

Exploring the Influence of Grandparental Socio-Economic Status on the Association Between Parental BMI and Offspring BMI Trajectories

Jie Zhang¹, Gemma Clayton^{2,3}, Kim Overvad¹, Anja Olsen^{1,4}, Deborah A Lawlor^{2,3}, Christina C Dahm¹

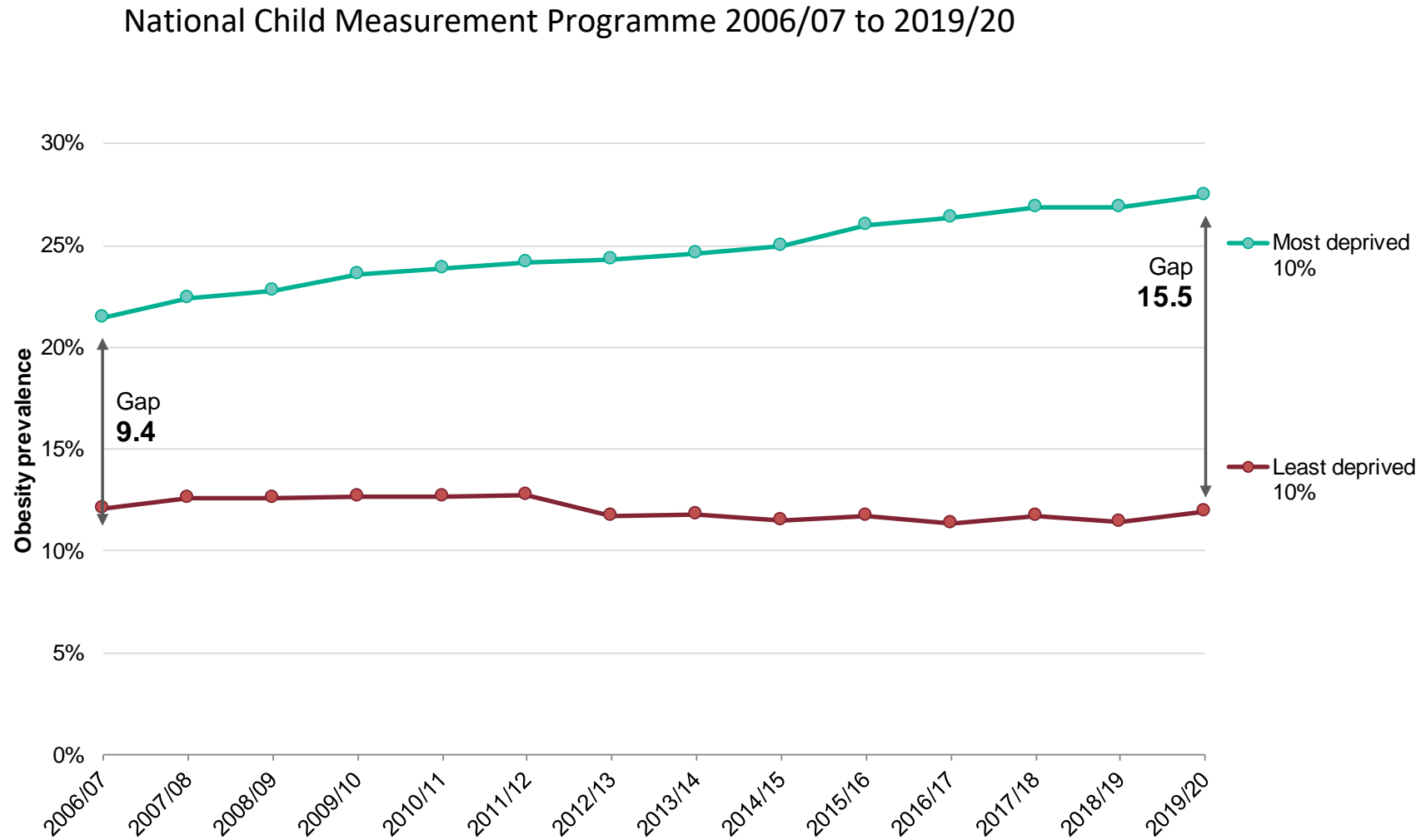
¹ Department of Public Health, Aarhus University, Steno Diabetes Center, Aarhus, Denmark;

² Population Health Sciences, Bristol Medical School, University of Bristol, Bristol, United Kingdom;

³ MRC Integrative Epidemiology Unit, University of Bristol, Bristol, United Kingdom;

⁴ Danish Cancer Society Research Center, Copenhagen, Denmark

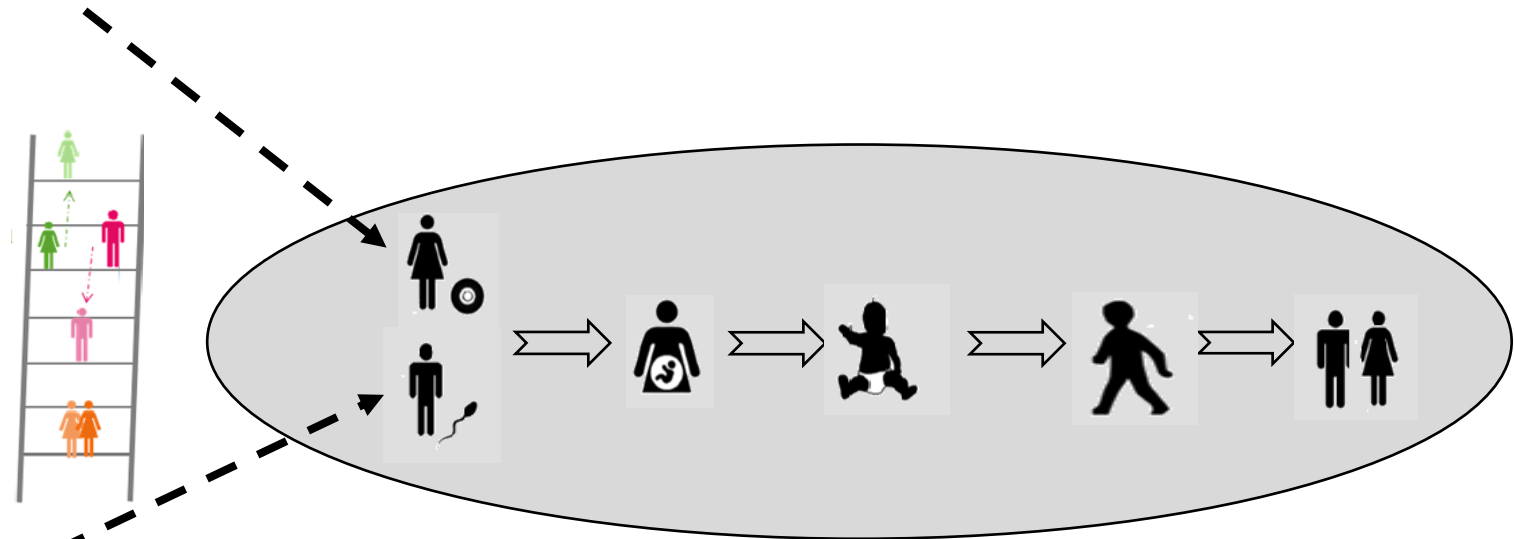
Obesity prevalence by deprivation decile



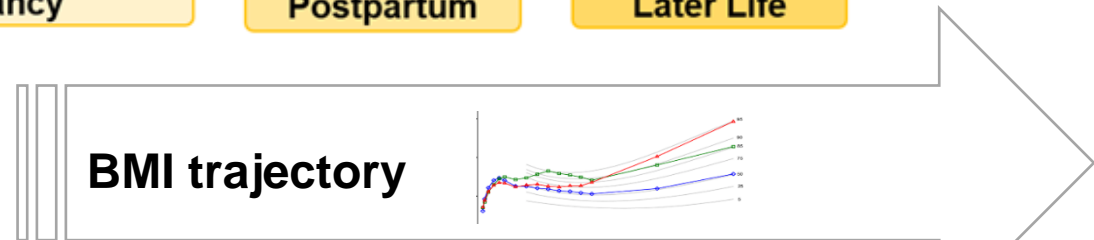
Simplified schematic illustration of the aims of the study

Maternal family SEP

Paternal family SEP



Pre-conception Pregnancy Postpartum Later Life



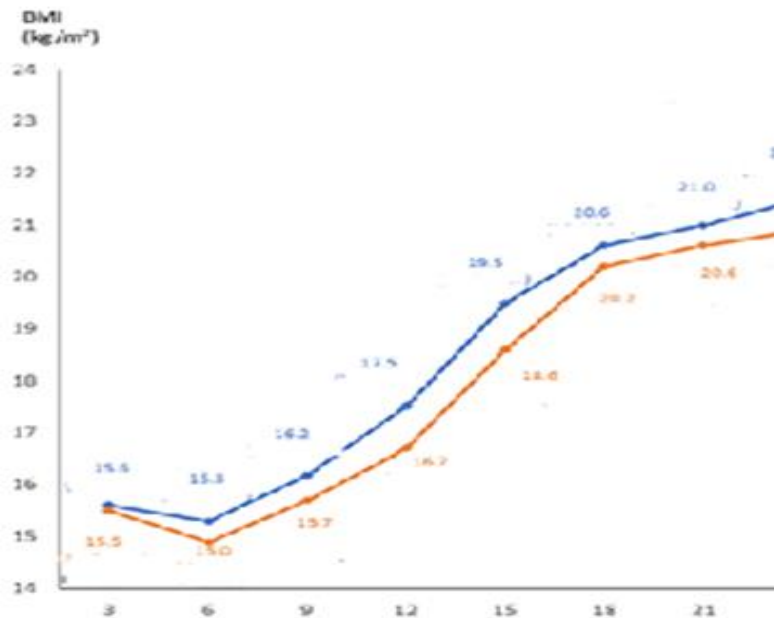
G-1: Grandparent

G0: Parent

G1: (Grand)child
Born: 1990-1992

Hypotheses

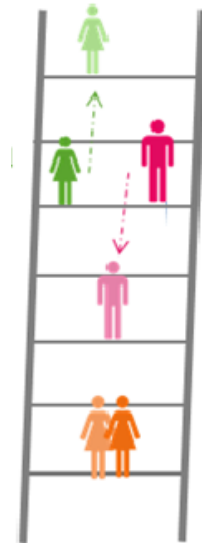
- ❖ Children with parents who were overweight or obese would be at higher risk for early onset of obesity and accelerated increases in BMI at an early stage of life;
- ❖ The BMI trajectories were steeper for individuals from lower family socioeconomic position (SEP) background.



Parents with OWOB



Parents with normal weight



Avon Longitudinal Study of Parents and Children (ALSPAC)

Baseline data collection 1991–1992

14,451 pregnancies enrolled,
13,867 live births to 13,761 women

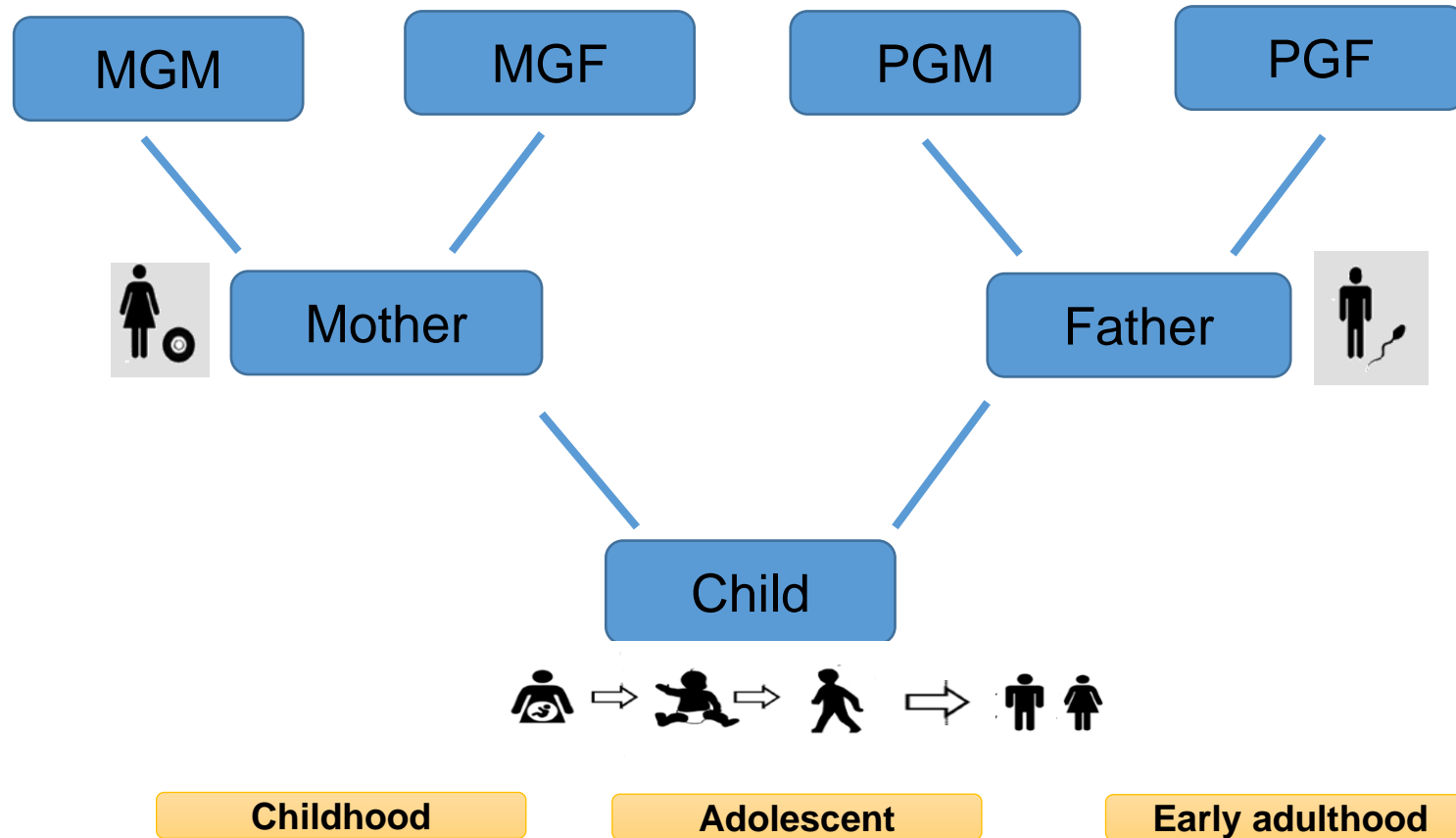
Demographic questionnaires

Lifestyle questionnaires

- During pregnancy
- Throughout childhood and adolescent



Study participants



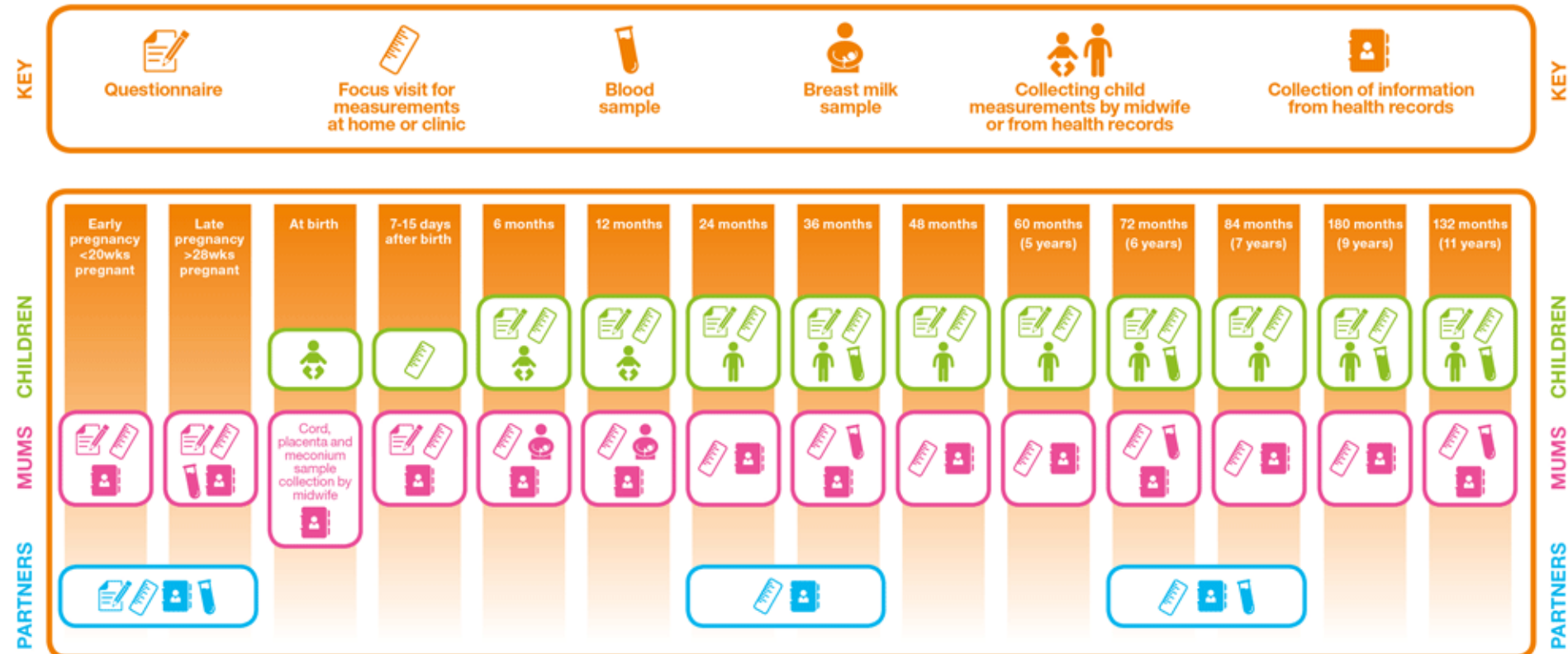
G-1: Grandparents
socioeconomic position

G0: Parents

G1: Grandchild
Born: 1990-1992

**Avon Longitudinal Study of Parents and Children
(ALSPAC)**

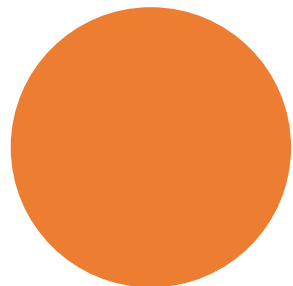
Offspring BMI



- Offspring BMI measured from age 1-18 years old
- Total measurements: 111,510 for 13,612 individuals
- Median measure: 12 (2-24)

Lawlor, D. A., Lewcock, M., Rena-Jones, L., Rollings, C., Yip, V., Smith, D., ... & Executive, A. L. S. P. A. C. (2019). The second generation of The Avon Longitudinal Study of Parents and Children (ALSPAC-G2): a cohort profile. Wellcome Open Research, 4. doi: 10.12688/wellcomeopenres.15087.2

Methods

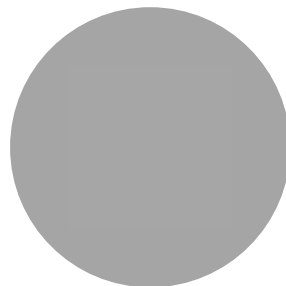


*Exposure

Maternal/Paternal weight

*OWOB (BMI \geq 25kg/m²) VS
Normal weight (<25kg/m²)*

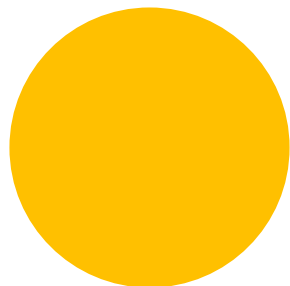
(n=11,222)



*Modifier

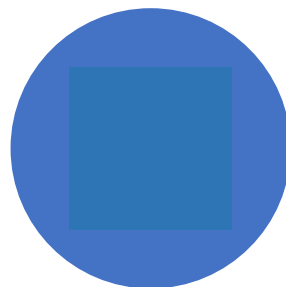
Grandparental SEP

Low SEP vs High SEP



*Outcome

*Repeated measurement of
offspring BMI from age 1 to 18
years old (n=13,612)*



*Confounders

*Age, sex, parity, parental
smoking/drinking status*

Multilevel models

Allows for the change in scale and variance of BMI over time and capture the complex pattern of growth

Model 1: IV=Maternal/Paternal BMI

Fitting an interaction term between offspring age and maternal BMI

Model 2: IV=Grandparental SEP

Fitting an interaction term between offspring age and grandparental SEP

Model 3: IV=Maternal/paternal BMI*Grandparental SEP

Additionally incorporating an interaction term between offspring age and grandparental SEP

Specific aims

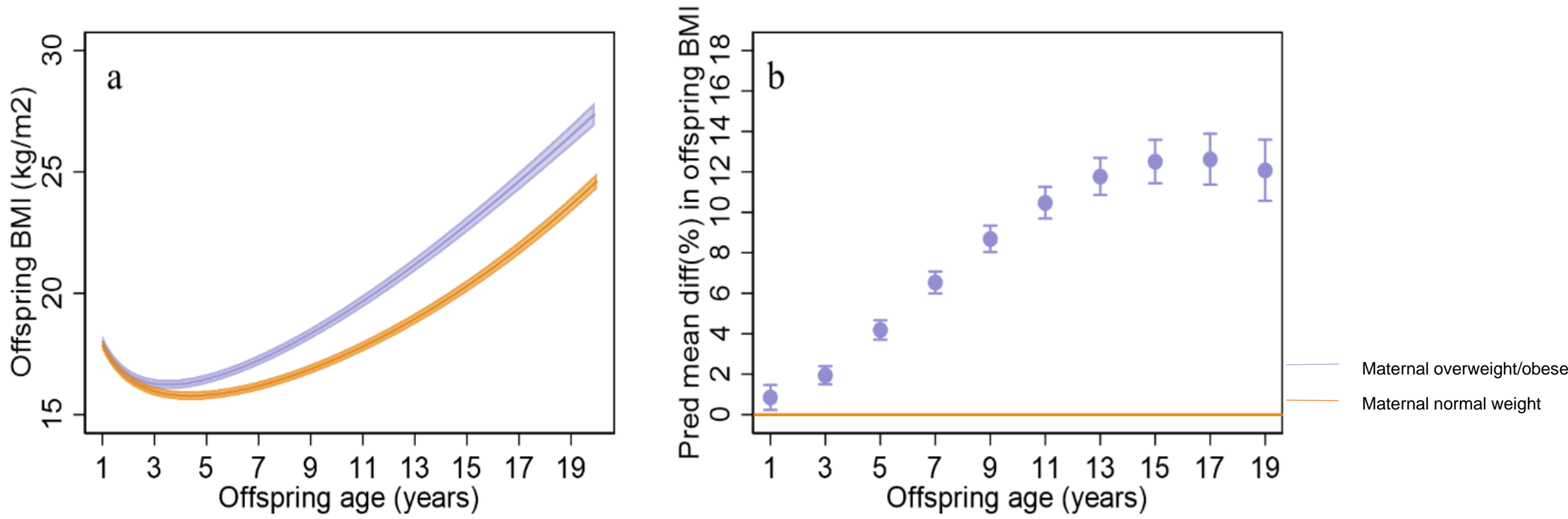
1

How parental BMI influence offspring BMI growth trajectories

Model 1:

We explored whether offspring BMI trajectories (from ages 1 to 18) differed by parental weight status (overweight/obesity vs normal weight)

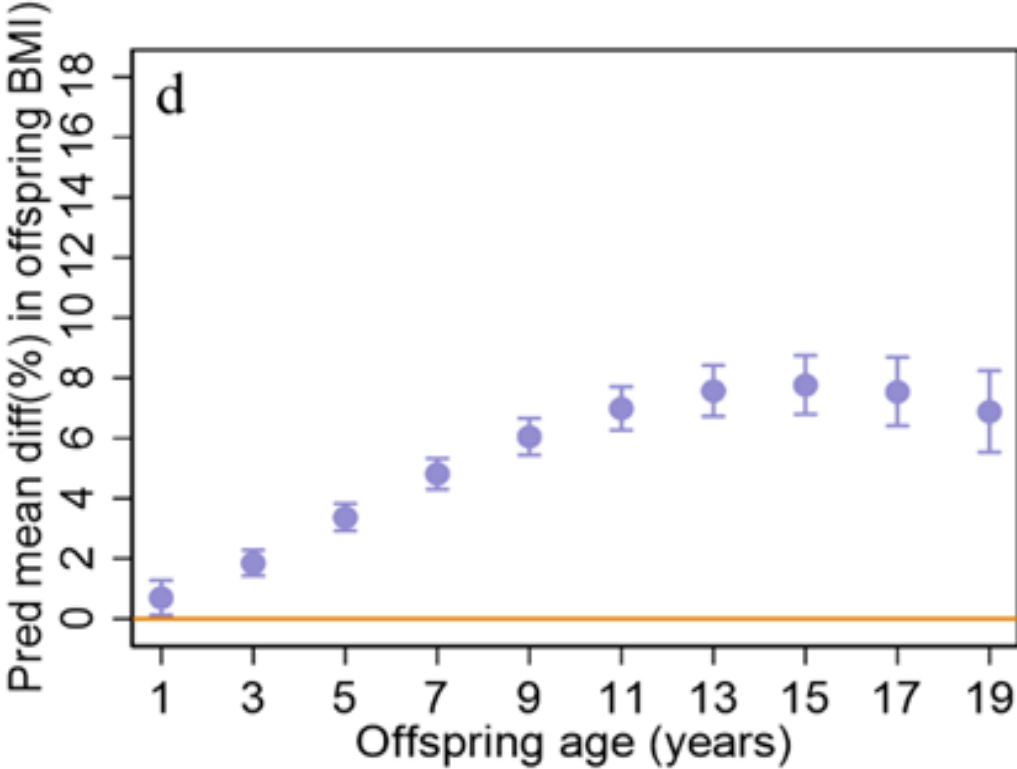
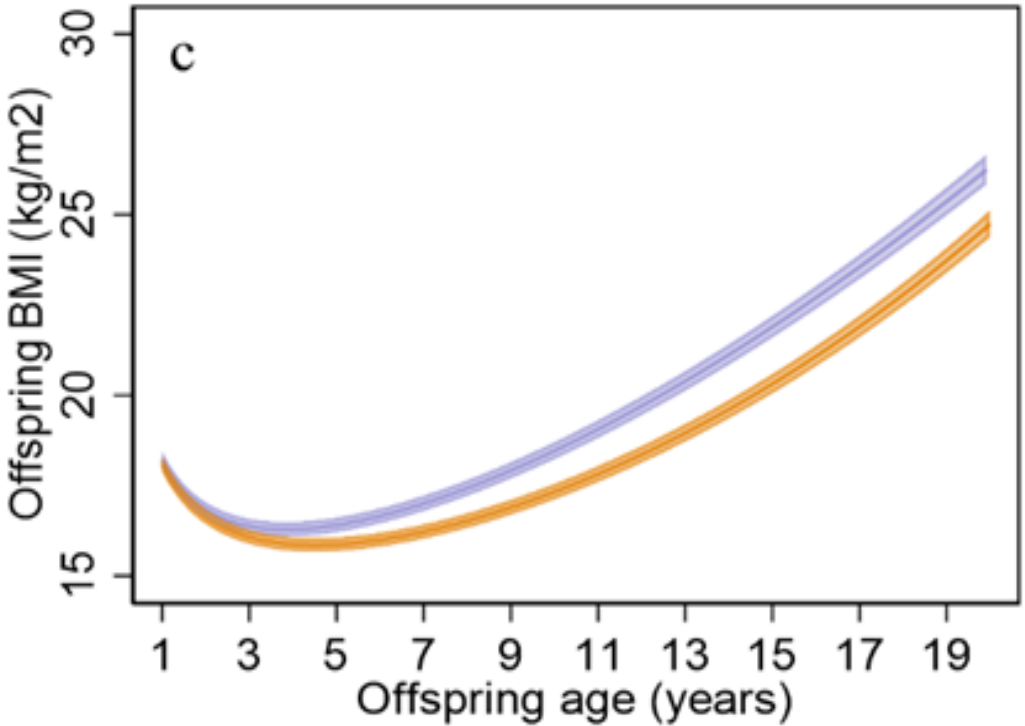
Maternal weight status on child's BMI growth trajectories



- a. Offspring BMI trajectories by maternal weight status
- b. Predicated mean difference % in offspring BMI between mothers with overweight or obesity and normal weight

Figure1. Predicted offspring BMI trajectories by parental weight status

Paternal weight status on child's BMI growth trajectories



- c. Offspring BMI trajectories by paternal weight status
- d. Predicated mean difference % in offspring BMI between fathers with overweight or obesity and normal weight

Figure1. Predicted offspring BMI trajectories by parental weight status

Specific aims

2

How grandparental SEP influences offspring BMI growth trajectories

Model 2:

We explored whether offspring BMI trajectories (from ages 1 to 18) differed by grandparental SEP (low vs high)

Family sep

Grandparental SEP

High

Low

Education level

A-Level, university
degree or above

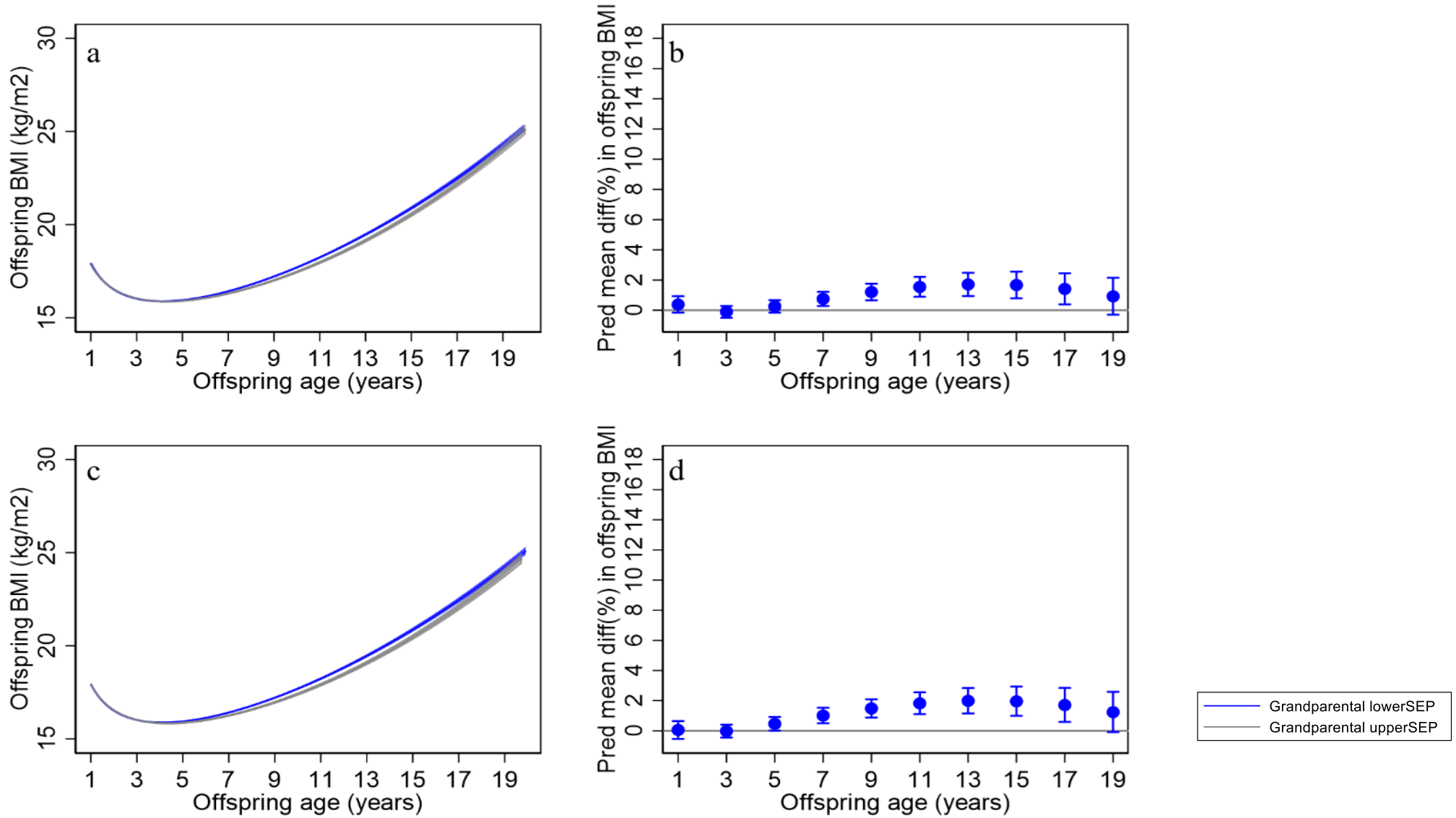
CSE, Vocation, and O-
Level

Index of inequality score

Upper 10%

Lower 10%

Predicted offspring BMI trajectories by Grandparental SEP



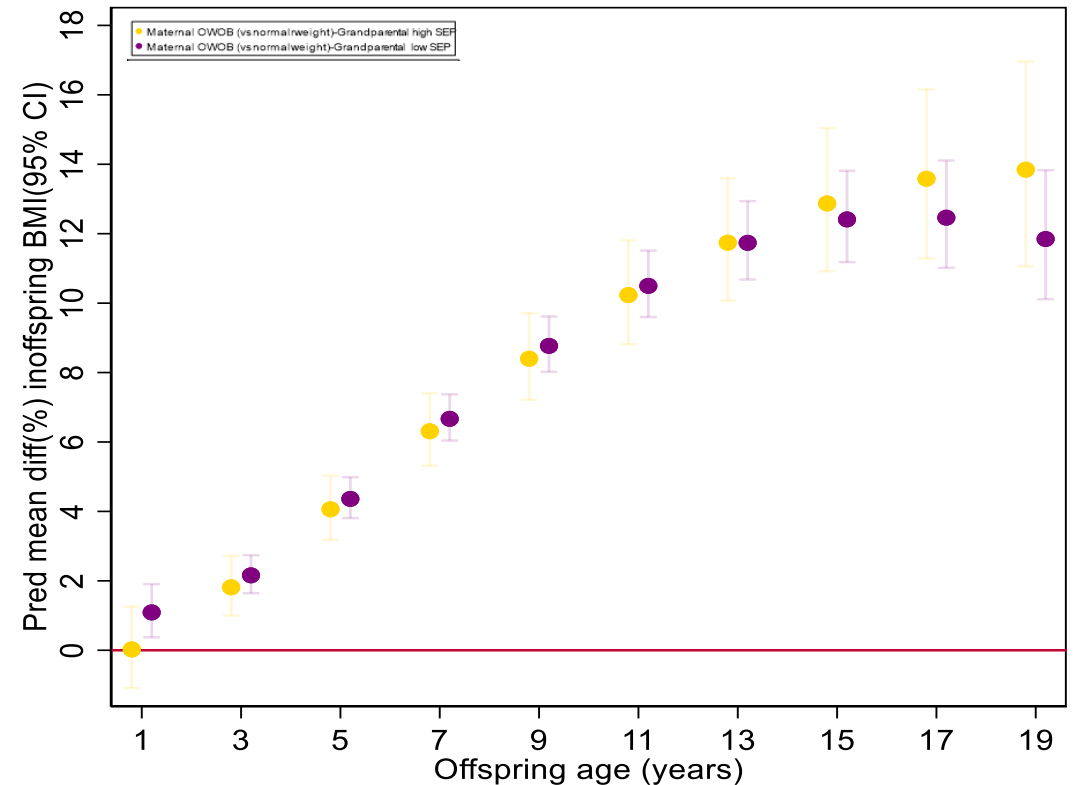
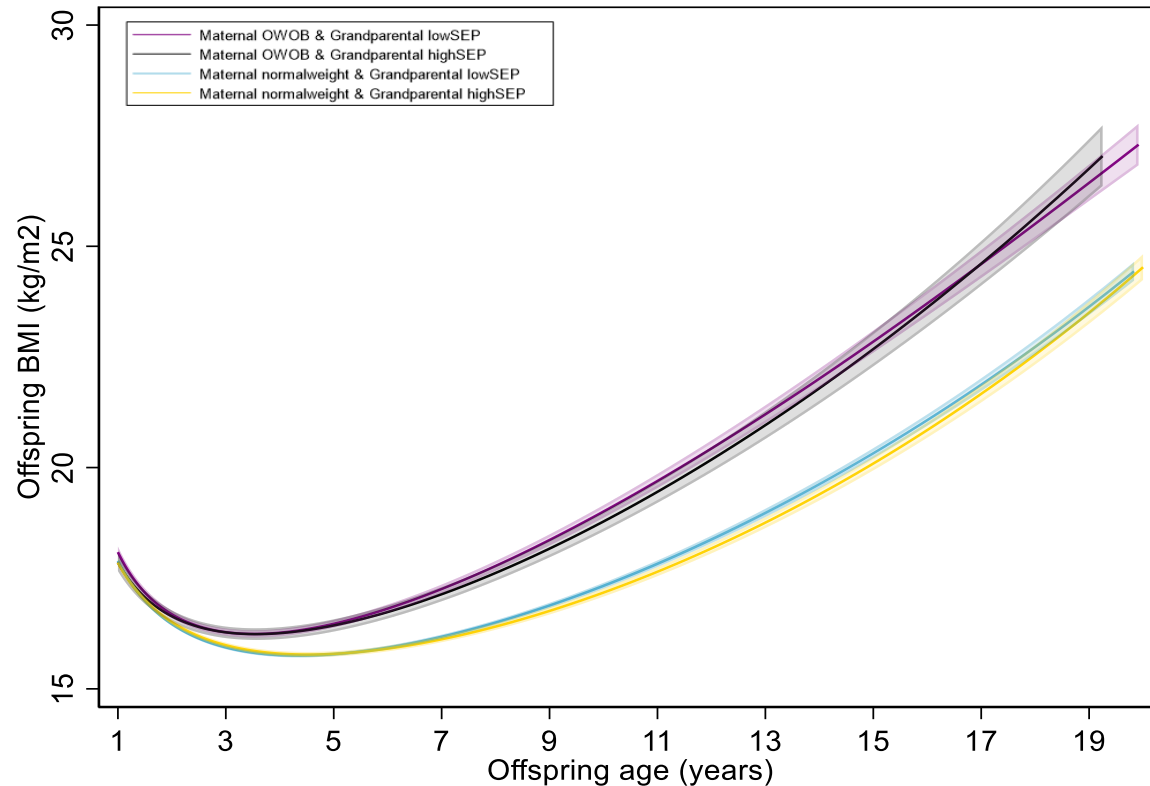
- a. Offspring BMI trajectories by grandparental SEP (mother side)
- b. Predicated mean difference % in offspring BMI between high and low grandparental SEP (mother side)
- c. Offspring BMI trajectories by grandparental SEP (father side)
- d. Predicated mean difference % in offspring BMI between high and low grandparental SEP (father side)

Specific aims

3

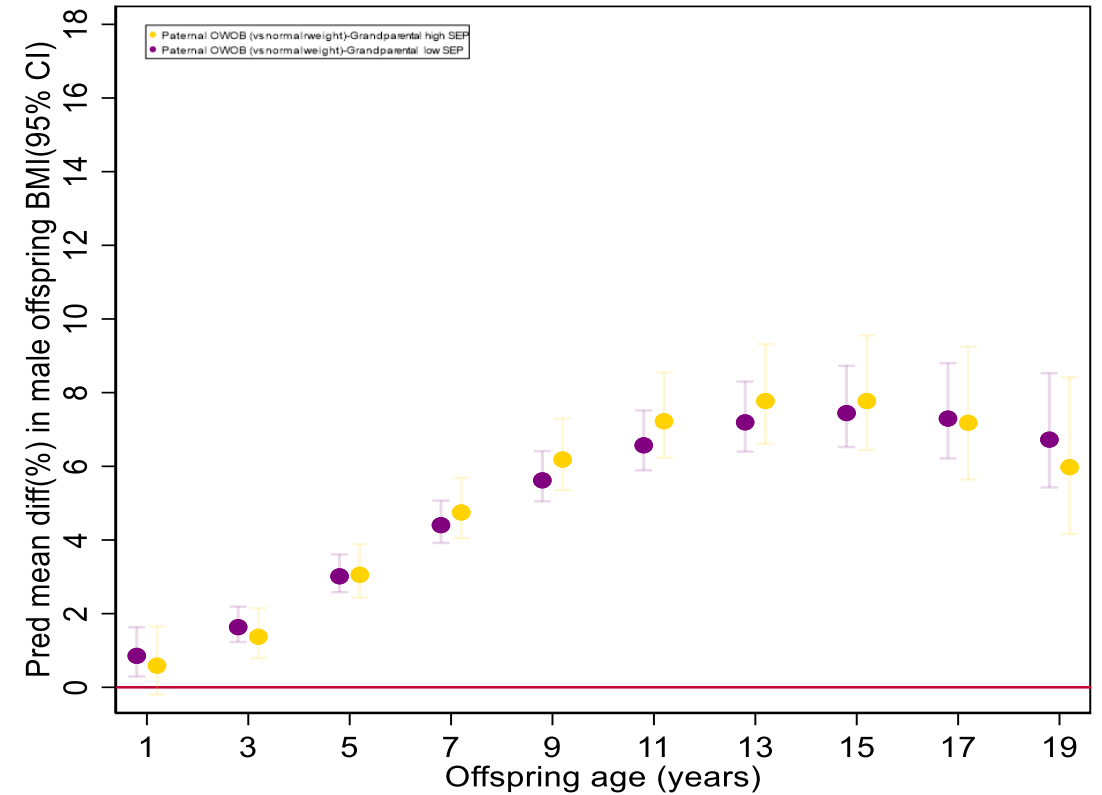
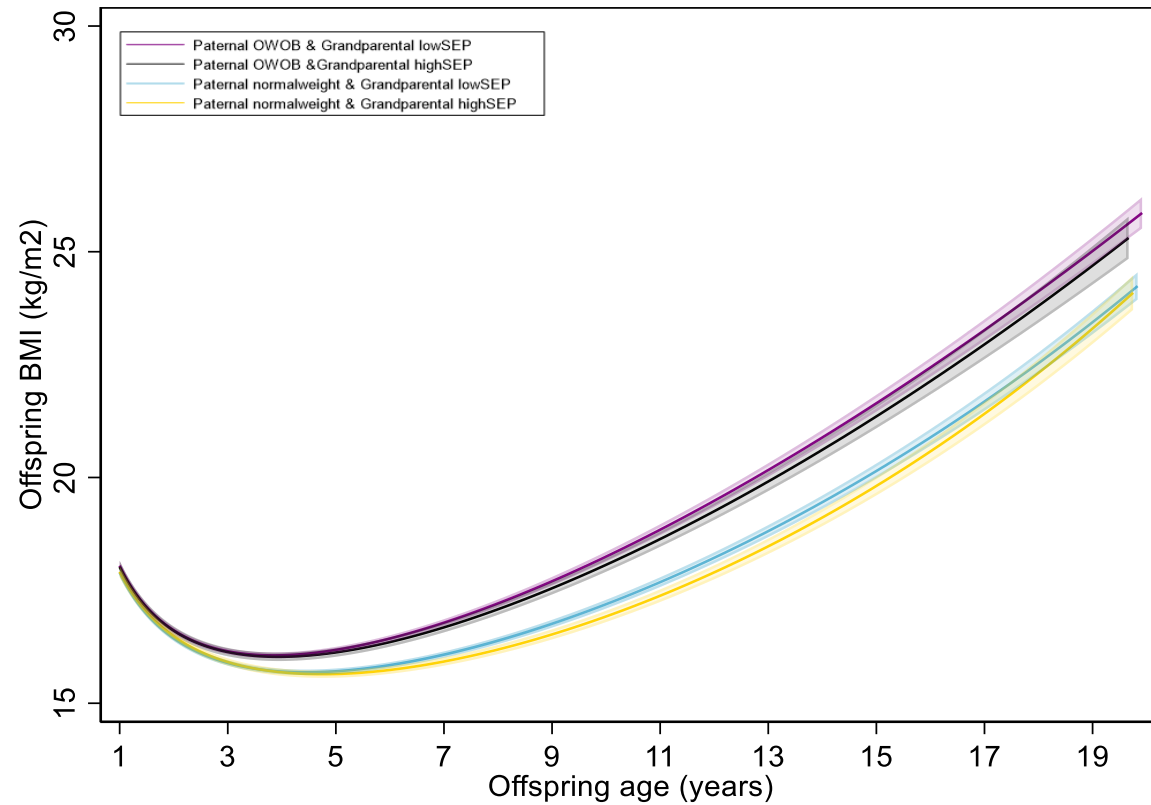
Whether the parent-offspring BMI associations differ according to grandparental SEP and social mobility

Predicted offspring BMI trajectories by paternal weight status and grandparental SEP (mother side)



- Offspring BMI trajectories by maternal BMI and grandparental SEP (mother side)
- Predicted mean difference % in offspring BMI between mothers with OBOB and normal weight by grandparental SEP (mother side)

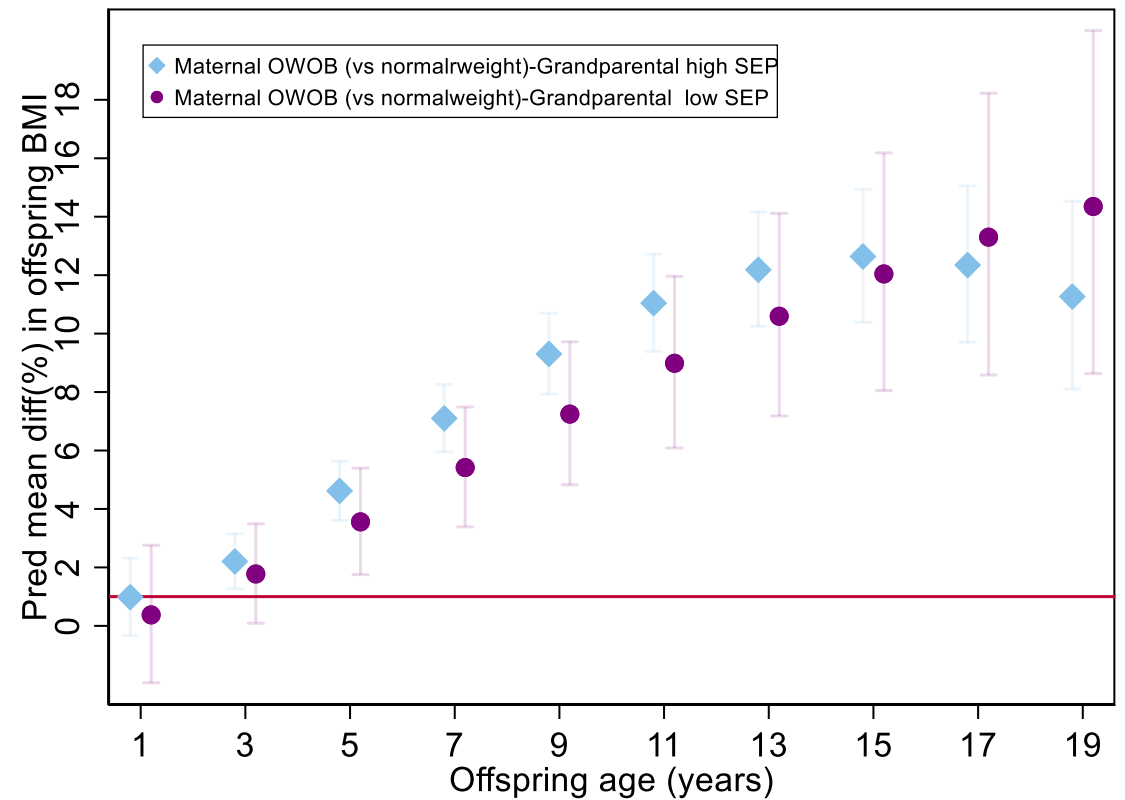
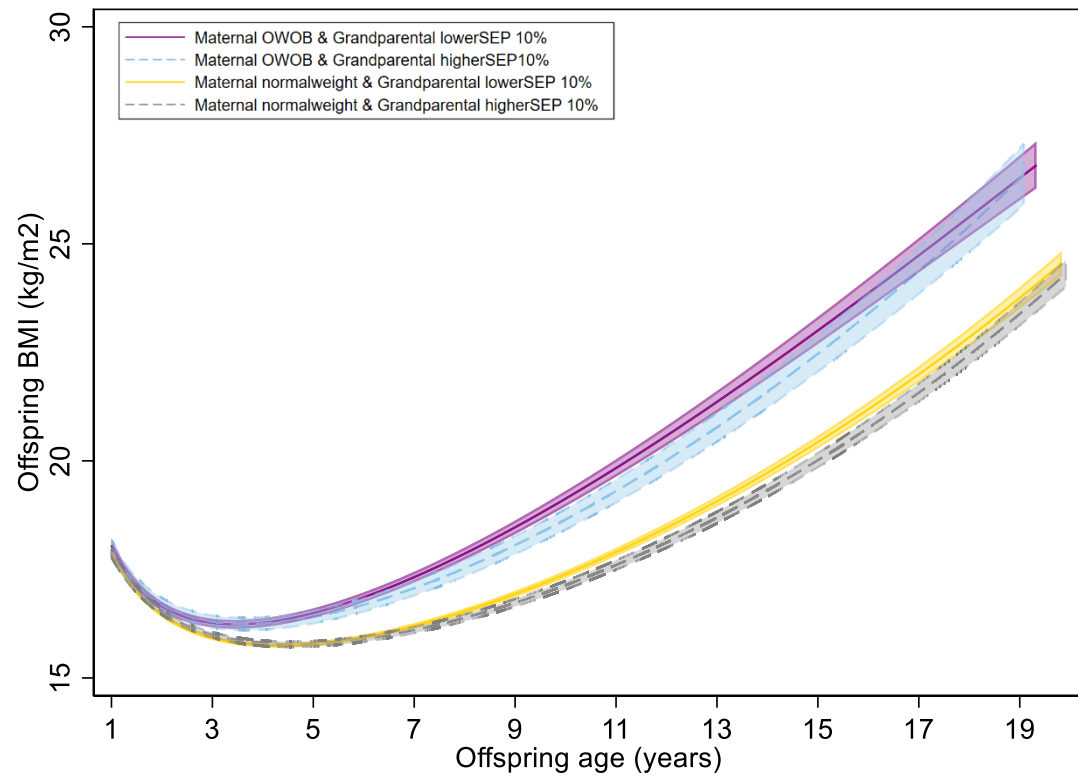
Predicted offspring BMI trajectories by paternal weight status and grandparental SEP (father side)



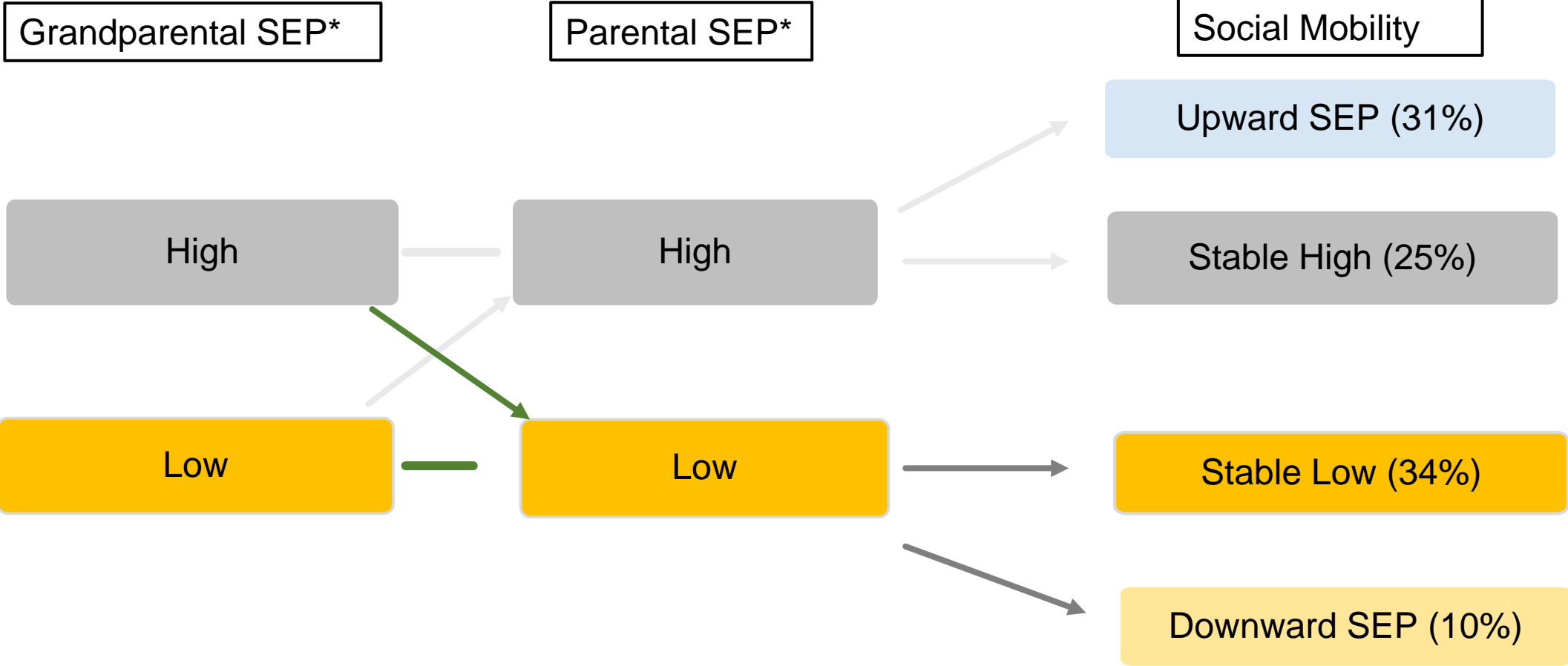
Left: Offspring BMI trajectories by maternal BMI and grandparental SEP (mother side)

Right: Predicted mean difference % in offspring BMI between mothers with OWOB and normal weight by grandparental SEP (mother side)

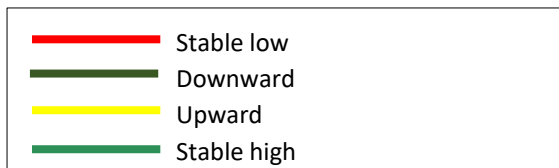
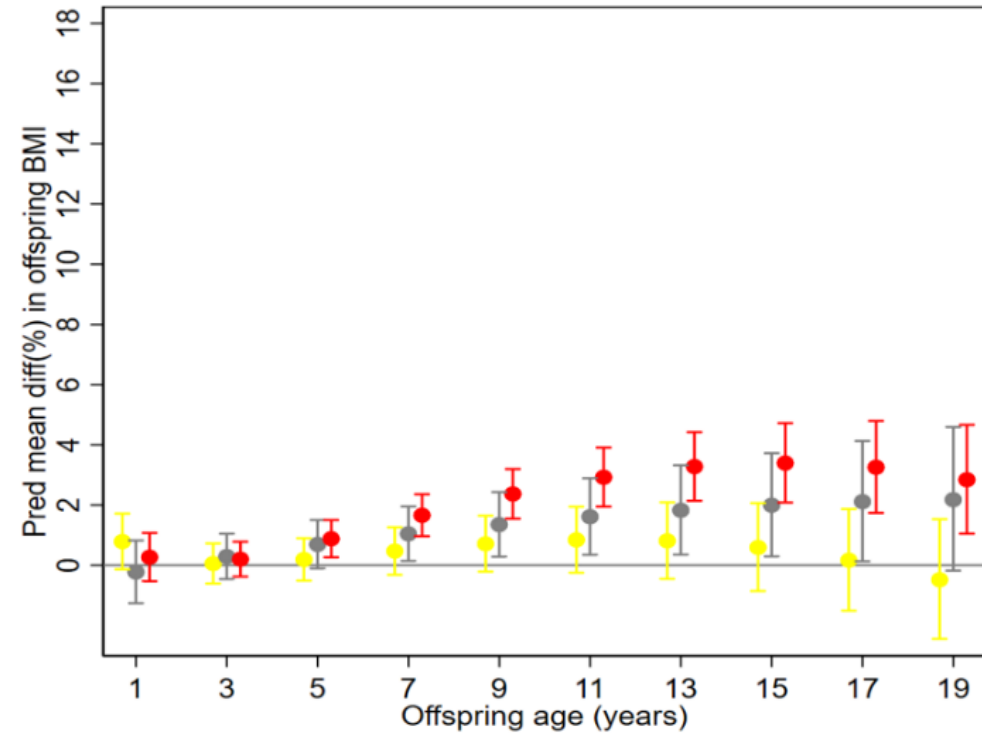
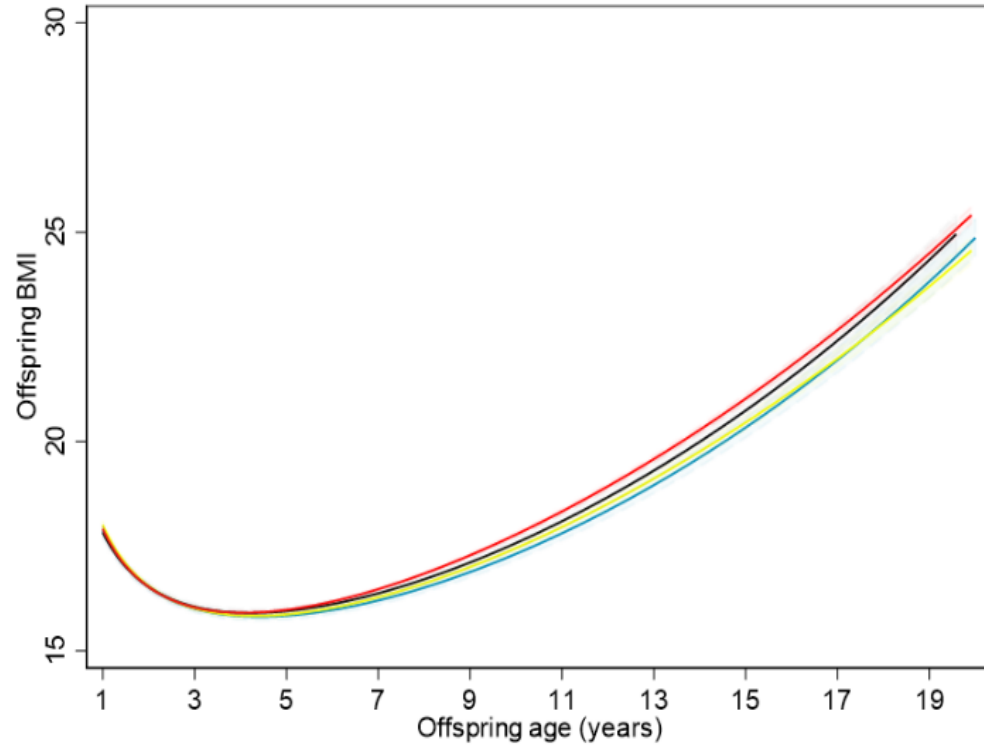
Offspring BMI trajectories by parental BMI and grandparental SEP (Index of inequality score)



Social mobility



Offspring BMI trajectories by social mobility



Sensitivity analyses

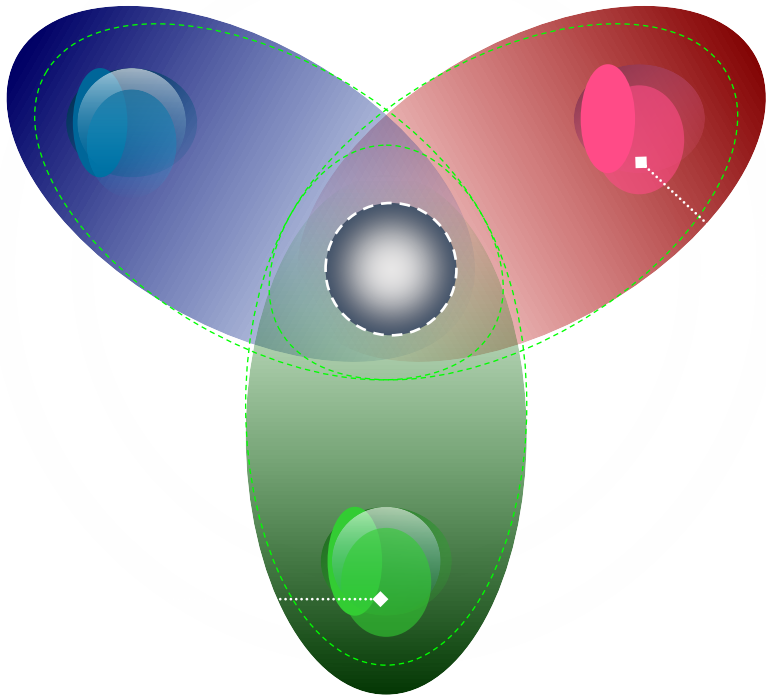
- ❖ *Employed Index of inequality score as SEP indicator*
- ❖ *Parental BMI treated as continuous variable and grandparental SEP was categorized into three categories (high, medium, and low)*
- ❖ *Multiple imputation was employed to handle missing data for grandparental SEP*

Limitations



- ❖ Measurement error of anthropometric information and family SEP
- ❖ Education itself could not capture all aspects of SEP
- ❖ Lack of data before 1 year and adiposity rebound

Strengths



- ❖ Examine SEP origin and development of obesity across three generations
- ❖ Multilevel analytical approach
- ❖ Sensitivity analyses

Conclusion-

- ❖ Children with parents who were overweight or obese were set to different BMI growth trajectories at an early stage of life;
- ❖ The difference persisted and widen throughout childhood and adolescence;
- ❖ Grandparental low SEP was related to higher offspring's BMI trajectories;
- ❖ Not enough evidence to support grandparental SEP modify the parental-offspring BMI association.

Supervision team:

Population Health Sciences, Bristol Medical School, University of Bristol & MRC Integrative Epidemiology Unit

- Deborah Lawlor
- Gemma Clayton

Aarhus University

- Christina Dahm
- Kim Overvad
- Anja Olsen



Get in touch

Email: jiezh@ph.au.dk

Twitter: [@EvelynZ31667894](https://twitter.com/EvelynZ31667894)