

# Sex-specific associations between early-life exposure to manganese and white matter microstructure in adolescents and young adults

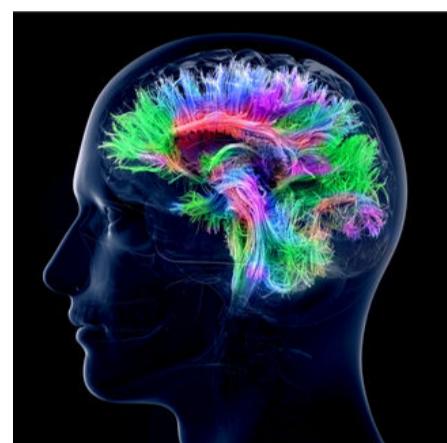
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## Conclusions

- Early-life Mn exposure to Manganese is associated with white matter microstructure alterations within regions involved in widespread functions
- The effect of Mn exposure on the brain differs by sex.

## Background

- The brain white matter (WM) connects gray matter regions into functional networks
- WM is critical for human cognition and behavior.
- Early-life metal exposure can disrupt WM maturation and lead to long-lasting changes in neuronal circuitry.
- Despite evidences suggesting associations between Manganese (Mn) and neurodevelopmental effects, the underlying brain mechanisms of these associations are poorly understood.
- **Objective:** To examine associations between early-life exposure to manganese (Mn) and WM microstructure in young adults.

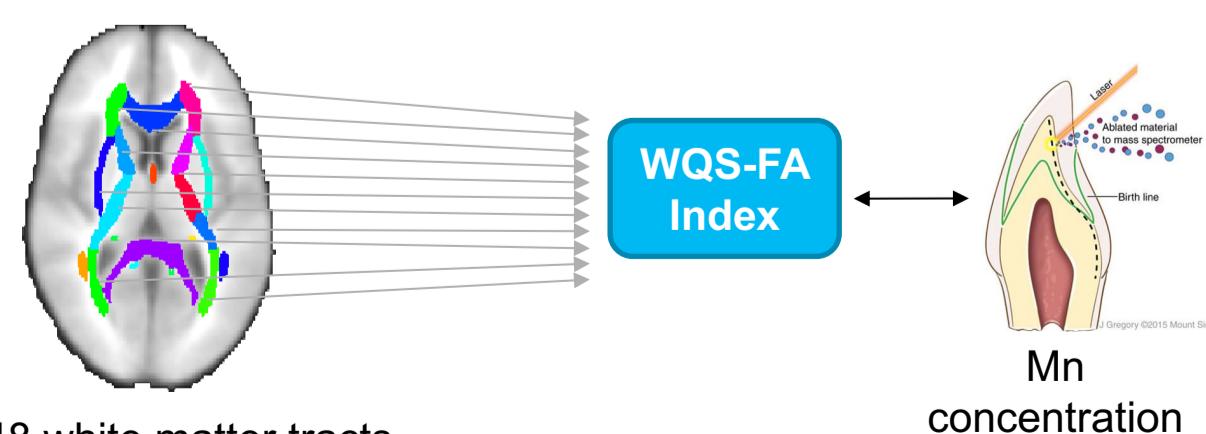


## Methods



**Participants:** 73 adolescents and young adults from the **PHIME cohort** (Age 16 - 23 years; 39 females)

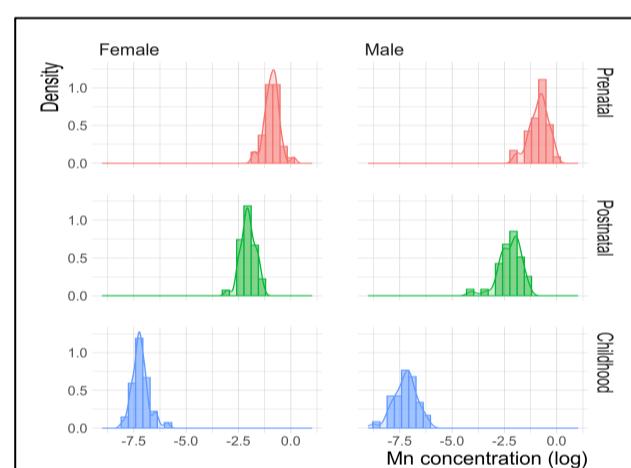
- Prenatal, early postnatal and childhood Mn concentrations were measured in deciduous teeth using laser ablation-inductively coupled plasma-mass spectrometry.
- White matter integrity measured using fractional anisotropy (FA) metric from diffusion tensor imaging (DTI)
- **Statistical analysis:** weighted quantile sum (WQS) regression.



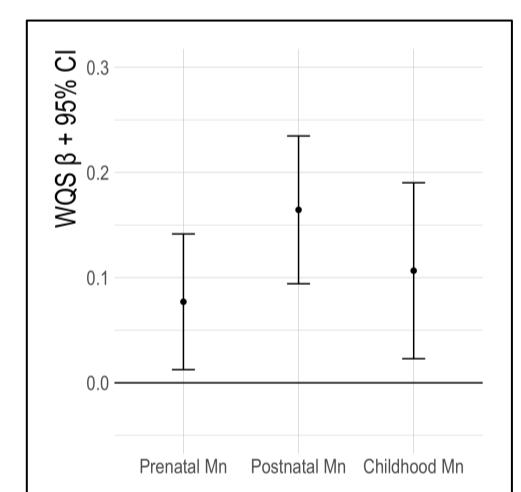
## Results

Table 1. Sex-stratified sociodemographic characteristics and exposure characteristics of 73 young adults participating in this study.

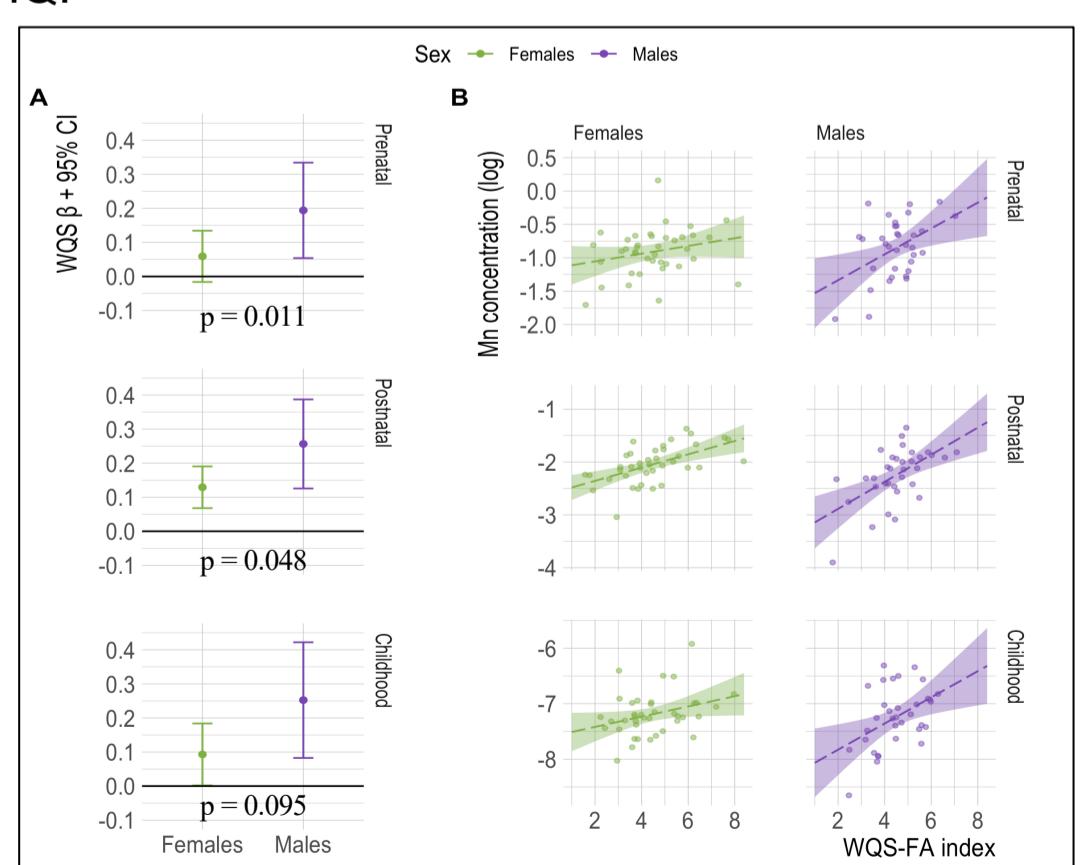
Characteristic	All Mean ± SD or %	Females Mean ± SD or %	Males Mean ± SD or %	p <sup>a</sup>
Age (years)	19.5 ± 2.2	19.7 ± 2.1	19.2 ± 2.4	0.44
SES				
Low	11 %	15 %	6 %	ref
Medium	66 %	64 %	68 %	0.31
High	23 %	21 %	26 %	0.26
IQ	104 ± 10	102 ± 11	106 ± 10	



**Figure 1.** Prenatal, postnatal, and early childhood manganese concentrations (log) measured in naturally shed deciduous teeth of 73 study participants, by sex.



**Figure 2.** Beta coefficients and 95% confidence intervals of the association between prenatal, postnatal, and early childhood manganese concentrations (log) and WQS-FA index. All models were adjusted for age, sex, SES and IQ.



**Figure 3.** (A) Beta coefficients and 95% confidence intervals of the association between Mn and WQS-FA index. Interaction p-values are provided for each timepoint. (B) Sex-stratified Regression lines and standard errors.