

Supplemental Information

APPROACH TO ESTIMATING THE CDE

The CDE is based on the counterfactual or potential outcome approach.¹¹ A child's potential outcome is the outcome that would have been observed had the value of the exposure, x , instead been set to a counterfactual level of x^* . For example, for disadvantaged children, their potential outcome represents the outcome that would have resulted had they not been disadvantaged. MSMs are used to estimate the CDE by approximating a randomized control trial design in observational data and have been usefully applied to understand causal pathways in child health.¹⁰

Adjusting for factors in the causal pathway as covariates in a regression model can introduce bias.³⁸ Instead, MSMs use the inverse probability of treatment weighting to create a pseudo population in which the association between the exposure and the measured confounding factors are removed.³⁸ The pseudo population is composed of copies of the original subjects who account not only for themselves (where, eg, an individual was observed to be disadvantaged) but also for subjects with similar characteristics who received the alternate exposure (not disadvantaged).³⁹ The goal is to ensure that individuals in each group (disadvantaged and not disadvantaged) are comparable in terms of the measured confounding characteristics.

In this analysis, 2 sets of weights were created with logistic regression

models. One accounted for the confounding between disadvantage in infancy and child outcomes, and the other accounted for the confounding between disadvantage at school-entry age and child outcomes. Weights were created following the procedure outlined by Cole and Hernán.³⁸

SUPPLEMENTAL TABLE 5 Characteristics of the ATP and LSAC Cohorts From Observed Data

Variable	ATP	LSAC
Child development outcomes		
Academic performance (10–12 y), <i>n</i>	1195	3098
High performance, %	72.0	81.9
Low performance, %	28.0	18.1
Self-regulation problems (10–12 y), <i>n</i>	1428	3663
Low problems, %	81.4	81.1
High problems, %	18.6	19.0
Socioeconomic disadvantage		
Socioeconomic position (0–1 y), <i>n</i>	2440	5105
High, %	76.6	75.9
Low, %	23.4	24.1
Socioeconomic position (4–6 y), <i>n</i>	1527	4386
High, %	76.4	75.1
Low, %	23.6	24.9
Socioeconomic indicators		
Mother education (0–1 y), <i>n</i>	2416	5104
Postgraduate, %	1.6	13.3
Bachelor's degree, %	9.9	20.0
Technical diploma and/or trade apprenticeship, %	16.4	35.6
11 or 12 y, %	38.0	19.8
≤10 y, %	34.1	11.8
Mother occupation (0–1 y), <i>n</i>	2380	5096
Professional and/or managerial, %	26.2	25.1
Nonprofessional, %	71.6	24.8
Housewife or not working, %	2.1	50.0
Father education (0–1 y), <i>n</i>	2353	4582
Postgraduate, %	3.4	12.5
Bachelor's degree, %	13.9	16.4
Technical diploma and/or trade apprenticeship, %	30.3	46.8
11 or 12 y, %	25.8	14.3
≤10 y, %	26.6	10.1
Father occupation (0–1 y), <i>n</i>	2389	5087
Professional and/or managerial, %	39.6	42.1
Nonprofessional, %	59.6	42.6
Pensioner, retired, and/or not working, %	0.8	15.3
Mother education (4–6 y), <i>n</i>	1366	4385
Postgraduate, %	3.7	15.1
Bachelor's degree, %	8.1	20.4
Technical diploma and/or trade apprenticeship, %	22.1	39.7
11 or 12 y, %	34.6	16.2
≤10 y, %	31.4	8.5
Mother occupation (4–6 y), <i>n</i>	1471	4381
Professional and/or managerial, %	32.9	33.7
Nonprofessional, %	57.1	31.7
Housewife, pensioner, student, or not working, %	10.0	34.6
Father education (4–6 y), <i>n</i>	1268	3870
Postgraduate, %	7.3	15.1
Bachelor's degree, %	13.4	16.1
Technical diploma and/or trade apprenticeship, %	37.6	49.0
11 or 12 y, %	20.7	11.9
≤10 y, %	21.0	7.9
Father occupation (4–6 y), <i>n</i>	1433	4371
Professional and/or managerial, %	46.1	45.7
Nonprofessional, %	51.2	38.8
Househusband, pensioner, student, or not working, %	2.8	15.5
Baseline confounders (0–1 y)		
Both parents born in non-English-speaking countries, <i>n</i>	2439	5007
Yes, %	3.0	12.7
No, %	97.0	87.3
Mother age, <i>n</i>	2440	5106
Mean (SD)	27.9 (4.5)	31.0 (5.5)

SUPPLEMENTAL TABLE 5 Continued

Variable	ATP	LSAC
Child sex, <i>n</i>	2442	5107
Girl, %	48.0	48.9
Boy, %	52.0	51.1
Aboriginal or Torres Strait Islander status	N/A	5107
Yes	N/A	3.2
No	N/A	96.8
Intermediate confounders (2–6 y)		
Child is sick, <i>n</i>	1647	4606
Yes, %	8.7	8.0
No, %	91.3	92.0
Parents are married or partnered, <i>n</i>	1670	4606
Yes, %	93.4	89.6
No, %	6.7	10.4
Mother psychological distress, <i>n</i>	N/A	4493
Mean (SD)	N/A	4.5 (0.5)

N/A, not measured.

SUPPLEMENTAL REFERENCES

38. Cole SR, Hernán MA. Constructing inverse probability weights for marginal structural models. *Am J Epidemiol.* 2008;168(6):656–664
39. Linden A, Adams JL. Using propensity score-based weighting in the evaluation of health management programme effectiveness. *J Eval Clin Pract.* 2010;16(1):175–179