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*e-brief*

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## EDUCATION PAPERS

# School Grades: Identifying Alberta's Best Schools, an Update

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- This study compares student outcomes at Alberta elementary schools where students come from similar socio-economic backgrounds, thus revealing “good” schools where principals, teachers and staff are making a positive difference in student performance.
- The study screens out the influence of socio-economic factors on how a school's students perform on Alberta's Provincial Achievement Tests for grades 3, 6 and 9. This identifies those schools that perform better or worse than other schools with students of similar backgrounds.
- The resulting school ratings by percentile are useful not only to parents, but also to teachers, school board administrators and education officials who wish to identify schools whose practices deserve imitation.

How do parents, teachers, taxpayers and school administrators know how well individual elementary schools in Alberta perform for children? This *e-brief* compares student outcomes across schools where students come from similar socio-economic backgrounds, a direct and fair comparison. The purpose of this analysis is not to rank schools, but rather to seek out useful indicators of top performing schools whose practices deserve further investigation.

Alberta's standardized tests are the starting point for this study. Alberta Education conducts standardized achievement tests for students in grades 3, 6 and 9 in languages, mathematics and science, known as the Provincial Achievement Tests (PATs).<sup>1</sup> In two previous publications for the C.D. Howe Institute – *Signposts of Success*, a book on Ontario schools published in 2005 and a Backgrounder on Alberta schools published in 2007<sup>2</sup> – I showed that between 40 and 50 percent of the variation in schools' average test scores (averaged over many tests over many years) is explained by variation in measures of schools' socio-economic environments. It is reasonable to infer that much of the remaining variation reflects factors specific to a school, such as the principal, the teachers and the other staff. Adjusting test scores to remove the influence of the socio-economic factors yields measures of relative school performance that are more representative of a school's effectiveness than rankings based on raw annual results.

1 I use scores for 857 schools with Grade 3 classes, 806 schools with Grade 6 classes and 454 Grade 9 schools.

2 Similar school indicators are also published by the C.D. Howe Institute for schools in British Columbia and Ontario.

This report updates and extends the analysis of Alberta schools using achievement test results in 2006/07, 2007/08, and 2008/09 for grades 3, 6 and 9.<sup>3</sup> The Grade 3 tests are in language and mathematics. For grades 6 and 9, school results are calculated using the language, mathematics and science tests.

### *Measuring Actual School Performance*

The first step in creating the ratings is to determine how schools did on these assessments. The focus of this analysis is on the share of students who achieve the “standard of excellence” on Alberta PATs.<sup>4</sup> The percentage of students who achieve excellence on a test at a school is only calculated if over a three-year period there were a total of 45 or more students in that grade at that school on that test.<sup>5</sup> By using this threshold, the presence of only one or two students in a year in a grade, for example, does not significantly affect the school’s result. The percent of students achieving the standard of excellence on each of the two Grade 3 tests – and on each of the three grade 6 and 9 tests – was then averaged to provide a measure of school performance for each grade. The vertical axis of Figure 1 shows the percentage of students in Grade 3 over the three-year period studied achieving the standard of excellence (averaged over the two Grade 3 PATs).<sup>6</sup>

### *Creating a Socio-economic Picture of the Student Body at Each School*

The next step creates a social and economic profile of each school; that is, characterizes the background of the school’s student body. By linking the location of students’ homes to very small geographic units,<sup>7</sup> I use detailed socio-economic data in the 2006 Census to draw an accurate picture of the family backgrounds of students for most schools.<sup>8</sup> The socio-economic data for the schools in this analysis together with the provincial average values of these variables are available on the C.D. Howe website by **CLICKING HERE**.

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3 Separate analyses are performed for grades 3, 6 and 9.

4 Alberta Education states that the standards are “a specification of the percentage of students at a given grade or year in school who are expected to achieve the acceptable (85%) or excellent level (15%)” and that “because the difficulty of the test varies slightly from year to year and to facilitate the comparison of student performance over time, Alberta Education adjusts the cut-scores that define the Acceptable Standard and the Standard of Excellence each year.” Overall provincial results are found at <http://education.alberta.ca/media/1130929/multiyearprovpat.pdf>. The percent who achieve the standard of excellence does vary between examination and somewhat less between years on the same examination. I find that, averaged over all tests and all years, approximately 18 percent of students achieve the standard of excellence.

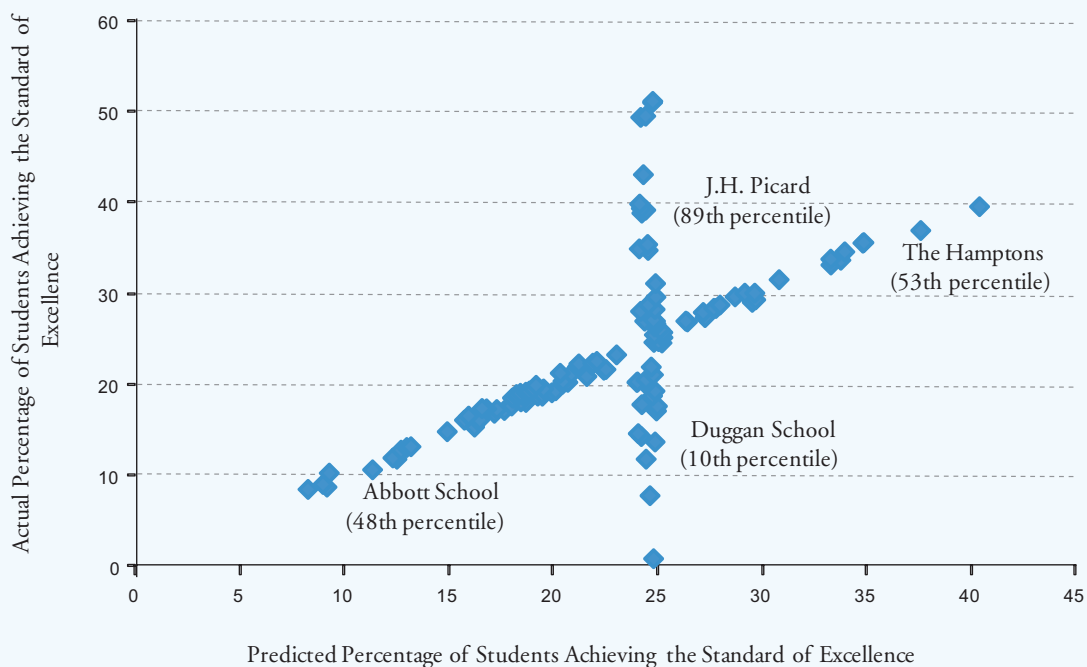
5 All students in the grade at the school are included as the base for calculating the percent who achieve excellence. It is important that all students are included when calculating the percentage of students who achieve excellence. Because all students are used as the base for the percentage calculation, a school does not increase the percentage of students achieving the standard of excellence by encouraging students who would not attain this standard to avoid the PAT. If a school manipulates participation in the PAT and excludes students who would not achieve the standard of excellence, then the percentage of students who write the PAT and achieve the standard of excellence is a very misleading measure of school achievement. This has been a problem with the Foundation Skills Assessment in British Columbia but not with the standardized tests in Ontario.

6 Similar figures could be drawn for Grade 6 and Grade 9.

7 The details of this process can be found in chapter three of *Signposts of Success* (Johnson 2005) but they are summarized here. The census variables that describe each school in the school profiles are: the percentage of lone parents; the percentage of persons living in detached dwellings; the percentage of persons who immigrated to Canada in the past five years; the percentage of persons born outside Canada; the percentage of persons who speak an official language at home; the percentage of persons who are aboriginal; the unemployment rate; the unemployment rate of adults with children; the percentage of those over 20 years of age without a high school diploma; the percentage of those over 20 years of age who have some university education; the percentage of those over 20 years of age with a university degree; the percentage of persons who moved in the last calendar year; the percentage of persons who moved in the last five calendar years; and average household income.

8 For schools with more than six students, Alberta Education provides information on how many students at a school in 2008/09 lived in each Dissemination Area.

Figure 1: Actual and Predicted Test Scores of Selected Alberta Grade 3 Schools



Sources: Author's calculations from 2006 Census; Alberta Education.

### Comparing the Performance of Schools

The horizontal axis of Figure 1 presents the predicted value of the percentage of students who would be expected to achieve excellence at these schools based on the socio-economic composition of the students who attend each school.<sup>9</sup>

The upward-sloping diagonal line of points from schools in Figure 1 represents the estimated relationship between socio-economic characteristics of a school's students and the school performance measure. This line uses 83 of 857 Grade 3 schools. These 83 Grade 3 schools are those where the performance of students at the school is close to the performance predicted by the socio-economic environment from which the school draws its students.<sup>10</sup> One such school, Abbott School, in Edmonton, had less than 10 percent of its students achieve the standard of excellence. Another school, The Hamptons School, in Calgary, had 35 percent of its students achieve the standard of excellence. However, the difference in results between Abbott and the Hamptons is entirely accounted for by differences in the social and economic background of their students. The teachers and other staff at these schools along the diagonal line perform at the average level for the province in this sense. It is the schools on the vertical line in Figure 1 that are of central interest.

The 40 schools along the vertical line of Figure 1 have a similar mix of students whose socio-economic characteristics predict that between 24 and 25 percent of students would achieve the standard of excellence.<sup>11</sup> The

9 The details of this calculation are found in the Appendix. The predicted scores are the fitted values of a regression of actual scores on a set of social and economic variables. Simply, this is the part of the variation in the outcomes at schools that is associated with variation in social and economic background of their students. The residual of the regression is the part of the variation in school outcomes that is not associated with the social and economic background of students.

10 For the 83 schools on this line, the difference between the actual percentage of excellent students and the predicted percentage of excellent students is less than one percentage point.

11 The same line could be drawn for schools in any range of prediction with respect to achieving the standard of excellence. The use of this range in Figure 1 is arbitrary and for explanatory purposes only.

actual percentage of students achieving the standard of excellence in that group varies from 1 percent to 51.9 percent. To repeat the crucial point, the 40 schools on the vertical line all operate in comparable social and economic conditions. Given that these schools are similar in this way, J.H. Picard is a better school than Duggan School because with a similar mix of students, student performance at J.H. Picard is substantially better than student performance at Duggan School. The figure makes it clear there are large differences in school performance where schools provide education to students with similar backgrounds.

### *Interpreting the Relative School Performance Measures*

Rather than placing all schools on a figure,<sup>12</sup> differences between the actual and the predicted percentage of students who achieve the standard of excellence are presented as a percentile in the tables found on the C.D. Howe website by **CLICKING HERE**. A percentile score of 50 indicates that, compared to schools with students that have similar social and economic characteristics, a school at the median: half of other schools are better and half are worse. On the other hand, a percentile score of 90 says that a school is better than 90 percent of schools whose students have similar social and economic characteristics. This would be a good, indeed a great, school.

In Figure 1, percentile scores are shown in parentheses for the schools included as examples. Notice that Abbott School and The Hamptons both have percentile scores near 50. J.H. Picard has a percentile score of 89 and Duggan School has a percentile score of 10. The performance gap between these schools is wide; at J.H. Picard 35 percent of students in Grade 3 achieved the standard of excellence while at the Duggan School only 14 percent of Grade 3 students did so. Large percentile differences translate into large differences in student performance.

Comparing schools now becomes an exercise in the interpretation of these percentile numbers. It is important to be very clear that there is no significant difference between schools with percentiles of 98 and 97 or even between 95 and 90. But if one school is at the 90th percentile and another school is in the 10th percentile, it is very likely that the staff at the 90th percentile school are doing a better job than at the 10th percentile school. Differences of this magnitude are worth understanding.

### *Identifying Alberta's Best Schools*

There are excellent schools in Alberta and they stand out. Table 1 lists 13 schools, in alphabetical order, above the 80th percentile in all three grades.<sup>13</sup> This suggests that the strong performance is related to factors that persist throughout the school. Many elementary schools in Alberta do not include Grade 9. Thus, to provide a comprehensive list of outstanding schools, Table 2 lists 24 schools<sup>14</sup> where the percentile ratings in both Grade 3 and Grade 6 exceed the 90th percentile. This list includes a broad spectrum of public, private and charter schools. School authorities are invited to take this data and ask what happens at these strong schools that produces excellent results, and how best practices could be transferred to other schools.

## Conclusion

This analysis solves, to a very large degree, the problem of using achievement test results to make a fair comparison of schools. The outcome measures only compare schools where students are from similar social and economic backgrounds. There are substantial differences in the performance of students in Provincial Achievement Tests across similar schools. Parents can take this data and applaud the strong performance of high percentile schools as well as ask questions about the performance of low percentile schools.

12 The relative performance measures for grades 3, 6 and 9 for all schools in Alberta could be placed on a figure like Figure 1. With three grades and about 850 schools, however, the mass of dots would be unreadable.

13 This list draws from the 182 schools in the province where there is assessment data from all three grades and all three grades have more than 45 students.

14 There are 673 schools where there are percentile ratings for both Grade 3 and Grade 6.

Table 1: Top Performing Schools (80th Percentile and Up) with Grades 3, 6 and 9, in Alphabetical Order

School name	School type	School authority name	The average percentage of persons in school catchment areas who:		
			<i>Immigrated to Canada in the past 5 years</i>	<i>Are Aboriginal</i>	<i>Are over 20 years of age and have some university education</i>
Airdrie Koinonia Christian School	Private	Airdrie Koinonia Christian School Society	1.8	2.4	23.8
Almadina Language Charter Academy	Charter	Almadina School Society	8.9	3.4	19.6
Aurora School	Charter	Aurora School Ltd.	4.8	3.6	31.4
Barnwell School	Public	Horizon School Division No. 67	7.3	2.0	5.5
Clear Vista School	Public	Wetaskiwin Regional Division No. 11	1.6	18.1	11.1
Covenant Christian School	Public	Black Gold Regional Division No. 18	0.8	5.0	14.7
Grandview Heights School	Public	Edmonton School District No. 7	3.9	1.5	59.0
Olds Koinonia Christian School	Public	Chinook's Edge School Division No. 73	0.8	2.6	17.5
Stratford Elementary/Junior High School	Public	Edmonton School District No. 7	3.8	4.2	33.3
Strathcona-Tweedsmuir School	Private	Strathcona-Tweedsmuir School	1.9	1.1	52.1
Two Hills School	Public	St. Paul Education Regional Division No. 1	3.8	1.7	10.2
Webber Academy	Private	Webber Academy Foundation	3.1	1.9	56.9
Westmount Charter School	Charter	Westmount Charter School Society	4.2	1.5	46.9
<b>Provincial Average</b>			<b>2.7</b>	<b>5.3</b>	<b>24.9</b>

Sources: Author's calculations from 2006 Census; Alberta Education.

Table 2: Top Performing Schools (90th Percentile and Up) with Grades 3 and 6, in Alphabetical Order

School name	School type	School authority name	The average percentage of persons in school catchment areas who:		
			<i>Immigrated to Canada in the past 5 years</i>	<i>Are Aboriginal</i>	<i>Are over 20 years of age and have some university education</i>
Barnwell School	Public	Horizon School Division No. 67	7.3	2.0	5.5
Clear Vista School	Public	Wetaskiwin Regional Division No. 11	1.6	18.1	11.1
Clear Water Academy	Private	Clear Water Academy Foundation	2.8	1.5	53.2
Covenant Christian School	Public	Black Gold Regional Division No. 18	0.8	5.0	14.7
Dapp School	Public	Pembina Hills Regional Division No. 7	0.1	2.3	8.9
Grandview Heights School	Public	Edmonton School District No. 7	3.9	1.5	59.0
Guthrie School	Public	Sturgeon School Division No. 24	0.6	1.4	7.0
Hillhurst School	Public	Calgary School District No. 19	3.3	2.0	53.4
Immanuel Christian Elementary School	Private	The Society for Christian Education in Southern Alberta	0.8	3.6	17.9
LaPerle School	Public	Edmonton School District No. 7	2.3	10.6	22.6
Manning Elementary School	Public	Peace River School Division No. 10	0.1	3.0	11.1
Mount Pleasant School	Public	Edmonton School District No. 7	6.5	3.3	41.3
New Horizons School	Charter	New Horizons Charter School Society	0.8	2.6	29.2
Sacred Heart Academy	Separate	Christ the Redeemer Catholic Separate Regional Division No. 3	0.1	4.6	16.8
St. Martin	Separate	Edmonton Catholic Separate School District No. 7	3.8	3.3	39.7
Stratford Elementary/Junior High School	Public	Edmonton School District No. 7	3.8	4.2	33.3
Strathcona-Tweedsmuir School	Private	Strathcona-Tweedsmuir School	1.9	1.1	52.1
Suzuki Charter School	Charter	Suzuki Charter School Society	2.3	4.0	30.9
Vanier Community Catholic School	Separate	Living Waters Catholic Regional Division No. 42	0.9	8.5	13.9
Webber Academy	Private	Webber Academy Foundation	3.1	1.9	56.9
Westbrook School	Public	Edmonton School District No. 7	5.4	2.0	54.1
Windsor Park School	Public	Edmonton School District No. 7	4.5	1.9	66.0
<b>Provincial Average</b>			<b>2.7</b>	<b>5.3</b>	<b>24.9</b>

Sources: Author's calculations from 2006 Census; Alberta Education.

## Appendix A Methodological Details

This appendix presents details on the construction of a school's socio-economic profile and the calculation of the predicted percentage of students who achieve the 'standard of excellence' in Alberta in grades 3, 6 and 9.

### *Creating a School's Socio-economic Profile*

I use the locations of students to construct the social and economic variables that capture the characteristics of the school's population. Each student at a school lives in a Dissemination Area (DA), the smallest geographic unit in the 2006 Census. The characteristics of the average person or family unit that lives in this small geographic area are part of the information reported in the Census. For all schools with a total enrolment greater than six students, Alberta Education provides information on how many students at that school in 2008/09 lived in each Dissemination Area. After matching postal codes to Dissemination Areas, the process of constructing a school profile with this information is straightforward. An example is the easiest way to understand. Suppose a given school has 10 students who live in two different DA's, call them DA #1 and DA #2. Six students live in DA #1 and 4 students live in DA #2. In DA #1, 80 percent of the families are single-parent families and in DA #2 only 20 percent of the families are single-parent families. The percentage of lone parents at this school is calculated as  $(0.6 \times 80 \text{ percent}) + (0.4 \times 20 \text{ percent}) = 56 \text{ percent}$ . The larger the school, the more accurately the school profile will resemble the profile of students who wrote the achievement tests over the three years studied. We do not have data on the DA of students by grade. This is another reason to restrict ourselves to comparing schools where we have 45 or more students in a grade over the three years of testing. By requiring 45 or more students in a grade, this means that the school is relatively large and the social and economic picture of the students who attend the school is accurate. This process is repeated for all schools and for a series of Census variables. The resulting school profiles are on the C.D. Howe website at [www.cdhowe.org](http://www.cdhowe.org) and are available for use by other interested researchers and school boards upon request.

### *Estimating the Relationship between Socio-economic Measures and Test Scores*

I estimate the relationship between socio-economic factors and student performance using regression analysis. The percentage of students achieving the standard of excellence is the dependent variable in the regression and seven social and economic variables are used as right-hand-side variables. Table A-1 presents the coefficients from the three different regressions for grades 3, 6 and 9.

The variables that are available to predict a school's results are: the percentage of lone parents; the percentage of persons living in detached dwellings; the percentage of persons who immigrated to Canada in the past five years; the percentage of persons who speak an official language at home, the percentage of persons who are aboriginal; the unemployment rate; the unemployment rate of adults with children; the percentage of those over 20 years of age without a high-school diploma; the percentage of those over 20 years of age who have some university education; the percentage of those over 20 years of age with a university degree; the percentage of persons who moved in the last calendar year; the percentage of persons who moved in the last five calendar years; and average household income.

The regression coefficients in Table A-1 are the effects of a change in a socio-economic variable on the percentage of students at a school that achieve the standard of excellence. The first coefficient value -0.080 in the column labeled "Coefficient in Grade 3 Regression (standard error)" says that, everything else being equal, if school A has one percentage point more children from lone-parent families than school B (for example 21 percent compared to 20 percent), the percentage of students who attain the standard of excellence would be predicted to be 0.080 percentage points lower at school A than school B. The value in parentheses, the standard error of the estimated coefficient 0.04, is neither large nor small relative to -0.080. This means that the value -0.080 is not different from zero at a 5 percent level of statistical significance but is different from zero at a 10 percent level (as indicated by the single asterisks). The p-value

## Appendix A (cont'd)

associated with the rejection of the null hypothesis that this coefficient is zero is 0.08. This means if you were to believe that the effect of having more lone-parent households on school results is not zero, you would be correct 92 times of 100 times but incorrect 8 times of 100 times.

The next coefficient in the column describing the Grade 3 regression says that, everything else equal, if one percentage point more persons speak an official language at home in school A than in school B, then 0.080 percentage points more students are predicted to achieve the standard of excellence at school A than at school B. The coefficients in all three columns have a similar interpretation for the prediction of the percentage of students above the standard of excellence in each grade.

There are a number of noteworthy aspects to Table 1. The values of the coefficients on the socio-economic descriptors of schools are not the same in the grade 3, grade 6 and grade 9 regressions. This means that social and economic factors that relate strongly to grade 3 results may relate more strongly or less strongly to grade 6 and grade 9 results. Notice for example that the association of lone parenting with lower grade 9 results is substantially weaker than with grade 3 or grade 6 results. The strong association of language spoken at home with better test results is restricted to grade 3 test results. Aboriginal students seem to have more trouble with the grade 6 achievement tests relative to grade 3 or grade 9 achievement tests. Recent immigrants also have more trouble with the grade 6 test than either the grade 9 or grade 3 tests.

The predictive role of income is captured by including the logarithm of average household income in the regression. Using a logarithm makes very large values of average income less likely to skew results. Income plays a larger predictive role in the grade 6 results than in the grade 3 or 9 results.

The percentage of persons who live in detached dwellings plays a significant role in predicting grade 3 and grade 9 results but not grade 6 results. The coefficient on this variable is relatively small.

A very large predictive role is found for a measure of

the education of adults living in the school community. This is measured by the percentage of persons over 20 with some university education. All else equal, if school A has one percentage point more persons with some university education than school B, it is predicted to have 0.425 percentage points more students achieve the standard of excellence in grade 3; 0.493 percentage points more students achieve the standard of excellence in grade 6; and 0.506 percentage points more students achieve the standard of excellence in grade 9. Those are all large effects and the individual coefficients are precisely estimated. The estimated effect of another percentage of the school community having some university education is smaller in grade 3 than in the other two grades. This important fact, which is also found in the results from other provinces, says school outcome measures that depend on differences between results in early and late grades should be associated with the social and economic background of students.

The choice to include in each of these regressions some variables that are not statistically significant is deliberate. It is clear that these variables are inter-related. If we have a school community with higher incomes, we will have families who are more likely to live in detached homes. The variables included in Table 1 are statistically significant (at a 10 percent level) in at least one of the prediction equations by grade. All variables are included in all prediction equations to show how the influence of social and economic variables is different in different grades. This warns against using a single variable to predict results or to characterize the social and economic background of students in all grades.

The last numbers to explain in Table 1 are the last three rows marked “number of schools in the regression;” “explanatory power of the regression;” and “standard error of the regression.” The former is the total number of schools with a total of at least 45 students in the grade studied over the three years. The second number, which must fall between 0 and 1, is an indicator of the strength of the overall relationship between social and economic factors and school achievement results. If this value were 1.0, then the dots



## Appendix A (cont'd)

representing all schools would fall along the upward sloping line in Figure 1. There would be no schools along the vertical line. All of the variation in the percentage of students attaining the standard of excellence at various schools would be associated with the students' socio-economic background. If the "explanatory power of the regression" were zero, then variation in the social and economic background of students would not be associated with variation in achievement test results. The values in Table 1 (0.40 for grade 3; 0.47 for grade 6; and 0.45 for grade 9) indicate that 40 percent; 47 percent and 45 percent of the variation in the percentage of grade 3, grade 6 and grade 9 students that achieve the standard of excellence among Alberta schools is associated with social and economic factors. The remaining variation is associated with other factors that are not observed. It is reasonable to infer that much of the remaining variation reflects factors at the schools themselves: the principals, the teachers and the other staff. The school performance measures are based on this "residual." The residuals for these regressions constitute 50-60 percent of the

variation between school results. There is therefore substantial evidence that how well schools do their job likely matters for student outcomes.

Finally the last row shows in a different way that the variation in school results not associated with social and economic variables is of interest; that is, is of practical significance. The standard error of 8.7 in Grade 3 says that across a very reasonable range of schools with similar social and economic background, students get very different results. Using the normal distribution from statistics, to move from one standard deviation below the average school to one standard deviation above the average school, is to move from a school in the 15th percentile to a school in the 85th percentile and to move the percentage of students achieving the standard of excellence in grade 3 by 17.4 percentage points of students (2 standard deviations in the grade 3 regression).<sup>15</sup> If we were to consider two schools with 100 students, one in the 15th percentile and one in the 85th percentile, then 17.4 more students in the higher percentile school achieve the standard of excellence.

15 The 15th percentile is one standard deviation below the mean and the 85th percentile is one standard deviation above the mean.

Table A-1: The Regression Used to Predict School Achievement

Variable	Coefficient in Grade 3 regression (standard error)	Coefficient in Grade 6 regression (standard error)	Coefficient in Grade 9 regression (standard error)
The percentage of lone parents.	-0.080 (.04)*	-0.102 (.06)*	-0.03 (.04)
The percentage of persons who speak an official language at home.	0.080 (.04)**	-0.028 (.04)	-0.04(.04)
The percent of persons who are aboriginal.	-0.110 (.04)**	-0.183(.04)**	-0.11 (.03)**
The percentage of persons who immigrated to Canada in the past 5 years.	-0.644 (.15)**	-1.04(.16)**	-0.661 (.18)**
The logarithm of average household income.	2.42 (1.37)*	4.12 (1.64)**	1.22 (1.69)
The percentage of persons living in detached dwellings.	0.099 (.02)**	0.045 (.03)	0.07 (0.02)**
The percentage of those over 20 years of age who have some university education.	0.425 (.03)**	0.493 (.04)**	0.506 (.05)**
Number of schools in the regression.	857	806	454
Explanatory power of the regression.	0.40	0.47	0.45
Standard error of the regression.	8.7	8.8	7.5

\*Indicates a statistically significant coefficient at a 10 percent level of significance.

\*\* Indicates a statistically significant coefficient at a 5 percent level of significance.

Sources: Author's calculations from 2006 Census; Alberta Education.

## References

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- Johnson, David. 2007. "School Grades: Identifying Alberta's Best Public Schools." C.D. Howe Institute Backgrounder 104.

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