

# *Comparing the Standardized Test Scores of British Columbia's Public and Independent Schools*

by Angela MacLeod and Joel Emes



## MAIN CONCLUSIONS

■ In all six Foundation Skill Assessment exams (FSAs), non-elite independent schools had a higher five-year average score than public schools, by statistically significant amounts.

■ The largest difference on FSA exams was in Writing: non-elite independent schools scored 18.0% higher than public schools in grade 4, and 18.9% higher in grade 7.

■ On Provincial Required Exams (PREs), non-elite independent schools had a higher five-

year average score than public schools on four out of the five exams, by statistically significant amounts.

■ The largest difference on the PRE exams was in English 10: non-elite independent schools scored 5.4% higher than public schools.

■ After-tax income of families with students attending non-elite independent schools is nearly the same—only 1.9% higher—as that of families with students attending public schools.

## Introduction

This study examines whether there are differences between the test scores of public and independent schools in British Columbia. It builds on previous research that considered the differences (and similarities) between public and independent schools, such as student enrolment, taxpayer funding, and family income.

## K–12 education in British Columbia

It is helpful to briefly review the general structure of K–12 education in British Columbia. BC has a fully funded public education system available to all students from kindergarten to grade 12. Public schools in BC are exclusively secular institutions—unlike in Alberta, Saskatchewan, and Ontario, which also operate publicly funded Catholic schools. BC also provides taxpayer funding to qualifying independent schools, which receive either 35% or 50% of the per-student operating amount granted to public schools in their district.

The majority of K–12 students attend public schools across the provinces; however, British Columbia leads the country in independent school enrolment with 12.9%.<sup>1</sup> Further, an increasing number of families across Canada are turning to independent schools for the education of their children, with BC being no exception: in 2000/01 independent schools accounted for 8.7% of total enrolment in the province, increasing to 12.9% of total enrolment

in 2014/15 (the latest year for which comparable data is available) (MacLeod and Hasan, 2017).

A common misconception is that independent schools are primarily elite university preparatory schools catering exclusively to high-income families. The latest evaluation of independent schools in BC, however, concluded that only 27 of the 349 independent schools operating in British Columbia or 7.7% have the characteristics of elite university preparatory schools.<sup>2</sup> For the purposes of this essay, schools identified as “elite” consist of members of the Independent Schools Association of British Columbia (ISABC), as well as Little Flower Academy, St. Thomas More Collegiate, and Vancouver College. The same classification was used in the previous study *Comparing the Family Income of Students in British Columbia's Independent and Public Schools* (Clemens, Parvani, and Emes, 2017); the classification is discussed further in the next section.

The remaining independent schools, or what the analysis classifies as “non-elite” independent schools, offer a diverse spectrum of religious and pedagogical approaches. As at 2013/14, 188 of BC's independent schools had a religious orientation, and one in five (20%) are categorized as specialty schools that address specific curriculum and pedagogical preferences. Waldorf schools, Montessori schools, special-needs education, as well as schools focusing on specific subject matter such as arts, athletics, or STEM (Science/Technology/Engineering/Math) fall within this categorization (Van Pelt, Hasan, and Veldhuis, 2016).

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<sup>1</sup> Based on the 2014/15 school year. For further discussion on student enrolments in British Columbia and across Canada, please see MacLeod and Hasan, 2017.

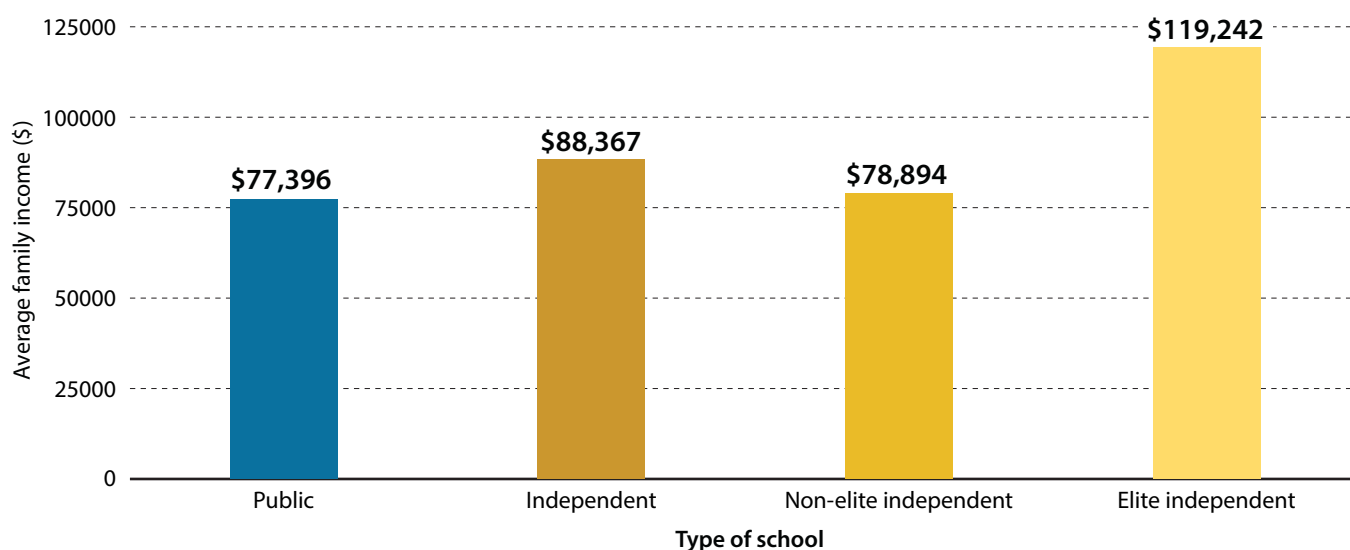
<sup>2</sup> As of the 2013/14 school year. See Allison, Hasan, and Van Pelt, 2016.

## Background—comparing the family income of students in British Columbia's independent and public schools

Another common misconception about independent schools is that they cater only to the very wealthy. However, a recent study, *Comparing the Family Income of Students in British Columbia's Independent and Public Schools* (Clemens, Parvani, and Emes, 2017), found that families who choose a non-elite independent school for the education of their children have virtually the same after-tax family income as families choosing public schools. Data from BC's Ministry of Education and Statistics Canada was used to determine average family income at the school level (figure 1).<sup>3</sup>

The average after-tax family income of students attending public schools in British Columbia in 2011 was \$77,396. The average after-tax family income for families attending all independent schools was 14.2% higher at \$88,367 than public schools. Families with children attending an elite independent school had an after-tax family income that was 54.1% higher than public school families (\$119,242). However, students attending a non-elite independent school had an after-tax family income that was nearly the same as families in public schools at \$78,894, a mere 1.9% difference. The key insight from this analysis is that the after-tax incomes of families choosing non-elite independent schools is essentially the same as those families that send their children to the province's public schools.

**Figure 1: Average family income (\$) of students in public and non-elite and elite independent schools, 2010**



Source: Clemens, Parvani, and Emes, 2017.

<sup>3</sup> Data provided by the BC Ministry of Education in response to a special request; it included enrolment by grade and school, as well as by postal code, census division, and dissemination area. The authors then used data from the 2011 *National Household Survey* (Statistics Canada, 2017) to match families' "average total income after tax" to the Ministry of Education data, by children's ages and dissemination area, in order to calculate a school's average parental income. The main analysis used a 65% coverage ratio, which means that each school included in the study had parental income available for at least 65% of its students. The analysis was repeated using 50% and 80% coverage ratios, which showed a small variance from the 65% coverage ratio. For a complete explanation, see Clemens, Parvani, and Emes, 2017: 3–4.

## Student testing in British Columbia

Each year BC students in grades 4 and 7 complete the Foundation Skills Assessment (FSA) exams in Reading, Writing, and Numeracy. This testing is intended to provide “parents, teachers, schools, school districts and the Ministry of Education with important information on how well students are progressing in the foundation skills of Reading, Writing, and Numeracy” (British Columbia, Ministry of Education, 2018). The scores for the exams are based on both multiple choice and written responses.

FSA 2008 *Technical Notes* outlines the Foundation Skills Assessment exams as follows:

the reading component includes 39 multiple-choice questions (1 mark each) and one written-response question (4 marks) for a total of 43 marks. The writing component includes two written tasks, one shorter (4 marks) and one longer (8 marks) for a total of 12 marks. The numeracy component includes 40 multiple-choice questions (1 mark each) and two written-response questions (4 marks each), for a total of 48 marks.<sup>4</sup>

The scores achieved by students in Reading and Numeracy are scaled and standardized using Item Response Theory,<sup>5</sup> which “allows for the difficulty

of items to be weighted based on actual student responses” and “more precise comparisons for results from one year to the next” (Mailman School of Public Health, n.d.). Scaled scores range from 200 to 800, with a mean of 500.

Scores in the Writing component are “used to calculate numbers and proportions of students at each level of performance, and average scores” (Mailman School of Public Health, n.d.). The maximum score that can be achieved is 12.

Secondary students write the Provincial Required Exams (PREs) in grades 10, 11, and 12. In order to receive a secondary school diploma, students must write five exams:<sup>6</sup> English 10, a Math 10<sup>7</sup> exam, Science 10, Social Studies 11,<sup>8</sup> and a Language Arts 12<sup>9</sup> exam. The scores that a student achieves on these exams are combined with the classroom mark awarded by their teacher to determine an overall “blended” course mark. The Language Arts 12 exam is worth 40%, and the other required exams are worth 20%, of the overall blended course mark.

Students may choose to write elective provincial exams in other grade-12 courses. If the exam is attempted, it is worth 40% of the overall blended course mark. Students will still receive full credit for a course without taking the exam, in which case the classroom mark will make up the entirety

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<sup>4</sup> FSA 2008 *Technical Notes*, dated July 8, 2008, p. 2; provided by British Columbia's Ministry of Education.

<sup>5</sup> More information on Item Response Theory and its application to test scores, can be found at Mailman School of Public Health, n.d., <<https://www.mailman.columbia.edu/research/population-health-methods/item-response-theory>>.

<sup>6</sup> British Columbia is in the process of phasing out PREs in favour of Numeracy and Literacy exams that will be required for secondary school graduation but will not affect individual course scores. For more information, please see British Columbia, Ministry of Education (n.d.), <<https://curriculum.gov.bc.ca/graduation-info>>.

<sup>7</sup> Either Foundations of Math and Pre-Calculus 10, Principles of Math 10, Applications of Math 10, or Essentials of Math 10.

<sup>8</sup> Can be Social Studies 11, Civic Studies 11, or First Nations 12.

<sup>9</sup> Can be English 12, or Communications 12.



of the overall course mark. However, many post-secondary institutions require completion of these exams as an entrance requirement. None of the elective exams have been included in the study as there were not a sufficient number of results for independent school students to complete a rigorous statistical analysis.

Scores for the provincial exams are reported as percentages. The scores that are reported in this study are from the exams only, and do not include either classroom marks, or overall blended course marks.

### Methodology

All of the students writing an FSA test in a particular year were divided into groups based on the nature of the school they attend: public, non-elite independent, and elite independent. They were then further divided by the specific test (reading, writing, and numeracy) as well as by their grade level. An average was calculated for each group using school scores weighted by the number of students in the school who wrote the test. Scores were collected over a five-year period (2011/12–2015/16) and averaged.

As with the FSA, all students writing a Provincial Required Exam (PRE) in a particular year were divided into groups based on the nature of the school they attend: public, non-elite independent, and elite independent. They were further divided by the specific test subject (English 10, Math 10, Science 10, Social Studies 11, and English

12). An average was calculated for each group using school scores weighted by the number of students in the school who wrote the test.<sup>10</sup> Scores were collected over a five-year period (2011/12–2015/16) and averaged.

The Ministry of Education withholds results for a particular school when there are fewer than ten exams completed for a particular subject and grade. In other words, if a school has less than ten students who have written a specific test, the results do not get released by the Ministry, and as such have been precluded from our analysis.

### Results

#### *Foundation Skills Assessment*

The five-year average results for the years 2011/12 to 2015/16 for each of the FSA exams are presented in [table 1](#). Note that the average five-year scores have been provided by school type: public, non-elite independent, and elite independent. Also shown is the percentage difference between the average five-year score for public schools for each test and the scores of both non-elite and elite independent schools.

Both categories of independent schools performed better than public schools for each of the six FSA exams, in amounts that are statistically significant (see the notes to table 1 for details of significance testing). The largest difference between non-elite independent schools and public schools was in Writing, where the non-elite schools scored 18.0% higher on grade-4 exams

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<sup>10</sup> The actual calculation of the average is different than that for the FSA as a result of the nature of how the data are reported but the end result is a school average weighted by number of students. Specifically, PRE results come with an “average percent” by school (for each subject) that is calculated as the “sum of marks” divided by the “number of marks”. The “sum of marks” is the aggregate score in the particular exam for the school and the “number of marks” is the number of exam writers.

# Comparing the Standardized Test Scores of BC's Public and Independent Schools

and 18.9% higher on grade-7 exams (figure 2). The second highest difference was in Numeracy, where the non-elite schools performed 14.4% higher on grade-4 exams and 14.2% higher on grade-7 exams (figure 3). The smallest difference was in Reading, with the non-elite schools

performing 10.2% higher on grade-4 exams, and 10.3% higher on grade-7 exams (figure 4).

Elite independent schools performed higher on each exam compared to both public schools and the non-elite independent schools.

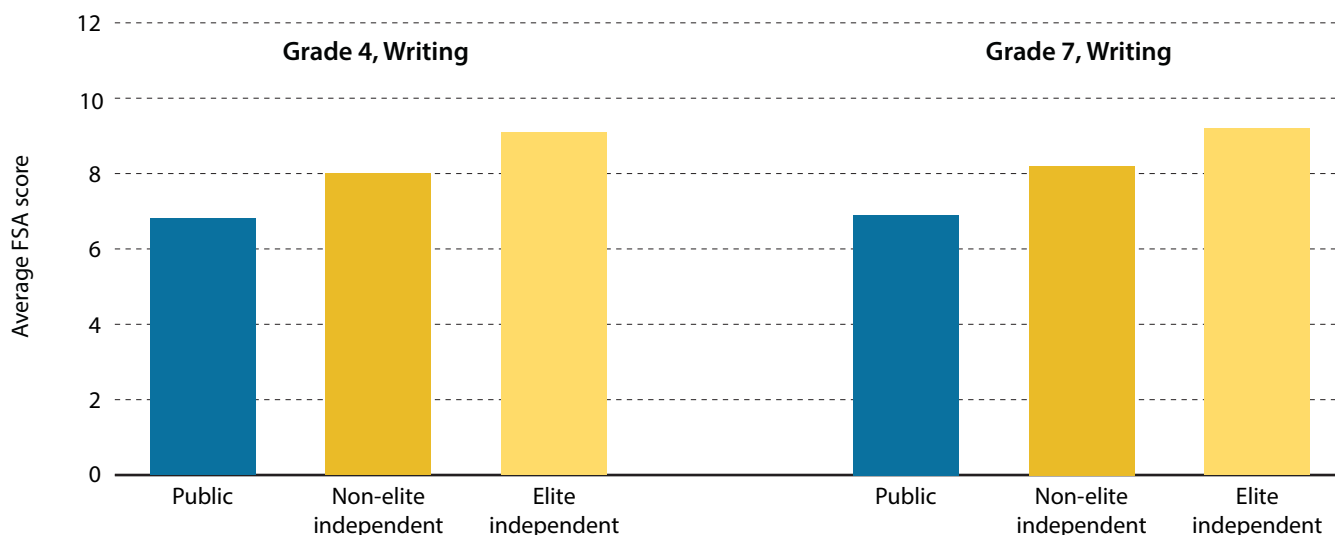
**Table 1: Average scores on the Foundation Skill Assessment (FSA) tests, 2011/12–2015/16**

	Best score possible	Public schools	Non-elite independent schools	Difference (%), non-elite independent and public	Elite independent schools	Difference (%), independent elite and public
Grade 4, Writing	12	6.8	8.0	18.0	9.1	34.8
Grade 4, Numeracy	800	484	554	14.4	611	26.1
Grade 4, Reading*	800	486	536	10.2	588	21.0
Grade 7, Writing	12	6.9	8.2	18.9	9.2	34.0
Grade 7, Numeracy	800	471	538	14.2	595	26.4
Grade 7, Reading*	800	486	536	10.3	583	19.9

Sources: FSA test results provided by the BC Ministry of Education in response to a special request; calculations by authors.

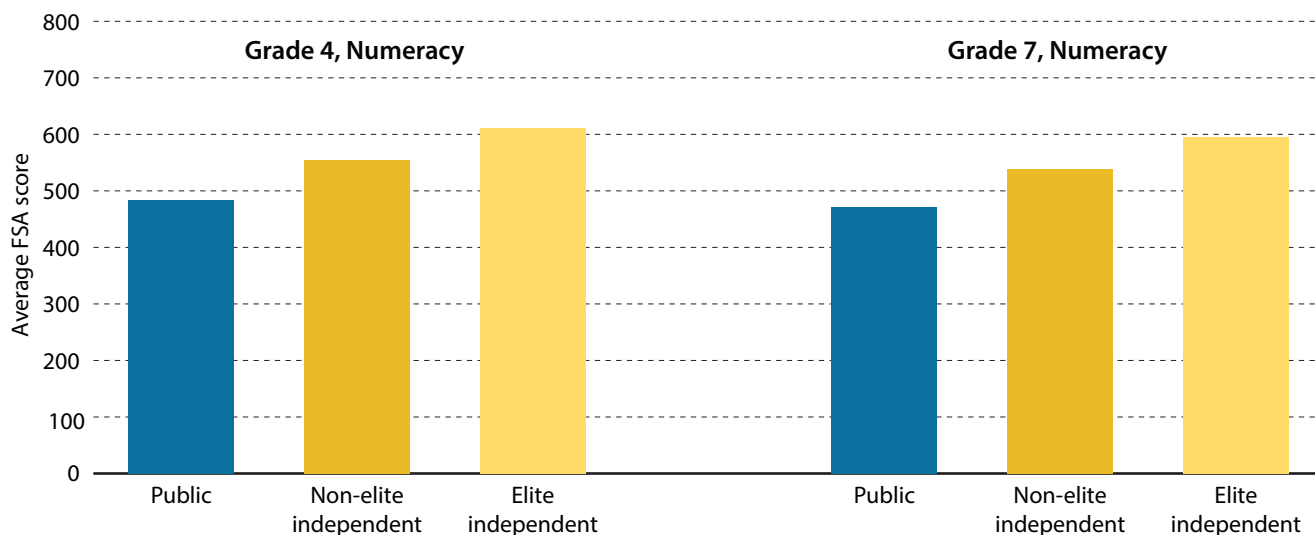
Note \*: For the results with the smallest differences in average score (Grade 4, Reading at 10.2% and Grade 7, Reading at 10.3%) we checked every year in the five-year average for statistical significance. The results show that there is less than a 0.01% chance that the average scores are equal. Further, for the other comparisons in the table, we performed the same test using the 2015/16 average scores and obtained the same result. These highly significant test results, combined with the low year-to-year annual fluctuations in average scores within groups makes us confident that all the results presented here are statistically significant. We produced these results using the Welch ANOVA procedure, which allows for different sample sizes and variances.

**Figure 2: Writing—average scores on the FSA tests, by school classification, 2011/12–2015/16**



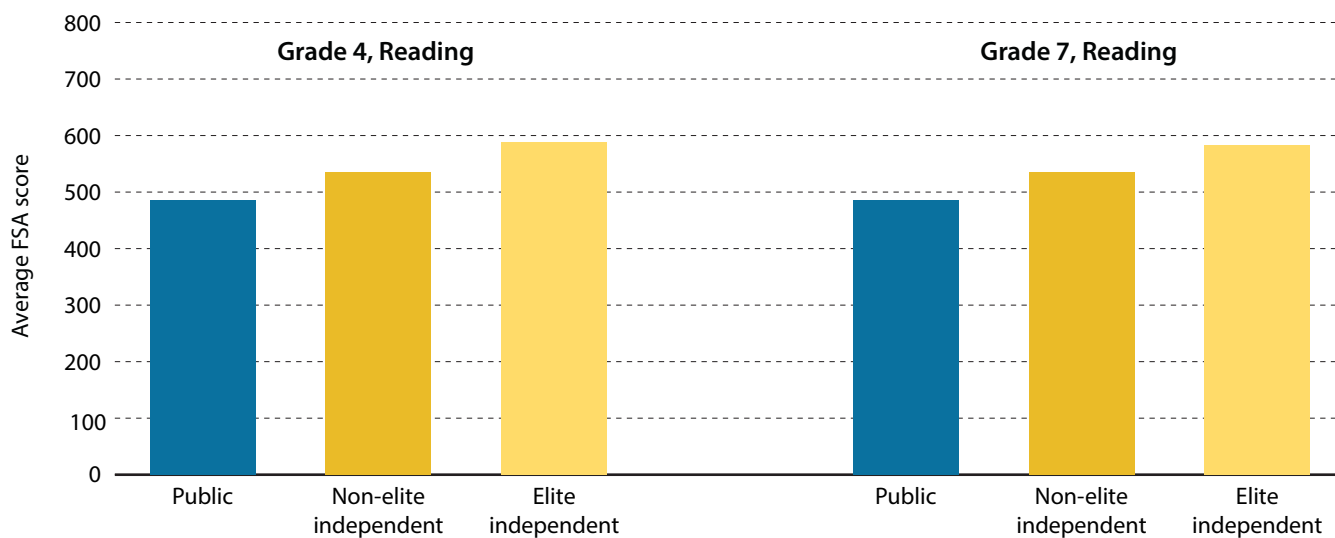
Source: FSA test results provided by the BC Ministry of Education in response to a special request; calculations by authors.

**Figure 3: Numeracy—average scores on the FSA tests, by school classification, 2011/12–2015/16**



Source: FSA test results provided by the BC Ministry of Education in response to a special request; calculations by authors..

**Figure 4: Reading—average scores on the FSA tests, by school classification, 2011/12–2015/16**



Source: FSA test results provided by the BC Ministry of Education in response to a special request; calculations by authors..

## Provincial Required Exams

The five-year average results for the years 2011/12 to 2015/16 for each of the provincial exams included in our analysis are presented in [table 2](#). Note that the average five-year scores have been provided by school type: public, non-elite independent, and elite independent. also

shown is the percentage difference between the average five-year score for public schools for each test and the scores of both non-elite and elite independent schools.

As with the FSA exams, non-elite independent schools performed better than public schools on

# Comparing the Standardized Test Scores of BC's Public and Independent Schools

all the PRE exams (figure 5). The range of scores was from 0.5% on English 12, which is not statistically significant to 5.4% for English 10. Science 10 had the second largest difference at 4.8%, followed by Foundations of Math and Pre-Calculus 10 at 4.6% and then Social Studies 11 at 2.9%, all of

which are statistically significant differences (see notes in table 2 for details of significance testing).

Elite independent schools outperformed both public schools and non-elite independent schools, with statistically significant differences for each exam.

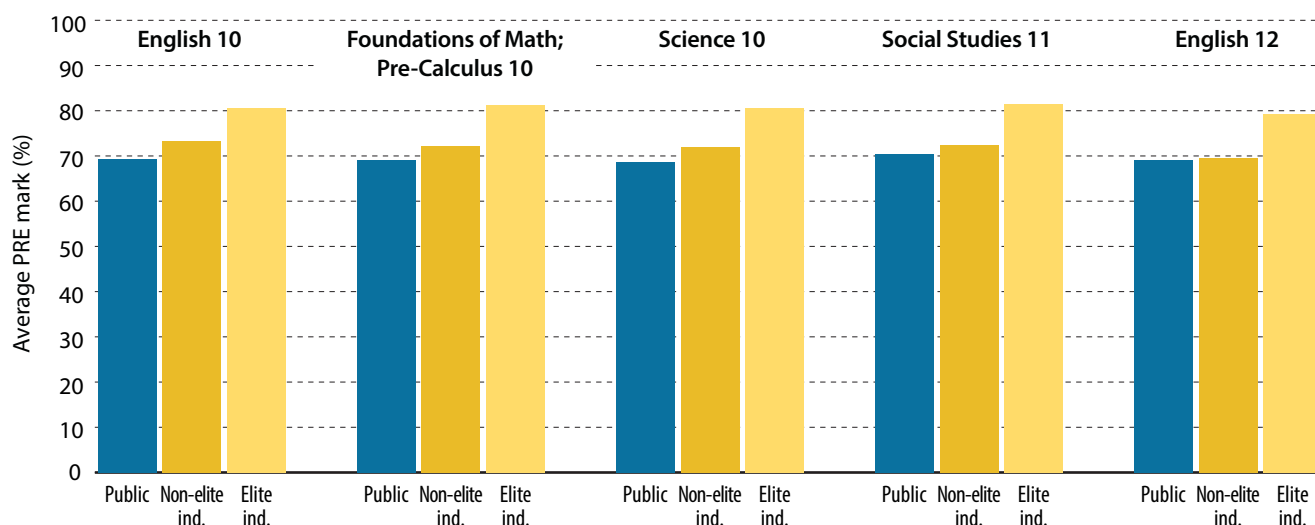
**Table 2: Average marks on the Provincial Required Exams (PREs), 2011/12–2015/16**

	Best mark (%) possible	Public schools (%)	Non-elite independent, schools (%)	Difference (%), non-elite independent and public	Elite independent schools (%)	Difference (%), independent elite and public
English 10	100	69.4	73.2	5.4	80.5	15.9
Foundations of Math; Pre-Calculus 10	100	69.1	72.3	4.6	81.3	17.8
Science 10	100	68.7	72.0	4.8	80.6	17.4
Social Studies 11*	100	70.4	72.4	2.9	81.5	15.8
English 12*	100	69.2	69.6	0.5**	79.3	14.7

Sources: Test results on the PREs provided by the BC Ministry of Education in response to a special request; calculations by authors.

Notes: \*For the results with the smallest differences in average mark (English 12 at 0.5% and Social Studies 11 at 2.9%) we checked every year in the five-year average for statistical significance. The results show that (a) average marks on English 12 are statistically the same in public and non-elite independent schools; and (b) there is less than a 0.01% chance that the average marks for Social Studies 11 are equal. Further, for the other comparisons in the table, we performed the same test using the 2015/16 average marks and found statistical significance in every instance. These highly significant test results, combined with the low year-to-year annual fluctuations in average marks within groups makes us confident that all the results presented here are statistically significant (except as noted). We produced these results using the Welch ANOVA procedure, which allows for different sample sizes and variances. \*\*Not statistically significant.

**Figure 5: Average marks (%) on the PREs, by school classification, 2011/12–2015/16**



Source: PRE test results provided by the BC Ministry of Education in response to a special request; calculations by authors.



### Conclusion

A previous study determined that the after-tax family income of students in non-elite public schools is virtually the same as that of families with students in public schools. This study answers whether there were statistically significant differences in the test scores between three types of schools; public, non-elite independent, and elite independent.

In ten out of the eleven exams included in this analysis—six FSA exams, and five provincial exams—non-elite independent schools had a five-year average score that was higher than public schools by an amount that was statistically

significant. On one exam, English 12, non-elite independent schools scored only 0.5% higher than public schools, an amount that was not statistically significant.

Elite independent schools out-performed both public and non-elite independent schools, by statistically significant amounts, on all eleven exams in the analysis. However, the most important finding is that, even though families with students in non-elite independent schools have virtually the same after-tax family income as families with students in public schools, non-elite independent schools score higher on all FSA exams and five out of the six provincial exams included in the analysis.

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