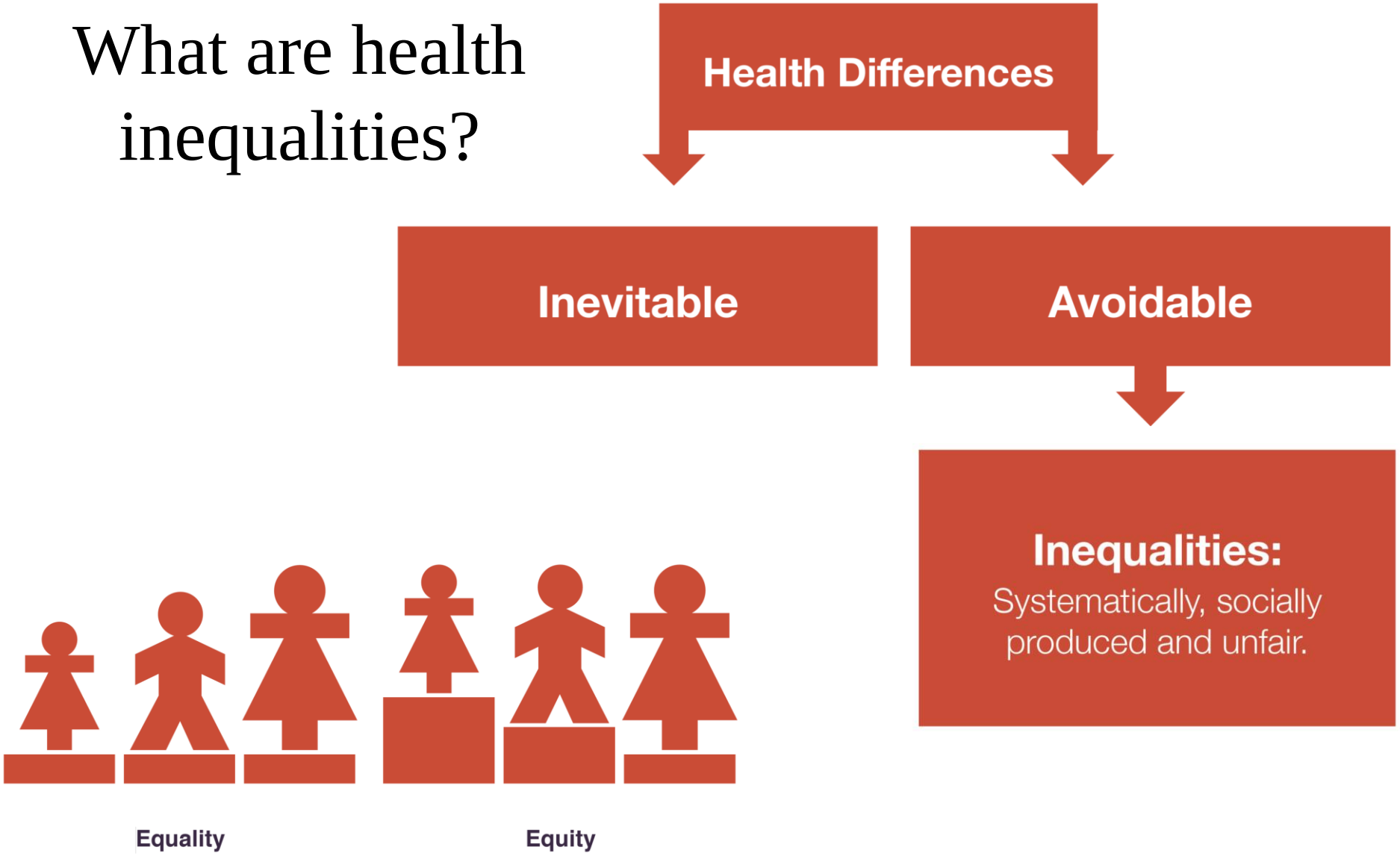
Health Inequality in the Long Run: Social and Spatial Dimensions of Mortality

Hannaliis Jaadla

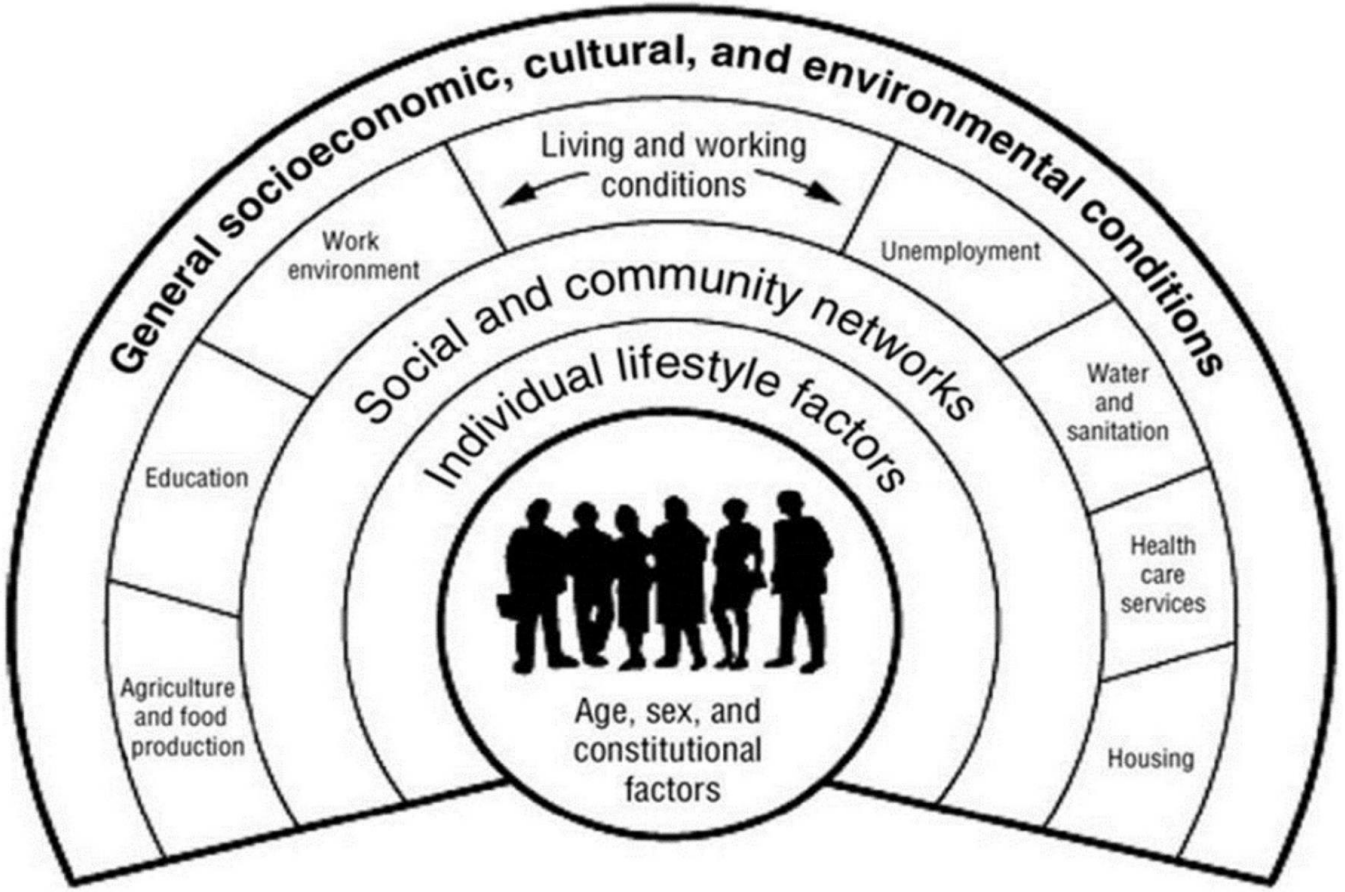
University of Cambridge and Tallinn University

‘GreatLeap Online Lecture Series. Module 2: Database management’
May 30, 2025

What are health inequalities?



Social determinants of health

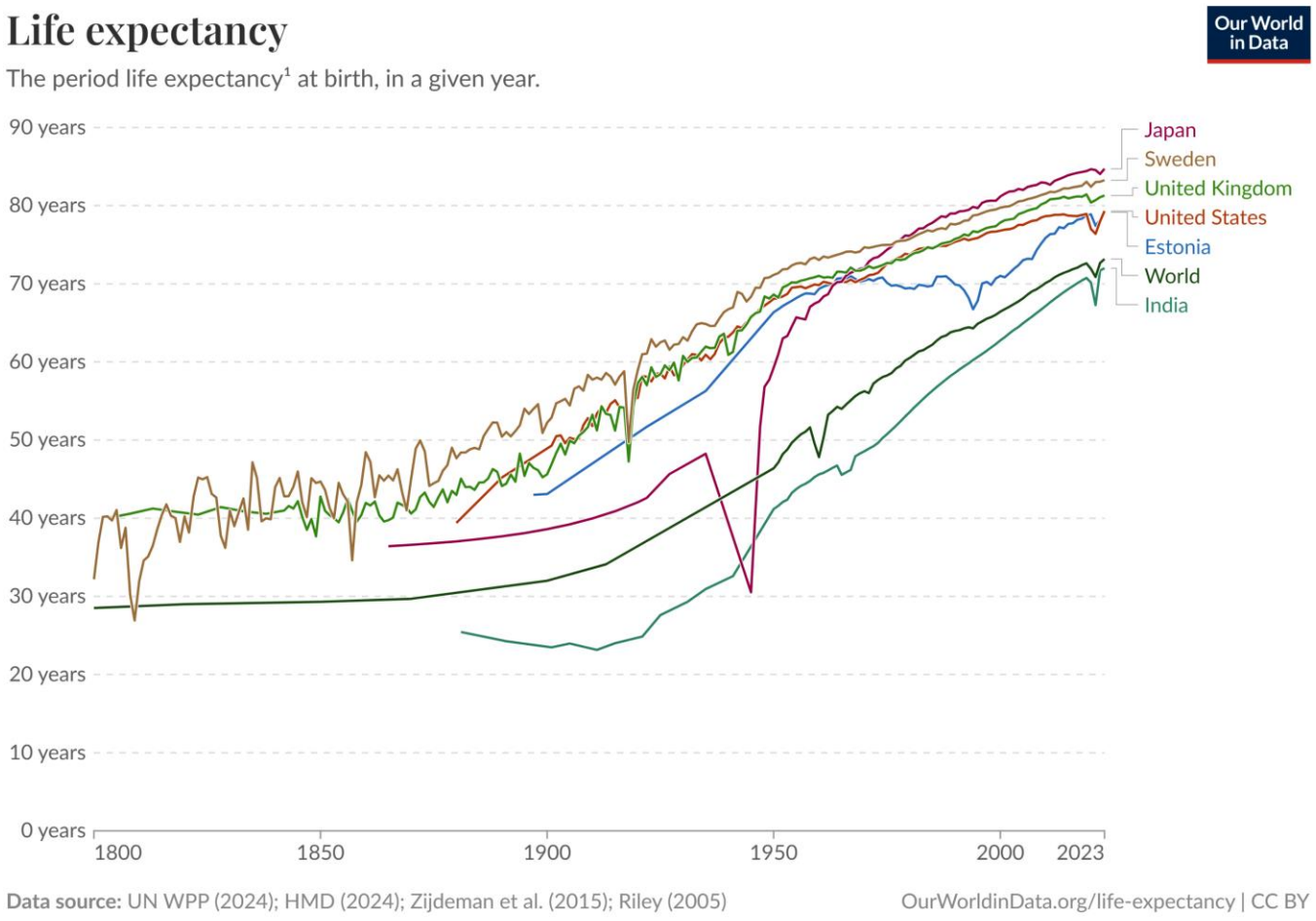


Source: Dahlgren and Whitehead (1991)

Outline

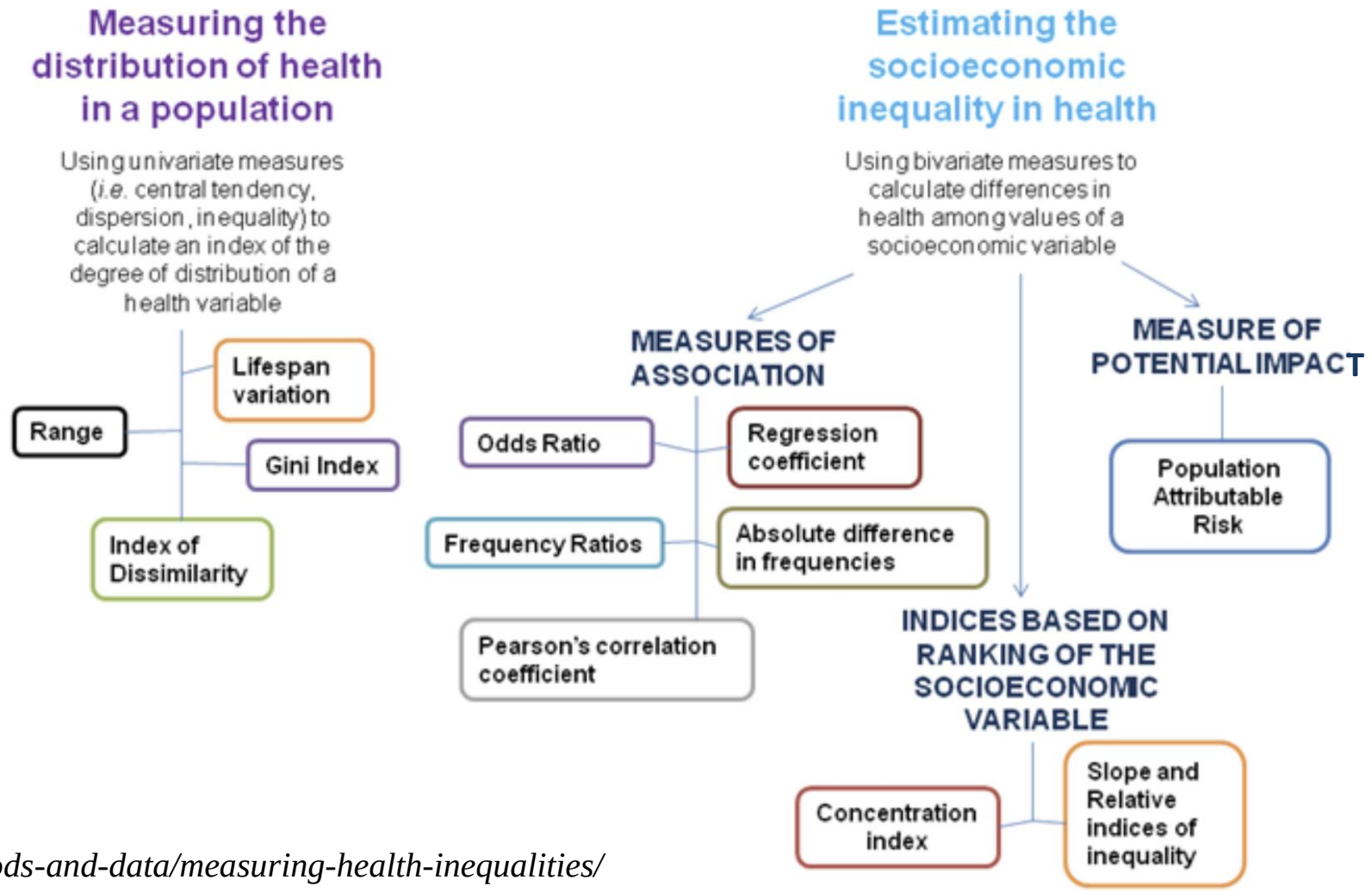
- Measures of health inequality
- Measures of socioeconomic status
- Social inequalities in mortality
- Geography and health inequalities

Inequalities in mortality



1. Period life expectancy Period life expectancy is a metric that summarizes death rates across all age groups in one particular year.
For a given year, it represents the average lifespan for a hypothetical group of people, if they experienced the same age-specific death rates throughout their whole lives as the age-specific death rates seen in that particular year.
Learn more in our articles: "Life expectancy" – What does this actually mean? and Period versus cohort measures: what's the difference?

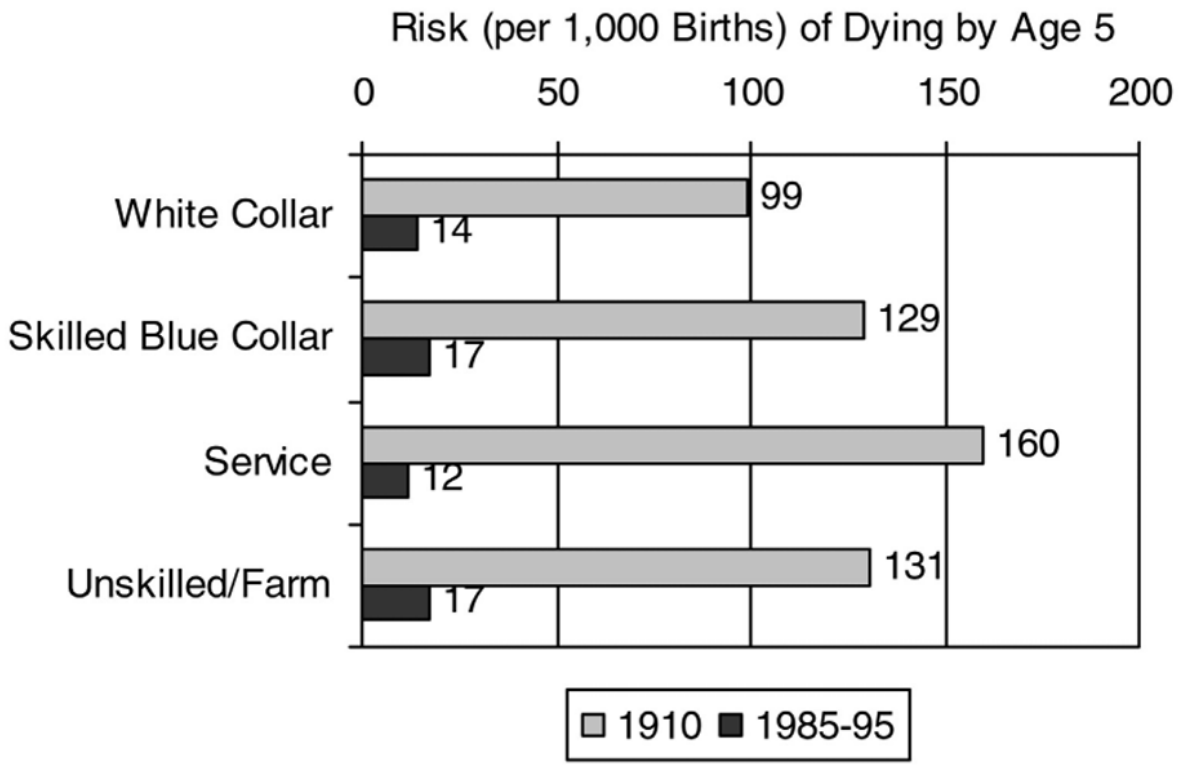
Measures of health inequalities

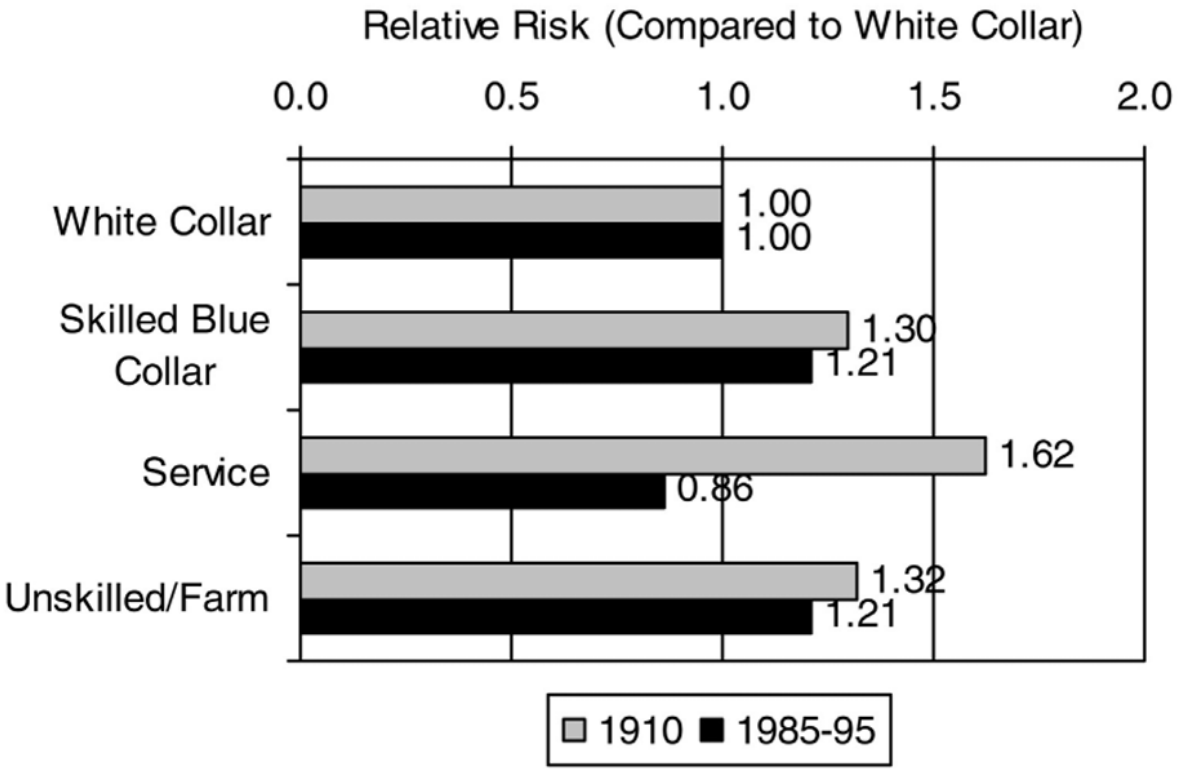


www.scotpho.org.uk/methods-and-data/measuring-health-inequalities/

Absolute vs relative changes

FIGURE 2. Probability of Dying Before Age 5 ($q5$) by Major Occupation Group of Head of Household, 1910 and 1985–95





Warren & Hernandez 2007

Measures of socioeconomic status

Occupation or social class

	Theoretical basis	Measurement	Strengths	Limitations
Occupation/ Social class	◦ Social standing ◦ Material resources ◦ Health literacy ◦ Occupational hazards	◦ Current occupation ◦ Longest held occupation ◦ Parental occupation ◦ Head of household ◦ Classification schemes	◦ Availability	◦ Inactive population ◦ Compositional changes ◦ Comparability

Galobardes et al. 2006; Elo 2009

- Historical International Standard Classification of Occupations (HISCO)
  - HISCLASS
  - Social Power scheme (SOCPO)
  - HIS-CAM

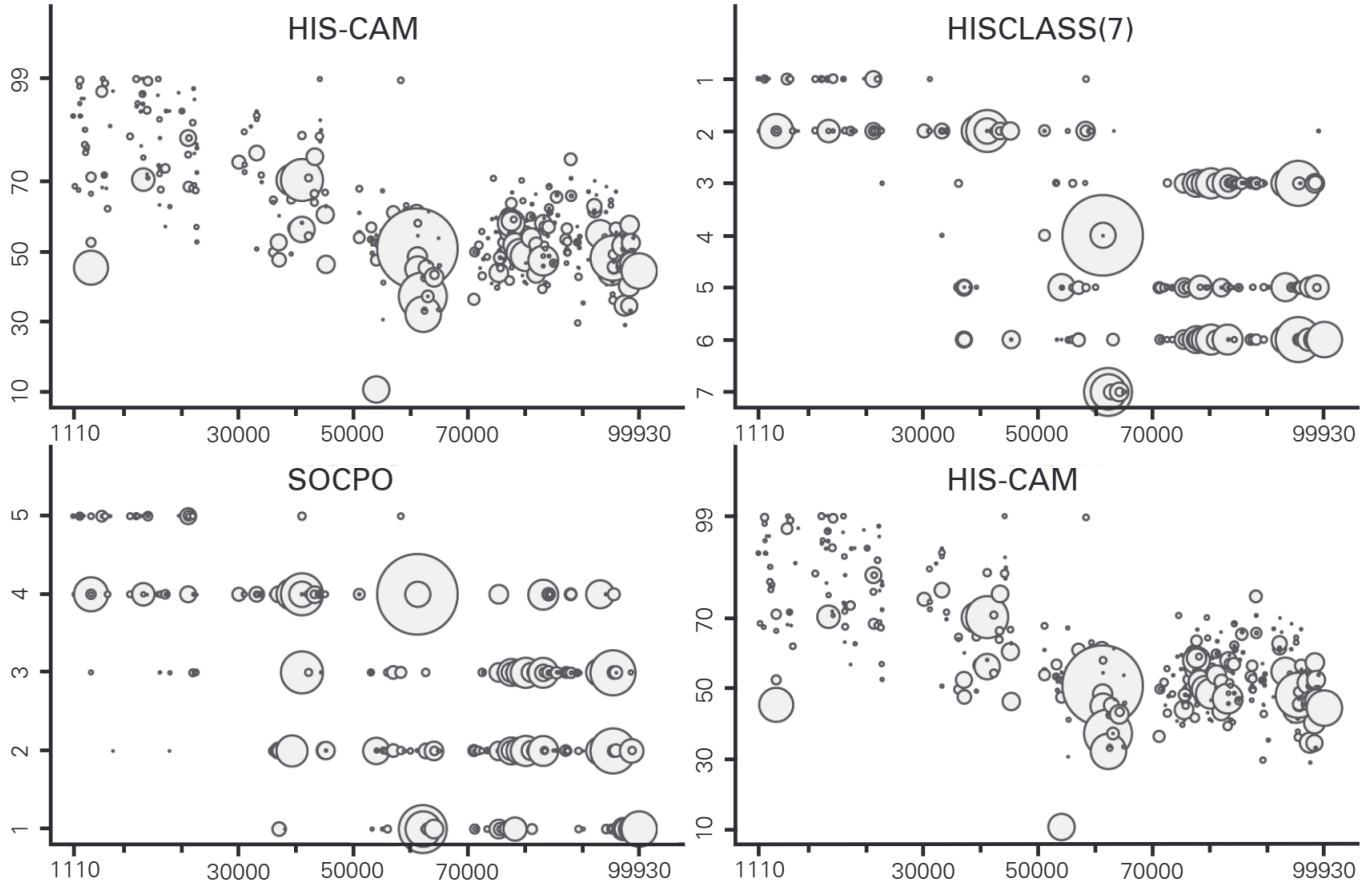
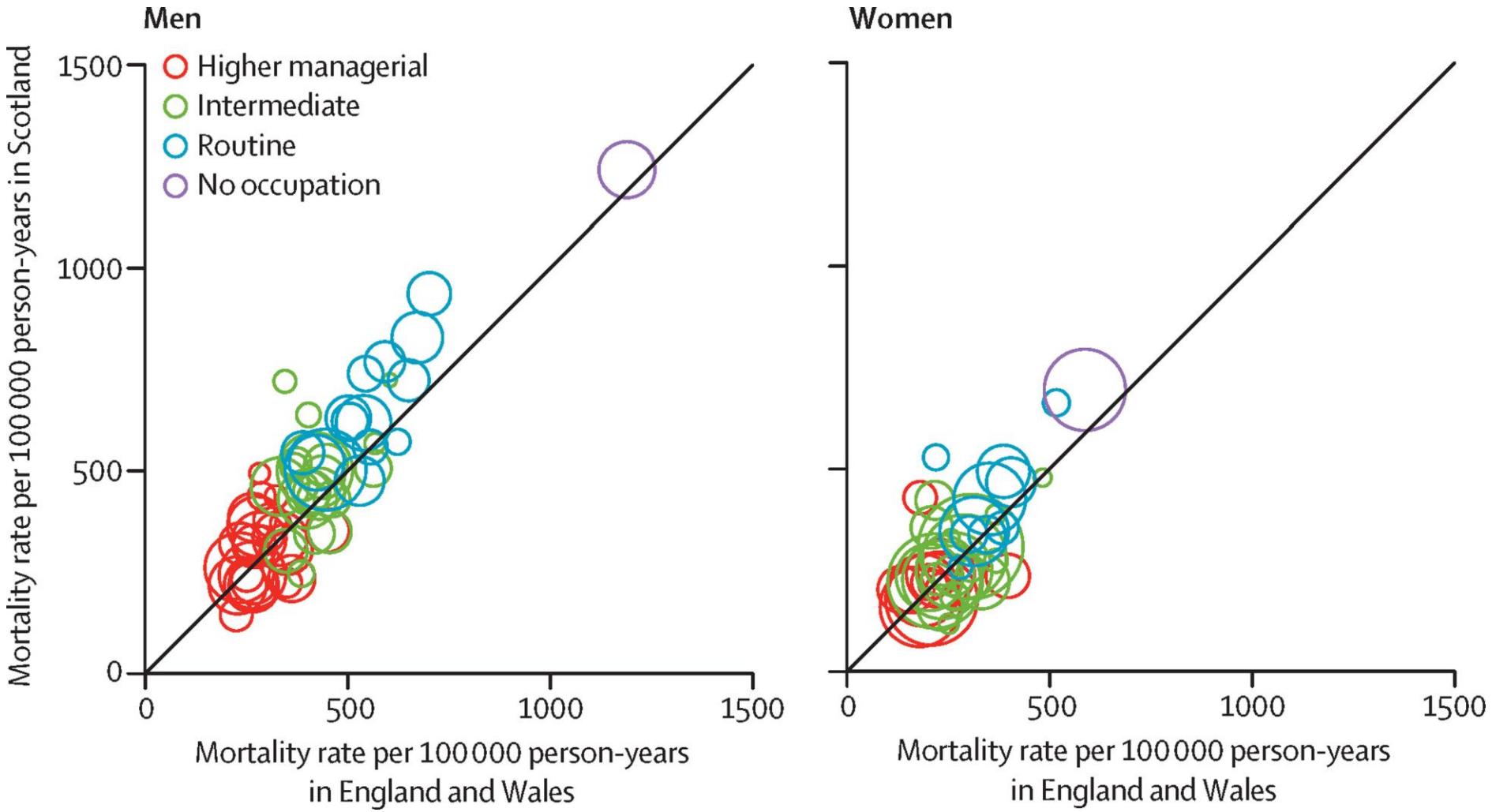


Figure 2.2 *Distribution of grooms' occupational titles coded in HISCO for HIS-CAM, SOCPO, and HISCLASS 7, 1835-1939, N=17,334**
Source: *Historical Sample of the Netherlands, release 2007_01 (2007).*
Horizonal axis shows HISCO 5-digit unit groups.
Size of circles shows number of grooms from each HISCO unit in each class category.

Van Leeuwen, Maas, and Miles 2002, 2005; Van de Putte and Miles 2005; Zijdeman 2007, 2010; Lambert et al. 2006

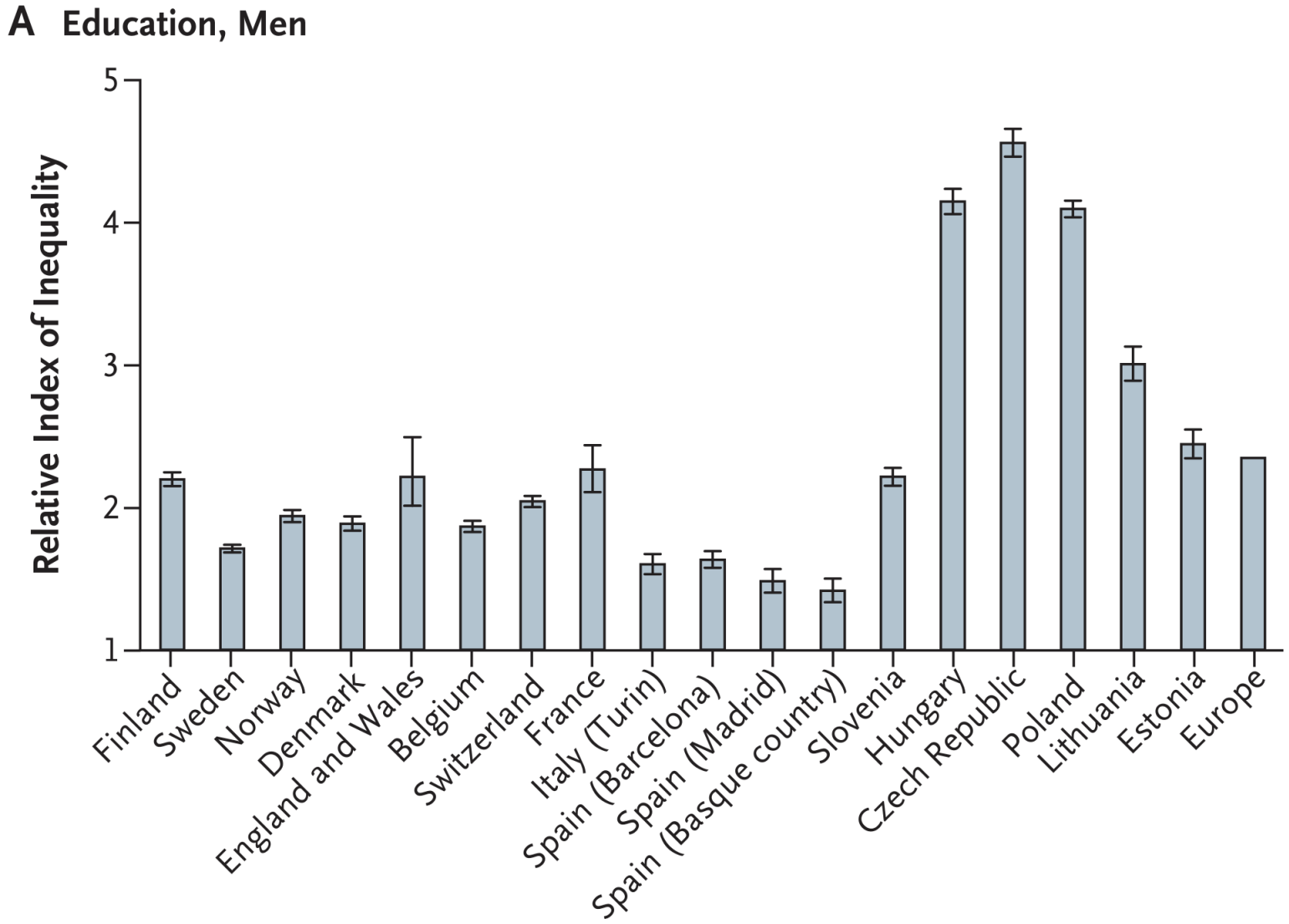


Katikireddi et al. 2017

Education

	Theoretical basis	Measurement	Strengths	Limitations
Education	◦ Socioeconomic position ◦ Human captial ◦ Health literacy ◦ Material resources	◦ Years of education ◦ Completed education ◦ Parental education ◦ Literacy	◦ Availability ◦ Stability	◦ Historically rare ◦ Compositional changes ◦ Quality ◦ Comparability

Galobardes et al. 2006; Elo 2009



Mackenbach et al. 2008

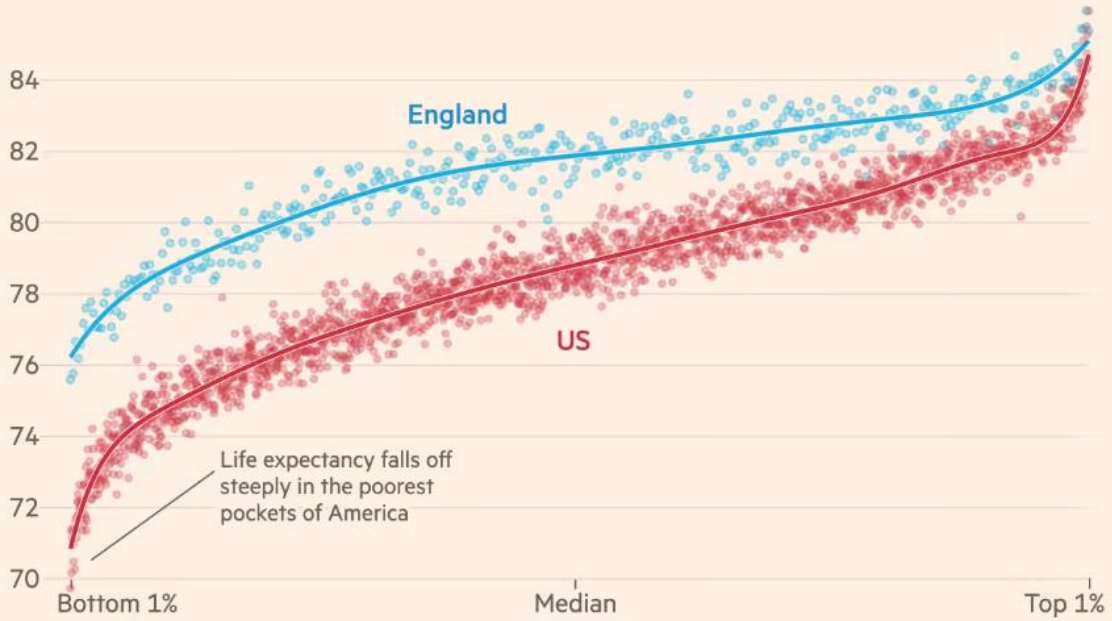
Income or wealth

	Theoretical basis	Measurement	Strengths	Limitations
Income/ Wealth	◦ Socioeconomic position ◦ Material resources – direct ◦ Cumulative effect over life course	◦ Absolute income ◦ Household income ◦ Relative measures of income	◦ Best indicator of material living standards	◦ Availability ◦ Willingness to disclose information

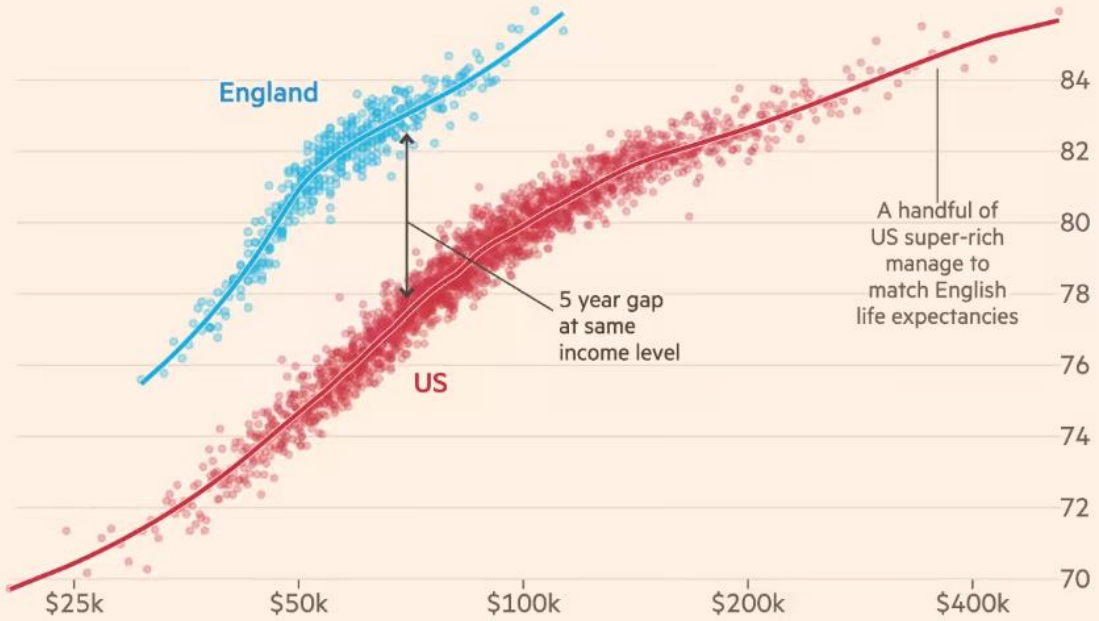
Galobardes et al. 2006; Elo 2009

Americans die earlier than the English across the income distribution, despite typically earning significantly more

Life expectancy at different points along each country's income distribution*



Life expectancy by net household income (2022 purchasing power parities)



*Each dot represents census tracts or Medium Super Output Areas containing roughly 100,000 people
Sources: FT analysis of US Small-area Life Expectancy Estimates Project, Rashid et al. (2019), American Community Survey and ONS small area income estimates
FT graphic by John Burn-Murdoch / @jburnmurdoch
© FT

Housing

	Theoretical basis	Measurement	Strengths	Limitations
Housing	◦ Socioeconomic circumstances ◦ Material resources ◦ Indicator of wealth	◦ Household tenure ◦ Household amenities ◦ Water supply ◦ Sanitation ◦ Household condition ◦ Overcrowding	◦ Available in surveys and censuses	◦ Availability ◦ Comparability

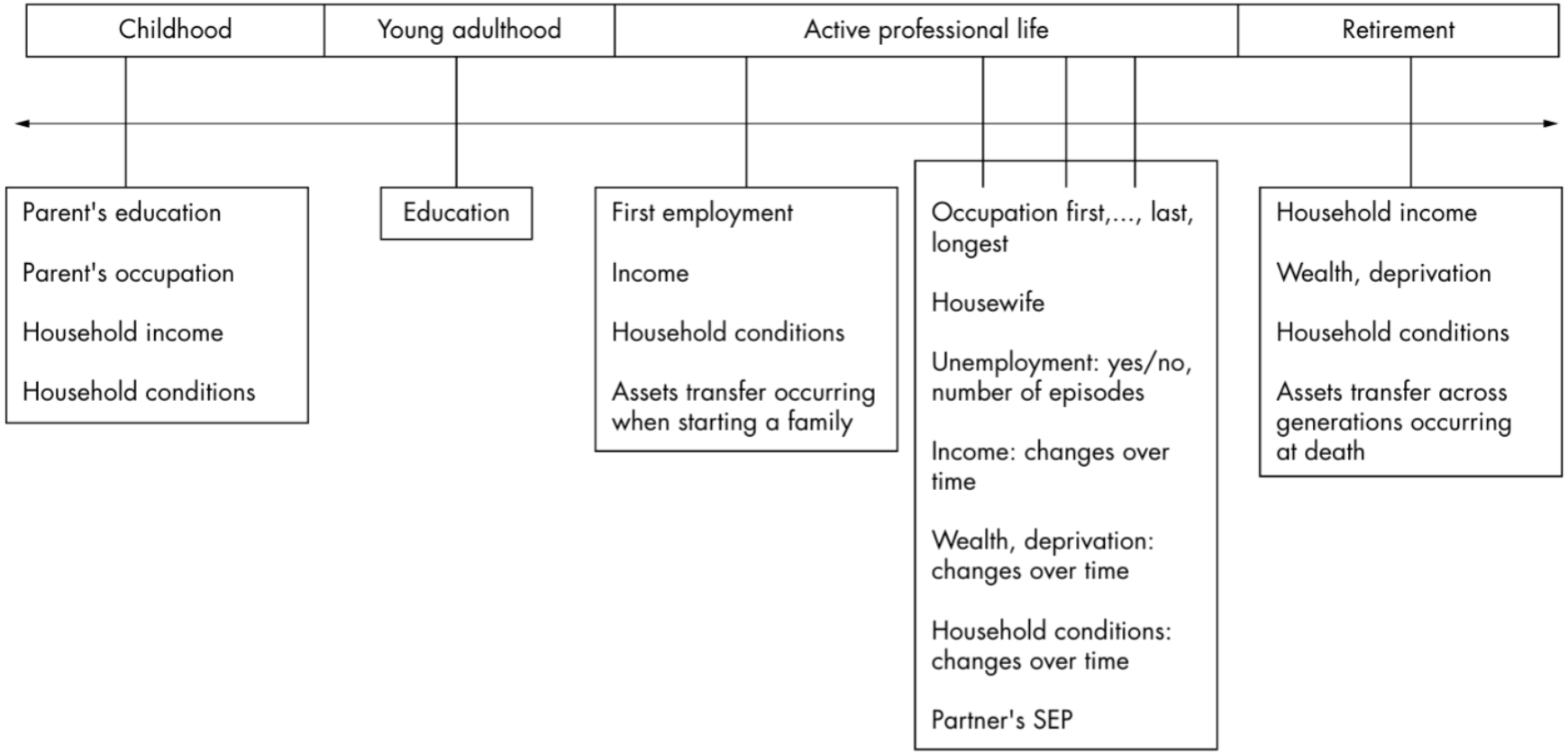
Galobardes et al. 2006; Elo 2009

Table 4 Hazard ratios of explanatory variables for infant death from diseases of the digestive system and all other causes, calculated using a Cox proportional hazard model, Lutheran parishes of Tartu, 1897–1900

	Cause of death	
	Diseases of the digestive system	All other causes
Water supply		
Artesian well	0.15***	0.40
Groundwater well	0.22***	0.82
River	1.00	1.00
Privy		
In-house	1.00	1.00
In the yard	0.92	1.62*
Cesspit		
Yes	1.58	1.05
No	1.00	1.00
Paving of the yard		
Yes	1.00	1.00
No	1.97**	0.91
Household size		
1–4 persons	1.00	1.00
5+ persons	0.82	1.33*
Model		
Number of observations	1,832	1,832
Number of infant deaths	107	157
Degrees of freedom	22	22
p-value	0.000	0.005

Jaadla & Puur 2016

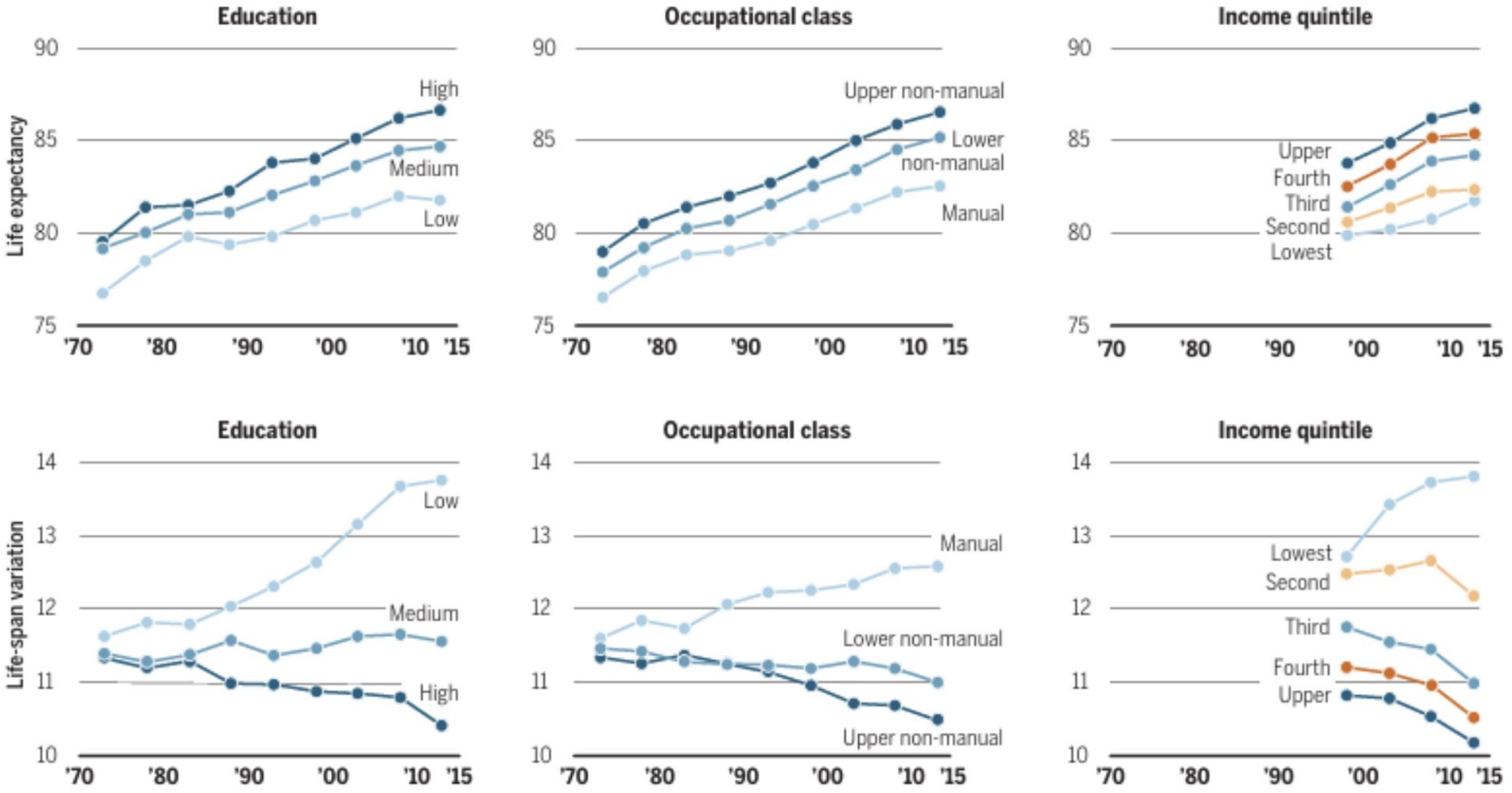
Measures of socioeconomic status - Life course



Galobardes et al. 2006

Trends in life expectancy and life-span variation for Finnish females, 1971–1975 to 2011–2014

Life expectancy is the average age at death, and life-span variation is the standard deviation, conditional upon survival to age 30, with age-specific death rates frozen at those observed in the given year. See supplementary materials for data and methods, including trends for males (which are qualitatively similar), and robustness checks using alternative measures of life-span variation.



Van Raalte et al. 2018

Social inequalities in health and mortality

- Early reporting of social inequalities:
  - In **England and Wales**, mortality by occupational class from 1851 *(Registrar General).*
  - In **France**, area-level mortality and poverty 1820s and occupational differentials in mortality from 19th century.
  - In **USA**, social class differentials in mortality in the late 20th century, racial differences in mortality early 20th century

- Competing theoretical views of long-term changes:
  - Divergence-Convergence Hypothesis *(Antonovsky 1967, 1980)*
  - The Fundamental Cause Theory (FCT) *(Link and Phelan 1995, 2010)*
    - Stages of social inequalities in Cause-specific mortality *(Clouston et al 2016)*

Divergence-Convergence Hypothesis

Before 1650	• Small SES differences • Highly virulent diseases • Lack of treatments
1650–1850	• Widening of SES differences • Increasing economic inequality • Decline in virulent diseases
1850–1970	• Narrowing of SES differences • Diminishing economic inequality • Diffusion of sanitation and medical technologies

Antonovsky 1967, 1980

The Fundamental Cause Theory (FCT)

SES-related resources – money, power, prestige, social networks, knowledge – promote health under different circumstances

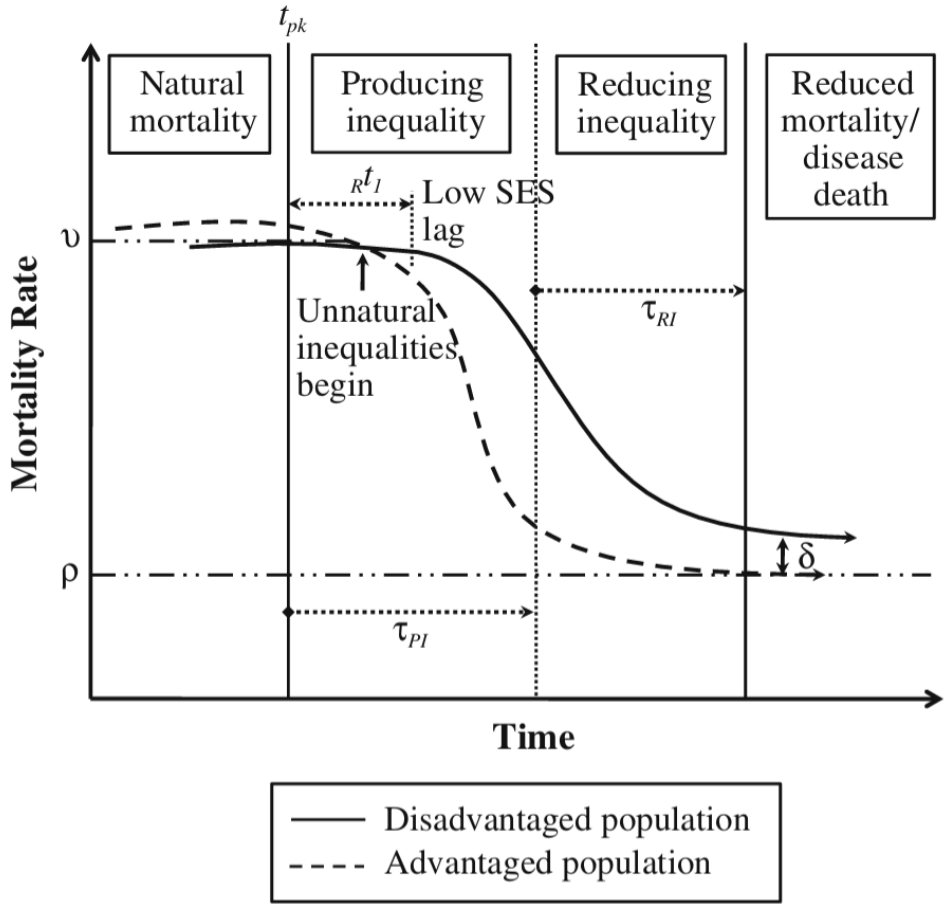
The precise links and mechanisms depend on context

As diseases change mechanisms change, but high SES is always beneficial to health

The only possible exception is when diseases were largely non-preventable

(Link and Phelan 1995)

Stages of Social Inequalities in Cause-Specific Mortality

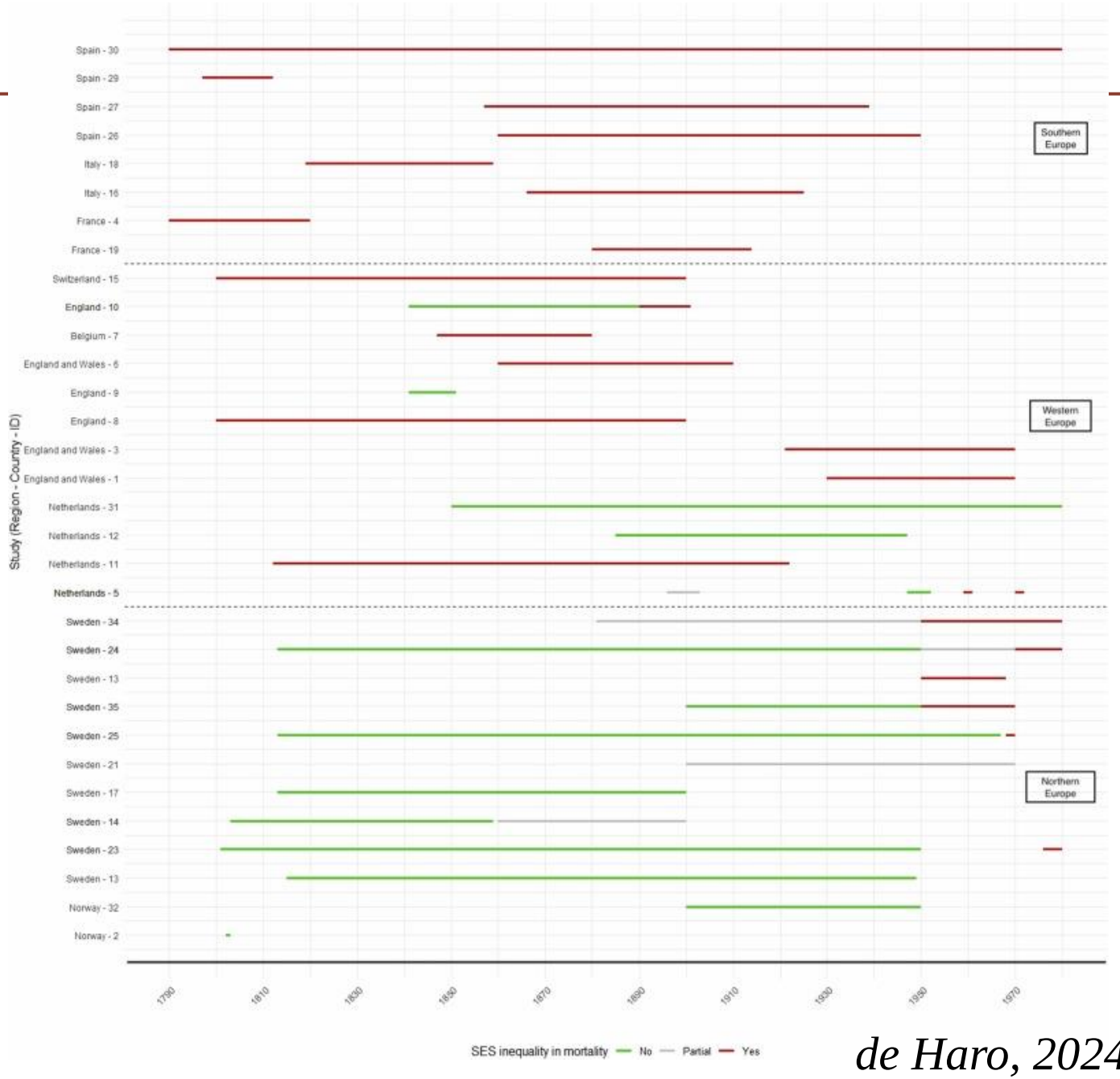


Clouston et al., 2016

Long run patterns in social inequalities

Evidence: 1790–1980

- Heterogeneity in patterns:
  - Constancy in Southern Europe
  - SES inequalities emerge in Northern Europe mid-20th c.
  - Context and study specific in Western Europe.



de Haro, 2024

Inequalities in childhood mortality, Sweden

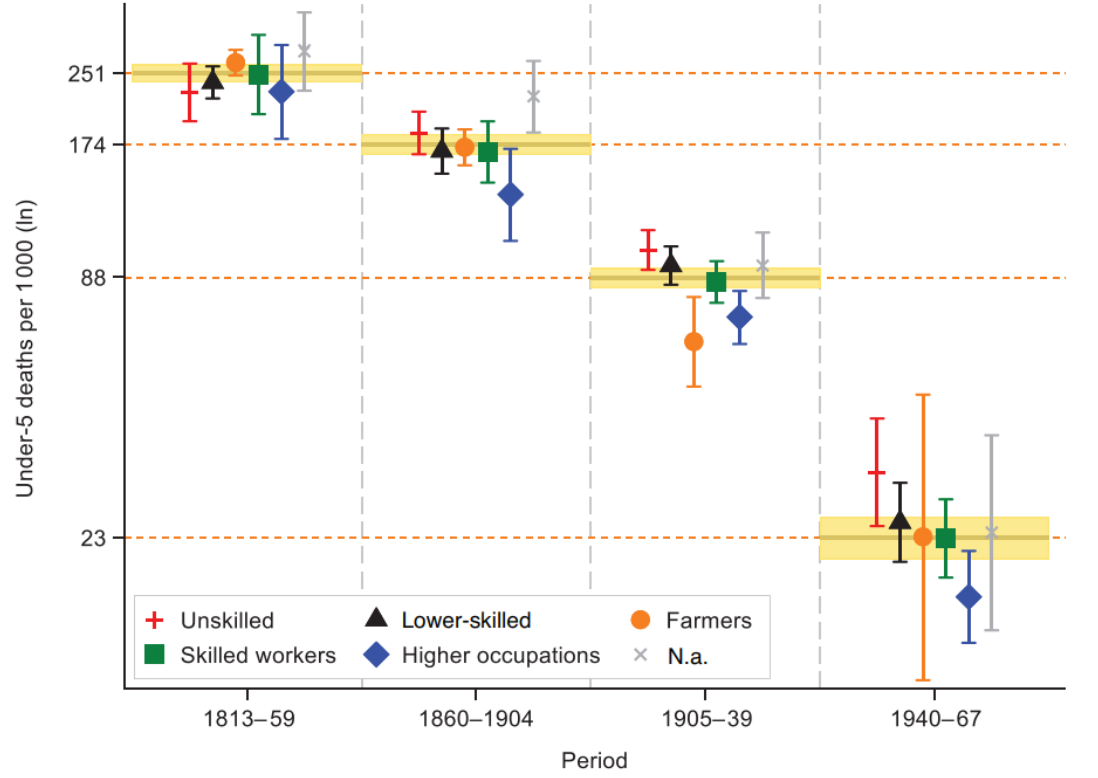


FIGURE 2 Under-five mortality ratios by social class and period. 95% confidence intervals are shown.

Dribe & Karlsson, 2022

Inequalities in adult mortality, Sweden

Table 3 Cox proportional hazards estimates of mortality at 30–59 years by social class in the main study sample: The five rural/semi-urban parishes (1813–2015) with Landskrona (1922–2015)

	1813–1864	1865–1919	1920–1949	1950–1969	1970–1989	1990–2015
Men						
Higher white-collar	1.389	0.856	0.819	0.940	0.695*	0.795
Lower white-collar	0.876	0.735	1.120	0.992	0.742**	0.837
Medium-skilled	1.015	0.850	0.973	0.874	0.974	0.789
Lower-skilled	1	1	1	1	1	1
Unskilled	1.500**	1.070	0.977	1.044	1.067	1.360
Farmers	0.873	0.928	0.828	0.992	0.598	0.382
NA	1.596†	1.261	1.601*	1.834*	3.645**	3.251**
Women						
Higher white-collar	1.260	0.637	0.872	0.597*	0.674	0.524**
Lower white-collar	0.905	0.845	0.797*	0.804†	0.792	0.608**
Medium-skilled	1.303	0.724	0.830†	0.925	1.094	0.679†
Lower-skilled	1	1	1	1	1	1
Unskilled	1.444*	0.962	1.079	1.041	1.063	0.786
Farmers	1.112	0.964	0.962	0.552	0.708	1.187
NA	1.487*	1.306	1.218	2.691**	2.985**	3.300**

Bengtsson, Dribe & Helgertz, 2020

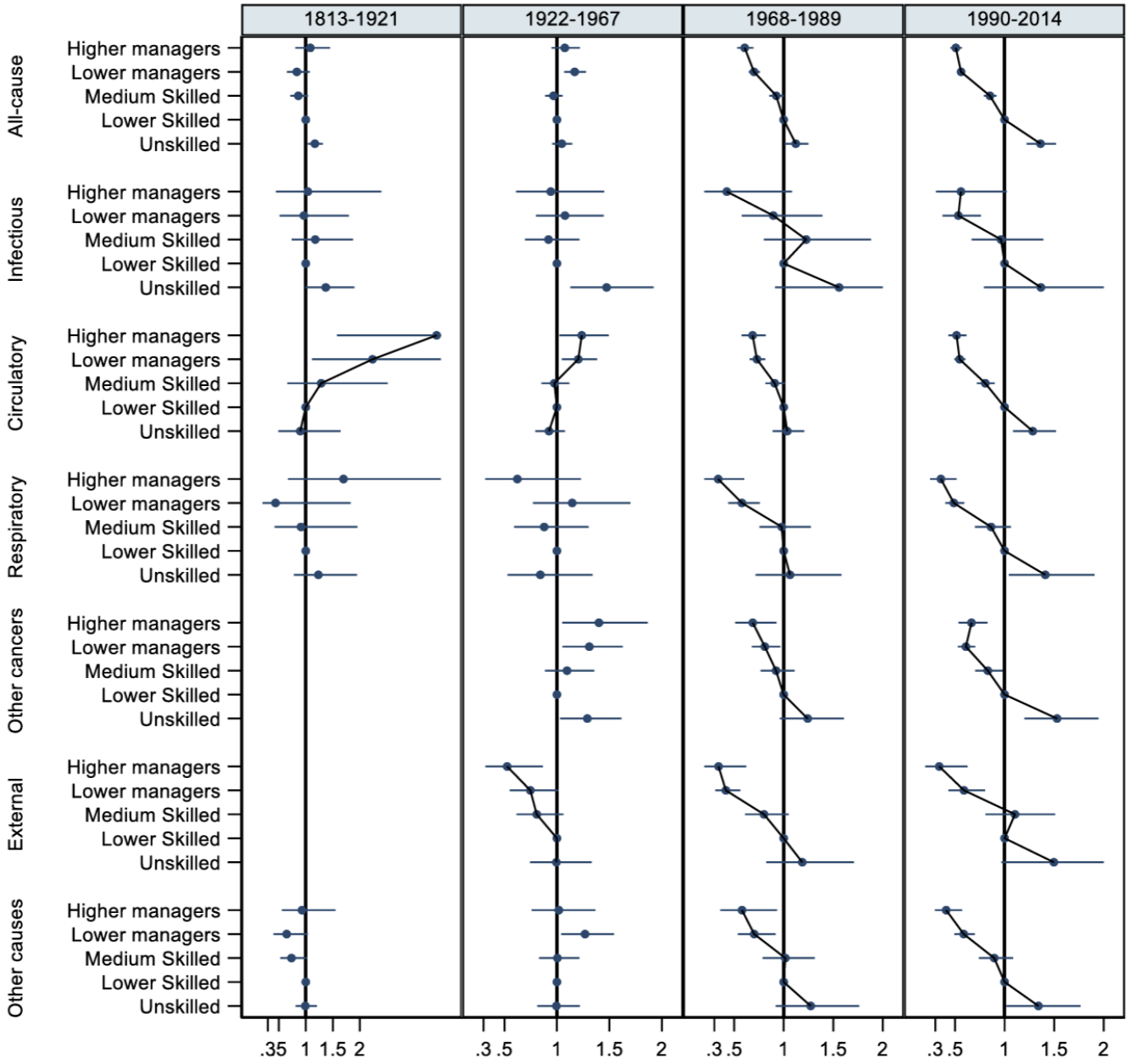
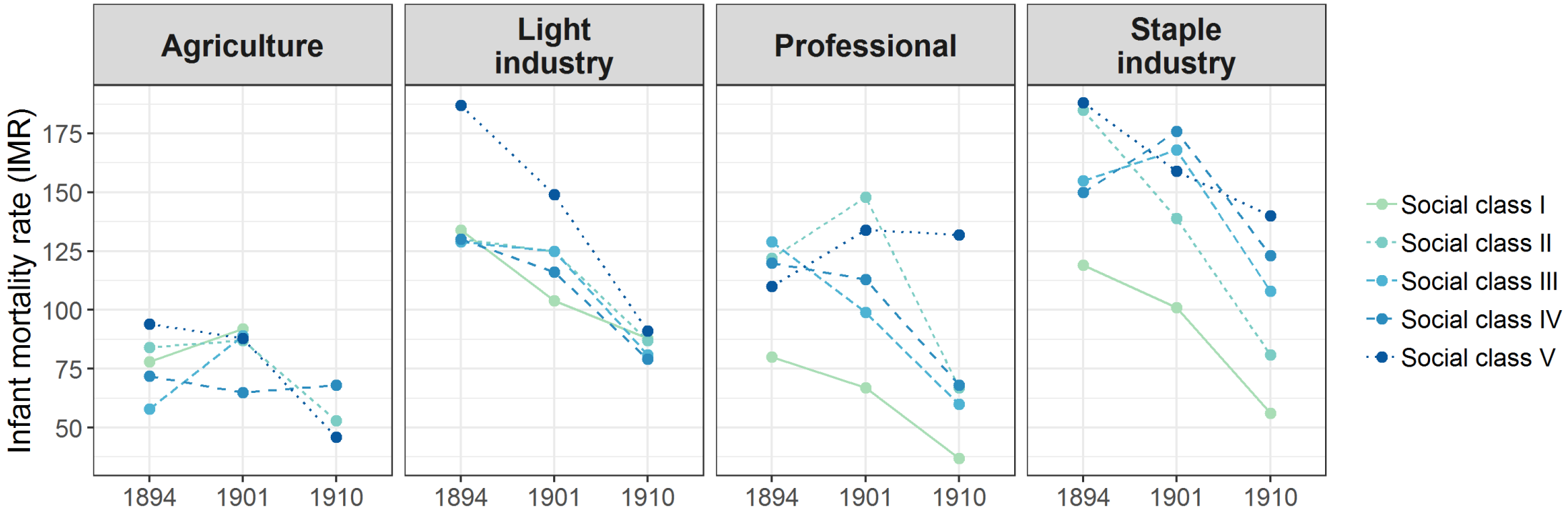


Fig. 2 All-cause and cause-specific mortality hazard ratios and 95% confidence intervals using a more detailed SES grouping, men, ages 30–0 (five parishes and, from 1922, Landskrona). The reference category is lower skilled (estimates for farmers not shown)

Inequalities in cause-specific mortality, Sweden

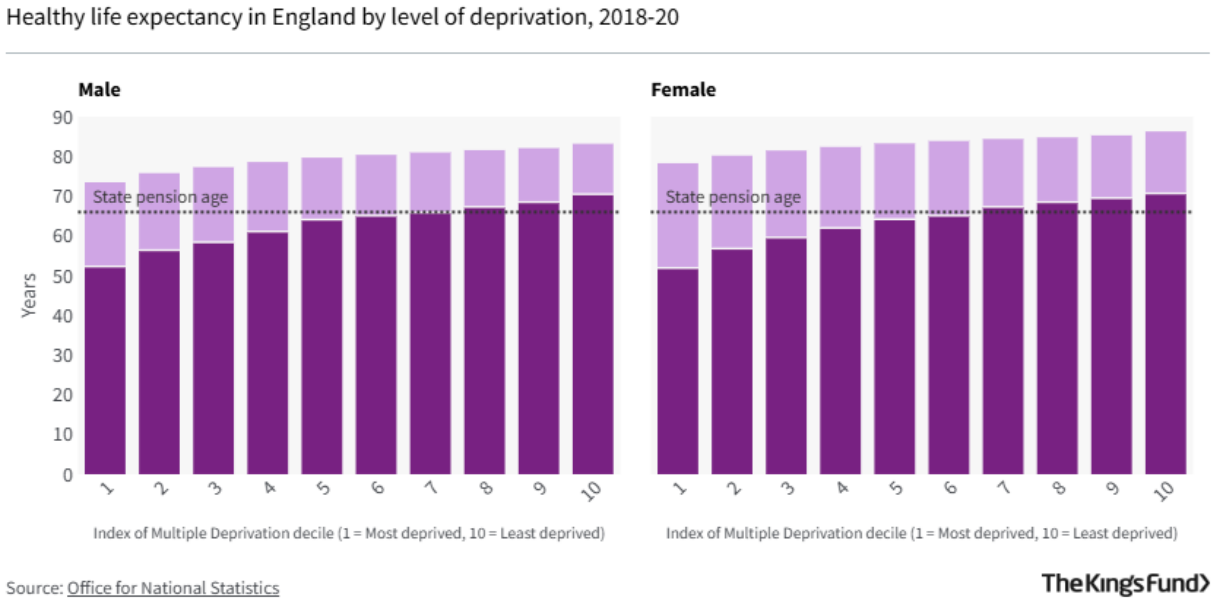
Debiasi & Dribe, 2020

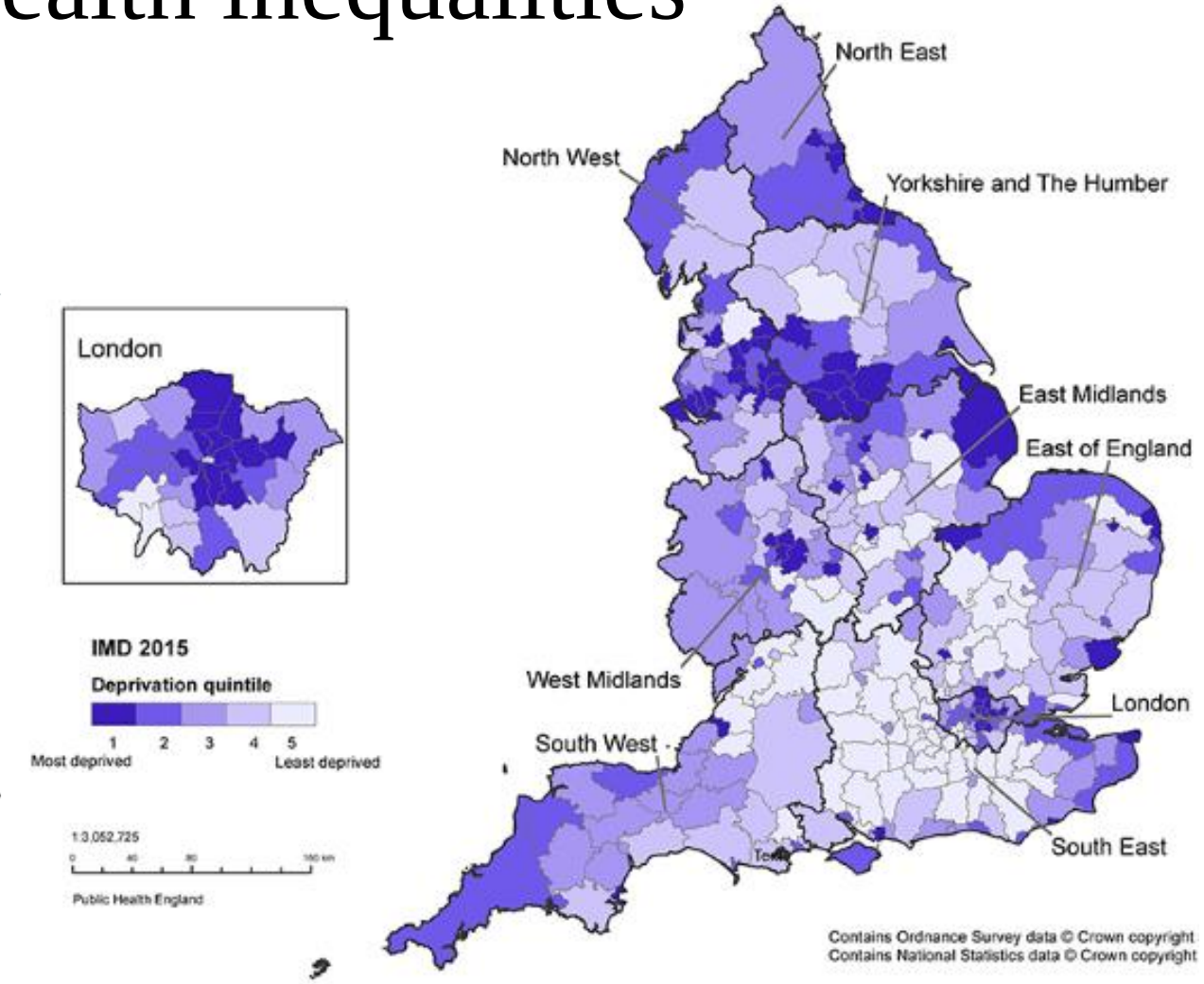
Place vs social class, England, 1894–1910



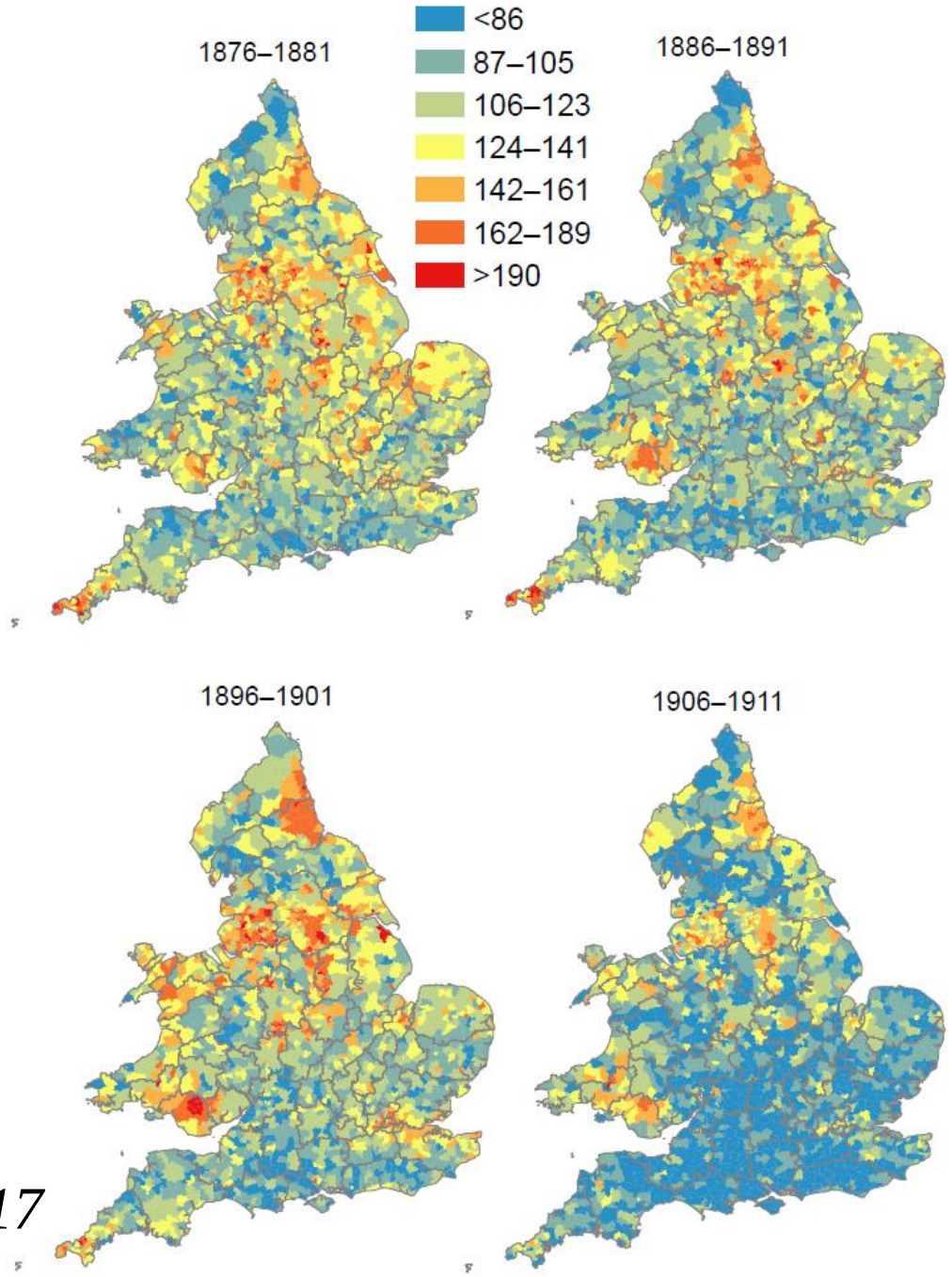
Reid, 1997

Geography and health inequalities



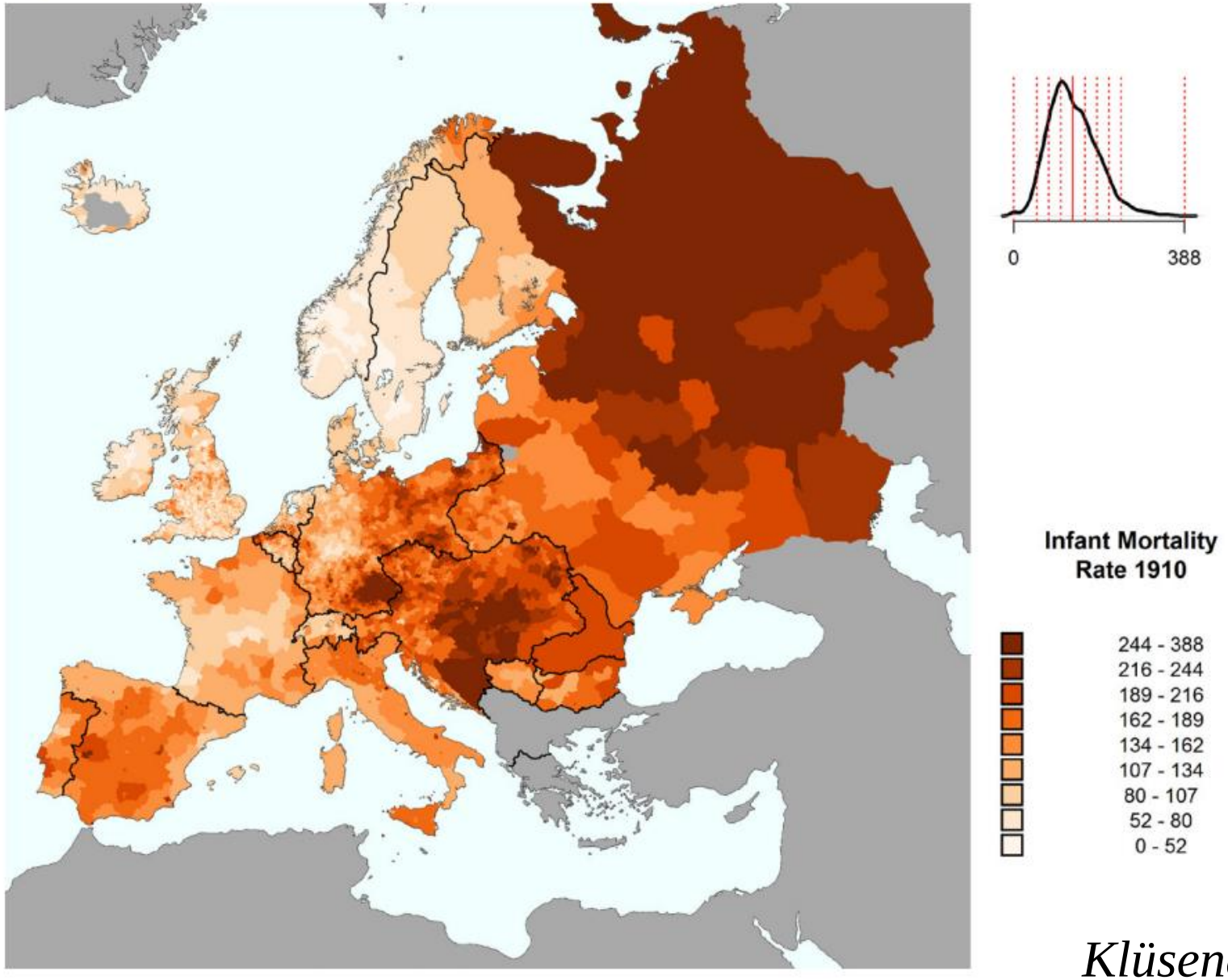


Regional variation in infant mortality



Jaadla & Reid 2017

Figure 2: Spatial variation in infant mortality rates 1910*

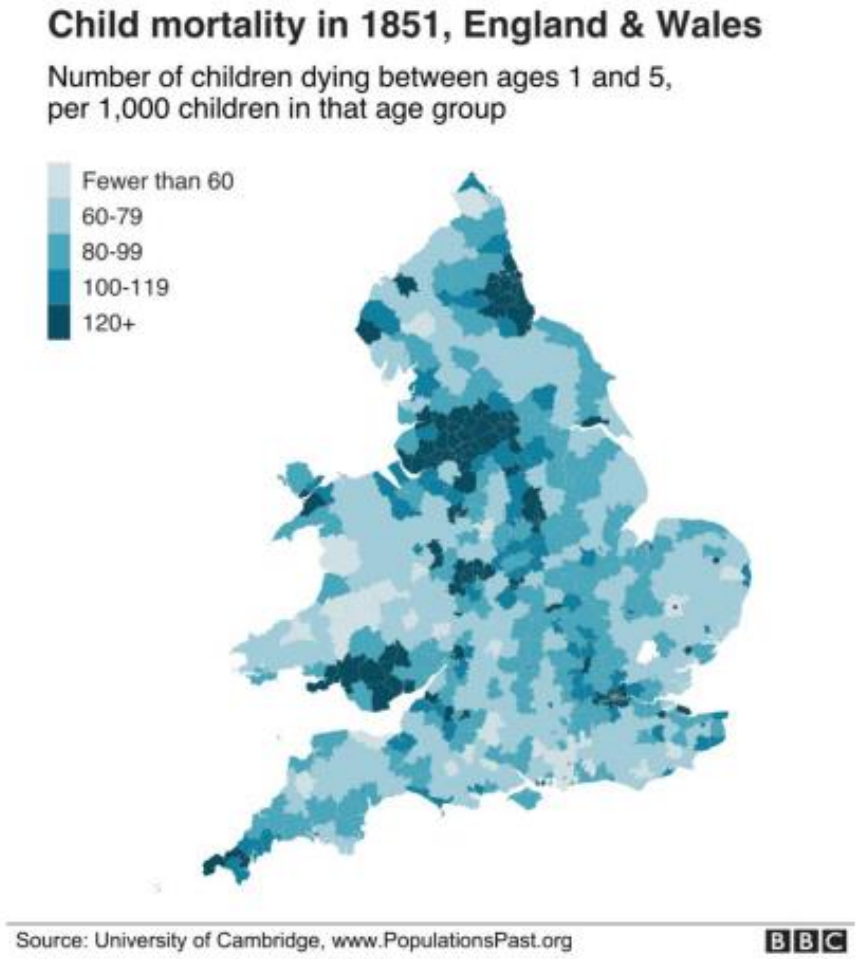


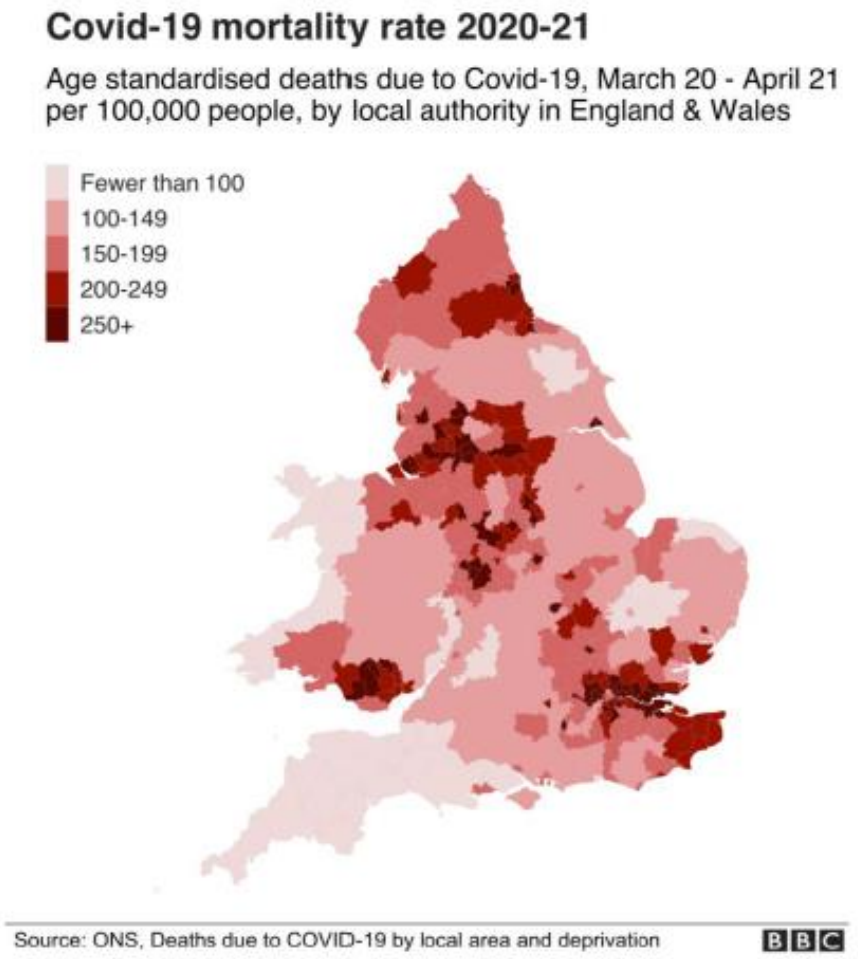
Klüsener et al. 2014

Regional inequalities in mortality

- Strong spatial variations in health and mortality
  - Level of urbanisation
  - Local disease environments and population density
  - Public health and investments in sanitation
  - Occupational and industrial structure of local areas
  - Healthcare provision
  - Poverty and deprivation

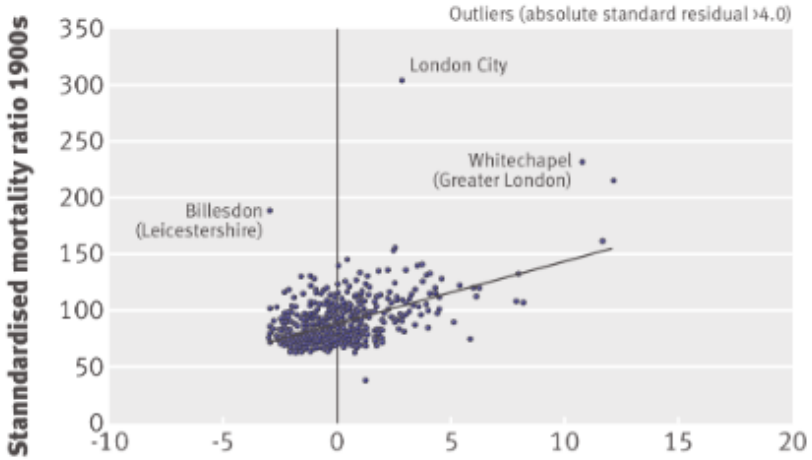
Persistence of inequalities in health over time

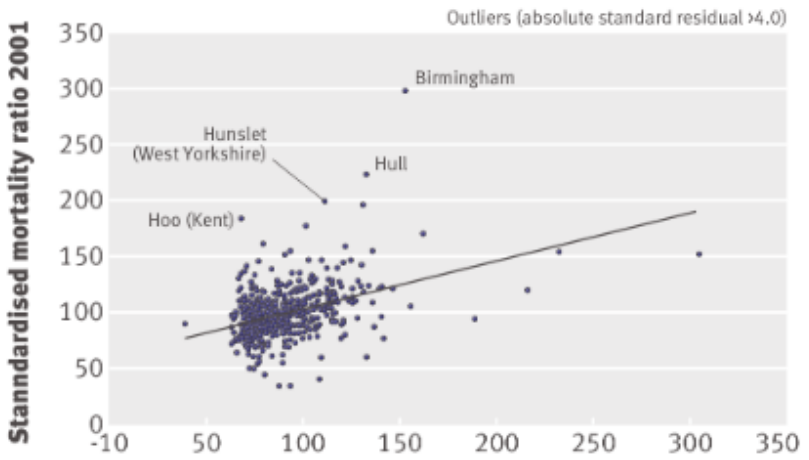


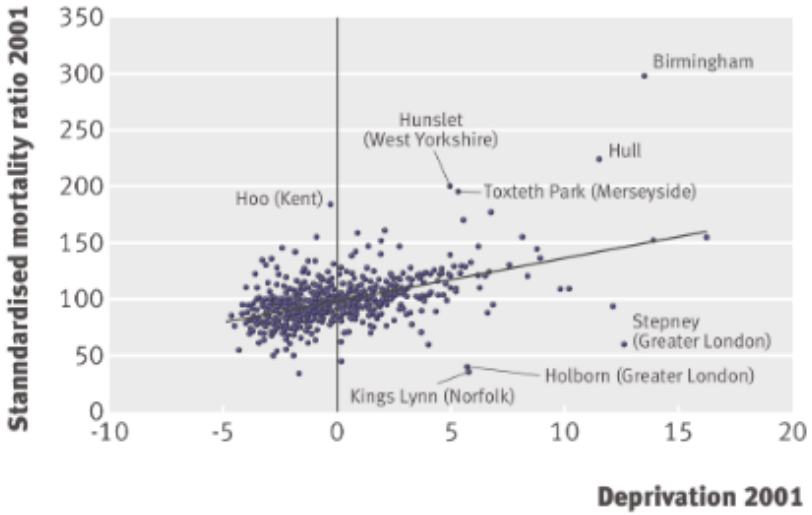


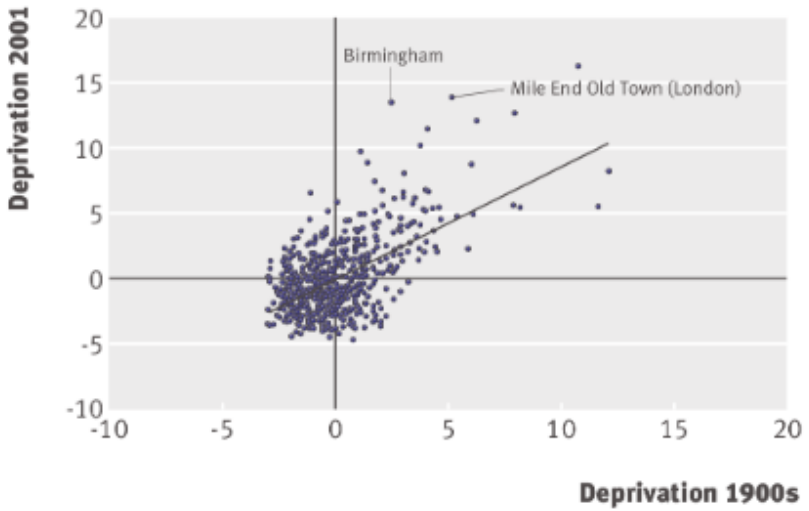
BBC News: 8 July 2021 https://www.bbc.co.uk/news/health-57730353

Longstanding relation between deprivation and mortality



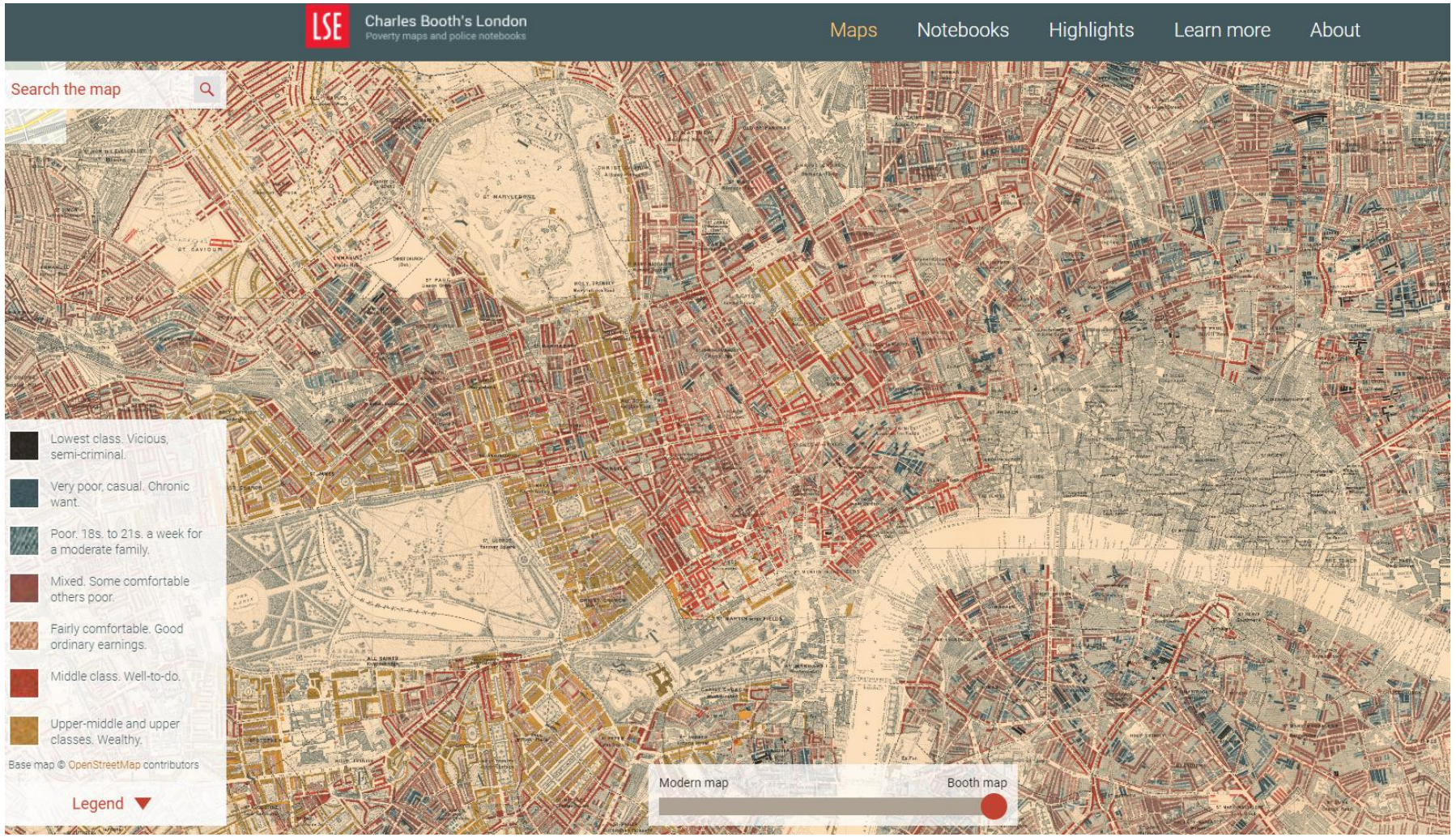






Gregory 2009

Past poverty as a strong predictor of present mortality



https://www.booth.lse.ac.uk

Past poverty as a strong predictor of present mortality

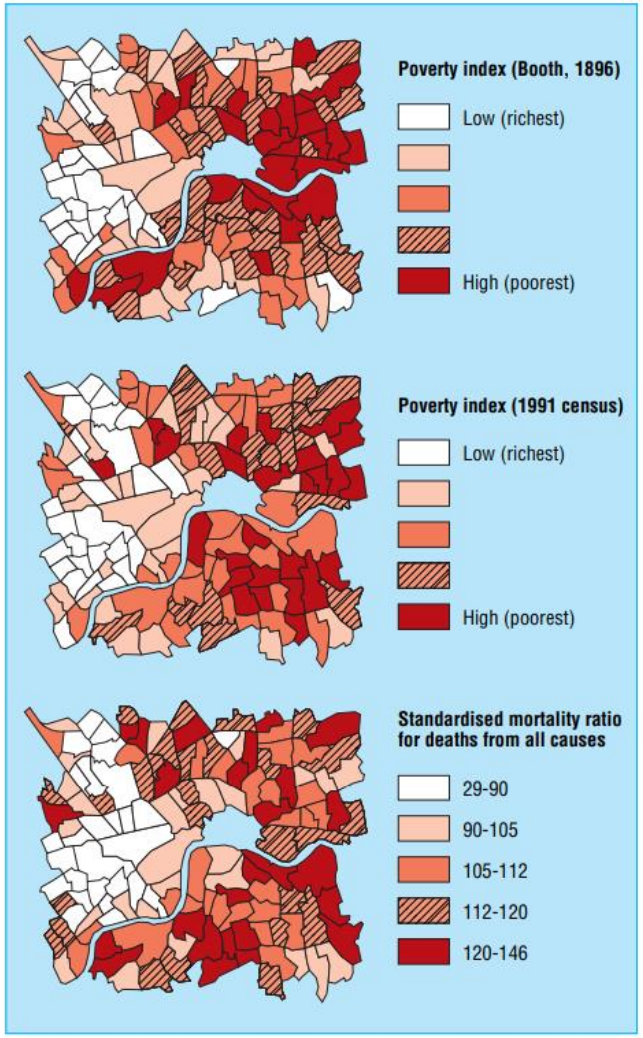


Fig 3 London poverty in 1896 (top) and 1991 (middle) and mortality in the 1990s (bottom)

Dorling et al. 2000

- How to study health inequalities?
  - What dimensions of inequality?
  - Measurement and comparability?
- Strong social and spatial inequalities in health and mortality.
- Demographic modernization magnified these differences.
- Cause of death patterns as indicators of mechanisms in health inequalities.