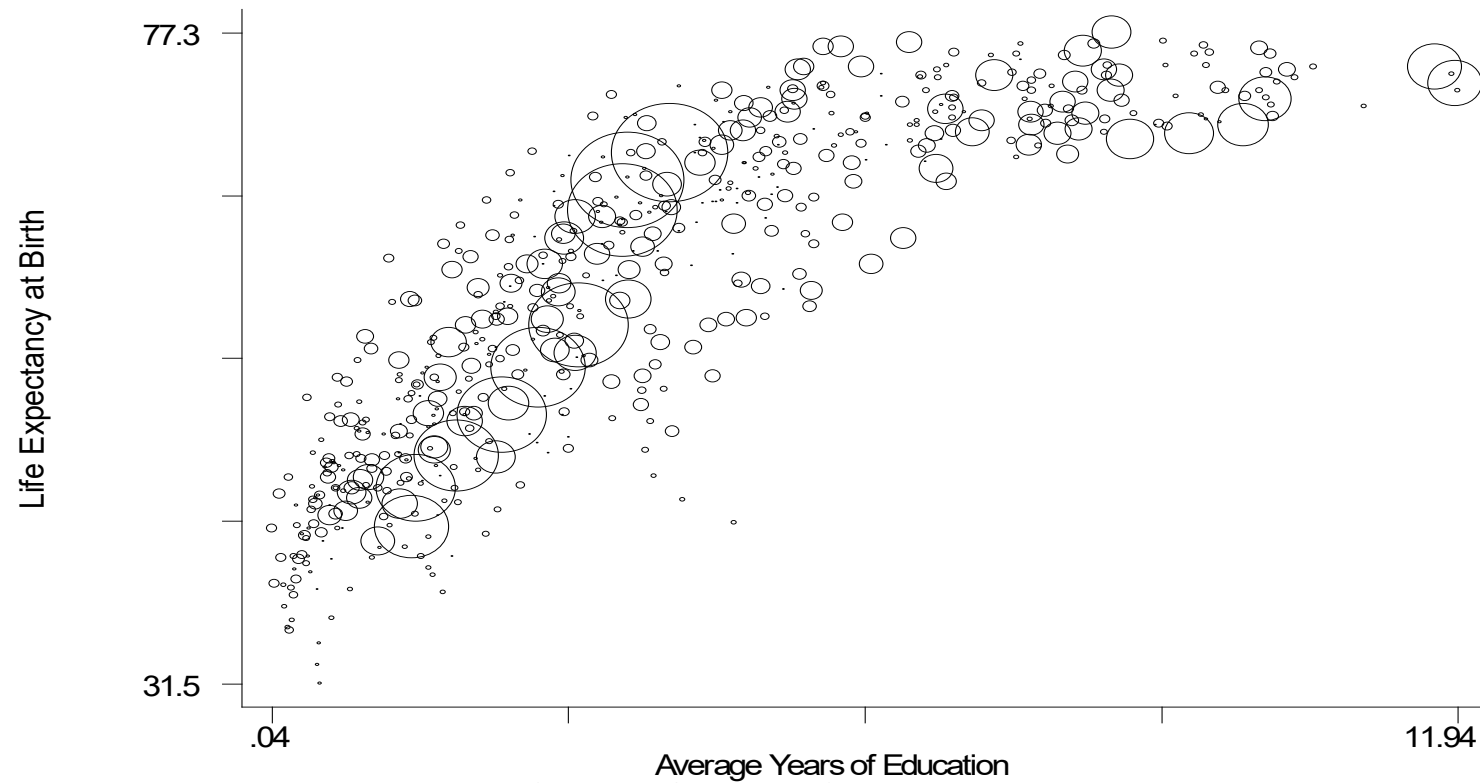


The effect of Education on Health and Mortality: An Overview

ADRIANA LLERAS-MUNEY

Education and life expectancy across countries

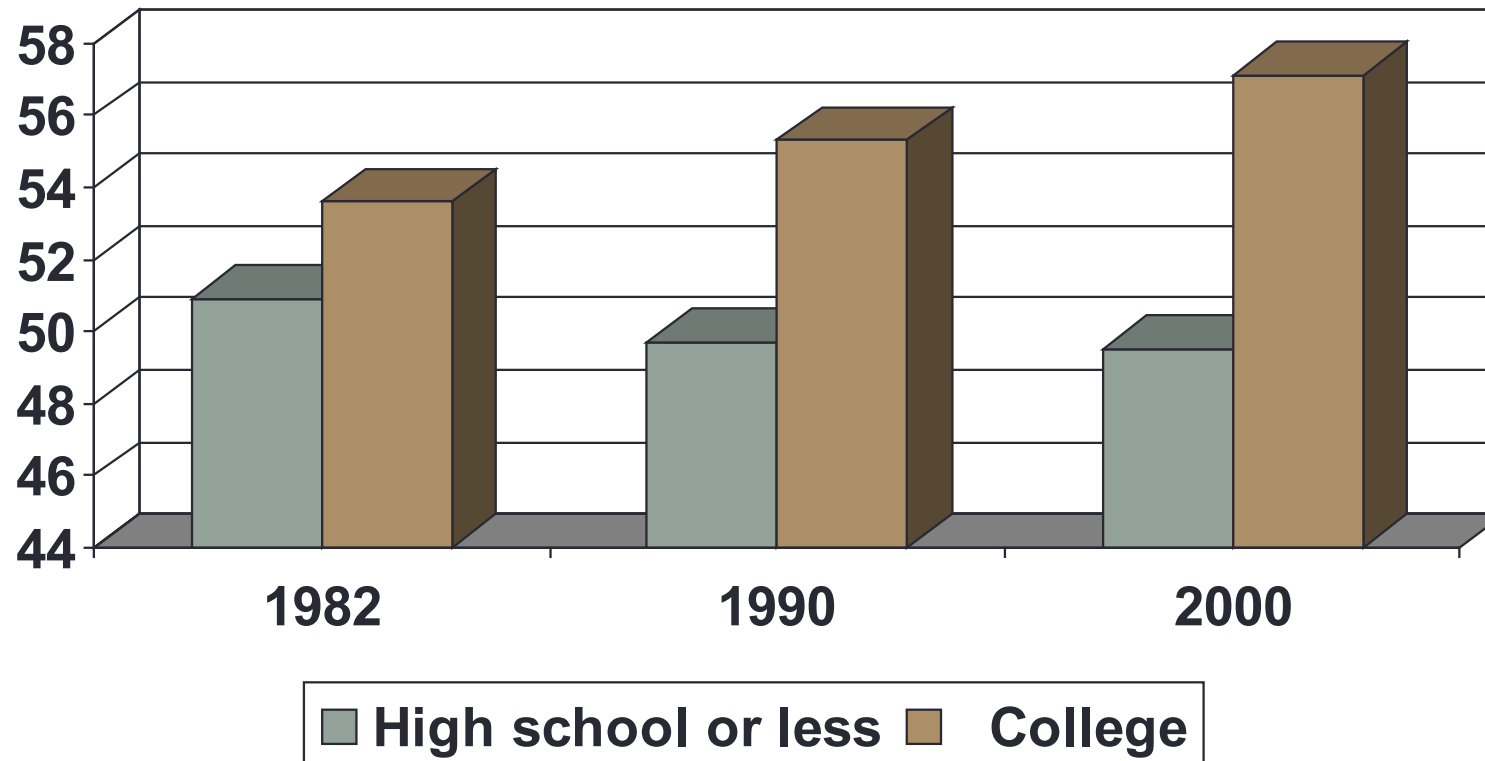
Cutler and Lleras-Muney (2008)



Preston Education Curves for 138 Countries, 1960-1985

Large and growing education gaps in life expectancy in developed countries: US case

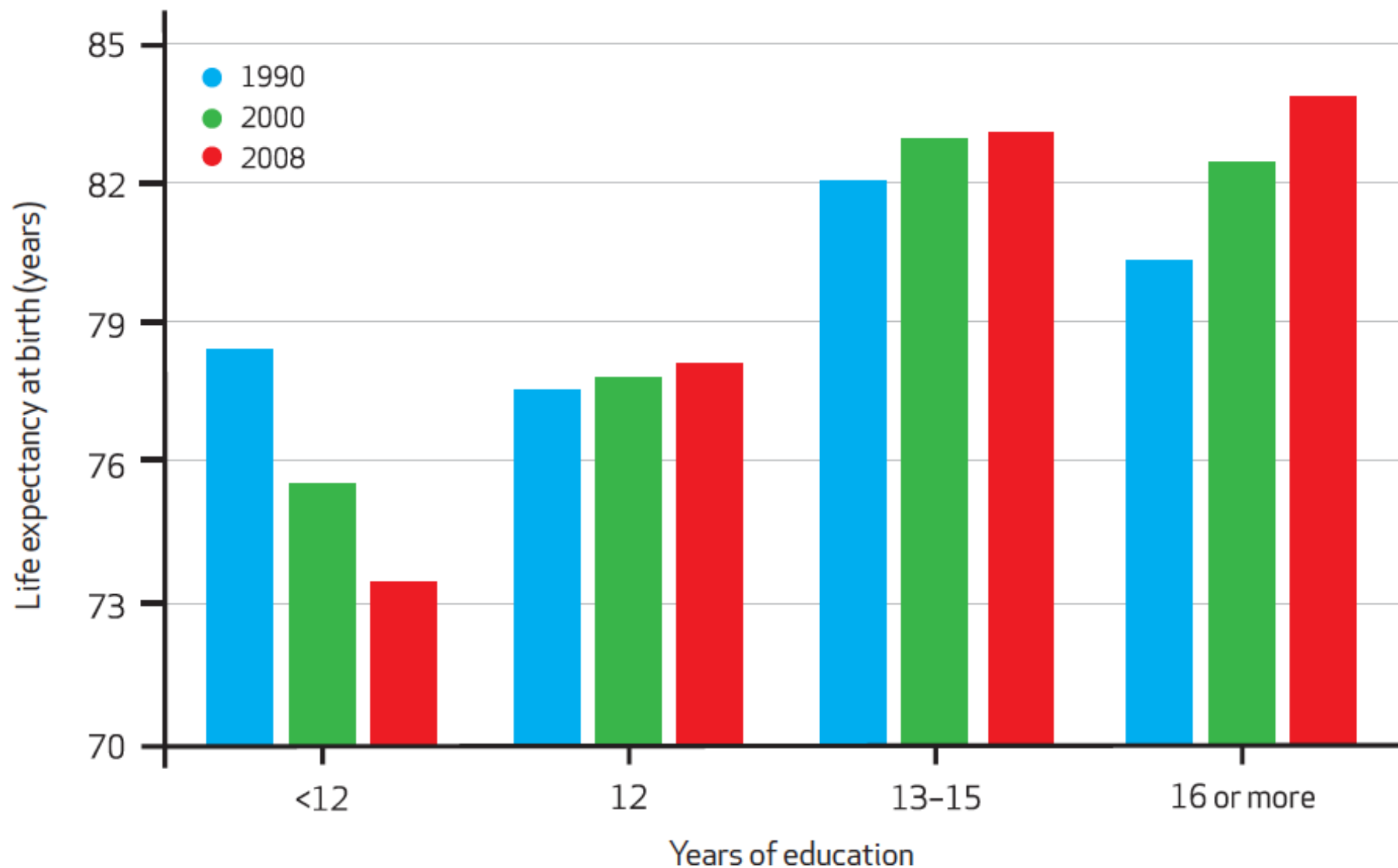
Life Expectancy at Age 25, by Education



(Cutler et al. 2008)

EXHIBIT 2

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



Olshansky, S. Jay,
et al. (2012)

Why would education lead to better health?

Proximate causes:

- Better environments
- Better behaviors
- Better access to care

Deep causes: education changes

- Information, attitude towards science
- Personality (conscientiousness, patience)
- Resources (income, health insurance)
- Social networks (spouse, friends)

Education is a marker for higher SES.

- More SES better position to gain advantage of any dimension that improves health (fundamental causes of health, Link and Phelan).

Why is the association between education and health so strong?

Economics approach in last 20 years

1. **Is there a causal effect of education on health and longevity?** There are many plausible alternative hypothesis.
 - Health -> education: 1. better bodies, better cognition, 2. long life, longer investments
 - Genes (IQ, health), parental SES (income, education), personality (conscientiousness, patience), environment (pollution, food), might determine both.
2. **What are the mechanisms?**
 - Key to further establishing causality
 - Useful for policy design: e.g. if education -> \$ -> longevity, give people \$!

Why is economics approach different?

1. Separate elements of SES: education vs income vs occupation vs...
 - Each has potentially different effects
 - Each is “produced” differently and can be affected by different policy tools: Do we send people to school? Give them money?
2. Establish causal effects: Key to informing policy
 - Make use of experiments or “natural experiments” credibly ruling out alternative hypothesis

Causal effects of schooling

Two decades of research

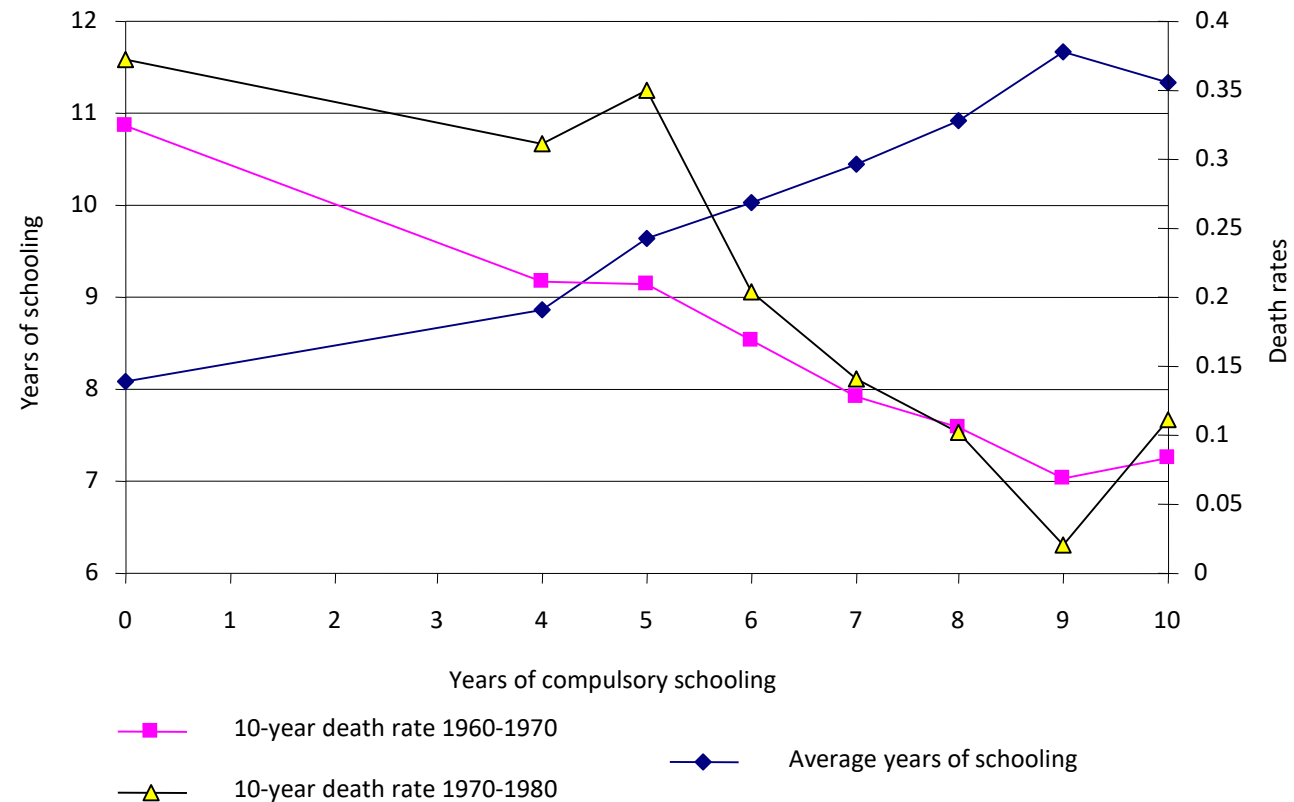
Does education improve health?

- YES: Lleras-Muney (2005)
- NO: Clark and Royer (2013)
- A very large number of other papers also using compulsory schooling with estimates in between
 - One exception: study looks at effect of college on mortality using Vietnam as experiment. Finds college education lowers mortality in the US.

Why results so disparate? What have we learned, how do we move forward?

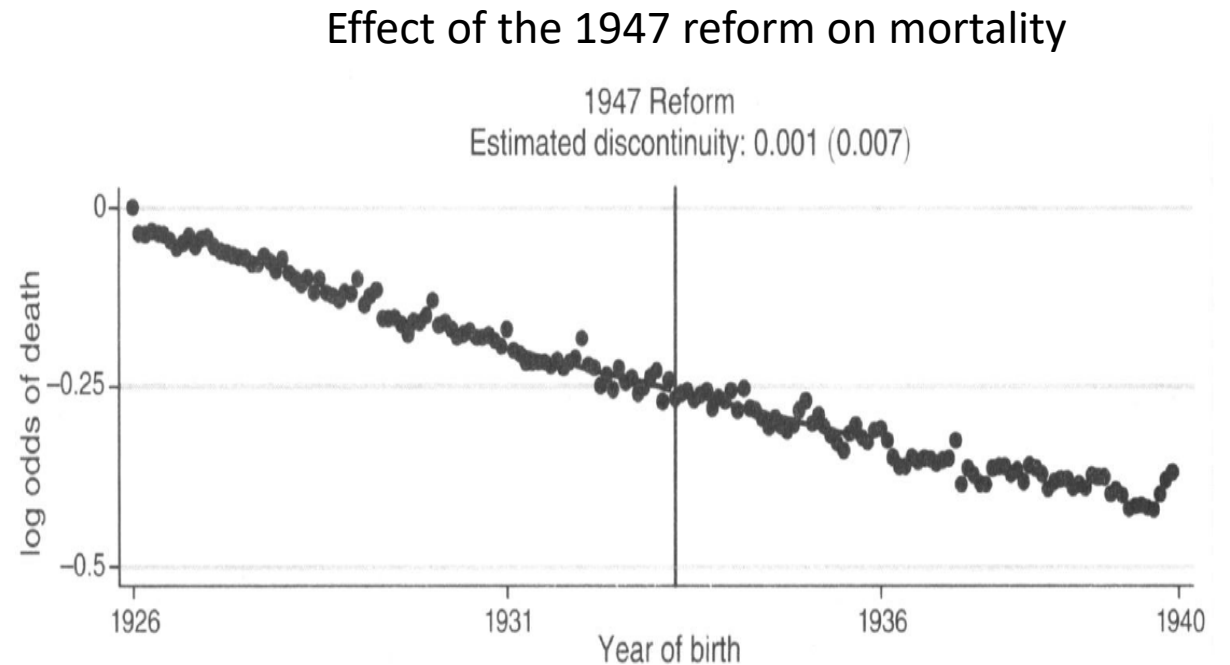
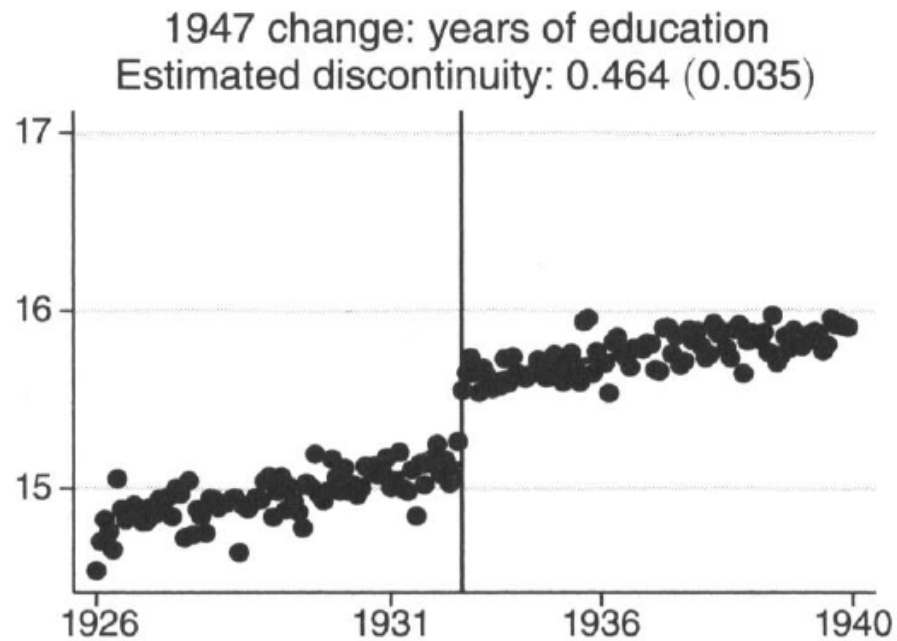
Effect of compulsory schooling on mortality: more education leads to longer life in the US

White cohorts born 1901-1925 US (Lleras-Muney 2005)



1 more year of CSL
*1/20 individuals went
to school for one more
year
*increased longevity 1+
years

And in the UK: Large effects on education but no effect on mortality!



Clark and Royer (2013)

Galama, van Kippersluis and Lleras-Muney 2018

Review all quasi-experimental studies published since 2005 investigating effect of education on mortality, smoking and obesity

- These outcomes are known to be bad

Focused on studies with experimental or quasi experimental approaches

- RCTs (mostly early childhood education)
- Twins
- Compulsory schooling and other education policies

Findings

- In general find education lowers mortality & smoking rates, evidence for obesity is mixed
- Omitted variable bias is different for different measures of health
- Large variation across countries & time periods some estimates being 0 and some showing education is *increases* mortality
- Larger effects for men than women
- Larger effects for older cohorts & poorer countries (though not lower education)
- Large effects when labor market returns are higher and when peers are affected

Some well understood issues with CSL studies

1. Lack of precision: estimates are noisy, effects could be much larger or smaller
2. Range of education is limited, usually reforms affect bottom of distribution and only move education by at most 1 year
3. There are technical details that matter a lot (eg do we control for state-level trends etc.)
4. The entire population is not affected. Who is and does that matter?
 - Only a subset of children are forced to go to school (only estimate local average treatment effect): will talk more about this.

Heterogeneity and mechanisms

What is “the” effect of education anyway?

Literature testing strong hypothesis that education either matters or not (always for all people in all circumstance)

Going beyond “the” effect of education: Extending basic model to include interactions

- When does it education matter? For whom?

Schooling could be bad for your health in some cases

Educated might engage in behaviors that could harm their health, if this is not known

1. **Occupation choices:** Sit in a chair more, maybe subject to more stress. Barcellos et al (2018) find that UK reform increased BP, similar results for 1959 French reform (Courtin et al. 2019) which also led to worse BP and inflammatory markers.
2. **Income effects:** More educated are richer. Rich individuals consume more stuff. Eg: HIV in Africa diffused first among rich and educated (who have more sex)
3. **Other unsuspected effects:** Using more contraceptives & having fewer kids. Educated women more likely to have reproductive system cancers.

Schooling could be protective because the alternatives are worst

Counterfactual matters: what do children do when they are not in school?

- Kline and Walters (2016) demonstrate this in the case of Head Start: benefit to children depends on what the alternative sources of care is.

“Incarceration effects”: when alternative to school is working in mine, or a dangerous occupation, being in a room with other kids is better, even if learn nothing.

- Early 20th century child labor was far more dangerous than mid century child labor.

Conversely if schools are bad, working could be much better!

- If teachers are bad or abusive (e.g. catholic priest scandals), education will be bad for children. And forcing children to attend school is bad for their health and well-being.

Teacher quality likely matters: its not just the years in school but the content

Pink Floyd, *The Wall*

“We don't need no education
We don't need no thought control
No dark sarcasm in the classroom
Teachers leave them kids alone
Hey! Teachers! Leave them kids alone!
All in all it's just another brick in the wall.
All in all you're just another brick in the wall.”

Quality of education: what did you learn in school? Time in school is not the same as education

- Teacher quality matters: Chetty et al. long term effects of better teachers. **We should expect similar results for health & longevity. Would be worth investigating.**
- **Many education reforms (expansions) are associated with *lower* quality of school, many did not increase cognitive skills** (eg Germany post WWI study Pischke and Von Wachter 2008)

Role of compulsion

What can we learn about the effect of voluntarily attending school from observing the effect of *forcing* individuals to attend schools?

- Who is forced, children or parents? Why do they need to be forced?
- How is the mandate enforced? (is it enforced? By whom, what are the penalties?)
- If eg Blacks don't go to school because they are abused and they have low returns to school in labor market, forcing them will make matters worse not better!

Are CSL a good experiment?

- Voluntary versus involuntary education
- Treatment effects vary endogenously because of individual responses to treatment: if the treatment is seen as good individuals make complementary investments. (pay attention in class)
- **In the absence of market failures->returns to CSL should be negative!**

Can help explain heterogeneity across contexts. But also raises the question: what is the ideal experiment? Maybe CSL is not.

Other social policy matters: There were other policies that were likely complementary in US

CSLs part of larger expansion in education in the US which raised many education inputs

- School construction/expansion
- Improvement in the quality of teachers measured by teacher salaries
- Increase in education expenditures
- More systematic data collection

Greater female empowerment after voting laws

- Rise in female organizations and women's vote
- Associated with shift towards investment in children's expenditures in terms of maternal and infant health programs
- Prohibition efforts to prevent excessive alcohol drinking

Public health interventions

Social policy: rise of welfare state (old age pensions, mother's pensions, Worker's Comp, UI)

Early HK formation programs matter for very disadvantaged populations: Perry School program

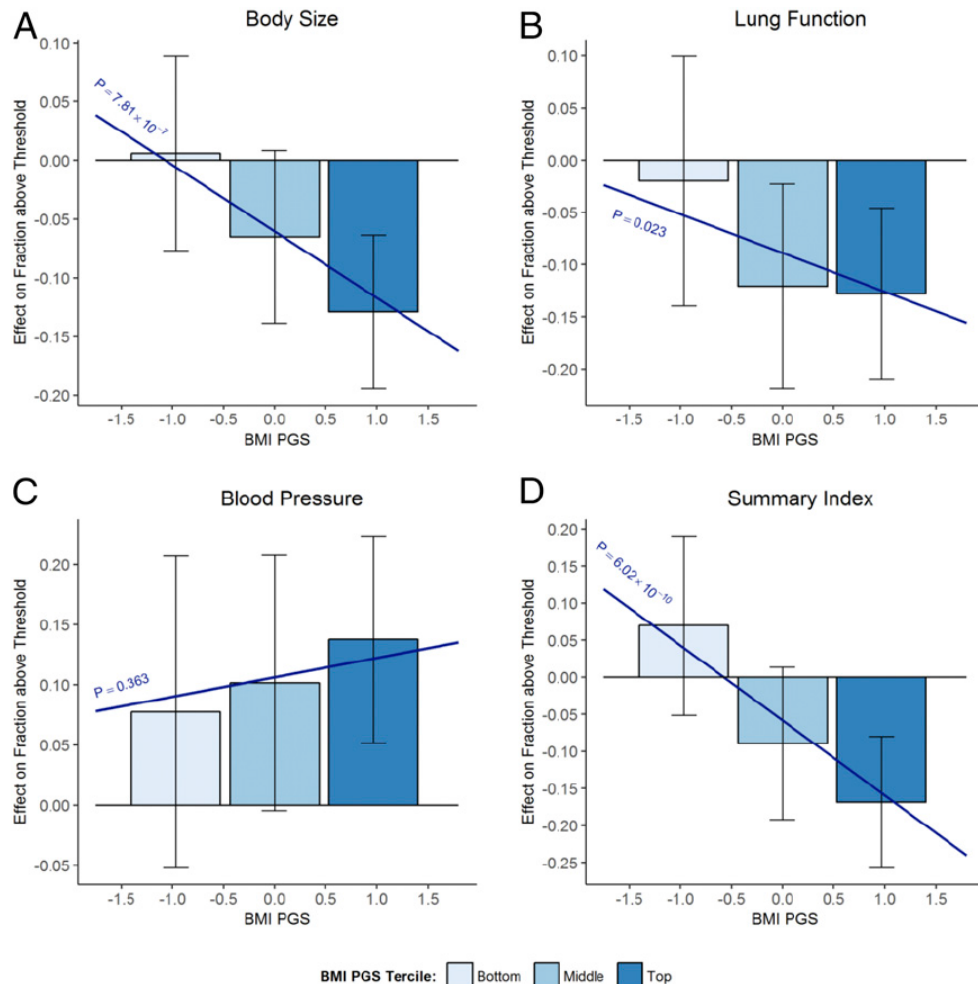
TABLE 1—PROGRAM TREATMENT EFFECTS

Variable	Treatment effect			Control group		Treatment group	
	Effect	Effect size	p-value	Mean	Standard error	Mean	Standard error
<i>Panel A. Males</i>							
CAT total at age 14, end of grade 8	0.566*	0.652	(0.060)	0.000	(0.164)	0.566	(0.204)
Number of misdemeanor arrests, age 27	−1.21**	−0.363	(0.036)	3.03	(0.533)	1.82	(0.445)
Number of felony arrests, age 27	−1.12	−0.324	(0.101)	2.33	(0.554)	1.21	(0.342)
Number of adult arrests (misd.+fel.), age 27	−2.33**	−0.402	(0.024)	5.36	(0.927)	3.03	(0.734)
Monthly income, age 27	0.876**	0.607	(0.018)	1.43	(0.231)	2.31	(0.352)
Use tobacco, age 27	−0.119*	−0.236	(0.093)	0.538	(0.081)	0.419	(0.090)
Number of misdemeanor arrests, age 40	−3.13**	−0.372	(0.039)	8.46	(1.348)	5.33	(1.042)
Number of felony arrests, age 40	−1.14*	−0.266	(0.092)	3.26	(0.684)	2.12	(0.598)
Number of adult arrests (misd.+fel.), age 40	−4.26**	−0.373	(0.041)	11.7	(1.831)	7.46	(1.515)
Number of lifetime arrests, age 40	−4.20*	−0.346	(0.053)	12.4	(1.945)	8.21	(1.778)
Employed, age 40	0.200**	0.394	(0.024)	0.500	(0.085)	0.700	(0.085)
Sample size	72			39		33	

Other studies find:

- larger effects of earlier interventions (v late)
- greater for low SES than high SES
- Greater for boys

Education matters only when you have a propensity to get sick: Barcellos et al. 2018



UK CSL reform lowered BMI only among those with genetic predisposition to high BMI

Similar for BP and Lung Function

Education matters only when there is information about how to improve health

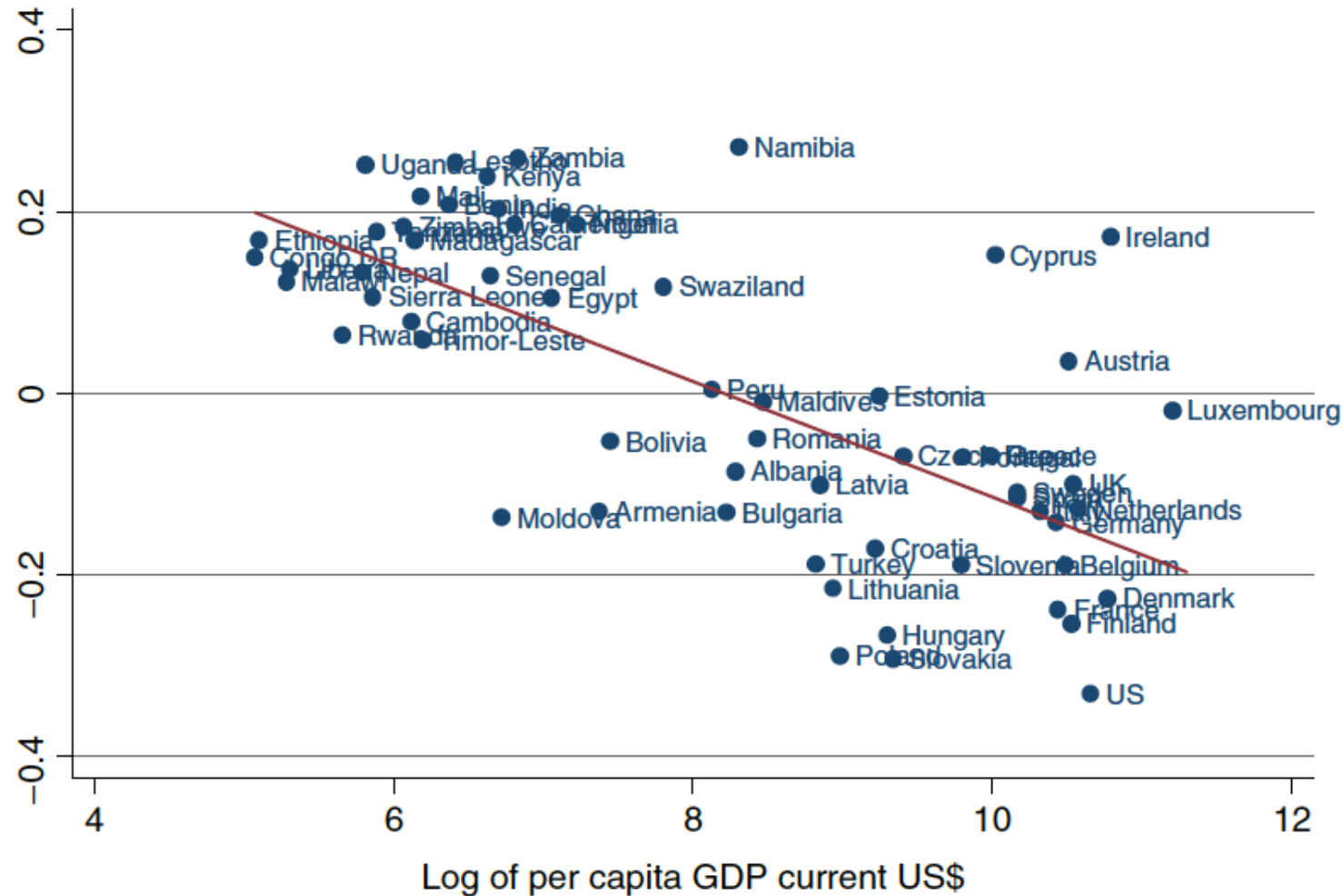
Table 1 The evolution of knowledge and smoking gradients in education in the US 1949–69

Year of survey:	1949	1954	1957	1969
<i>Panel A: Effect of education on knowledge</i>				
Dependent variable:	“Do you think cigarette smoking is harmful or not?” What is your opinion – do you think cigarette smoking is one of the causes of lung cancer, or not?			
Less than high school	0.057*	– 0.054*	– 0.065**	– 0.041
Some college	0.012	0.032	0.116**	0.045
College +	0.021	0.067	0.172**	0.111**
<i>Panel B: Effect of education on smoking</i>				
Dependent variable:	Current Smoker?			
Less than high school	– 0.056*	– 0.016	0.024	0.054*
Some college	0.019	– 0.026	– 0.008	0.011
College +	– 0.045	– 0.061	– 0.003	– 0.076*

All regressions are adjusted for age, sex, and race. Individuals with a high-school degree only are the reference group.

Note: *, significant at the 10%; **, at the 5%.

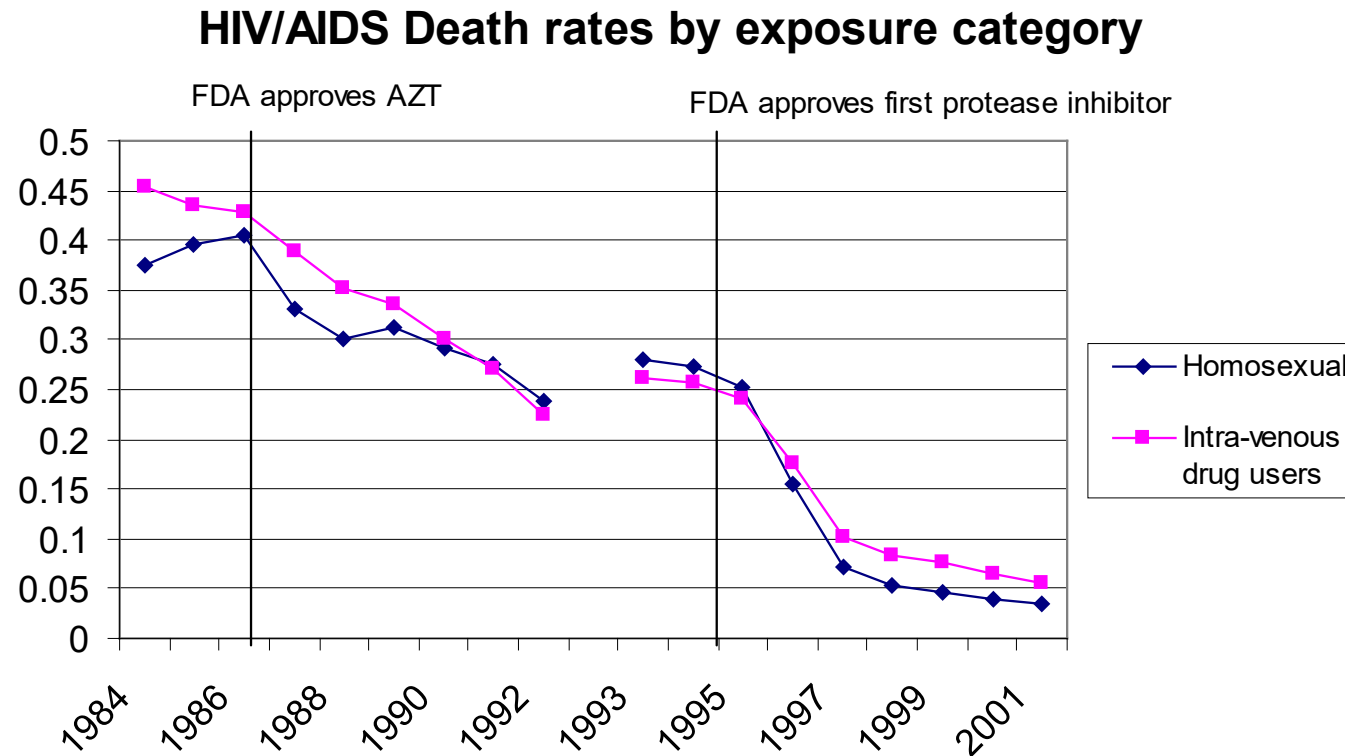
Context matters: Education and BMI around the world, what's good for you changes over time and space



From Cutler and Lleras-Muney (2014)

Education matters if there are technologies that improve health: More educated use newer drugs first

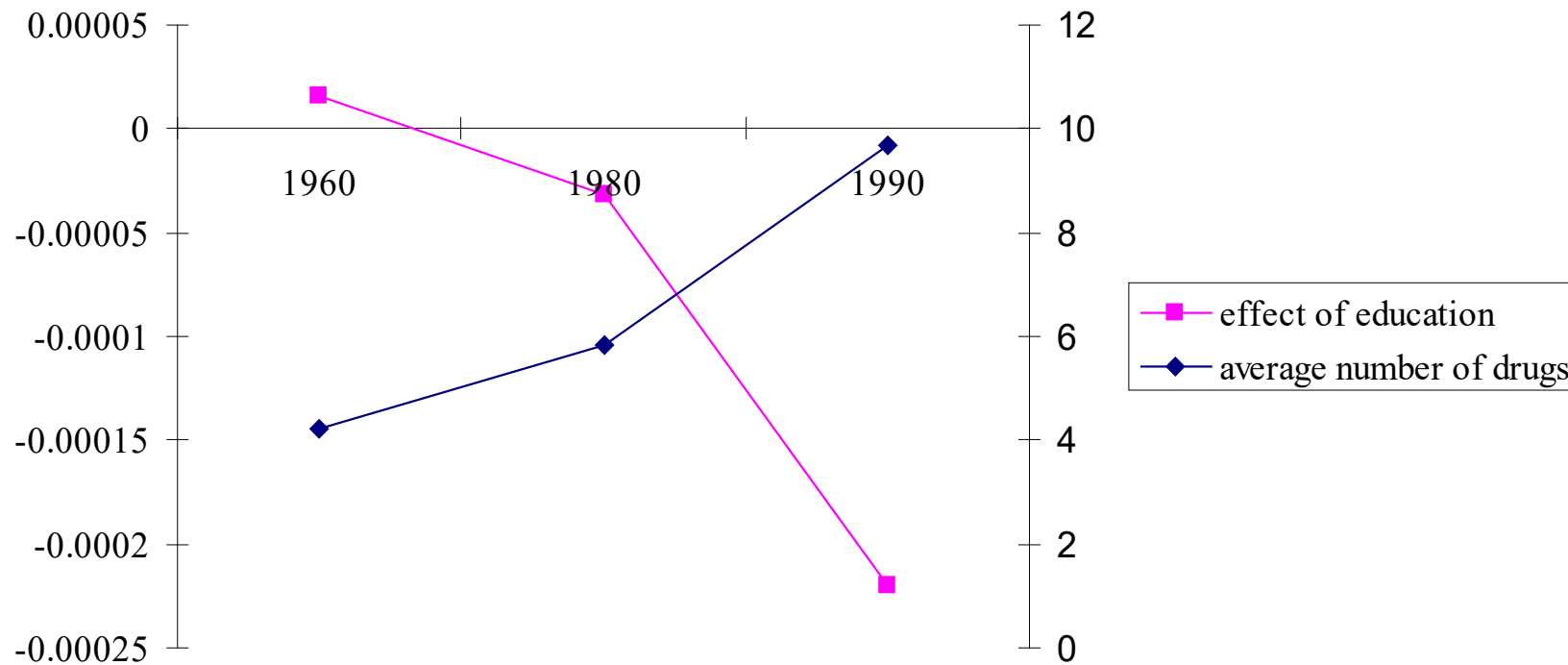
(Lichtenberg and Lleras-Muney 2005)



Education advantage greater when there is more medical innovation to affect health

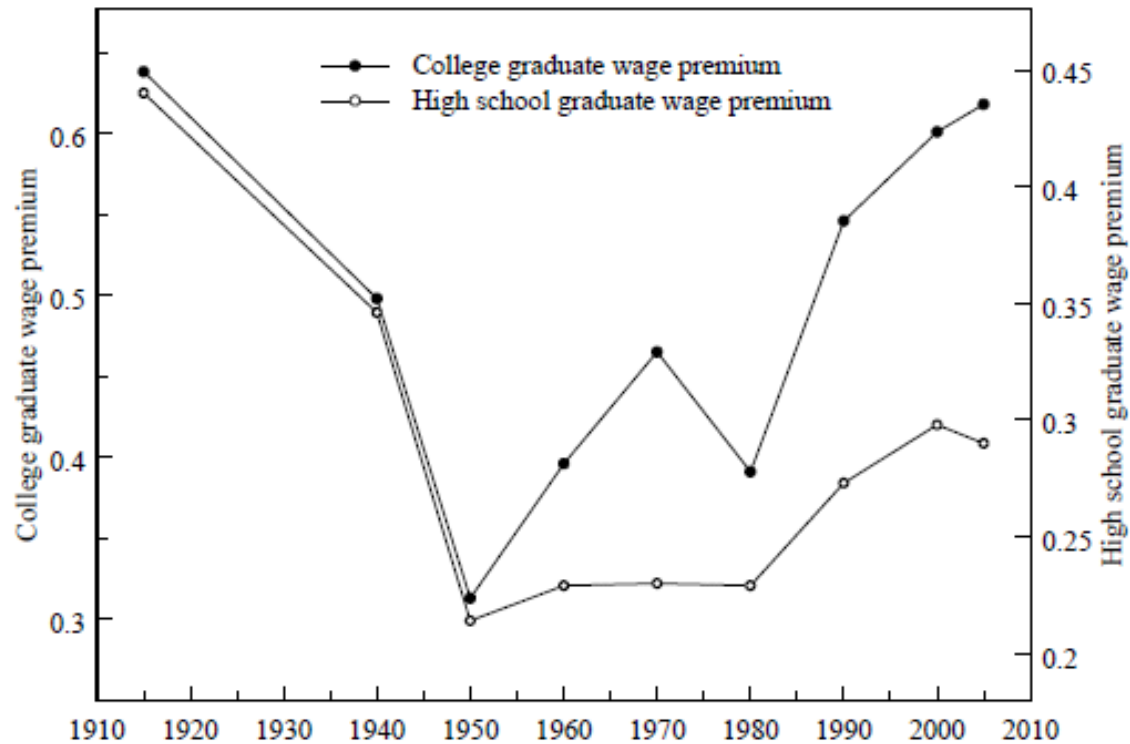
(Glied and Lleras-Muney 2008)

Graph 1a: Education gradients and number of drugs for Cardiovascular mortality, 1960-1990



Would matter more in the US because access to care more unequal...

Education matters more when it is associated with greater incomes: in 1920 and today but not e.g. in 1950!



Returns to CSL on wages low in many of the experiments used to investigate longevity effects

(UK 1947 3-4%, Sweden 2%, US 8%)

Maybe that is why so many people were dropping out at exactly the CS age!

Education matters more in bad times: evidence from Europe

Table 2: Education, Unemployment Rate and Outcomes in Eurobarometer

Dependent variables	(1) Income Quartile (1: highest - 4: lowest)	(2) General Poor Health (Yes = 1)	(3) Life dissatisfaction (Yes = 1)	(4) Obesity (Yes = 1)	(5) Smoker (Yes = 1)	(6) Daily drinker (Yes = 1)
<i>Panel A. Mean Unemployment Rate around year of graduation (3 years)</i>						
UR when graduating (3 years average)	1.313** (0.372) [0.727]	0.052 (0.134) [0.184]	0.122* (0.072) [0.078]	0.089 (0.128) [0.156]	0.411** (0.120) [0.156]	0.203* (0.123) [0.103]
(Education - 9) * UR	-0.102* (0.053) [0.120]	-0.033** (0.016) [0.018]	-0.047** (0.010) [0.015]	-0.047** (0.019) [0.013]	-0.041** (0.017) [0.030]	-0.028 (0.018) [0.014]
Observations	50,590	28,440	87,450	17,734	48,367	19,656
R-squared	0.259	0.062	0.169	0.036	0.073	0.065

Taken from Cutler et al. (2014)

Peer groups matter

Strong peer effects in risk behaviors:

- Jensen and Lleras-Muney (2014) find that an RCT that gave information about returns to school increased school, lowered smoking and alcohol drinking among adolescents. 2 mechanisms: lower earnings when in school and fewer friends that smoke.
- UK reforms: when everyone is forced to be in school one more year: peers do not change!

Hoxby: sorting on observables into college has dramatically increased in the US.

- growing returns to education and greater sorting might explain increasing disparities.

In Sum: Not all education matters

Returns to other investments/environments might be larger

- Sports v math

Timing of investment matters: “critical windows”

Returns to education on lifetime health depend on

- How strongly education effects income, cognition, social skills
- The extent to which these have health returns (does access matter, is income effect on cons of bad stuff large, etc)
- Several “shocks” (information, Labor market conditions, etc) likely to interact with education

Unknown factors

- Fertility education and cancer: more education lowers fertility and increases cancer risks

Women

Appear less sensitive than men in many dimensions – unclear why this is so.

- Women live longer than men despite lower average SES
- Several recent studies find worse conditions affect men more, interventions help men more.

Different labor market experience & subject to important changes in social norms (eg smoking, drinking)

Women are different?

- Marriage affects their SES. but marriage has deleterious effects on women's (but not men's) health...
- Social networks of women are different

The importance of dynamics

WHEN ARE EFFECTS MEASURED?

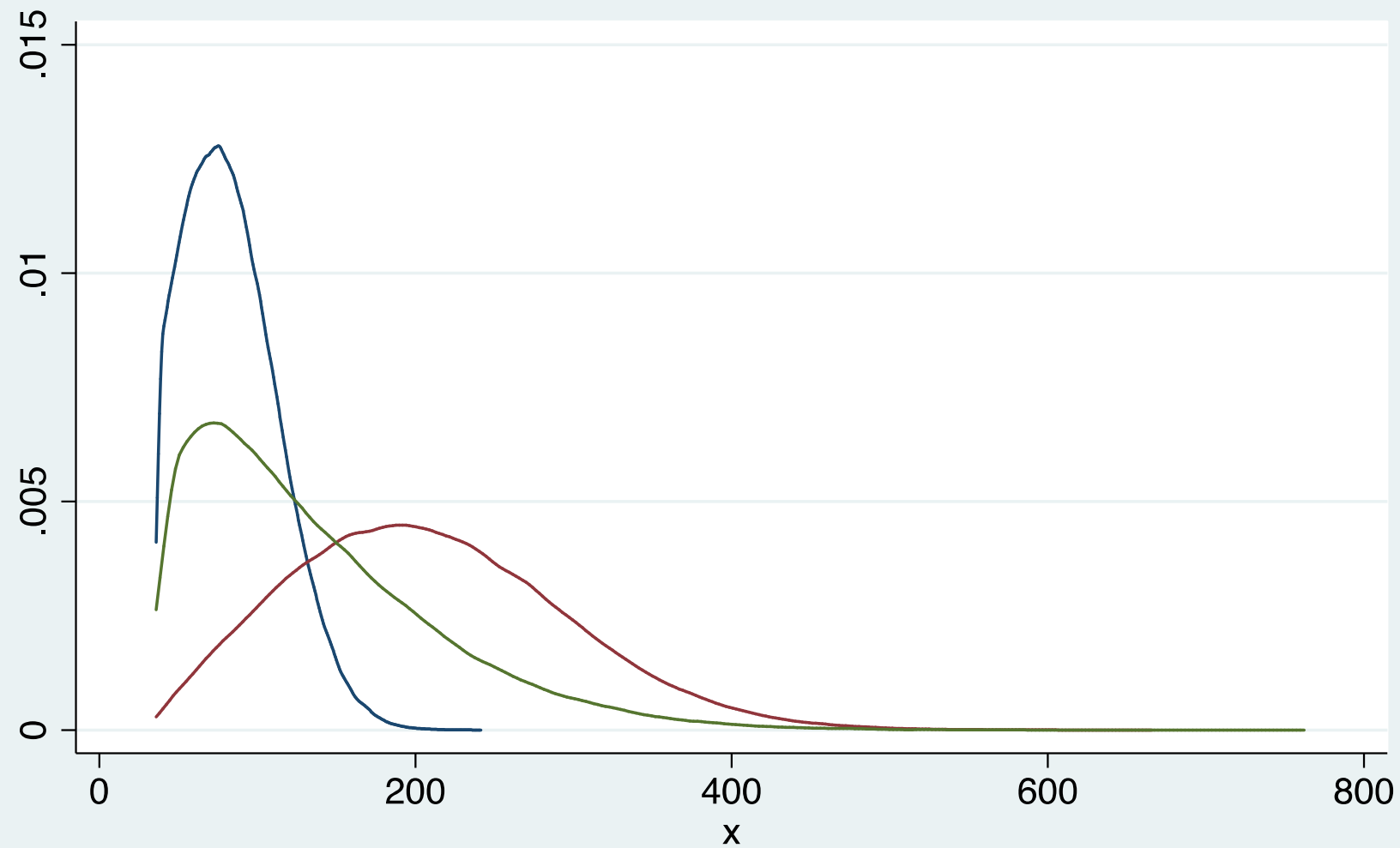
Predictions from a simple model of health and mortality

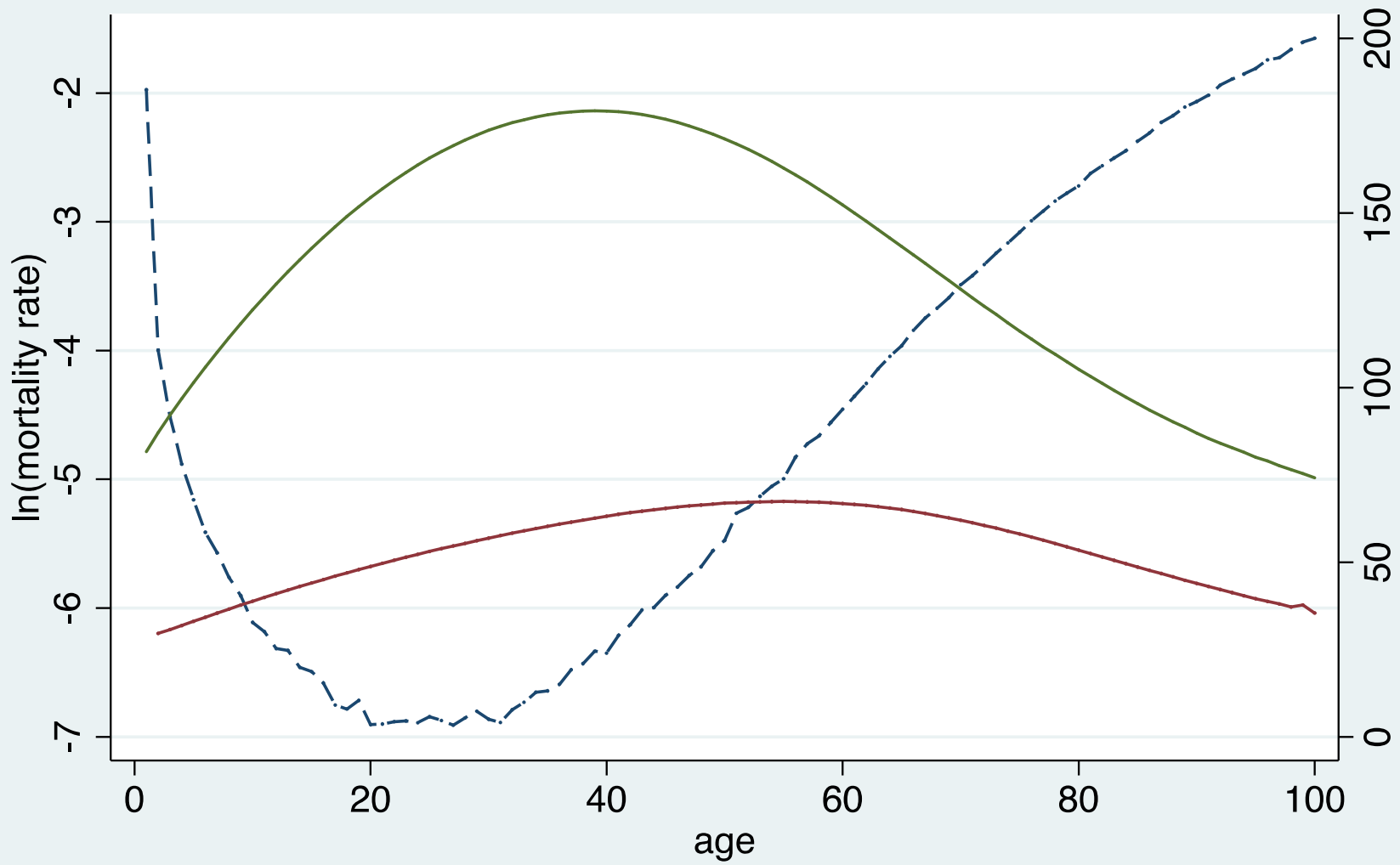
Take the simplest model of health and mortality (from Lleras-Muney and Moreau 2019): what is the implied evolution of SES gradients?

$$H_0 \sim N(\mu_H, \sigma_H^2)$$

$$H_t = H_{t-1} - \delta t^\alpha + I + \varepsilon_t \quad \varepsilon_t \sim i.i.d. N(0, \sigma_\varepsilon^2)$$

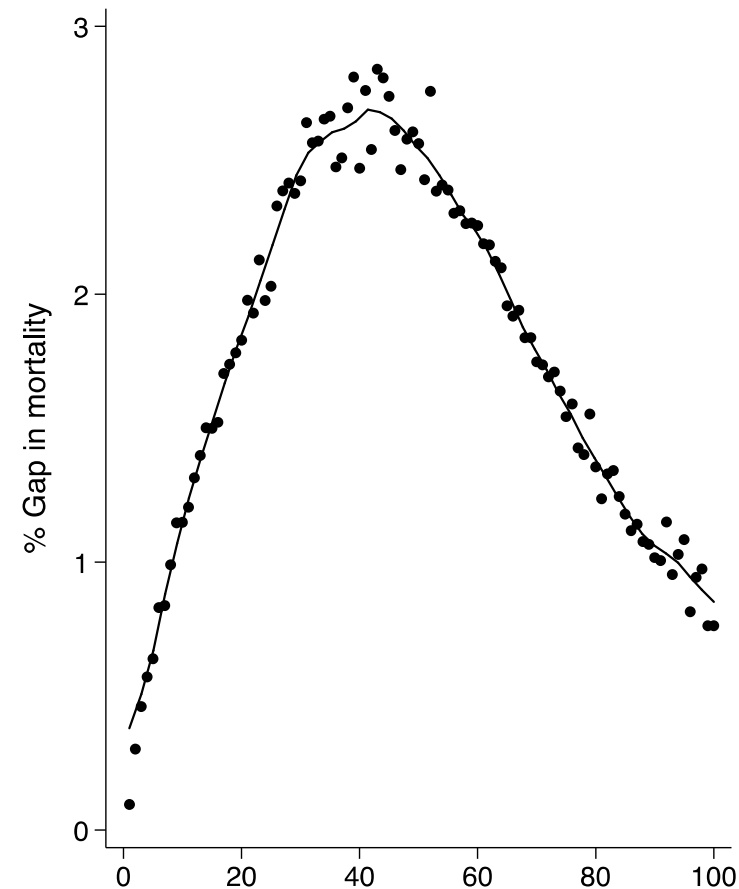
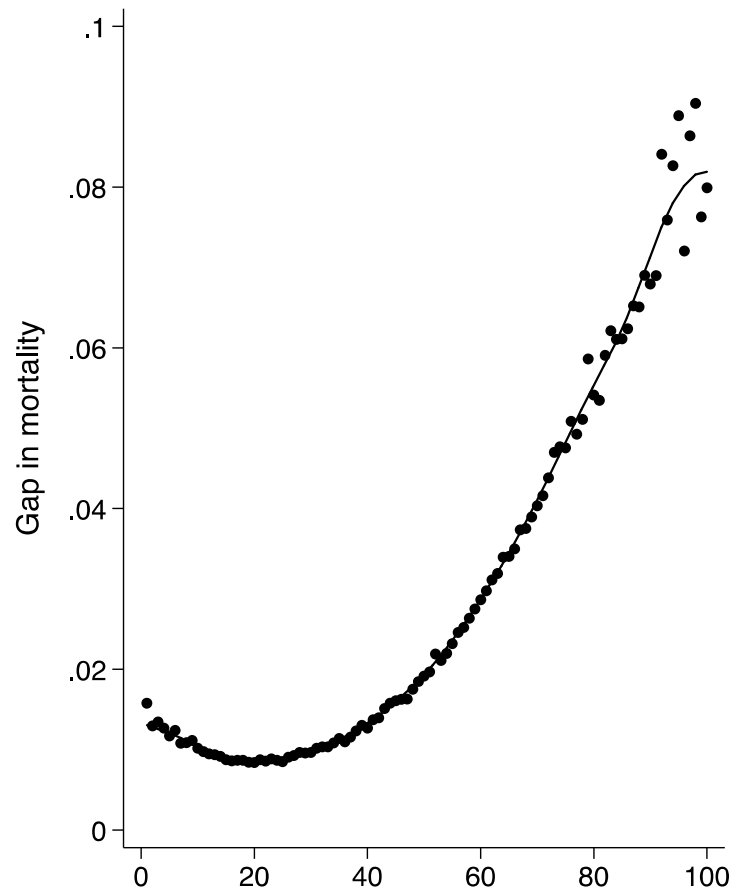
Die when $H_t < \underline{H}$





Gaps in mortality rates between I-rich and I-poor

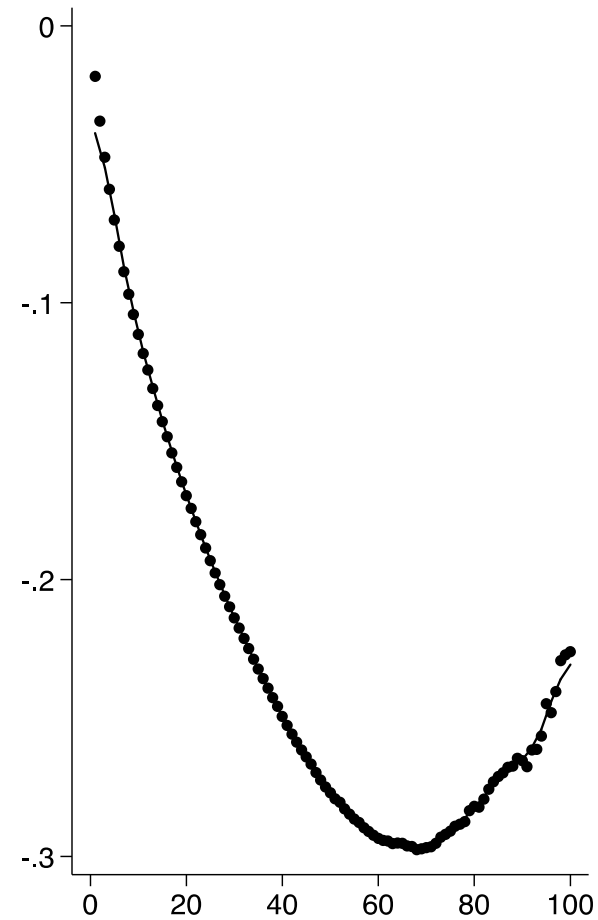
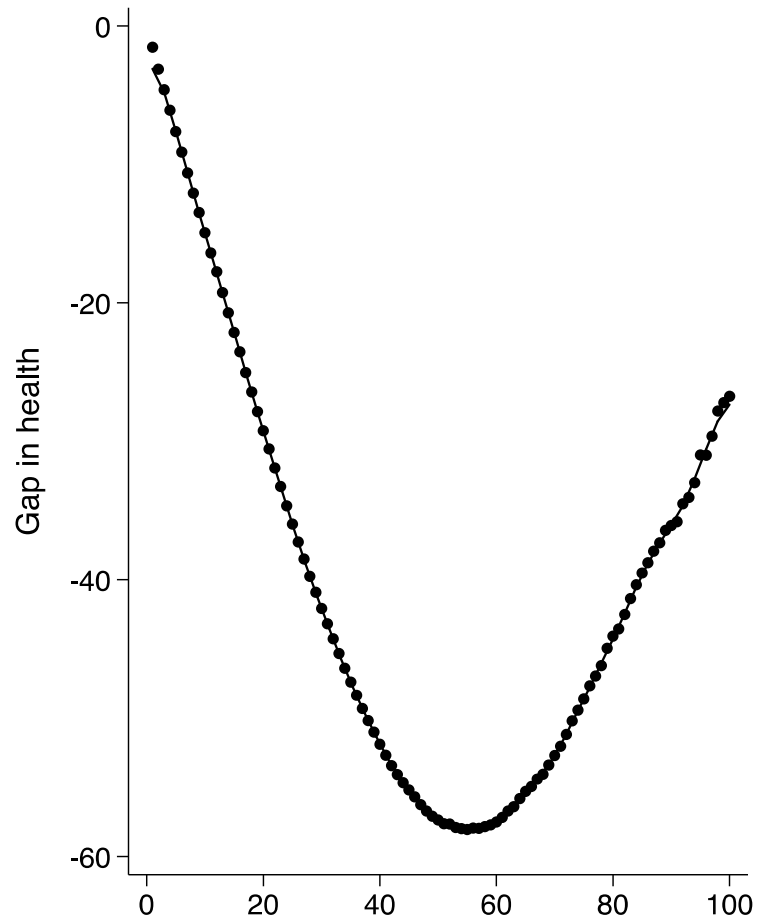
a. 50% Investment decline



Gaps emerge and increase with age. Much larger gaps in old age than at one

Gaps in Health

50% Investment decline



U-shape effects
on health
(Case et al. 2002)

So what?

Effect of education on health and mortality depends on the age at which it is measured and depends on how we measure it (levels, logs?)

- Studies & meta-analysis need to more carefully account for dynamics to produce comparable estimates.
-

For “young” adults it will be hard to measure impacts on mortality: small number of deaths

- Note: “60 is the new 50”. definition of young is changing.
- Many papers that find 0 effects of CSL use at cohorts born since 1940, with very low mortality rates in adulthood...

Omitted variables: What if the effect of education is not causal?

Need to find out why education matters

Too many papers are satisfied by saying $IV=0 < OLS$ so there, the effect of education is not causal

But education remains one of the most powerful predictors of income, wellbeing (marital stability, happiness), health and mortality.

Important for policy to identify source of the Omitted Variable Bias: if education is not what matters, what does?

- **What is education standing in for?**

Summary of take-aways for future research

1. Change reporting to allow for Meta-Analysis
2. Improve our understanding of Heterogeneity
 - Make this model driven and more systematic
3. The importance of dynamics
 - Make better use of modelling to understand this in data
4. Omitted variable bias
 - Understanding what it is not just whether there is any
5. Education v education policy
 - Understanding the difference better: what is the ideal experiment? Should we track changes in skills?
How policy affected returns?