

How Big An Impact Does Socio-economic Status Have On Cause Of Death Rates?

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- Danish data:
 - affluence
 - education
 - cause of death
- US cause of death data by education group
- Comparison: Denmark vs US
- English data: early stages

Purpose of looking at cause of death data

- What are the key drivers of all-cause mortality?
- How are the key drivers changing over time?
- Which causes of death have high levels of inequality:
 - by education;
 - by affluence?
- Can we point to specific causes of death as responsible for *growing inequality*?
- Beware of
 - changes in ICD classification of deaths (1998-99)
 - drift in how deaths are classified
 - changing education levels (grade inflation)
- Insight into mortality underpinning life insurance and pensions



- Statistics Denmark National Register Database
- Key data (amongst others) for each individual:
 - Date of birth (\Rightarrow age)
 - Date of death
 - Wealth
 - Income
 - $\text{Affluence} = \text{Wealth} + 15 \times \text{Income}$
 - Education
 - Cause of Death



Education and Affluence Levels

Education (Denmark)

Low education	Primary and lower secondary education
Medium education	Upper secondary education
High education	Tertiary education

(No education data for cohorts born before 1922.)

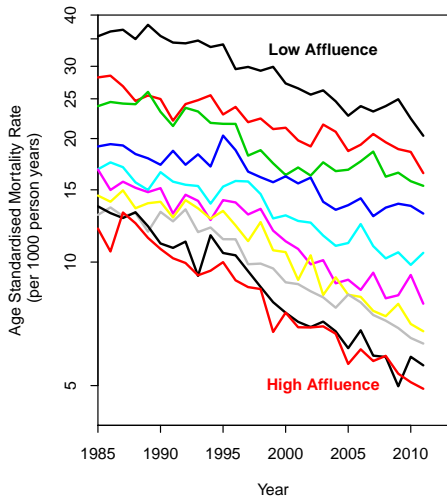
Affluence

Level 1	Low affluence <i>decile</i>
⋮	⋮
Level 10	High affluence <i>decile</i>

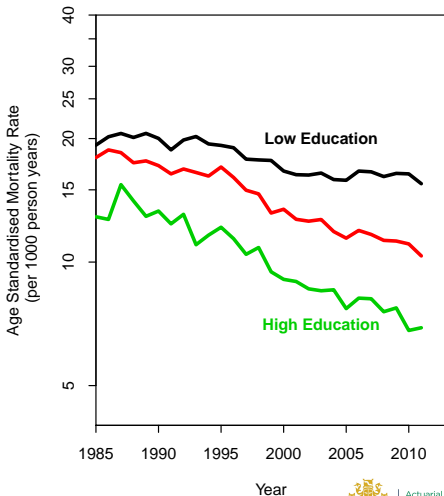


Age Standardised Death Rates, Age Group 55-64

Age Standardised Mortality Rates per 1000
Ages 55-64 by Affluence



Age Standardised Mortality Rates per 1000
Ages 55-64 by Education



Cause of Death Data – Health Inequalities

- Deaths subdivided into 29 CoD groups
- Age groups 31-35, 36-40, ..., 91-95
- Year groups 1985-89, 1990-94, 1995-99, 2000-2004, 2005-2009
- Compare affluence groups
- Compare education groups



Cause of Death Data – Health Inequalities

1	Infectious diseases incl. tuberculosis	2	Cancer: mouth, gullet, stomach
3	Cancer: gut, rectum	4	Cancer: lung, larynx, ..
5	Cancer: breast	6	Cancer: uterus, cervix
7	Cancer: prostate, testicular	8	Cancer: bones, skin
9	Cancer: lymphatic, blood-forming tissue	10	Benign tumours
11	Diseases: blood	12	Diabetes
13	Mental illness	14	Meningitis + nervous system (Alzh.)
15	Blood pressure + rheumatic fever	16	Ischaemic heart diseases
17	Other heart diseases	18	Diseases: cerebrovascular
19	Diseases: circulatory	20	Diseases: lungs, breathing
21	Diseases: digestive	22	Diseases: urine, kidney,...
23	Diseases: skin, bone, tissue	24	Senility without mental illness
25	Road/other accidents	26	Other causes
27	Alcohol → liver disease	28	Suicide
29	Accidental Poisonings		



Ages 71-75; Years 2005-2009

Rank	Least Affluent	Most Affluent
1	Ischaemic heart	Skin/bone cancer
2	Respiratory	Ischaemic heart
3	Lung cancer etc.	Prostate cancer
4	Skin/bone cancer	Respiratory
5	Other	Lung cancer etc.
6	Cerebrovascular	Cerebrovascular
7	Other heart	Other
8	Diabetes	Gut cancer
9	Gut cancer	Other heart
10	Prostate cancer	Alzheimers etc.

Prostate: almost no inequality

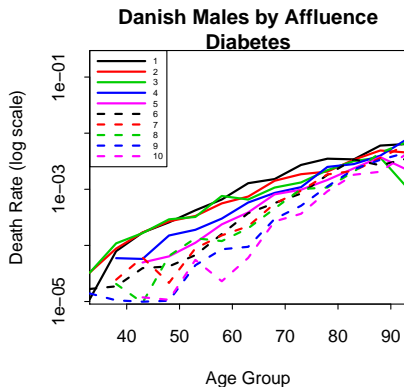
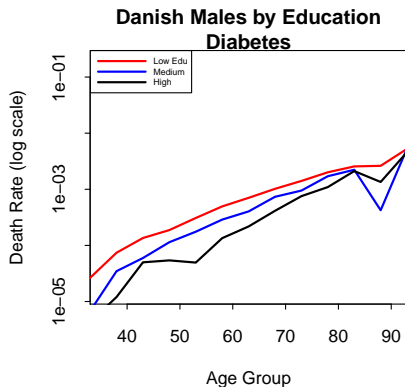


Ages 71-75; Years 2005-2009

Rank	Low Education	High Education
1	Ischaemic heart	Skin/bone cancer
2	Respiratory	Ischaemic heart
3	Lung cancer etc.	Lung cancer etc.
4	Skin/bone cancer	Respiratory
5	Cerebrovascular	Prostate cancer
6	Other heart	Cerebrovascular
7	Other	Other heart
8	Prostate cancer	Other
9	Gut cancer etc.	Gut cancer etc.
10	Circulatory	Circulatory



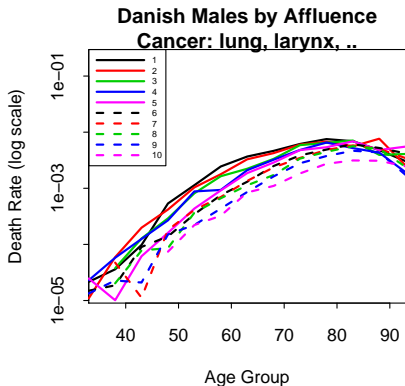
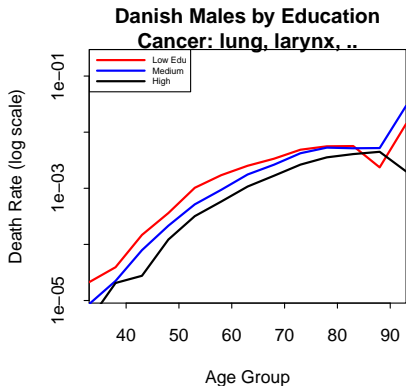
Denmark: Cause of Death Data 2005-2009



Affluence \Rightarrow much wider



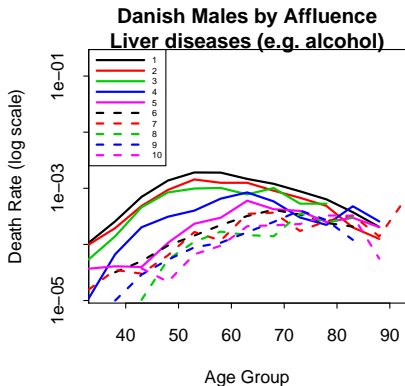
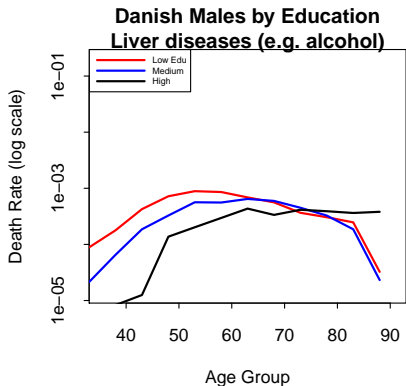
Denmark: Cause of Death Data 2005-2009



High levels of mortality inequality



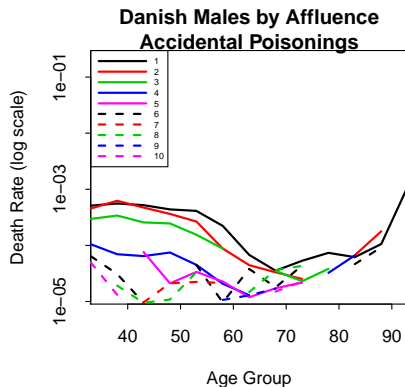
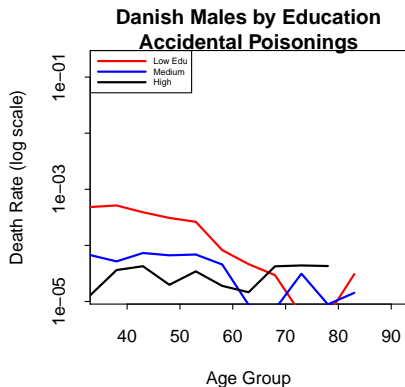
Denmark: Cause of Death Data 2005-2009



Very large differences in middle ages.



Denmark: Cause of Death Data 2005-2009



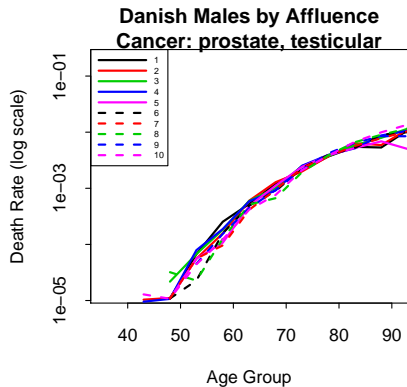
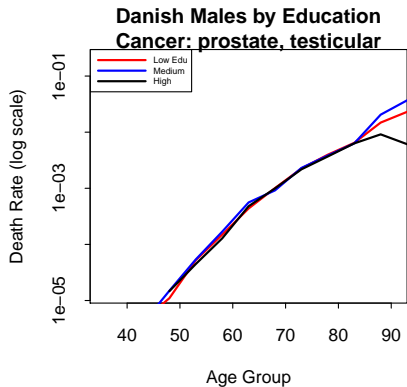
Low affluence \Rightarrow over $20\times$ at young ages



- Many causes of death have known risk factors or drivers
e.g. smoking, diet, healthy lifestyle etc.
⇒ clear socio-economic differences
- Biggest differences at ages < 60
- Affluence ⇒ stronger predictor than education (sometimes very much stronger)
- Other diseases do not have strong differences:

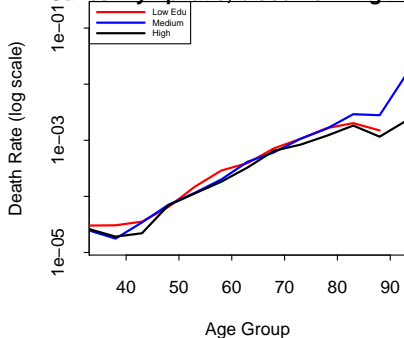


Denmark: Cause of Death Data 2005-2009

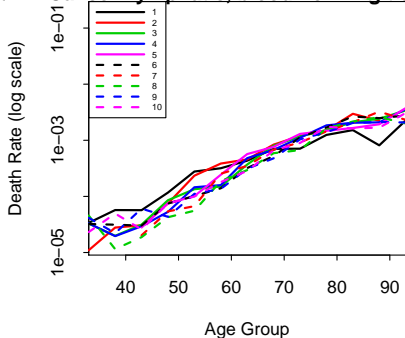


Denmark: Cause of Death Data 2005-2009

Danish Males by Education
Cancer: lymphatic, blood-forming tissue



Danish Males by Affluence
Cancer: lymphatic, blood-forming tissue

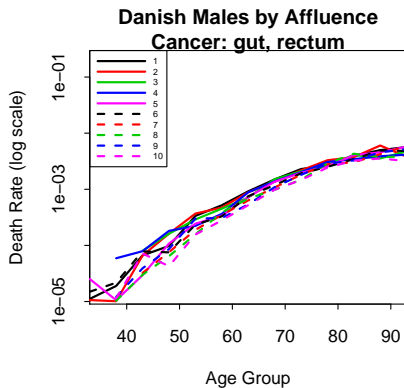
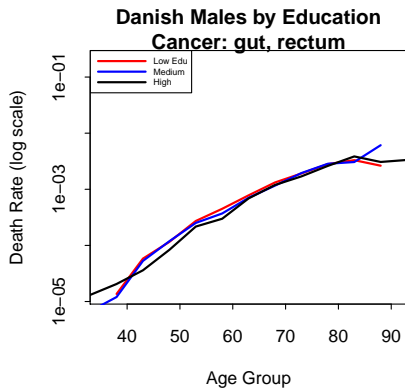


Education \Rightarrow no effect

Affluence \Rightarrow small effect



Denmark: Cause of Death Data 2005-2009



Denmark: Cause of Death Data – Health Inequalities

- Some causes of death have **no obvious link** to lifestyle/affluence/education
e.g. Prostate Cancer
CancerUK: *Prostate cancer is not clearly linked to any preventable risk factors.*
Possible unavoidable risk factors: genetic; race
- But Affluence \Rightarrow inequalities
- Possible explanations (a very non-expert view)
 - *onset* is not dependent on lifestyle/affluence/education
 - BUT less affluent/educated \Rightarrow
 - ??? later diagnosis
 - ??? engage less well with treatment process
 - ??? unhelpful environment
 - ??? genetic/racial

Data sources:

- Human Mortality Database (aggregate exposures)
- CDC individual deaths records
- Current Population Survey (CPS)
⇒ population education levels



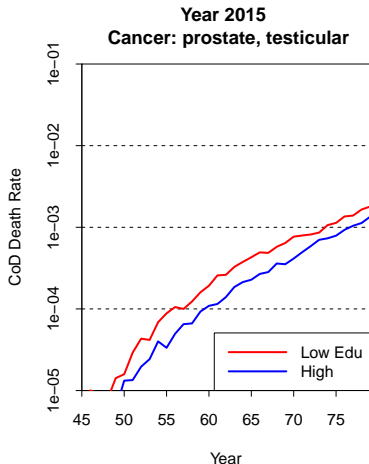
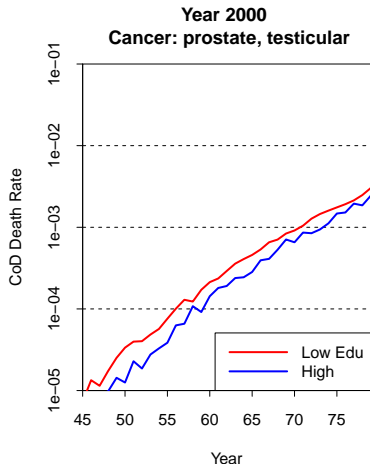
- Males and Females (2)
- Single ages 40-89 (50)
- Single years 1989-2015 (27)
- Causes of death (30)
- Low (\leq high school) & high (\geq some college) education level (2)

Note 1: further separation of high into (a) $<$ bachelors degree and (b) \geq bachelors degree was found to be unreliable.

Note 2: HMD's Human Cause of Death Database \Rightarrow
All ages (5's), 1999-2013 BUT no education subdivision



US Education Data



Note 1: some improvements above age 60

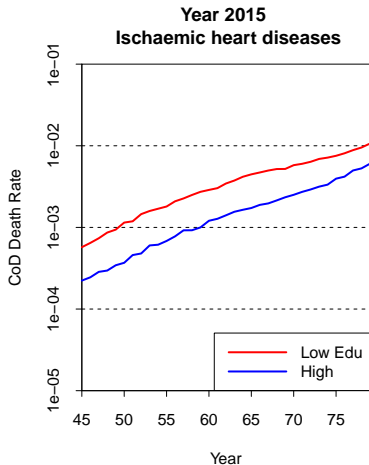
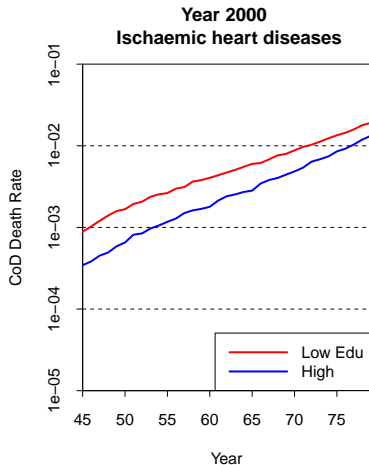
Note 2: widening gap

Recall: Denmark \Rightarrow very narrow gap

US wider gap: health insurance inequalities; genetic/racial



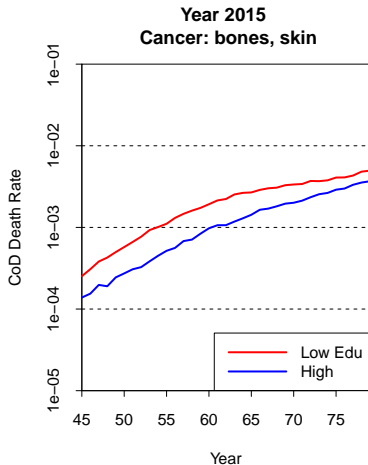
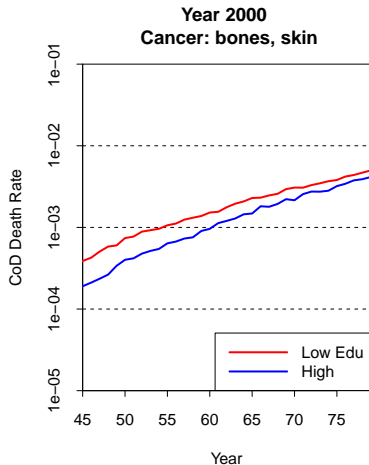
US Education Data: Males Age 55 – Top Causes



Improvements
Widening gap



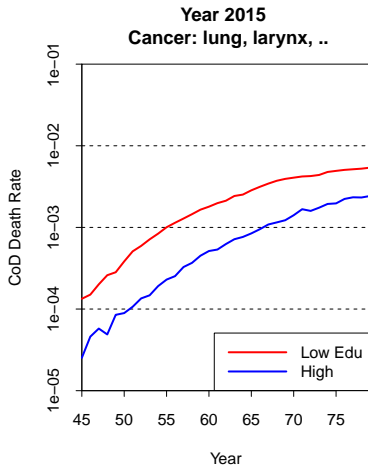
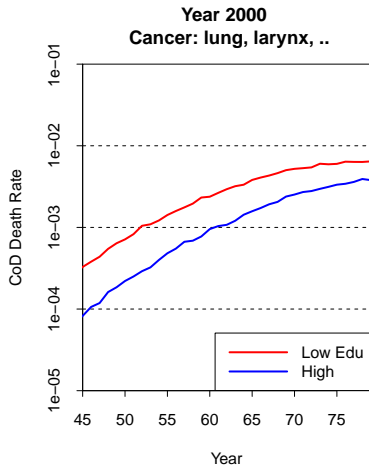
US Education Data



Widening gap
Some worsening, some improving



US Education Data

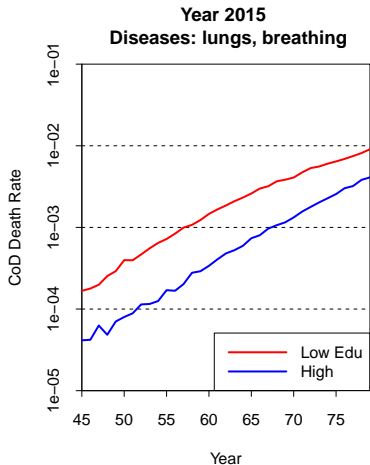
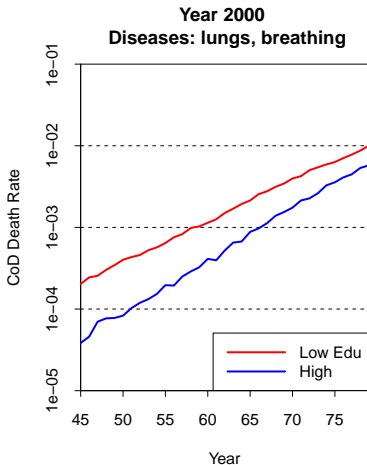


Widening gap, some improvements

Improvements possibly linked to smoking prevalence



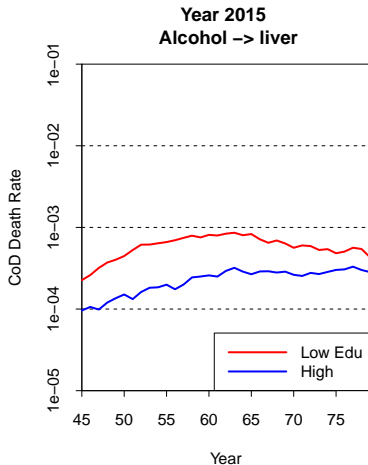
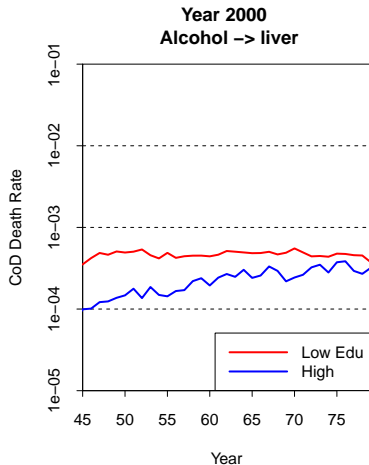
US Education Data



Widening gap
Modest improvements



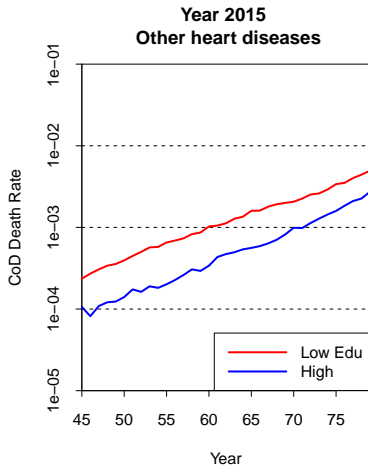
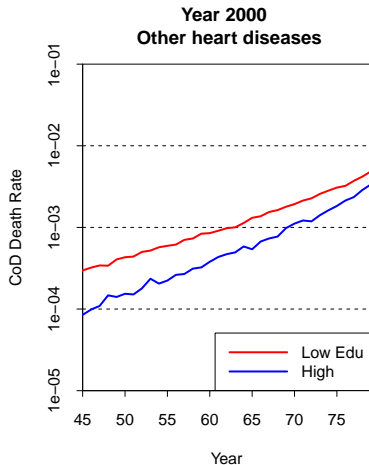
US Education Data



Case & Deaton (2015) ⇒ Deaths of Despair ↗



US Education Data

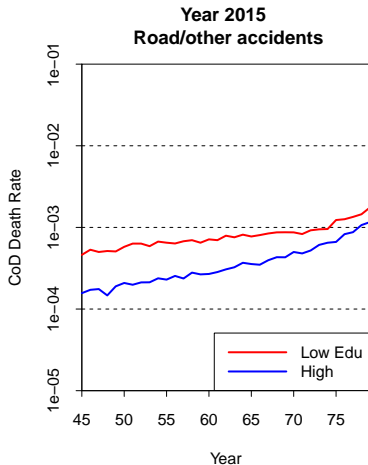
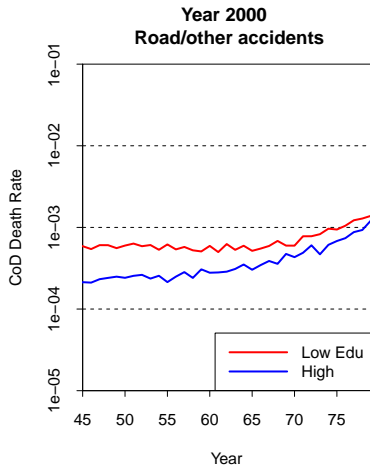


Widening gap

Modest improvements for high education



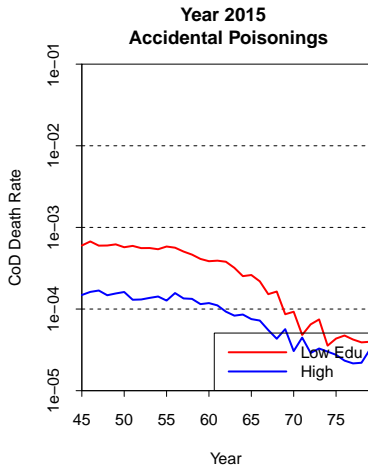
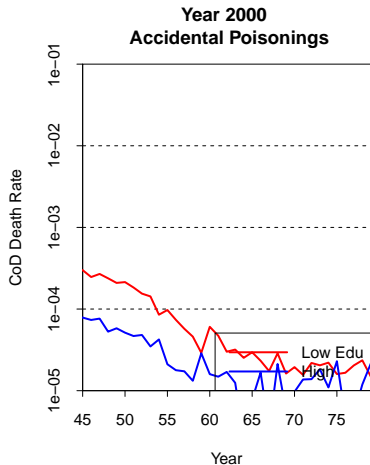
US Education Data



Mixed picture



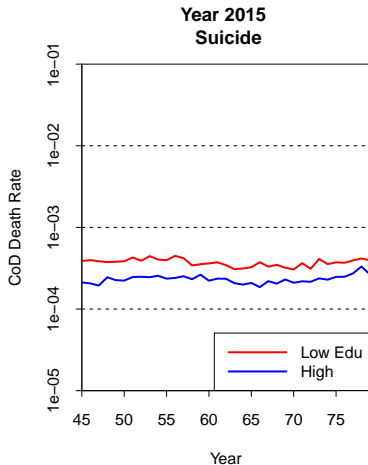
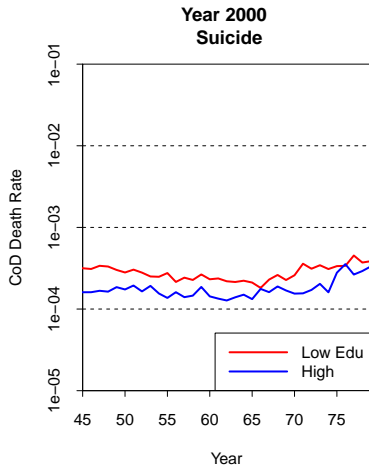
US Education Data



Case & Deaton (2015) \Rightarrow Deaths of Despair \nearrow Year



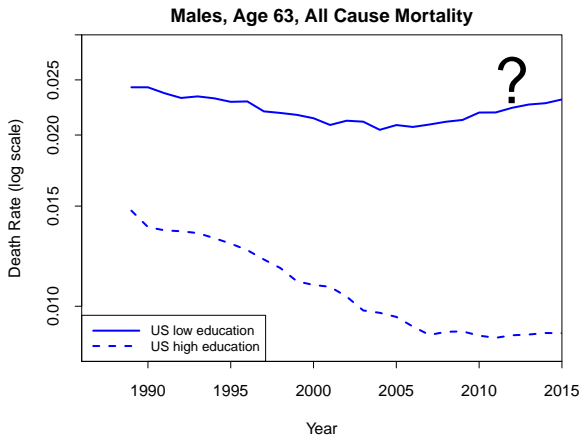
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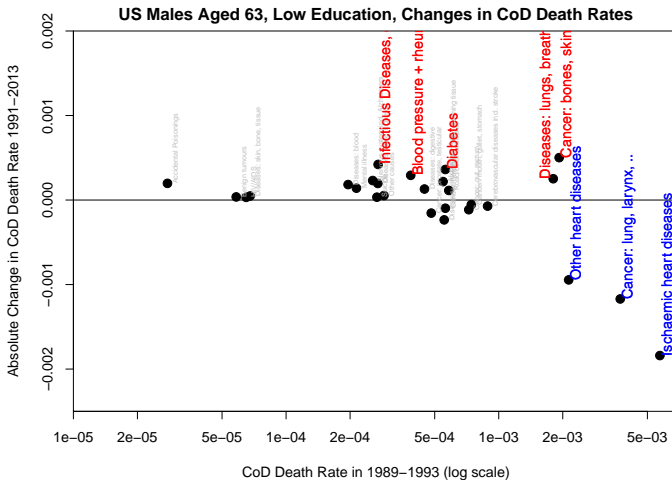
Case & Deaton (2015) \Rightarrow Deaths of Despair \nearrow



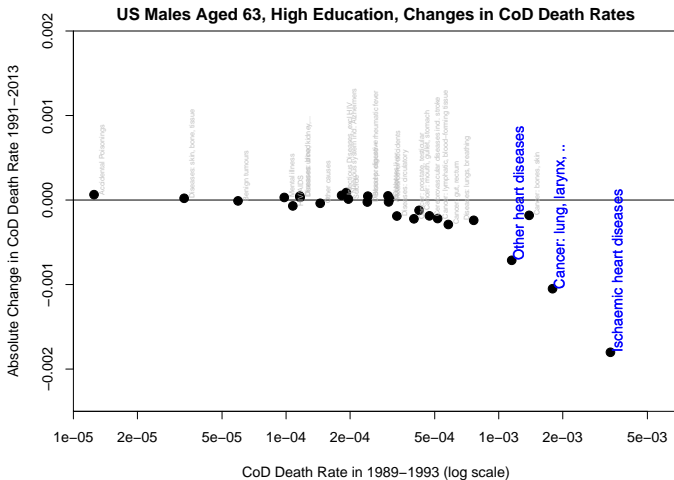
US Males Age 63 / 61-65



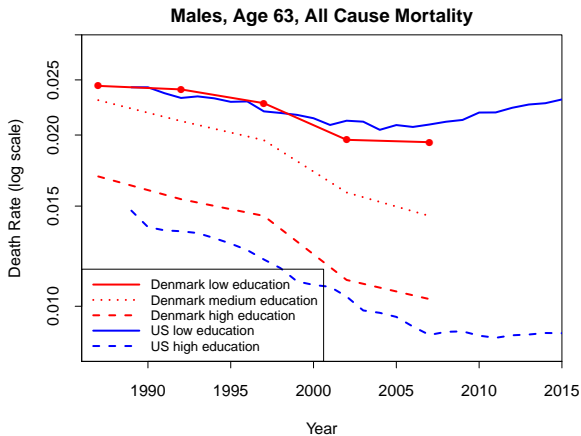
US Drivers of Change 1991-2013, Males Age 63



US Drivers of Change 1991-2013, Males Age 63

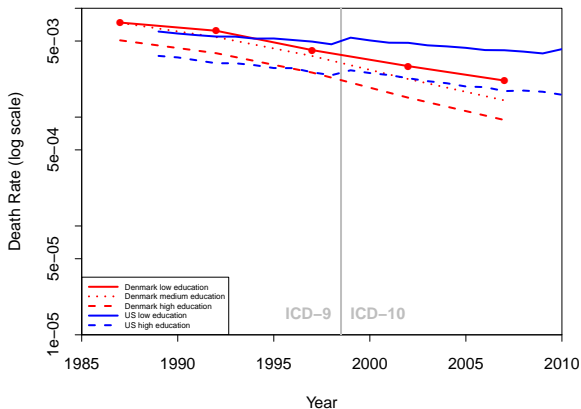


US versus Denmark, Males Age 63 / 61-65



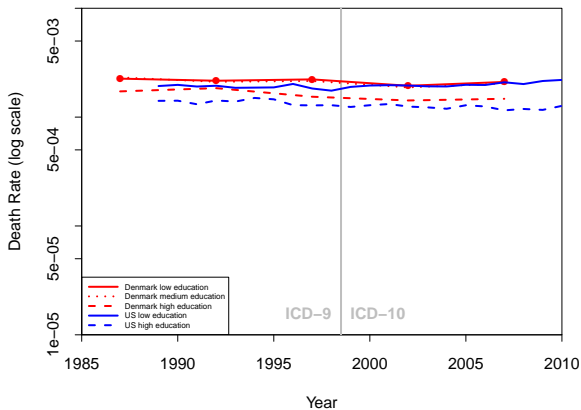
US versus Denmark, Males Age 63 / 61-65

Males, Age 63, Ischaemic heart diseases



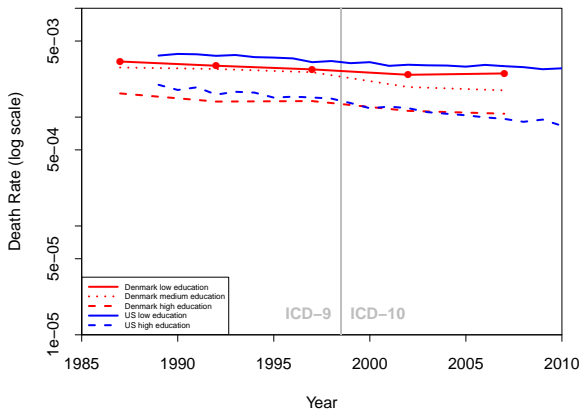
US versus Denmark, Males Age 63 / 61-65

Males, Age 63, Cancer: bones, skin



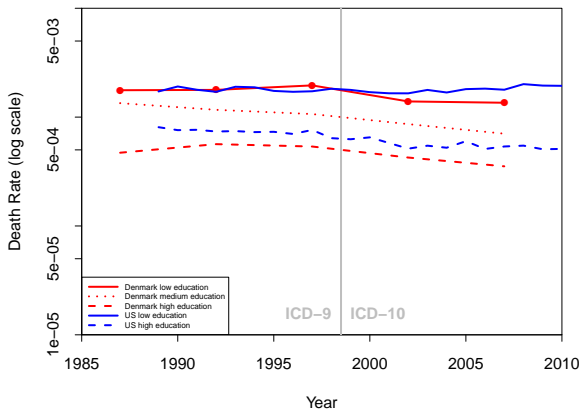
US versus Denmark, Males Age 63 / 61-65

Males, Age 63, Cancer: lung, larynx, ..

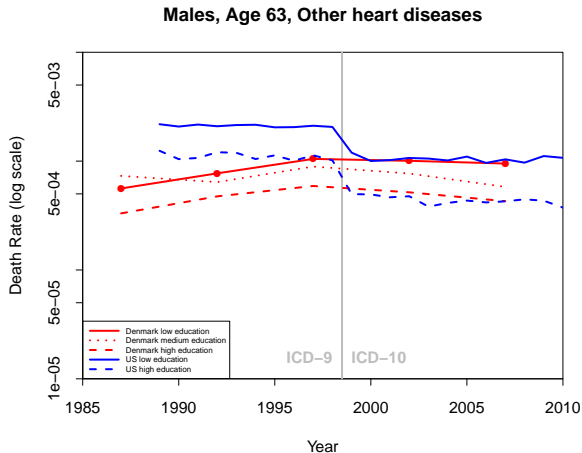


US versus Denmark, Males Age 63 / 61-65

Males, Age 63, Diseases: lungs, breathing



US versus Denmark, Males Age 63 / 61-65

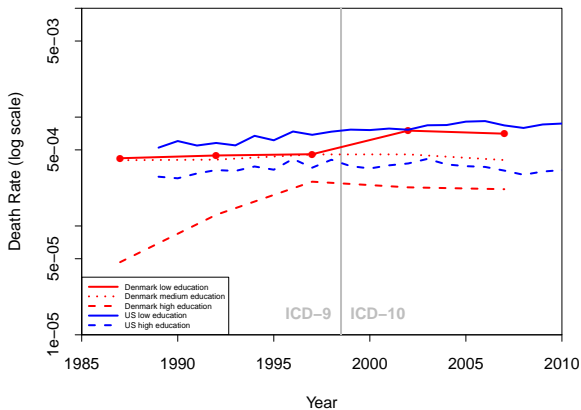


Denmark not impacted by IMD change???



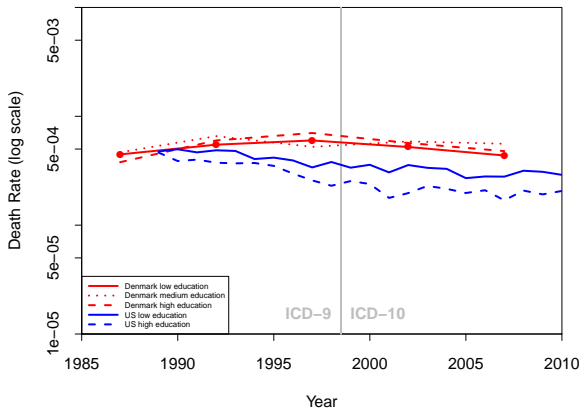
US versus Denmark, Males Age 63 / 61-65

Males, Age 63, Diabetes



US versus Denmark, Males Age 63 / 61-65

Males, Age 63, Cancer: prostate, testicular



Wider US gap: access to healthcare post-diagnosis + genetic/racial???

No preventable risk factors, but Denmark much higher???

Potentially genetic/racial???



Further remarks

- Need to factor in changing levels of educational attainment
- Can we link smoking prevalence to e.g. lung cancer mortality?
- Working on obtaining English data by socio-economic \times geographic groups and cause of death
- Built from small geographical areas rather than individual records.



Summary

- Affluence better than education for all CoD if you have the data
- Impact of affluence/education varies with CoD
- Significant levels of inequality for most of the big CoD's
- Impact of education varies between countries (e.g. different health systems)
- Work in progress!

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Thank You!

Questions?

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