ADHD

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Outline

- ADHD proposal outline
- Preliminary data analysis for proposal from 5 cohorts
- Potential mediators of early SES & ADHD
- Next steps

Background

- Systematic review (2015) – cross-sectional association low SES & ADHD

- Limited high quality longitudinal data

- No methodologically robust longitudinal studies comparing low SES/ADHD association across countries

Objectives

- To confirm the association of low SES at age 0-5 yrs with increased risk of ADHD at age 10-11 years in different country settings

- To compare the effect sizes of the relationship in different country settings

- To compare the social gradient in risk of ADHD at 10-11 yrs by SES in early childhood in different country settings

Research?s & Hypotheses 1

- Does low SES in early childhood increase the risk of ADHD at age 10-11 years in different country settings?

- *Hypothesis* – risk will be increased in all countries although effect sizes may differ

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Research?s & Hypothesis 2

- Is there a social gradient in risk of ADHD at 10-11yrs by SES in early childhood in different country settings?

- *Hypothesis* – social gradients in ADHD risk by early childhood SES will be present in all cohorts although the slope of the gradients may vary

Outcome of interest

- **At age 10-11 years**:
- ADHD

Rate of ADHD by cohort

Outcome	MCS (n = 13354)	ABIS (n= 16394)	ELDEQ (n= 1263)	LSAC – B cohort (n=3759)	LSAC – K cohort (n=4164)	GenR
ADHD	175 (1.3%)	311 (1.9%)	102 (7.6%)	133 (3.5%)	104 (2.5%)	

Exposures

- Household income in tertiles
- Maternal education at baseline – high, middle, low (based on ISCED)

Education frequency by cohort

Education	MCS (n = 13354)	ABIS (n= 16394)	ELDEQ (n= 1263)	LSAC – B cohort (n=3759)	LSAC – K cohort (n=4164)	GenR
High	4176 (31.3%)	5068 (30.9%)	394 (29.5%)	1412 (37.56%)	1287 (30.91%)	
Medium	5544 (41.5%)	9525 (58.1%)	557 (41.8%)	2011 (53.50%)	2296 (55.14%)	
Low	1272 (20.8%)	1379 (8.4%)	382 (28.6%)	334 (8.89%)	555 (13.33%)	
Missing	852 (6.4%)	422 (2.6%)	1 (0.1%)	2 (0.05%)	26 (0.62%)	

Baseline confounders

- Child's sex

- Breast feeding

- Mother's race/ethnicity/country of birth

- Low Birth weight

- Mother's age at birth

- Smoking in pregnancy

- Lone parenthood

- Maternal depression

- Parenting warmth

Bivariate analysis of selected covariates by ADHD 1

Variables	MCS (n = 13354) OR (95% CI)	ABIS (n= 16394) OR (95% CI)	ELDEQ (n= 1263) OR (95% CI)	LSAC – B cohort n=3759 @ 10-11y OR (95% CI)	LSAC – K cohort n=4164 @ 10-11y OR (95% CI)	GenR
Sex **Girl** **Boy**	Ref 4.20 (2.65,6.66)	Ref 3.74 (2.83,493)	Ref 0.97 (0.64,1.47)	Ref 2.63 (1.79,3.88)	Ref 5.05 (3.00, 8.53)	
Breast feeding: **Yes** **No**	Ref 2.01 (1.32, 3.06)	Ref 1.94 (1.22,3.40)	Ref 0.96 (0.61,1.50)	Ref 1.74 (0.98,3.07)	Ref 1.94 (1.11,3.40)	
Birth weight: **<2.5kgs** **2.5kgs+**	0.94 (0.44,2.01) Ref	1.76 (1.04,2,97) Ref	2.11 (0.80,5.57) Ref	0.88 (0.38, 2.01) Ref	1.07 (0.49, 2.33) Ref	
Smoking in pregnancy: **Yes** **No**	1.47 (0.94,2.29) Ref	2.75 (2.10,3.58) Ref	0.95 (0.59,1.54) Ref	2.33 (1.52,3.56) Ref	1.66 (1.004, 2.74) Ref	

Bivariate analysis of selected covariates by ADHD 2

Variables	MCS (n = 13354) OR (95% CI)	ABIS (n= 16394) OR (95% CI)	ELDEQ (n= 1263) OR (95% CI)	LSAC – B cohort n=3759 @ 10-11y OR (95% CI)	LSAC – K cohort n=4164 @ 10-11y OR (95% CI)	GenR
Lone parent at baseline: Yes No	3.44 (2.23,5.29) Ref	3.79 (2.40,5.93) Ref	1.99 (1.09,3.65) Ref	2.40 (1.41, 4.07) Ref	1.86 (1.13,3.06) Ref	
Maternal depression: Yes No	1.54 (1.02,2.34) Ref	1.35 (0.33,5.46) Ref	1.10 (0.56,2.18) Ref	2.51 (1.65, 3.82) Ref	1.73 (1.13, 2.64) Ref	
Parenting warmth: Low Warm	2.57 (1.25,5.31) Ref	Not available	Not available	1.04 (0.48, 2.26) Ref	0.92 (0.49,1.73) Ref	

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Model sequence in regression analyses

- **Model 1**: income/education alone

- **Model 2**: add child's sex & multiple births

- **Model 3**: add low birth weight, smoking in pregnancy & ever breastfed

- **Model 4**: add mother's ethnicity/country of birth & mother's age

- **Model 5**: add lone parent

- **Model 6**: add maternal depression & parental warmth

Regression model summary - ADHD by income tertile

Cohort	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
MCS: **Low** **Middle** **High**	3.95 (2.24,6.96) 1.51 (0.80,2.86) Ref	4.02 (2.29,7.07) 1.51 (0.80,2.86) Ref	3.37 (1.90,5.98) 1.38 (0.72,2.62) Ref	3.80 (1.97,7.33) 1.46 (0.74,2.87) Ref	2.94 (1.52,5.68) 1.43 (0.73,2.81) Ref	3.63 (1.68,7.87) 1.56 (0.77,3.15) Ref
ELDEQ: **Low** **Middle** **High**	1.71(0.98,2.99) 2.05(1.21,3.50) Ref	1.71(0.98,2.99) 2.05(1.21,3.50) Ref	1.71(0.98,2.99) 2.03(1.19,3.46) Ref	1.72(0.98,3.01) 2.05(1.20,3.50) Ref	1.68(0.96,2.94) 2.02(1.18,3.44) Ref	1.68(0.96,2.95) 2.02(1.18,3.44) Ref
ABIS: **Low** **Middle** **High**	2.03 (1.52,2.72) 1.56 (1.15,2.12) Ref	2.04 (1.52,2.73) 1.56 (1.15,2.12) Ref	1.38 (0.93,2.04) 1.35 (0.92,2.00) Ref	1.24 (0.82,1.89) 1.34 (0.90,2.00) Ref	1.20 (0.79,1.83) 1.34 (0.90,2.00) Ref	1.20 (0.79,1.83) 1.34 (0.90,2.00) Ref
LSAC B **Low** **Middle** **High**	1.22 (0.74, 2.01) 1.00 (0.62, 1.62) Ref	1.25 (0.76, 2.07) 1.04 (0.64, 1.69) Ref	1.10 (0.66, 1.85) 0.97 (0.60, 1.59) Ref	1.05 (0.62, 1.80) 0.95 (0.58, 1.56) Ref	0.91 (0.51, 1.63) 0.96 (0.58, 1.57) Ref	0.90 (0.50, 1.61) 0.91 (0.55, 1.50) Ref
LSAC K **Low** **Middle** **High**	1.24 (0.74, 2.09) 0.94 (0.56, 1.60) Ref	1.24 (0.74, 2.10) 0.92 (0.54, 1.56) Ref	1.06 (0.62, 1.84) 0.88 (0.52, 1.50) Ref	0.95 (0.54, 1.67) 0.85 (0.49, 1.44) Ref	0.89 (0.47, 1.67) 0.84 (0.49, 1.44) Ref	0.81 (0.43, 1.54) 0.81 (0.47, 1.39) Ref
GenR **Low** **Middle** **High**						

Regression model summary - ADHD by mother's education at baseline

Cohort	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
MCS: **Low** **Middle** **High**	1.68 (1.36,2.08) 1.36 (1.12,1.66) Ref	1.65 (1.35,2.10) 1.37 (1.12,1.66) Ref	1.65 (1.32,2.06) 1.36 (1.12,1.66) Ref	1.70 (1.35,2.13) 1.35 (1.11,1.64) Ref	1.47 (1.17,1.84) 1.27 (1.04,1.55) Ref	1.42 (1.13,1.77) 1.24 (1.02,1.52) Ref
ELDEQ **Low** **Middle** **High**	0.89(0.52,1.38) 0.85(0.52, 1.51) Ref	0.89(0.52,1.38) 0.85(0.52,1.51) Ref	0.92(0.53,1.61) 0.87(0.53,1.42) Ref	0.94(0.53,1.66) 0.85(0.51,1.40) Ref	0.87(0.48,1.55) 0.82(0.49,1.37) Ref	0.87(0.48,1.55) 0.82(0.48,1.55) Ref
ABIS: **Low** **Middle** **High**	4.66 (3.22,6.75) 1.86 (1.36,2.53) Ref	4.78 (3.30,6.93) 1.89 (1.39,2.58) Ref	3.89 (2.28,6.63) 1.73 (1.15,2.61) Ref	3.25 (1.85,5.68) 1.65 (1.09,2.49) Ref	3.16 (1.85,5.68) 1.65 (1.09,2.49) Ref	3.13 (1.78,5.51) 1.64 (1.08,2.48) Ref
LSAC B **Low** **Middle** **High**	4.10 (2.29, 7.34) 1.27 (0.80, 2.03) Ref	4.27 (2.37, 7.66) 1.28 (0.80, 2.04) Ref	3.57 (1.91, 6.66) 1.20 (0.74, 1.92) Ref	3.47 (1.84, 6.56) 1.17 (0.72, 1.89) Ref	3.38 (1.78, 6.40) 1.16 (0.71, 1.88) Ref	3.34 (1.76, 6.36) 1.13 (0.69, 1.83) Ref
LSAC K **Low** **Middle** **High**	2.93 (1.48, 5.79) 1.90 (1.08, 3.34) Ref	2.99 (1.50, 5.94) 1.85 (1.05, 3.27) Ref	2.55 (1.25, 5.21) 1.76 (0.99, 3.12) Ref	2.37 (1.14, 4.89) 1.68 (0.94, 2.99) Ref	2.35 (1.14, 4.86) 1.67 (0.93, 2.98) Ref	2.30 (1.11, 4.76) 1.64 (0.92, 2.93) Ref
GenR **Low** **Middle** **High**						

Interpretation

- **Hypothesis 1** – limited confirmation by income following adjustment – MCS & ELDEQ only. By education, ALL except ELDEQ

- **Hypothesis 2** – only confirmed in MCS by income but in ALL but ELDEQ by maternal education

Potential mediators

- Is the association mediated through different variables and, if so, which variables?

- Does low SES have a direct & an indirect effect through mediating variables on ADHD?

- Mediation analysis

Next steps

- Refine analysis & address definition differences etc.
- Include US & Canadian (NLSCY) cohorts
- Estimate slope of gradients
- Test for other potential mediators
- Meta-regession
- Longitudinal Effect Decomposition analysis
- Cumulative analysis
- Update systematic review
- Publication

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