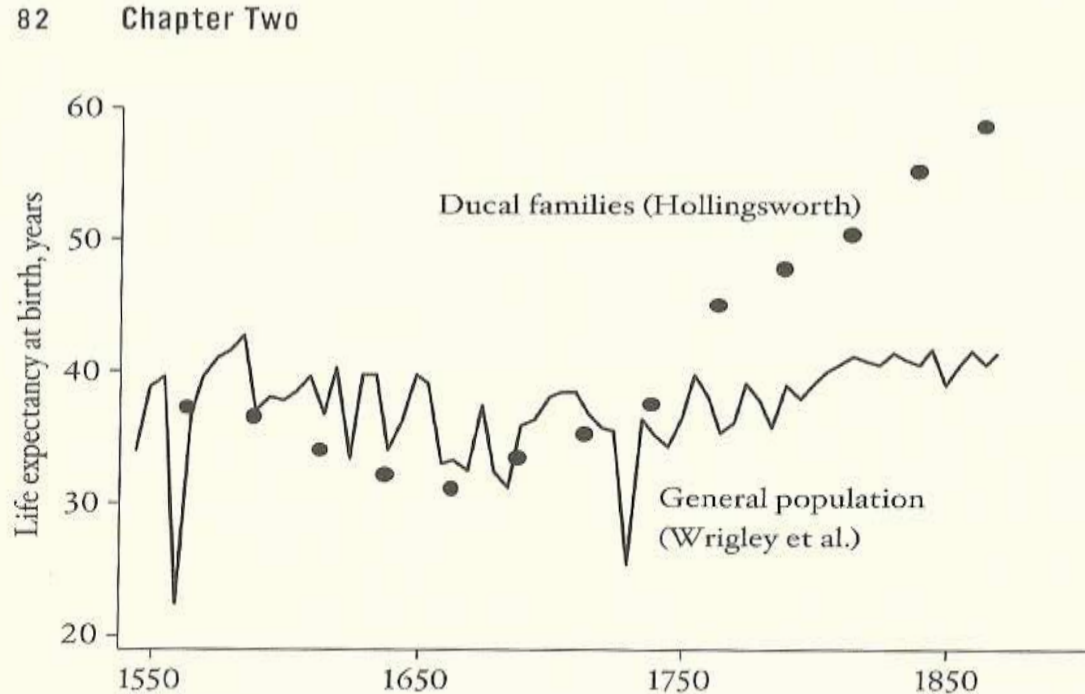


FIGURE 3 Life expectancy for the English population and for ducal families. (After Bernard Harris, 2004, "Public health, nutrition, and the decline of mortality: The McKeown thesis revisited," *Social History of Medicine* 17(3): 379-407.)

What explains socioeconomic gradient in health?

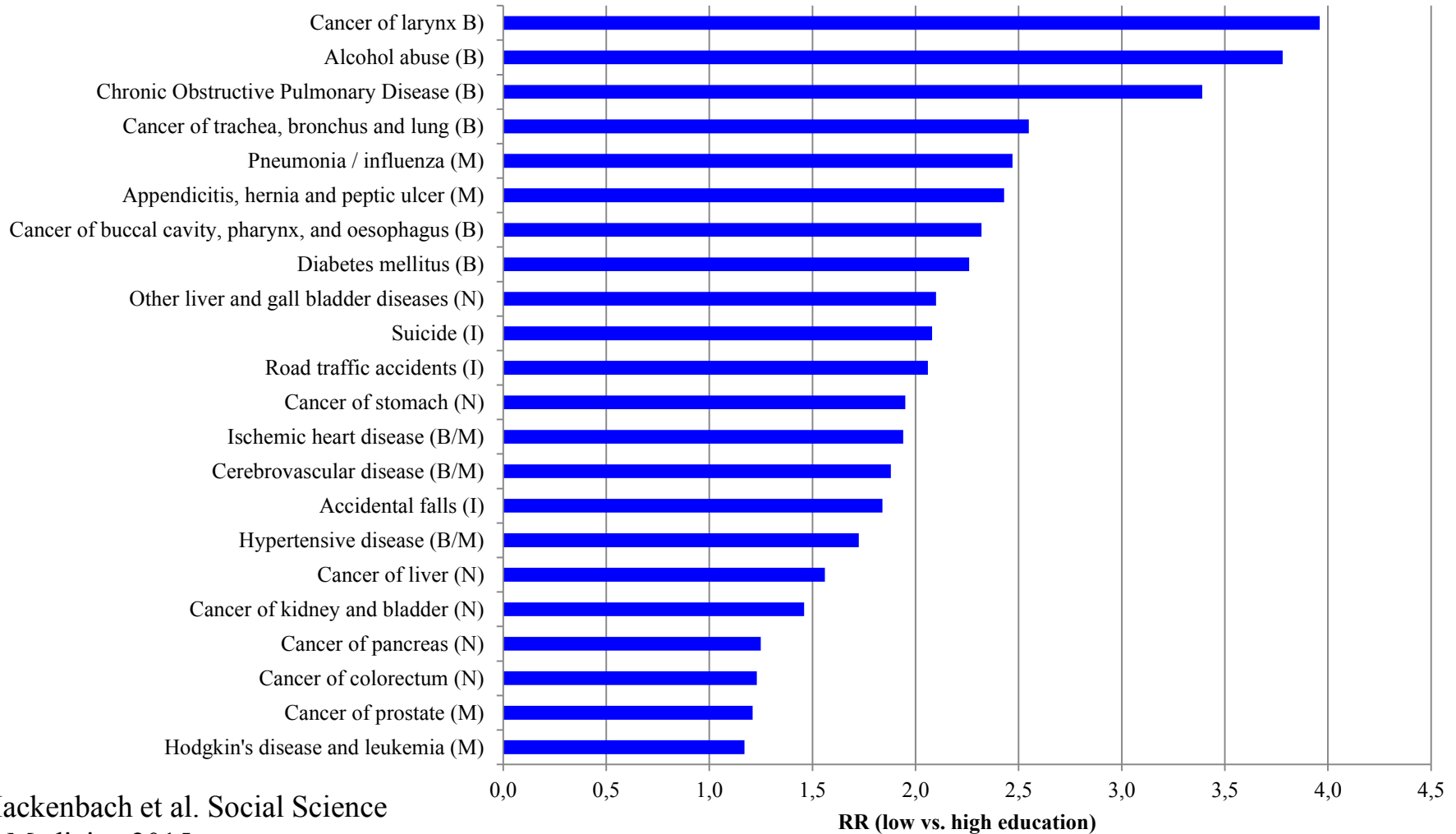
- Deaton (2013) – it emerged with effective medicine
 - Evidence of socioeconomic gradient in diffusion of medical technology in US (Goldman & Lakdawalla, CEAP '05; Glied & Lleras-Muney, Demography '08; Jayachandran et al, AEJ: Applied '10)
- But Chetty et al (2016) find LE at bottom of income distribution is not correlated (across commuting zones) with indicators of healthcare access and quality
- And what explains gradient in EU with universal health coverage?

Fundamental cause hypothesis (Link & Phelan, JHSB 1995)

- SES is fundamental cause of health inequality
 - Any form of social and economic privilege (material, knowledge, power, networks) will be used to gain advantage in avoidance & treatment of disease
 - Mechanisms that drive health inequalities change with circumstances
 - If equalize access to medical care, health inequalities will emerge through differential health behaviour
 - ‘Tested’ by Mackenbach et al (SSM 2015)

Education-related inequality in mortality by cause of death

Median Mortality Relative Risk (low/high education) 19 European populations, 2000s, Men



Education-related inequality in mortality by whether cause of death is preventable

Median Mortality Relative Risk (low/high education) 19 European populations, 2000s, men and women

	Men	Women
All causes of death	1.90	1.67
All preventable causes	2.15	1.90
Amenable to behaviour change	2.35	2.30
Amenable to medical intervention	1.82	1.90
Amenable to injury prevention	1.94	1.40
All non-preventable causes	1.53	1.43

Chetty et al (2016)

- Across commuting zones, life expectancy at bottom quartile of income distribution is correlated with
 - health behaviours? YES
 - healthcare access? NO
 - residential segregation? YES (+)
 - income inequality? NO
 - social capital? YES (-)
 - local labour market? NO
 - local govt. exp. YES (+)
 - median home value YES (+)
 - fraction college graduate YES (+)
 - population density YES (+)

Is gradient becoming steeper?

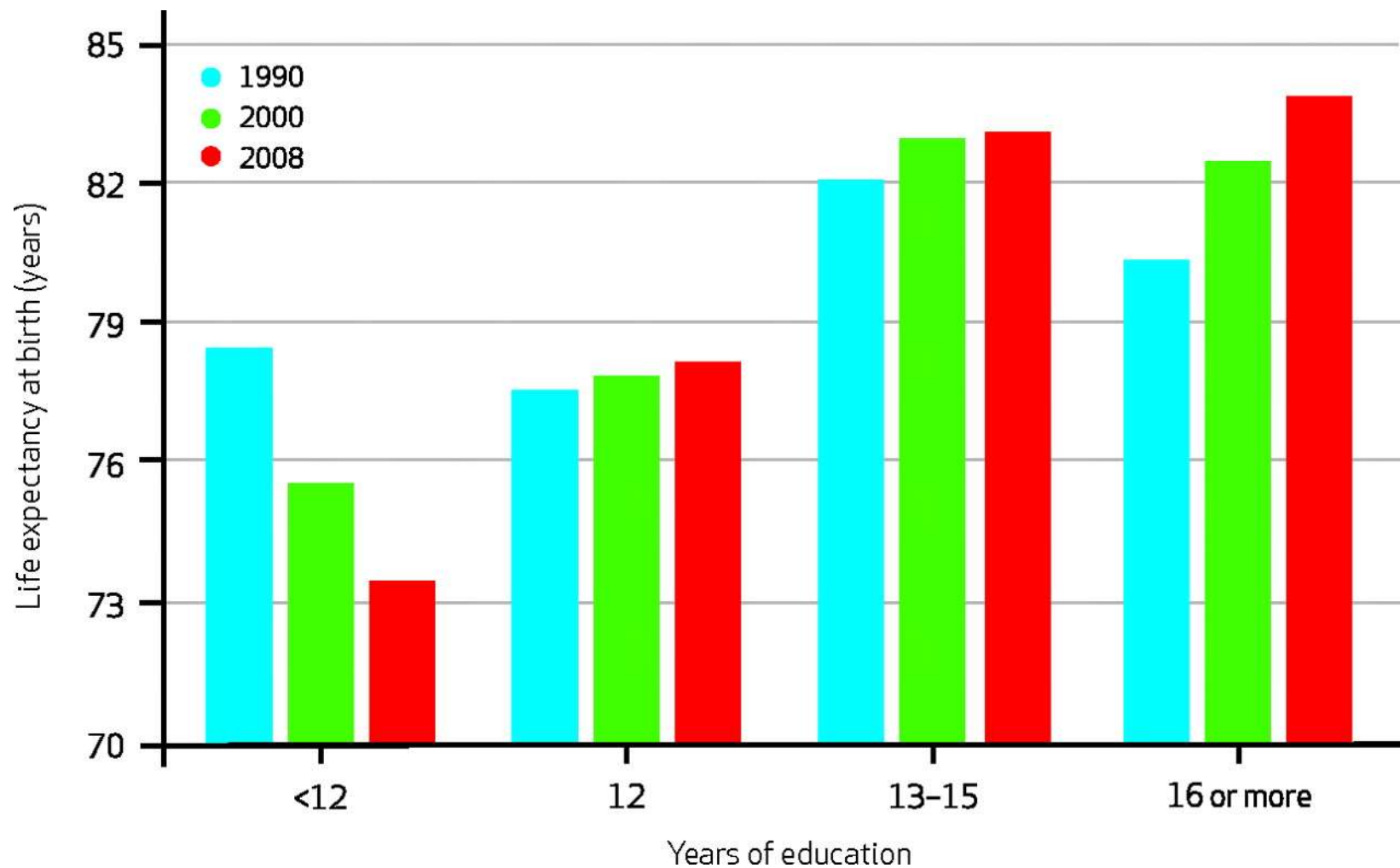
- Increasing income inequality → increasing health inequality?
- Expect total health inequality to rise if income is causal determinant of health
 - Is it?
- Even if it is, income gradient in health need not increase

Is gradient becoming steeper in US?

- Yes according to:
 - Case & Deaton (Brookings Papers 2017)
 - Chetty et al. (*JAMA* 2016)
 - Cutler et al. (*Journal Health Economics* 2011)
 - National Academies of Sciences (2015)
 - Olshansky et al. *Health Affairs* (2012)

Trend in education gradient in life expectancy

Life Expectancy At Birth, By Years Of Education At Age 25 For US White Females, 1990–2008.



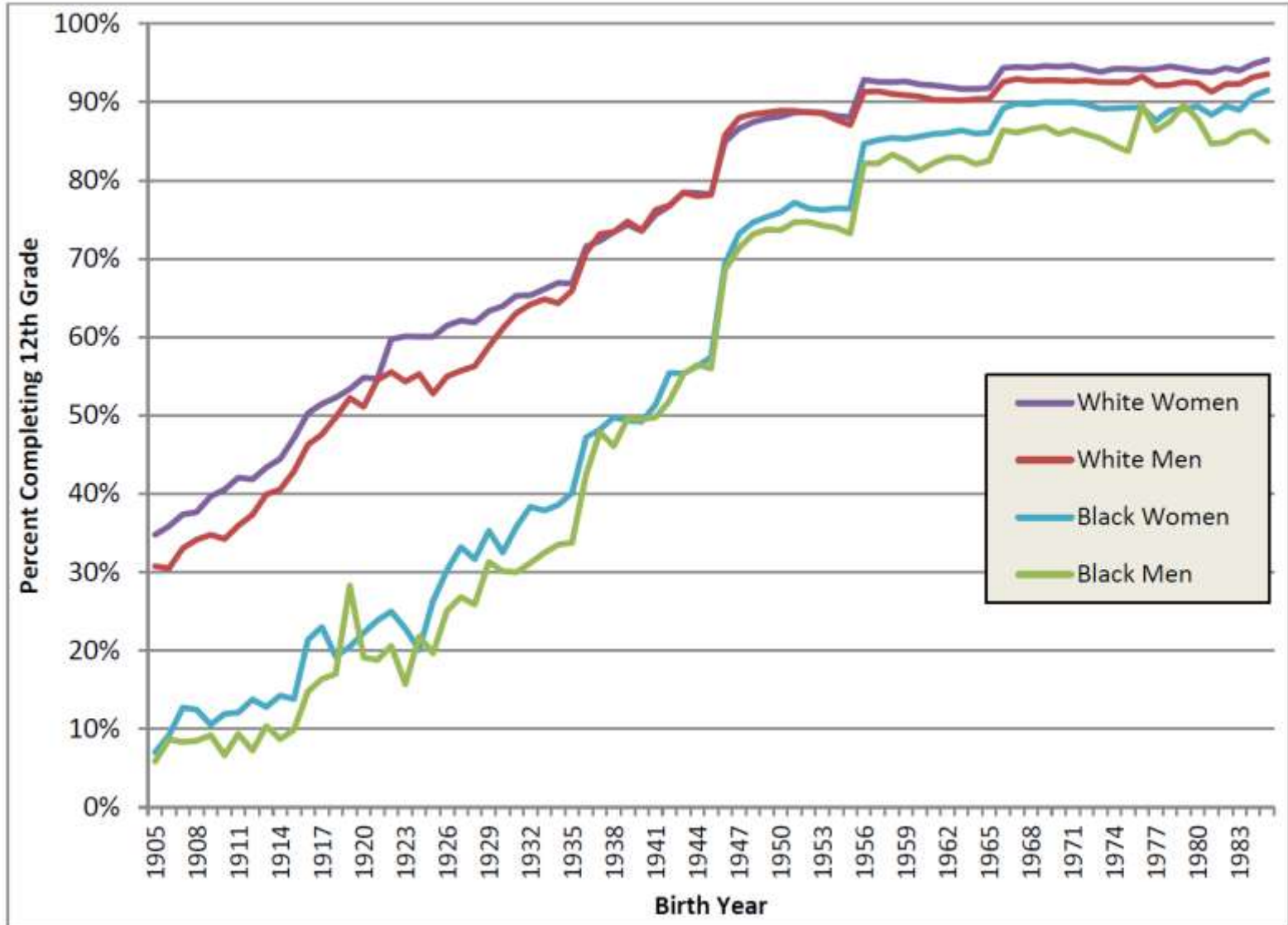
S. Jay Olshansky et al. Health Affairs
2012;31:1803-1813

HealthAffairs

But low education group is
shrinking

Bound et al. Health Affairs 2015

Figure 1: Percent completing 12th grade, by race, sex, and birth year



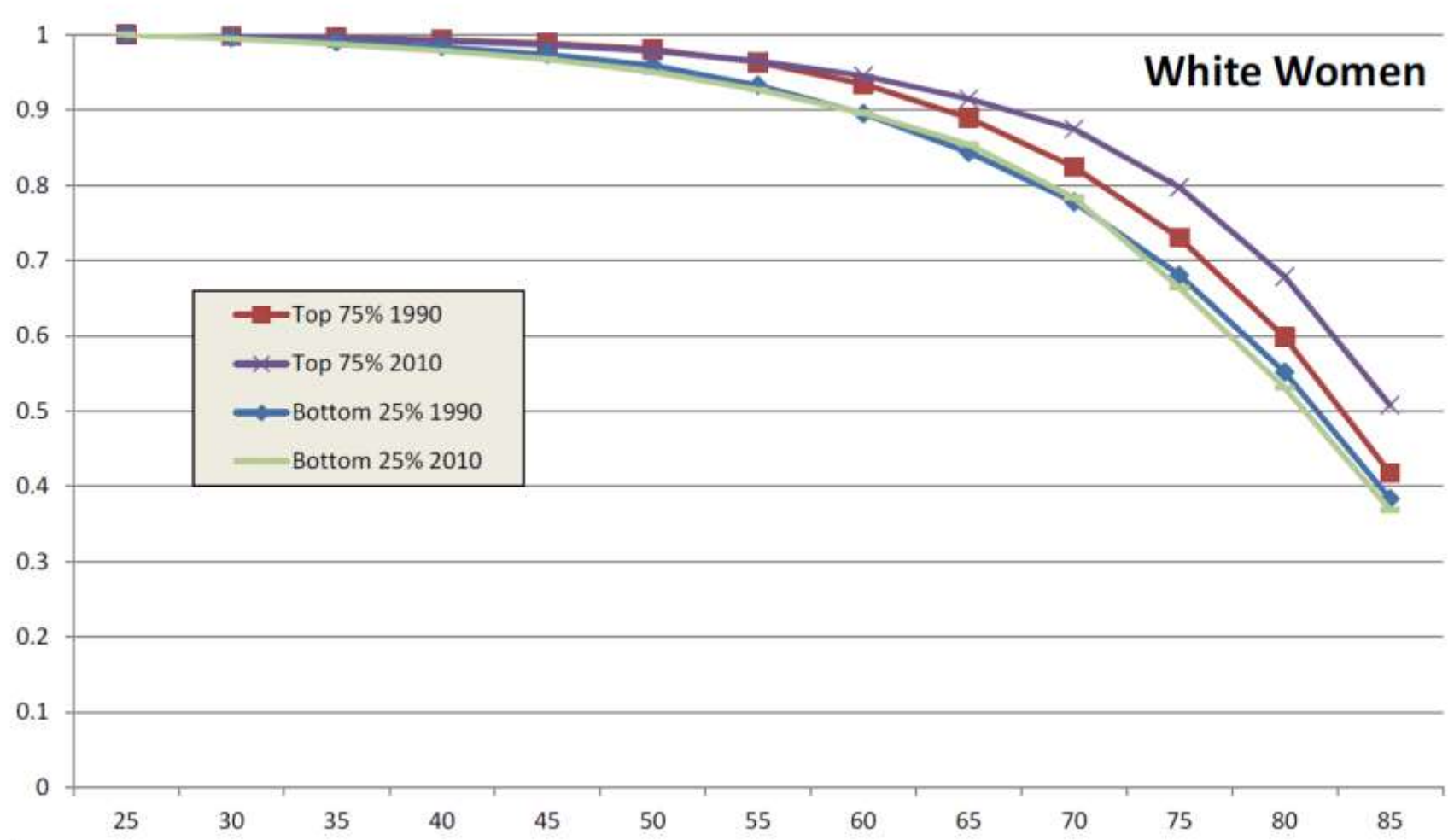
Source: Authors' tabulations based on U.S. Census data (Ruggles et al. 2010).

Not comparing like with like

- Smaller low education group likely to be different in composition
- Least healthy left behind
- Bound et al. *Health Affairs* (2015) examine trends in mortality rate in bottom quartile of education distribution
- (see Goldring et al *JHE* (2016) for another correction)

Bound et al. Health Affairs 2015

Figure 4: Survival Curves by educational rank, white men and women, 1990 and 2010

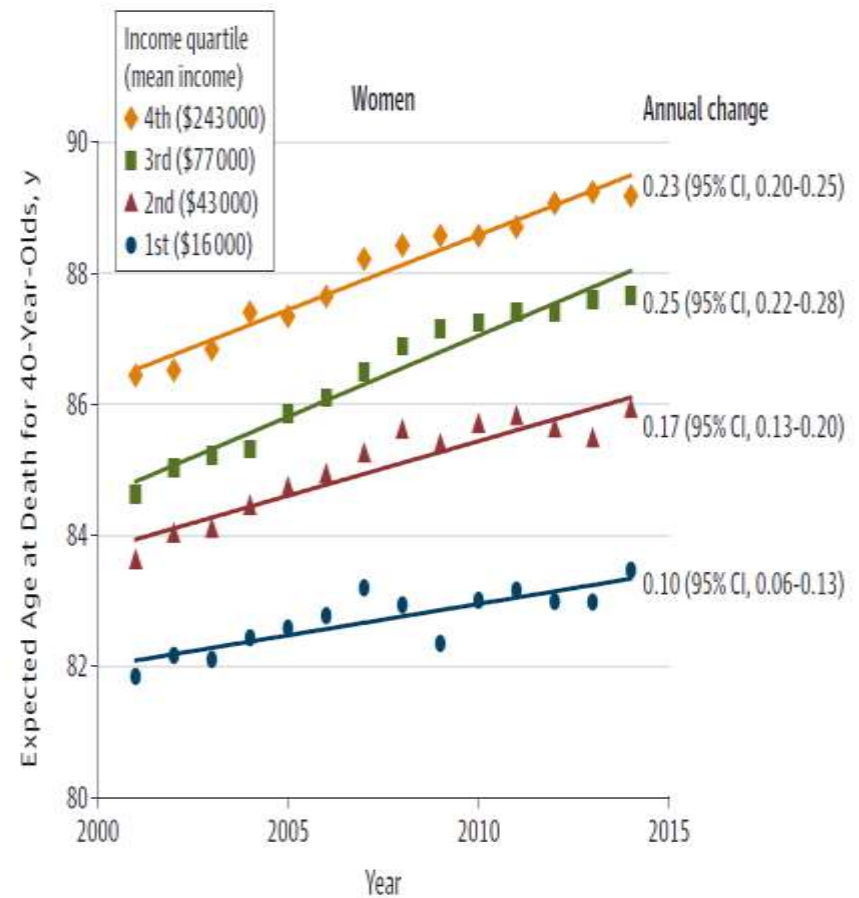
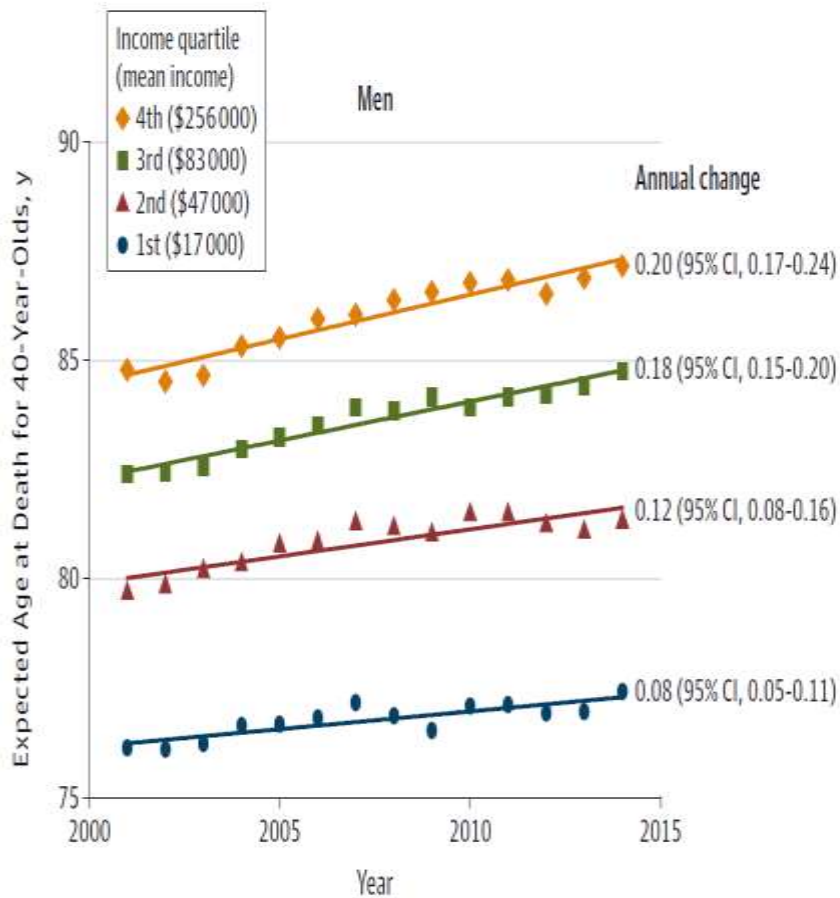


Trend in income gradient in life
expectancy

Rich experiencing greater increase in life expectancy at age 40 in US (Chetty et al *JAMA* 2016)

Figure 3. Changes in Race- and Ethnicity-Adjusted Life Expectancy by Income Group, 2001-2014

A Life expectancy by income quartile by year

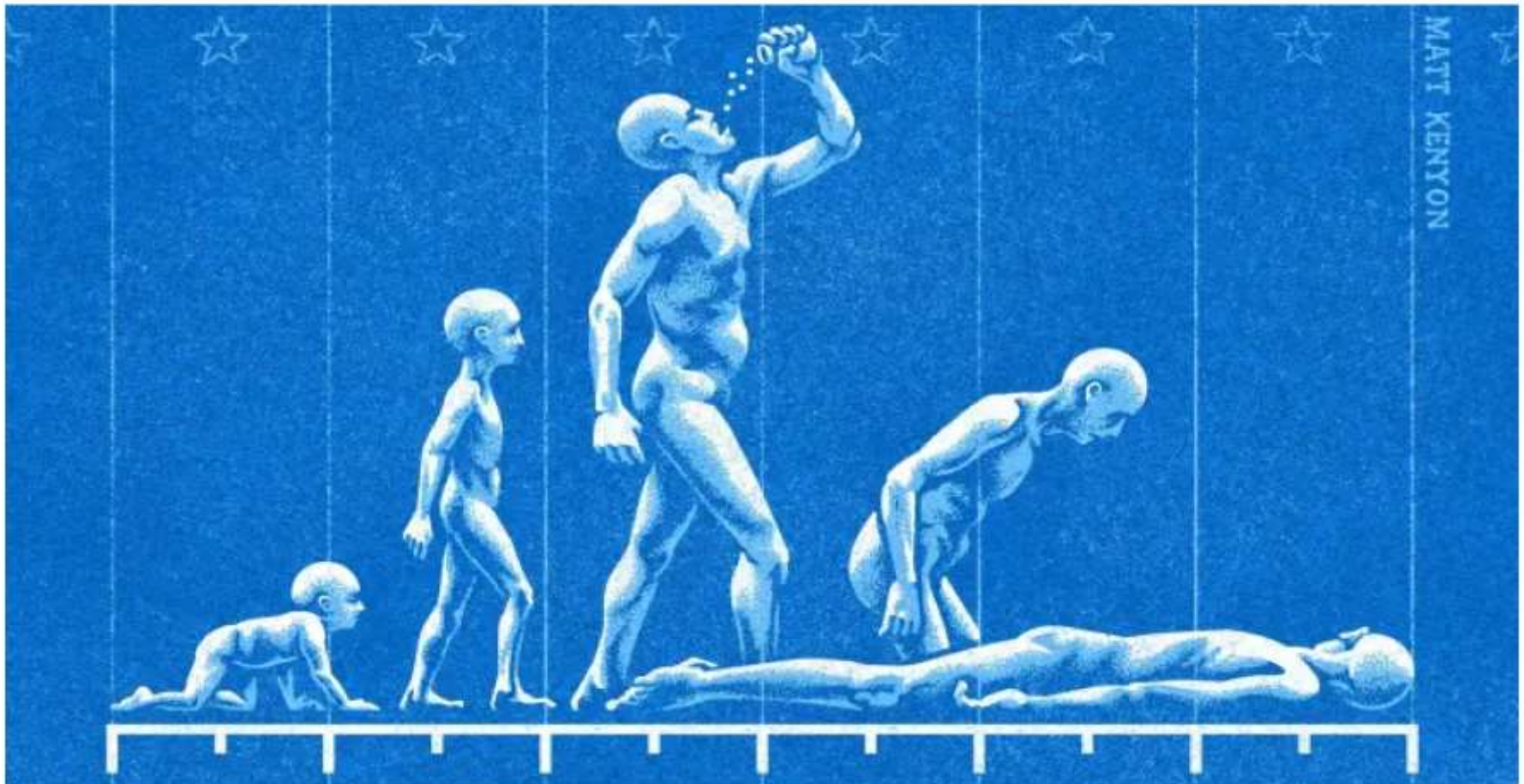


US Inequality

The life and death of Trumpian America

Expecting to die younger than your parents goes against what westerners have taken for granted

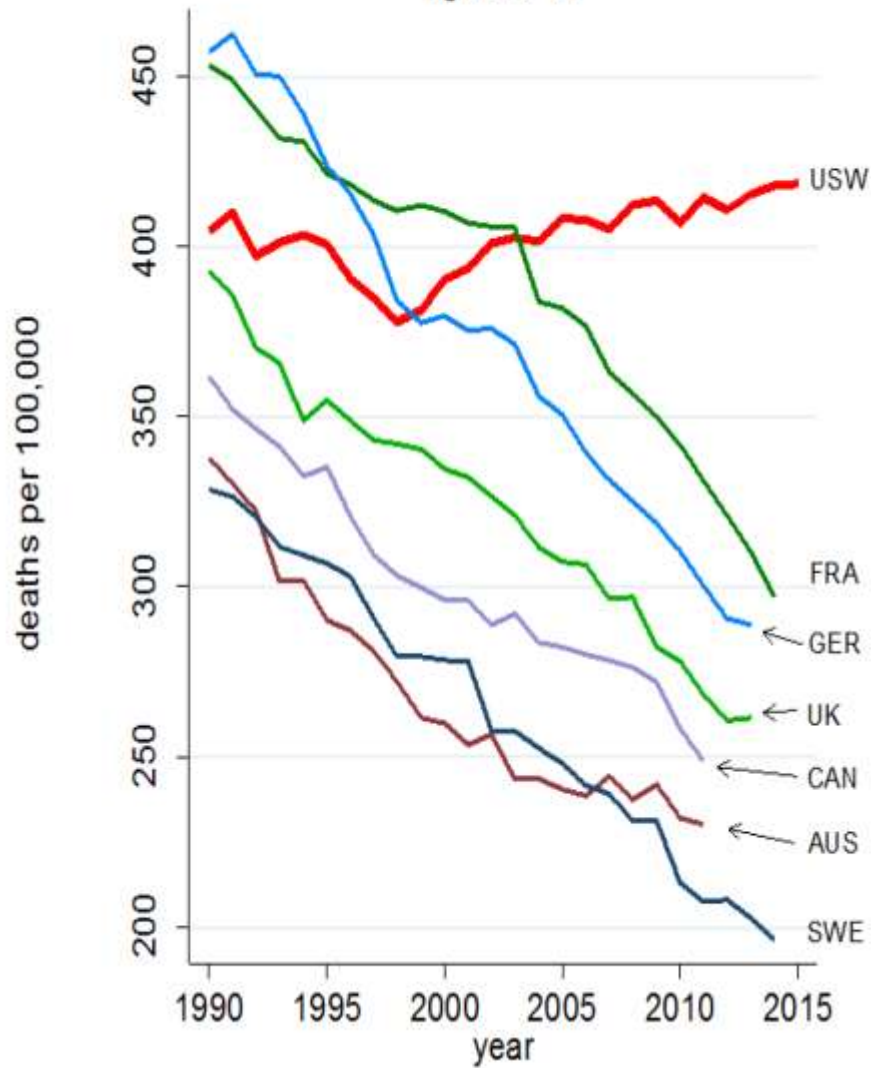
Edward Luce



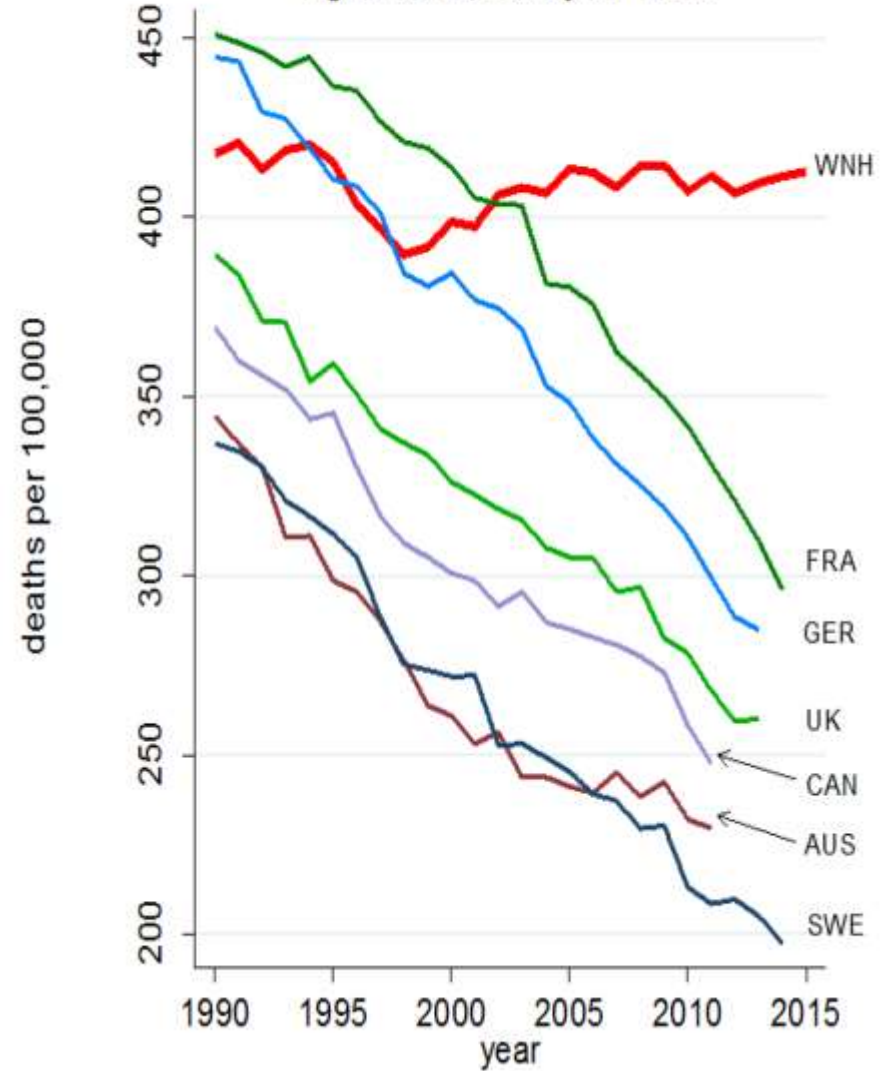
Rising mortality of middle-aged
whites in US.....

Figure 1.3

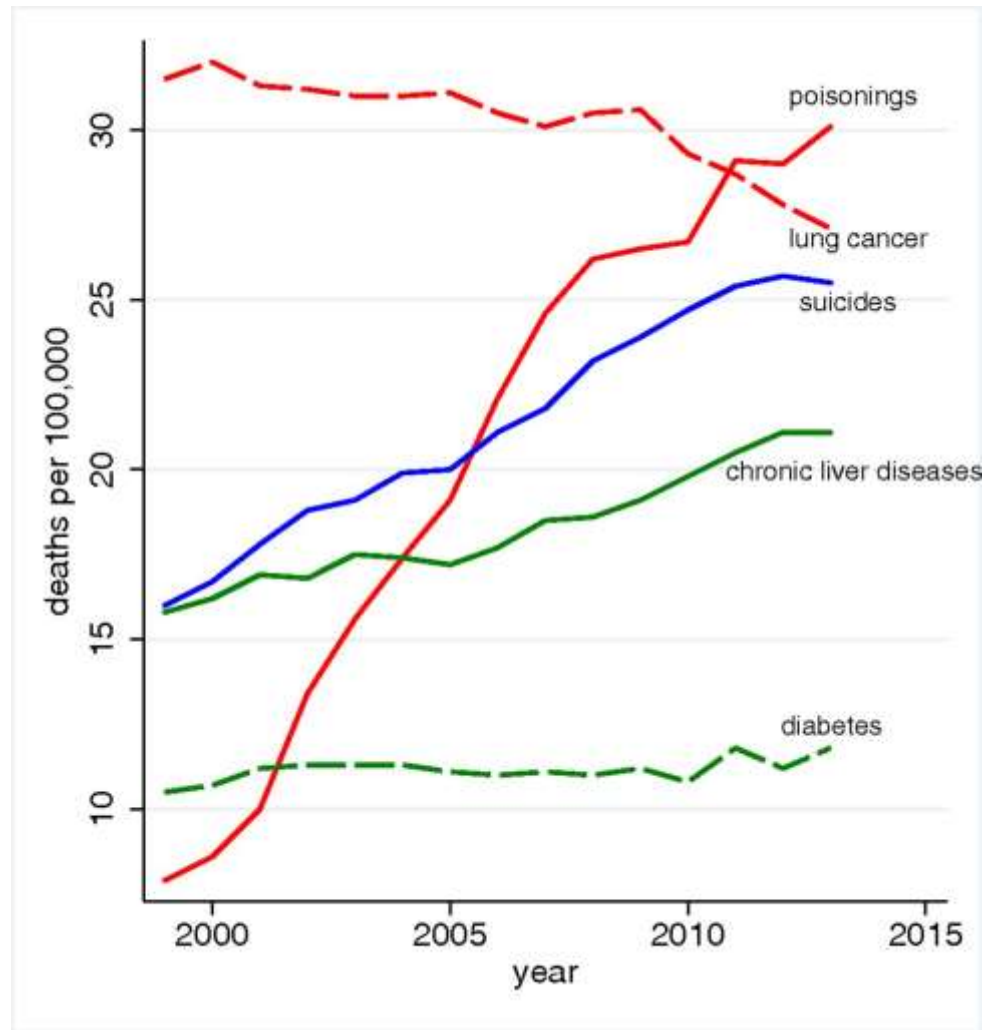
All-cause mortality rates
ages 45-54



Age-adjusted mortality rates
ages 45-54, base year=2010



Mortality by cause, white non-Hispanics ages 45–54.



Anne Case, and Angus Deaton PNAS 2015;112:15078-15083

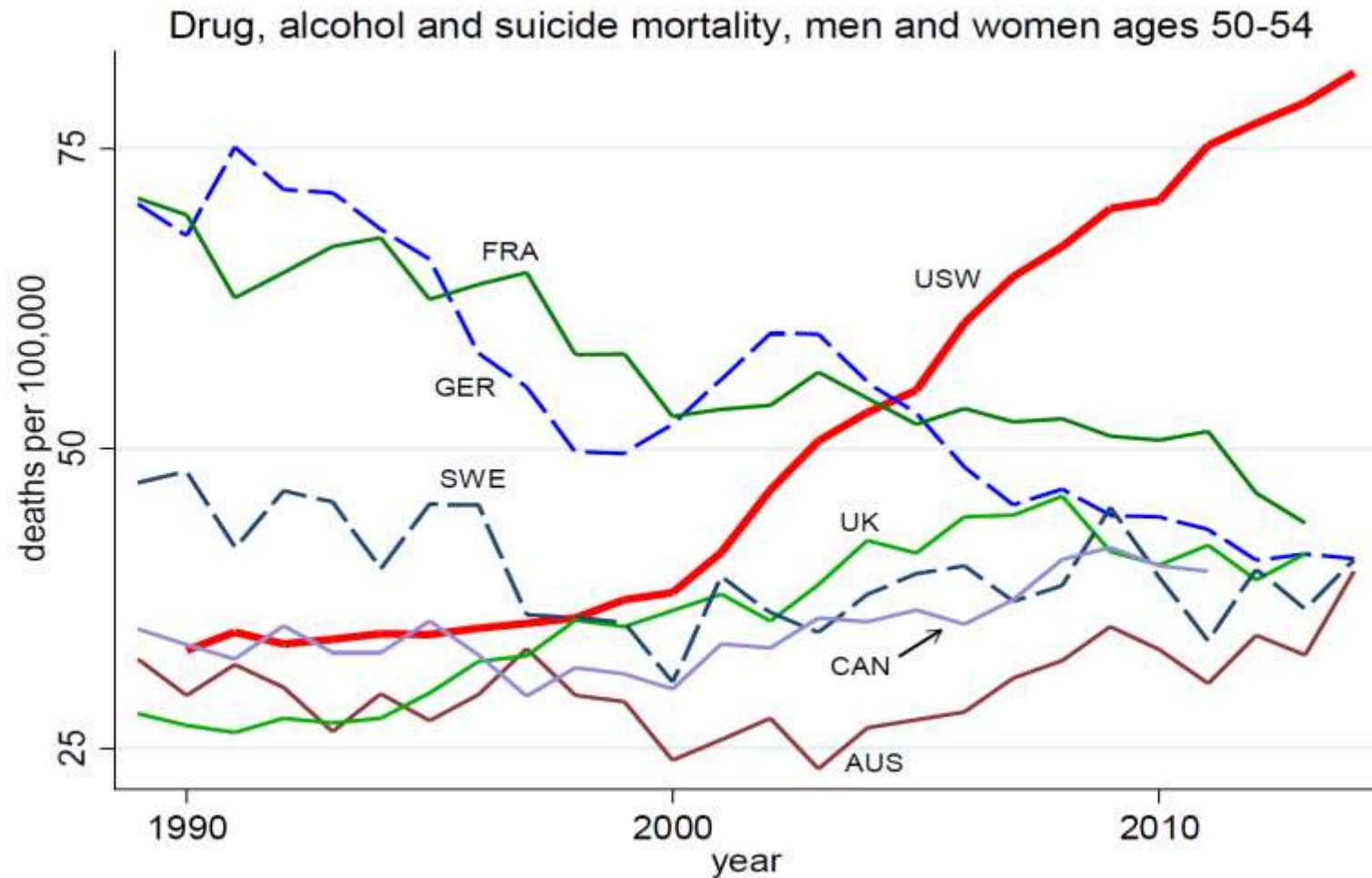


Figure 1.5: Deaths of despair, men and women, aged 50-54

Figure 1.10 Change in mortality rates, white non-Hispanics 1998-2015

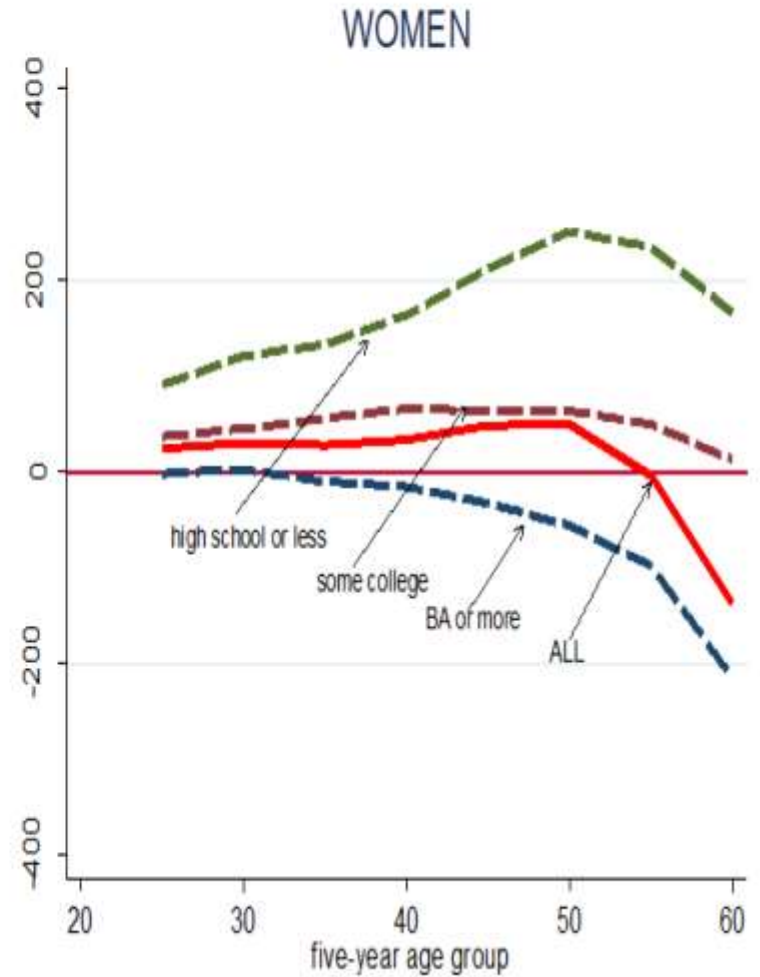
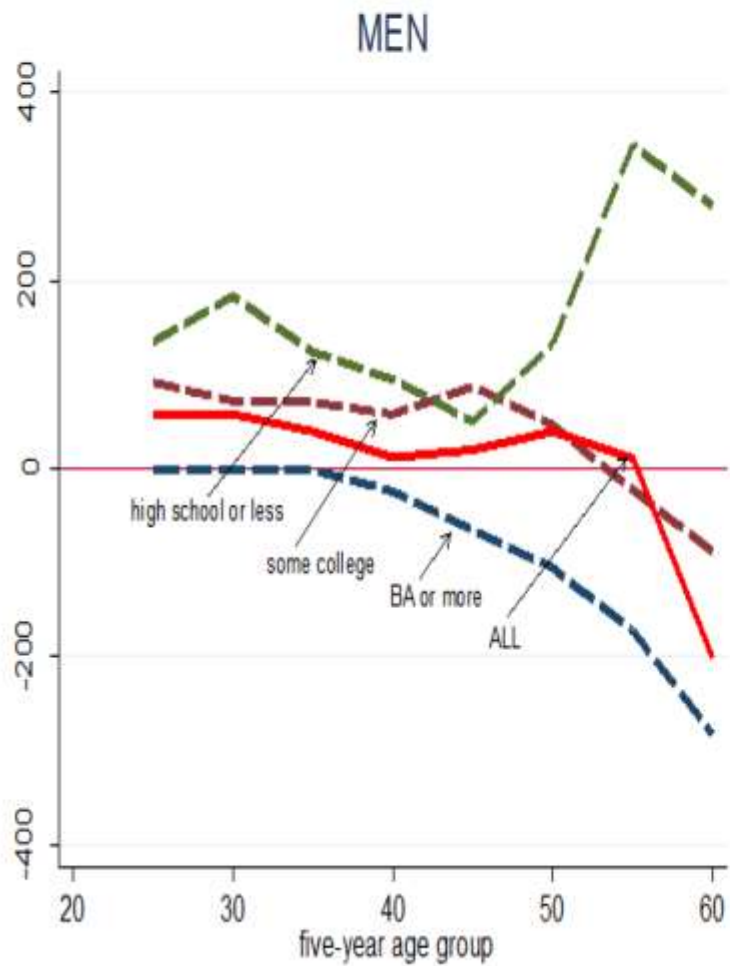
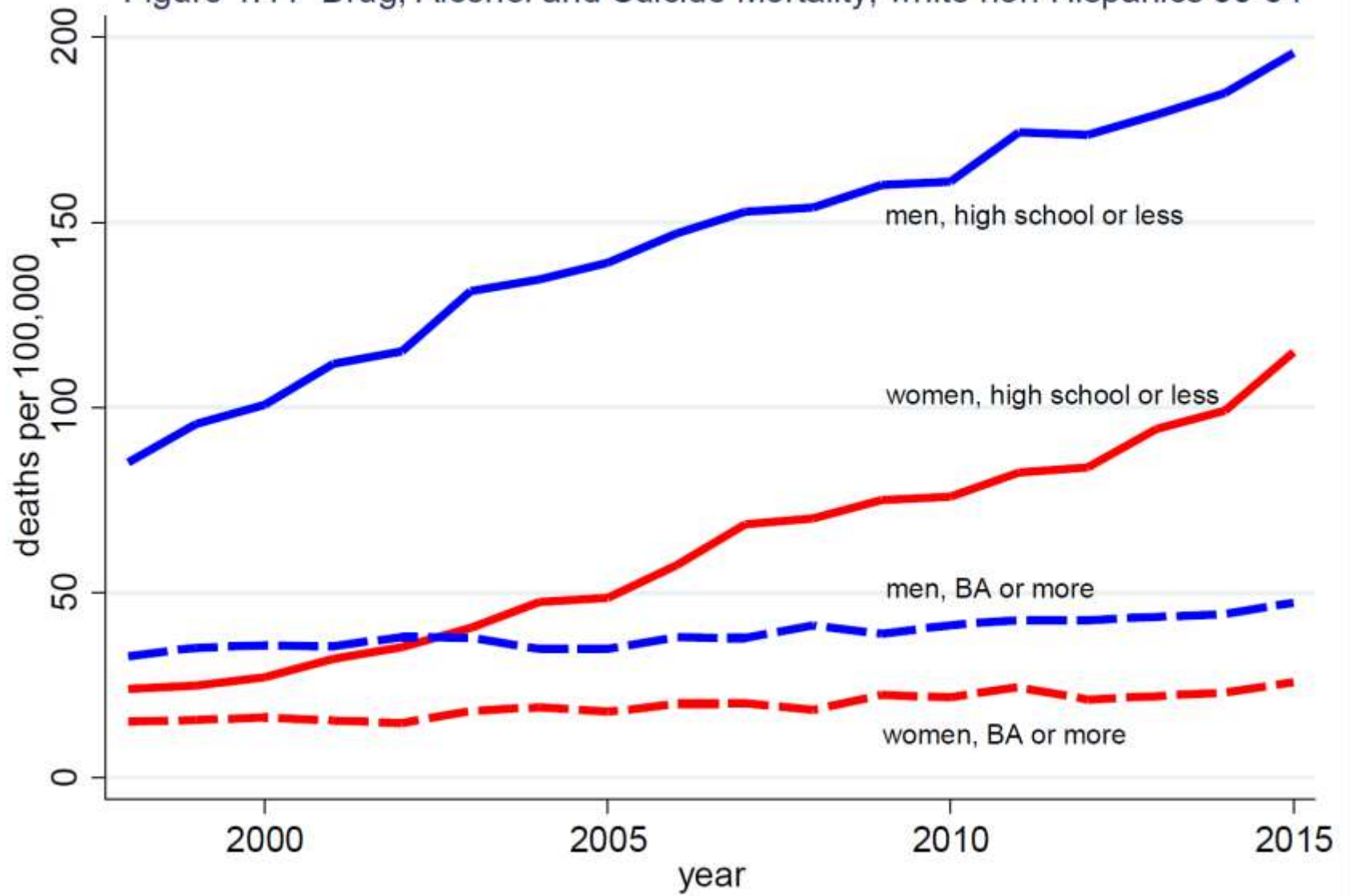


Figure 1.11 Drug, Alcohol and Suicide Mortality, white non-Hispanics 50-54



But what is happening to SES
mortality gradient at younger ages?

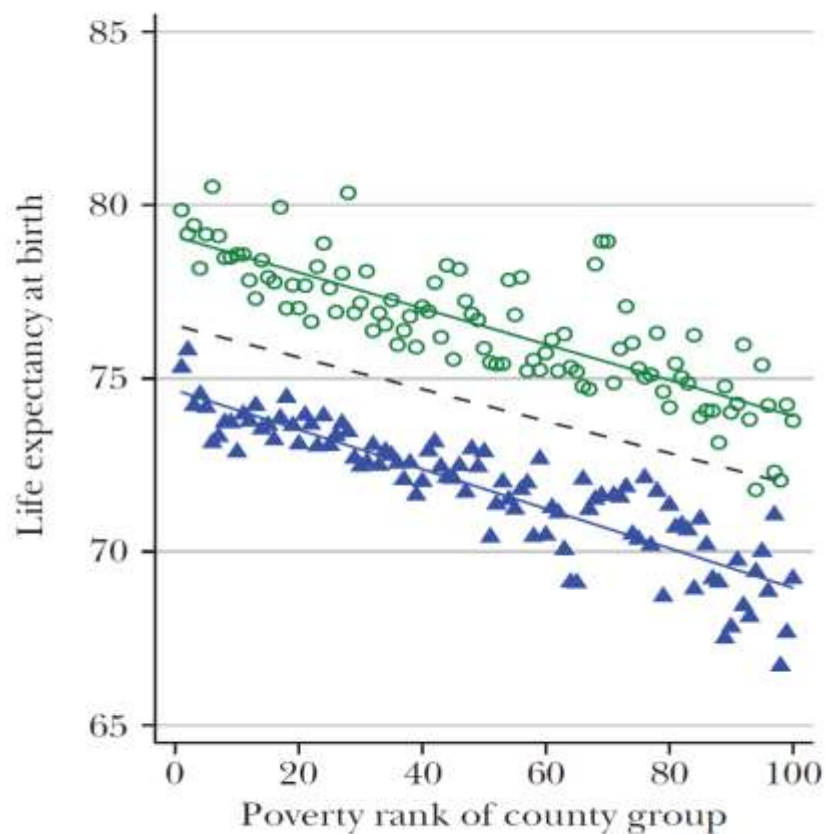
Currie & Schwandt *JEP* & *Science* 2016

- Compare life expectancy **at birth** across US counties ranked by poverty rates

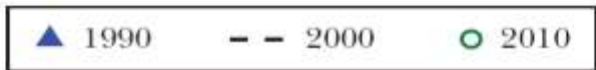
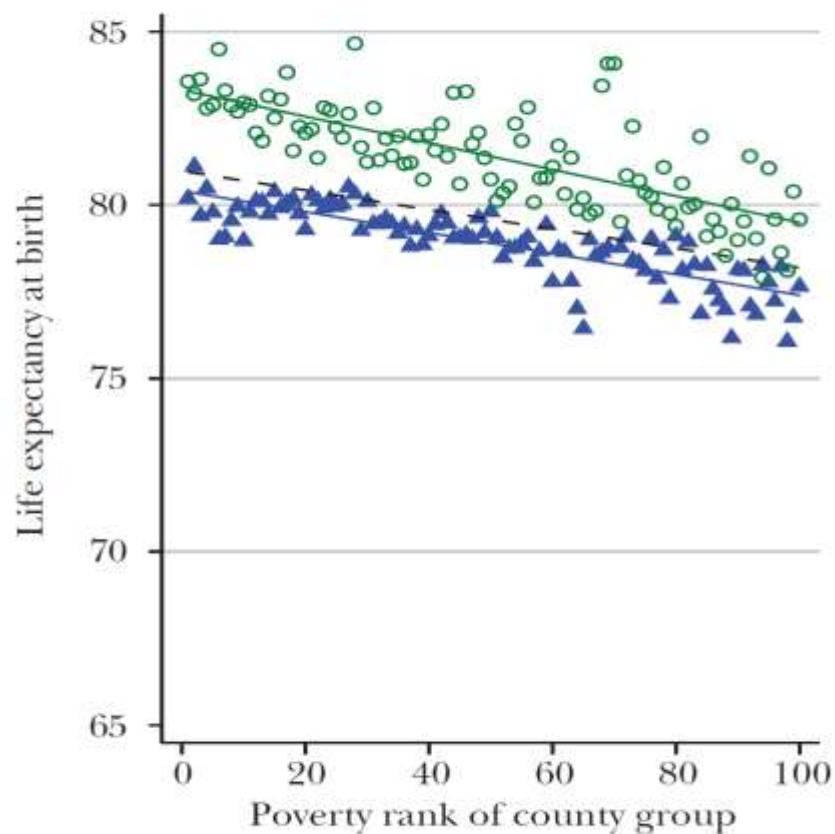
Male life expectancy increasing equally in rich & poor counties (Currie & Schwandt *JEP* 2016)

Life Expectancy at Birth across Poverty Percentiles

A: Men

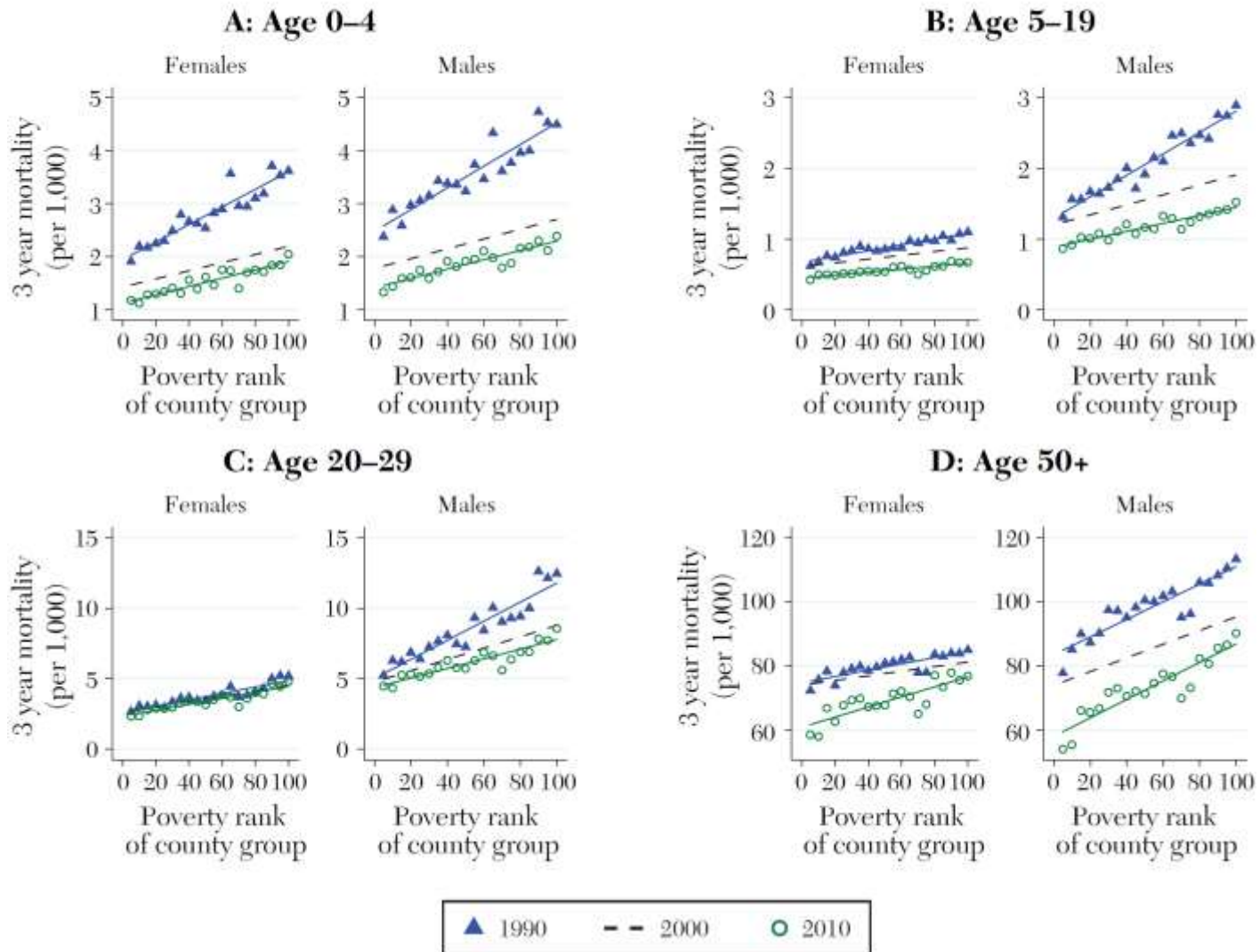


B: Women



Inequality falling at younger ages (Currie & Schwandt *JEP* 2016)

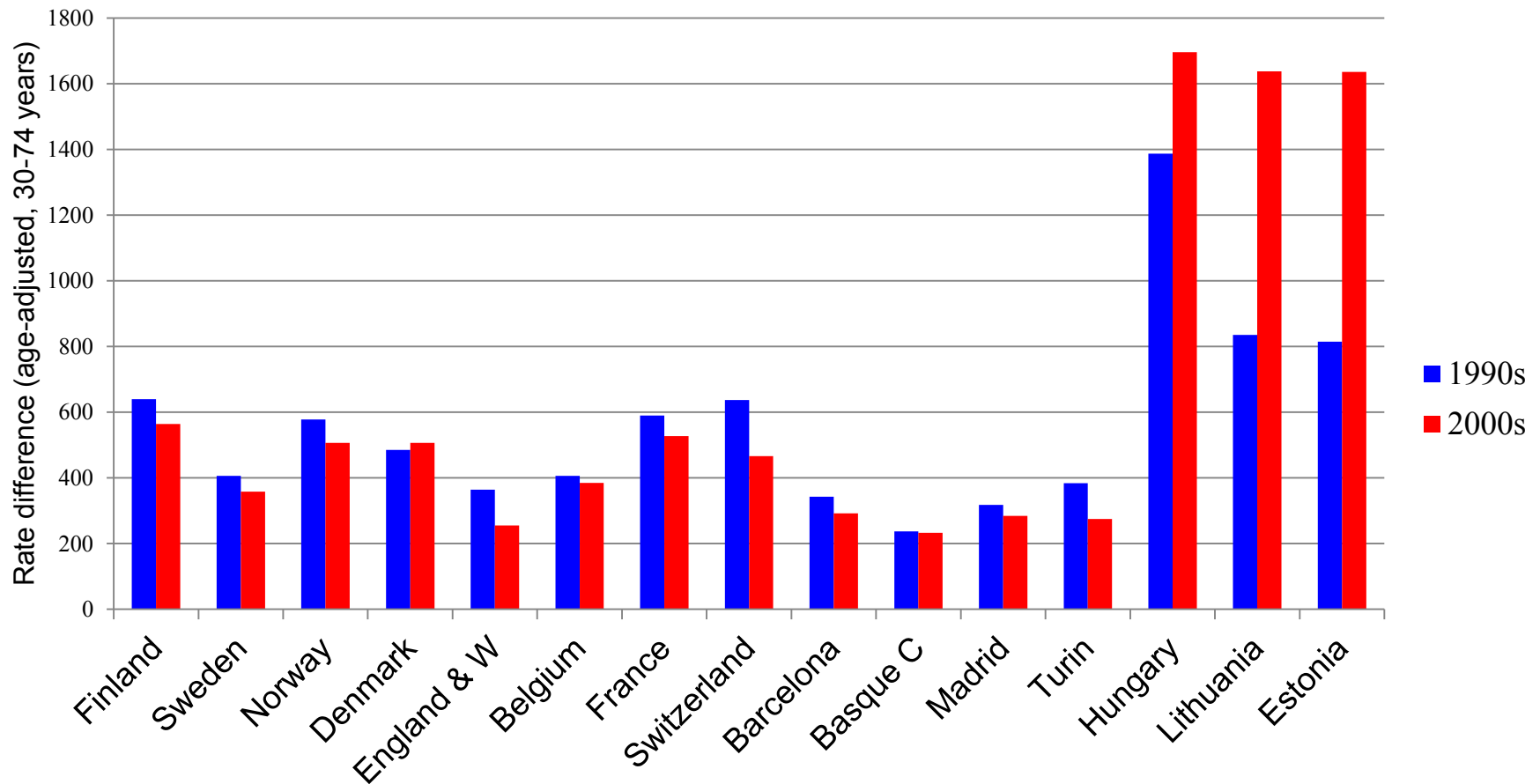
Three-Year Mortality Rates across Groups of Counties Ranked by their Poverty Rate



Is gradient becoming steeper in
Europe?

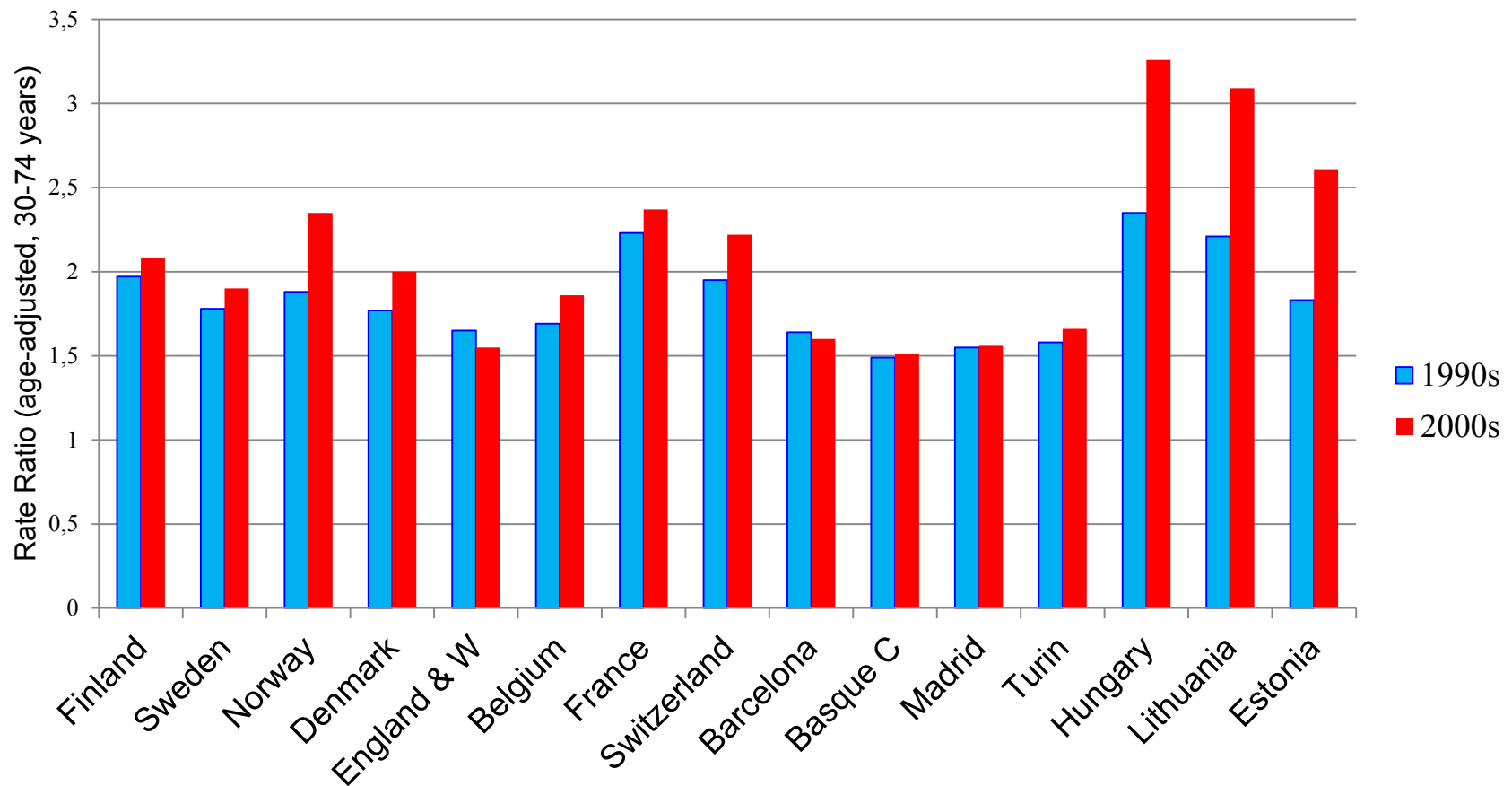
ABSOLUTE INEQUALITIES MOSTLY DECREASING

**Rate differences of all-cause mortality
low vs. high education, 1990s and 2000s, men**



RELATIVE INEQUALITIES MOSTLY INCREASING

**Rate Ratios of all-cause mortality
low vs. high education, 1990s and 2000s, men**



Summary of evidence

- Everywhere, the less educated and poorer are less healthy
- US
 - Adults: increasing health inequalities by education & income
 - Children: decreasing health inequality by poverty
- Europe
 - Health inequality by education falling absolutely but rising relatively

Why is there a socioeconomic gradient in health?

- Causal effect SES → health?
 - And if so, what's are the mechanisms?
 - Why do health behaviours differ by SES?
 - Does access / utilization of healthcare play a role?
- Causal effect health → SES?
 - Ill-health → loss of employment / earnings
 - Ill-health → medical expenses → loss of wealth
 - (Childhood) Ill-health → loss of education
- Confounding factors
 - Time/risk preferences, innate ability → investment in health and human capital

Can economic theory explain health inequality?

- View health as a good
- Individuals demand health
- Variation in health understood as variation in determinants of demand
- Need model of demand for health
- Extend model of human capital (Schultz AER 1961, Becker 1964, Ben-Porath JPE 1967) to health capital (Grossman JPE 1972)

Grossman model (JPE, 1972)

- Utility derived from stock of health (H) and consumption (C), $U(H,C)$
- H subject to (exog.) depreciation offset thru' investment, $I(m,\tau;E)$
 - m - medical care, τ - time input, E - human capital
- Health produced as well as consumed
- Health stock generates flow of healthy days
- Earnings from these healthy days represent production benefits of health (sickness days result in earnings losses)

Predicted impact of socioeconomic factors on health

- **Wealth:** Health is normal good – demand rises with wealth
- **Wage:**
 - Pure investment version of model ($U(C)$):
 - A) \uparrow wage \rightarrow greater production losses from sickness time $\rightarrow \uparrow H$
 - B) \uparrow wage \rightarrow greater opportunity cost of health investment $\rightarrow \downarrow H$
 - A) dominates if mkt. goods e.g. medical care in production of health
 - Pure consumption model ($U(C,H)$ and no sickness time loss):
 - \uparrow wage $\rightarrow \uparrow H$ if relative time input to health production $<$ time input to production of other consumption goods
- **Education:** Better educated presumed to have knowledge advantage raising productivity of health investments $\rightarrow \uparrow H$

Galama & van Kippersluis (EJ forthcoming)

- Extend Grossman with aim of developing a unified theory capturing multiple mechanisms thru' which health and SES are related
- Particular emphasis on the lifecycle profile of the SES-health gradient, i.e. widening until middle-age and then narrowing in old age

G & vK extensions to Grossman

1. Decreasing returns to scale (DRTS) in health production function
2. Job-related health stress
 - Increases health depreciation rate
 - Poor substitute health capital for limited financial/human capital
3. Healthy & unhealthy consumption
 - Affect health depreciation
4. Returns to education thru' wage rate
 - In addition to potential impact on efficiency of health production
5. Endogenous optimisation of length of life

Comparative dynamics of health wrt wealth

- Wealthy live longer
- Wealthy value health more
- Wealthier are healthier at all ages
- Health more sensitive to wealth when longevity can be extended
 - Health inequality greater in environments where resources can be used to extend life

Conjectured wealth effects on health behaviour

- Wealthy engage more in healthy consumption
 - Direct wealth effect (+)
 - Indirect health benefit effect (+)
- Wealthy likely to engage less in severely unhealthy consumption
 - Direct wealth effect (+)
 - Indirect health cost effect (-)
- Wealthy engage less in job-related health stress
 - Compensating wage valued less (-)
 - Indirect health cost effect (-)

Education effects

- Education raises the wage
 - positive wealth and production benefits effects
 - offset by higher opportunity cost of time effect
- Also may raise efficiency of production of health investment, and possibly healthy and unhealthy consumption
 - Increase these activities

How might education raise efficiency of health production?

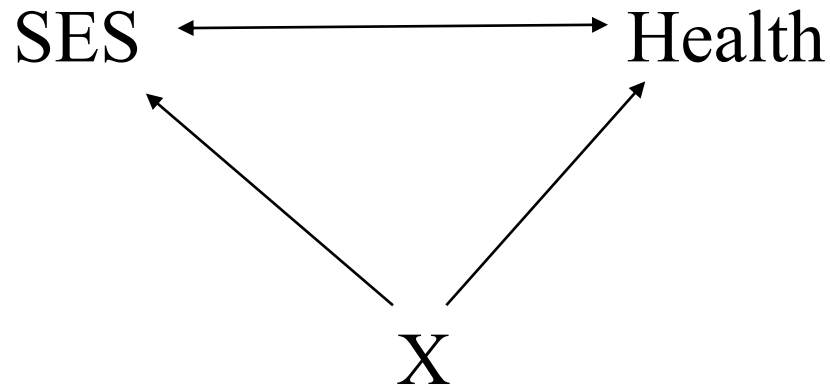
- Cognition → improved decision making → more productive and allocative efficiency in health generation
 - effective use of curative and preventive care & medication
 - health behaviour & lifestyle
- Improved acquisition and processing of information
 - health behaviour
 - management of chronic conditions
 - awareness and use of new medical technologies
- Peer effects

Does (extended) Grossman model provide insight into causes of health inequality?

- Models health behaviour of rational agent facing no uncertainty
- Yet, health and return on health investment inherently uncertain
- Health behaviour tends to deviate from rationality, e.g.,
 - Present bias / time inconsistency
 - Optimism bias
 - Information aversion
- Do such biases vary with SES?
- Education effect thru' efficiency of health production is black box

Evidence on causal effects

Identification problem



Confounders (X): preferences (risk/time), parental investment, cognitive and non-cognitive ability, etc.

Identification strategies

- Control for **observable** confounders
- Purge **unobservable** confounders arising from childhood environment, genes and preferences using **fixed effects** (sibling, twin or individual)
- Exploit **exogenous variation** in SES (**IV** and **RDD**)
 - Education: schooling reforms
 - Wealth: lottery prizes, stock/housing market, pension reforms

Clark & Royer (AER 2013)

- 1944 Education Act
 - Raised school leaving age in Britain from 14 to 15 from April 1, 1947
 - Minimum years of schooling raised to > 9
 - Affected all cohorts born after April 1933
 - Further raised leaving age to 16 on September 1, 1972
 - Minimum years of schooling raised to > 10
 - Affected all cohorts born after September 1957

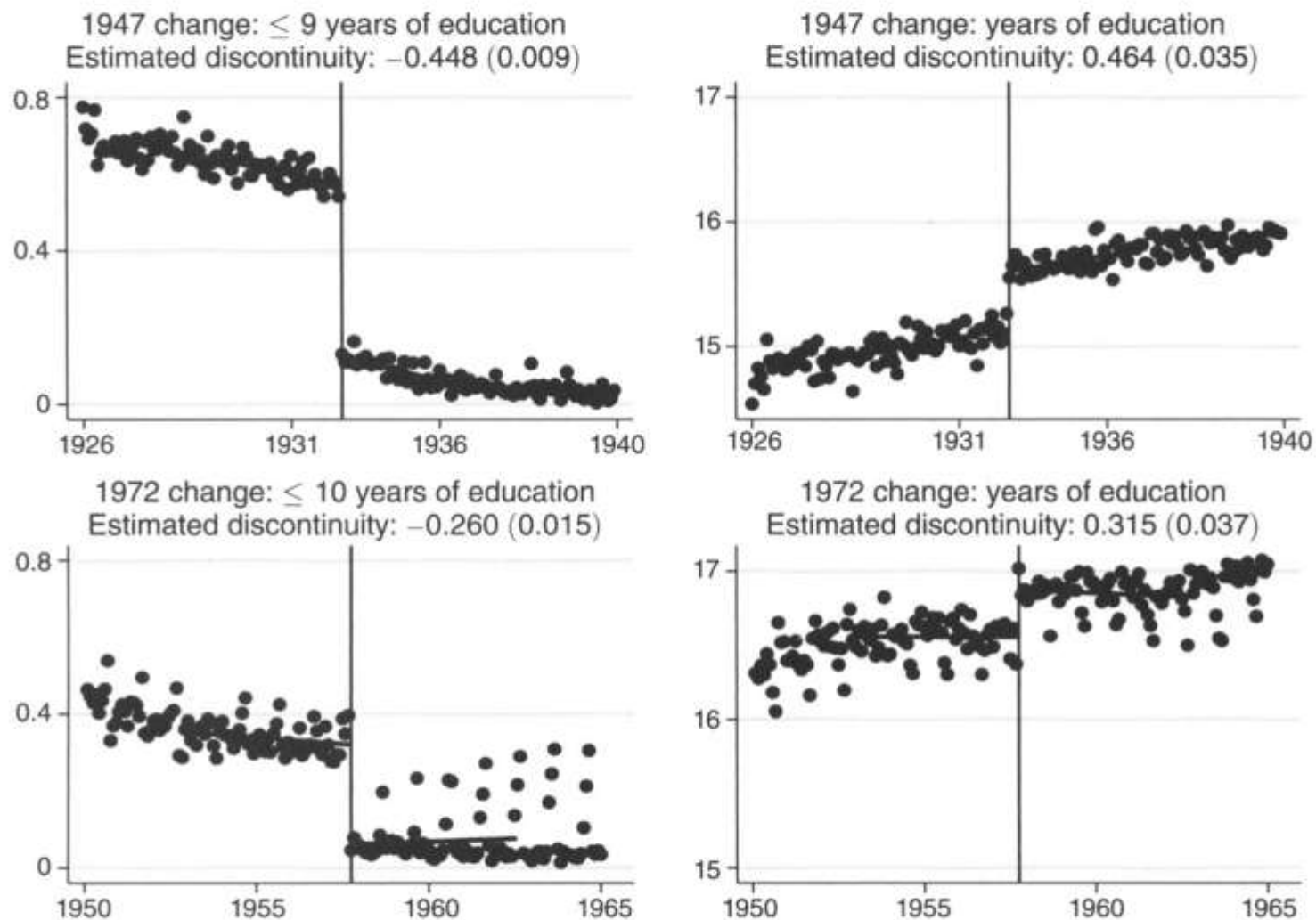


FIGURE 2. THE IMPACT OF THE COMPULSORY SCHOOLING CHANGES ON EDUCATIONAL ATTAINMENT

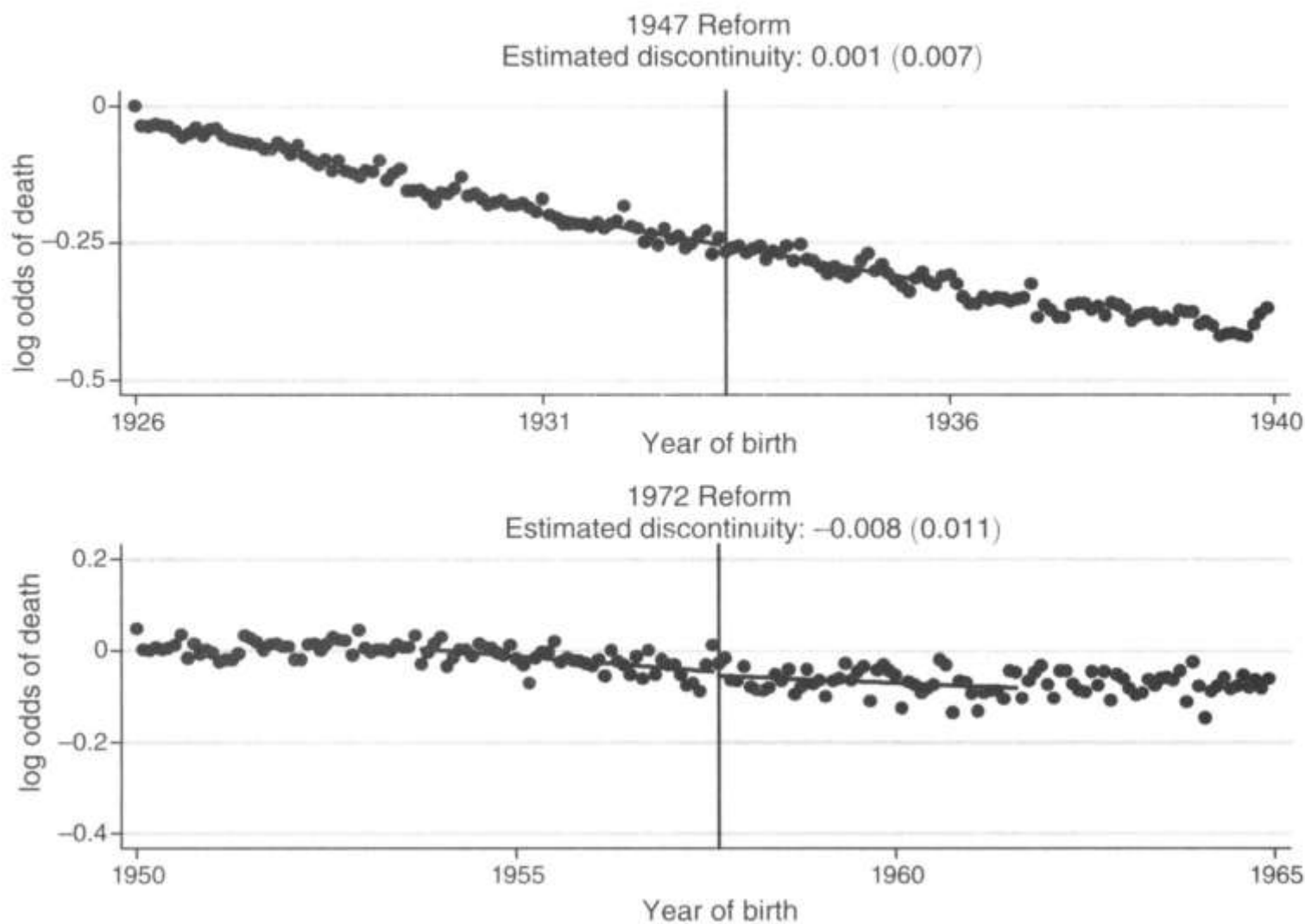
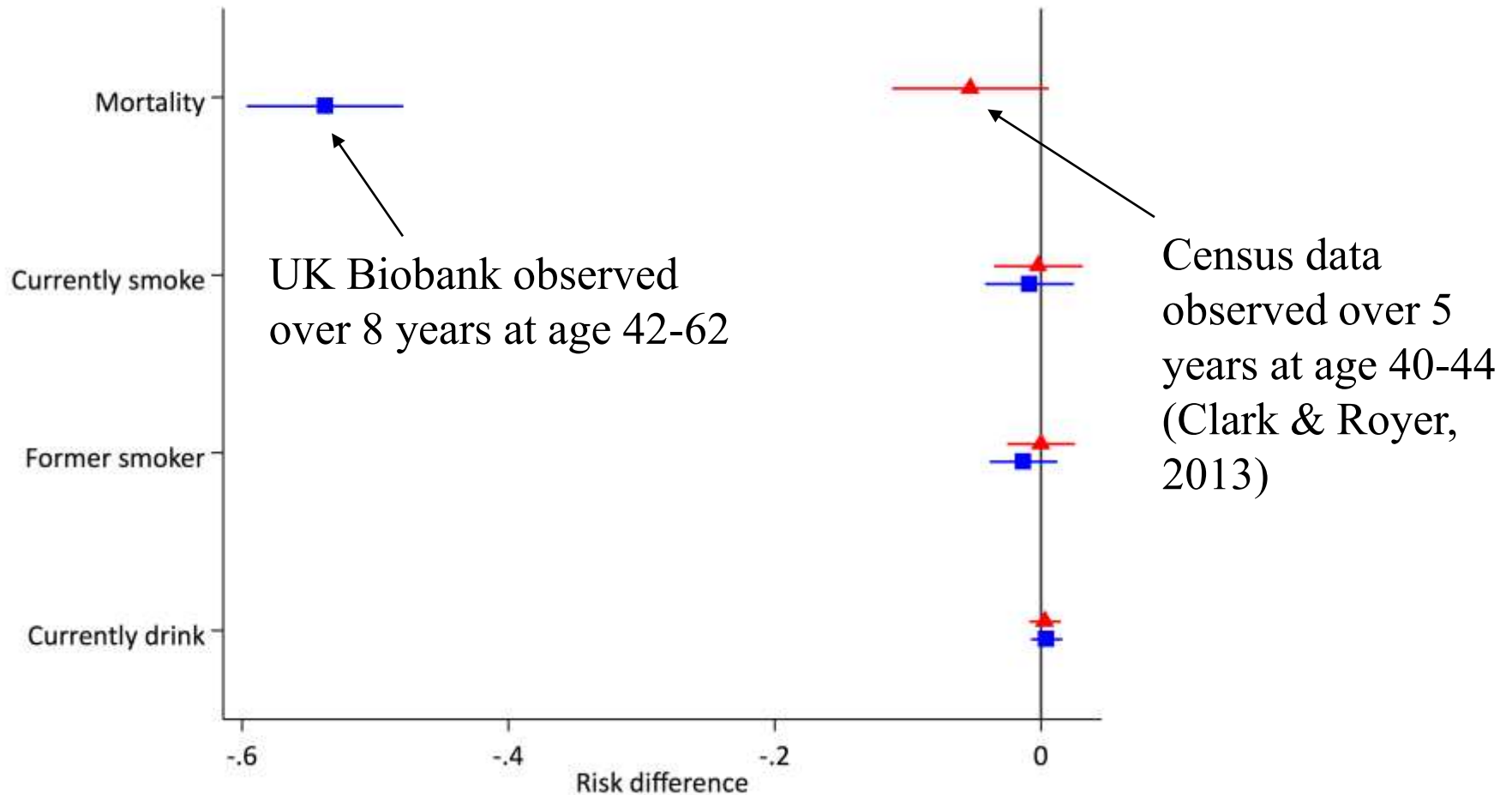
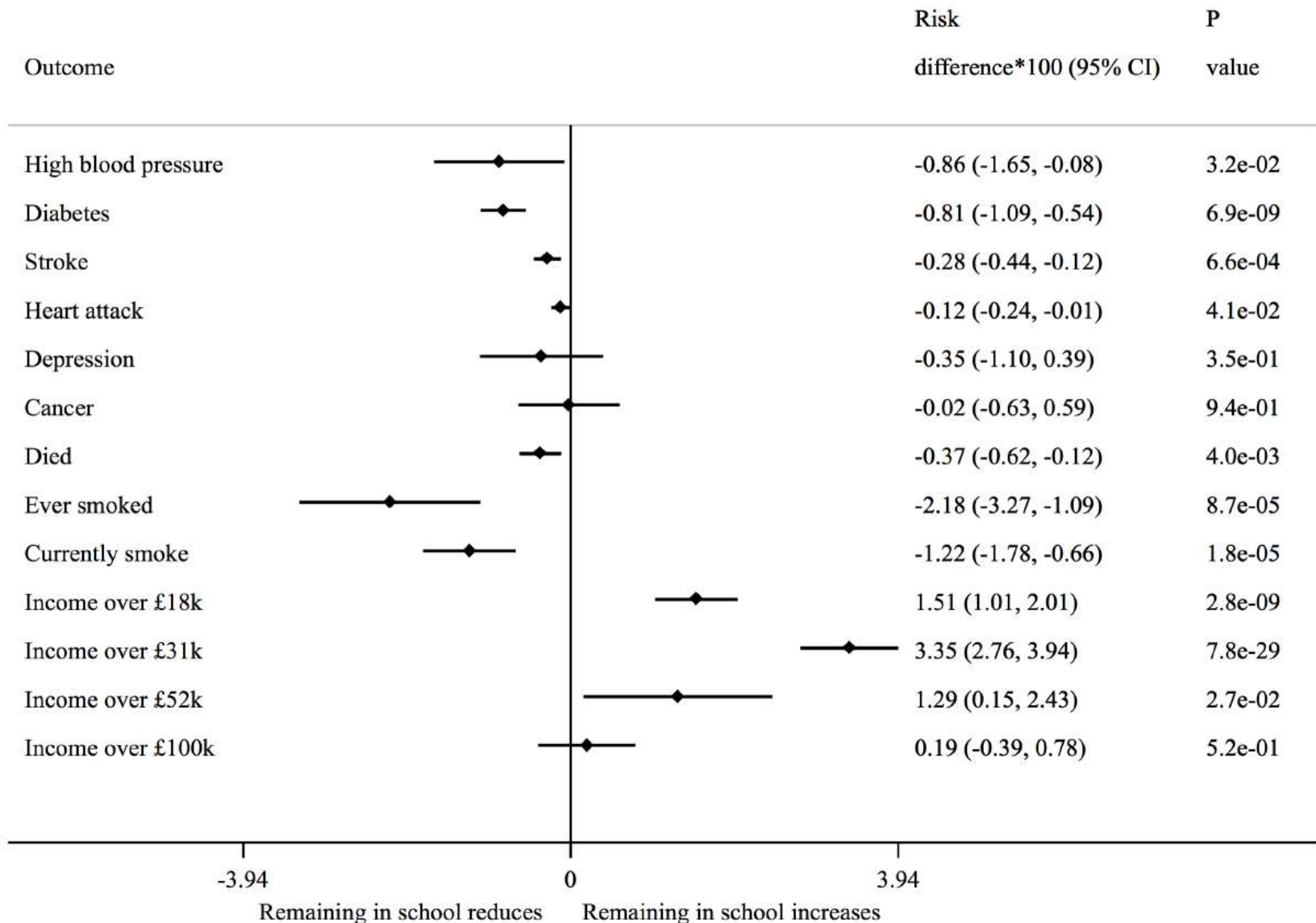


FIGURE 3. THE IMPACT OF THE COMPULSORY SCHOOLING CHANGES ON MORTALITY

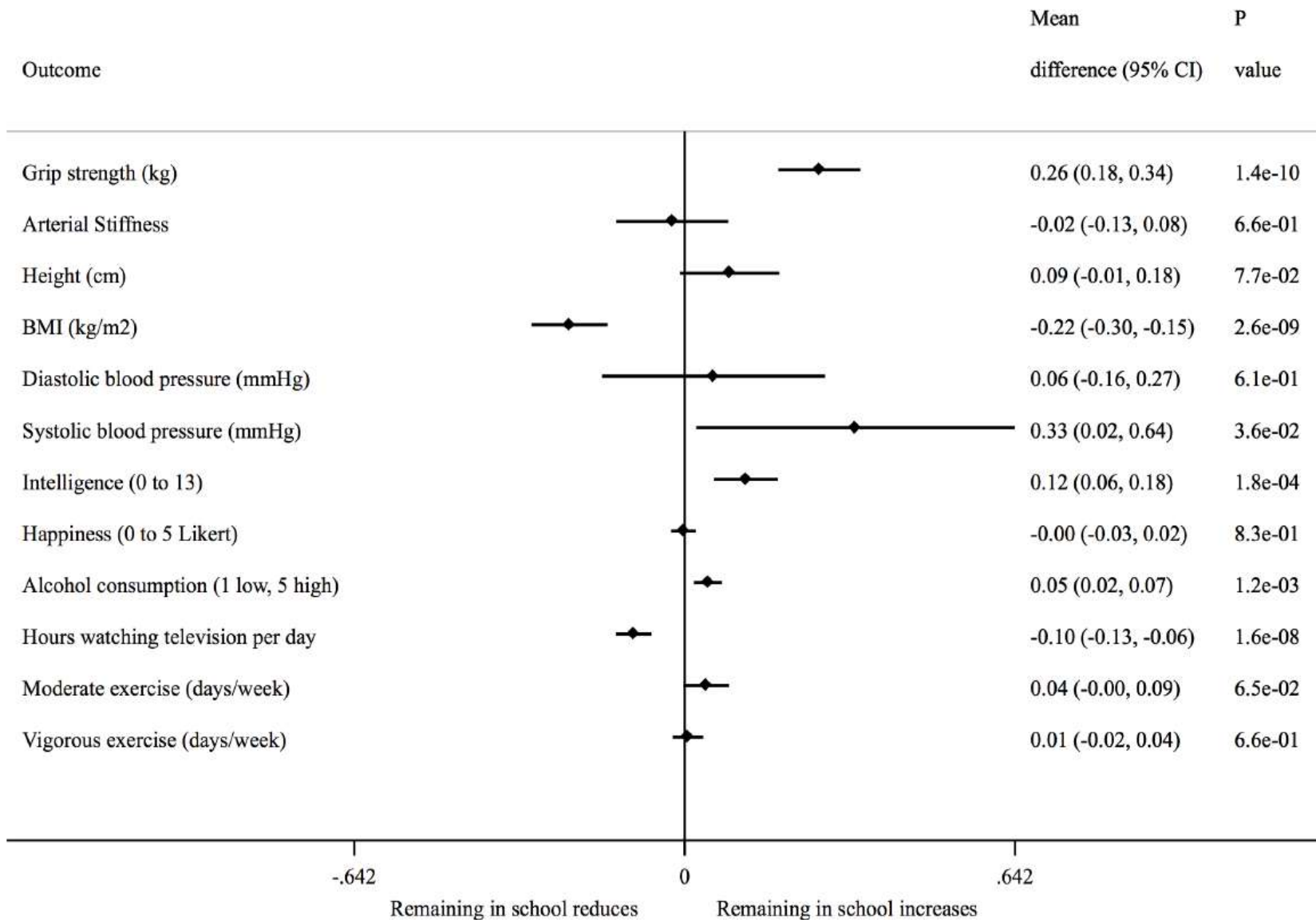
Davies et al (2018) find effect of 1972 reform on mortality using older sample (UK Biobank)



Davies et al (2018): DID effects of 1972 reform accounting for age effects (UK Biobank)



Davies et al (2018): DID effects of 1972 reform accounting for age effects (UK Biobank)



Evidence of education effect on mortality using compulsory schooling laws

- Estimates of negative impact:
 - US (Lleras-Muney, REStuds, 2005)
 - 1 year education ↓ 10-year mortality rate by 6.3 percentage points (baseline of 10.6 percent)
 - Not robust to state specific trends (Muzumder, Econ Perspectives '08)
 - NL (Van Kippersluis et al, JHR, 2011)
 - 1 year education ↓ 8-year male mortality at age 81 by 3 ppts (baseline 50%)
 - No effects for females
 - Britain (Davies et al, Nature Human Behaviour 2018)
- Estimates of no impact:
 - Britain (Clark & Royer, AER, '13)
 - France (Albouy & Lequien, JHE, '09)
 - Sweden (Meghir et al, NBER, 2012)

Evidence of education effect on health

- Controlling for observables, still find positive correlation between health and education
- Purging fixed unobservables, only some studies find positive correlation
- Instrumenting education
 - mixed evidence of effect on mortality
 - effects on some health outcomes (e.g. diabetes) / behaviour
- Often IV estimate \gg OLS
 - opposite to *a priori* expectation
 - explained by LATE and/or measurement error?
 - or low precision of IV plus publication bias \rightarrow large IV estimates published

Wealth effect on health

Cesarini et al, QJE 2016

- Swedish administrative data on players of 3 lotteries
- Prizes are large (typically, 7x median annual income)
- Match winners to players in same draw or to other winners and take differences within the match
- Identification from randomness of winning conditional playing or of amount won
- Big advantage over comparisons of lottery winners with non-players
- Follow for 10 years post win

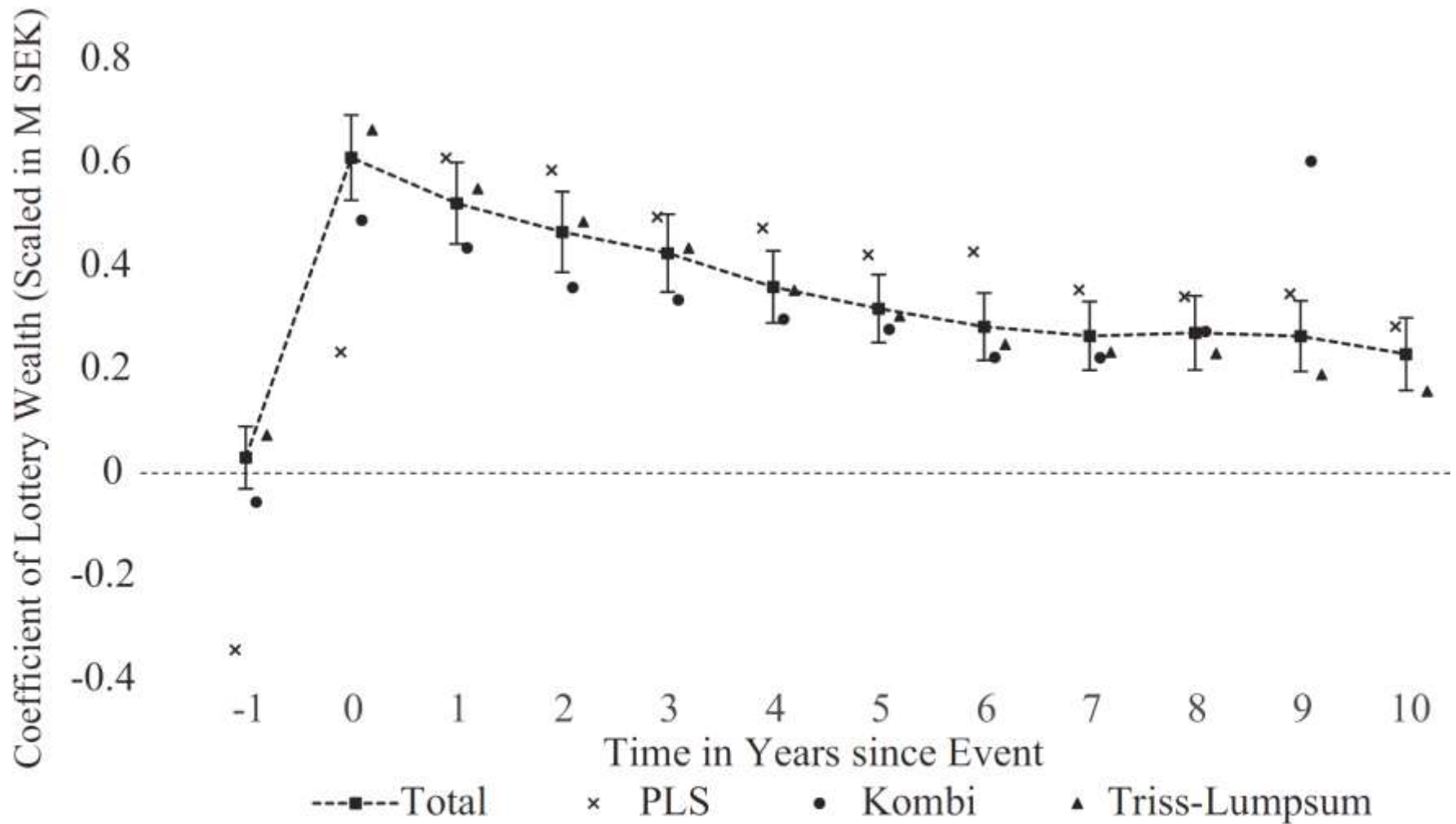


FIGURE I

The Effect of Lottery Wealth on Net Wealth According to Administrative Registers

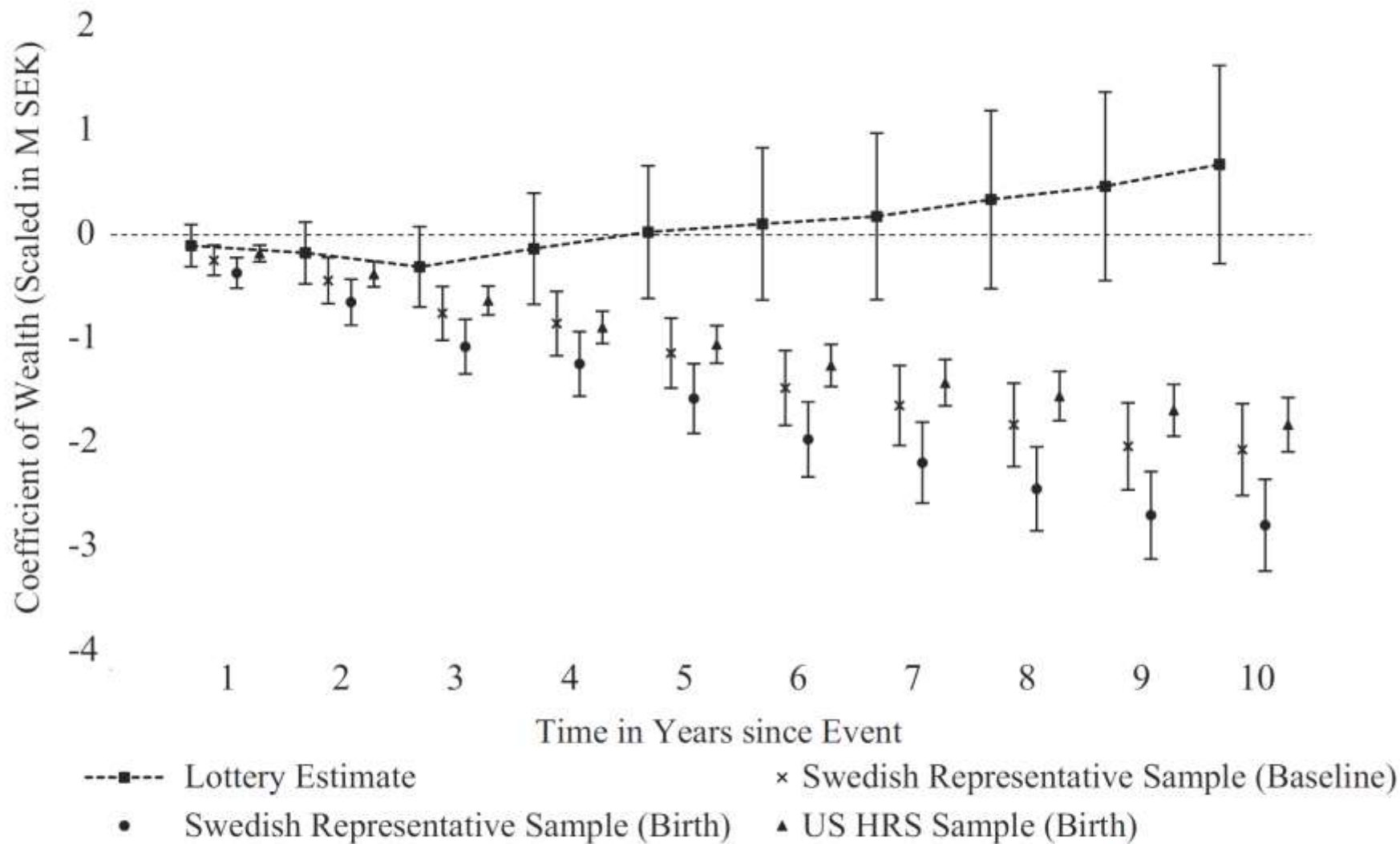


FIGURE II
Wealth and Mortality

Cesarini et al, QJE 2016

- Can rule out effect on mortality of 1/6 of cross-section wealth-mortality gradient
- Effect on healthcare utilization also bounded to tight interval around zero
- Non-robust evidence a small reduction in medication for anti-anxiety and insomnia
- Some increase in child healthcare utilization and reduction in child obesity
- Otherwise, no consistent, robust, significant effects on child health or child development indicators

Schwandt (AEJ: Applied, forthcoming)

- US Health and Retirement Study 1998-2011
- Wealth shock = stock holding \times stock market changes
- 10% wealth loss \rightarrow impairment of 2-3% standard deviation in physical health, mental health and survival

Limitation of IV approach

- Immediate response to wealth shock does not identify accumulated effect of lifetime wealth on evolution of health.
- According to Grossman (1972), health is stock that accumulates from past investment and depreciates. Wealth effect, if any, likely to evolve gradually, not occur suddenly.

Testing non-causality (Adams et al 2003)

- Test no causal effect of wealth on health (and vice versa)
- Aim to establish if correlation could arise from causal effect, not to identify the causal effect
- Regress health on lagged health, lagged wealth and controls
- Use lags to avoid reverse causality
- First test for model invariance in order to establish if have model capable of capturing causal effects
- If model is invariant and lagged wealth not significant, then wealth does not Granger-cause health
- If lagged wealth is significant, cannot infer causality since could be due to correlated unobservables
- So, approach is most useful when do not find Granger causality

Results

- AHEAD panel of elderly (70+) Americans
- In addition to wealth, also use income and education as measures of SES
- For mortality and acute, sudden-onset diseases, hypothesis of no causal effect of SES is accepted
- For mental health problems (not universally insured), non-causality is rejected
- For chronic conditions (not all universally insured), evidence is mixed
- See Smith (JHR 2007) for similar conclusions

Stowasser et al (2012)

- Extend the analysis by using
 - Larger sample
 - Longer panel
 - Younger cohorts (50+) with more variation in health insurance cover
- Find that Granger causality from SES to health cannot be rejected for a much larger set of outcomes
- Cannot conclude there is causality, but less grounds for concluding there is not

Income effect on health

- Evidence of income impacting negatively on health
 - Health is counter cyclical (Ruhm, QJE '00, JHE '05)
 - Health deteriorates with receipt of income in US (Dobkin & Puller JPubE '07, Evans & Moore JPubE '11)
 - Lower pensions as result of US Social Security Notch reduced mortality (Snyder & Evans REStat '06)
- Evidence of child health rising with parental income (Case et al, AER, '02; Currie & Stabile, AER, '03)

SES → health: evidence

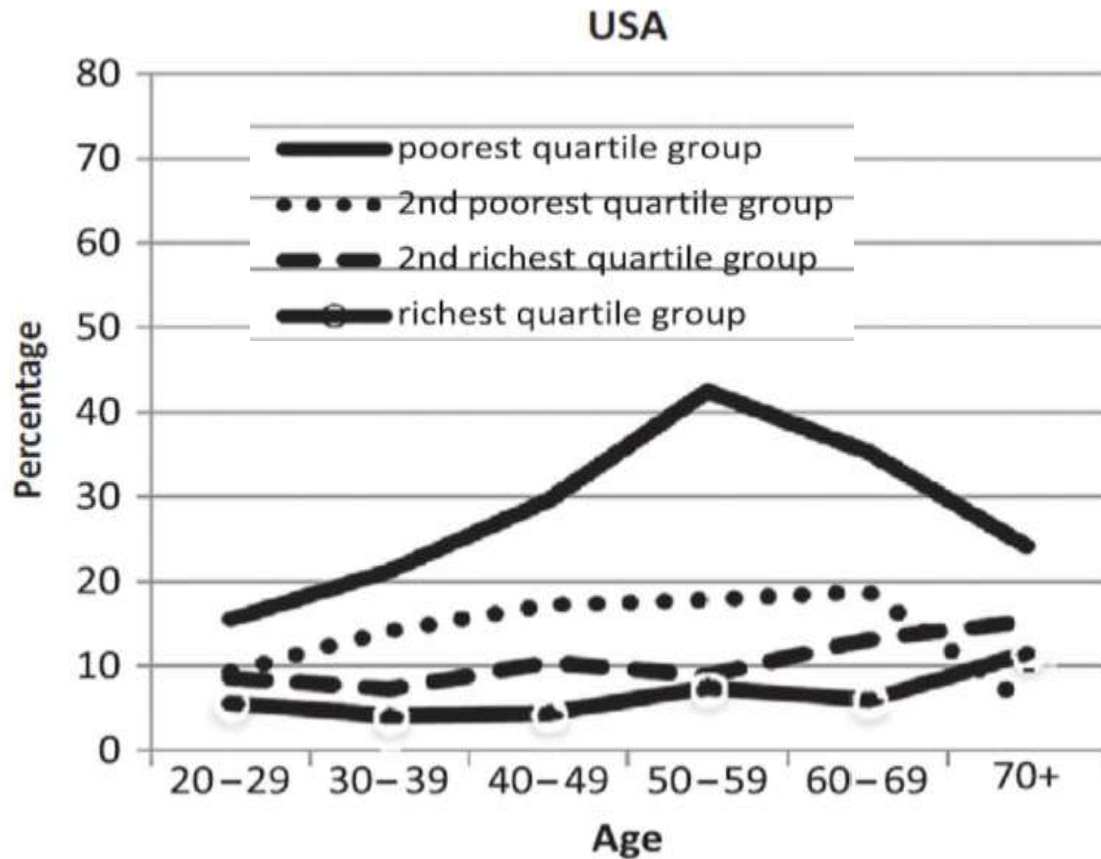
- Mixed evidence of causal effect of wealth on health
- Evidence of negative effect of income on adult health (US)
- Evidence of positive effect of parental income on child health (US)
- Evidence of effect of education on health is mixed
- Given no consistently strong evidence of effect of SES on health, why is there a strong SES gradient in health?
 - Correlated unobservables
 - Difficult to capture causal relationships that evolve slowly
 - **Reverse causality**

Poor are less healthy

Less healthy are poor

Income-related health inequality

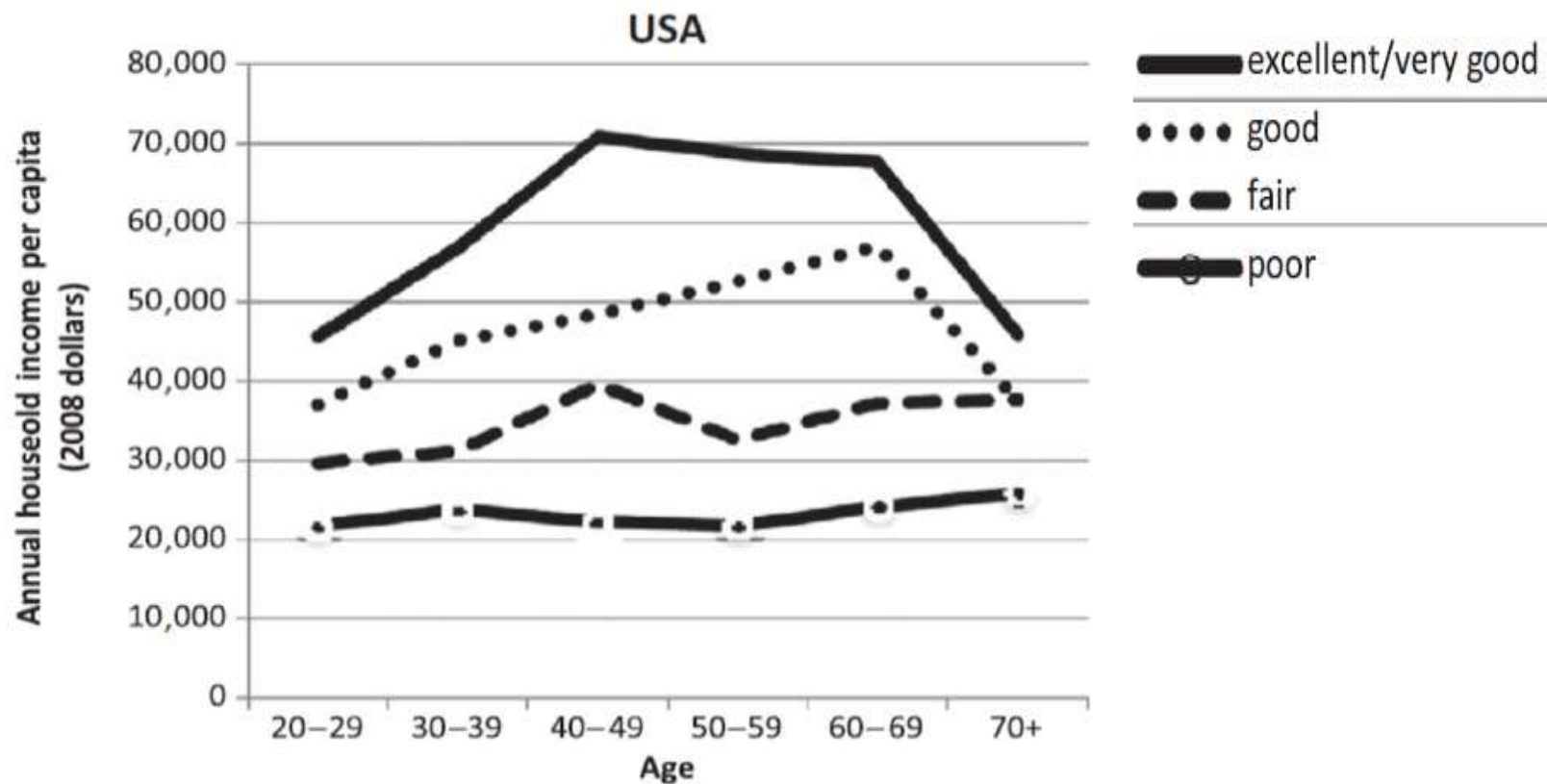
Percentage reporting less than good health by income quartile & age



Source: O'Donnell et al (2015) Figure 17.1

Health-related income inequality

Income by reported health and age



Source: O'Donnell et al (2015) Figure 17.2

Income gradient in health or health
gradient in income?

SES causation vs health selection

Correlation between ill-health and non-employment is very strong

- A very large proportion of those not working report health problems

One third of US prime age males not in labour force report a disability

Table 7: Disability Rate - Prime Age Men by Labor Force Status

	<i>Employed</i>	<i>Unemployed</i>	<i>Not in LF</i>
Difficulty dressing or bathing (%)	0.2	0.4	7.5
Deaf or difficulty hearing (%)	0.9	1.4	4.0
Blind or difficulty seeing (%)	0.4	0.9	4.0
Difficulty doing errands such as shopping (%)	0.3	0.9	15.0
Difficulty walking or climbing stairs (%)	0.8	2.1	20.0
Difficulty concentrating, remembering, or making decisions (%)	0.7	2.4	16.3
Any disability (%)	2.6	5.8	34.0
Multiple disabilities (%)	0.5	1.4	17.7
<i>N</i>	<i>1,965,782</i>	<i>137,952</i>	<i>253,853</i>

Notes: Data from monthly CPS surveys June 2008-August 2016, prime age (25-54) men only. Cells show the percentage of men in each labor force category with the condition listed in the row. Specific disabilities are not mutually exclusive. N is total number of survey respondents for each group.

Half of prime age US males not in labour force report experiencing pain

Table 8: Prevalence of Pain and Pain Medication, By Labor Force Status

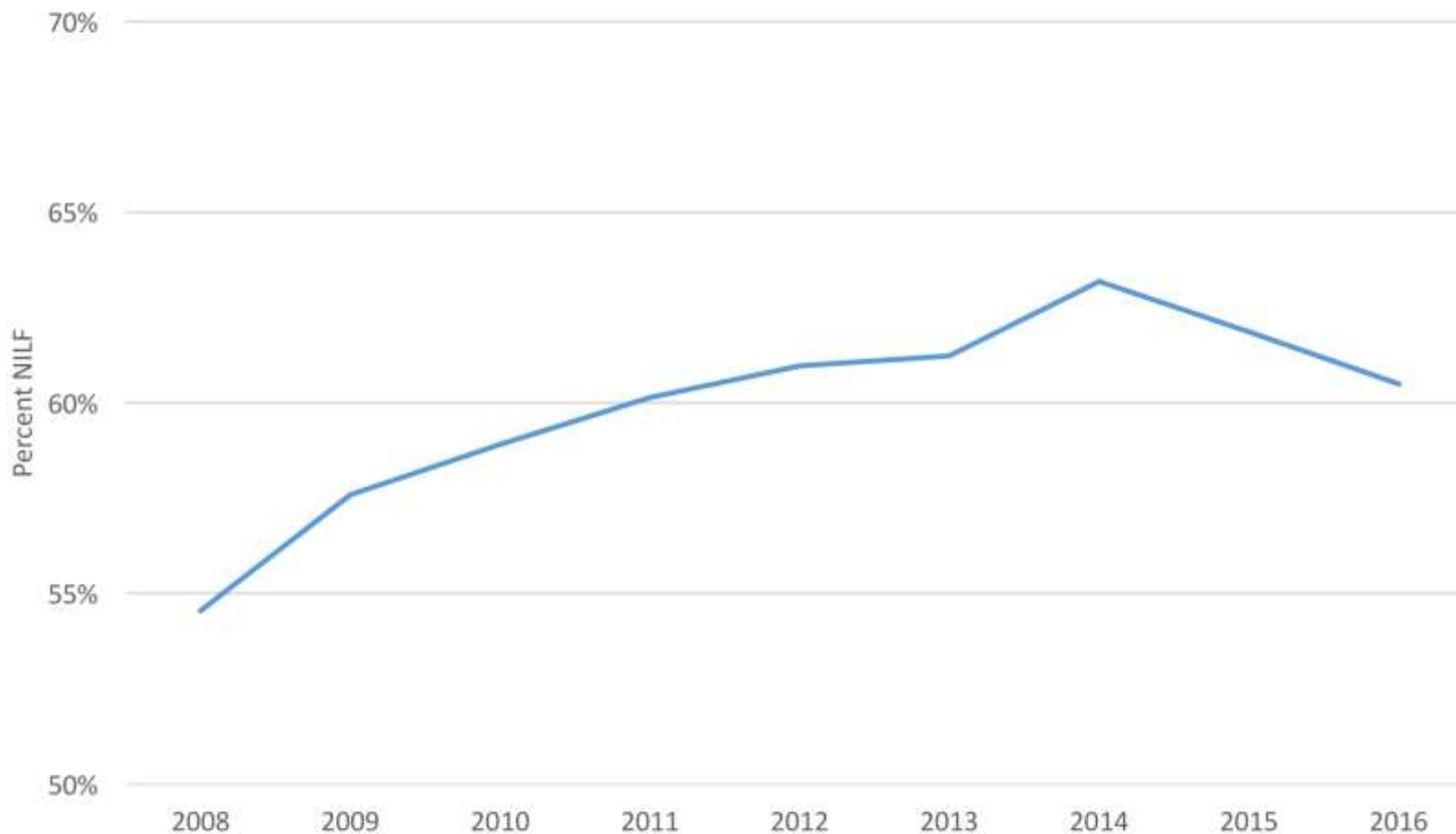
	<i>Employed</i>	<i>Unemployed</i>	<i>Not in LF</i>
All Prime Age Men			
<i>Average Pain Rating (0-6)</i>	0.76	0.81	1.97
<i>Time Spent with Pain > 0</i>	29.6%	26.3%	51.6%
<i>Took Pain Medication Yesterday</i>	20.2%	18.9%	43.5%
<i>N</i>	7,277	468	683
Disabled Prime Age Men			
<i>Average Pain Rating (0-6)</i>	1.49	1.25	2.81
<i>Time Spent with Pain > 0</i>	52.3%	42.1%	70.9%
<i>Took Pain Medication Yesterday</i>	32.4%	12.4%	57.7%
<i>N</i>	191	25	276

Notes: Sample is ATUS Well-being module respondents, prime age (25-54) men, pooling years 2010, 2012, and 2013. Weighted using the final well being activity weights. N is number of respondents.

Correlation between ill-health and non-employment is very strong

- A very large proportion of those not working report health problems
- And rate non-employment is high and rising in US among those reporting a health problem

Figure 7a: Probability of Being Out of the Labor Force Conditional on Having any Disability, Prime Age Men



Notes: Data from monthly CPS, June 2008 through August 2016.

Kreuger (2016)

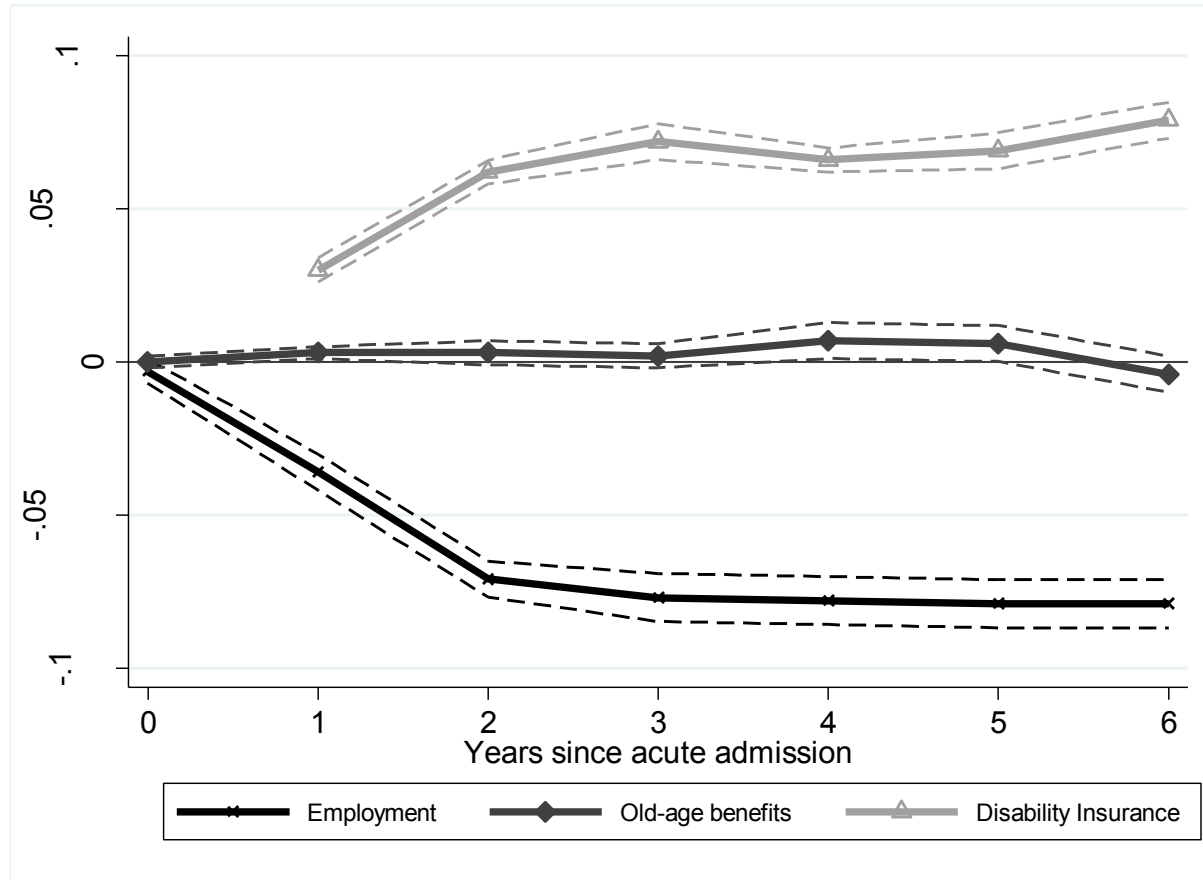
Identification of health impact on employment

- Usual unobservable heterogeneity & simultaneity problems
- Measurement error in health particular problem
 - Typically use reported health (work limitation)
 - Non-employed more likely to report ill-health (DI incentives & social stigma)
 - Upwardly biased estimate of impact of health on work
→ *justification bias* (Bound, JHR 1991)

Identification from health shocks

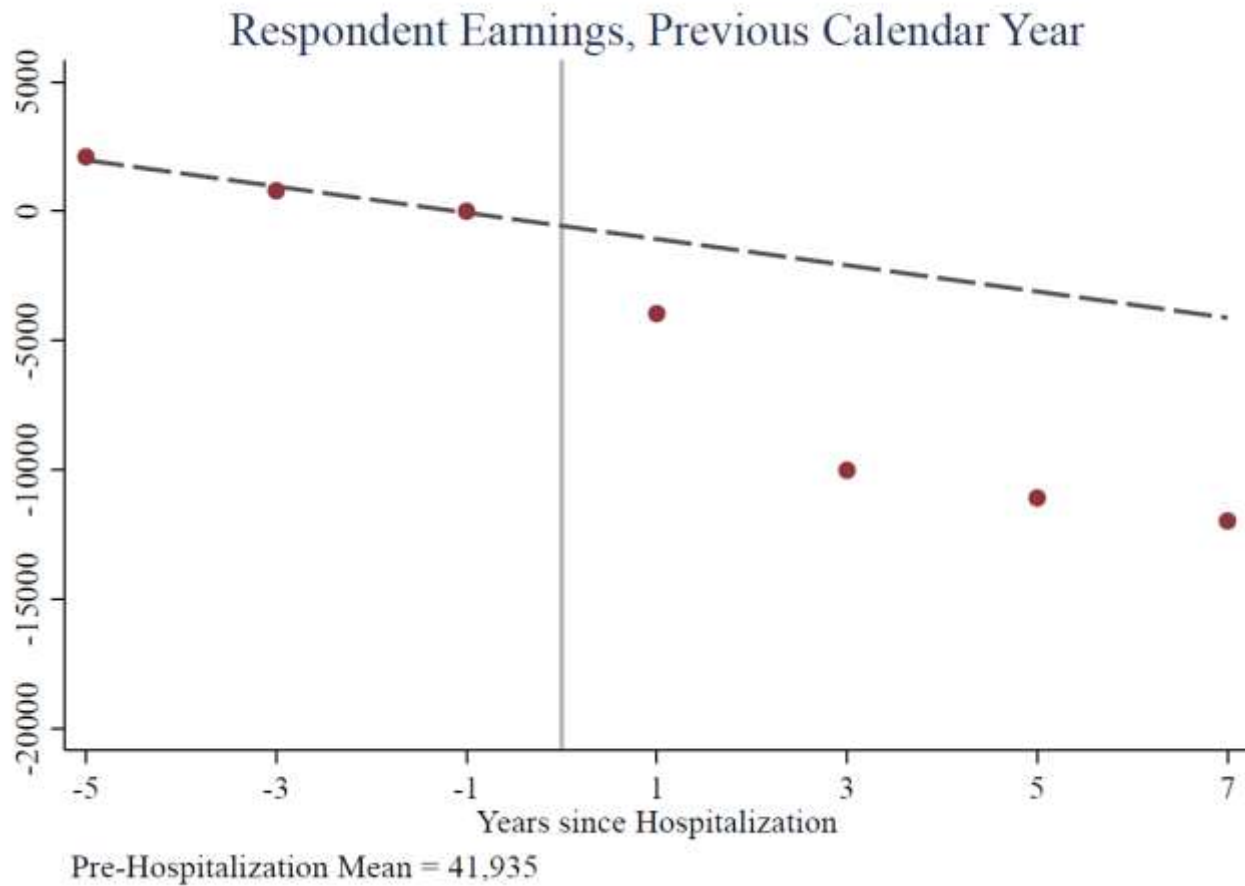
- Exploit narrowly defined health events, e.g. accidents, acute admissions, plausibly exogenous to lifecycle planning of health and labour supply
- Identify these events from administrative registers
 - Large sample size allows focus on specific conditions
 - Little or no measurement error
 - No reported health so avoids justification bias

Effects of emergency hospital admission on employment, DI enrolment and retirement in NL



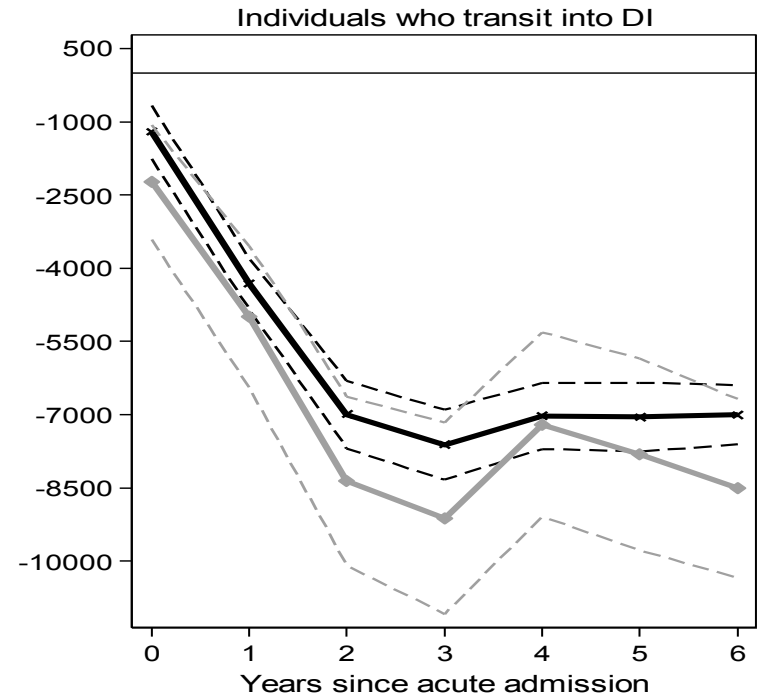
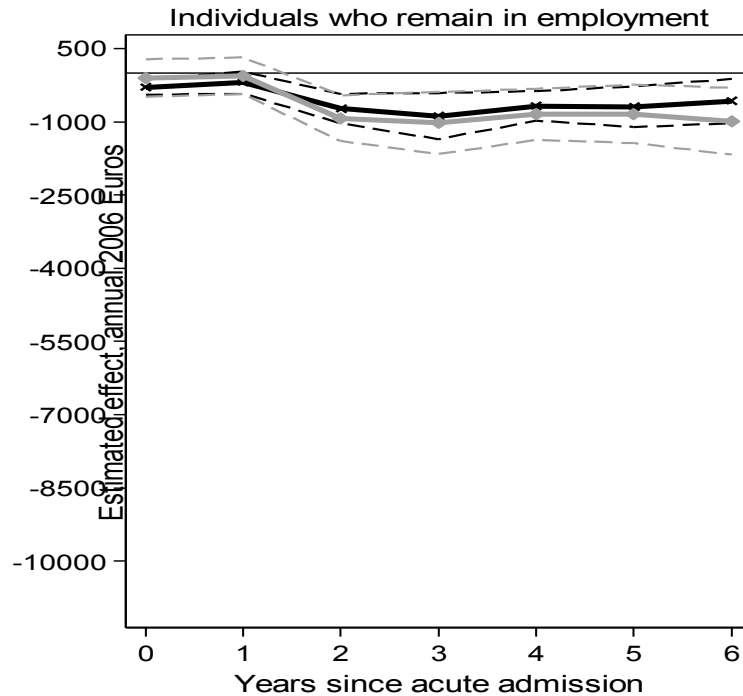
Source: Garcia-Gomez et al, JHR 2013

Effect of hospital admission on earnings, US non-elderly insured (Health & Retirement Study)



Source: Dobkin et al AER 2018

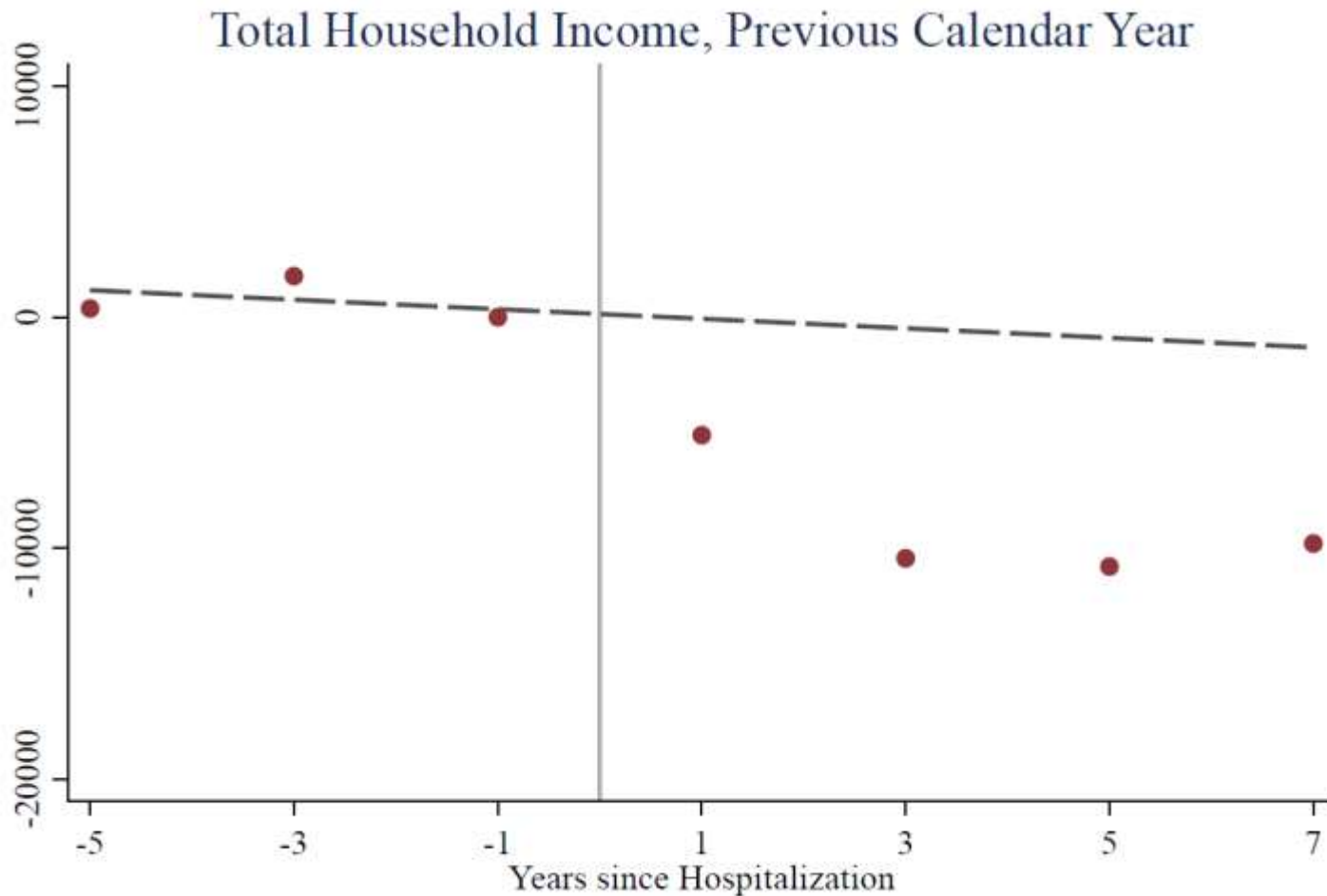
Effects of emergency hospital admission on income in NL (Garcia-Gomez et al 2013)



Personal income Household income

- Personal income falls by around 3% for those remaining in work
- It falls by 33% for those moving onto DI

Effects of hospital admission on income in US non-elderly insured (Dobkin et al 2018)

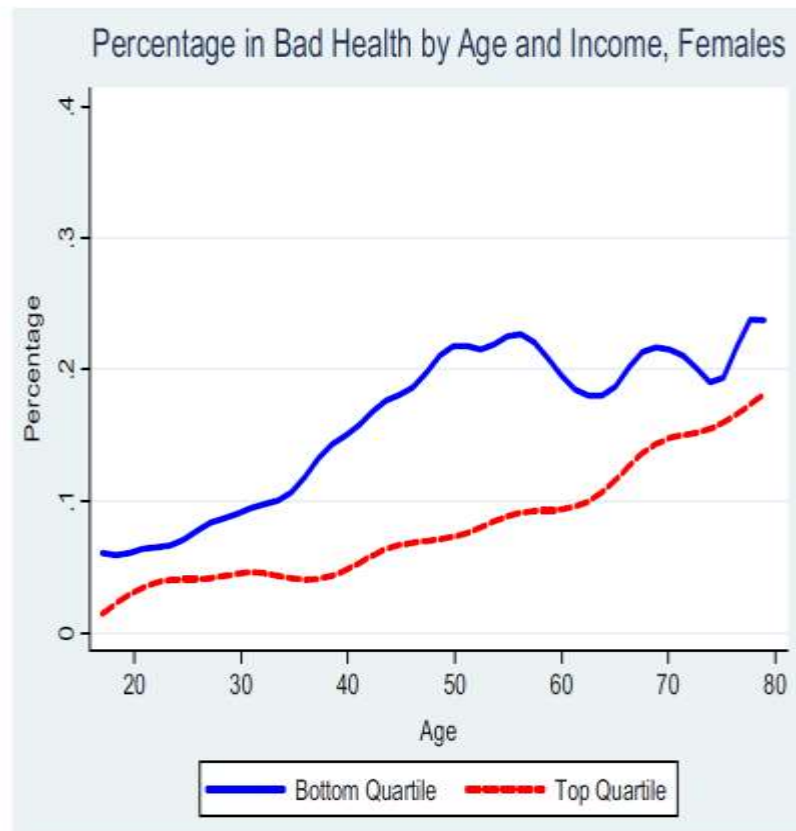
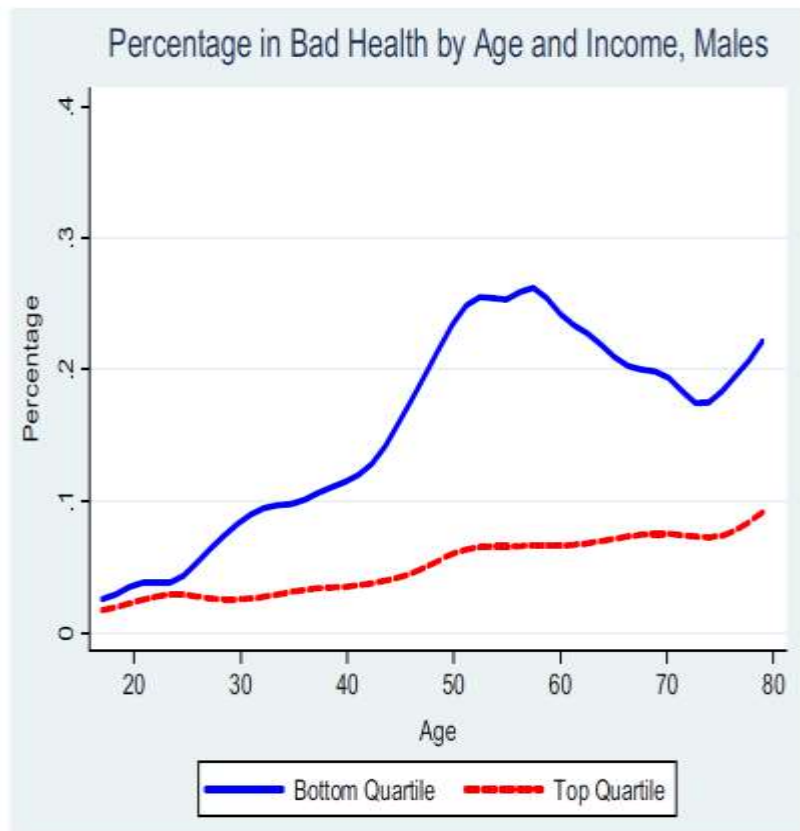


Pre-Hospitalization Mean = 91,336

How important is health impact on employment to understanding income gradient in health?

- Life cycle evolution of the gradient suggests it may be very important

Life cycle profile of income gradient in health, the Netherlands

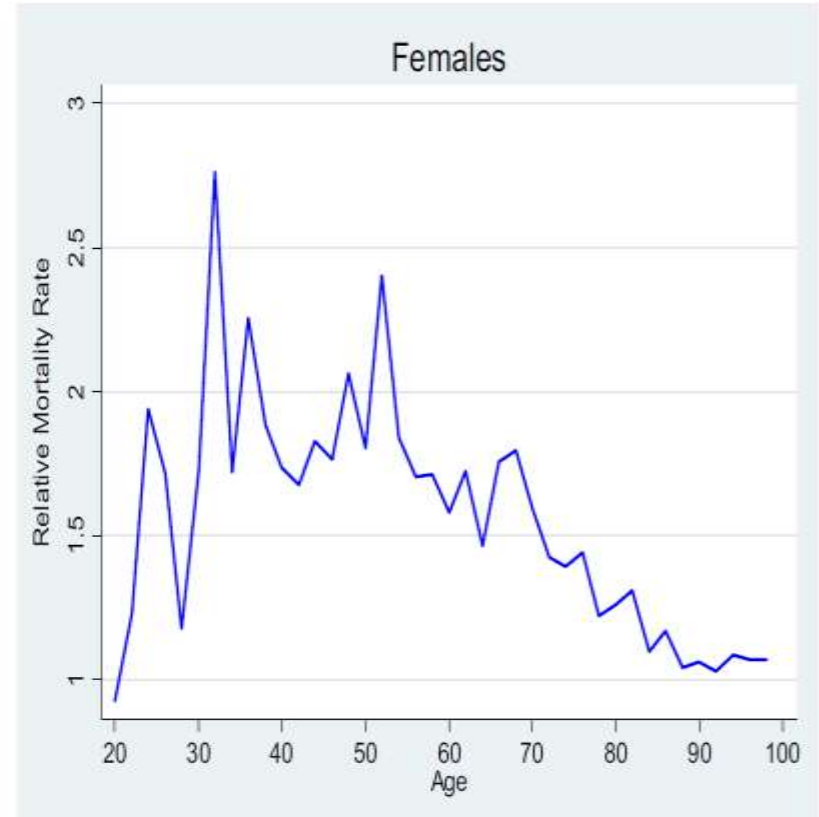
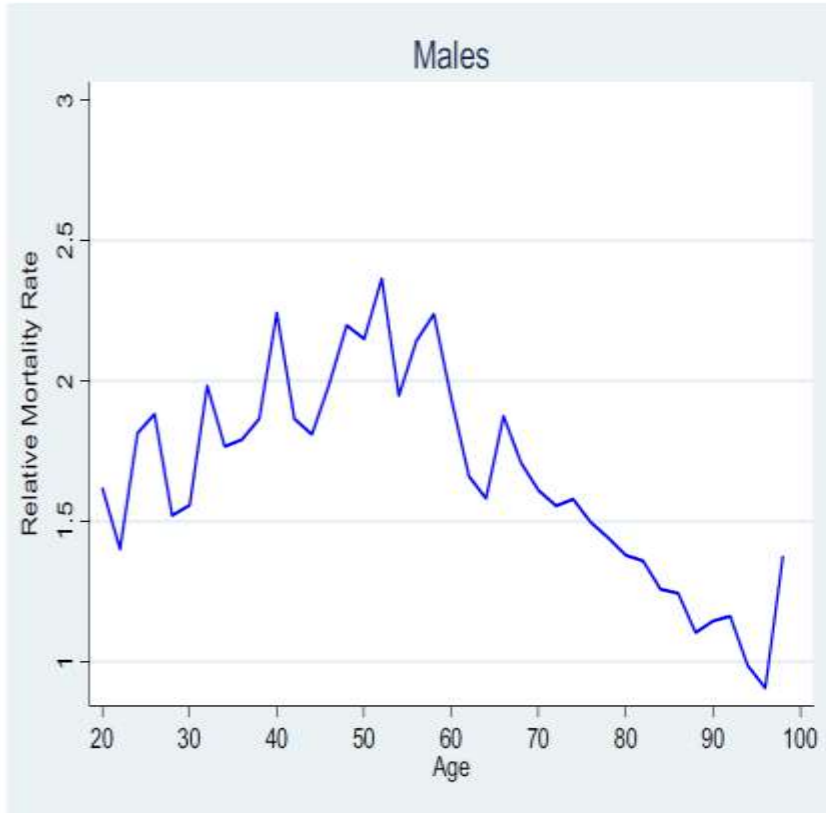


Source: van Kippersluis et al Social Science & Medicine 2010

- Similar pattern in other countries, e.g. US in Smith (2005)
- Correcting for cohort effects has little impact

Life cycle profile of income gradient in mortality, the Netherlands

Relative mortality rate

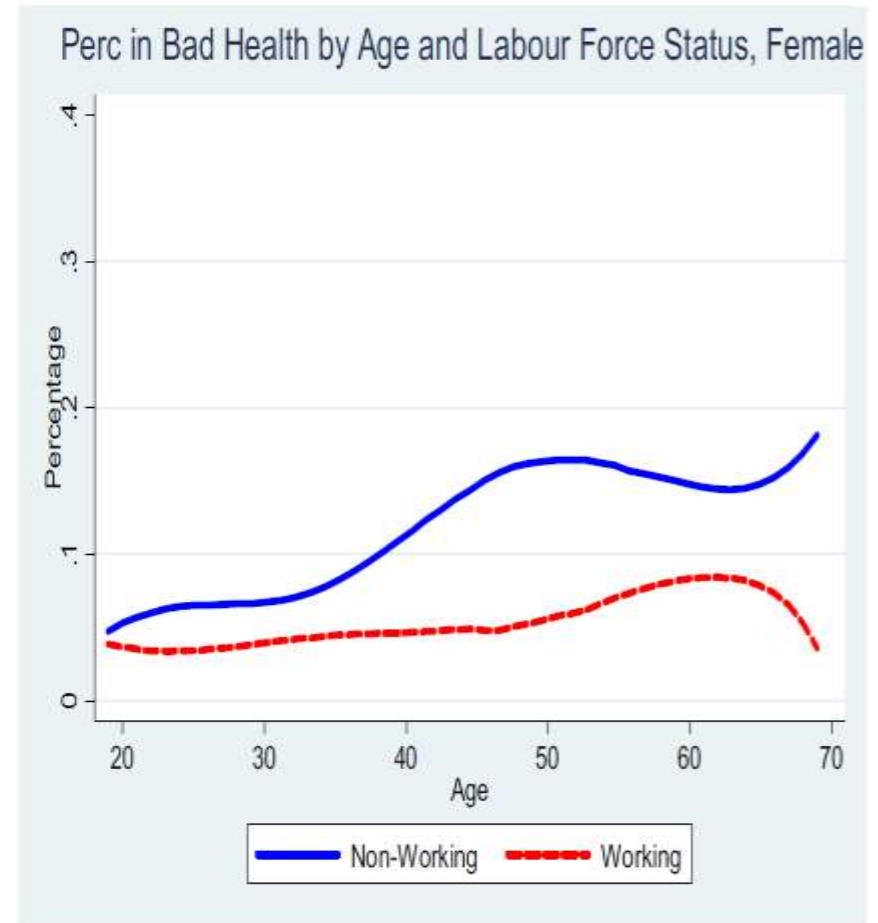
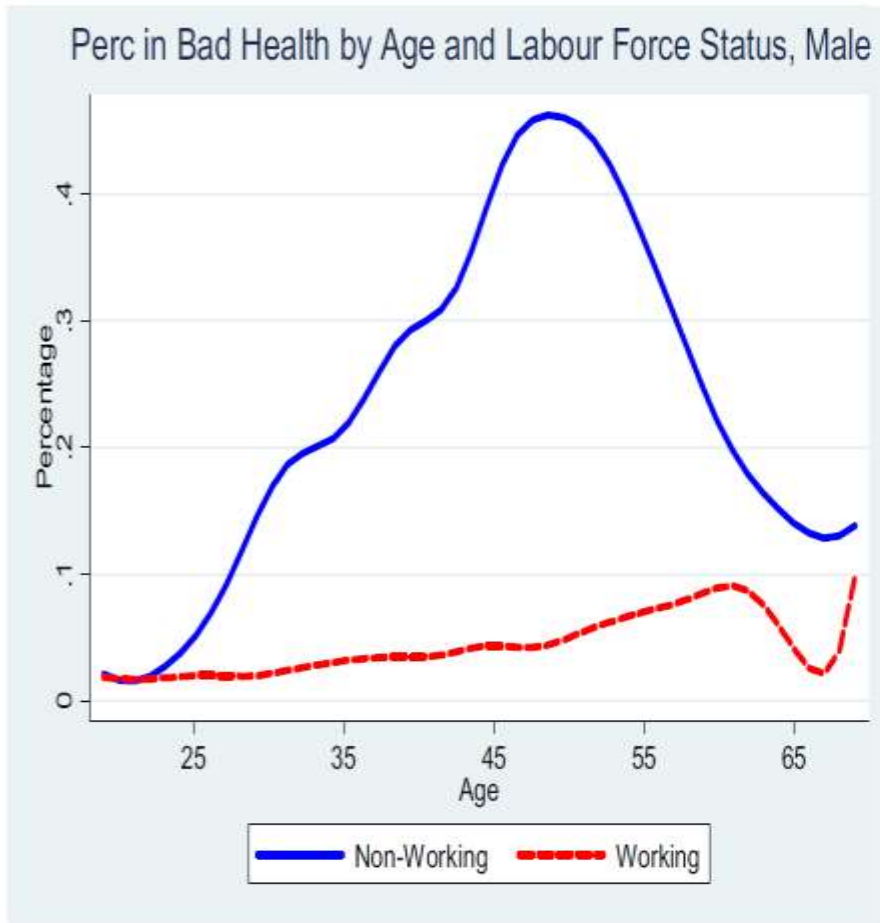


Source: van Kippersluis et al Social Science & Medicine 2010

- Mortality rate ratio of bottom over top income quartile

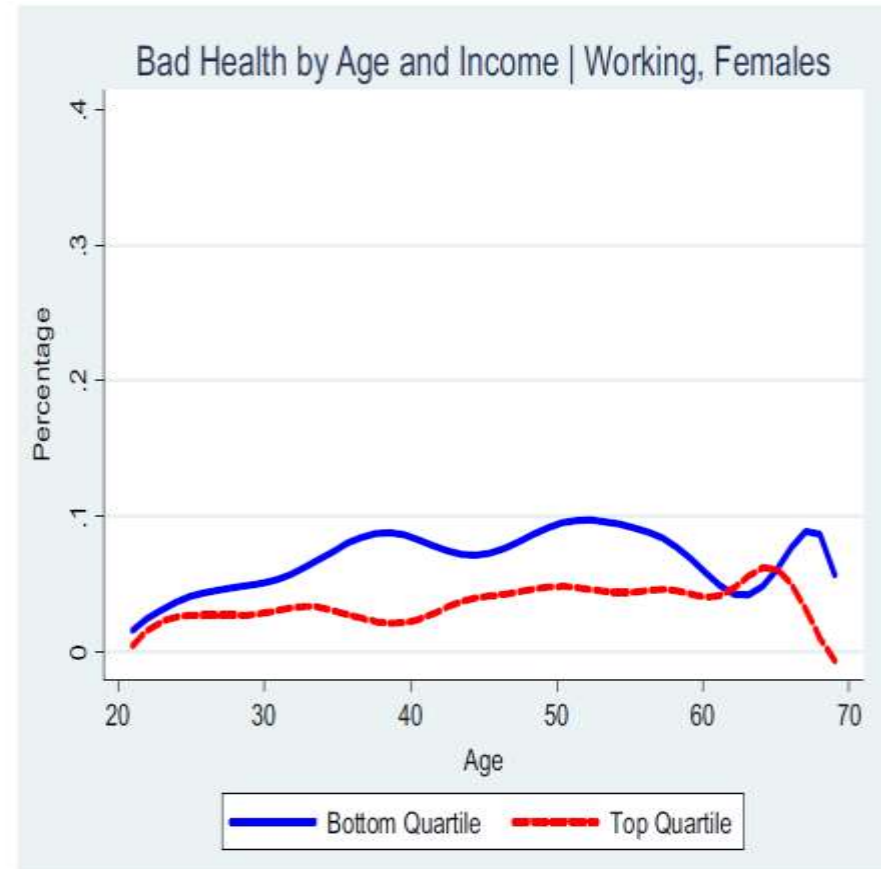
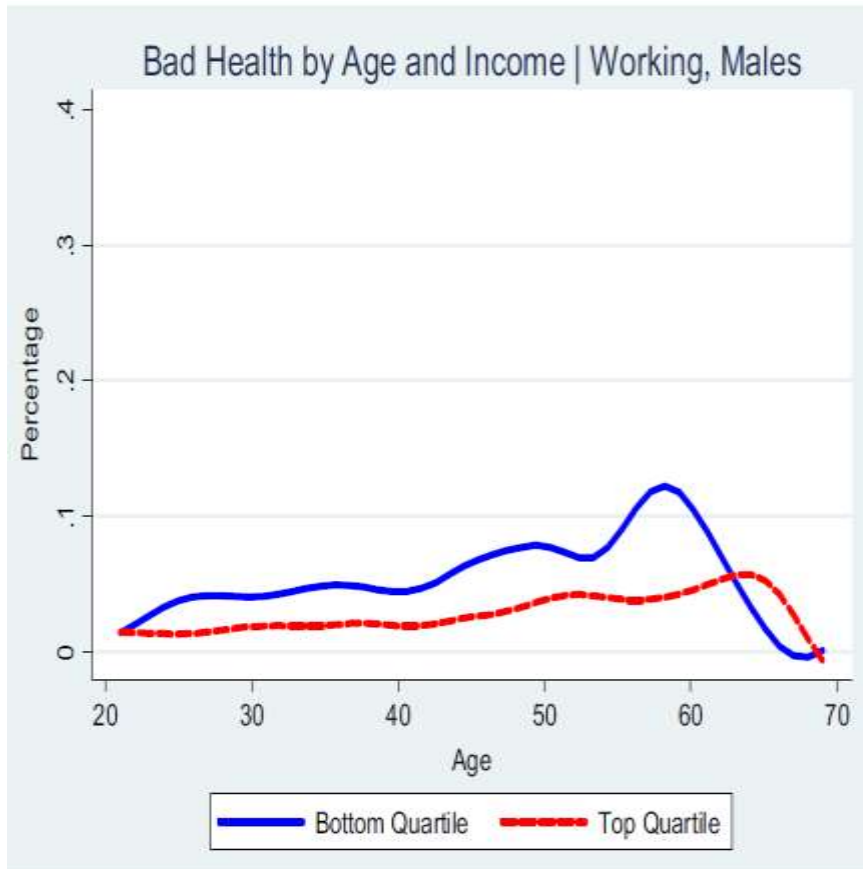
What explains this life cycle profile
of the gradient?

Life cycle profile of health by employment status, the Netherlands



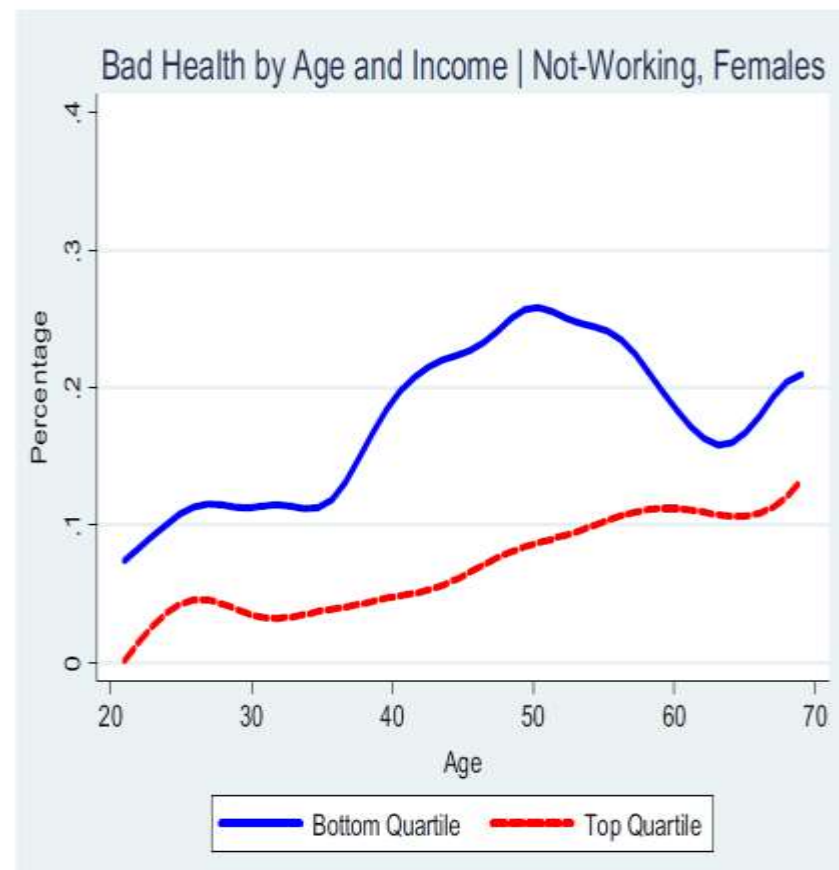
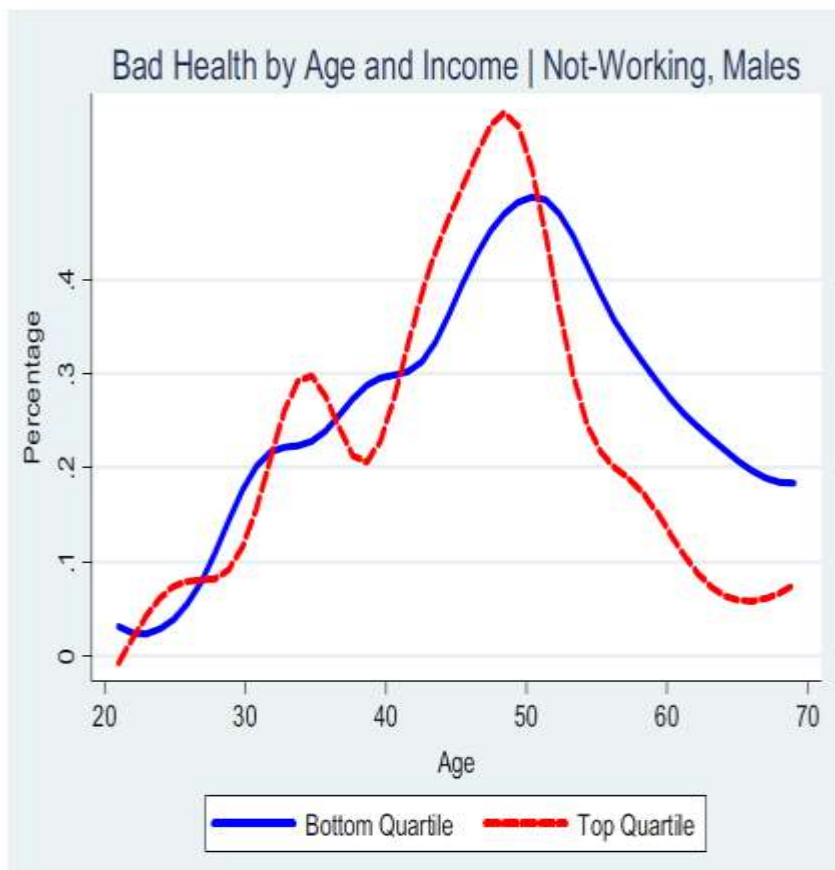
Source: van Kippersluis et al Social Science & Medicine 2010

Life cycle profile of income gradient in health for workers, the Netherlands



Source: van Kippersluis et al Social Science & Medicine 2010

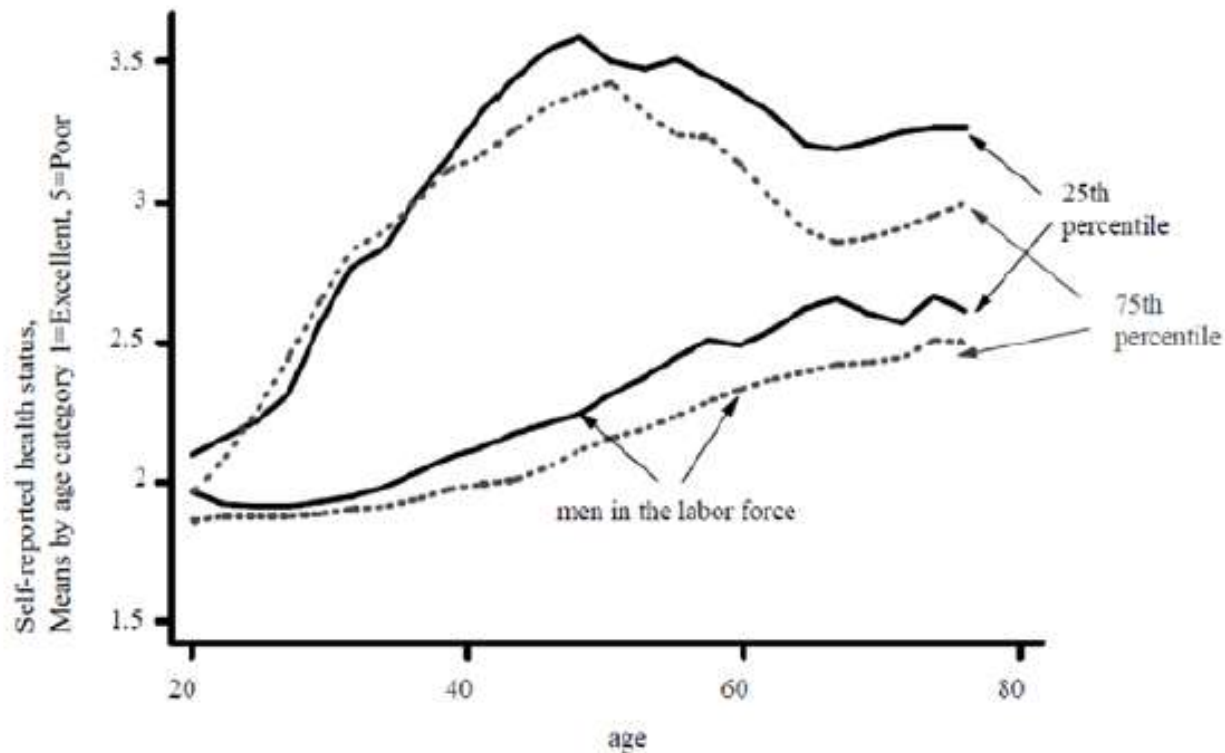
Life cycle profile of income gradient in health for non-workers, the Netherlands



Source: van Kippersluis et al Social Science & Medicine 2010

Also in US, health varies mostly with employment and this drives life cycle profile of income gradient in health

Figure 4: Self-reported health by age at the 25th and 75th income percentile of the income distribution by labor-force status, US Men



Source: Case and Deaton (2005) calculated from NHIS 1986-2001.

Contribution of health → employment to income gradient in health

- As folks age, some suffer ill-health → lose employment → lose income
- Given much of variation in health is in middle-age, this probably makes sizeable contribution to income gradient in health
- After middle-age, non-health reasons for labour force withdrawal dominate → gradient flattens
- Health selection needs to be taken very seriously
- But who experiences the loss of health?