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The Shape of the Socioeconomic Gradient: Testing to Functional Form of the Relationship between Socioeconomic Status and Early Child Development

Webb, S[1], Janus, M[2], Duku, E[1], Forer, B[3], Minh, A[3], Brownell, M[4,5], Muhajarine, N[6], and Guhn, M[3]

[1]Offord Centre for Child Studies

[2]McMaster University

[3]The Human Early Learning Partnership University of British Columbia

[4]University of Manitoba

[5]Manitoba Centre for Health Policy

[6]Department of Community Health and Epidemiology, College of Medicine, University of Saskatchewan

Introduction

The literature provides abundant evidence of socioeconomic gradients in health outcomes. However, it is unclear, and particularly understudied in early child development research, whether these observed gradients are linear, whether they diminish as socioeconomic status (SES) increases, and if they ultimately reverse in slope at the highest SES values.

Objectives and Approach

We linked neighbourhood-level Census and Tax Filer data with Early Development Instrument (EDI) data across Canada. The EDI is a kindergarten teacher-completed measure of five domains of early child development. We used this linked database to statistically compare and choose the most appropriate functional form of the relationship between each of the EDI domains (dependent variables), and the Canadian Neighbourhoods and Early Child Development (CanNECD) study's SES index (predictor) in regression models. Model comparison approaches included: visual checks of lines fitted using Generalized Additive Models, Akaike and Bayesian Information Criterions, Ramsay's RESET, J and Cox tests.

Results

The results indicate the optimal functional form of the gradient varies across domains of the EDI. The best model for the Physical Health and Well-Being domain was quadratic, suggesting there may be some reversal in slope at higher values of SES. The best models for the Social Competence and Language and Cognitive Development domains were logarithmic, indicating diminishing returns to SES but with no slope reversal. The best model for the Emotional Maturity domain was linear, suggesting the gradient was consistent across all values of SES. The best fit for the Communication Skills and General Knowledge domain was a cubic 'S' curve, suggesting the curve is positive and concave for lower levels of SES but curves upwards beyond a certain SES threshold.

Conclusion/Implications

The results demonstrate the importance of examining functional forms when modeling socioeconomic gradients. Assuming linear relationships between SES and health outcomes (early child development, in this case) may distort and bias the true nature of the relationships, thus leading to misinterpretations, especially at the highest and lowest values of SES.

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