

Social Determinants of Health, Infant Brain Development, and Early Childhood Social-Emotional Development

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Disclosures

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- Stock Equity (<10,000)

- None

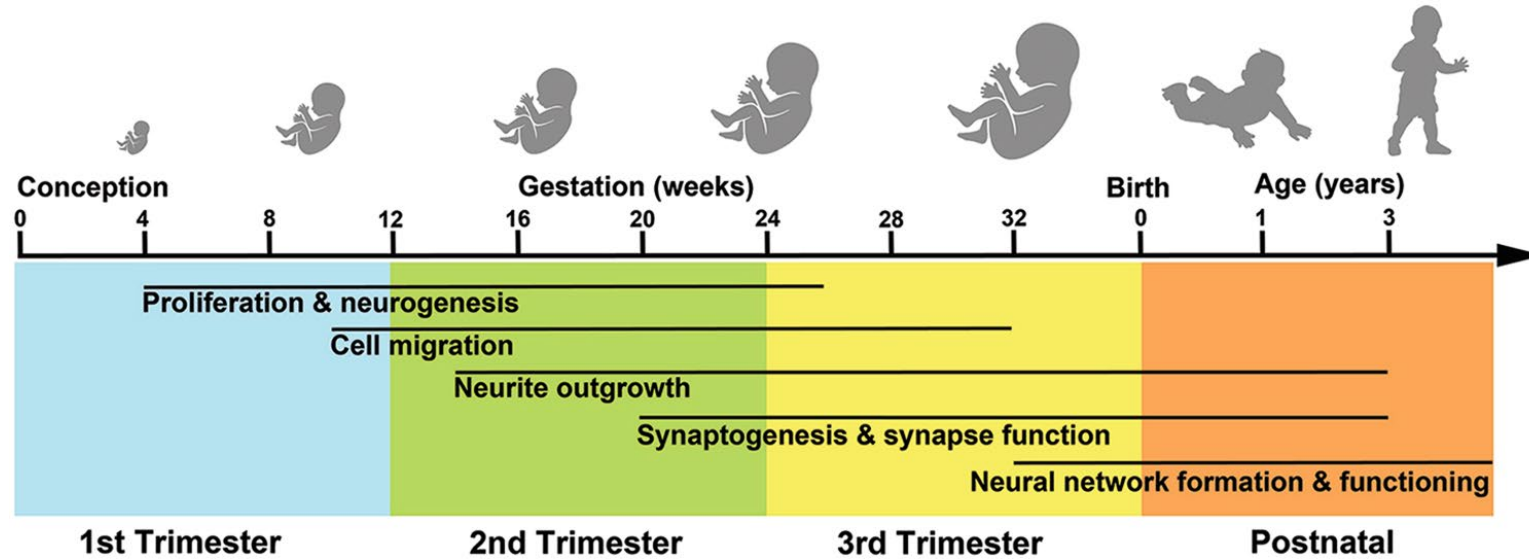
- Speakers Bureau(s)

- None

- Consulting Relationships

- None

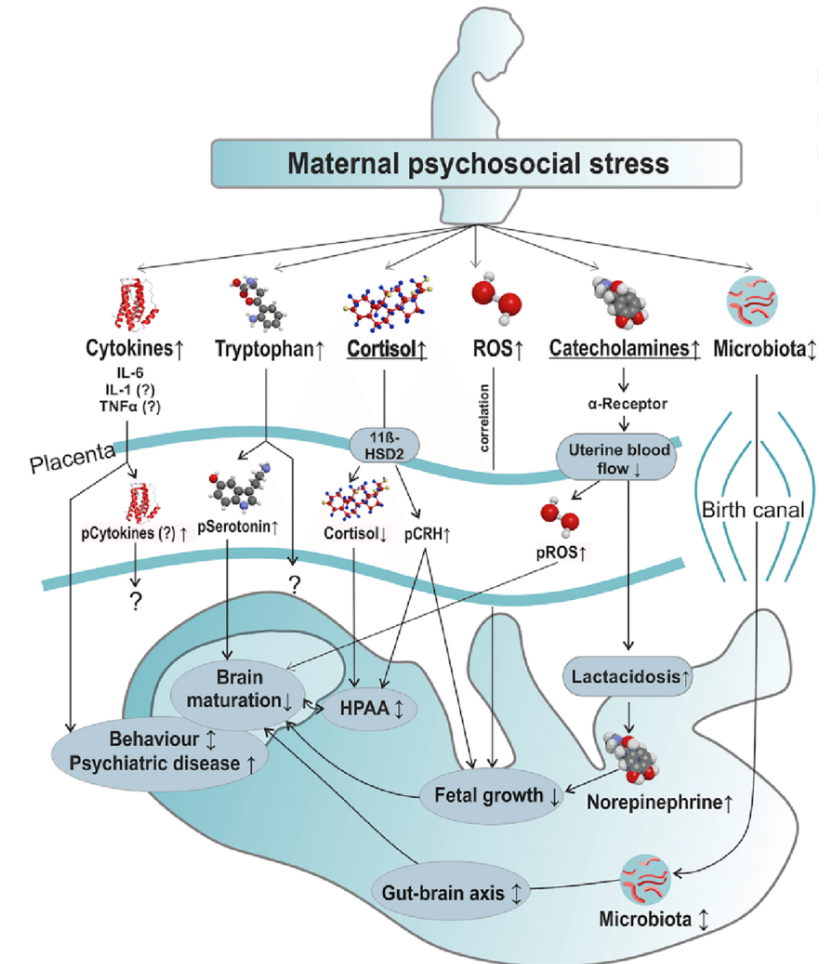
Prenatal Exposure and the Neonatal Brain



Courchesne et al (2019)



Potential Mechanisms Linking Stress To Neonatal Brain Development



Early Life Adversity, Gut Microbiome, Inflammation, and Brain Development

N=399



Joan Luby M.D.



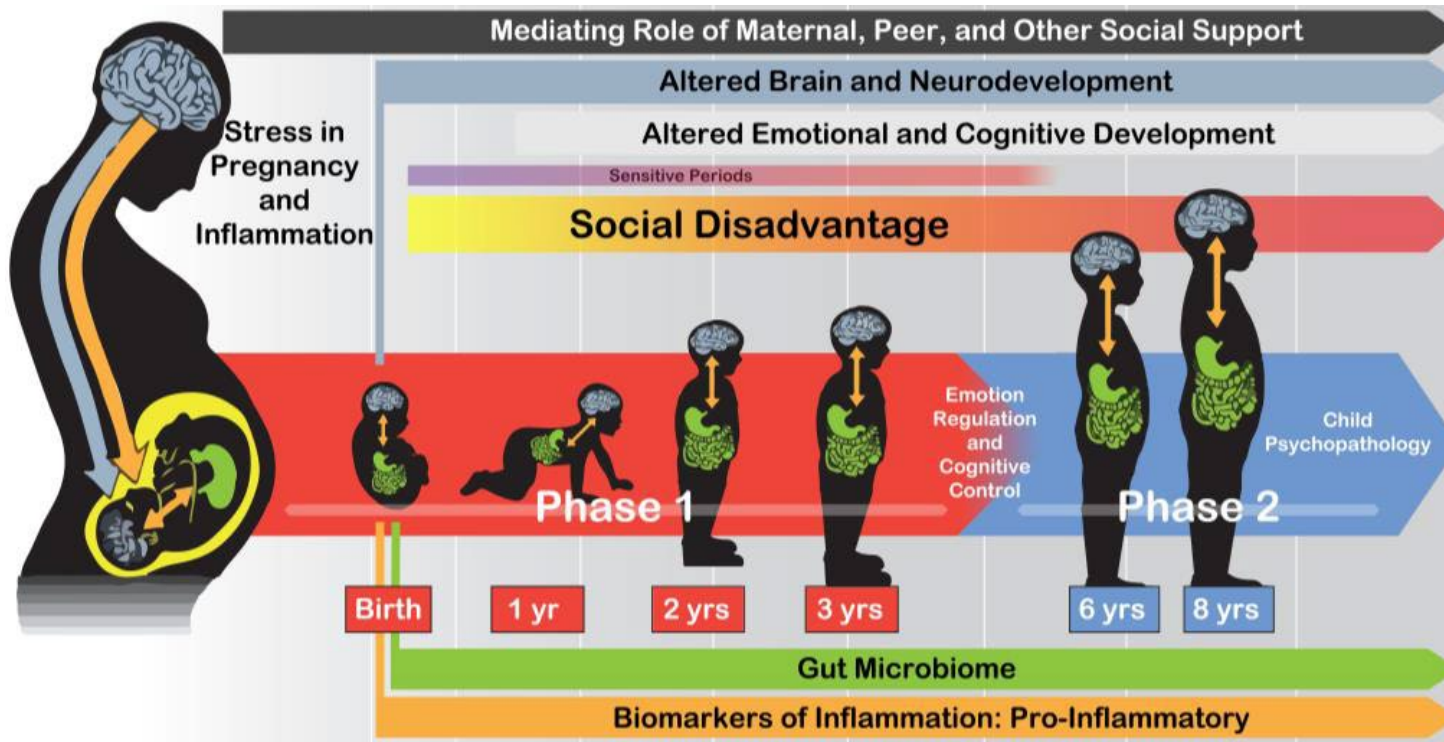
Barb Warner M.D.



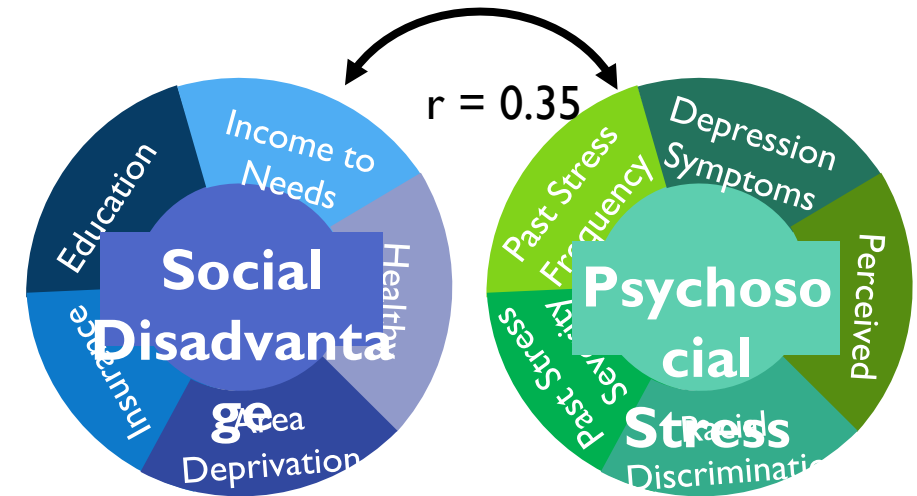
Chris Smyser M.D.



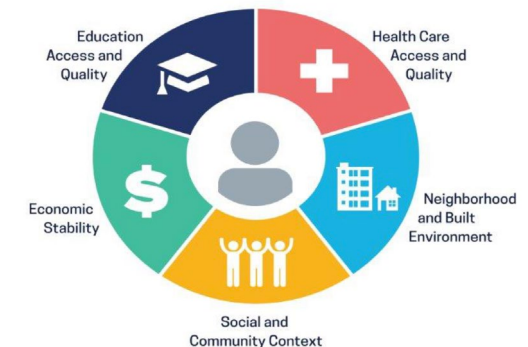
Deanna Barch Ph.D.



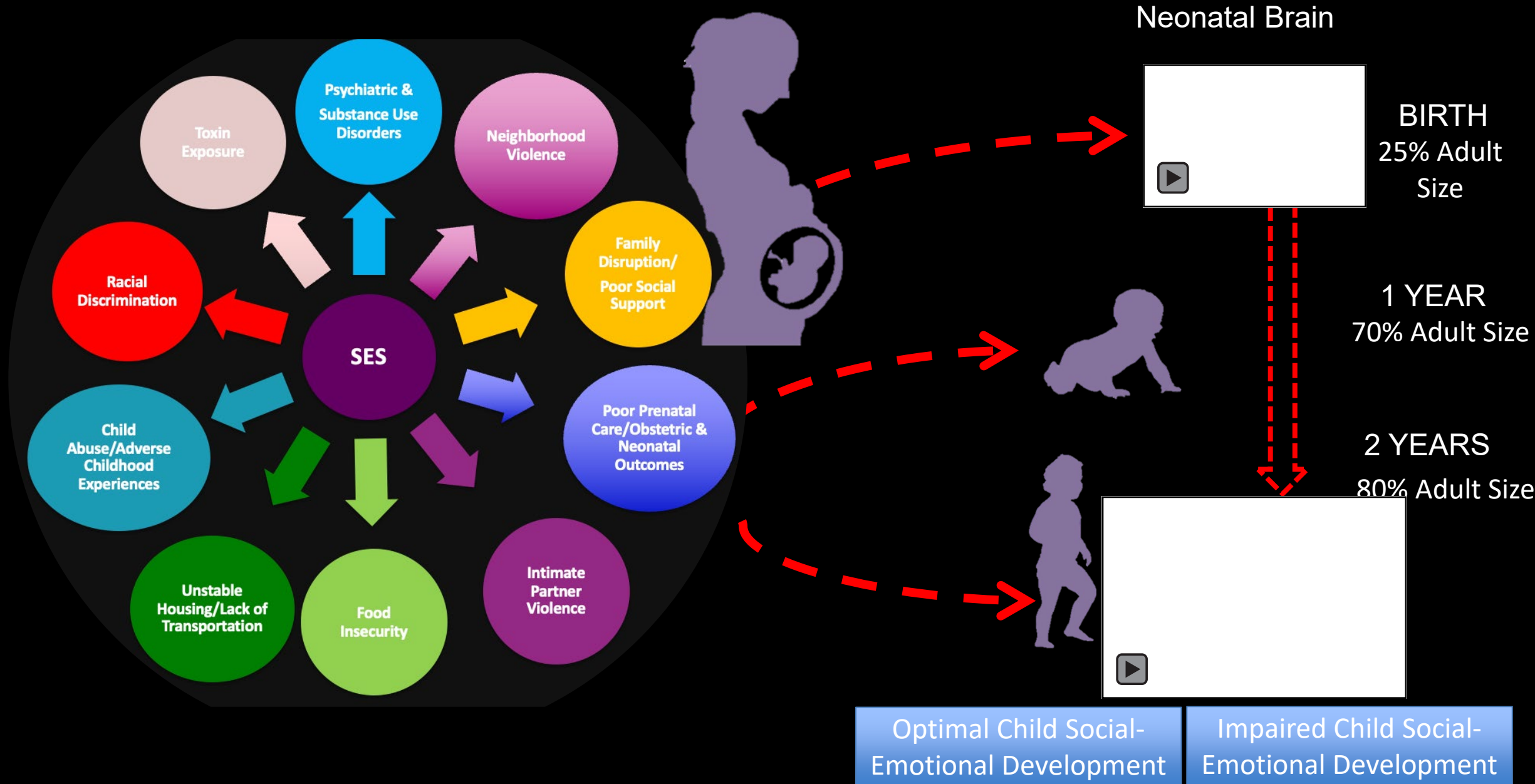
Average across three trimesters



Social Determinants of Health

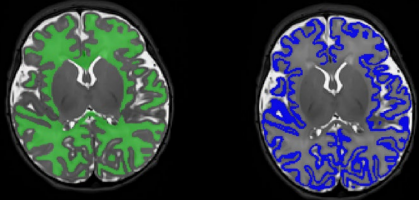


Social Determinants and the Developing Infant Brain

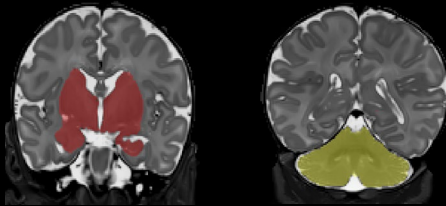


Imaging Analysis Methods

Brain Volumes

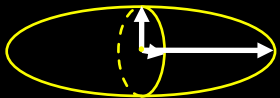


White Matter Cortical Grey Matter

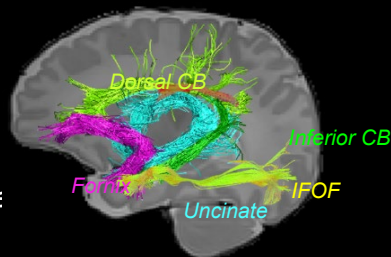


Subcortical Grey Matter Cerebellum Matter

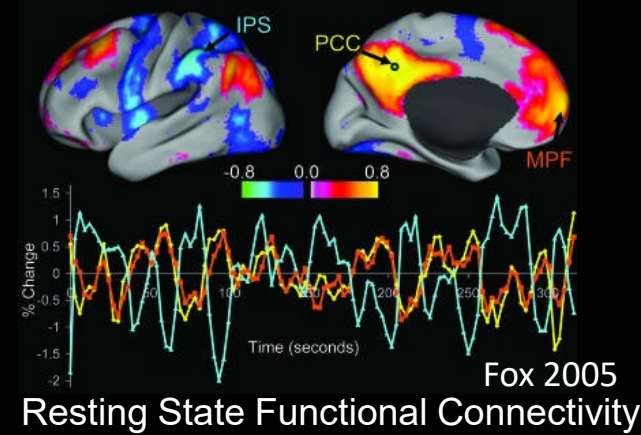
Brain Structural Connectivity



FA: degree to which the diffusion deviate from spherical
MD: overall diffusion, average of 3 eigenvalues

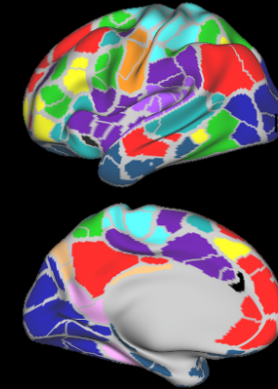


Brain Functional Connectivity

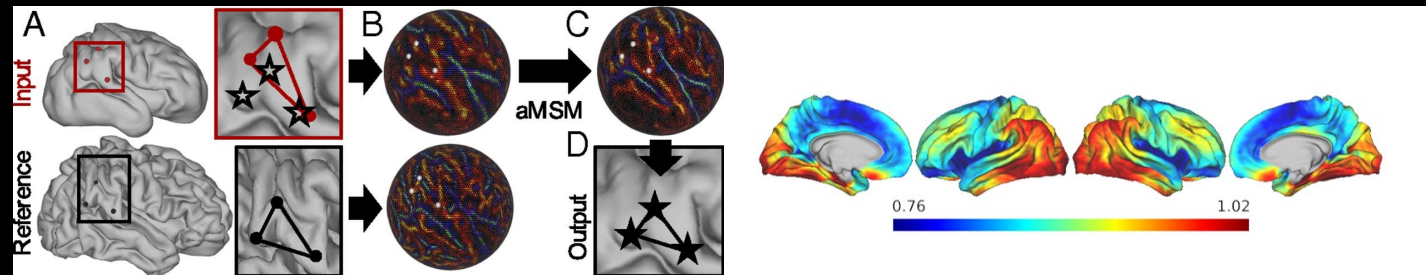


Functional Brain Networks

- Somatomotor-Hannd
- Somatomotor-Mouth
- Auditory
- Rostrosplenial
- Visual
- Frontoparietal
- Dorsal Attention
- Cingulo-opercular
- Parietal Memory
- Salience
- Ventral Attention
- Default Mode



Cortical Expansion



Garcia et al., PNAS 2018

Gorham et al., prep

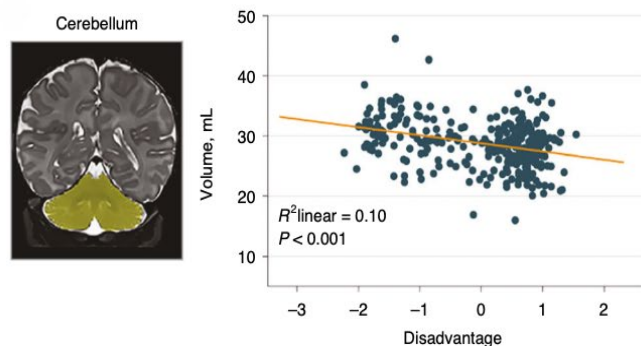
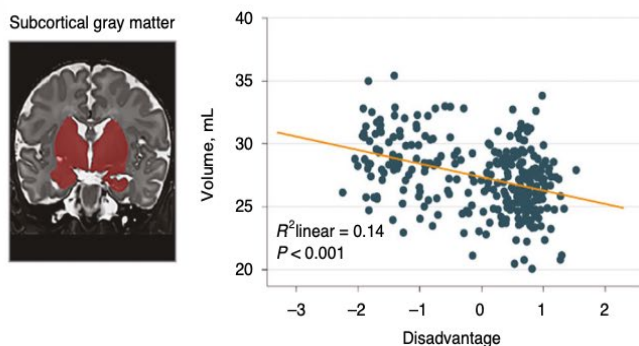
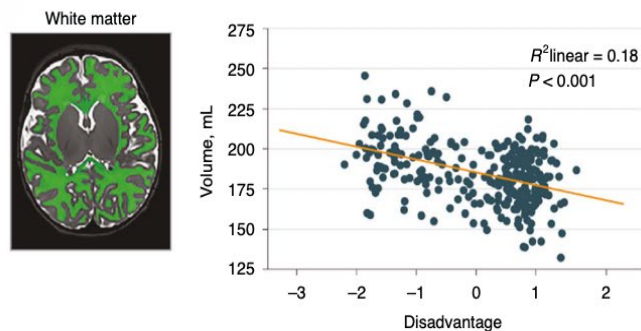
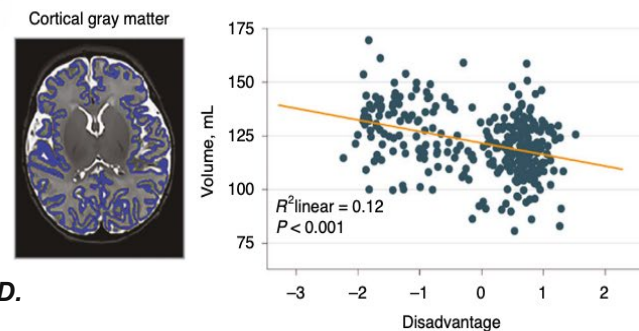
Maternal Prenatal Socioeconomic Disadvantage Alters Neonatal Brain Structure and Function



Brain Volumes

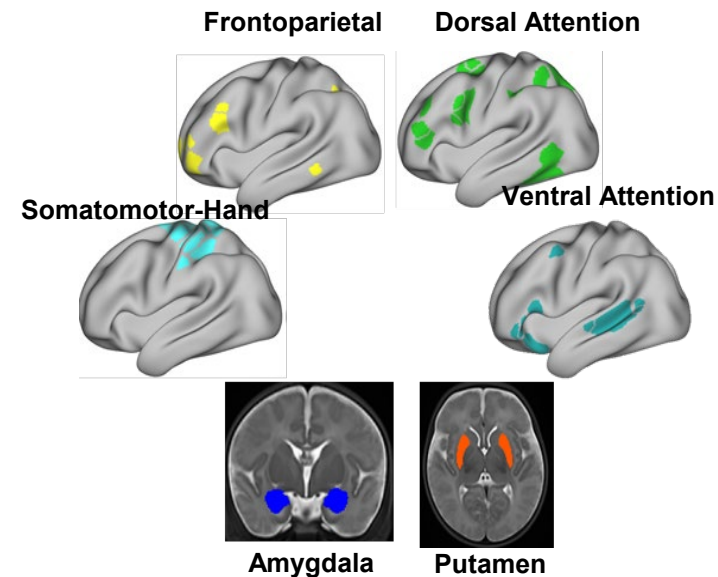


Regina Triplett, M.D.



Triplett et al. JAMA Network Open. 2022

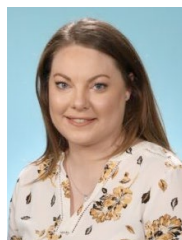
Brain Functional Connectivity



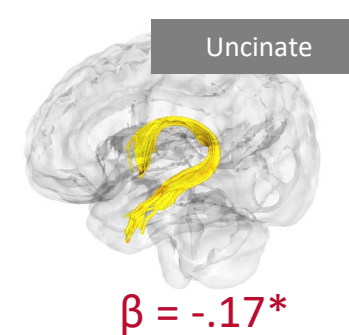
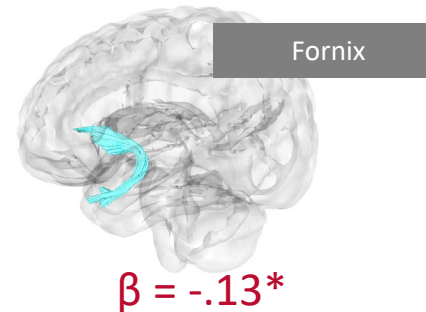
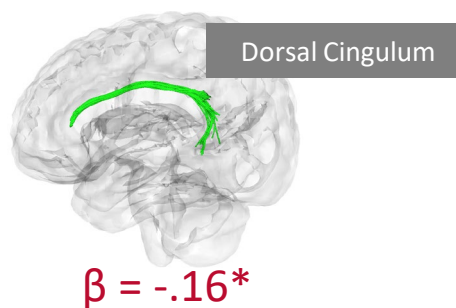
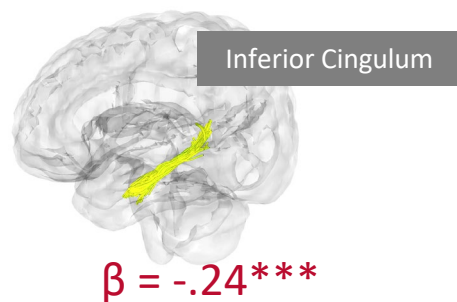
Ashley Nielsen PhD

Nielsen et al. PNAS 2024

Brain Structural Connectivity



Rachel Lean, PhD



Lean et al., PNAS 2022

Maternal Prenatal Inflammation & Social Disadvantage



Maternal Prenatal IL-6

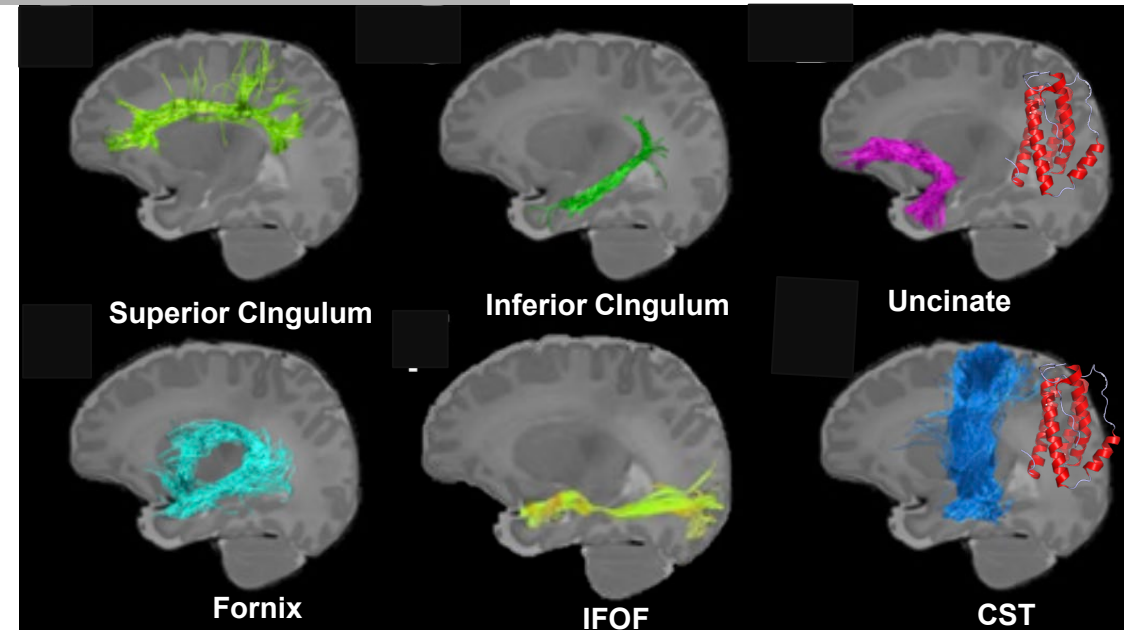


Ashley Sanders, PhD

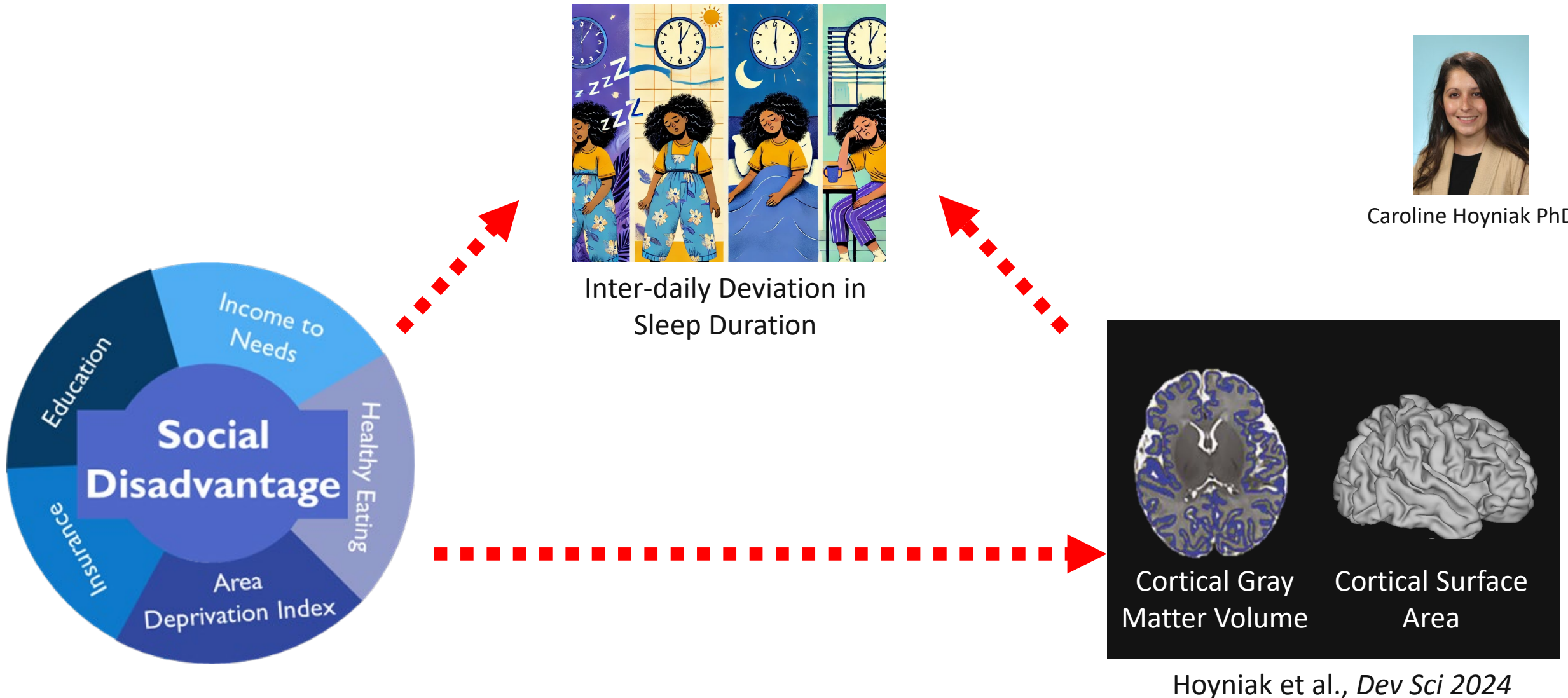
Maternal Prenatal Disadvantage, IL-6 & Infant Structural Connectivity



Sanders et al., *Transl Psychiatry* 2024



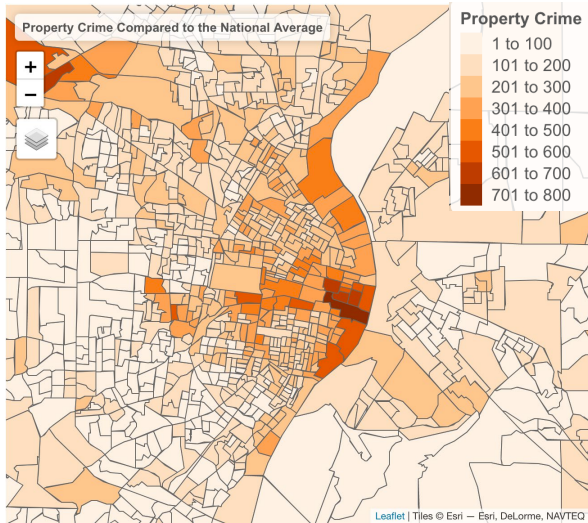
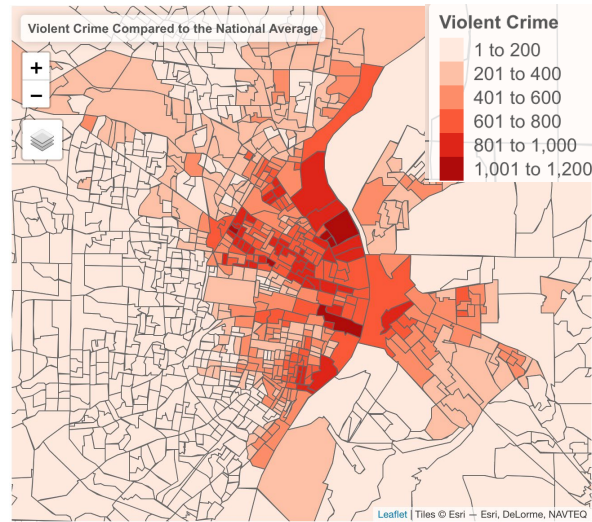
Maternal Prenatal Deviation in Sleep Duration Mediates Association Between Social Disadvantage and Neonatal Brain Development



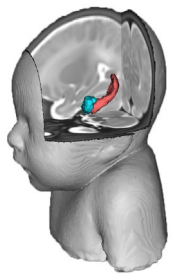
Prenatal Crime Exposure Effects Neonatal Connectivity and Age 2 Externalizing Symptoms



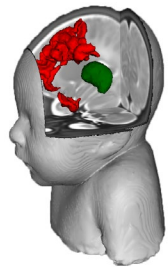
Rebecca Brady
MD PhD Candidate



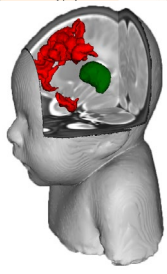
Predictors	ITSEA Externalizing t-score		
	Statistic	std. Beta	p
Intercept	1.45	0.00	0.149
Time	2.28	0.06	0.023
GA at Birth	-0.36	-0.02	0.719
PMA at Scan	1.46	0.09	0.146
Amygdala-Thalamus	-2.53	-0.14	0.012
Income-to-Needs	-1.22	-0.07	0.222
Violent Crime	2.64	0.17	0.009
Racial Discrimination	2.63	0.15	0.009
Violent Crime-by-Time	-1.42	-0.05	0.156



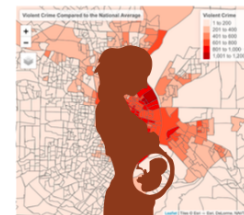
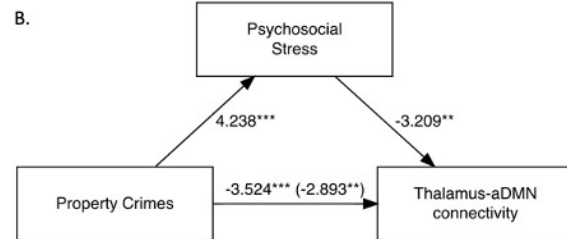
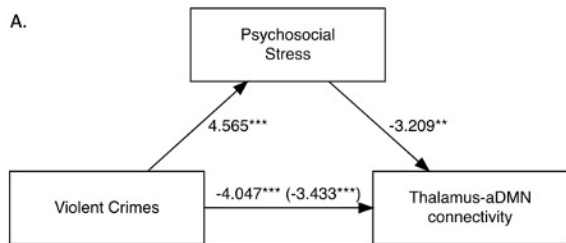
Amygdala-Hippocampus



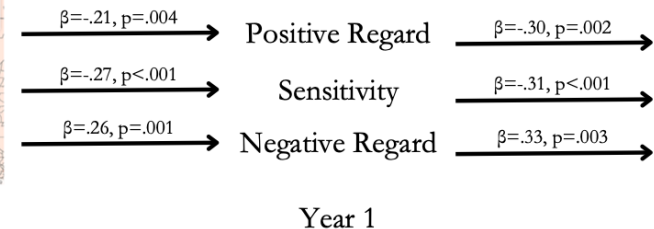
Thalamus-aDMN



Thalamus-aDMN



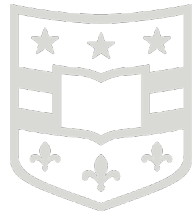
Birth



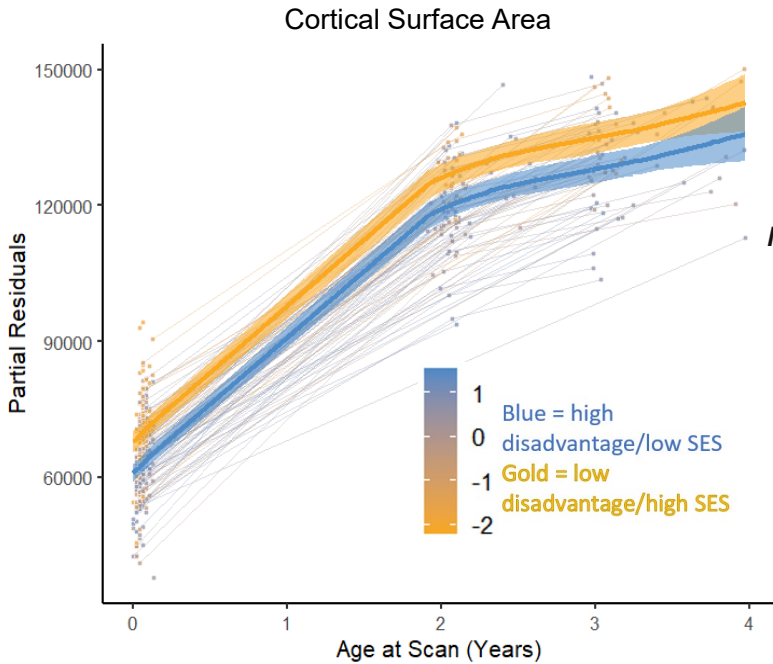
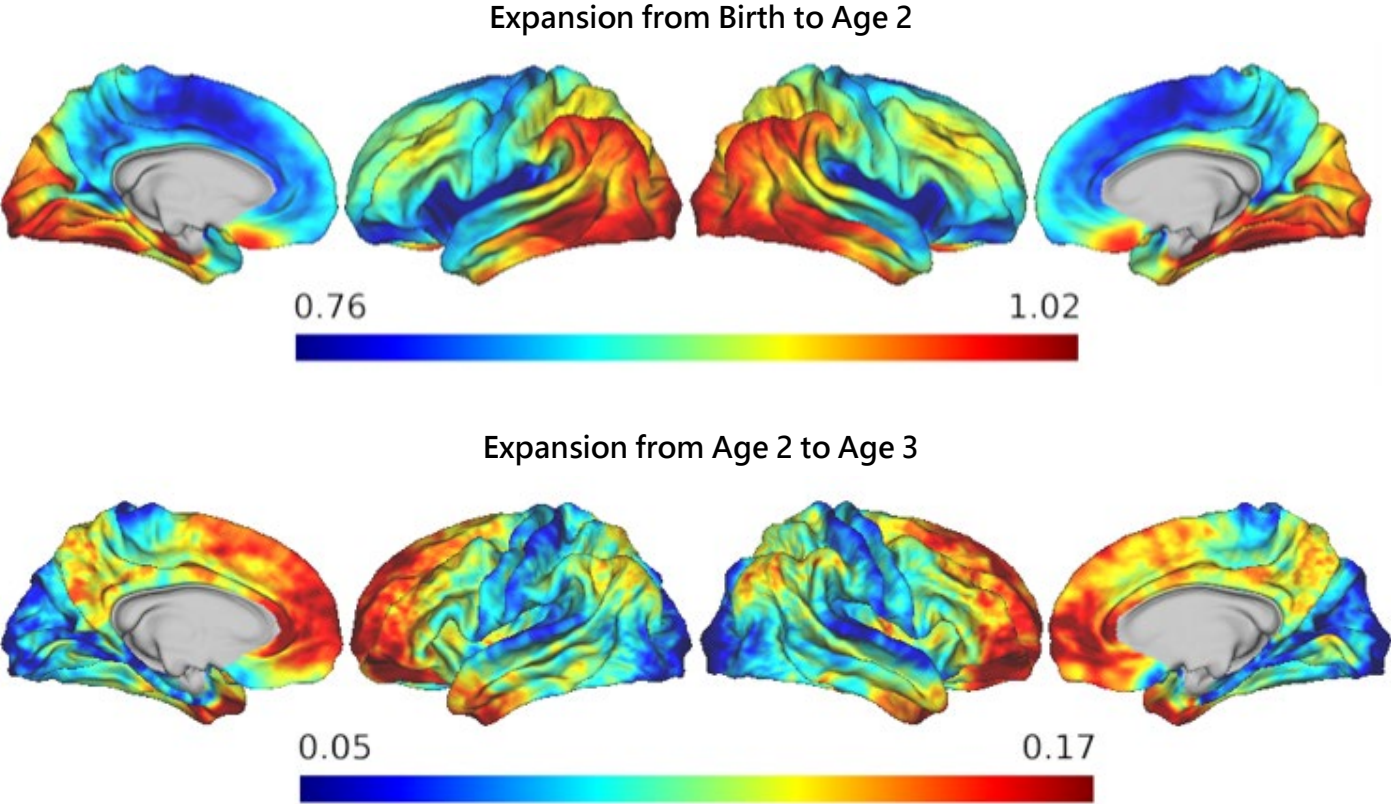
Brady et al. JAACAP 2023

Externalizing Symptoms

Cortical Expansion in the First Three Years of Life and Social Disadvantage



Lisa Gorham,
MD/PhD Candidate

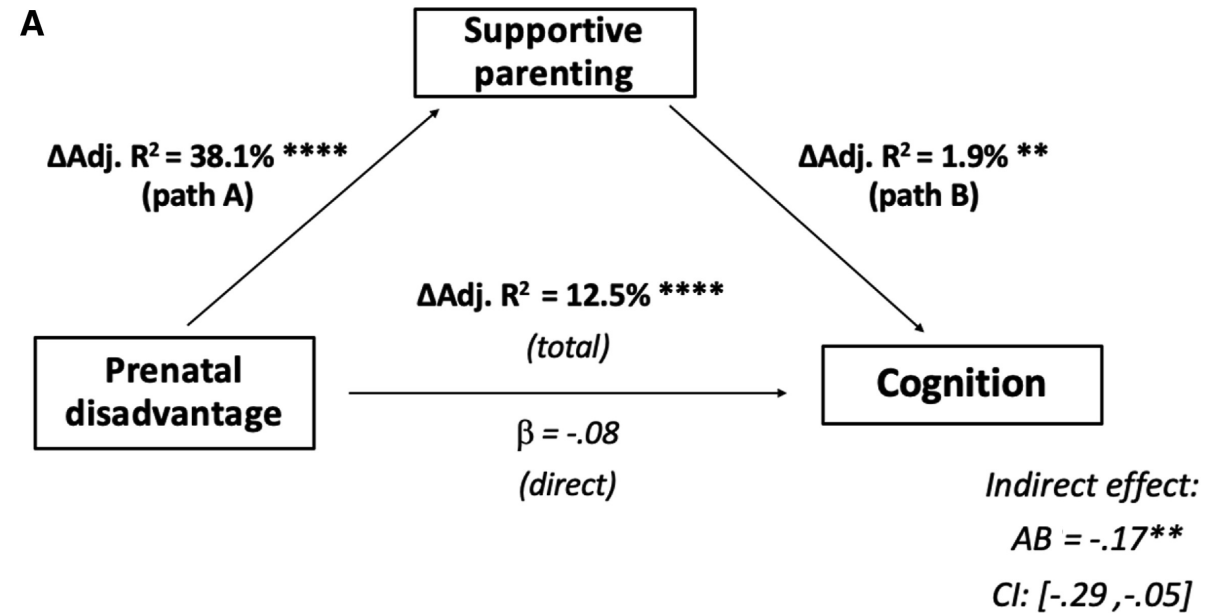
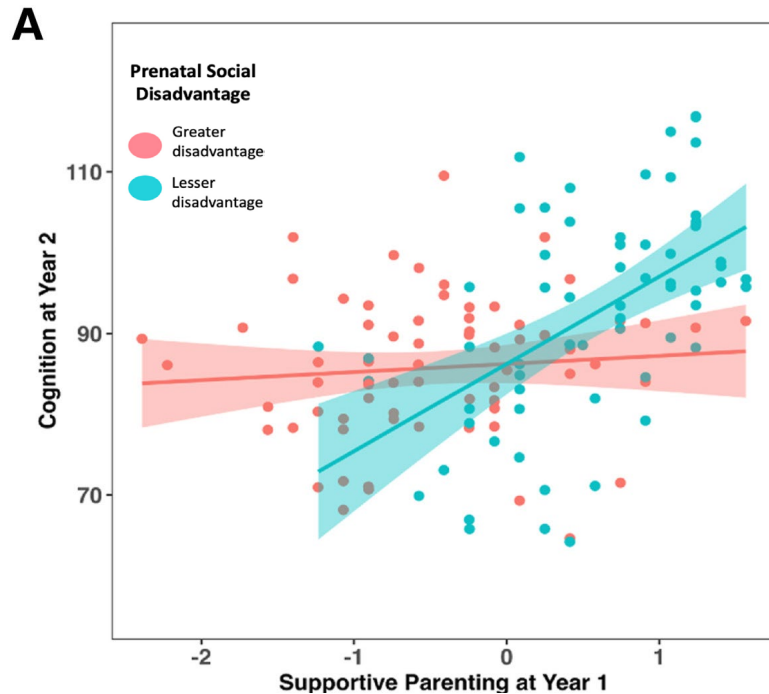
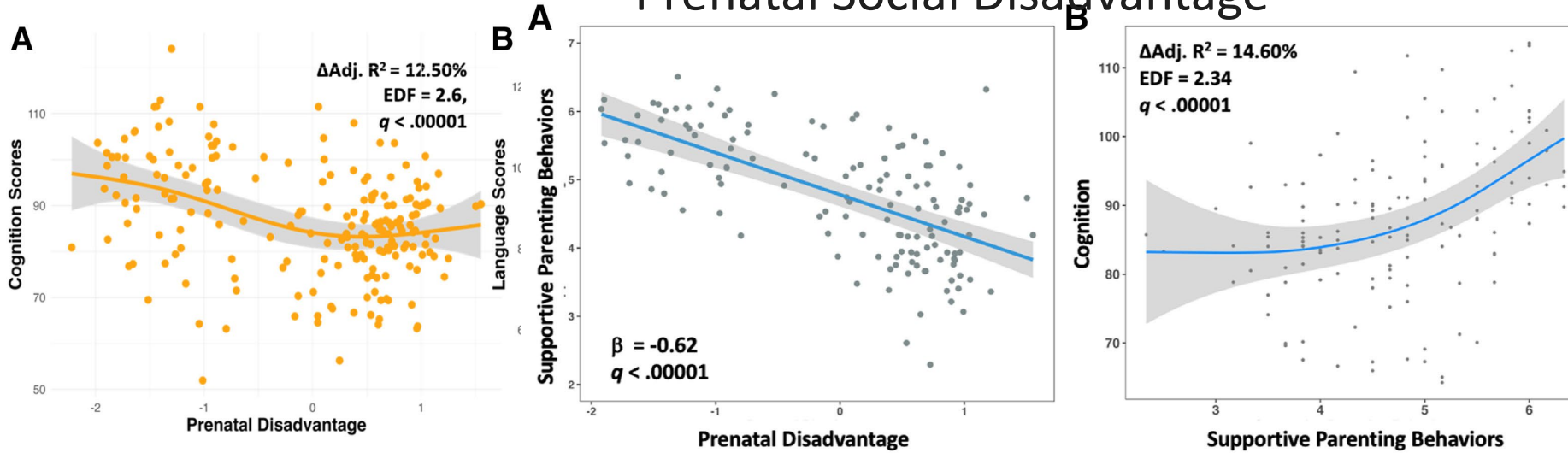


	F Value	P Value
Main Effect of Disadvantage	14.11	<0.001
Age* Disadvantage Interaction	2.788	0.096

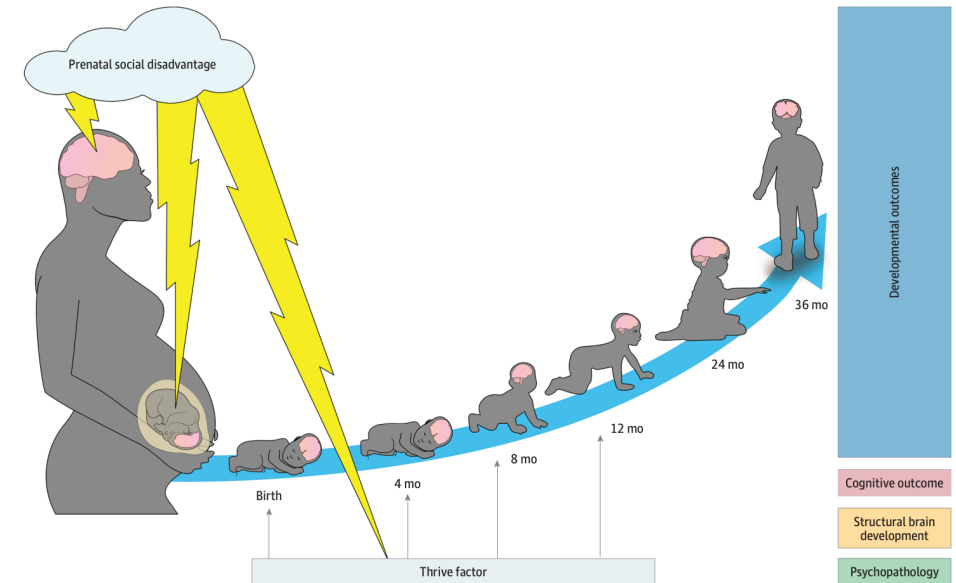
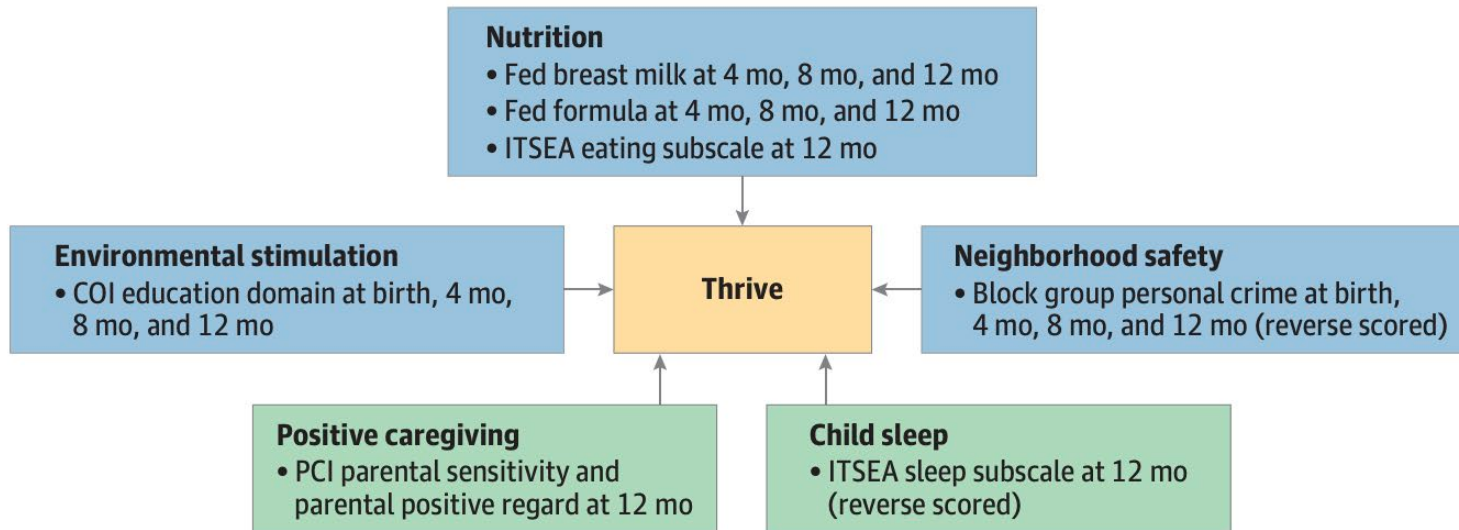
Parenting and Cognitive and Language Abilities at 2 Years of Age Depend on Prenatal Social Disadvantage



Shelby Leverett, MS
Neurosciences PhD Student

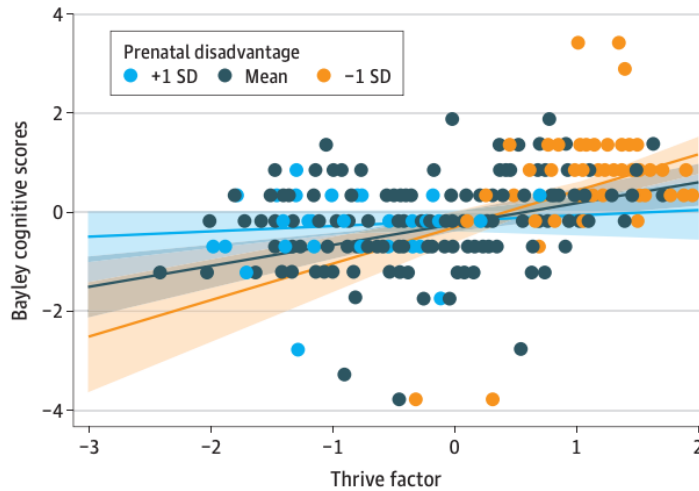


Basic Environmental Supports for Positive Brain and Cognitive Development in the First Year of Life

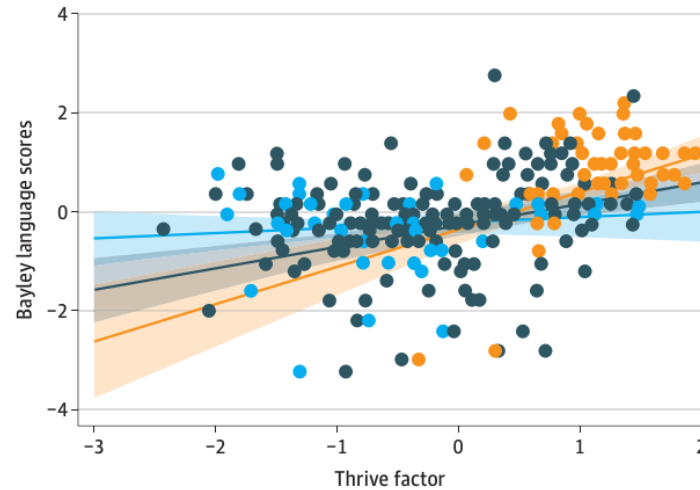


Prenatal Social Disadvantage Moderates the Association Between Thrive Factor and Early Childhood Development

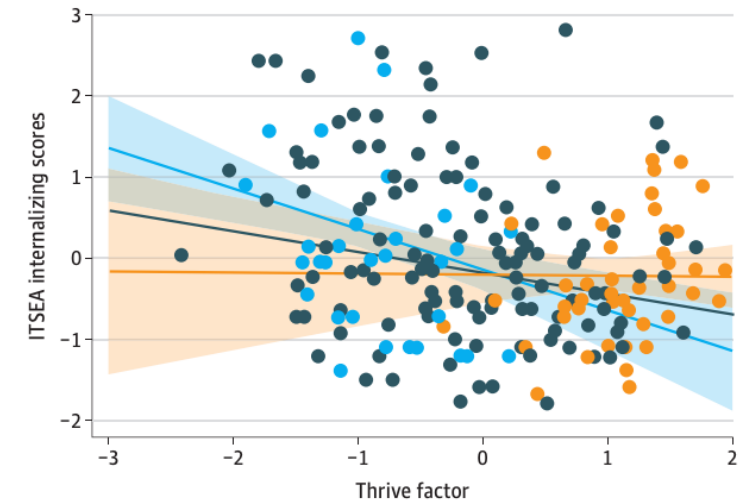
A Year 3 Bayley cognitive scores



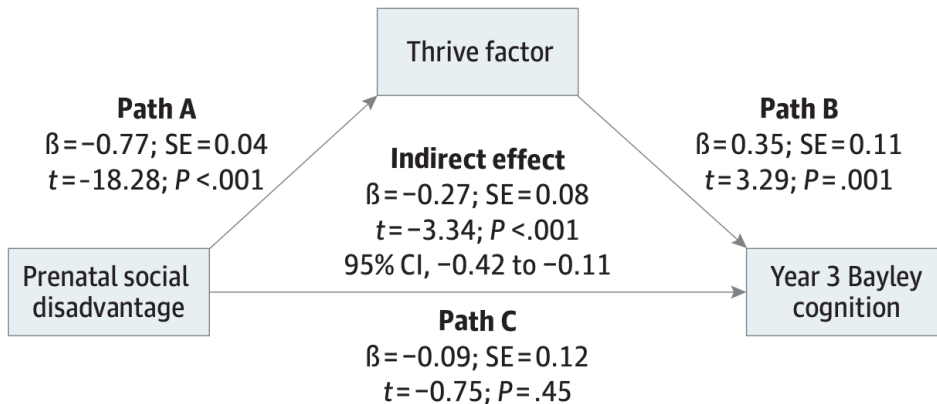
B Year 3 Bayley language scores



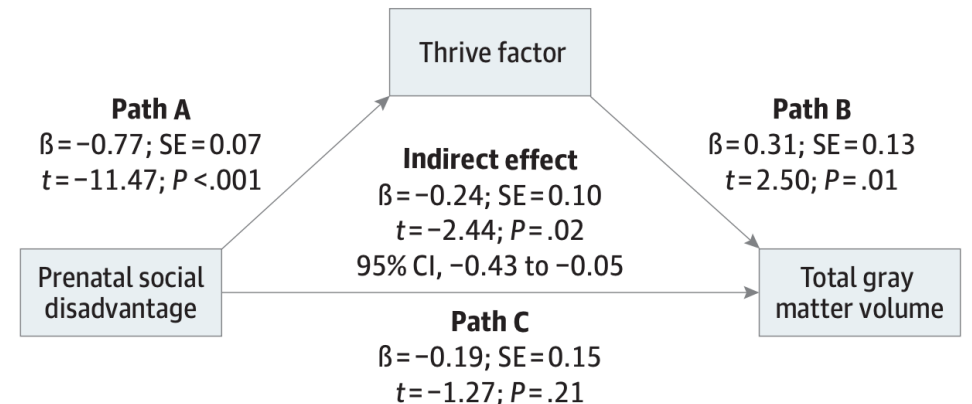
C Year 2 ITSEA internalizing scores



A Year 3 Bayley cognitive composite



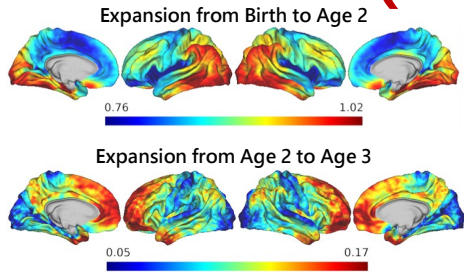
B Total gray matter volume (relative to intracranial volume)



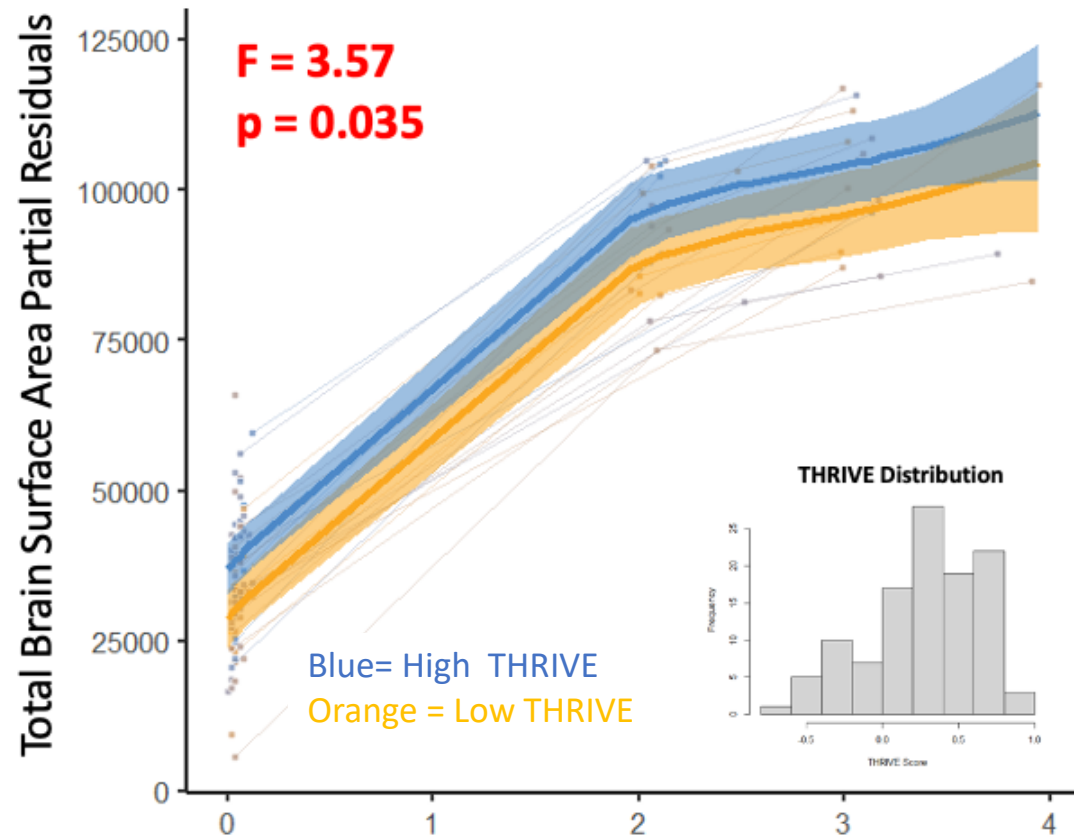
Social Disadvantage Moderates Positive Life Experiences (THRIVE) Impact on Cortical Development



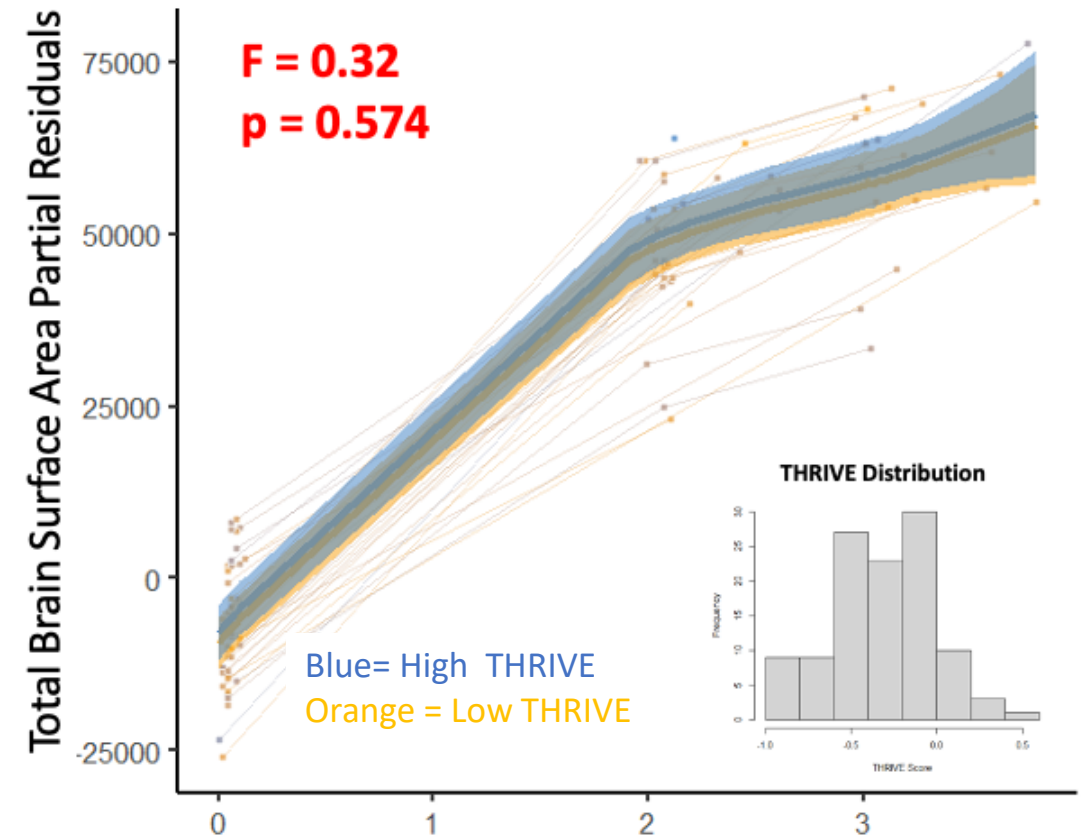
Lisa Gorham,
MD/PhD Candidate



Lesser Disadvantage



Greater Disadvantage



Concluding Thoughts

- Social Determinants of Health impact infant brain development
 - Some evidence that improving SDOH could optimize brain development
- Parenting practices, sleep, and nutrition are important factors that promote resilience
 - ***Only if a basic level of resources are met***



Acknowledgements

Our Participants and Families

WUNDER Faculty & Staff

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Nicole Lashley-Simms

Jackson Gress

Sally Gacheru

Cecilia Nam

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Mary Goldschmidt

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Berenice Anaya

Tara Shepherd

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Aidan Latham

David Loseille

Caleb Gardner

Mia Ruppel

Kayle Cohen

Kevine Ngalula

Nick Bloom

Kari Murray

Faculty:

Regina Triplett

Ashley Nielsen

Rachel Lean

Jeff Neil

Josh Shimony

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