

Explaining Variations in School Readiness: The Influence of Child Demographics, Socioeconomic Characteristics, and Neighbourhoods



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Introduction

- Numerous factors can account for different levels of school readiness exhibited by children when they enter school.
- The objective of this study is to quantify the influence of child demographics and socioeconomic characteristics in an attempt to explain variations in school readiness. In addition, the influence of an area's neighbours is assessed to add a spatial dimension that has been rarely studied.
- The end result is two models, a non-spatial and a spatial regression model, which can be used to predict children's school readiness at a geographically grouped level.
- The influence of neighbouring areas' school readiness can provide a proxy measure of potential underlying neighbourhood effects.
- The cities of Toronto and Hamilton, in Ontario, Canada, were used as study areas.



Measuring School Readiness: The Early Development Instrument

- The Early Development Instrument (EDI) numerically measures a child's school readiness with the use of a psychometric scoring system (Janus and Offord, 2007). The EDI is a short survey that is completed by kindergarten teachers on each child in their class to quantify the observations they have made about the abilities of their kindergarten students.
- The results of the instrument are conveyed through numerical scores, which can be statistically analyzed, that illustrate school readiness in five general domains of child development: physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and general knowledge.
- The domain scores can be utilized to determine whether or not a child is in a vulnerable state in comparison to other children in their community. Children with EDI scores in the lowest 10th percentile of the scores within their community are deemed vulnerable.

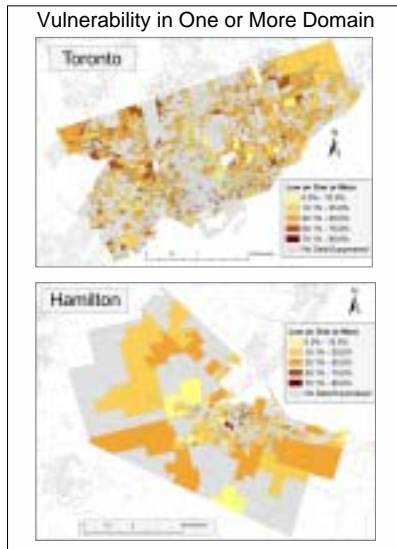
Variables of Influence to School Readiness

- Child Demographics**
 - In addition to evaluating school readiness, the EDI collects information about various child demographics such as age, sex, and languages spoken.
- Socioeconomic Characteristics**
 - Various socioeconomic variables have been found to relate to school readiness in previous studies.
- Neighbourhoods**
 - Research on children's readiness to learn often examines a child's 'neighbourhood,' and is completed in many different ways to consistently conclude that neighbourhoods provide a source of explanation to variations in school readiness.

Methodology

Data

- EDI scores from the population of kindergarten children in Toronto and Hamilton in 2004/2005 were analyzed.
- Scores were aggregated to Canadian Census boundaries based on postal code location. This results in vulnerability rates for each of the 5 domains, and a rate of those vulnerable on one or more domain.



- Child demographics collected within the EDI were used for all children for whom it was completed.
- Socioeconomic characteristics were calculated from Statistics Canada's 2001 Census.

Data Preparation

- Data were transformed to make the distribution normal and a Principal Component Analysis was completed to reduce data and test for the absence of multicollinearity.

Methods

- Multiple Linear Regression**
 - Stepwise linear regression analyses of the 6 vulnerability rates were completed separately for each city to evaluate the influence of the independent variables at the 5% significance level.
- Spatial Multiple Linear Regression**
 - An area's neighbours were determined based on Queen's connectivity (Anselin, 2003), denoting spatial neighbours if they share a boundary.
 - To determine the influence of neighbours the vulnerability rates of surrounding areas were considered. The percentages of vulnerable children in each domain was spatially lagged. The result is a spatial autoregressive term in the models for each of the spatial multiple linear regression analyses completed.

Results

Influential Variables

- Domain Differences**
 - The results of both the non-spatial and the spatial regression analyses indicate that differences exist when examining the variables that influence vulnerability in each school readiness domain, which may be expected from reviewed literature
- City Differences**
 - The combination of influential variables also varies between Toronto and Hamilton, indicating that different child demographics and socioeconomic characteristics are influential to the explanation of the same domain in different cities
- Spatial and Non-Spatial Differences**
 - Variables significant in the non-spatial regression became insignificant with the inclusion of the spatial autoregressive term

Explanatory Powers

Comparison of the R-squared values of the non-spatial and spatial regression results						
	Physical Health and Well-Being	Social Competence	Emotional Maturity	Language and Cognitive Development	Communication Skills and General Knowledge	Low on One or More Domain
Hamilton						
Non-Spatial Regression R-Squared	0.235	0.185	0.184	0.191	0.278	0.268
Spatial Regression R-Squared	0.240	0.289*	0.224*	0.198*	0.281	0.301*
Change in R-Squared	+0.005	+0.100	+0.040	+0.007	+0.003	+0.033
Toronto						
Non-Spatial Regression R-Squared	0.062	0.104	0.086	0.116	0.274	0.208
Spatial Regression R-Squared	0.082*	0.116*	0.098*	0.124*	0.278*	0.215*
Change in R-Squared	+0.020	+0.012	+0.012	+0.008	+0.004	+0.007

* The spatial regression results marked with an asterisk have a spatially lagged variable that significantly contributes (at the 0.05 level) to the explanatory power of the model (R-squared).

- In both the non-spatial and spatial analyses, the models in some domains have a higher explanatory power than others
 - Some domains, such as social competence and emotional maturity, have a higher relation to child demographics and socioeconomic characteristics
 - Individual reliability of the teacher evaluation of the students varies by domain due to the nature of the child development elements examined
- The increase in explanatory power with the inclusion of the spatially lagged variables varies by domain
 - Indicates that neighbouring vulnerability rates influence domains differently
- The explainability varies between Toronto and Hamilton
 - Child demographics and socioeconomic characteristics used in these analyses explain more variation in Hamilton than they do in Toronto
 - This may be related to the general diversity of the population in Toronto and a lack of heterogeneity with the neighbourhoods

Summary of Findings

- A relationship exists between an area's vulnerability rate, neighbouring vulnerability in school readiness, child demographics, and socioeconomic characteristics
- A lack of school readiness in a location's neighbours has an influence on a location's own vulnerability in school readiness
- The inclusion of a spatial autoregressive term in the multiple linear regression analyses has led to an increase in the explanation of the variation in vulnerability rates, from 0.3% to 10.0%. This could be indicative of the presence of a neighbourhood effect

References:

- Anselin, L. (2003). An introduction to spatial autocorrelation analysis with GeoDa. [Online]. Accessed 23 March, 2006. Retrieved from: <https://www.geoda.uiuc.edu/pdf/spauto.pdf>.
 Janus, M. & Offord, D. (2007). Psychometric properties of the Early Development Instrument (EDI): A teacher-completed measure of children's readiness to learn at school entry. *Canadian Journal of Behavioural Science*, 39(1), 1-22.

For more information on the EDI and School Readiness projects visit our website at www.offordcentre.com/readiness