

# Gut Microbiome Moderates the Impact of Early Adversity on Basal Ganglia Neurophysiology in Children and Adolescents



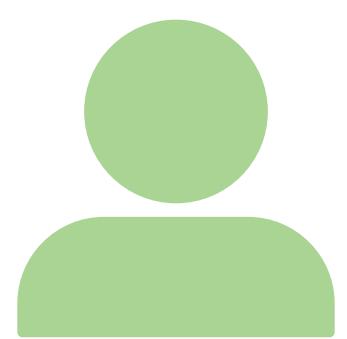
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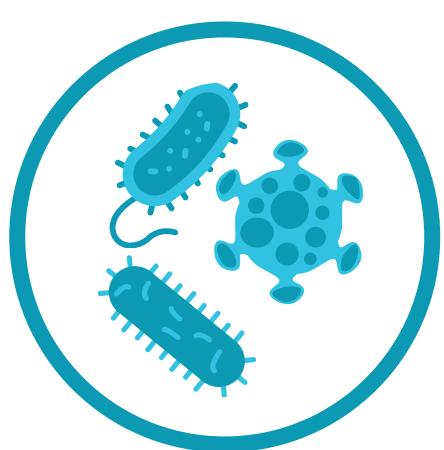
## Introduction

- Iron is necessary for dopamine synthesis and accumulates in the basal ganglia over time, with higher tissue iron levels in the basal ganglia of youth linked to improved affective and cognitive function<sup>1-3</sup>
- One factor underlying variance in circulating iron is the composition of the gut microbiome – the microorganisms inhabiting the gut: However, while the microbiome is known to affect circulating iron levels, its link to basal ganglia iron in youth is unknown<sup>4,5</sup>.
- Understanding the relationship between the gut microbiome and basal ganglia tissue iron is especially relevant for youth exposed to interpersonal adversity (IA; significant separation from or maltreatment by a caregiver), who are at increased risk for later mental health problems<sup>6-8</sup>

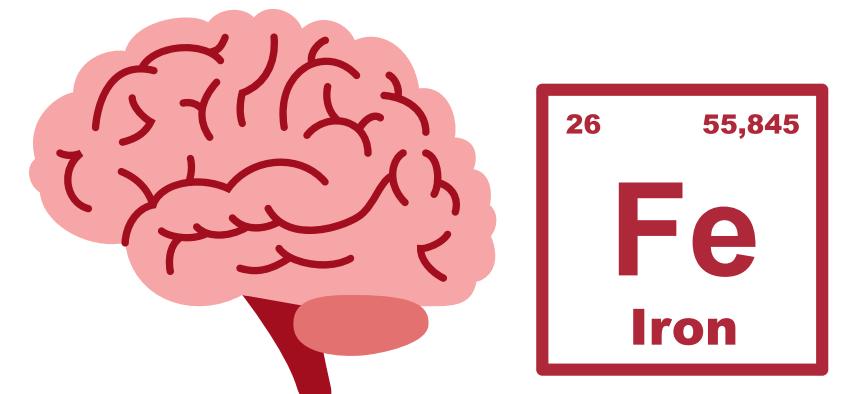
## Methods



- N = 98 youth age 5-18
- 58% female
- 22% non-Hispanic white
- 45% in interpersonal adversity (IA) group



Stool microbiome (16S)



nT2\*w images → basal ganglia tissue iron

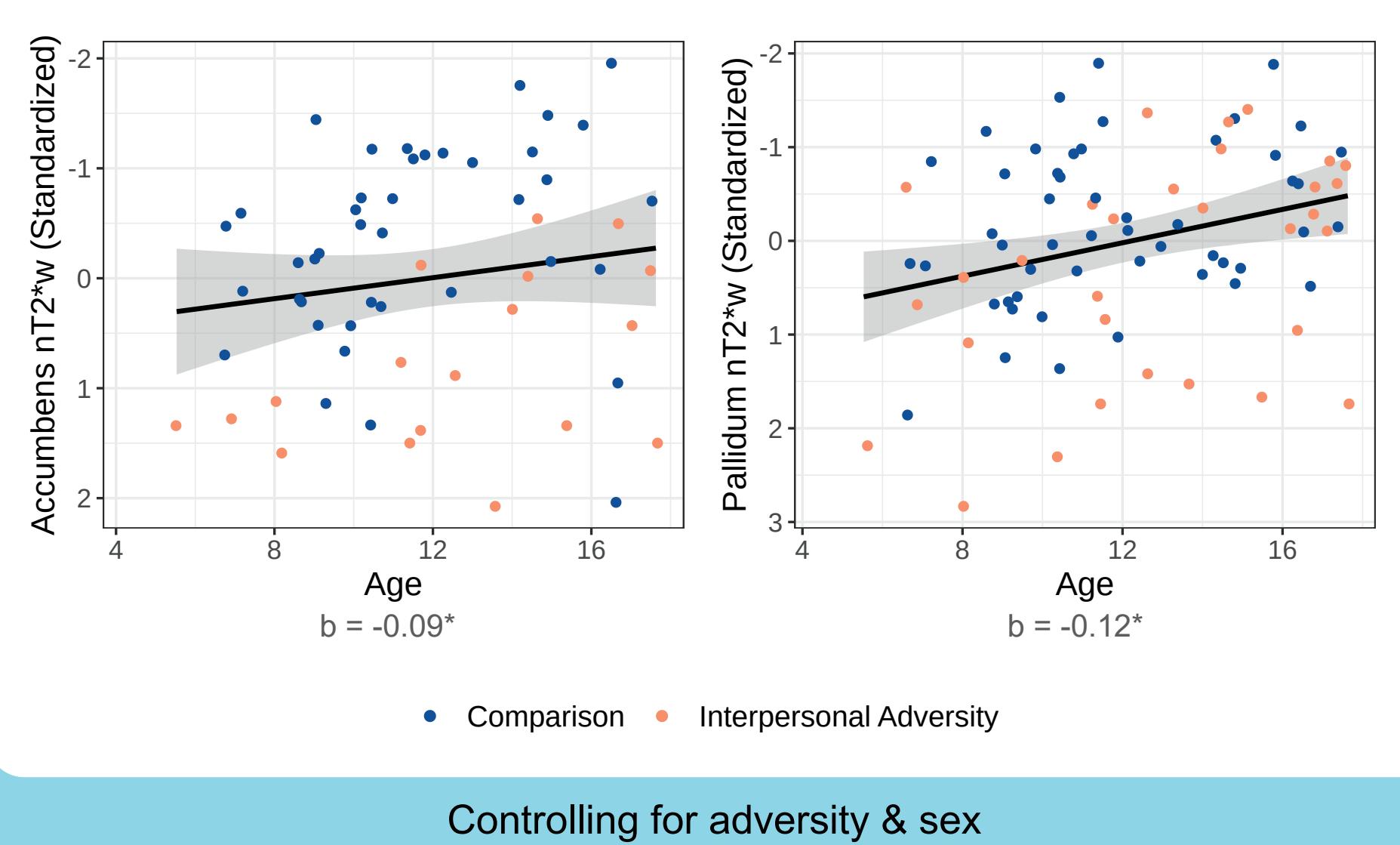


Child Behavior Checklist (CBCL)<sup>9</sup>: Internalizing and externalizing sx

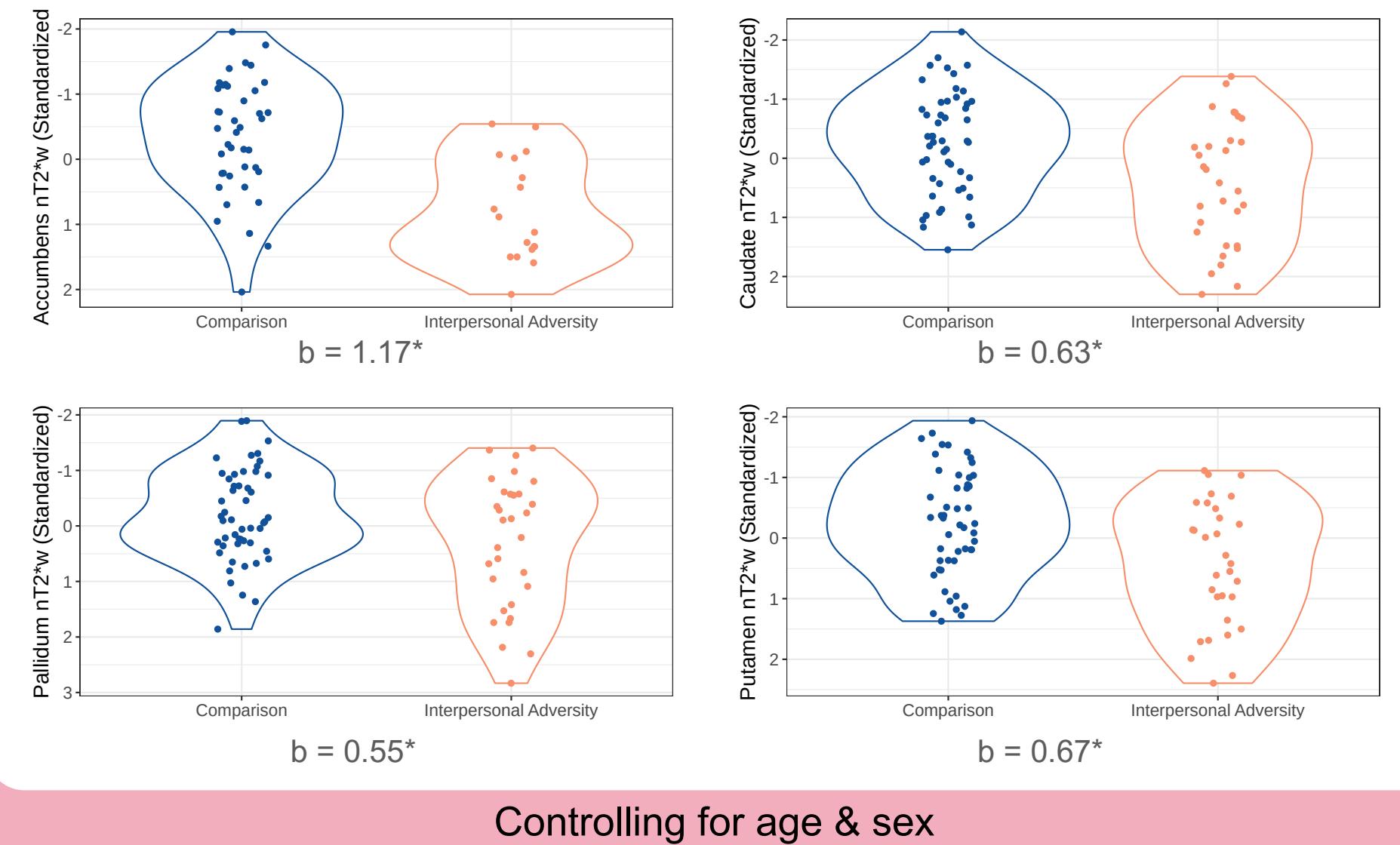


- Genera filtered for prevalence in 20% of samples
- Shannon's alpha diversity
- Adversity \* Microbiome interactions
- BH correction (q<.05)

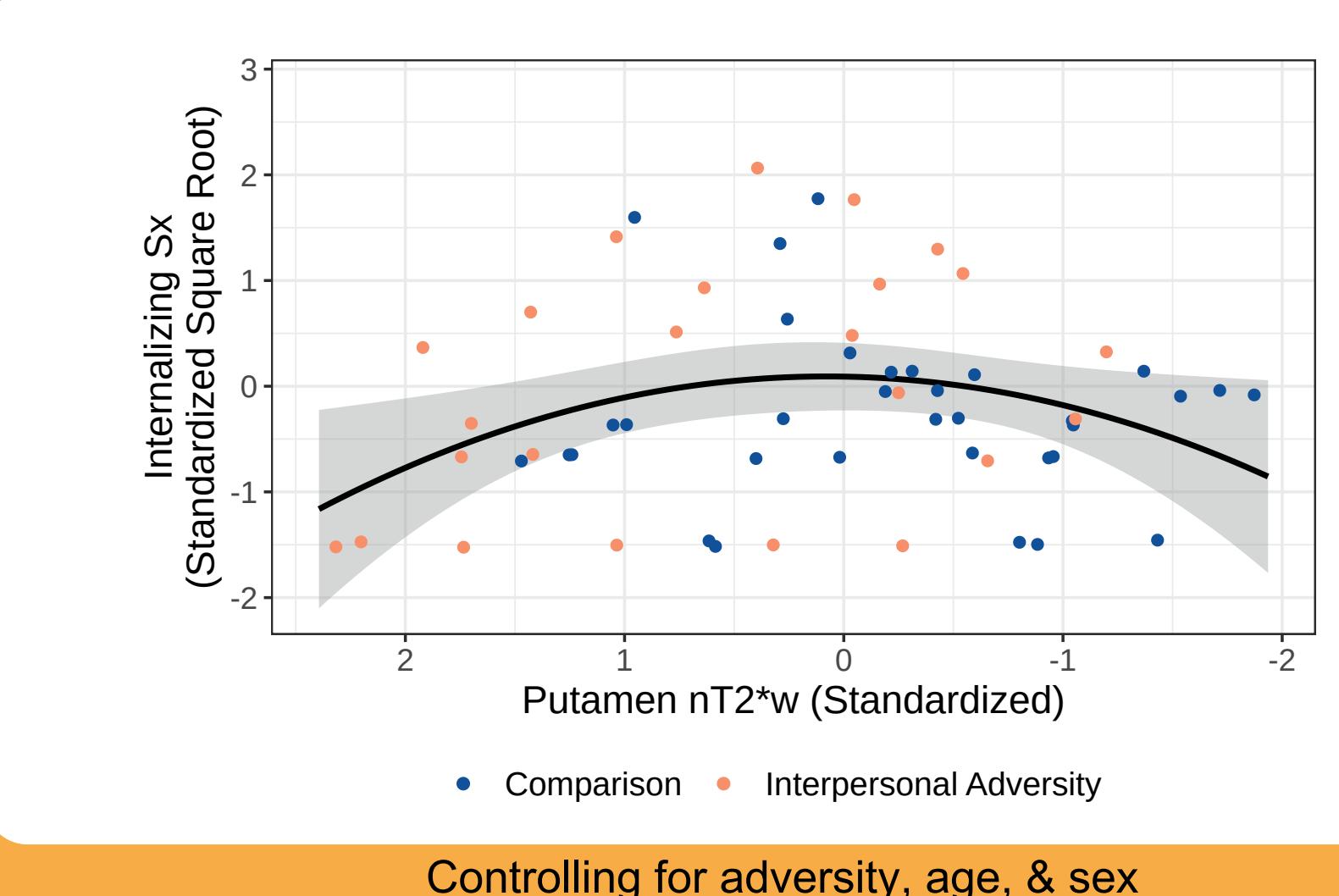
## Age is Associated with More Tissue Iron



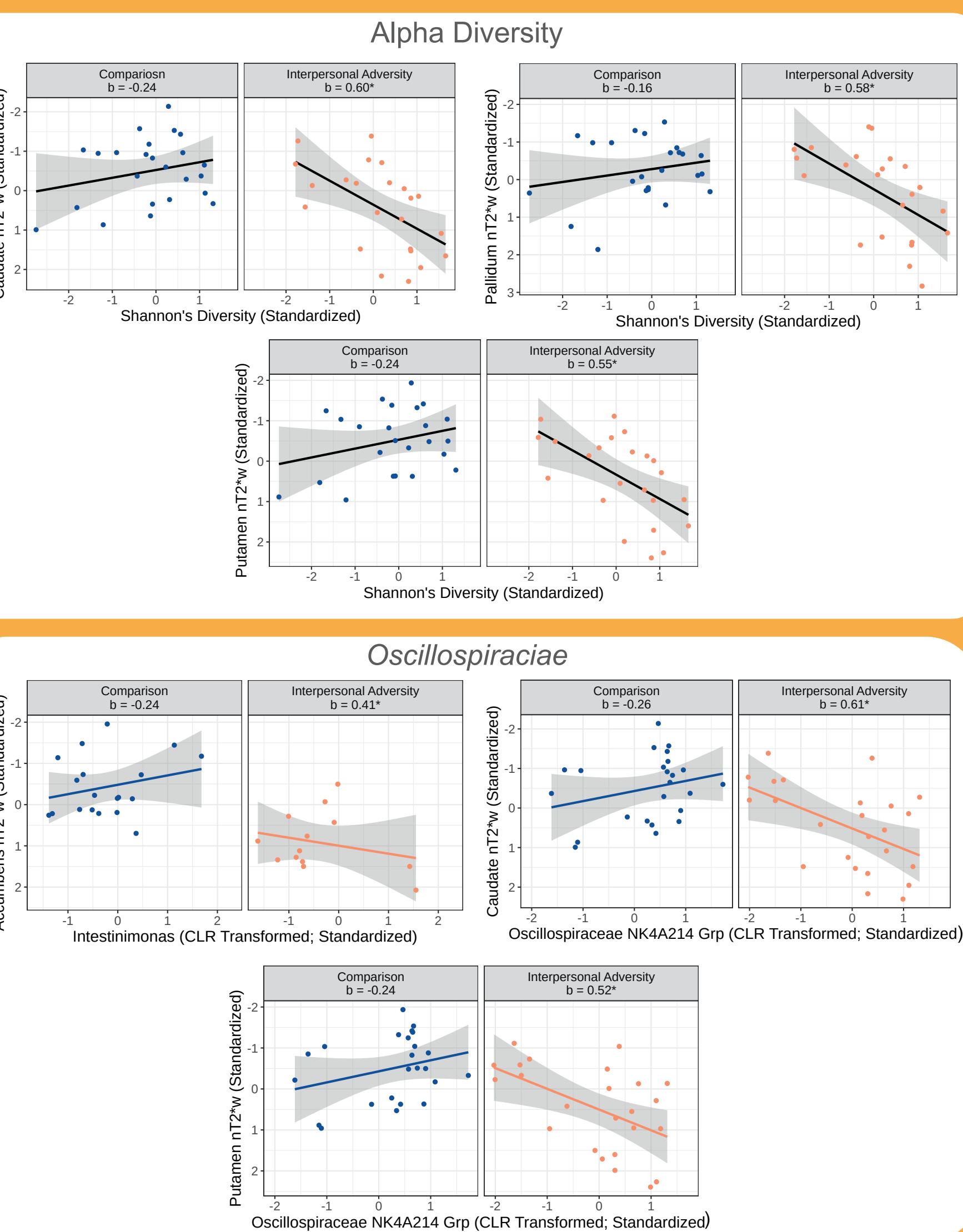
## Adversity is Associated with Less Tissue Iron



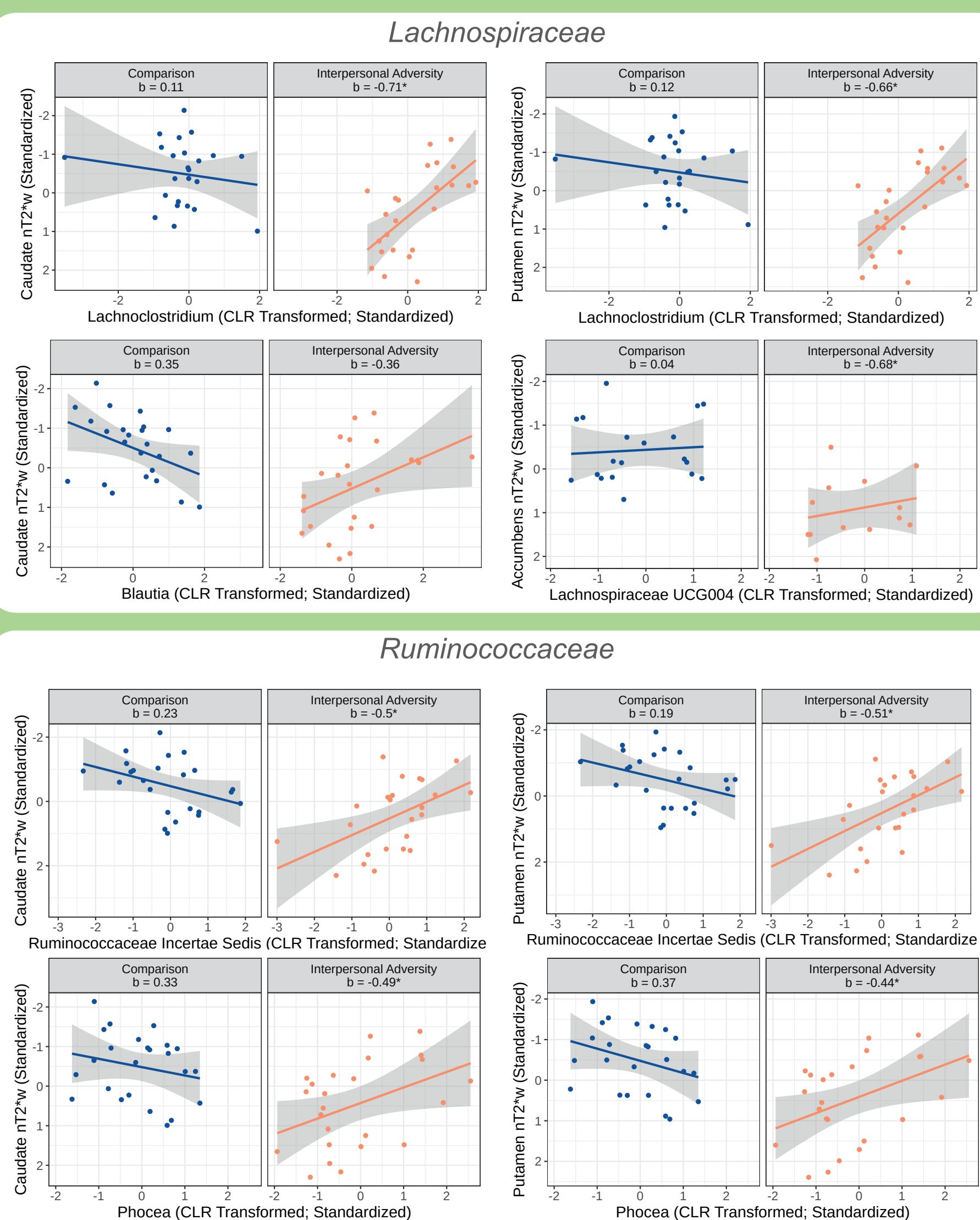
## Youth with Average Tissue Iron have Highest Internalizing Sx Risk



## Alpha Diversity & Genera in Oscillospiraceae are Associated with Lower Tissue Iron in the IA Group



## Genera in Lachnospiraceae & Ruminococcaceae are Associated with Higher Tissue Iron in the IA Group



## Discussion

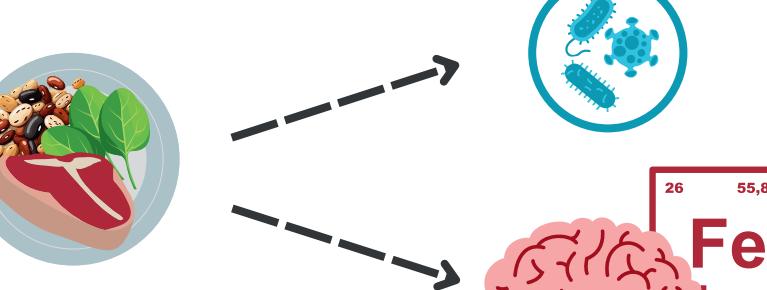
Largely associated with lower basal ganglia tissue iron in adversity group:

**Shannon's Diversity & Oscillospiraceae**

Largely associated with higher basal ganglia tissue iron in adversity group: **Lachnospiraceae & Ruminococcaceae**

### Possible Explanations:

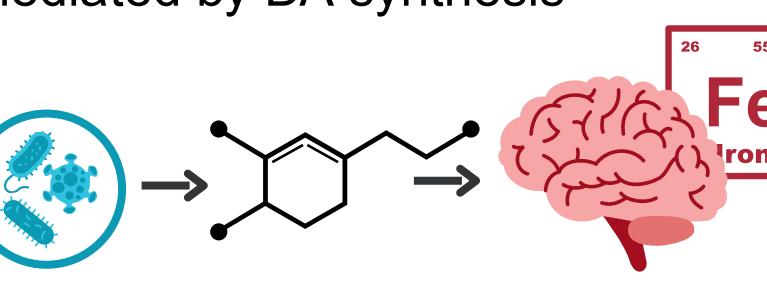
Dietary iron is a confound within the IA group



Certain microbiome characteristics facilitate iron absorption in the IA group



Microbiome associations with tissue iron in the IA group are mediated by DA synthesis



## Future Directions

- Test confounding effect of dietary iron
- Test other behavioral correlates of basal ganglia tissue iron (e.g. reward learning)
- Examine longitudinal changes in tissue iron and in microbiome composition
- Sequence the microbiome at a higher taxonomic resolution (i.e. strain instead of genus level)
- Sequence microbiome functions (i.e. genes) in addition to taxonomic makeup
- Examine other DA synthesis markers (e.g. neuromelanin)

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