

# Early-Life Community Material Deprivation is Associated with Decreased School-Age IQ in the HOME (Health Outcomes and Measurements of the Environment) Study

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## INTRODUCTION

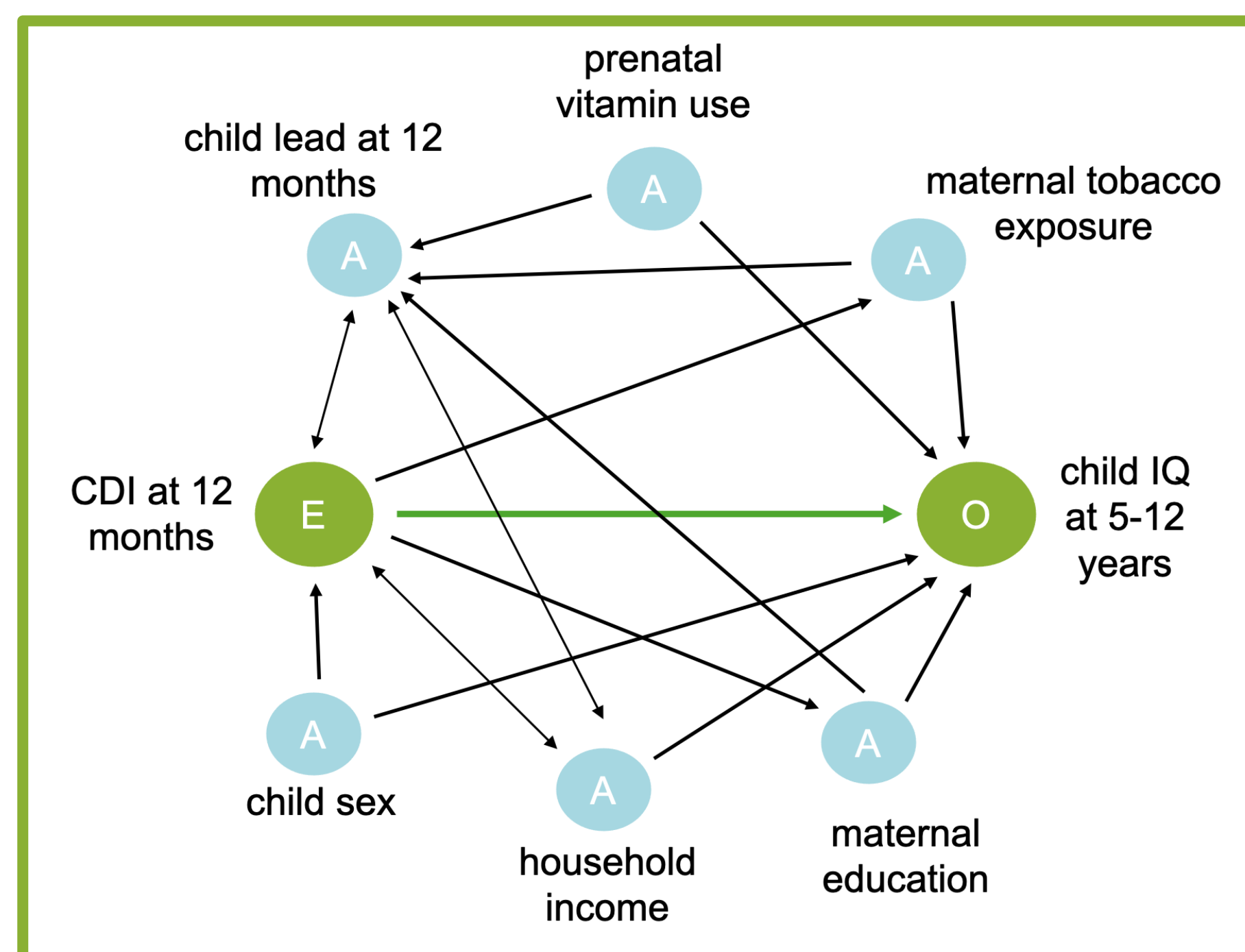
- Optimizing cognitive potential can positively influence long-term health outcomes
- Diverse environmental factors are associated with a child's IQ
- Household socioeconomic status mediates child IQ, but few studies have examined the role of community disadvantage

## OBJECTIVES

Examine the relationship between **Community Deprivation Index (CDI)** at age 12 months and **child IQ** at 5-12 years.  
Explore modification of this association by **socioeconomic factors**.

## METHODS

- From 2003-2006, pregnant women in the Greater Cincinnati metropolitan region were enrolled in a longitudinal cohort
- CDI** was calculated utilizing 2015 American Community Survey census-tract level variables, characterizing community-level material deprivation
  - Scores range from 0 to 1
  - Higher CDI score indicates increased census tract deprivation
- IQ** was measured via WISC at age 8-12 years or via WPPSI at age 5 years if WISC was unavailable



**Figure 1:** Directed Acyclic Graph illustrating relationships between covariates of interest. CDI: Community Deprivation Index. A: covariates adjusted for. E: exposure of interest. O: outcome of interest.

**Table 1:** Participant Characteristics

Characteristic	N = 233 <sup>1</sup>
<b>Sex</b>	
Female	132 (57%)
Male	101 (43%)
<b>Twin Gestation</b>	
Singleton	222 (95%)
Twin	11 (4.7%)
<b>Maternal Education</b>	
High School or Less	46 (20%)
Some college	67 (29%)
College Grad	120 (52%)
<b>Household Income</b>	
<\$20,000	50 (21%)
\$20,000-\$40,000	39 (17%)
\$40,000-\$80,000	79 (34%)
>\$80,000	65 (28%)
<b>Prenatal Vitamin Use</b>	
Daily	176 (76%)
Weekly	27 (12%)
Rarely or Never	30 (13%)
<b>Mean Gestational Cotinine (ng/mL)</b>	7.86 (36.22)
<b>CDI at 12 months</b>	0.37 (0.16)
<b>Child Lead at 12 months (ug/dL)</b>	2.17 (1.79)
<b>FSIQ at 5-12y</b>	103.30 (16.19)
Perceptual Reasoning	107.26 (16.13)
Processing Speed	97.50 (14.93)
Verbal Reasoning	101.00 (15.80)
Working Memory Index	102.77 (15.86)

<sup>1</sup> n / N (%); Mean (SD)  
<sup>2</sup> Pearson's Chi-squared test; Fisher's exact test; Wilcoxon rank sum test

CDI: Community Deprivation Index, FSIQ: Full-Scale Intelligence Quotient, SD: standard deviation

**Table 2:** Unadjusted versus adjusted model estimates for the association between CDI and IQ.

IQ ages 5-12y	CDI at 12 months			
	Unadjusted		Adjusted	
	$\beta$	95% CI	$\beta$	95% CI
Verbal Comprehension	-3.9	-5.0, -2.8	-1.2	-2.8, 0.45
Perceptual Reasoning	-4.6	-5.7, -3.4	-1.5	-3.1, 0.21
Processing Speed	-2.9	-4.0, -1.7	-1.3	-3.0, 0.32
Working Memory (WISC-IV)	-3.4	-4.7, -2.2	-1.5	-3.4, 0.32
Full-Scale IQ	-5.0	-6.1, -3.8	-1.8	-3.3, -0.16

**Table 3:** Household income and prenatal vitamin use are effect modifiers in the association between CDI and FSIQ.

	CDI and FSIQ		
	Interaction p-value	$\beta$	95% CI <sup>1</sup>
<b>Maternal Education</b>	0.20		
HS or less		-3.6	-7.9, 0.64
Some college		-0.67	-3.9, 0.26
College graduate or higher		-1.6	-4.0, 0.67
<b>Household Income</b>	0.019*		
<\$20,000/year		-5.7	-9.3, -2.2
\$20,000-\$40,000/year		1.1	-3.0, 5.2
\$40,000-\$80,000/year		-0.93	-3.9, 2.0
>\$80,000/year		-2.0	-5.7, 1.6
<b>Prenatal Vitamin Use</b>	0.70		
Daily		-1.5	-3.3, 2.6
Weekly		-2.6	-9.4, 4.2
Rarely or Never		-7.1	-13.6, -0.69

<sup>1</sup>CI = Confidence Interval

Models were adjusted for: sex, household income, maternal education, maternal prenatal vitamin use, and maternal serum cotinine. The Working Memory subtest is only available for WISC-IV scores. CDI = Community Deprivation Index, SES = socioeconomic status, CI = confidence interval, IQ = intelligence quotient.

## CONCLUSIONS

- Higher CDI score** in early childhood is significantly associated with **decreased full-scale IQ** several years later
- For every 0.1-unit increase in CDI score, there is an **estimated loss of 1.8 full-scale IQ points** in our adjusted models (95% CI: -3.3, -0.16)
- There is significant effect modification by household income on the association of CDI with full-scale IQ
- Maternal education modifies the effect of CDI on full-scale IQ

## FUTURE DIRECTIONS

- Investigating the effects of community-level factors on cognitive potential are necessary to better understand outcomes and target public health efforts
- Examining a child's CDI over time could help elucidate whether early-life or concurrent deprivation has a greater impact on cognition

## ACKNOWLEDGEMENTS

We thank the HOME Study participants for all their contributions to this study. The CCHMC Institutional Review Board (IRB) approved this study [IRB 2015-6165, 2015-6170] and informed consent was obtained from all participants. This work was supported by the United States National Institute of Environmental Health Sciences (NIEHS) and Environmental Protection Agency (EPA) (P01 ES011261, EPA P01 R829389, R01 ES014575, R01 ES020349, R01 ES027224, R01 ES025214). This work was also supported by the Cincinnati Children's Pediatric Residency Program Research Innovation in Support of Excellence (RISE) Award SPR300849.

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