

School Readiness, Neighbourhood Affluence and Grade 3 Test Results

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The analyses reported in this document were carried out with the goal of establishing whether there is an association between children's school readiness in kindergarten, the results of Grade 3 tests and socioeconomic status of the neighbourhoods using data from the North and South parts of the Greater Toronto Area.

The following data sources were used:

- School Readiness data collected with the Early Development Instrument (EDI) (McMaster University)
- Grade 3 performance levels collected by the Education Quality and Assessment Office (School boards)
- Socioeconomic status of neighbourhoods from Statistics Canada 1996 Census (Statistics Canada).

School Readiness

Data on children's school readiness were collected with the Early Development Instrument in March-April 2000 in Toronto District School Board (North and South Regions), and Toronto Catholic District School Board (North York only). In total, 230 schools participated. Using schools' postal codes, the data was aggregated to Census Tract (CT) areas, which were considered neighbourhoods. It was assumed that children's homes were in the same CT area as the school, since individual children's postal codes were not available.

The EDI data provide school-level means of children's abilities in five domains of readiness to learn: physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and general knowledge. The lowest 10% and highest 10% of scores were identified for each scale. Children who score in the bottom 10% on **one or more scales** were operationally defined as "Not ready". Three summary measures were used in the analyses: percent of children **not ready to learn per neighbourhood**, the reverse of this measure: the percent of children **ready to learn**, and the percent of children scoring high on one or more scale.

To allow for comparison with results from British Columbia as reported in Mustard and Picherack (2002), the percentages of children scoring in the lowest 10% and highest 10% on the language and cognitive development scale were used for some analyses.

EQAO Grade 3 Tests

The Grade 3 provincial tests, devised by the Education Quality and Assessment Office of Ontario (EQAO), were written by children in May 2000, in three domains: reading, writing and mathematical skills. Data available from school boards provides the percentages of students scoring at each of the 4 levels of achievement (Table 1).

Table 1. Definitions of achievement at EQAO tests.

Level 1	Level 2	Level 3	Level 4
Limited knowledge, understanding and application of skills	Some knowledge, understanding and application of skills	General knowledge, understanding and application of skills	Thorough knowledge, understanding and application of skills
Not meeting provincial standards		At provincial standards	Above provincial standards

For most analyses, the percentages of children at Level 3 and 4 were added up to produce an overall percentage of children who perform at or above provincial standards. In some of the analyses, the extreme ends of the scale were used: the percentage of children at level 4 (achieving above standards), and the percentage of children at Level 1 (achieving below standards). In all cases, the Method 2 percentages were used, that is the distribution of scores based on the number of students who actually took the test (EQAO, 2000).

Socioeconomic Status

Data relevant to socioeconomic aspects of neighbourhoods were obtained from Statistics Canada based on the 1996 Census. The following variables were used:

- unemployment rate,
- adults with no high school education,
- recent immigration,
- incidence of low income level,
- lack of home ownership,
- mobility within the last year,
- lack of ability to speak either official language,
- population with majority of income coming from government transfer payments,
- lone parenthood.

These 9 variables were used to calculate a Social Index value of each neighbourhood. A neighbourhood received a score of 1 on a variable if the value of this variable was equal to or lower than the national average, and 0 if it was higher. The sum of these scores provided the Social Index, which ranges from 0-9, with 9 being the most at risk status (Connor 2000).

In addition, neighbourhoods were divided into five groups based on the median income levels: the lowest 20% was considered to be the group of the least affluent neighbourhoods, the highest 20th percentile was the group of the most affluent neighbourhoods.

Neighbourhood (Census Tract) Aggregations

Data from all sources were aggregated to the neighbourhood (CT) level. There were in total 162 neighbourhoods. There were 1-4 schools per neighbourhood; and 4-241 individual students per neighbourhood. The EDI indicator, percentages of children ready to learn (or not) by neighbourhood were calculated based on the actual numbers; the EQAO indicators were average percentages based on percentages reported for schools belonging to the neighbourhood.

Data Analyses and Results

Kindergarten and Grade 3

Bivariate correlations were performed between the school readiness indicator at kindergarten (% ready to learn) and percentages of children doing well in Grade 3 in reading, writing and math. The results are in Table 2. As it can be seen, all correlations are statistically significant, however, they are not very strong.

Table 2. Correlations between school readiness and Grade 3 tests' results¹.

Correlations	% Read well (Grade 3)	% Write well (Grade 3)	% Math well (Grade 3)
Percent Ready to Learn (EDI)	0.281 *	0.168 *	0.183 *

Kindergarten, Grade 3, and socioeconomic characteristics of neighbourhoods

Further, correlations were carried out between the school readiness and Grade 3 performance indicators for each of the socioeconomic variables (Table 3).

The kindergarten school readiness was correlated with all nine neighbourhood socioeconomic characteristics. While the direction of association with Grade 3 test results was the same in all areas, some showed stronger, and some weaker associations than with school readiness. For example, the percentages of recent immigrants and people who moved recently per neighbourhood are more strongly associated with school readiness than Grade 3 tests. The reverse appears to be true for lack of high school education: the magnitude of the correlation with Grade 3 tests in all three academic areas is greater than with school readiness scores.

Table 3. Correlations between neighbourhood socioeconomic characteristics and EDI and Grade 3 test results.

Census data 1996	% Read well (Grade 3)	% Write well (Grade 3)	% Math well (Grade 3)	% Ready to Learn (EDI)
Unemployment rate	-.338*	-.308*	-.300*	-.281*
% No HS diploma	-.476*	-.442*	-.440*	-.259*
% Recent Immigrants (1991-6)	-.175*	-.113	-.078	-.210*
Incidence of low income %	-.374*	-.321*	-.264*	-.375*
% No home owners	-.179*	-.141	-.046	-.298*
% Mobility	-.126	-.100	-.091	-.282*
% Neither English nor French	-.391*	-.326*	-.329*	-.290*
Government transfer payments %	-.500*	-.446*	-.443*	-.321*
% Lone-parents	-.305*	-.278*	-.168*	-.311*
Social Index	-.457*	-.404*	-.353*	-.353*

¹ Throughout the report, correlations significant at the $p < .05$ level or lower, are designated with an asterisk (*).

Associations between the overall indicator of the neighbourhood socioeconomic status (Social Index) and the kindergarten and Grade 3 results are also summarised on Fig. 1. It shows that school readiness measured at 5 years of age, and percentage of children scoring well on reading, writing and math in Grade 3 (8 years) decrease as the numbers of risks in schools' neighbourhoods increase. The slope, however, is less steep for school readiness than it is for the results of Grade 3 tests.

Neighbourhood affluence

The percentages of children not ready to learn were also compared using the median income level in the neighbourhood as an indicator of the neighbourhood affluence. The least affluent neighbourhoods were those whose median income level was in lowest 20th percentile; the most affluent were those with median income in the highest 20th percentile. Fig. 2 shows that though the gradient is not quite perfect, there is nevertheless a strong association between the affluence and children's lack of school readiness. The percent of children not ready to learn in neighbourhoods with income in the lowest 20th percentile (mean 31.1%) was significantly higher than those in all the other four groups. The percentage of children not ready in the neighbourhood with the income level above the 80th percentile (mean 11.7) was significantly higher than that in all other four groups.

Contribution of kindergarten school readiness and neighbourhood characteristics to Grade 3 scores

The extent to which it is possible to predict Grade 3 test results from the school readiness levels was examined using the Ordinary Least Squares regression technique.

Table 4 summarises the results of the first round of analyses. When readiness to school was the only predictor variable used, it significantly contributed to the Grade 3 test scores. Nevertheless, it is worth to note that the percent of variation contributed by the EDI (R^2) is relatively small.

Table 4. Prediction of Grade 3 results from EDI scores.

Outcome (Grade 3)	Coefficient (s.e.)	R^2 adjusted	p-value
% Reading well	.281 (.094)	.07	<.000
% Writing well	.168 (.085)	.02	.035
% Doing math well	.183 (.106)	.03	.021

Next, Social Index was included in the model. Table 5 summarises the results. Social Index is a significant predictor of Grade 3 scores in all three areas. The higher the census tract's social index, the worse off it was. This is also shown by the coefficients for the social index, which indicate that for every unit increase in a neighbourhood's social index there is an accompanying statistically significant decline in Grade 3 score.

Table 5. Predictors of Grade 3 Reading, Writing and Math scores including Social Index.

(a) Grade 3 Reading score

Predictor	Coefficient (s.e.)	R^2 adjusted	p-value
% Ready to Learn	0.163 (0.093)	0.07	0.080
Social index sum	-2.917 (0.542)	0.14	<0.001

(b) Grade 3 Writing score

Predictor	Coefficient (s.e.)	R ² adjusted	p-value
% Ready to Learn	0.027 (0.085)	0.03	0.751
Social index sum	-2.485 (0.495)	0.13	<0.001

(c) Grade 3 Math score

Predictor	Coefficient (s.e.)	R ² adjusted	p-value
% Ready to Learn	0.086 (0.109)	0.03	0.429
Social index sum	-2.625 (0.637)	0.10	<0.001

Finally, using the forward stepping approach of stepwise linear regression, we explored which components of the Social Index contribute most significantly to the Grade 3 scores (Table 6).

Table 6. Predictors of EQAO Reading, Writing and Math Scores – using readiness to learn and components of the Social Index.

(a) EQAO Reading score

Predictor	Coefficient (s.e.)	R ² adjusted	p-value
% Ready to Learn	0.226 (0.089)	0.07	0.012
Low Income	-9.893 (3.016)	0.11	0.001
High School Diploma	-8.211 (2.746)	0.04	0.003

(b) EQAO Writing score

Predictor	Coefficient (s.e.)	R ² adjusted	p-value
% Ready to Learn	0.043 (0.082)	0.02	0.596
High School Diploma	-9.100 (2.352)	0.11	<0.001
Lone Parents	-5.721 (2.551)	0.03	0.026
Immigrants	-7.548 (3.571)	0.02	0.036

(c) EQAO Math score

Predictor	Coefficient (s.e.)	R ² adjusted	p-value
% Ready to Learn	0.131 (0.102)	0.03	0.203
No High School Diploma	-11.060 (3.166)	0.10	0.001
Low Income	-7.001 (3.477)	0.02	0.046

As it can be seen, lack of high school education was a strong contributor to low Grade 3 scores in all three areas of achievement. In addition, low income level in neighbourhood contributed significantly to

the Grade 3 Reading and Math Scores and the percentage of lone parents in neighbourhood was an important predictor of Grade 3 Writing scores.

High and low level of achievement in neighbourhoods

When the low and high levels of achievements were considered separately, it appears that the high levels have a stronger association than the low levels. Table 7 shows correlations between two “low” EDI measures: % of children not ready to learn overall, and % of children scoring in the lowest 10% of the Language and Cognitive Development scale with the percentages of children scoring at the lowest level of achievement (Level 1) on the Grade 3 tests.

Table 7. Correlations between low achievement in kindergarten and in Grade 3.

	% Read Level 1	% Write Level 1	% Math Level 1
% Not Ready to Learn	.217*	.010	.079
% Low on Language	.125	-.012	.080

Table 8 shows correlations between the two “high” EDI measures: % of children in the top 10% on one or more scales, and % of children scoring in the top 10% of the Language and Cognitive Development scale with the percentages of children scoring at the highest level of achievement (Level 4) on Grade 3 tests.

Table 8. Correlations between high achievement in kindergarten and in Grade 3.

	% Read Level 4	% Write Level 4	% Math Level 4
% High on one or more scale	.139	.237*	.110
% High on Language	.189*	.329*	.145

Associations between students’ low and achievement and the neighbourhood socioeconomic status (education, income, employment, single parenthood and overall Social Index) are summarised in Tables 9 and 10.

Table 9. Low achievement and socioeconomic status.

	% Not Ready to Learn	% Low on Lang & Cog Dev Scale	Level 1		
			Reading	Writing	Math
Unemployment Rate	0.316**	0.141	0.334**	0.141	0.267**
% No High School Diploma	0.264**	0.101	0.275**	0.183*	0.278**
% Incidence of Low Income	0.295**	0.119	0.319**	0.101	0.171*
% Lone Parents	0.230**	0.105	0.252**	0.110	0.024
Median Family Income	-0.453**	-0.243**	-0.406**	-0.187*	-0.246**
Social Index	0.421**	0.165*	0.430**	0.216**	0.237**

Table 10. High achievement and socioeconomic status.

	% High on 1 or More Scales	% High on Lang & Cog Dev Scale	Level 4		
			Reading	Writing	Math
Unemployment Rate	-0.392**	-0.248**	-0.153	-0.204**	-0.134
% No High School Diploma	-0.218**	-0.177*	-0.158*	-0.315**	-0.230**
% Incidence of Low Income	-0.241**	-0.130	-0.229**	-0.292**	-0.170*
% Lone Parents	-0.242**	-0.215**	-0.256**	-0.350**	-0.093
Median Family Income	0.356**	0.170*	0.310**	0.382**	0.223**
Social Index	-0.407**	-0.280**	-0.285**	-0.419**	-0.215**

At the kindergarten level, the specific high abilities in the language and cognitive domains appear to be more strongly associated with neighbourhood characteristics than the low abilities. At grade 3 level, there is a similar pattern in writing abilities.

Limitations

It is crucial to point out that there are important limitations to the interpretation of analyses in this report. The specific issues are as follows:

- There is inherent variability in any test scores from year to year. For example, the EQAO Grade 3 results at school level correlate between year 1999 and 2000 at between 0.52 to 0.57 for the three domains; the EDI scale scores correlate at between 0.40 to 0.65, and the percentage of children not ready to learn at 0.38.
- Kindergarten and Grade 3 data were collected in the same year, thus providing concurrent cross-sectional analyses, and not longitudinal ones, with the same children contributing scores at both time points.
- Census data were collected three years before either of the school data.
- While the EDI data were available at the individual level, and thus could be accurately aggregated to the neighbourhood level, the Grade 3 tests were only available as aggregate scores for schools, thus further aggregation may have reduced their accuracy.
- Since individual children's postal codes were not available, assumption had to be made that they lived in the same neighbourhood as the school is. For most children, this will be a correct assumption, but not for all of them.
- While in the North section of Toronto almost the whole population of 5-year-olds was involved, since both public and separate schools participated, in the South section only the public board participated, leaving out a significant number of children.

Conclusions

Two main issues were investigated in this report: first, whether there is an association between kindergarten school readiness and Grade 3 results; second, whether the distribution of scores at either age is associated with neighbourhood affluence.

Notwithstanding all the limitations of the databases used in the analyses, this report provides a positive answer to both questions.

Two points warrant particular attention:

- 1) In this particular community, the relationship between either grade results and socioeconomic characteristics of neighbourhoods was stronger than between the two grade results themselves (kindergarten with Grade 3).
- 2) Associations were strongest at the two ends of the spectrum: More children not ready for school lived in the neighbourhoods of lowest affluence than in any other ones, and more children with excellent school readiness lived in neighbourhoods of highest affluence than in any other ones.

There is, therefore, a significant gap in children's abilities due to socioeconomic factors, present at both 5 years of age and growing as children grow older. Bridging this gap should be the focus of policy-makers as well as professionals involved in early childhood development.

References

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