Understanding the production of health inequalities over the life course:

the embodiment dynamic

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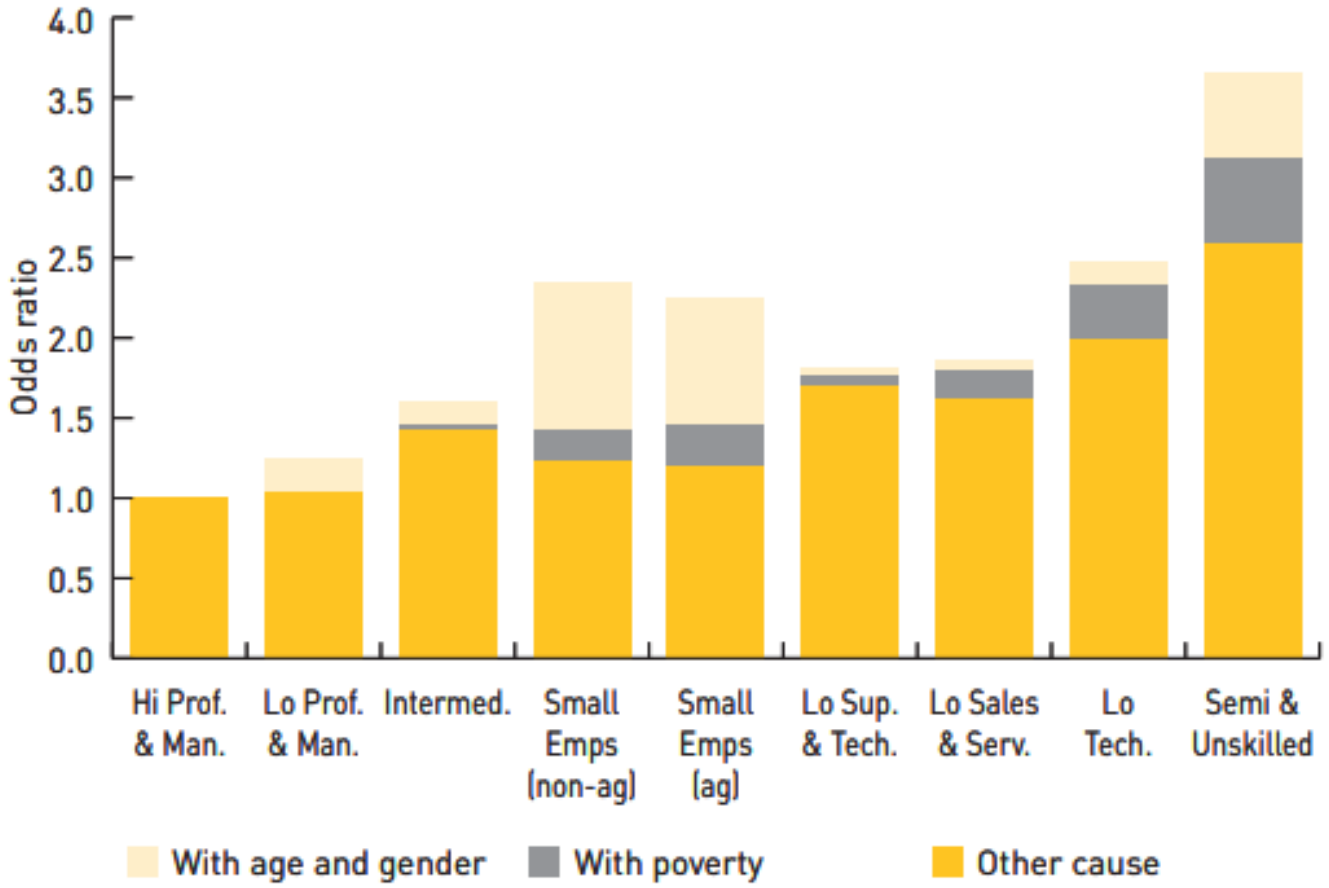
Health inequalities

"systematic, avoidable and unfair differences in health that can be observed between populations, between social groups within the same population or as a gradient in a population classified by social position"

[McCartney, Popham, et al. 2019]

Social class and self-reported poor health in Ireland

Figure 2.12: ESeC class differentials in 'less than good health' before and after controls for age, gender and income poverty (EU-SILC 2004)

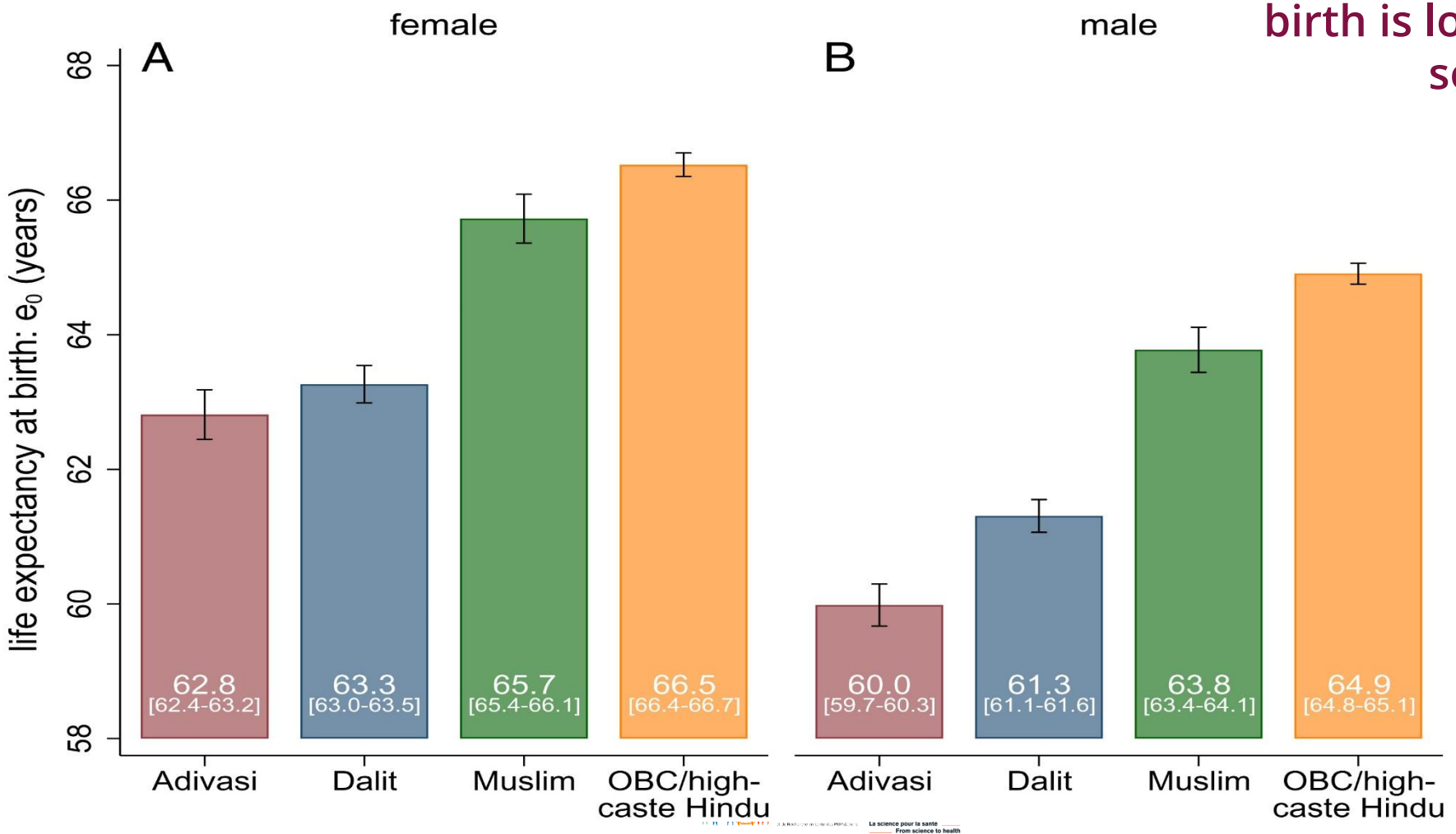


The odds of reporting poor health increases by social disadvantage

[Layte, Nolan & Nolan 2007]

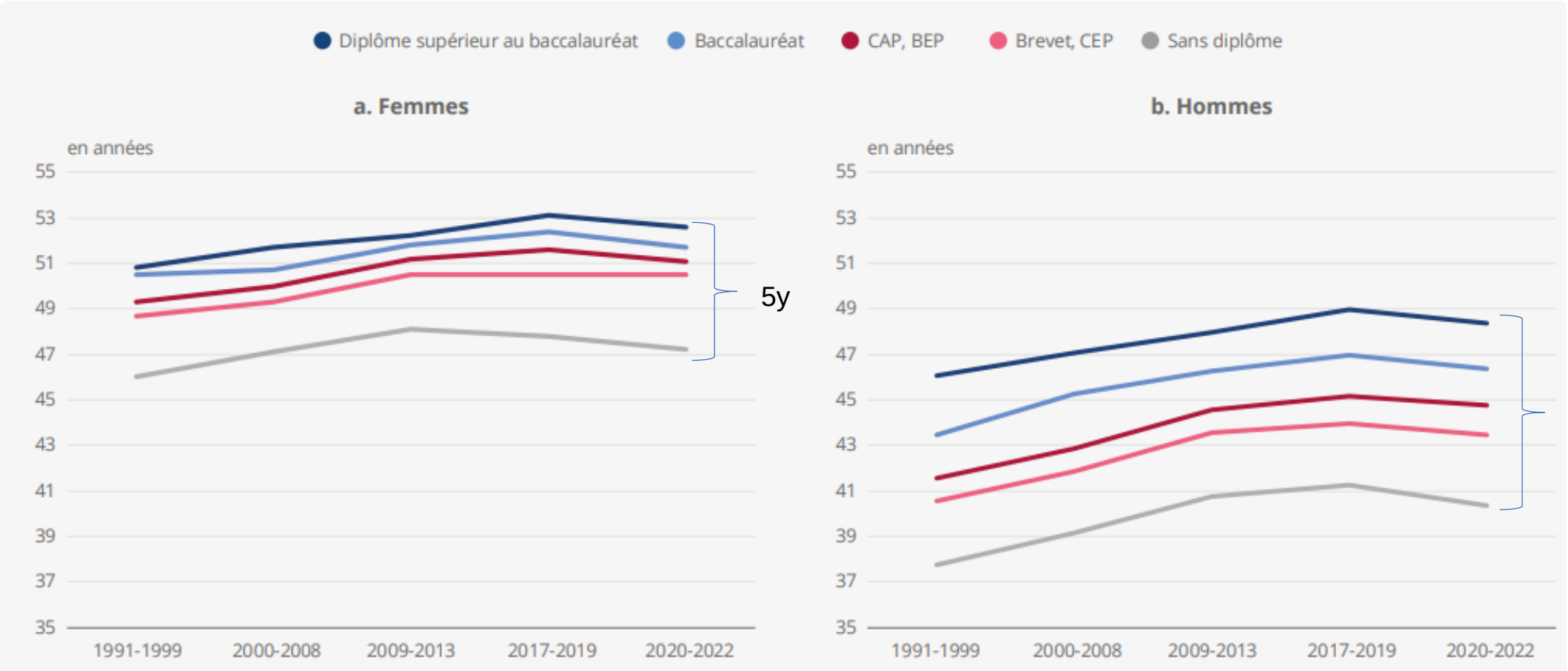
Caste & life expectancy in India

Average life expectancy at birth is lower among the more socially disadvantaged



[Vyas et al 2022 PNAS]

Life expectancy at 35 in France by level of education



Life expectancy trends are starting to drop. Average life expectancy beyond 35y is lowest for people with low education. Gaps are wider among men, and there is a wide gender gap.

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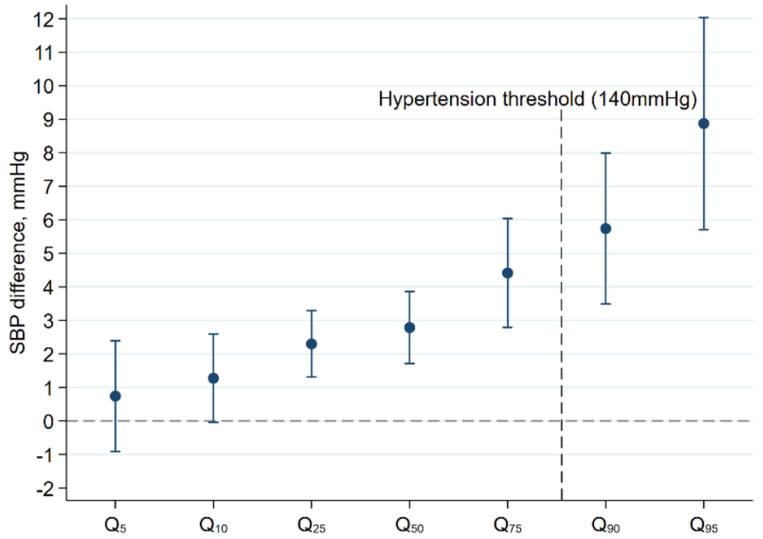
Blood pressure

Socioeconomic inequalities in blood pressure: co-ordinated analysis of 147,775 participants from repeated birth cohort and cross-sectional datasets, 1989 to 2016

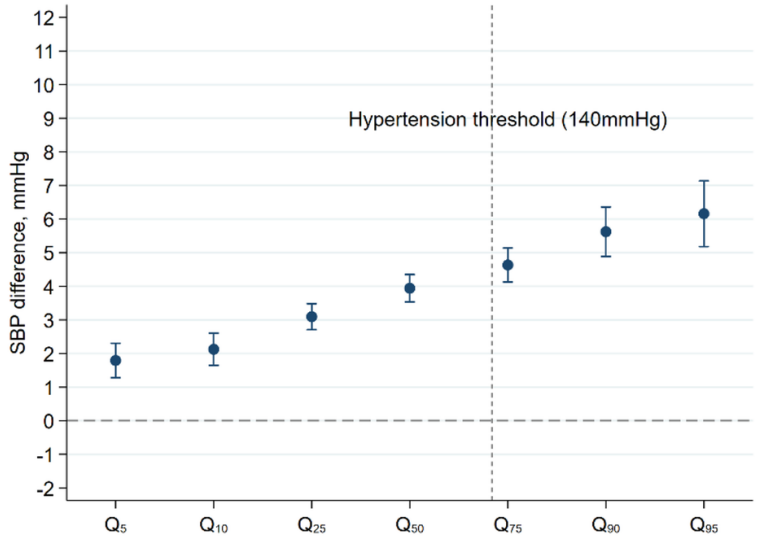
[Bann et al 2020 BMC Med]

Blood pressure is socially patterned with higher blood pressure among more socially disadvantaged

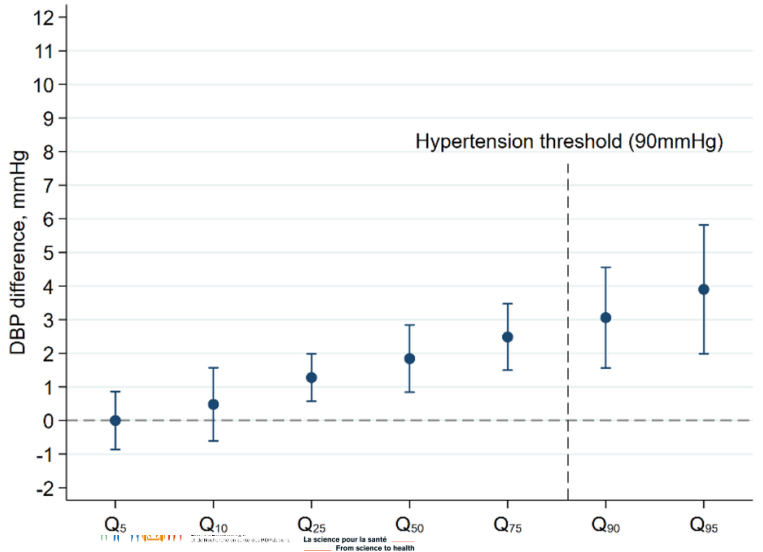
a) Systolic blood pressure, birth cohort data



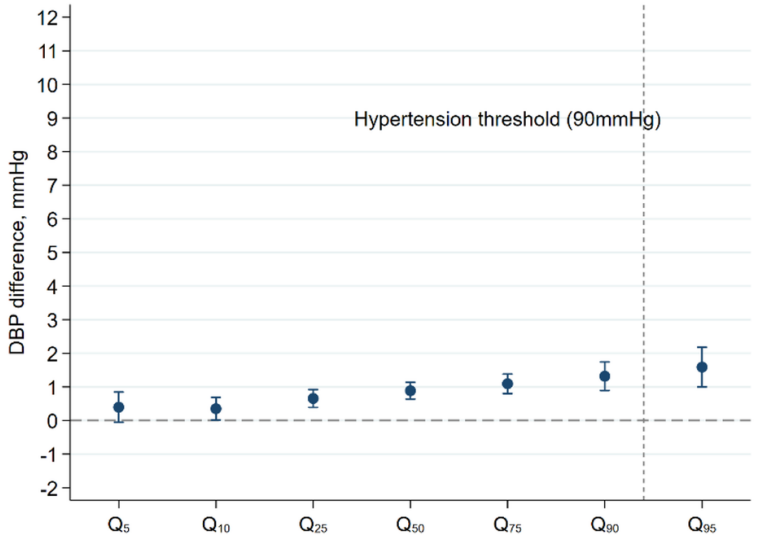
b) Systolic blood pressure, repeated cross-sectional data



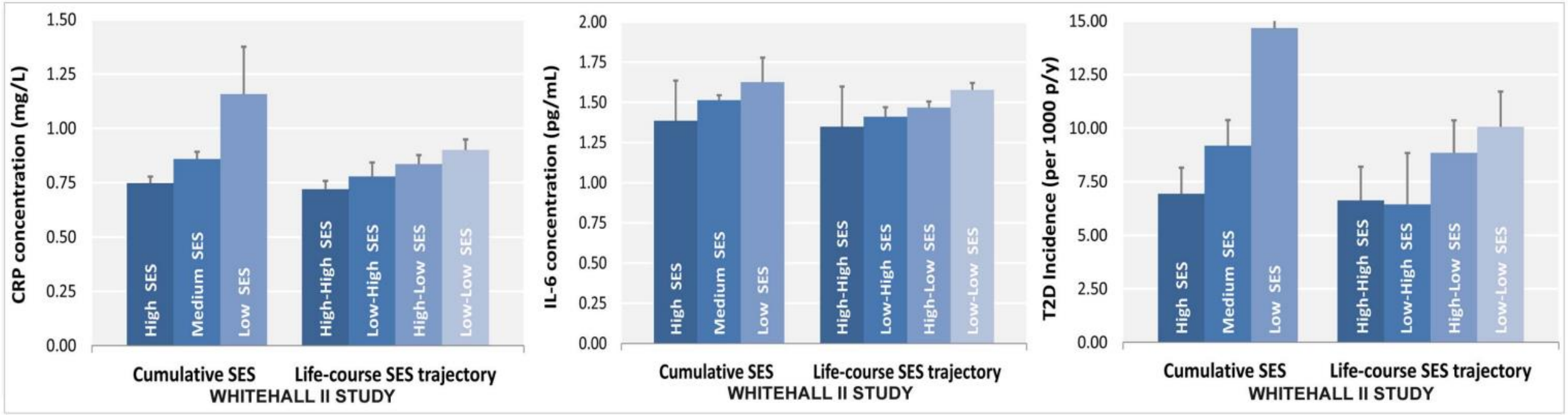
c) Diastolic blood pressure, birth cohort data



d) Diastolic blood pressure, repeated cross-sectional data



Inflammation & type II diabetes

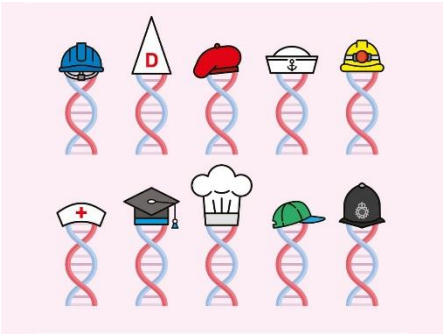


[Stringhini et al 2013 Plos Med]

Some markers of inflammation are socially patterned with levels of CRP & IL6 among more socially disadvantaged. The incidence of type 2 diabetes is also socially patterned

The social gradient in health

Is pervasive across populations and over time, we observe it using many different types of social variables, and many health outcomes



Embodiment

Embodiment

One of the most fundamental processes that underlies the production of health inequalities over the life course

- Is overlooked among scientists and health professionals
- Is often misunderstood
- Helps explain persistent systemic health inequities
- Is an adaptive process driven by socio-structural determinants from early life

Embodiment

"at the most general level, embodiment …/… refers to how we, like any living organism, literally incorporate, biologically, the world in which we live, including our societal and ecological circumstances"

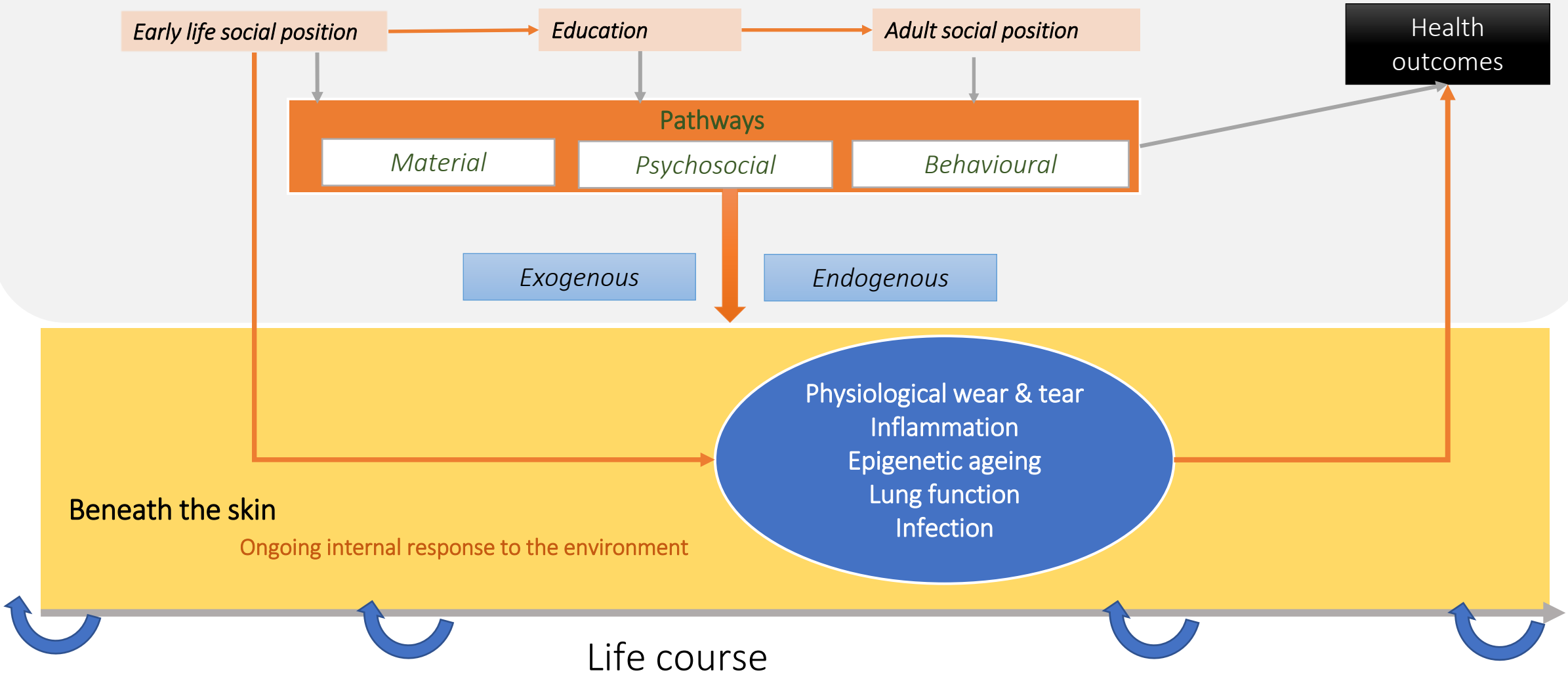
[Krieger 2005 JECH]

[Kelly-Irving & Delpierre 2021]

Embodiment: a dynamic

Ubiquitous structural systems:

Racism, gender, class, caste & political environment



The Weathering Hypothesis

An example of how socio-structural determinants, in this case systemic racism, are embodied

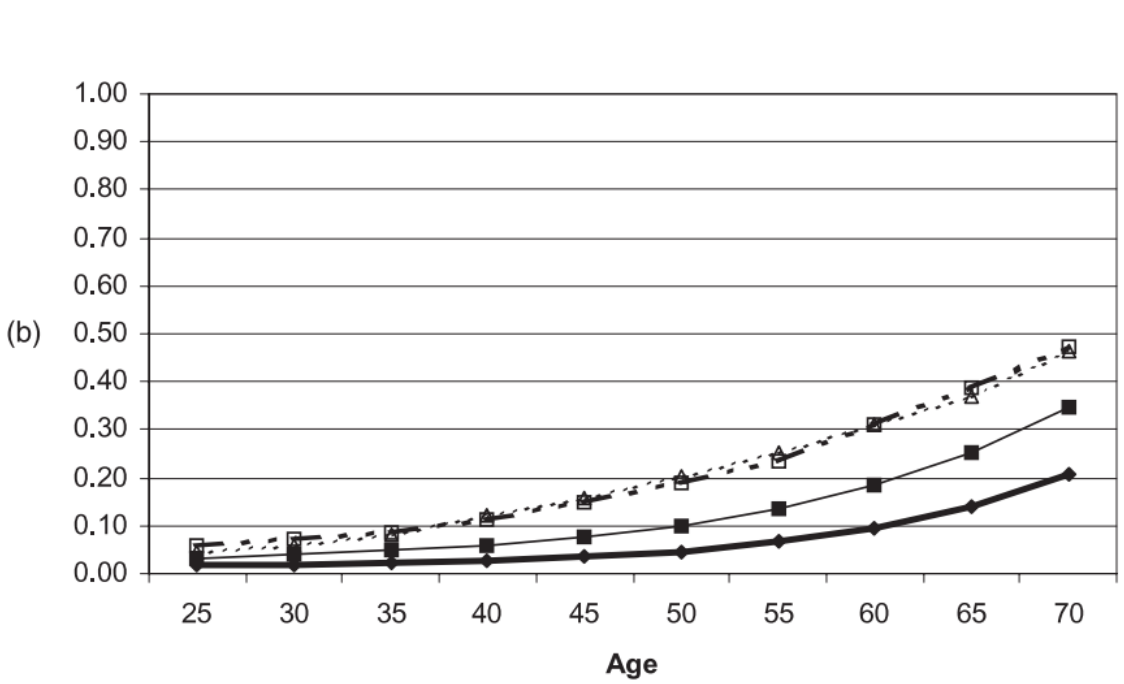
The Weathering Hypothesis

"In all social classes, members of minority groups are subject to racial or ethnic discrimination that can be costly to health.

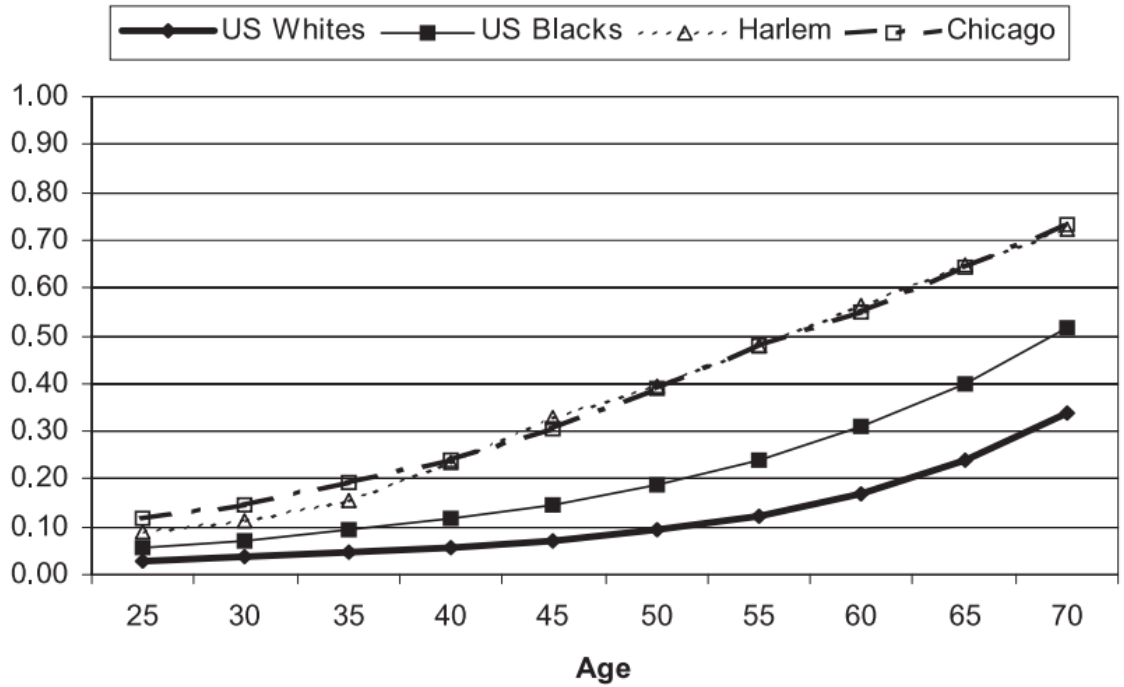
This can take concrete, observable forms, such as **diminished access to health services and health education or residence in segregated neighborhoods with excessive exposure to environmental hazards**.

It may also be the product of evolving concepts of psychosocial risk. For example, there are empirical indications that prolonged, effortful, active coping with social injustice may, itself, exact a physical price."
[Geronimus 1992]

Weathering & mortality



Probability of dying by various ages in selected populations, women, 1990



Probability of dying by various ages in selected populations, men, 1990

In both women and men mortality rates across the lifecourse were higher among Black Americans, especially from the poorest urban areas, with an amplification of the effect by age

[Geronimus & Thompson 2004]

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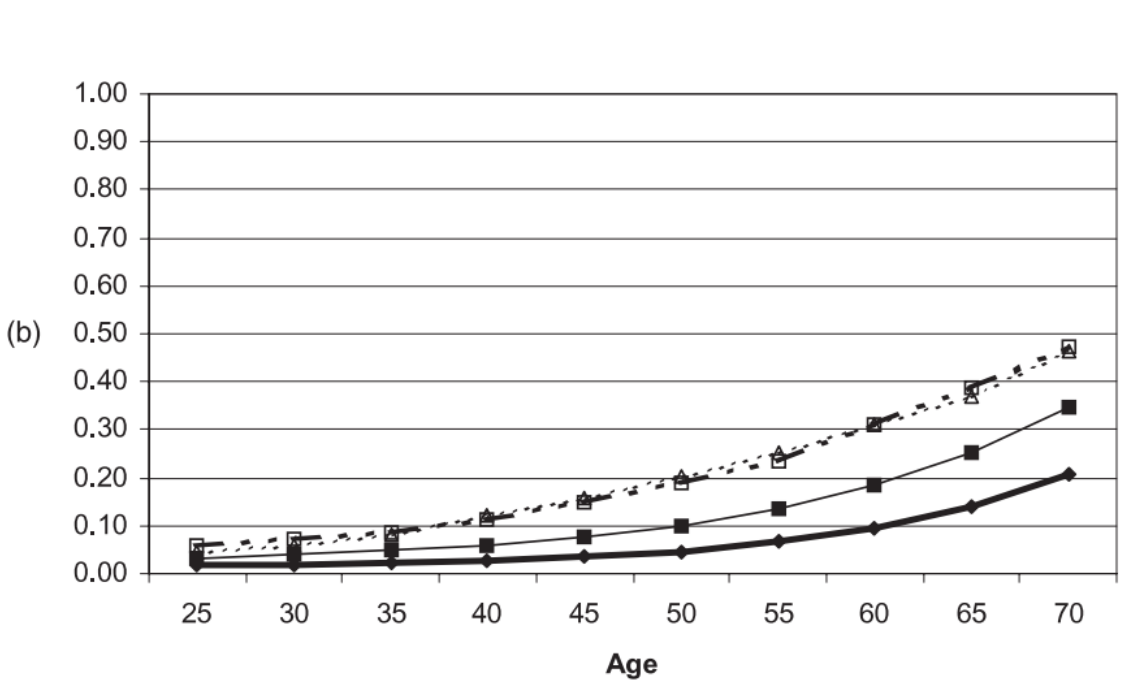
Weathering & mortality



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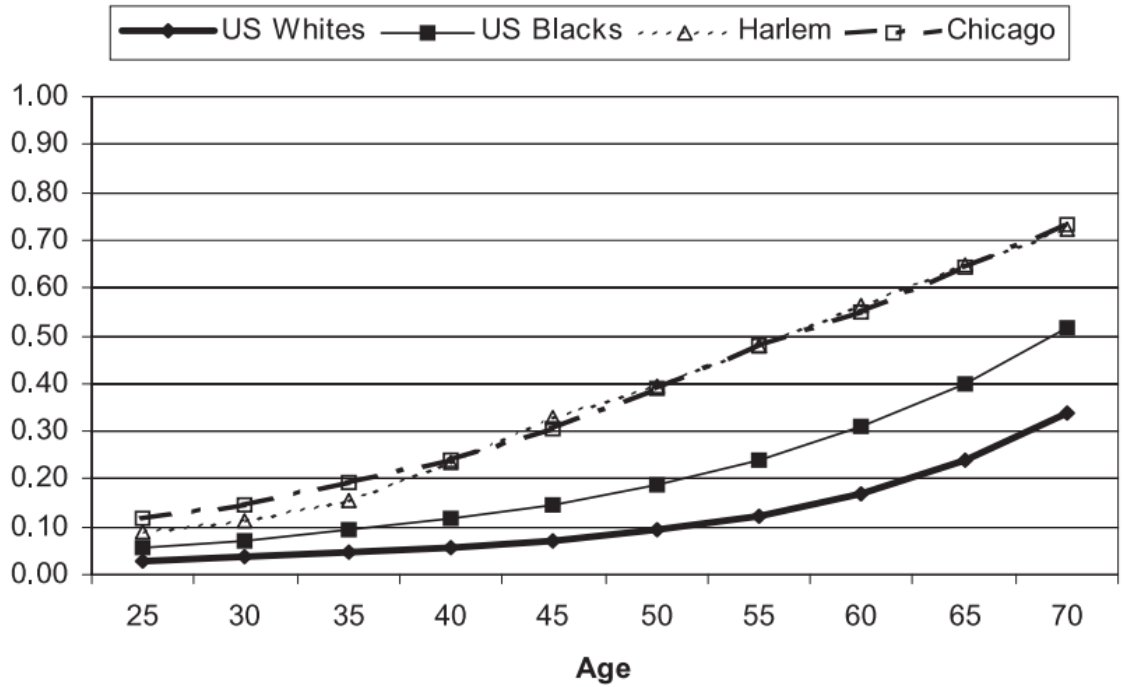


Probability of dying by various ages in selected populations, men, 1990

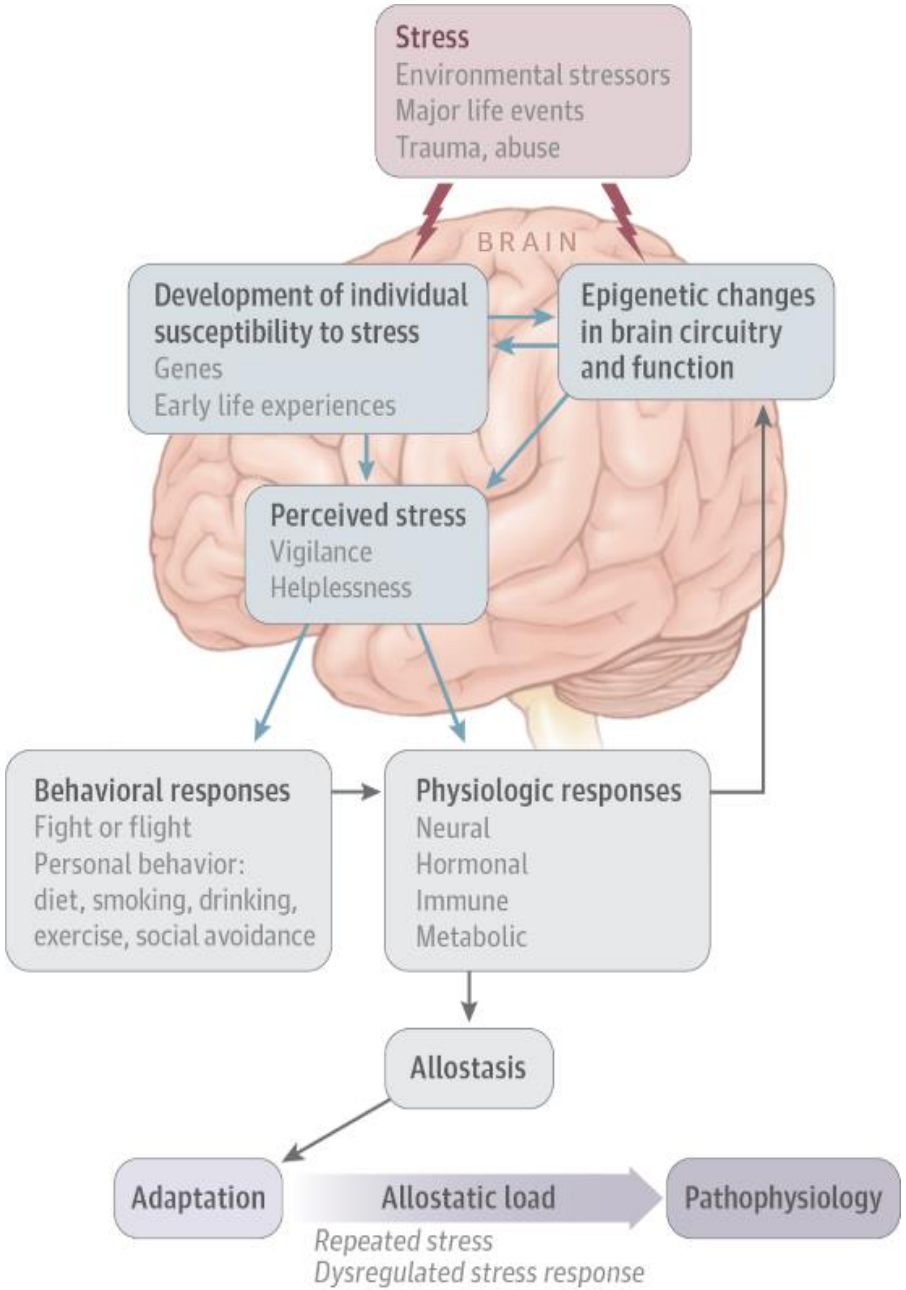
"Weathering posits that African Americans experience early health deterioration because, relative to Whites, **they have much greater and more frequent experiences with social and economic adversity. On a physiological level, persistent, high-effort coping with acute and chronic stressors has a profound effect on health and disease"**

[Geronimus & Thompson 2004]

Physiological wear-and-tear

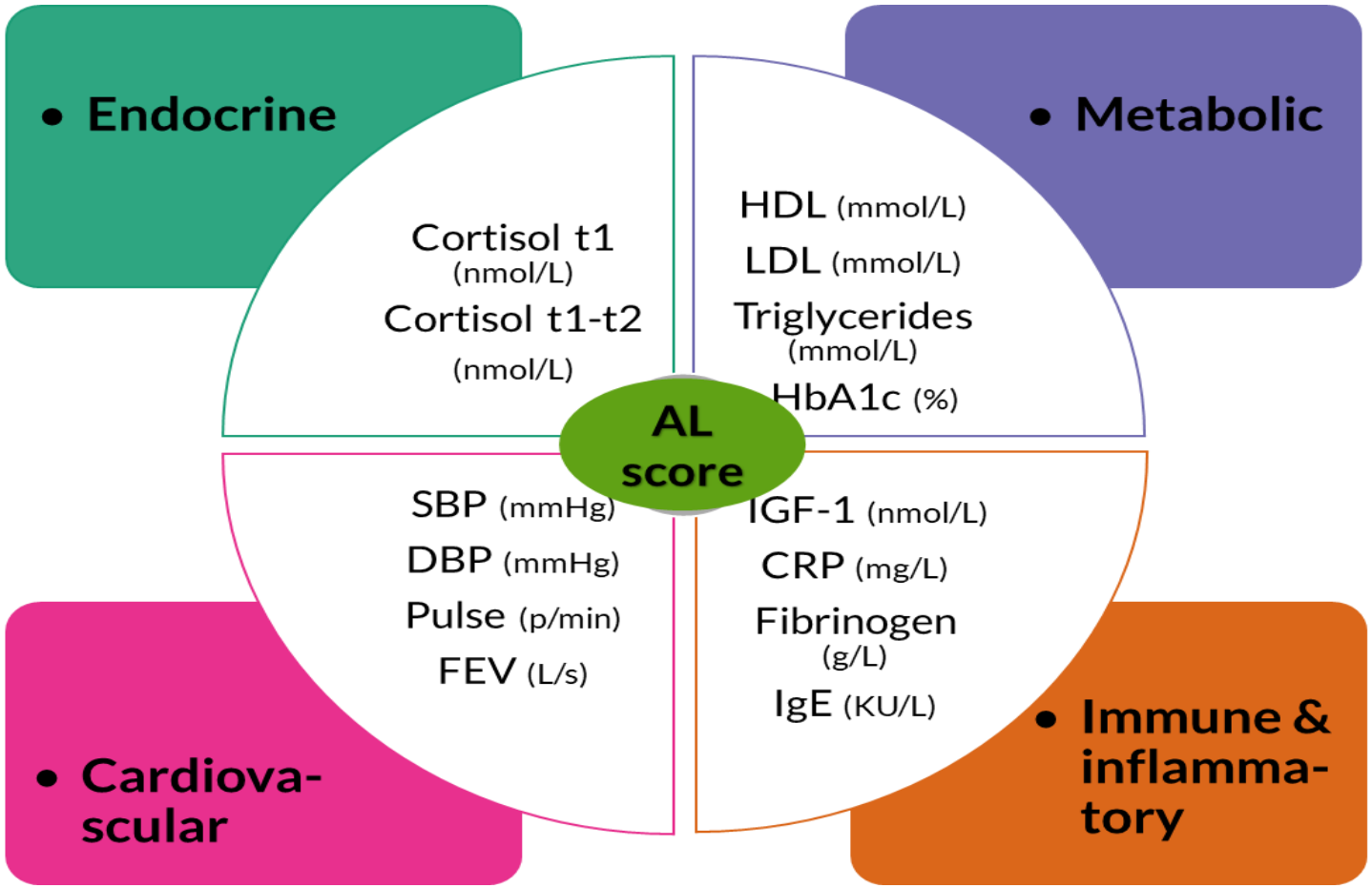
Allostatic load: "The strain on the body produced by **repeated ups and downs of physiologic response** .../... and the impact of wear and tear on a number of organs and tissues, can predispose an organism to disease. We define this state of the organism as allostatic load" (*McEwen and Stellar 1993*)

Inflammaging: elevated levels of blood inflammatory markers that carries high susceptibility to chronic morbidity, disability, frailty, and premature death *(Ferrucci & Fabbri 2018)*



[McEwen JAMA Psychiatry. 2017]

Allostatic load: measuring physiological wear-and-tear



Typical allostatic load construction:

1. Highest-risk quartile definition (‘1’ vs low risk ‘0’)
2. Sum score of dichotomized biomarkers

Weathering & physiological wear-and-tear

- Black Americans are more likely to have higher physiological w&t than White Americans
- The probability for White men and women to have higher physiological w&t is similar
- Black women are more likely to have higher physiological w&t compared to Black men and White Americans

[Geronimus et al 2006]

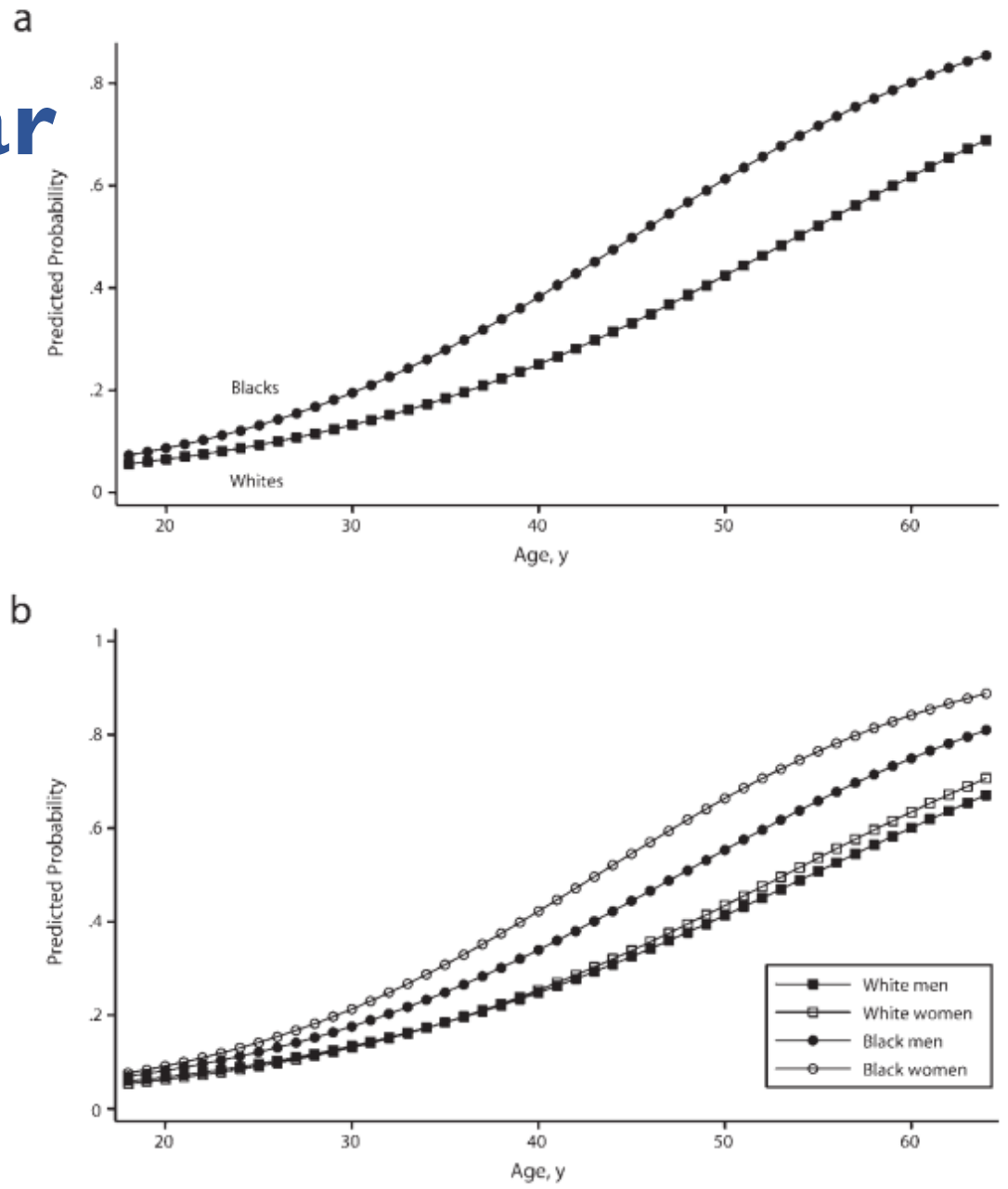


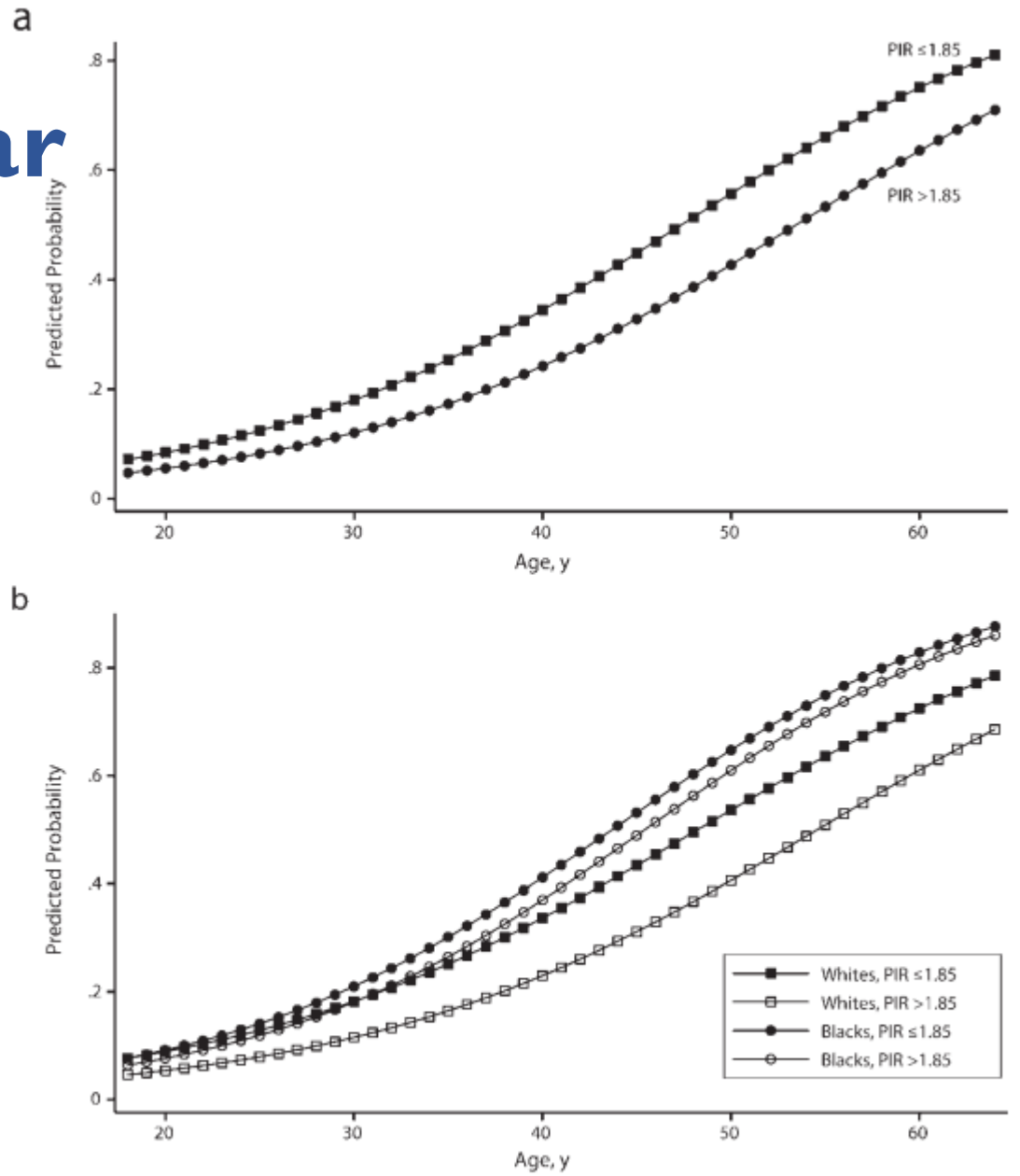
FIGURE 1—Probability of having an allostatic load of 4 or higher, as predicted by race (a) and race and gender (b).

Weathering & physiological wear-and-tear

- Poor Americans are more likely to have higher physiological w&t than their non-poor counterparts
- The probability of having higher physiological w&t is higher among poor White Americans compared to the non-poor
- The probability of having higher physiological w&t among Black Americans is not driven by poverty

Racism and gender are the main drivers of physiological w&t differences

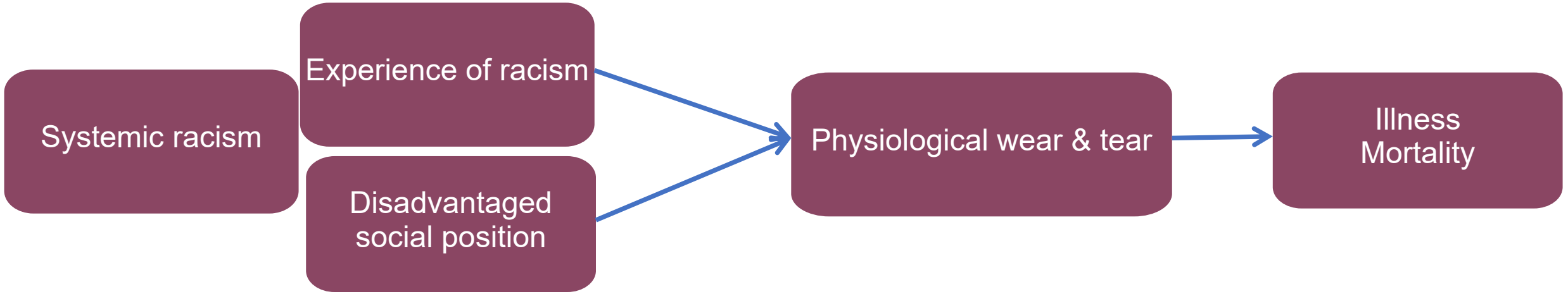
[Geronimus et al 2006]



Note. PIR = poverty income ratio.

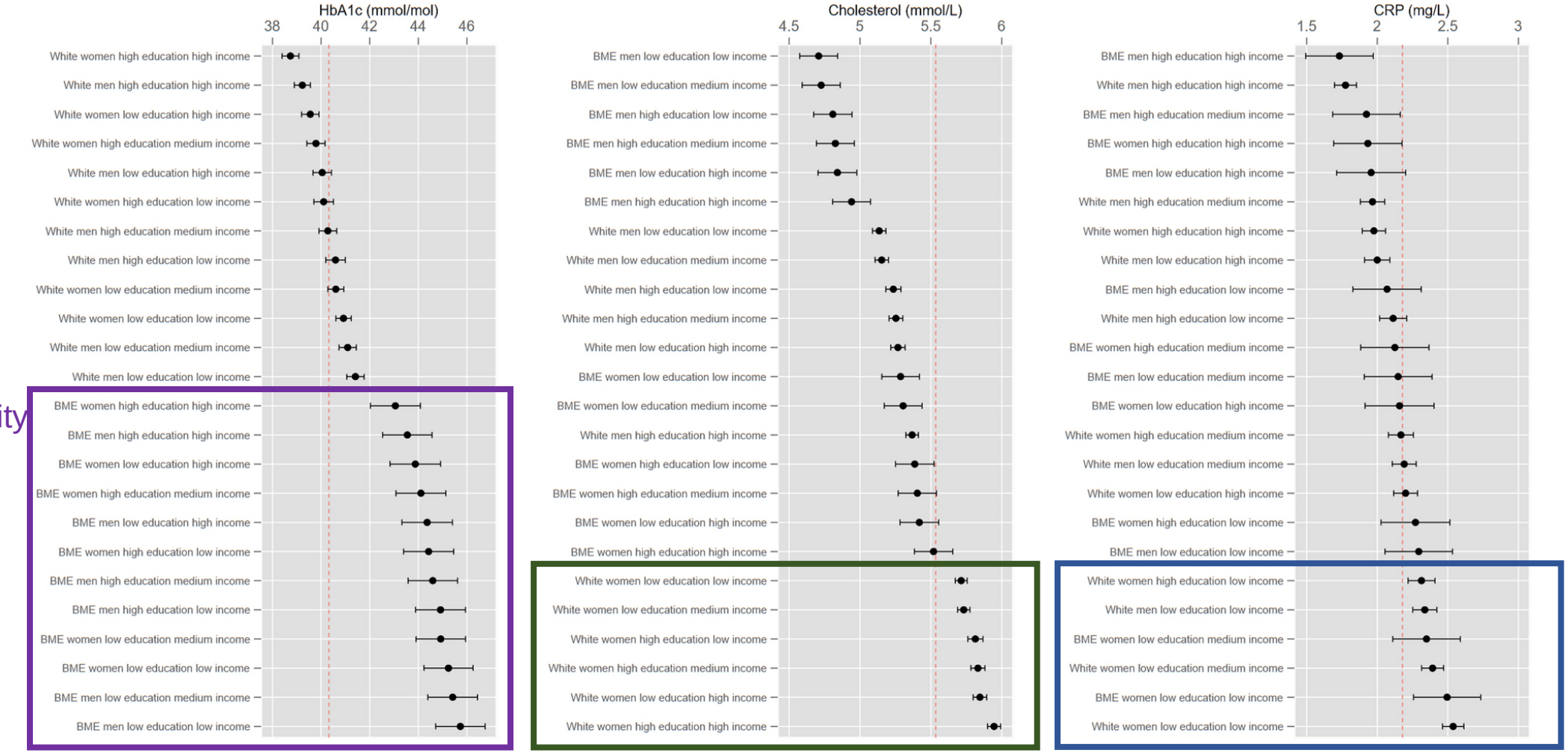
FIGURE 2—Probability of having an allostatic load of 4 or higher, as predicted by poverty income ratio (a) and poverty income ratio and race (b).

Weathering & physiological wear-and-tear: systemic racism



- Simons et al (2021) found that both a disadvantaged social position and the experience of racism were associated with a greater risk of having chronic diseases
- The effect of racism on risk of chronic disease was strongly mediated by inflammation
- Obaoye et al (2023) found that the relation between reported discrimination and mortality risk was mediated by physiological w&t

Intersecting socio-structural determinants and biomarkers



Ethnicity

X axis = effect size. Reference level = sample mean.

[Holman et al 2020 Sci reports]

Ethnicity & Gender

Socioeconomic

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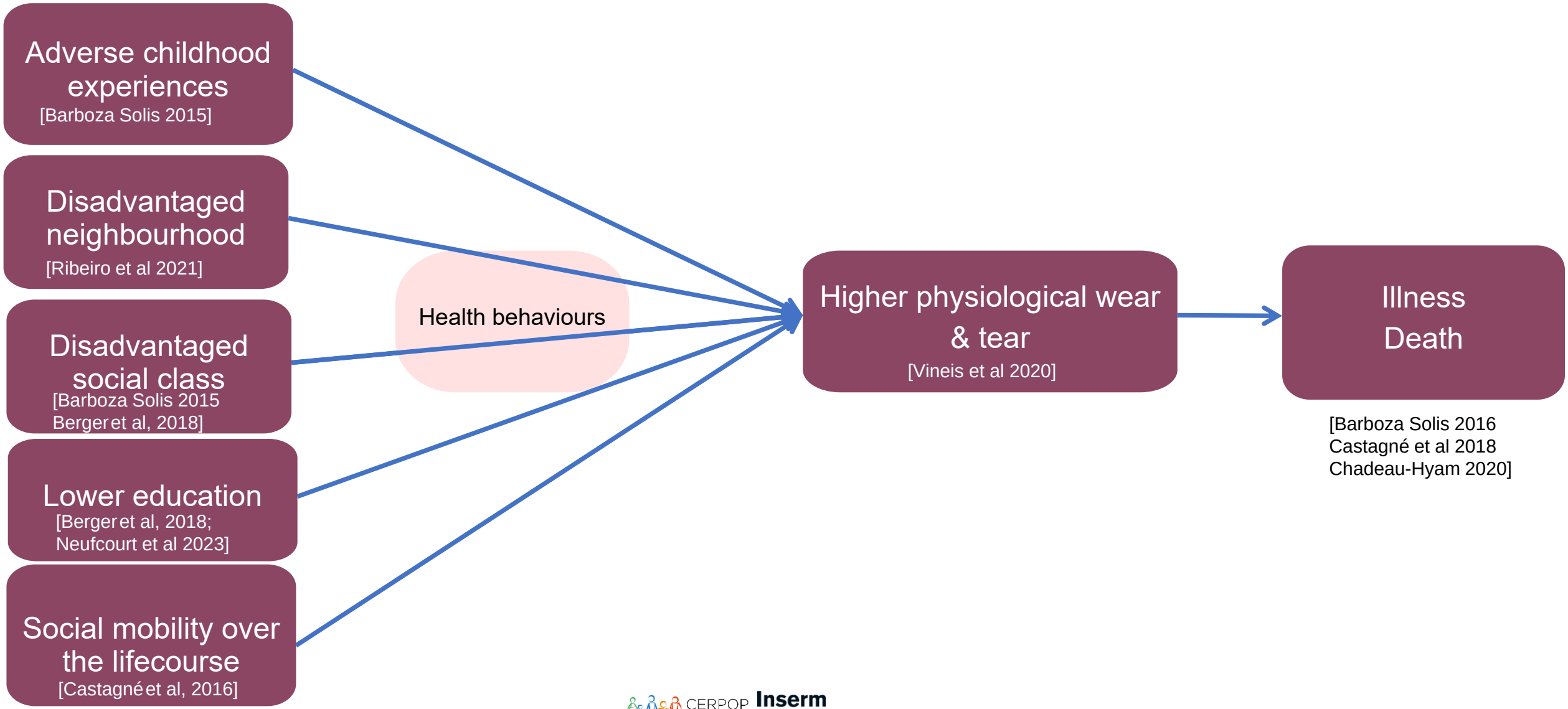
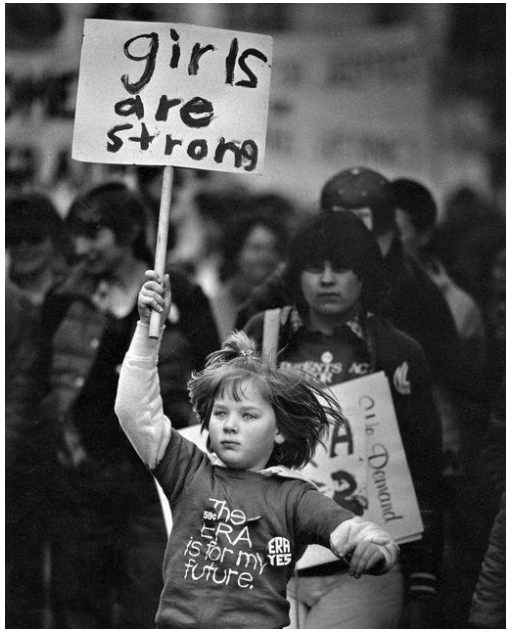
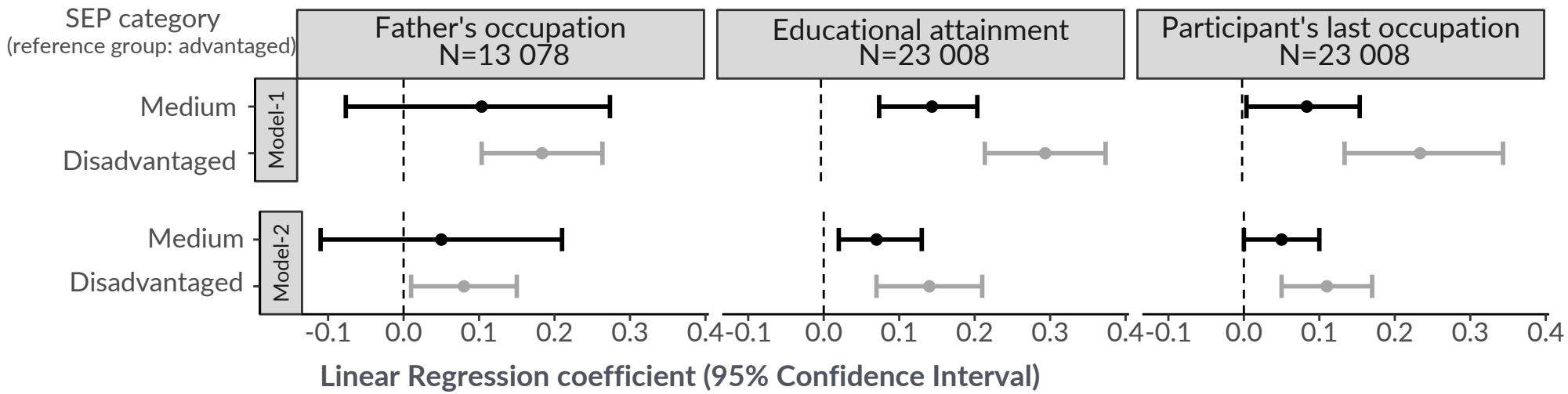
Numerous socially driven pathways to physiological **wear-and-tear**



When does it start?



Association between social position at three life stages & inflammation (CRP)



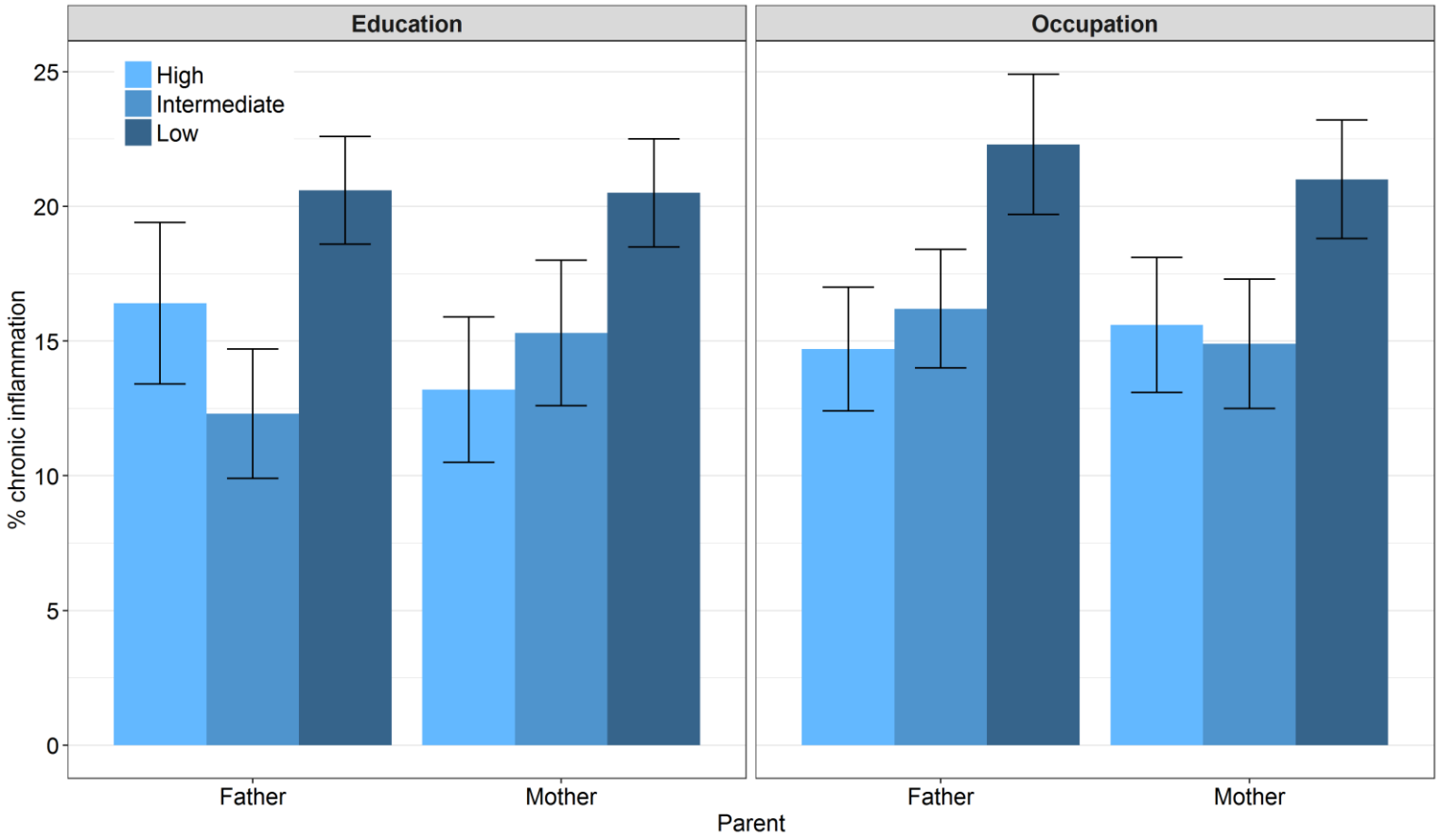
Model 1: Adjusted for sex. Model 2: Adjusted for body mass index, smoking, alcohol & physical activity

[Berger *et al* 2019 Nat Comms]

Inflammation is higher adults from more disadvantaged social backgrounds, and this is not explained by 'classic risk factors'

When? Life course & timing

Embodiment from childhood:
Parental social position & global inflammation: C-Reactive Protein in highest quartile at two time points age 13 & 17 y in EPITEEN cohort

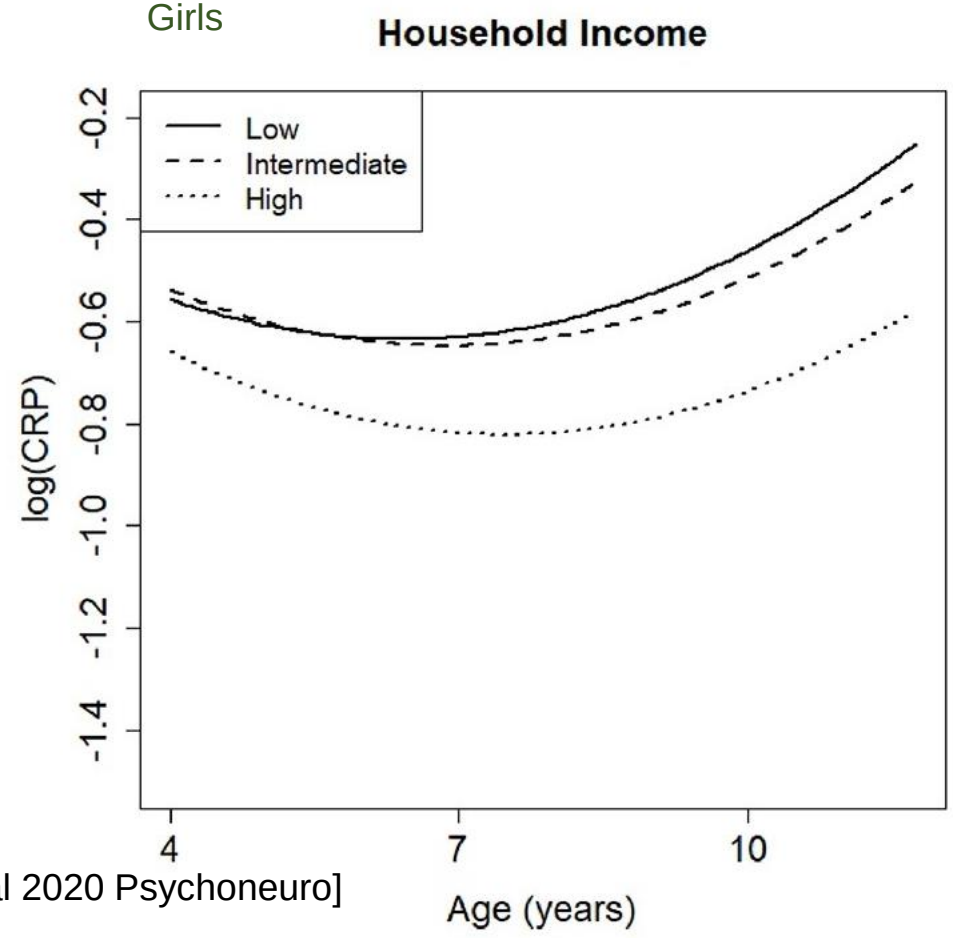


Inflammation is higher among teenagers from more socially diadvantaged families

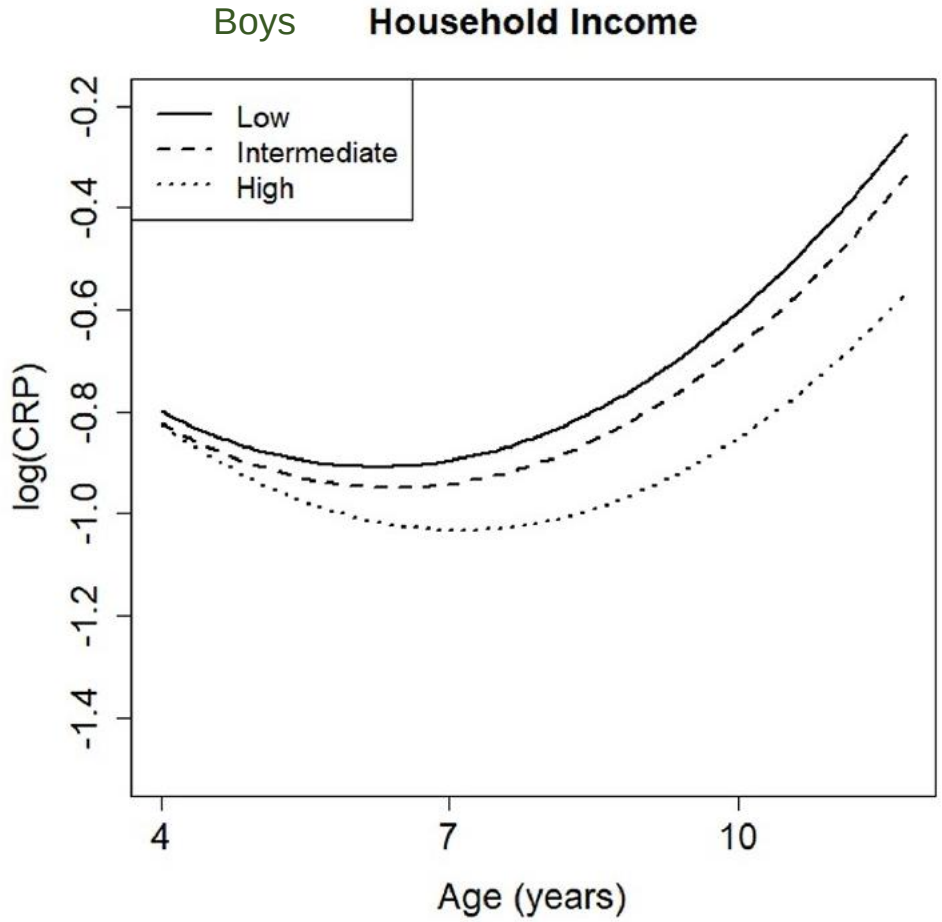
[Fraga et al Arch dis child 2020]

Life course, timing, intersectionality

Girls



Boys



[Soares et al 2020 Psychoneuro]

Girls have higher levels of inflammation. Higher levels of inflammation among the more disadvantaged children emerges earliest in the life course for boys, with steeper increases across childhood

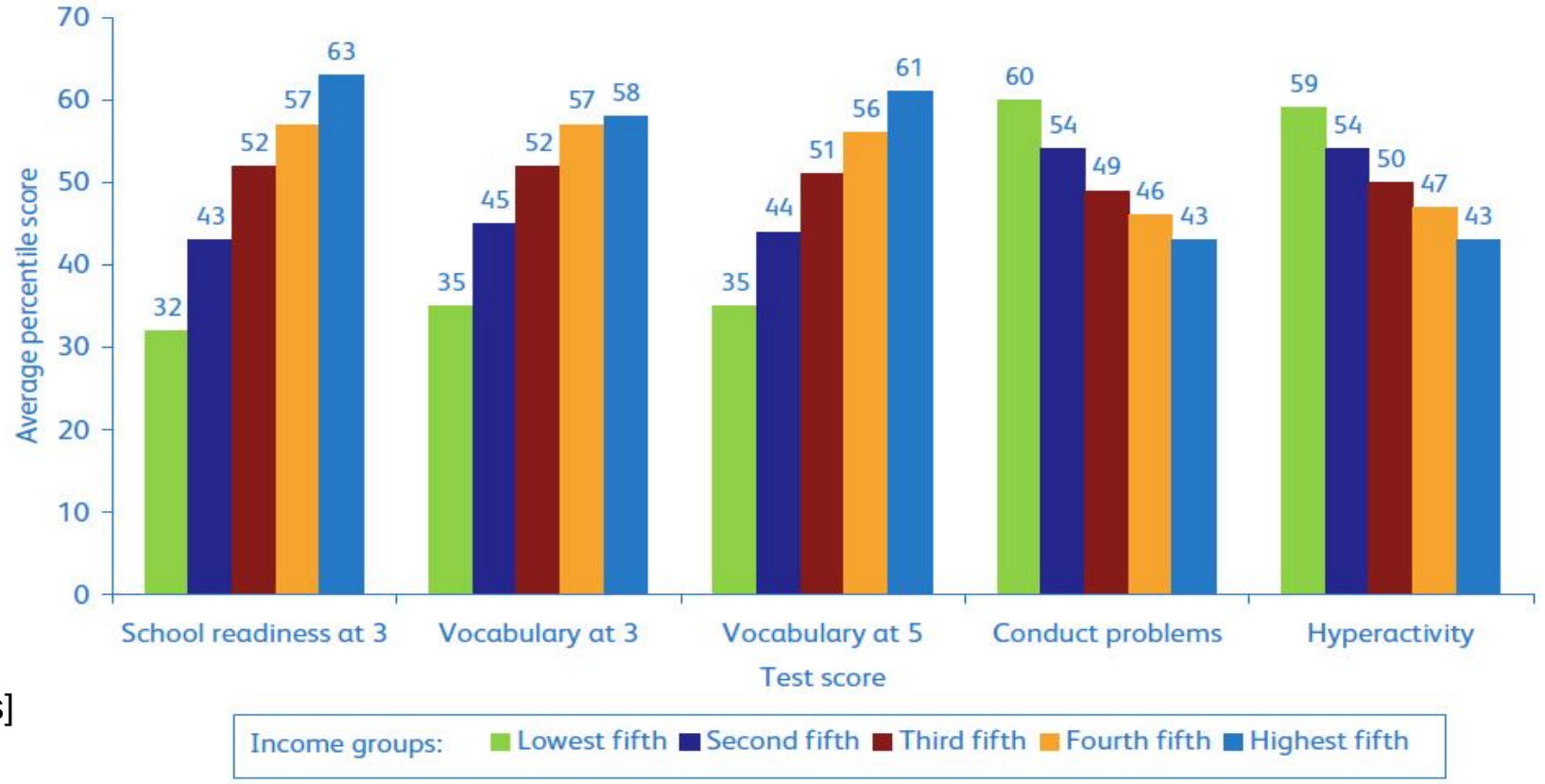
Embodied child development

Social gradient in child developmental indicators.

Lowest rates of school readiness and vocabulary in lowest income families; highest rates of conduct problems and hyperactivity in lowest income families

Figure S12: Indicators of school readiness by parental income group, UK: Average assessment for group as percentile of overall range of assessments

There are already substantial gaps in school readiness at ages 3 and 5 between children from poorer and richer families



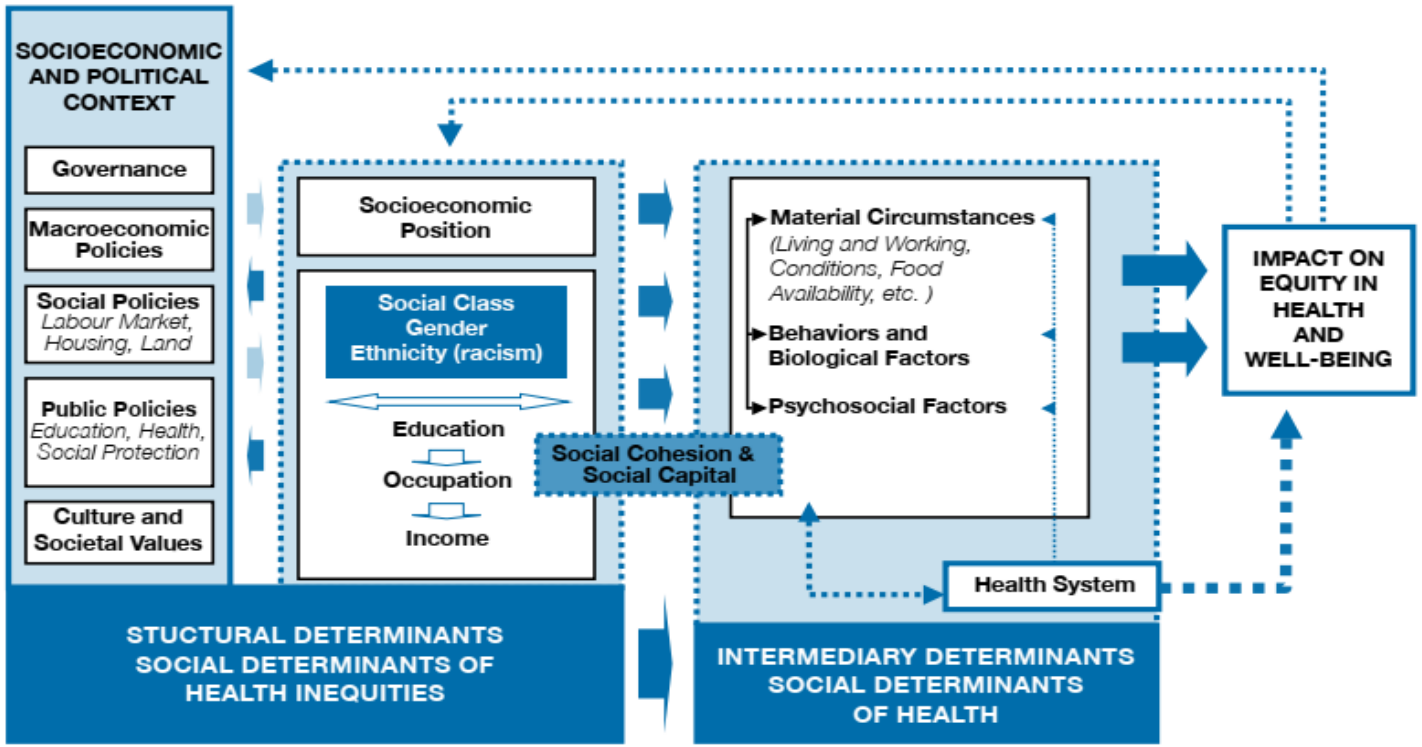
[Waldfogel & Washbrook, 2011 Child Devt Res]

Future directions

- To understand how in inequalities are produced we need to examine intersecting social categories across the life course
- Continue to collect good quality social, biological and health data collected across the life course and across country-contexts
- Invest in understanding explanatory pathways: can you reverse embodied social inequality? If so, does it affect health outcomes?
- Well-conceptualised frameworks, triangulation of methods
- Life course transition stages as their potential as areas for interventional research to inform policy

Our challenge: Ubiquity of these systems & exposures

Figure A. Final form of the CSDH conceptual framework



[Solar O, Irwin A. 2010 WHO]

"Small changes in ubiquitous causes may result in more substantial change in the health of populations than larger changes in rarer causes"

[Keyes and Galea 2018]

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Concluding remarks

Embodiment is one of the most fundamental processes that underlies the production of health inequalities over the life course

Structural systems affect *who* in society experiences adversity, discrimination, and their life long embodied consequences

Thank you!

gendhi
gender & health inequalities

Thanks to the Equity team