RESEARCH NOTE

To Graduation and Beyond: Secondary school performance and tertiary education outcomes

THE NEW ZEALAND INITIATIVE

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Introduction

The purpose of secondary schooling varies depending on who you ask. For many parents, educators, and education professionals, schooling is meant to transmit the most 'powerful' knowledge that exists. For others, it is to transform and prepare society for the ever-changing future.

But almost all would agree that they want students to be more than just proficient in English, history, maths and science. They want students to be employable, lifelong learners, and participating citizens.

Quantifying such subjective outcomes is a great challenge the education sector faces today. Academic measures such as NCEA are considered by many as a good proxy for those in-demand outcomes in students, at least partially. Others say such measures fall short in many areas. Indeed, NCEA is not a perfect measure but it is a practical metric that educators, researchers and government can use to identify and study student and school performance.

University Entrance (UE) attainment is arguably a better measure of student achievement. However, like NCEA it does not capture all the aspects of educational attainment that educators, parents and society care about.

Fortunately, innovations in data management have helped The New Zealand Initiative study how our schools are performing on outcomes beyond NCEA and UE attainment.

Using data on more than 500,000 students in Statistics New Zealand's Integrated Data Infrastructure (IDI), this report shows how nearly 500 secondary schools are preparing students for further tertiary education. Specifically, it examines whether students are progressing into tertiary education, and whether they complete a tertiary qualification after enrolling.

Of course, not every student needs to or should go on to tertiary education. There are many worthwhile opportunities outside of formal education.

Nevertheless, a successful secondary school should provide every student with the skills and knowledge they need to succeed in their endeavours after graduation – tertiary education included. For this reason, this report shows how effective our current school system is in preparing the next generation for further tertiary study. Future IDI research should investigate alternative post-school outcomes such as employment, benefits uptake, and interactions with Justice and Corrections.

This is the sixth report in the Initiative's series of IDI school performance research. Details of our school performance tool and all previous reports can be found in Section 1A of the Appendix.

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Key findings

Progression into tertiary education: Results

- A greater proportion of high-performing schools were found in deciles 9 and 10 when we evaluated schools on the progression of their students into tertiary education – before adjusting for family socioeconomic background. This is consistent with results from our analysis one, three, five and seven years after graduation.
- There are both high-performing low and high decile schools after adjusting for family socioeconomic background. There are also few to no high-performing middle decile 5 and 6 schools. This finding is consistent with the evaluations after one, three, five and seven years.
- Evaluating schools on outcomes that occur further from graduation (five and seven years) showed higher levels of uncertainty among school estimates. This increase is significant enough that several schools in the top 10% of the distribution are not statistically distinguishable from the middle 80% of schools at the lower bound.

Completion of tertiary education: Results

- Before adjusting for family socioeconomic background, we found a greater proportion of high-performing low decile schools when evaluated on the completion of a tertiary qualification one and three years after graduation. We also found a small proportion of high-performing middle decile schools in the one- and three-year evaluations.
- Evaluating schools on the completion of a tertiary qualification five and seven years after graduation showed a greater proportion of high-performing high decile schools. A small proportion of high-performing low and middle decile schools were found in the five-year evaluation.
- However, adjusting for family socioeconomic background showed high-performing schools across all deciles, albeit with a greater level of uncertainty among the school estimates.
- While there are high-performing schools across all deciles, a greater proportion exists across deciles 1–4 in the one-, three-, five-, and seven-year evaluations.

Summary statistics

Table 1 summarises the number of students in our dataset who 1) gained UE; 2) progressed into a tertiary education institution; and 3) completed a tertiary qualification once they were enrolled.

Table 1: Outcome variables statistics: A summary

Dependent variables	Yes	No
University Entrance (UE)	136,998	402,717
Progression into tertiary education within 1 year of graduation	205,263	334,455
Progression into tertiary education within 3 years of graduation	242,025	297,693
Progression into tertiary education within 5 years of graduation	251,754	287,964
Progression into tertiary education within 7 years of graduation	255,714	284,001
Completion of tertiary education within 1 year of graduation	36,897	234,042
Completion of tertiary education within 3 years of graduation	81,303	189,630
Completion of tertiary education within 5 years of graduation	119,811	151,125
Completion of tertiary education within 7 years of graduation	128,706	142,230

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 2 summarises the various tertiary qualifications included in our analysis and the number of students who gained those qualifications.[1]

Table 2: Tertiary education qualification statistics: A summary

Qualification	Number of students
PhD and other doctorates	126
Master's	4,380
Bachelor's with honours	10,092
Post-graduate diplomas	2,508
Post-graduate certificates	2,061
Bachelor's	72,099
Graduate diplomas/ certificates	4,041
Professional association diplomas	21
National diploma/ national certificates levels 5–7	3,735
New Zealand diplomas	4,191
Diplomas/ certificates issued by TEO levels 5–7	24,165
New Zealand certificates/ technician's certificates	489
National certificates level 4 and other level 4 certificates	50,211
Professional association certificates	s
Trade certificates level 4	s
Licences	174

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.
Note: That cells containing values of 5 and below have been suppressed (s) subject to Microdata Output Guide Rule 4.11.4.

Table 3 summarises the number of students who attended each tertiary education provider in our dataset. Not every student in our dataset had information on which tertiary provider they attended.

Table 3: Tertiary education provider statistics: A summary

Tertiary education providers	Number of students
Polytechnic	28,908
Private training establishment	22,020
University	43,392
Wānanga	2,931

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

As with previous reports, we evaluated schools before and after adjusting for a suite of family background characteristics. For a comprehensive list of these independent variables and their relevant summary statistics, see section 3A of the Appendix.

Distribution of school performance

To demonstrate the distribution of school performance, we allocated schools into high-, average-, and low-performing categories, and then binned them across paired deciles. High-performing schools are schools in the top 10% of the distribution, middle-performing schools are in the middle 80%, and low-performing schools are in the bottom 10%.

Schools in the top and bottom 10% of the distribution are broadly statistically different from schools in the middle of the distribution. Different bar colours have been used to indicate schools at the top of the distribution that are statistically indifferent from schools in the middle of the distribution at the lower bound (as a result of larger confidence intervals) (see Table 4).

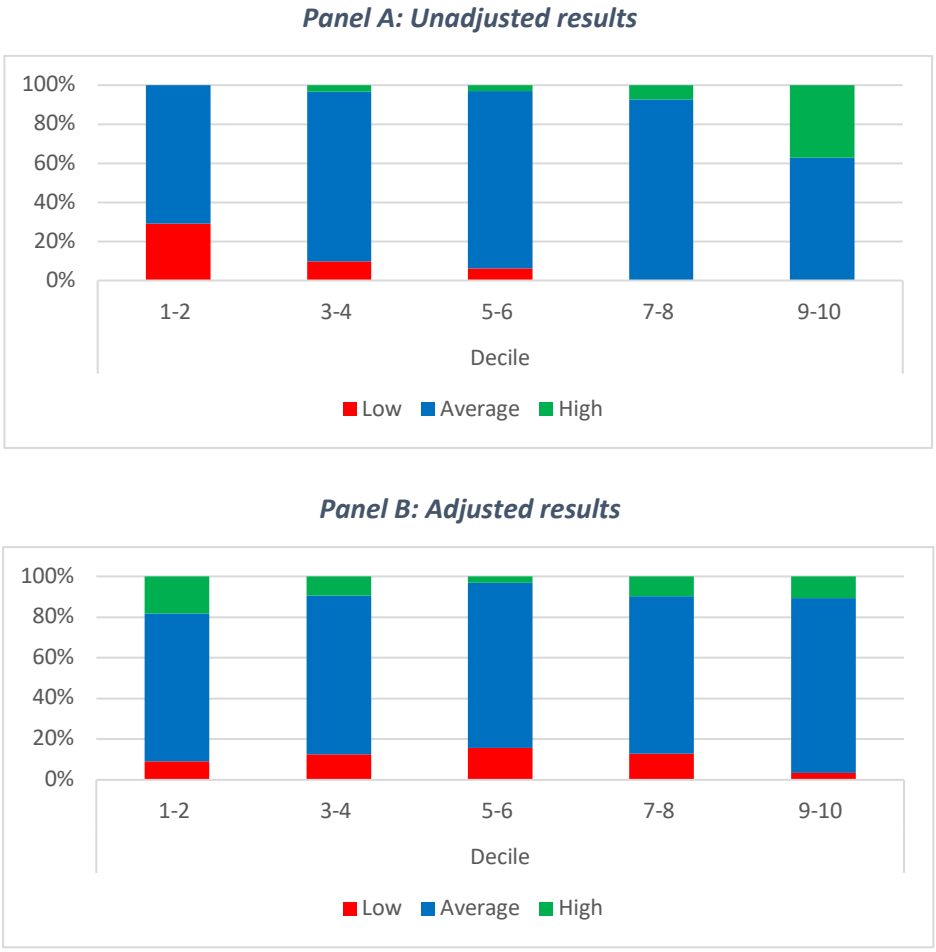
Table 4: Relevant colours and categories demonstrating the distribution of school performance

High-performing	Top 10% schools
Average-performing	Middle 80% schools
Low-performing	Bottom 10% schools
High-performing but with uncertainty	Top 10% school, but with larger confidence intervals and greater uncertainty in school estimates. There are some schools in this top 10% that have small confidence intervals but a significant number have large confidence intervals, which make their estimates indistinguishable from middle-performing schools at the lower bound.

Progression into tertiary education results

This section describes the distribution of school performance after evaluating schools on whether their students progressed into tertiary education. Each figure shows both unadjusted and adjusted results in Panels A and B, respectively. The unadjusted results show school performance before our tool adjusted for family socioeconomic background; the adjusted results show the results after. The tables showing the number of schools in each of the three performance categories for each of the following stacked bar graphs (Figures 1 to 4) are in section 6A of the Appendix.

Figure 1: Progression into tertiary education one year after graduation



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Before adjusting for family background, most high-performing schools were in deciles 9 and 10 (see Figure 1 Panel A). Similarly, most underperforming schools were in deciles 1 and 2.

These results are not surprising given a greater number of students from high decile schools progress into tertiary education compared to students from both low and middle deciles (see Tables 5 and 6).

However, after separating the contribution of family socioeconomic background, we found high-performing schools across all deciles (see Figure 1 Panel B). In fact, Panel B shows a greater proportion of high-performing decile 1 and 2 schools (nearly 20%) compared to all other deciles.

Panel B also shows a higher proportion of low-performing decile 5 and 6 schools compared to all other deciles.

Table 5: Distribution of students across tertiary education providers

Tertiary Institution	Decile									
	1	2	3	4	5	6	7	8	9	10
Polytechnic	912	1,797	2,004	2,754	4,161	4,746	2,973	4,323	2,949	2,289
Private training establishment	1,380	1,536	1,698	2,265	2,544	2,835	2,109	2,670	2,367	2,616
University	411	1,134	1,533	2,646	4,149	5,118	4,842	6,600	7,104	9,855
Wānanga	420	552	609	384	312	246	105	147	93	63

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 5 shows a greater number of students from high-decile schools enrolling in polytechnics, private training establishments (PTEs), and universities compared to Wānanga.

Table 6: Distribution of tertiary qualifications across deciles

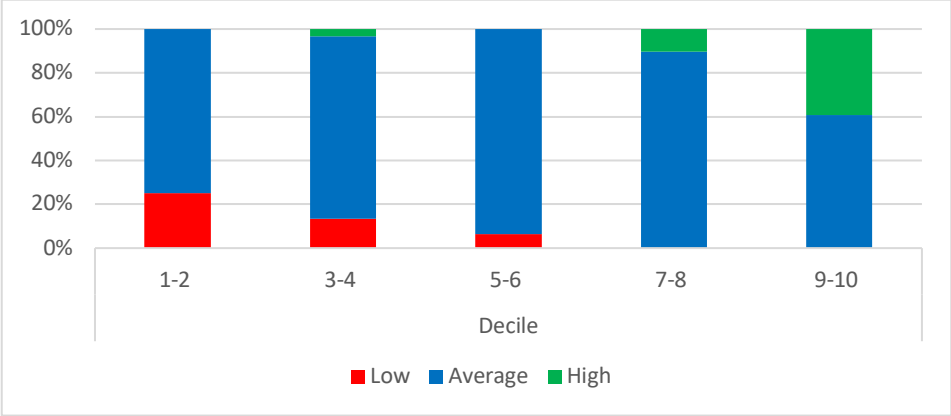
Qualification	Decile				
	1–2	3–4	5–6	7–8	9–10
PhD and other doctorates	s	6	30	36	51
Master's	120	360	921	1,197	1,782
Bachelor's with honours	240	879	1,977	2,877	4,119
Post-graduate diplomas	108	288	534	615	963
Post-graduate certificates	132	237	525	504	663
Bachelor's	3,072	7,650	16,086	19,155	26,136
Graduate diplomas/ certificates	180	450	1,011	1,098	1,302
Professional association diplomas	s	s	s	s	9
National diplomas/ national certificates levels 5–7	483	672	1,077	879	624
New Zealand diplomas	330	642	1,227	1,098	894
Diplomas/ certificates issued by TEO levels 5–7	2,136	3,792	6,291	5,964	5,982
New Zealand certificates/ technician's certificates	33	84	135	117	120
National certificates level 4 and other level 4 certificates	7,653	10,476	13,719	10,401	7,962
Professional association certificates	s	s	s	s	s
Trade certificates level 4	s	s	s	s	s
Licences	s	18	36	39	78

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.
Note: Cells containing values of 5 and below have been suppressed (s) subject to Microdata Output Guide Rule 4.11.4.

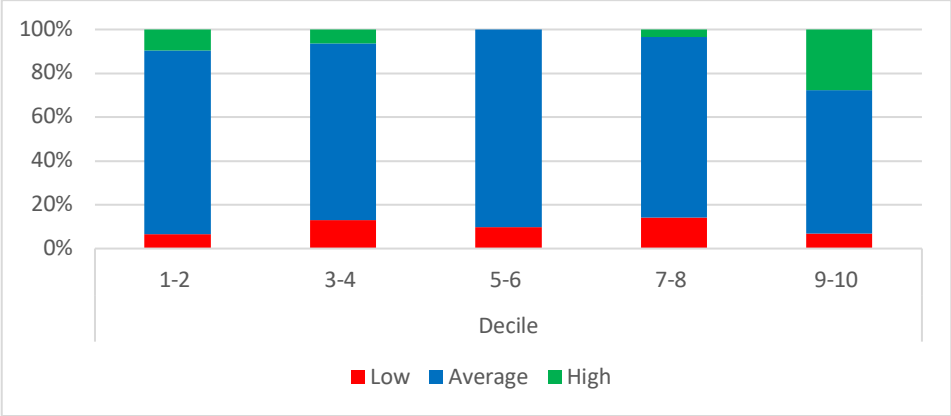
Similarly, Table 6 shows a greater number of students from high decile schools attaining PhDs, master's and bachelor's degrees, diplomas and certificates relative to low decile schools.

Figure 2: Progression into tertiary three years after graduation

Panel A: Unadjusted results



Panel B: Adjusted results



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

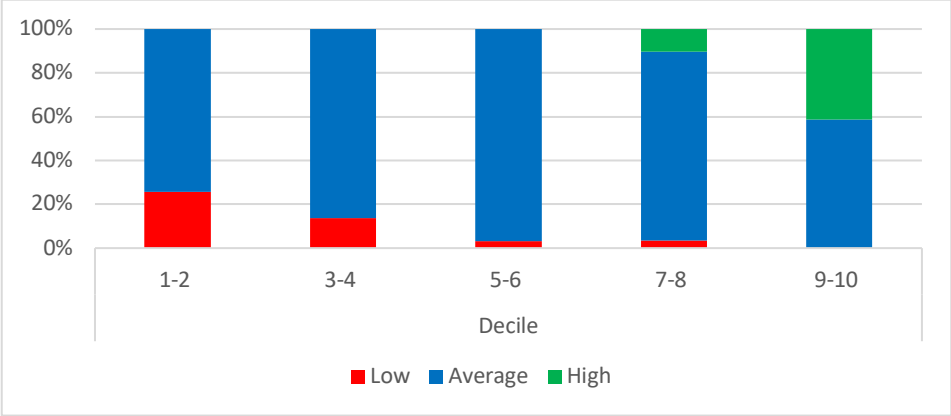
Evaluating schools on students progressing into a tertiary institution showed similar results in both our one- and three-year analysis.

Before adjusting for family background, a greater proportion of high-performing schools were in deciles 9 and 10 (see Figure 2 Panel A). After adjusting for family background, high-performing schools were found in both low and high deciles (see Figure 2 Panel B). That said, the proportion of high-performing schools still skews to high deciles.

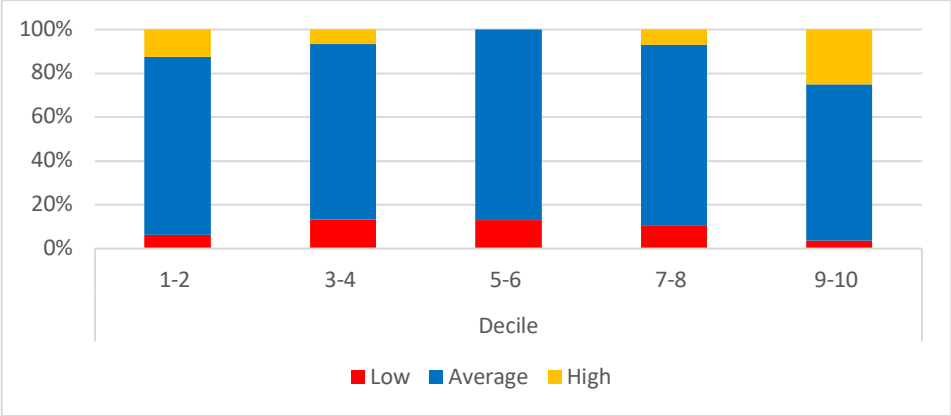
There are no high-performing decile 5 and 6 schools in the middle category even after adjusting for family background.

Figure 3: Progression into tertiary five years after graduation

Panel A: Unadjusted results



Panel B: Adjusted results



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Again, the results of student progression into a tertiary institution five years after graduation skewed to high decile schools before adjusting for family background. All high-performing schools are in deciles 7 to 10 (see Figure 3 Panel A). Among these high-performing schools, 40% are in deciles 9 and 10.

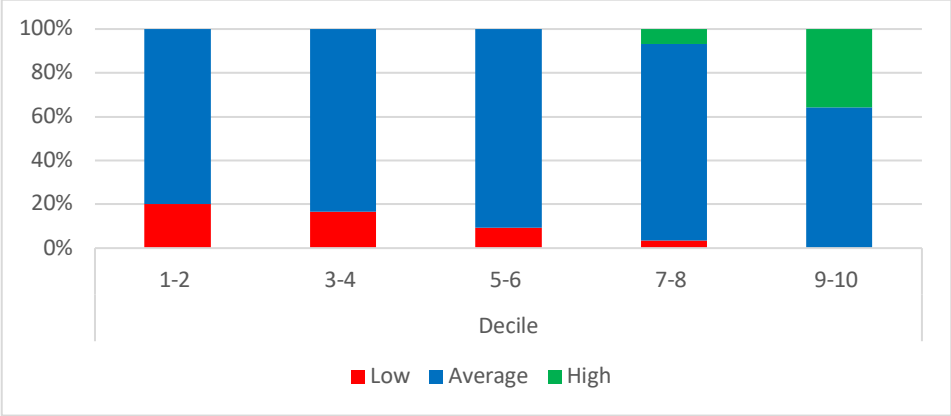
After adjusting for family background, the high-performing schools skewed to both low and high deciles.

In contrast to Figures 1 and 2, schools in the top 10% of the distribution are now not all statistically different to schools in the middle 80% of the distribution (as indicated by the yellow bars) at least at the lower bound of the estimates. Due to Statistics New Zealand's (SNZ) confidentiality restrictions, we cannot identify how many high-performing schools have large enough confidence intervals that make their estimates statistically indifferent from average-performing schools.

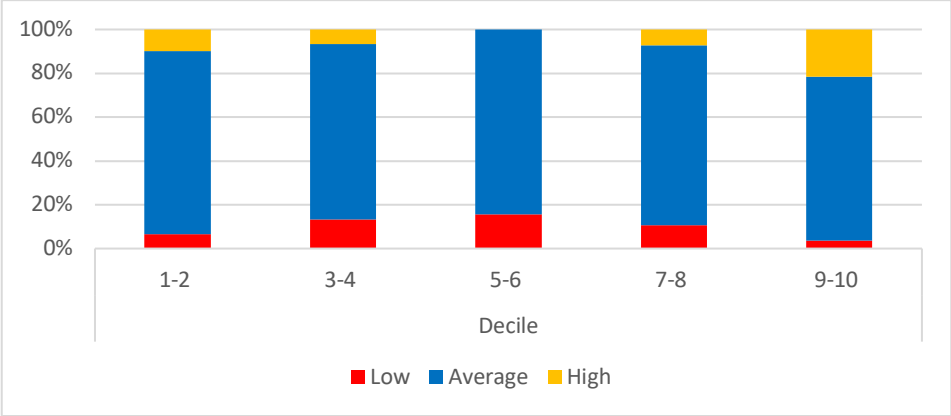
The greater proportion of underperforming decile 5 and 6 schools is noteworthy on the progression of students into tertiary education five years after graduation.

Figure 4: Progression into tertiary seven years after graduation

Panel A: Unadjusted results



Panel B: Adjusted results



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Figure 4 Panel A shows similar results to Panel A in Figures 1–3, where high decile schools dominate the high-performing category before adjusting for family background.

Results in Figure 4 Panel B are also similar to Panel B in Figures 1–3, where high-performing schools skew to both the low and high decile schools. Low-performing schools also skew to deciles 5 and 6.

Consistent with our analysis of students five years out of high school, we found more uncertainty in school estimates when we evaluated students seven years after graduation. The yellow bars again indicate that confidence intervals in several high-performing school estimates line up with schools in the middle 80% of the distribution at the lower bound (see Figure 4 Panel B).

These results are not surprising given the length of time students have been out of high school. At five years, students have spent the same amount of time from Years 9 to 13. It is expected that the longer a student has been out of high school, the number of factors that influence whether they attend a tertiary institution increases. Similarly, the influence of other factors may also increase.

Summary of progression into tertiary education results

Unadjusted results discussion

It is not overly surprising that a greater proportion of high-performing schools exist among high deciles before our tool adjusted for family background. A greater proportion of students from high-decile schools go into tertiary education (see Table 5).

Adjusted results discussion

Interestingly, high-performing schools exist across both low and high deciles after adjusting for family background when evaluating schools on the progression of their students into tertiary education.

We did find an absence of high-performing schools among middle-decile 5 and 6 schools, however. This could be a result of middle decile schools not adequately 1) helping their students' progress into tertiary education, or 2) directing their students into other post-school outcomes outside of tertiary education such as employment and on-the-job training.

Further research is needed to determine what each of the high-, average-, and low-performing schools are doing to get the outcomes shown in this report. Further research is also needed to determine the different pathways that students are taking after secondary school.

Policy implications (or lack thereof)

Secondary schools are not specifically designed to get their students into further tertiary education. It is up to the students to decide the next best step for themselves. Some schools may have more students going into tertiary, but that is not necessarily required of all schools. It is more important to identify which schools better prepare their students to enrol and complete their tertiary qualification. Then again, not every student who enrols into a tertiary qualification will complete it because some students may choose other options after they have enrolled. Without a doubt, there are no clear policy implications of our progression into tertiary results.

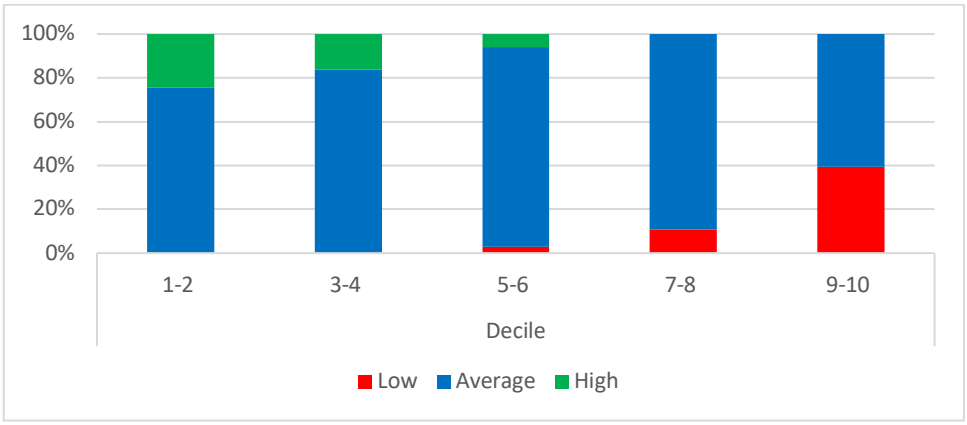
Completion of tertiary education

This section describes school performance based whether students completed a tertiary qualification after they enrolled in a tertiary education institution.

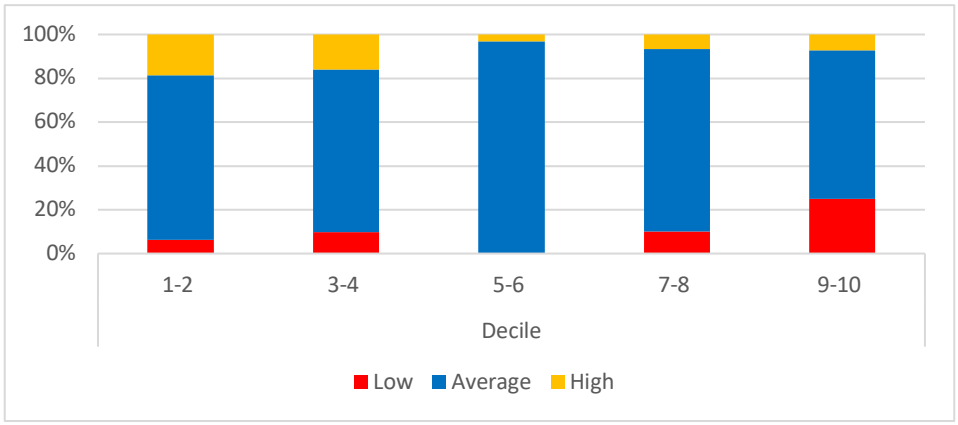
As with the progression into tertiary education section, each figure in this section shows both unadjusted and adjusted results in Panels A and B, respectively. The tables showing the number of schools in each performance category for each of the following stacked bar graphs (Figures 5 to 8) are in section 6A of the Appendix.

Figure 5: Completion of tertiary education one year after graduation

Panel A: Unadjusted results



Panel B: Adjusted results



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Figure 5 Panel A shows whether students completed a tertiary qualification within one year of graduation. As within previous figures, Panel A shows the results before adjusting for family background while Panel B shows the results after.

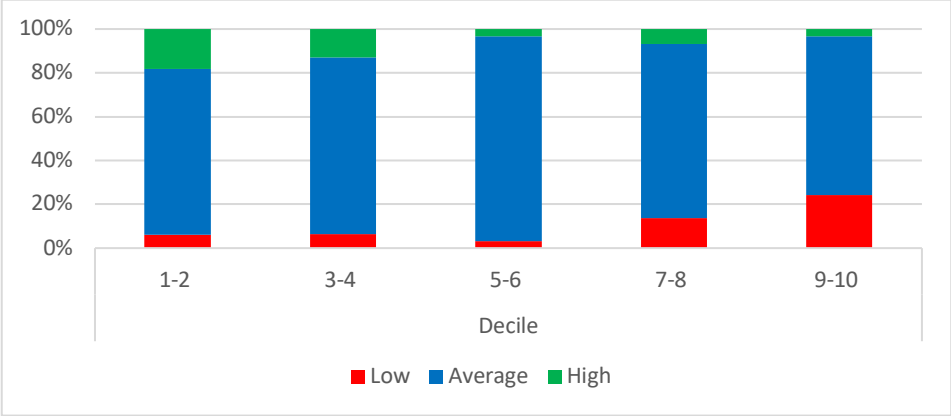
In contrast to progression into tertiary education (Figures 1–4 Panel A), Figure 5 Panel A shows most high-performing schools are in low deciles, while most underperforming schools are in high deciles.

However, after adjusting for family background, high-performing schools are found across all deciles. We still find many high-performing schools in deciles 1–4, though (see Figure 5 Panel B). Similarly, most underperforming schools are among high-decile schools.

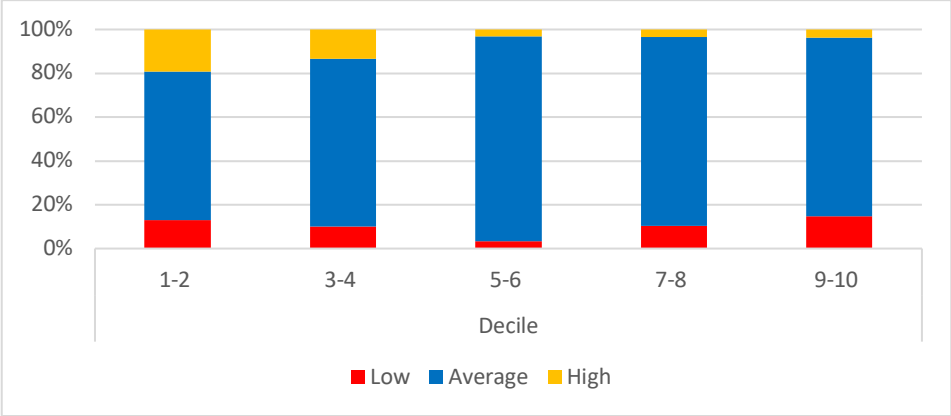
Like our progression into tertiary education results, more uncertainty exists in our adjusted school estimates. In our completion of tertiary education analysis, however, the higher level of uncertainty in school estimates is present even in our one-year analysis.

Figure 6: Completion of tertiary three years after graduation

Panel A: Unadjusted results



Panel B: Adjusted results



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

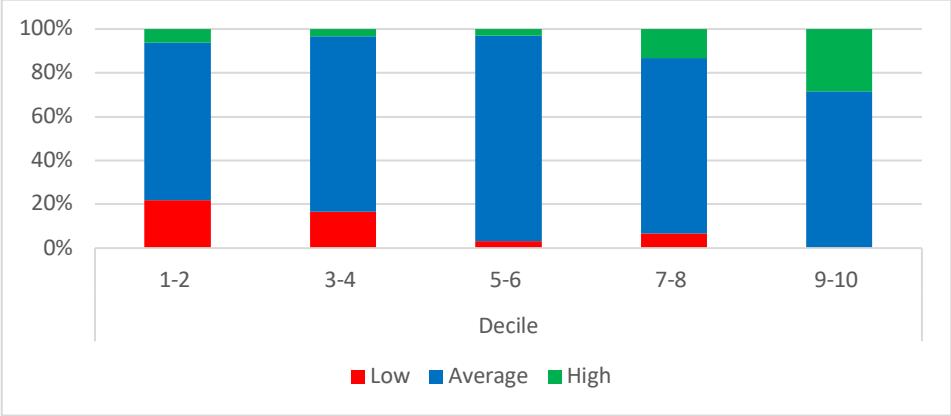
When schools were evaluated on whether their students completed a tertiary qualification three years after graduation, most high-performing schools were still found in low deciles (see Figure 6 Panel A). However, as with Figure 5 Panel A, this was before adjusting for family background.

After adjusting for family background, most high-performing schools were still in the low deciles (see Figure 6 Panel B).

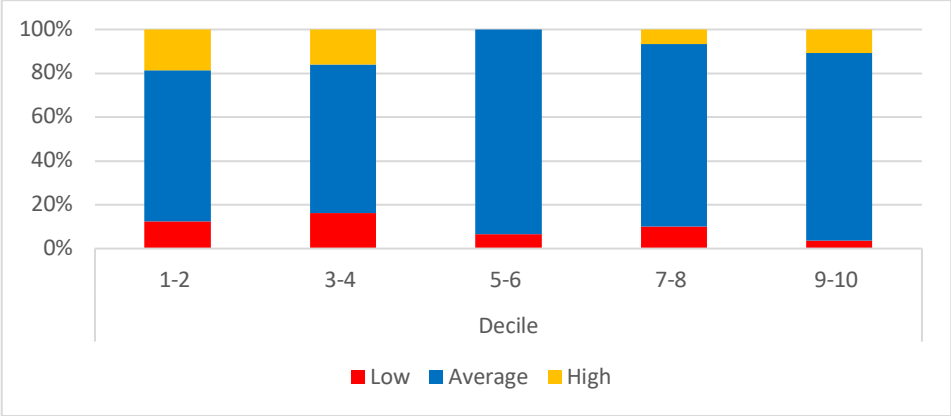
That said, there is more uncertainty among the school estimates (see yellow bars in Panel B).

Figure 7: Completion of tertiary five years after graduation

Panel A: Unadjusted results



Panel B: Adjusted results



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

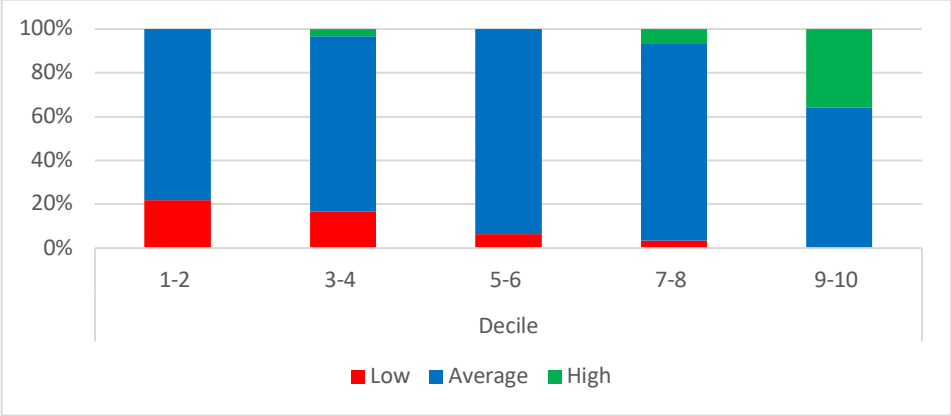
Evaluating schools on completion of tertiary qualifications five years after graduation showed a greater proportion of high-performing high decile schools before we adjusted for family background (see Figure 7 Panel A).

After adjusting for family background, we found high-performing schools across all deciles (see Figure 7 Panel B). However, unlike our one- and three-year analysis, we found high-performing schools are skewed to both the low and high deciles.

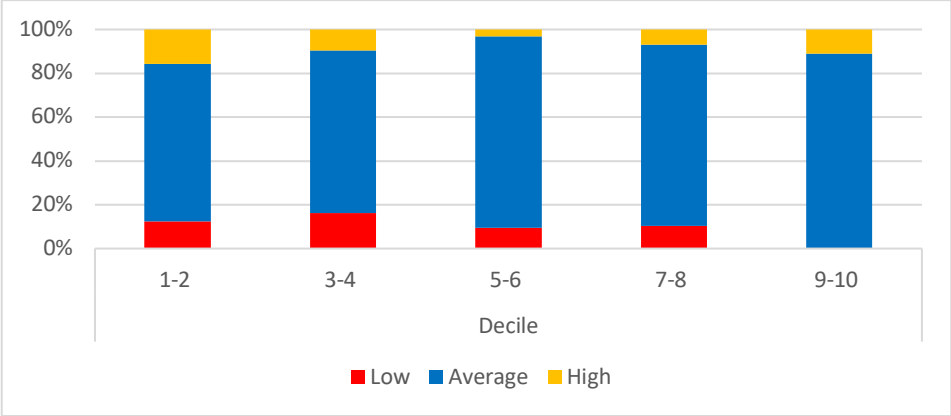
Like the previous completion of tertiary results, there is more uncertainty among our school estimates.

Figure 8: Completion of tertiary seven years after graduation

Panel A: Unadjusted results



Panel B: Adjusted results



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Finally, evaluating schools on whether their students completed a tertiary qualification within seven years after graduation showed a greater proportion of high-performing schools among high deciles (see Figure 8 Panel A).

Adjusting for family background showed a greater proportion of high-performing schools among deciles 1–4 and 7–10 (see Figure 8 Panel B). Like our analysis of schools and students one, three and five years after graduation, there is a higher level of uncertainty among our school estimates in the top 10% of the distribution.

Summary of completion of tertiary education results

Unadjusted results discussion

It is somewhat surprising that the distribution of high-performing schools switched from low deciles in our one- and three-year evaluations to high deciles in our five- and seven-year evaluations, given the progression into tertiary results.

This might be a result of the types of qualifications students from low versus high decile schools enrol in – ***if*** they enrol in a tertiary institution in the first place.

A greater proportion of high-performing low decile schools are in the one- and three-year evaluations, possibly because of students from low decile schools choosing to attempt short-term qualifications relative to students from high decile schools.

Similarly, a greater proportion of high-performing high decile schools are seen in the five- and seven-year evaluations, possibly because of students from high decile schools choosing to go for long-term qualifications relative to students from low decile schools.

These results are still surprising given that this project only included students who enrolled in a tertiary education institution in the completion of tertiary education evaluation. Future iterations of this research could expand the set of outcomes evaluated and include every student in their completion of tertiary evaluation.

Adjusted results discussion

As with the progression into tertiary education results, the adjusted completion of tertiary education results is what is important. Figures 5–8 show high-performing schools in both low and high deciles.

Unlike the unadjusted results, high-performing schools exist in both low and high deciles after adjusting for family background. This is not surprising. Both *Insights and Excellence* and *The State of Schooling* found high-performing schools in both low and high deciles when evaluated on NCEA and UE attainment.

Given the vast economic and education literature showing the large impact of socioeconomic background on academic outcomes,[2] it is no surprise that the large difference in school performance in our unadjusted results fades after adjusting for family background.

What is surprising is that our results also show few to no high-performing schools among middle deciles 5 and 6. It is not clear what is driving these results.

Policy implications

Evaluating schools on whether their students completed their tertiary qualification several years after the fact is a difficult task. A student may not complete their tertiary qualification they enrolled in for many reasons, including: 1) not having the right skills after leaving secondary school, which means the school may be underperforming; 2) the tertiary institution they enrolled in was itself a failing institution, or 3) personal reasons.

That said, there may be secondary schools in New Zealand doing a good job of preparing their students for tertiary qualifications. For sure, students with a better grasp of the basics in secondary school will be in a better position in tertiary than students who do not. Identifying which schools are 'truly' doing better requires educational professionals visiting the high-performing schools identified in this report for further research, and in modelling that evaluates schools on other post-school outcomes.

Consistency of top-performing schools

In previous sections, we showed the major changes in the distribution of school performance before and after our tool adjusted for family background. In this section, we examine whether top-performing schools in the unadjusted evaluation were also top performers in the adjusted evaluation.

To demonstrate this, Tables 7 and 8 present crosstabs showing the number of top 15 schools present in both the unadjusted and adjusted evaluations. Table 7 shows the results for progression into tertiary education evaluation. Table 8 shows the results for completion of tertiary education evaluation.

Table 7: Consistency of top 15 schools before and after adjusting for family background – progression into tertiary education

Number of schools in the top 15 in the unadjusted and adjusted analysis			
Progression into tertiary education one year after graduation		Adjusted	
		No	Top 15
Unadjusted	No	435	9
	Top 15	9	6
Progression into tertiary education three years after graduation		Adjusted	
		No	Top 15
Unadjusted	No	438	9
	Top 15	9	6
Progression into tertiary education five years after graduation		Adjusted	
		No	Top 15
Unadjusted	No	438	6
	Top 15	6	9
Progression into tertiary education seven years after graduation		Adjusted	
		No	Top 15
Unadjusted	No	438	6
	Top 15	6	9

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 7 shows that of the schools progressing their students into tertiary education within one and three years of graduation, six schools were ranked in the top 15 in both the unadjusted and adjusted evaluations. Similarly, nine schools ranked in the top 15 in both the unadjusted and adjusted evaluations among schools studied five and seven years after graduation.

Table 8: Consistency of top 15 schools before and after adjusting for family background – completion of tertiary education

Number of schools in the top 15 in the unadjusted and adjusted analysis			
Completion of tertiary education one year after graduation		Adjusted	
		No	Top 15
Unadjusted	No	444	s
	Top 15	s	12
Completion of tertiary education three years after graduation		Adjusted	
		No	Top 15
Unadjusted	No	444	s
	Top 15	s	15
Completion of tertiary education five years after graduation		Adjusted	
		No	Top 15
Unadjusted	No	441	6
	Top 15	6	9
Completion of tertiary education seven years after graduation		Adjusted	
		No	Top 15
Unadjusted	No	441	6
	Top 15	s	9

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.
Note: That cells containing values of 2 and below have been suppressed (s) subject to Microdata Output Guide Rule 4.13.2

Of the schools where students completed a tertiary qualification (if they attempted one) within one year of graduation, 12 schools were in the top 15 in both the unadjusted and adjusted results (see Table 8).

Evaluating schools three years after graduation showed all 15 schools in the top 15 in both the unadjusted and adjusted results. However, among schools five and seven years after graduation, nine out of 15 schools remained in the top 15 in both the unadjusted and adjusted results.

Policy recommendations

As with previous Initiative school performance reports, this report also raises more questions than it answers. Identifying how schools are performing is important, but equally important is identifying what each school is doing to get the results seen here.

As educators already know, there can be vast differences across communities, across and within schools, and within classrooms. These differences are not only quantitative (NCEA, UE, and post-school results) but also qualitative (such as educational philosophy, teacher quality, and pedagogy). Both quantitative and qualitative results can differ significantly. The combination of these differing qualitative results likely cause the different quantitative results seen in this report.

This highlights the importance of using our school performance tool to supplement other evaluation methods to obtain better information for making education policy. *In Fairness to Our Schools* made the case for the Ministry of Education using our school performance tool to evaluate every secondary school in the country.[3] Insights thus gained can then be used by both the Ministry and the Education Review Office (ERO) to study what each of the low-, average-, and high-performing schools are doing to get the outcomes seen here. ERO could then send every secondary school Principal and Board of Trustee member a personalised school report, as we suggested in *Insights and Excellence*.[4]

Regardless of whether ERO provides this information to the Ministry, schools or the public, the insights gained from high-performing schools should be used to improve the educational outcomes in both underperforming and average-performing schools. Our previous five reports clearly showed this need.

What is less clear, as this latest report shows, is whether the Ministry should use our school performance tool to improve progression outcomes – and to a lesser degree, completion of tertiary education. As noted in the Introduction, not every student needs to or should enter tertiary education. Many other productive opportunities are available for students to explore after leaving secondary school.

More so, this report demonstrates the versatility of our school performance tool and the many potential policy implications of research conducted in the IDI.

Conclusion

This report broadly identifies trends in the performance of New Zealand secondary schools in their ability to prepare their students for further tertiary education study.

At a glance, it appears that while high-performing schools generally exist across all deciles, high-performing schools tend to skew to both low and high deciles. This is clear from evaluating schools on both progression and completion of tertiary education, and after adjusting for family background.

Whether this is a consequence of better performance or other factors requires further research. Similarly, this body of work would benefit from expanding the set of post-school outcomes to employment, uptake of benefits, and interaction with Justice and Corrections. This is particularly pertinent for middle decile schools, which appear to be underperforming relative to their low-decile and high-decile peers.

This report also highlights the difficulty in evaluating schools on outcomes that occur further and further away from when students graduated. Among all our school estimates, the level of uncertainty in contextualised value-added scores increased significantly when we evaluated schools on outcomes that occur five and seven years after graduation. Many influences (including the tertiary institutions themselves) likely affect the tertiary outcomes of students five and seven years after secondary schools.

Unlike our previous research, the policy implications of this research are less clear. While it is appropriate and useful for the Ministry of Education to target higher NCEA and UE attainment (assuming NCEA becomes more robust), many will argue it is less appropriate to target tertiary enrolment rates, and to a lesser degree, higher completion rates.

Regardless of whether students progress into further study and complete a tertiary qualification, every secondary school should provide students with the skills and knowledge they need to succeed in whatever they endeavour after graduation – tertiary education included.

Unfortunately, this report finds that students may not be getting equal opportunities based on the secondary school they attend, at least in tertiary preparation.

Appendix

Section 1A: The New Zealand Initiative's school performance tool

Previous Initiative reports showed how we used linked government administrative data to build a school performance tool to evaluate every secondary school in New Zealand. The tool, which we developed in Statistics New Zealand's (SNZ) Integrated Data Infrastructure (IDI) datalab, was notable for identifying how much each secondary school contributed to its students' academic achievement after separating the contribution of each student's family socioeconomic background. We could now fairly evaluate secondary schools regardless of the community of students they served and the decile funding they received.

In *Tomorrow's Schools: Data and evidence* (2019), we debunked the myth that decile was a proxy for school quality and provided empirical evidence that there was *on average* no difference in school performance across deciles.

In Fairness to Our Schools: Better measures for better outcomes (2019) discussed the development of our school performance tool in the IDI and how individual schools performed across each decile. This report was complemented with the technical report, *Separating School and Family: Evaluating the effects of school and family background on student performance in NCEA* (2019), which further detailed the technical modelling that formed our tool.

Insights and Excellence: School success in New Zealand (2020) presented case studies on three secondary schools where we had applied the tool. It demonstrated the kinds of school reports that could be presented to the Minister of Education and every secondary school Principal and Board of Trustee member in the country.

The State of Schooling: State, state-integrated and private school performance in New Zealand (2020) showed how different school authorities (types) performed relative to each other. It found that even after separating the contribution of family background, state-integrated and private schools marginally outperformed state schools.

In each of these reports, we evaluated secondary schools on the performance of their students in NCEA and University Entrance (UE) attainment.[5] Critics of our research argued that NCEA and UE attainment were not perfect measures of student achievement, and that there were many other important aspects of school performance. This report addresses some of those concerns and evaluates the same secondary schools on alternative school outcomes available in the IDI.

In this report, we used data on 539,718 students to evaluate 462 secondary schools on whether their students progressed into a tertiary education institution and whether they gained a tertiary qualification within one, three, five or seven years after graduation.[6] Students included in our dataset participated in NCEA Level 1, 2 or 3 between 2008 and 2018 and or were enrolled into a New Zealand tertiary education institution between 2008 and 2018.[7]

Of course, tertiary education is only one of many post-school outcomes, and it does not fully address all the limitations of our previous research. Future IDI research should investigate other post-school outcomes available in the IDI. The code behind our school performance tool is publicly available to other IDI researchers in SNZ's data lab. For a more detailed description of our school performance tool and how each tertiary education outcome variable was created, see sections 2A to 5A of the Appendix.

Section 2A: Secondary school outcomes

Progression into tertiary education outcome variable: Students were allocated a binary outcome of 1 (yes) if they were present in the tertiary education courses IDI dataset[8] between 2008 and 2018; 0 (no) otherwise.

Completion of tertiary education qualification outcome variable: Students were allocated a binary outcome of 1 (yes) if they were present in the tertiary education qualifications IDI dataset[9] between 2008 and 2018; 0 (no) if they were present in the tertiary education courses IDI dataset but did not subsequently complete a qualification.

Section 3A: School performance tool

Based on SNZ's Integrated Data Infrastructure, our school performance tool is technically termed as a Fixed Effects Least Squares Dummy Variable (LSDV) Ordinary Least Squares (OLS) model. Here, the individual school-specific effects and the school-authority specific effects are the 'fixed effects' component of the model. The independent variables included in our analysis are listed in the tables below. For further details on our tool, see *In Fairness to Our Schools* (Chapter 2) and its corresponding full technical report, *Separating School and Family*.[10] Sections 3A to 5A in the Appendix specify the functional form of school performance tool in the context of this report.

Table 1A: Independent variables – Student socioeconomic background characteristics

X_i: **Student background characteristic variables**	
1.	Female (Y/N)
2.	Ethnicity
	• Māori
	• Pasifika
	• Australian
	• Asian
	• European
	• Middle Eastern
	• Latin American
	• African
3.	Number of abuse events by category identified by CYF
	• Sexual abuse
	• Physical abuse
	• Emotional abuse
	• Neglect abuse
	• Self-harm abuse
	• Behavioural abuse
4.	Refugee (Y/N)
5.	Disability (Y/N)
6.	English as a second or other language (ESOL) (Y/N)
7.	Reading recovery (Y/N)
8.	Number of suspensions
9.	Number of stand downs
10.	Expulsion (Y/N)
11.	Number of secondary schools attended
12.	Percentage of internal credits by NCEA year
	• NCEA level 1
	• NCEA level 2
	• NCEA level 3
13.	Access to the internet at home (Y/N)
14.	Access to heat at home (Y/N)

Table 2A: Independent variables – Parental background characteristics

W_i: Parents' background characteristic variables	
1.	Parents' home ownership (Y/N)
2.	Parents divorced (Y/N)
3.	Mother's education
	• None
	• High school certificate
	• Diploma (level 4–6)
	• Bachelor's degree (level 7)
	• Post-graduate degree (Master's/PhD)
4.	Father's education
	• None
	• High school certificate
	• Diploma (level 4–6)
	• Bachelor's degree (level 7)
	• Post-graduate degree (Master's/PhD)
5.	Mother's log income
6.	Father's log income
7.	Mother's hours worked
8.	Father's hours worked
9.	Mother's benefit spell (weeks)
10.	Father's benefit spell (weeks)
11.	Number of mother's offences
12.	Number of father's offences
13.	Mother has interacted with New Zealand Corrections (Y/N)
14.	Father has interacted with New Zealand Corrections (Y/N)

Table 3A: Independent variables – School type

Z_i: School type		
1.	Girls only school	(Y/N)
2.	Boys only school	(Y/N)
3.	State school	(Y/N)
4.	School isolation index	

Table 4A: Independent variables – School authority

A_i: School type		
1.	State	(base)
2.	State-Integrated	(Y/N)
3.	Private	(Y/N)

Table 5A: Dependent variable – Tertiary education outcomes

Y_i: **Tertiary education outcomes**		
1.	Progression into tertiary education one year after graduation	(Y/N)
2.	Progression into tertiary education three years after graduation	(Y/N)
3.	Progression into tertiary education five years after graduation	(Y/N)
4.	Progression into tertiary education seven years after graduation	(Y/N)
5.	Completion of tertiary education qualification one year after graduation	(Y/N)
6.	Completion of tertiary education qualification three years after graduation	(Y/N)
7.	Completion of tertiary education qualification five years after graduation	(Y/N)
8.	Completion of tertiary education qualification seven years after graduation	(Y/N)

Section 4A: Distribution of school performance equation

Equation 1: Restricted – Unadjusted regression annotated

$$\underbrace{Y_i}_{\substack{Tertiary\ Education\\ Outcomes}} = \underbrace{\beta_0}_{\substack{Student\\ constant}} + \underbrace{\beta_5 D_i}_{\substack{School\\ Contextualised\\ value-added}} + \underbrace{\epsilon_i}_{\substack{Random\\ error}}$$

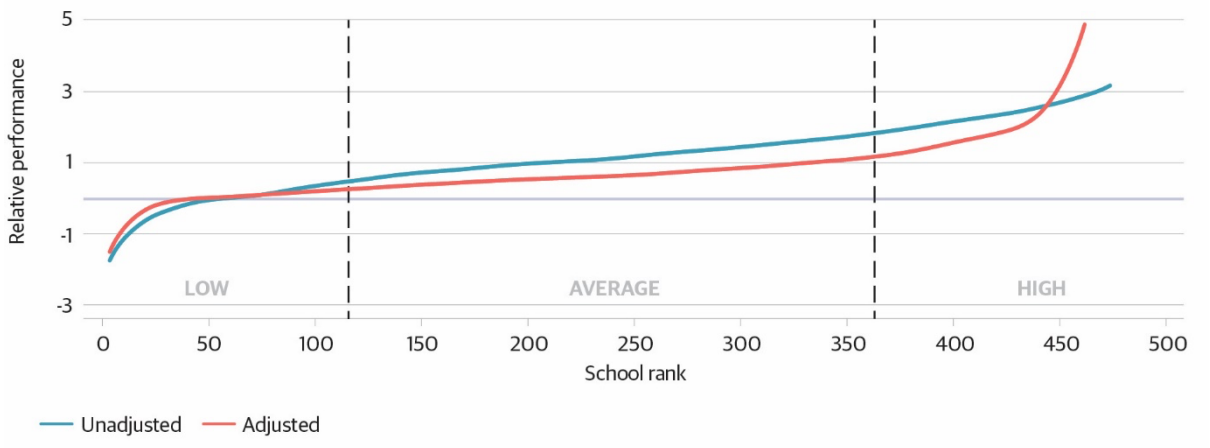
Equation 2: Unrestricted – Adjusted regression annotated

$$\underbrace{Y_i}_{\substack{Tertiary\ Education\\ Outcomes}} = \underbrace{\beta_0}_{\substack{Student\\ constant}} + \underbrace{\beta_1 T_i}_{\substack{Time\\ effects}} + \underbrace{\beta_2 X_i}_{\substack{Student\\ effects}} + \underbrace{\beta_3 W_i}_{\substack{Parent\\ effects}} + \underbrace{\beta_4 Z_i}_{\substack{School\\ type\\ effects}} + \underbrace{\beta_5 D_i}_{\substack{School\\ Contextualised\\ value-added}} + \underbrace{\epsilon_i}_{\substack{Random\\ error}}$$

Section 5A: Distribution of school performance

In the Initiative's second report on school evaluation, *In Fairness to our Schools*, we created three performance categories (low, average and high) based on the distribution of school performance for all the secondary schools in New Zealand. Figure 1A shows this distribution.

Figure 1A: Unadjusted and adjusted performance of New Zealand secondary schools – UE attainment (2008–17)



Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Figure 1A shows both the unadjusted (blue) and adjusted (red) distribution of school performance. The unadjusted curve shows the distribution before our tool separated the contribution of family background, while the adjusted curve shows the distribution after. Each curve represents the individual 'contextualised value-added' scores for the approximately 480 secondary schools in New Zealand.[11]

In this report, the term 'contextualised value-added' describes each school's 'school-specific effect.' This 'contextualised value-added' score is *not* a 'value-added' score like that used in other countries such as Australia, the United States and the United Kingdom, which measures academic gains from the beginning of one period to the end of another.

Rather, this school performance tool attributes the residual effect to each secondary school after adjusting for the family background characteristics of each student. Section 2A of the Appendix states the functional form of the tool.

Both curves represent estimated school effects and have a level of uncertainty that we are unable to show in this figure. To account for this uncertainly, we created three broad categories low-, average-, and high-performing.

In practice, schools performing in the bottom 10% broadly perform below expectations, middle 80% as expected and top 10% above expectations. Expectations of school performance are based on the socioeconomic breakdown of their students. The exact weightings of specific socioeconomic factors are discussed in detail in *Separating School and Family*. For an in-depth discussion of our tool, see Chapter 3 in *In Fairness to Our Schools*.

Section 6A: Table's enumerator results for Figures 1–8

Table 6A: Progression into tertiary education one year after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	27	9	6	s	s
Average	66	81	87	78	51
High	s	3	3	6	30
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	9	12	15	12	3
Average	72	75	78	72	72
High	18	9	3	9	9

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 7A: Progression into tertiary education three years after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	24	12	6	s	s
Average	72	75	90	78	51
High	s	3	s	9	33
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	6	12	9	12	6
Average	78	75	84	69	57
High	9	6	s	3	24

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 8A: Progression into tertiary education five years after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	24	12	3	3	s
Average	69	75	93	75	51
High	s	s	s	9	36
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	6	12	12	9	3
Average	78	72	81	72	60
High	12	6	s	6	21

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 9A: Progression into tertiary education seven years after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	18	15	9	3	s
Average	72	75	87	78	54
High	s	s	s	6	30
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	6	12	15	9	3
Average	75	72	81	69	63
High	9	6	s	6	18

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 10A: Completion of tertiary education one year after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	s	s	3	9	33
Average	75	78	90	75	51
High	24	15	6	s	s
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	6	9	s	9	21
Average	72	69	90	75	57
High	18	15	3	6	6

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 11A: Completion of tertiary education three years after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	6	6	3	12	21
Average	75	75	87	69	63
High	18	12	3	6	3
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	12	9	3	9	12
Average	63	69	87	75	66
High	18	12	3	3	3

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 12A: Completion of tertiary education five years after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	21	15	3	6	s
Average	69	72	90	72	60
High	6	3	3	12	24
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	12	15	6	9	3
Average	66	63	87	75	72
High	18	15	s	6	9

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Table 13A: Completion of tertiary education seven years after graduation – unadjusted & adjusted results

Unadjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	21	15	6	3	s
Average	75	72	90	78	54
High	s	3	s	6	30
Adjusted					
	Decile				
	1–2	3–4	5–6	7–8	9–10
Low	12	15	9	9	s
Average	69	69	84	72	72
High	15	9	3	6	9

Source: Author's calculations from Statistics New Zealand's Integrated Data Infrastructure.

Endnotes

[1] Note that counts of 2 or less have been supressed under Statistics New Zealand's Microdata Output Rule 4.13.2 and the security and confidentiality provisions of the *Statistics Act 1975*. Statistics New Zealand, "Microdata Output Guide" (5th edition) (Wellington: New Zealand Government, 2020).
[2] Yugo Nakamura, "A primer on value-added models: Towards a better understanding of the quantitative analysis of student achievement," Dissertation in fulfilment for Doctor of Philosophy, University of Washington (2013).
[3] Joel Hernandez, "In Fairness to Our Schools: Better Measures for Better Outcomes" (Wellington: The New Zealand Initiative, 2019).
[4] Joel Hernandez, "Insights and Excellence: School success in New Zealand" (Wellington: The New Zealand Initiative, 2020).
[5] To account for some of the issues of NCEA highlighted in "SCORE! Transforming NCEA Data," we used several other measures of NCEA, further discussed in our technical report *Separating School and Family*. Joel Hernandez, "Separating School and Family: Evaluating the Effects of School and Family Background on Student Performance in NCEA" (Wellington: The New Zealand Initiative, 2019). Also see Eric Crampton and Martine Udahemuka. "SCORE! Transforming NCEA Data" (Wellington: The New Zealand Initiative, 2018).
[6] Where graduation year is defined at year 13. However, students who entered a tertiary education institute before year 13 are also included.
[7] Note that students enrolled in NCEA level 3 in 2008 (and thus enrolled in NCEA level 2 in 2007) could have also been enrolled into a tertiary education institution in 2008.
[8] Source: [IDI_Clean_20200120].[moe_clean].[course]
[9] Source: [IDI_Clean_20200120].[moe_clean].[completion]
[10] Joel Hernandez, "In Fairness to Our Schools: Better Measures for Better Outcomes," op. cit.
[11] In this report, we use the term 'contextualised value-added' to describe the schools fixed-effect estimated for each secondary school in the country. This school 'contextualised value-added' score is *not* a typical 'value-added' score used in countries such as Australia, the United States and the United Kingdom.

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