

# Parental obesity in association with offspring cognitive and psychomotor development at 4 years of age: The Mother Child "Rhea" Cohort in Crete, Greece.

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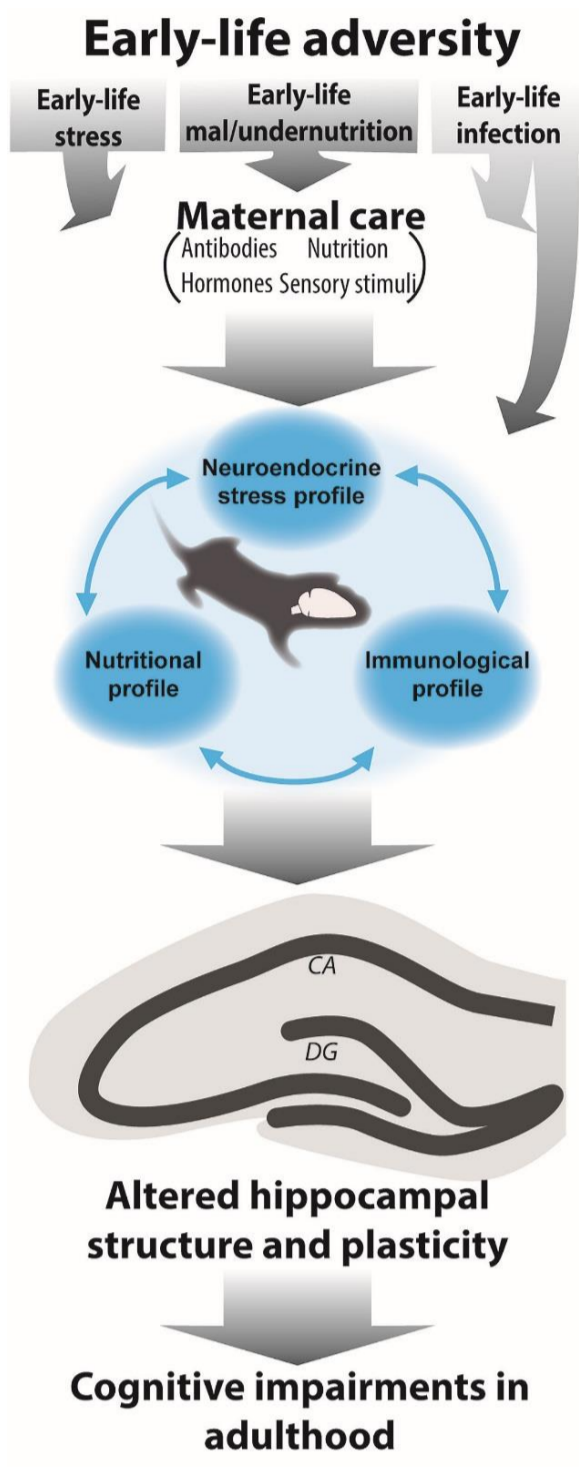
## BACKGROUND

Early life adversity (specifically stress, under/malnutrition and infection) increases the vulnerability to develop psychopathologies and cognitive decline later in life [1].

Animal studies suggest that maternal obesity may impact fetal brain structure and function and increase long-term susceptibility to neurodevelopmental and neuropsychiatric disorders probably through inflammatory mechanisms [2].

Human studies have shown an association between maternal obesity and adverse neurodevelopmental outcomes in offspring, including lower general cognitive capabilities and an increased incidence of autism spectrum disorders, developmental delay and attention deficit hyperactivity disorder, but the results are conflictive [3].

It is also unclear if reported associations are due to genetic background or intrauterine mechanisms, as a limited number of studies have examined so far the role of paternal pre-conception BMI in offspring neurodevelopment [4,5].



## OBJECTIVES

To investigate the association of maternal and paternal obesity status with offspring cognitive and psychomotor development at 4 years of age using data from a longitudinal, prospective pregnancy cohort, "Rhea" study in Crete, Greece.

## METHODS



**The Rhea Study:** a prospective mother-child cohort examining a population sample of pregnant women and their children at the prefecture of Heraklion, Crete. Recruitment occurred early in pregnancy during the twelve-month period from February 2007 until February 2008.

**Analytic sample:** 652 mother-child pairs after excluding twin pregnancies, women with pre-gestational diabetes and subjects with missing data on exposure and outcome variables.

**Exposure assessment:** Pre-pregnancy maternal body mass index (BMI) and paternal BMI were calculated at the first prenatal visit (mean: 12 weeks, SD: 1.5) by the formula weight/height<sup>2</sup>. Parents with BMI ≥ 25 kg/m<sup>2</sup> were classified as overweight or obese.

**Outcome assessment:** 1) Offspring neurodevelopment at 4 years was assessed by means of the McCarthy Scales of Children's Abilities (MSCA), which contains six scales: Verbal, Perceptual-Performance, Quantitative, General Cognitive, Memory and Motor scale. Alternative outcome scales for executive function and cognitive functions of posterior cortex were also created by reorganizing the tasks of MSCA in accordance with their association with specific neurocognitive function. 2) Emotional and behavioral development at 4 years was assessed by means of Strengths and Difficulties Questionnaire (SDQ) and Attention Deficit Hyperactivity Disorder (ADHD) Test.

**Data analysis:** Multivariable linear regression models were used to estimate the effect of pre-pregnancy BMI and paternal BMI on child neurodevelopment at 4 years of age after adjusting for multiple confounders. Effect modification by child's sex, maternal smoking during pregnancy, and gestational weight gain were assessed through inclusion of the interaction terms in the models (statistically significant effect modification if p-value < 0.05) and stratified analyses.

## RESULTS

Chart 1. Parental characteristics

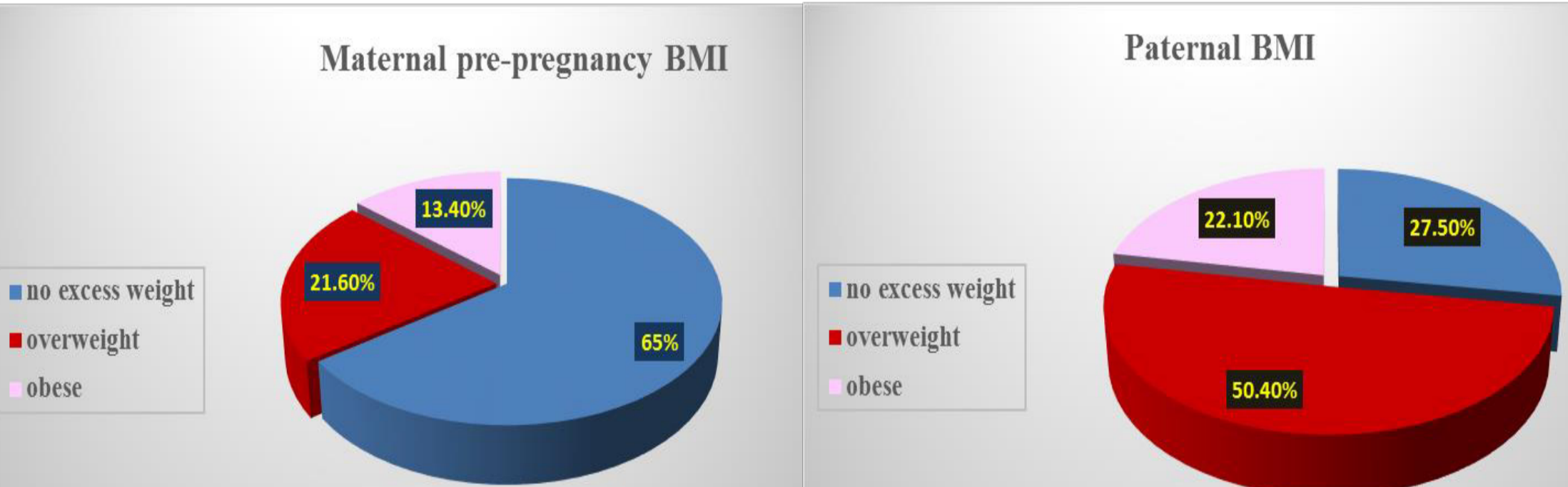
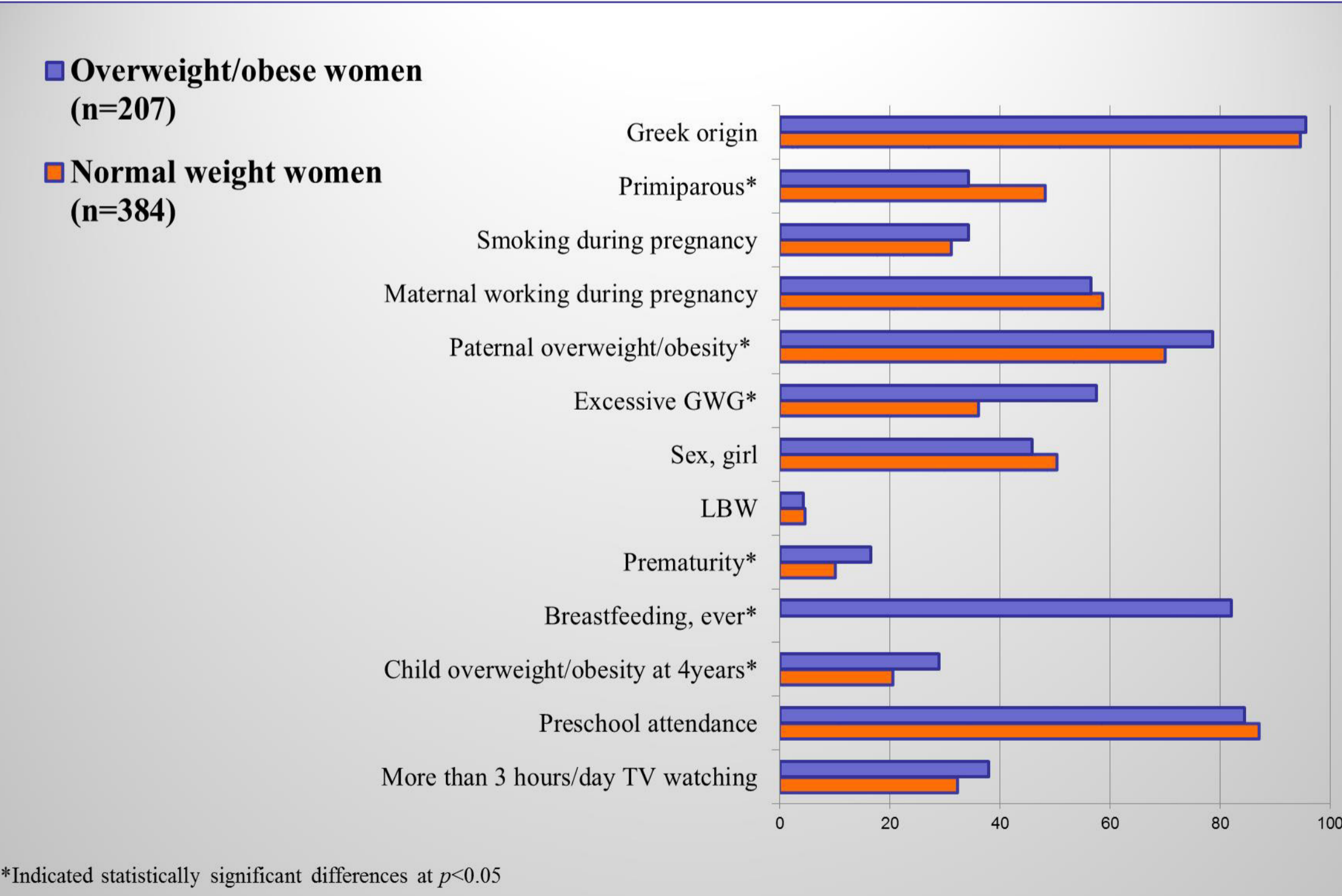


Chart 2. Descriptive characteristics of the study population by pre-pregnancy overweight/obesity



Maternal obesity pre-pregnancy was associated with reduced  
**a) general cognitive** (score reduction: -2.51; 95% CI: -4.78, -0.24),  
**b) quantitative** (score reduction: -2.50 95% CI: -4.89, -0.11)  
**c) memory** (score reduction: -2.66 95% CI: -5.07, 0.26)  
 developmental scores at 4 years of age.

No association was found between pre-pregnancy BMI and child emotional and behavioral development or ADHD symptoms at 4 years of age

Paternal obesity was not associated with offspring cognitive and behavioural development at 4 years of age.

Chart 3. Association between specific neurocognitive functions and parental overweight/obesity

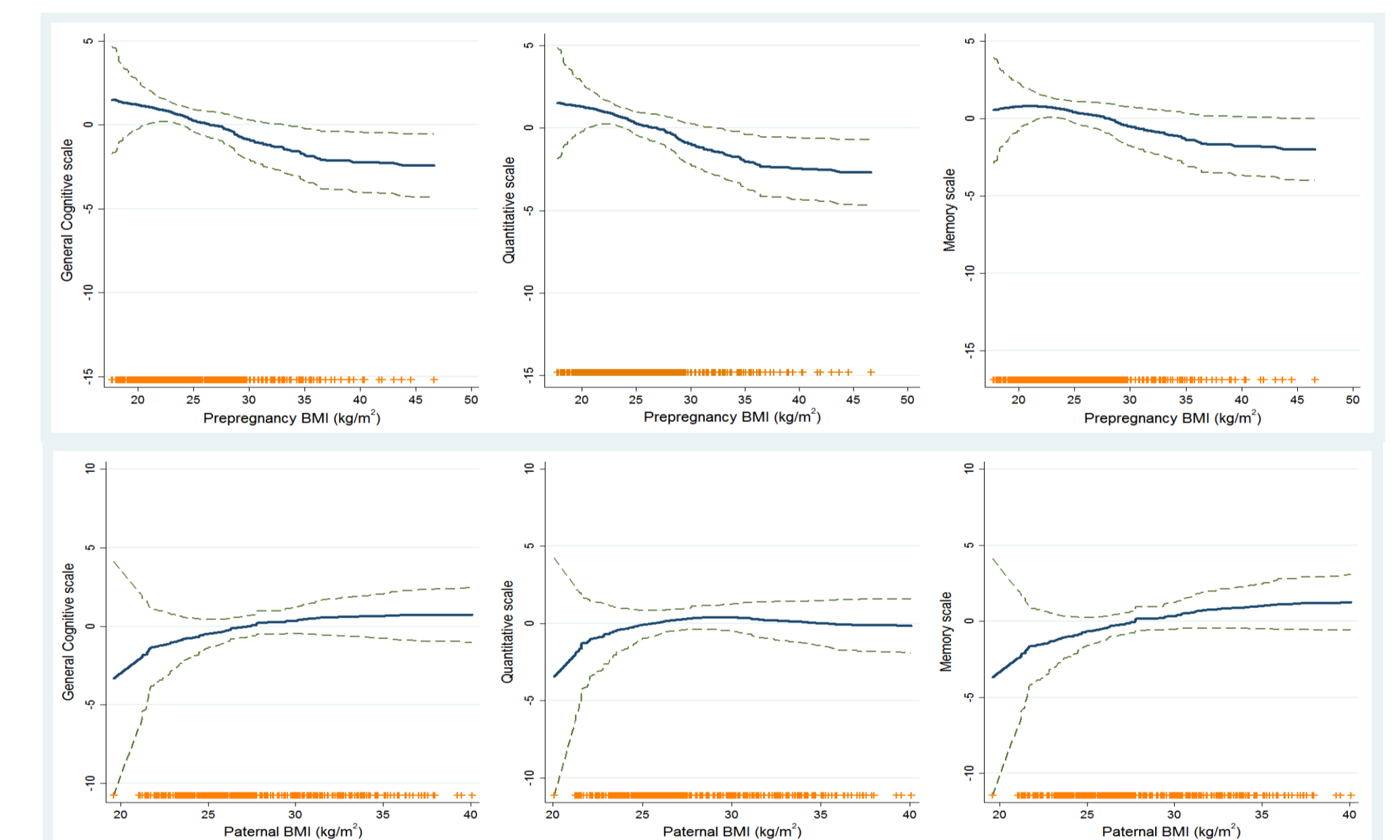
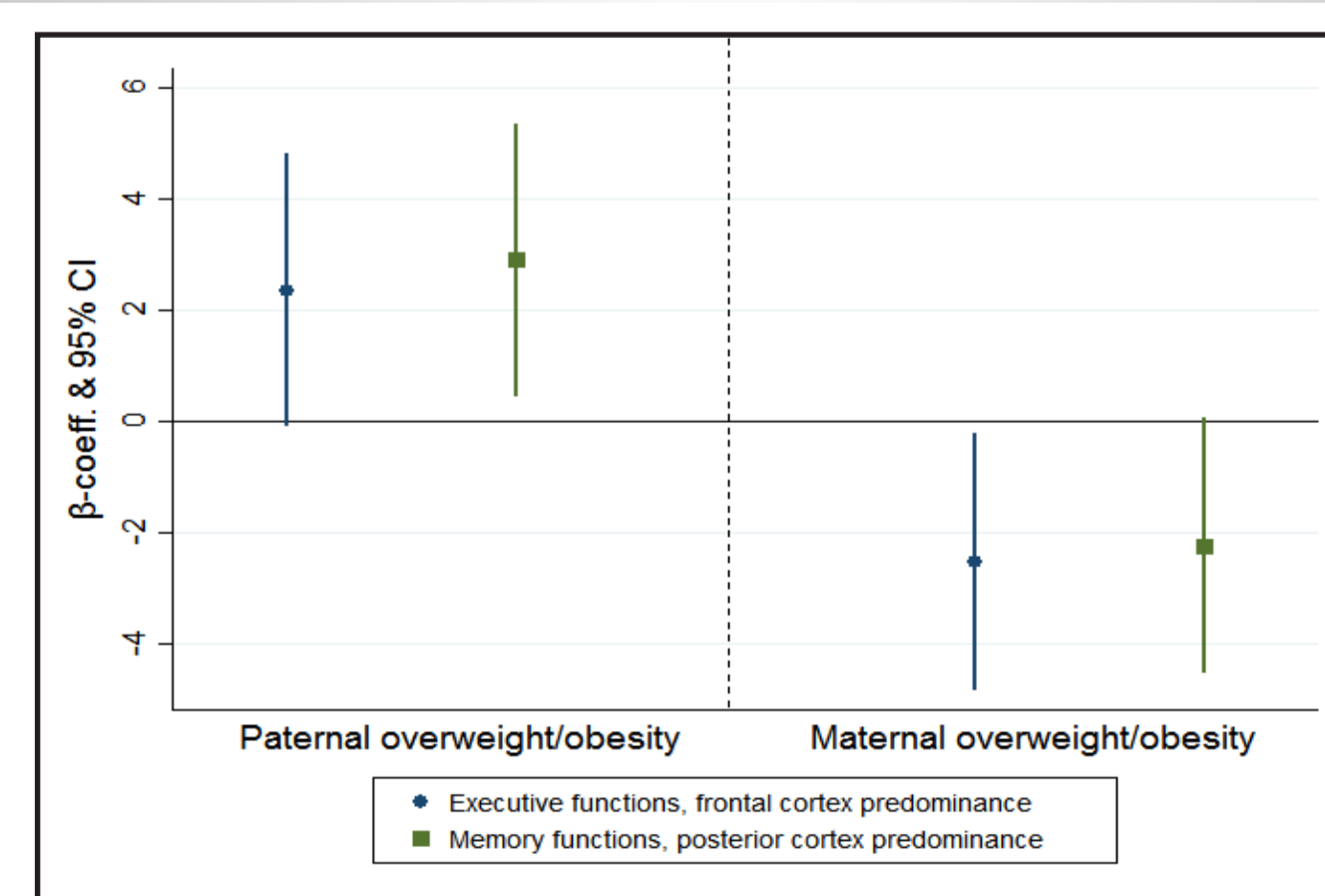
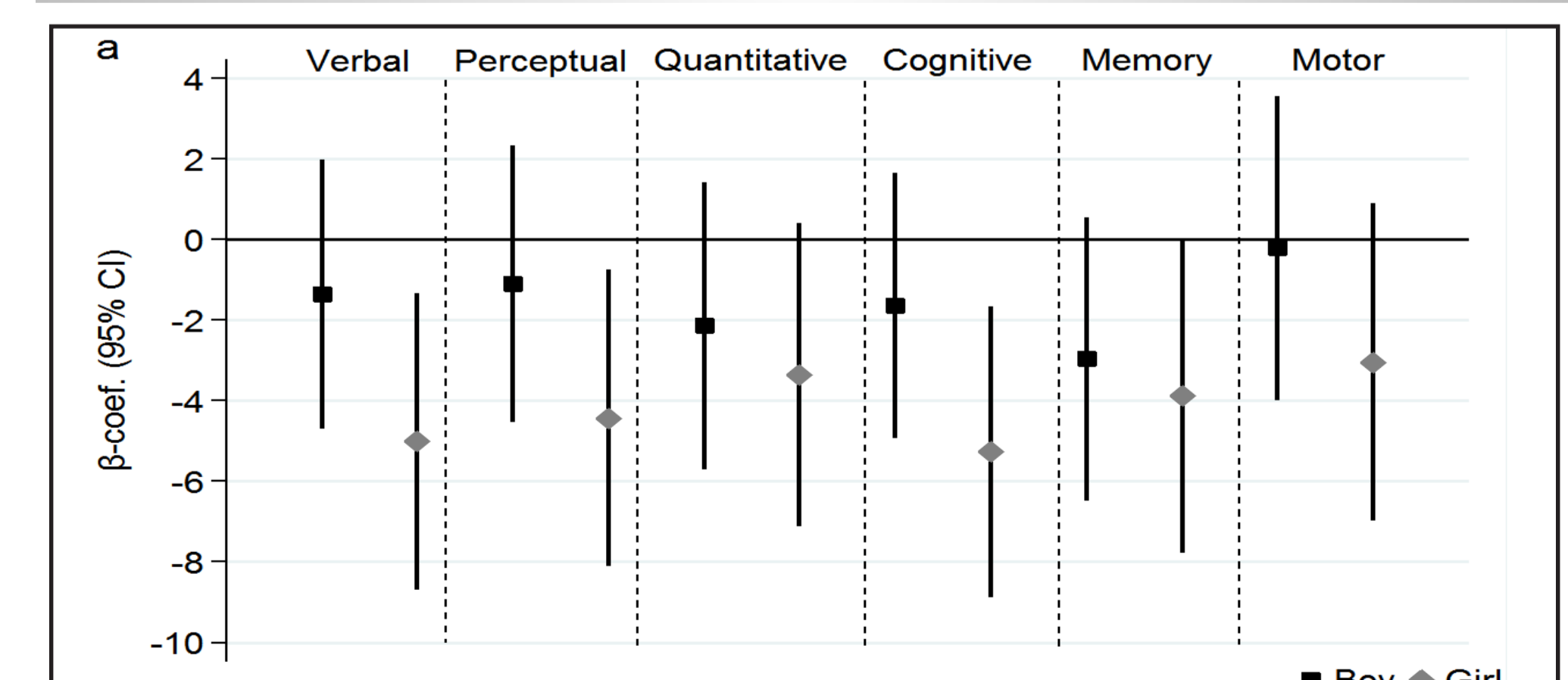


Chart 3. GAMS; adjusted associations (95% CIs) of maternal pre-pregnancy BMI with McCarthy scales, (a) verbal, (b) perceptual, (c) quantitative, (d) general cognitive, (e) memory and (f) motor scale. Models for maternal pre-pregnancy BMI were adjusted for examiner, quality of assessment, maternal age, maternal country of birth, education, parity, smoking during pregnancy, birth weight for gestational age z-score, breastfeeding duration, child sex, child BMI and nursery at 4 years of age. ++, observations.

Chart 4. Association between neurocognitive functions and maternal BMI stratified by sex



## CONCLUSIONS

Maternal pre-pregnancy BMI was associated with reduced cognitive development at preschool age. This association appeared more likely to be due to intrauterine mechanisms than shared family and social characteristics.

## References

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