THE EXPRESSION, EXPERIENCE AND TRANSCENDENCE OF LOW SKILLS IN AOTEAROA NEW ZEALAND

READING AND MATHEMATICS SKILLS AND THE LIFE-COURSE OUTCOMES OF YOUNG PEOPLE IN NZ

EVIDENCE FROM PISA AND LINKED ADMINISTRATIVE DATA

ABOUT THIS RESEARCH PROGRAMME

Over half a million adult New Zealanders live with low literacy and/or numeracy (L+N) skills, with a strong over-representation of Māori and Pacific peoples. This has significant economic and social costs, including increased risk of unemployment and poverty, detrimental effects on physical and mental well-being, and decreased social and political attachment.

This programme applies a mixed-method approach to the following research aims: to build a detailed population-wide picture of those with low L+N skills; analyse their life-course pathways and effectiveness of interventions with respect to a range of economic and social outcomes; forecast future changes in population skill level; and develop an understanding of the barriers and enablers that build resilience to risk, along with pathway to transcend low skills.

For further information about our programme and other outputs, see http://workresearch.aut.ac.nz/low-skills

RESEARCH PARTNERS

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Reading and mathematics skills and the life-course outcomes of young people in NZ: Evidence from PISA and linked administrative data

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Abstract

This paper examines the life-course trajectories of a cohort of NZ youth who participated in PISA 2009 when they were 15-years old by using linked administrative data to track their outcomes until 2020. PISA is a worldwide study that assesses key competencies of 15-year-old students, with a focus on reading, mathematics and science. This paper compares the outcomes of the nearly one-fifth of NZ students who were assessed at below Level 2 in either reading or mathematics (or both), which the OECD considers to be a 'baseline' level of proficiency, with those at or above this baseline.

It finds that students with low measured skills have less favourable outcomes in a number of areas. They have lower rates of participation in, and completion of, further education. They also have lower employment rates and average earnings, with labour market differences between the low-skills and above-baseline groups being particularly stark among women. Those in the low-skills group also have higher rates of hospitalisation and non-admitted secondary care events, as well as higher rates of criminal offending and convictions. Outcomes for Māori in both the low-skills and above-baseline groups are less favourable than those of their NZ European counterparts. For example, Māori with above-baseline skills have similar average earnings to NZ Europeans in the low-skills group.

Disclaimer

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers. These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit https://www.stats.govt.nz/integrated-data/.

The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

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Contents

1 Introduction

What is the relationship between young people's reading and mathematics proficiency at age 15 and their life-course outcomes? There is an established body of literature which examines the relationship between education and subsequent outcomes. While education and skill levels tend to be correlated, cognitive tests offer a more direct measure of skills than educational attainment measures, which, for example, do not account for the quality of education. Indeed, literature on the relationship between macroeconomic outcomes like economic growth and skills highlights the potential of improvements in skills to boost economic growth, and emphasises that skills are a more appropriate measure of human capital than educational attainment or years of schooling due to issues such as differences in educational quality (for example, OECD, 2010c; Hanushek and Woessmann, 2008).

While the relationships between education and individuals' subsequent outcomes and between skills and macroeconomic outcomes are established, there is less evidence on the relationship between skills and individuals' life-course outcomes, and the evidence that does exist is less definitive.

This paper uses measures of reading and mathematics skills of 15-year-old students using 2009 data for New Zealand from the OECD's Programme of International Student Assessment (PISA) linked to administrative data. While PISA is a cross-sectional survey, the ability to link NZ results to administrative data allows us to follow a cohort of young people and track their outcomes for 11 years until they are about 26 years old. We examine a number of dimensions including educational, labour market, health, family formation and justice outcomes.

The relationship between education and later outcomes is well established in the literature. This literature includes analysis that uses instrumental variables such as policy changes to increase the school leaving age and geographic proximity to college to make causal inferences (for example, Vuolo, Mortimer, and Staff, 2016; Clark and Royer, 2013; Card, 1999; Card, 1993). Prevailing evidence generally shows a positive effect of increased education on employment and earnings as well as other outcomes such as health. While our analysis examines associations and is therefore not causal in nature, the linking of PISA and administrative data provides a unique opportunity to gain insights into the life-course trajectories of young people with low reading and maths skills.

There is more limited evidence on the link between direct measures of skills and life outcomes, with a focus on labour market outcomes. Polidano and C. Ryan (2017) is perhaps the most similar to the current paper, as it uses 2003 PISA data for Australia linked with the Longitudinal Survey of Australian Youth (LSAY) to track the employment outcomes of participants to age 25. It finds no association between employment rates (measured in LSAY) or earning capacity (measured by occupational categories in LSAY) and reading proficiency at age 15 (measured in PISA). However, the linkage rate between PISA and LSAY was not overly high (about 80 %), and sample attrition of LSAY by age 25 was high (75 %). This highlights a potential advantage of the use of administrative data over longitudinal surveys, as sample attrition as well as issues such as reporting bias, do not arise with administrative data. One of the only studies which, like the current study, links skill assessments to administrative data to track outcomes over time appears to be Antoni and Heineck (2012). This study links German Working and Learning in a Changing World (ALWA) survey data with administrative data on earnings and finds literacy and numeracy skills are positively related to earnings. Other international research mostly uses longitudinal studies of youth rather than skill assessments linked

to administrative data and find a positive relationship between skills and employment and/or earnings (for example, Antoni and Heineck, 2012; Vignoles, De Coulon, and Marcenaro-Gutierrez, 2011; Dougherty, 2003; Green and Riddell, 2003; Ishikawa and D. Ryan, 2002; McIntosh and Vignoles, 2001).

From a policy perspective, the OECD's Better Life Initiative and the Treasury's Living Standards Framework both emphasise the importance of skills to wellbeing. Within the Better Life Initiative, skills and education are highlighted as important indicators to measure and understand due to the links between skill levels and wellbeing across a variety of dimensions, such as health, civic participation and economic outcomes (for example, see OECD, 2020; OECD, 2017). In a similar vein to the Better Life Initiative, the NZ Treasury's Living Standards Framework also emphasises the importance of education and skills, and includes 'Human capital' as one of its four capitals, alongside natural, social and financial/physical capital. It uses a broad definition of human capital as the "capabilities and capacities of people to engage in work, study, recreation, and social activities" and states that it includes "skills, knowledge, physical and mental health" (New Zealand Treasury, 2019, p. 4). This report, therefore, looks at the relationship between skill levels, with a particular focus on reading and mathematics skills, and a wider set of outcomes beyond just labour market consequences.

2 Background

2.1 PISA survey and skill levels

PISA is a worldwide study to evaluate educational systems by assessing key competencies of 15-year-old students, with a focus on reading, mathematics and science. It aims to measure students' capacity to apply their knowledge in real-life settings and solve problems in a variety of situations (OECD, 2010b). PISA started as an initiative of the OECD in 2000, and is administered every three years. Initially, 32 countries/regions took part, with participation expanding to 88 countries/regions in 2022. In 2009, 4,643 students from 163 schools participated in New Zealand. Students and schools were randomly selected to ensure that the sample was representative (Telford and May, 2010).

Based on all questions in the reading assessment, PISA 2009 provides an overall reading literacy scale that is divided into seven proficiency levels from Level 1b (the lowest level) to Level 6. Each level is associated with tasks that describe the skills and knowledge needed to achieve them. For example, at Level 2 some tasks "require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions. Others require recognising the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is not prominent and the reader must make low level inferences" (OECD, 2010b, p. 84). The OECD considers Level 2 to be a baseline level of proficiency that enables students "to participate effectively and productively in life" (OECD, 2010b, p. 13). Across OECD countries, according to PISA 2009, 81.2 % of students can perform tasks at least at Level 2, while only 0.8 % reach the highest level (OECD, 2010b).

Similar proficiency levels summarise the student performance in mathematics. Here, students at Level 2 "can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures, or conven-

tions. They are capable of direct reasoning and literal interpretations of the results." (OECD, 2010b, p. 130). Again, the OECD describes Level 2 as a baseline level of proficiency (OECD, 2010b). The share of students who are proficient at Level 2 is lower than in the case of reading, with about 78 % being assessed at Level 2 or higher across OECD countries (OECD, 2010b).

Throughout this paper, students whose measured PISA proficiency is less than Level 2 in mathematics or reading (or both) are referred to as students with low skills. This is consistent with the OECD's categorisation of student performance into top, strong, moderate and lowest performers, with this last group being those who are proficient below Level 2 (OECD, 2010b). They are compared to the residual group of students with skills above the baseline level.

While this provides a useful reference point, it is important to recognise that the limitations of this approach. Specifically, PISA was administered only in English in NZ, which raises the possibility that the PISA assessment may not reflect the true reading and mathematics skills of students whose first language is not English (noting that the mathematics assessment also requires English reading ability to interpret the questions). More generally, PISA only measures certain skills and the partiality of the notion of skills used in international tests such as PISA is in contrast to the diversity of skills used by people in their lives (Cochrane, Erwin, et al., 2020).

In addition, while the approach of examining one cohort offers advantages, it also has some limitations. Following a cohort of young people in the same age group over time has the advantage that they all face the same macroeconomic conditions. However, a potential disadvantage is that the cohort being investigated may not be representative of other cohorts. One particular issue for the PISA 2009 cohort may be the effect of the global financial crisis (GFC). The GFC meant that these individuals were facing tough economic conditions when they were in their last years of secondary school, and some of them would have been entering the workforce during a downturn. The timing may have particularly impacted the low-skills group, who would have been more likely to enter the workforce straight from school rather than going on to tertiary education (discussed in Section 4.1). By the time those in the cohort who went to university would have been finishing their bachelor's degree (about 2015 or 2016), the economic conditions were much improved. Therefore, any difference in outcomes between the low-skills and above-baseline group may also partly reflect differences in economic conditions when they entered the labour market. Research highlights that entering the labour market during an economic downturn can have long-term negative consequences for employment and earnings outcomes, with these consequences being greater for those with low-education levels, which, as will be shown, is correlated with low-skill levels (see Borland, 2020, for a recent review of the literature). Further, Dasgupta and Plum (2022) find that adults with low literacy and numeracy skills in New Zealand experienced the largest wage falls when changing employer during the GFC.

2.2 NZ's PISA results in international comparison and over time [1]

NZ performed well in PISA 2009 relative to other OECD countries. NZ's mean reading proficiency score was 520.9, placing it fourth in the OECD behind Korea, Finland and Canada. NZ's performance in mathematics was somewhat lower, with a score of 519.3, placing it seventh in the OECD behind Korea, Finland, Switzerland, Japan, Canada and the Netherlands. One feature of NZ's performance that these mean scores hide is that the distribution of NZ's scores were wide, with relatively high shares of low-performing and high-performing students. This is reflected in the share of students who were below Level 2 in reading (the blue bars in Figure 1). While NZ ranks fourth in terms of the mean reading score, it ranks only eighth in terms of the percentage of students below Level 2 proficiency. About 14.3 % of students were below Level 2 in reading, with Korea, Finland, Canada, Estonia, Japan, Australia and the Netherlands having a lower percentage of students who fall below this baseline. At the other distribution, at about 15.7 %, NZ also had the highest share students who score at Level 5 or above of any OECD country.

While this paper focuses on the 2009 PISA cohort, it is concerning that NZ's PISA performance has fallen over time in both absolute and relative terms. NZ's mean reading score had fallen from 520.9 in 2009 to 505.7 in 2018, with its ranking dropping from fourth to eighth in the OECD. The fall in mathematics has been even more marked, with the mean score falling from 519.3 to 494.5, and the ranking falling from seventh to 22nd, behind Latvia, France and Iceland, and just ahead of Portugal. Similarly, the share of students below Level 2 in reading has increased from 14.3 % in 2009 to 19.0 % in 2018, and from 15.4 % to 21.8 % for mathematics (comparing the blue bars for 2009 to the grey diamonds for 2018 in Figure 1). Assuming the differences in outcomes between low- and above-baseline skills groups that will be presented in Section 4 hold for later cohorts, these gaps are more concerning in light of the fact that the relative size of low-skills group has increased over time.

An additional concern for NZ is that despite high overall PISA results in 2009, the strength of the relationship between performance and socio-economic background is relatively strong (Figure 2). In contrast to NZ, other countries with above-average performance also have a below-average impact of socio-economic background on performance, such as Korea, Finland, Canada, Japan and Australia. Indeed, OECD (2010a) highlights that NZ and Belgium are the only two countries with average performance that is well above the OECD mean and large socio-economic inequalities.

[1] This section is based on published data using all NZ PISA participants rather than those who are linked to the IDI in order to compare NZ's results over time and to other countries. Therefore, the numbers may not be exactly the same as those in other sections of this paper, which are based on PISA participants who are linked to the IDI. See Section 3 for details.

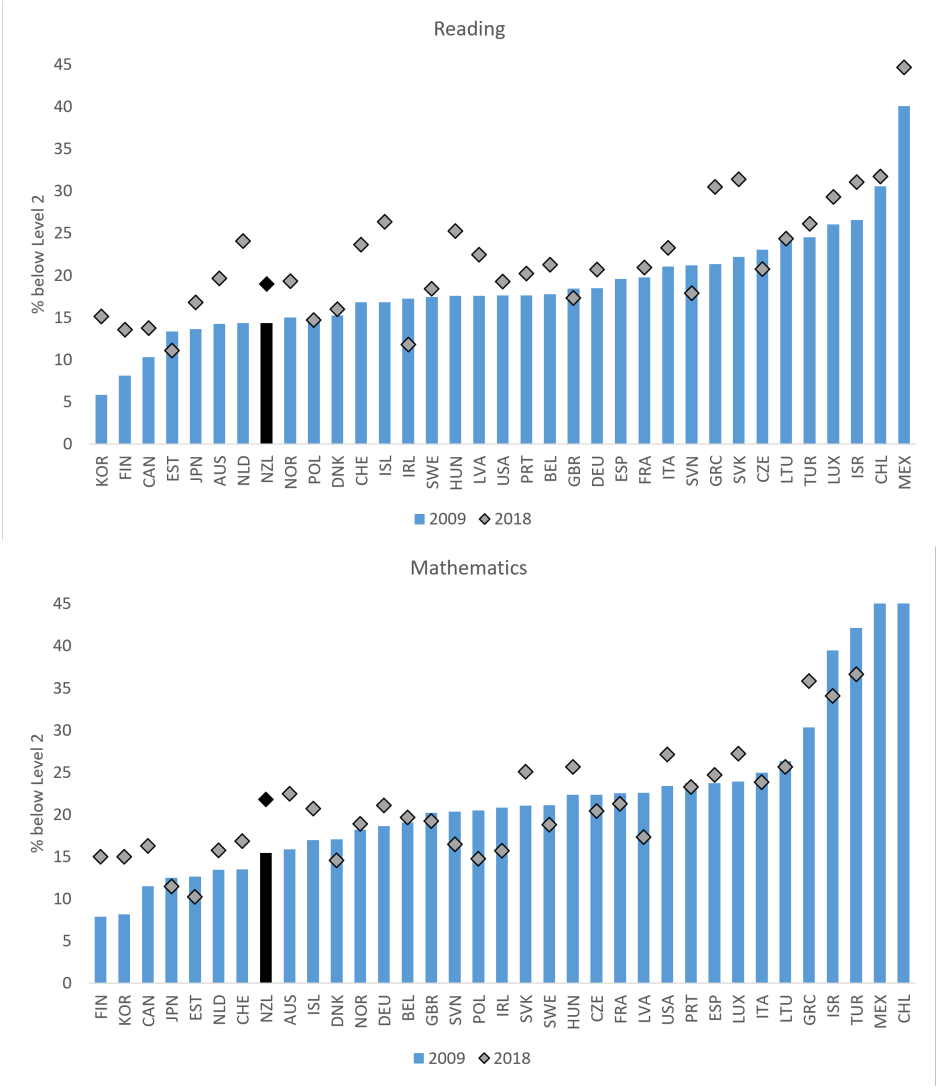

Figure 1: Percentage of students scoring below Level 2
Source: OECD (2019)

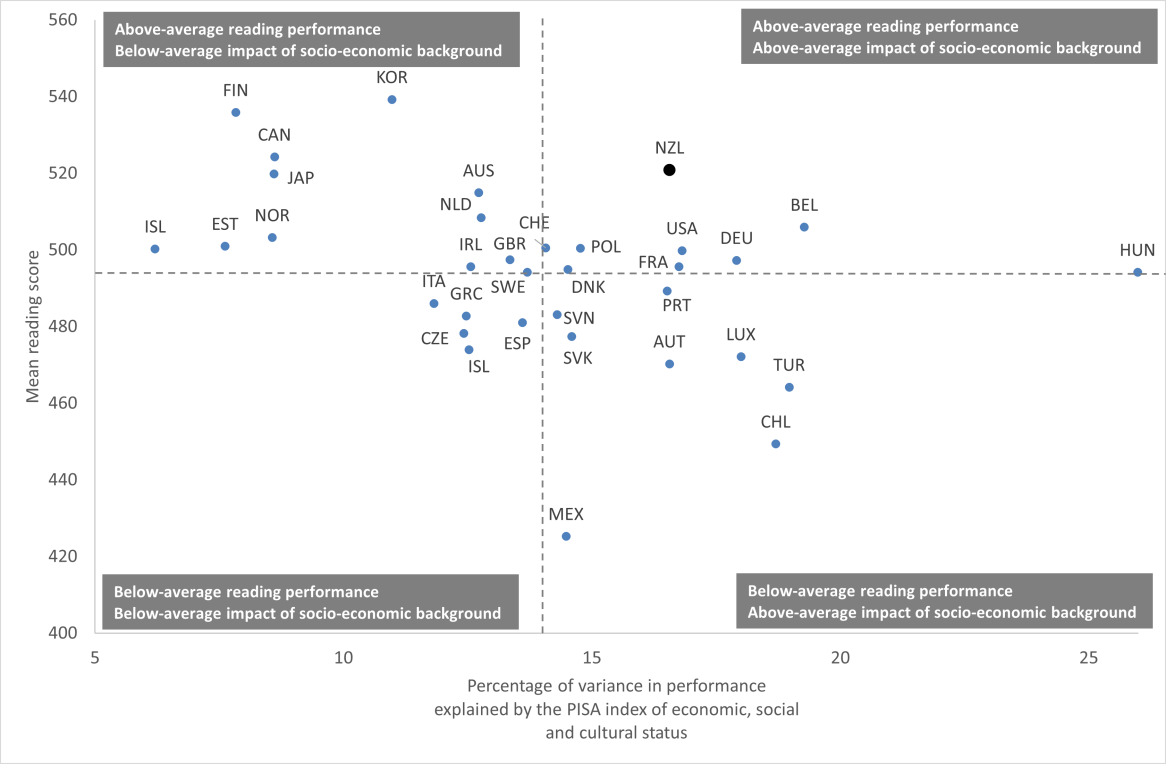

Figure 2: Strength of socio-economic gradient and reading performance

Source: OECD (2010a)

3 Data and method

This section outlines the data used and defines our population of interest. It then provides a descriptive portrait of this population.

3.1 Data

The Integrated Data Infrastructure (IDI) is a large research database managed by Stats NZ. It holds micro-data from various government agencies, organisations, and surveys with information on education, income, health and other life events. Stats NZ links the data so that records from all sources can be assigned to the person they belong to, and de-identifies it before it is made available for researchers (Stats NZ, 2020b).

The IDI includes the New Zealand data from PISA 2009. We can, therefore, follow the cohort of 15-year-olds who participated in PISA and study their outcomes using other data in the IDI until 2020, when they are in their mid-20s. We use multiple data sources to construct a range of outcome variables. Information on educational enrolment and attainment comes from the Ministry of Education. Income data comes from Inland Revenue (IR) and data on births and marriages is sourced from the Department of Internal Affairs (DIA). We further use health-related information from the Accident Compensation Corporation (ACC) and the Ministry of Health (MoH), and information on crime from the Ministry of Justice (MoJ) and the NZ Police. Tables 10 and 11 in the Appendix provide details of the outcome variables of interest including their full descriptions.

The student proficiencies in PISA are reported in the form of plausible values (PVs). PVs are not test scores, but are rather random numbers drawn from the distribution of scores that could be reasonably assigned to each individual (OECD, 2012). Each student has multiple PVs for the same scale, which are derived from a student's answers to test and background questions using imputation methods (OECD, 2012). PISA 2009 provides five plausible values for mathematics and five for reading, which we use to estimate population parameters. PISA data also comes with sampling and replicate weights to account for the complex survey design when estimating population parameters. All our estimates use the Stata package Repest which accounts for both sampling weights and plausible values (Avvisati and Keslair, 2020).

3.2 Population of interest

Our population of interest is those who participated in PISA 2009 who can be linked to other data in the IDI. The vast majority (94 %) of the PISA 2009 participants are linked to the IDI, representing more than 51,700 15-year-old students in New Zealand.[2] This linkage rate compares favourably to international studies. For example, Polidano and C. Ryan (2017) has about an 80 % linkage rate between PISA 2003 and the Longitudinal Survey of Australian Youth. Within the population of linked students, 19 % have low skills, meaning they were assessed to be below Level 2 in either reading or mathematics (or both).

[2] Students are aged between 15-years-3-months and 16-years-2-months when participating. For brevity, we refer to all students as '15-year-olds' in 2009.

Given that PISA is designed to be representative of the population of 15-year-olds in 2009, we examined whether the 6 % of those who could not be linked to the IDI were different to the population that could be linked. Based on PISA information, Table 9 in the Appendix shows that being born in New Zealand is positively associated with a link to the IDI. In terms of ethnicity, NZ European students are more likely to be linked while Asian students are less likely to be linked. The remaining differences between linked and not linked PISA participants are not statistically significant.

To compare students' outcomes over time, we construct an annual dataset of young people living in New Zealand in a given calendar year from 2009 to 2020. The use administrative data means that, in contrast to existing research that uses longitudinal surveys to track young people over time, sample attrition is not an issue. For example, Polidano and C. Ryan (2017) reports a 75 % sample attrition rate by age 25 for the Longitudinal Survey of Australian Youth. However, we do exclude people from our population of interest if they died over the examined period or if they spent more than 100 days of the given year abroad. The exclusion of those living abroad is necessary as information such as earnings based on IR records would be misleading for this group. Figure 3 summarises this exclusion from the population of interest over time by skill group. In both groups, the share of excluded individuals increases as the population ages, peaking at 16-19 % in 2019. Exclusion from the population of interest is mainly driven by youth moving overseas, while the number of deaths is negligibly small in both groups. The smaller share of excluded students in 2020 is likely attributable to the COVID-19 pandemic, which severely limited international travel. The above-baseline skills group appears to have a slightly higher likelihood of moving overseas and therefore being excluded from the population from 2016 (age 22) onwards, but the difference is not statistically significant.

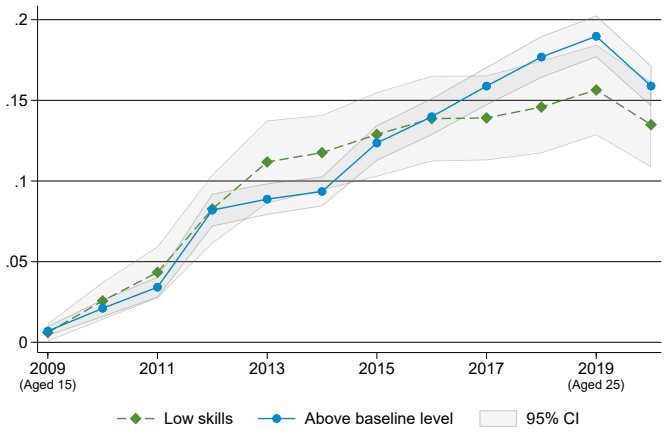

Figure 3: Share of individuals excluded from the population of interest

3.3 Student characteristics

Table 1 summarises the characteristics of our population of interest by skill group using PISA 2009 data. Females are underrepresented among those with low skills - about 40 % of students with low skills are female, compared to 51 % of students with above-baseline skills. Students with low skills are also more likely to have been born in New Zealand and be of Māori or Pacific Peoples ethnicity. These differences are consistent with Telford and May (2010), who provide a more detailed analysis of New Zealand's student performance using PISA 2009 data. They show that there are similar proportions of girls and boys at the lowest levels of mathematics proficiency, but many more boys do not reach Level 2 in reading. They also document the over-representation of Māori and Pacific students at lower levels of reading and mathematics proficiency.

Students' skills are correlated with parental characteristics. Parents of students with low skills have, on average, 0.78 fewer years of schooling and a lower occupational status compared with parents of students with a higher skill level.[3] Assuming that students' skills and educational achievement are correlated (which we analyse below), this difference is consistent with the large literature on the inter-generational transmission of education (Black and Devereux, 2011).

Table 1: Student characteristics by skill group

	(1) Low skills	(2) Above baseline	(3) Difference	(4) p-value
Female	0.40	0.51	-0.11	0.000
Born in NZ	0.76	0.80	-0.04	0.044
Socioeconomic status (ESCS)	-0.43	0.21	-0.64	0.000
Ethnicity				
NZ European	0.33	0.66	-0.32	0.000
Māori	0.31	0.15	0.16	0.000
Pacific Peoples	0.20	0.05	0.15	0.000
Asian	0.11	0.12	-0.01	0.369
Other	0.02	0.02	0.00	0.895
Highest parental				
Education in years	12.37	13.15	-0.78	0.000
Occupational status	42.51	54.35	-11.84	0.000

Notes: This table compares average characteristics of students with low skills (Column 1) and those with above-baseline skills (2). Column 3 shows the difference between skill groups, Column 4 shows the p-value testing the equality of the two means. The number of observations is 3,972 for highest parental education, 4,182 for parental occupational status because of missing information, and 4,356 for the remaining characteristics. ESCS is a standardised measure of socioeconomic status based on parents' highest occupational status, parents' highest educational level, and home possessions (see Avvisati, 2020).

[3] PISA measures occupational status using the 'International Socio-Economic Index of occupational status (ISEI)' developed by Ganzeboom, De Graaf, and Treiman (1992).

4 Results

This section tracks the outcomes of our population for 11 years after they participated in PISA at 15-years-old in 2009. We examine educational, labour market, family formation, health and criminal activity outcomes.

4.1 Education

We use Ministry of Education data within the IDI to examine a number of educational outcomes. As discussed in Section 3.2, our population of interest excludes those who are overseas for more than 100 days in a given year and only NZ educational outcomes are examined due to data availability. We examine both educational enrolment and attainment over time. For more information on how these outcome variables are defined and the IDI data sources, see Table 10 in Appendix A.

It is useful to start with some context of the NZ educational system to aid the interpretation of the results in this section. PISA participants would have generally been in Year 11 when they took part in the survey. Students typically begin formal school qualifications in Year 11 with the National Certificate of Educational Achievement (NCEA) Level 1. The final year of school is Year 13, when students would generally attempt NCEA Level 3. Students must achieve a specified NCEA result to gain University Entrance (UE). UE is the minimum requirement to go to a New Zealand university, although some university courses have more competitive entry criteria.

We first examine enrolment in education in Figure 4. The left-hand panel shows the share of PISA participants who are enrolled in any schooling, education or training over time. In 2009, when the cohort participated in PISA, 100 % are enrolled in some form of schooling or training. This is as expected since only those who are enrolled in school at the time PISA was administered are included in the survey. A year later, the vast majority are still enrolled in school, education or training, which is also as expected given the compulsory schooling age in NZ is 6-16 years, and many of the PISA participants would have still been 16 in 2010. The share in any schooling or training starts to fall in 2011, when the participants are about 17 years old. However, it remains above 20 % even in 2020, when the participants are 26 years old. This reasonably high share likely reflects the fact that any schooling, education or training can be anything from full-time university study to short vocational courses. Two years after PISA is also the point when differences between the low skills group and the above-baseline comparison group become apparent, with a higher share of those in the above-baseline group being enrolled in education. This gap increases over the next few years, reflecting that the above-baseline group are more likely to continue into higher education than the low-skills group. This difference starts to shrink in 2015 when participants are about 21 years old, which aligns with the age at which many in the above-baseline group may be finishing tertiary education (e.g. a three-year bachelor's degree). By 2018, at age 24, there is no statistically significant difference between the two groups.

The right-hand panel of Figure 4 compares the two skill groups based on the outcome indicator of enrolment in a bachelor's degree. As expected, this shows a more stark difference between the low-skills and above-baseline groups. In 2012, which for most participants would have been the year after they finished secondary school, the share of those in the above-baseline group enrolled in a

bachelor's degree is over 40 %, with the share peaking at over 45 % in 2013 and 2014. In comparison, less than 10 % of the low skills group are enrolled in a bachelor's degree in 2012, and just over 10 % in 2013 and 2014.

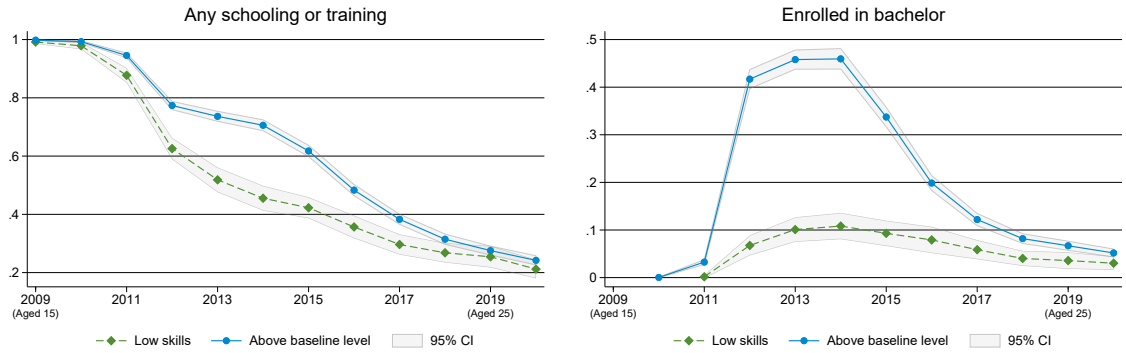

Figure 4: Enrolled in any education or training (left) and bachelor (right)

Turning from indicators of enrolment to educational attainment measures, the left-hand panel of Figure 5 shows the cumulative share of PISA participants who have attained a New Zealand Qualifications Framework (NZQF) Level 3 qualification over time. The NZQF has 10 levels: certificate levels 1-4, diplomas level 5-6, bachelor's degree and graduate diplomas and certificates level 7, postgraduate diplomas and certificates and bachelor honours degree level 8, master's degree level 9, and doctoral degree level 10. The typical progression would be for an individual to attempt NCEA Level 3 in their last year of secondary school, when they are about 17 years old in 2011. Indeed, the majority of the above-baseline skills group (about 60 %) have attained a Level 3 qualification (likely NCEA Level 3 for most) by the end of 2011, with this share increasing gradually over time before levelling off at just over 80 %. In contrast, just over a fifth of those in the low-skills group have achieved a Level 3 qualification by 2011, and by 2020, less than 60 % had achieved a Level 3 qualification. Thus, while 60 % of the above-baseline group obtain a Level 3 qualifications by 2011, when most will have been in Year 13, the low-skills group have not reached 60 % having achieved a Level 3 qualification by 2020.

The right-hand panel of Figure 5 shows the cumulative share of PISA participants who have attained a Level 7 qualification or higher (i.e., a bachelor's degree or higher) over time. By 2014 (age 20), a sizeable minority of the above-baseline group had completed a Level 7 or above qualification compared with a very small share of those in the low-skills group had. By 2020 (age 26), just over 10 % of those in the low-skills group had completed a bachelor's degree or higher, versus about 45 % of the above-baseline group.

Table 2 provides some additional education measures. The majority of both the low-skills (80 %) and above-baseline groups (88 %) have enrolled in tertiary education at some point between 2009 and 2020. However, the above-baseline group are much more likely to have enrolled in a bachelor's degree than the low-skills group (55 % versus 17 %), while the low-skills group are more likely to have enrolled in industry training (35 % versus 28 % of the above-baseline group) and targeted training (41 % versus 18 % of the above-baseline group). In terms of educational attainment, 80 % of the low-skills group have attained at least a Level 2 qualification versus 94 % of the above-baseline group. The differences are more stark at higher qualification levels, with the above-baseline group being

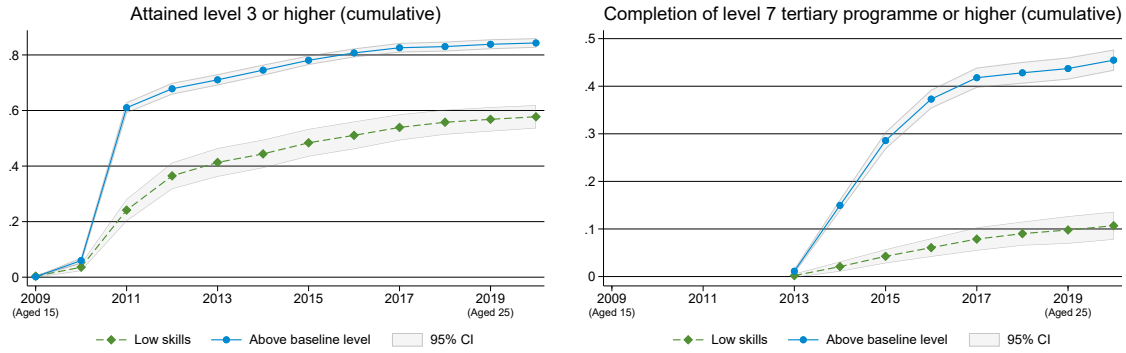

Figure 5: Educational attainment

almost five times more likely to have gained university entrance and more than four times as likely to have completed a bachelor's degree.

Despite these discrepancies by skill level, some students with low-skills still gained university entrance (11 %) and completed a bachelor's degree (9 %). This suggests that while skills, as measured by PISA, matter, they are not entirely deterministic of future educational outcomes. A potential area for future research is to investigate the characteristics and educational history of these individuals to understand what factors may be helping them to achieve higher educational outcomes than most of their low-skilled peers. For example, it may be that extra assistance, such as school interventions, helped them lift their cognitive skills and academic performance over their last years at secondary school. It would also be interesting to explore whether university entrance and bachelor's degree qualifications are protective for people with low skills at age 15 across the various outcomes examined in this paper, or whether some disadvantage persists.

Table 2: Educational enrolment and attainment

	(1) Low skills	(2) Above baseline	(3) Difference	(4) p-value
Ever enrolled in				
Tertiary education	0.80	0.88	-0.08	0.000
Bachelor	0.17	0.55	-0.38	0.000
Industry training	0.35	0.28	0.07	0.002
Targeted training	0.41	0.18	0.23	0.000
Educational attainment				
Level 2 or higher	0.80	0.94	-0.14	0.000
Level 3 or higher	0.56	0.82	-0.27	0.000
Level 4 tertiary programme or higher	0.29	0.59	-0.30	0.000
University entrance attained	0.11	0.52	-0.41	0.000
Completion of bachelor programme	0.09	0.40	-0.31	0.000

Notes: This table compares average outcomes of students with low skills (column 1) and those with above baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means. N=4356.

Figure 6 presents bachelor's degree enrolment by gender and Table 12 in Appendix A provides additional information by gender. This highlights that low-skilled women are much more likely than low-skilled men to enrol in and complete a bachelor's degree (3.6 and 4 times more likely respectively). While women with above-baseline skill levels are also more likely to enrol in and complete a bachelor's degree than above-baseline men, the difference is much smaller (1.4 and 1.7 times re-

spectively). This may, at least in part, reflect that more female-dominated occupations require bachelor's degree qualifications, such as nursing and teaching, than male-dominated occupations such as trades.

Similarly, Figure 6 presents bachelor's degree enrolment by ethnicity and Table 13 in Appendix A provides additional information by ethnicity. A comparison of NZ Europeans and Māori with above-baseline skills shows stark educational differences. NZ Europeans with above-baseline skills are much more likely to enrol in and complete a bachelor's degree than Māori with above-baseline skills (about 1.5 and 1.9 times respectively). There are similar, but less pronounced differences between above-baseline NZ Europeans and Pacific Peoples (about 1.1 and 1.3 times respectively). For students with low skills, the differences between ethnic groups are substantially smaller. 14 % of NZ Europeans with low skills enrol, and 8 % complete a bachelor programme. This compares to 12 % and 6 % for Māori, and 15 % and 5 % for Pacific Peoples with low skills.

The relatively low educational attainment among above-baseline Māori could partly reflect lower expectations of Māori students. For example, research finds that teachers are more likely to underestimate the abilities of Māori students compared with students of other ethnicities, that teachers and schools have lower expectations of Māori students and that Māori students perceive their schools to have lower academic aspirations for them than their NZ European peers (Hynds, Averill, Hindle, and Meyer, 2017; Rubie-Davies and Peterson, 2016; Rubie-Davies, Hattie, and Hamilton, 2006). In addition, Meehan, Pacheco, and Pushon (2019) find that the bachelor's degree participation gap between Europeans and Māori cannot be fully explained by observable factors such as prior school performance, socioeconomic status and parents' educational attainment, whereas the European-Pacific Peoples gap can be entirely explained by these factors. It may also partly be due to the average PISA scores of above-baseline Māori being lower than NZ Europeans.

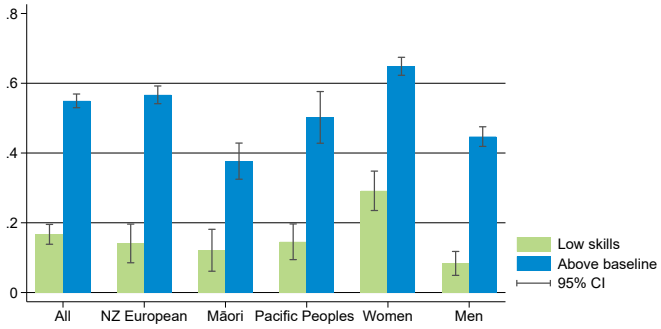

Figure 6: Share of young people who ever enrolled in a bachelor's degree

4.2 Labour market

We next examine several labour market outcomes. The importance of skills to labour market success has been increasingly highlighted in the context of the future of work. Beginning in the late 20th century alongside the introduction of computers and the internet, technological change was even more favourable to individuals with higher skills than in earlier time periods. Middle-income roles carrying out routine and predictable tasks have been increasingly automated, leading to a trend described as 'job polarisation' (Autor, Levy, and Murnane, 2003). In contrast to several other developed countries, job polarisation has not been apparent in the NZ labour market to date. However, the employment share of both low- and middle-income occupations has declined, while the share of high-income occupations has increased (New Zealand Productivity Commission, 2020). While it is unknown how technological changes will impact the returns to skills in the future, those with greater skills will be more able to adapt and meet future labour market challenges, a sentiment echoed by the Productivity Commission's inquiry into technology change and the future of work (New Zealand Productivity Commission, 2020).

We first look at employment and occupational outcomes before turning to earnings. Employment and earnings is based on IR tax data, which is available on a monthly basis in the IDI. A limitation of IR data is that it does not include hours information for the time period under study. Therefore, we focus on months employed and total earnings without any adjustment for hours employed. Since women work, on average, fewer hours than men and there are relatively less women in the low-skills group, this inability to adjust for hours may, therefore, result in an underestimate of the earnings gap between the low-skills and above-baseline groups. Therefore, we also present some results separately for men and women. Moreover, we can only observe whether or not a person is employed, and we cannot observe the reasons why they may not be in employment. For example, we do not know if it is due to being unemployed or because they are not in the labour force due to childcare responsibilities. Indeed, we expect that the earnings trajectories of men and women will differ since parenthood has, on average, a different effect on the employment and earnings of men versus women. For example, Sin, Dasgupta, and Pacheco (2018) finds that most women are out of paid employment for a considerable length of time after becoming parents and upon returning to employment, mothers experience a decrease in earnings, while the employment and earnings of fathers do not fall.

Occupation information comes from the 2018 Census, when the PISA participants were about 24. As such, the linkage rate is lower than the overall IDI linkage rate due to factors such as individuals needing to be present in NZ on Census night. In addition to providing information for only one point-in-time, it is based on a more limited sample of those who are in PISA and can be linked to the 2018 Census. Furthermore, occupation is only asked of those who worked in the week prior to the Census. It should also be noted that occupation information in the Census 2018 was deemed to be of poor quality by the external data quality panel and of moderate quality by Stats NZ.[4]

In addition to employment and earnings, we also examine NEET status (not in employment, education or training) and benefit receipt. NEET is based on employment information from IR and

[4] See https://www.stats.govt.nz/methods/data-quality-ratings-for-2018-census-variables (accessed on 22 June 2022) for details.

education and training information from the Ministry of Education. An individual is NEET if they have no earnings and are not enrolled in education in a given year. Benefit receipt is based on Ministry of Social Development data and measures whether or not the person received a main benefit at any point in a given year.

Employment

We first examine employment outcomes. Using monthly IR data, we define an individual to be employed if they have positive earnings in any month of the given year. To capture intensity of employment we also examine how many months of the year the individual was employed.

The left-hand panel of Figure 7 shows that, as expected, the employment rate for both the low-skills and above-baseline groups increases over time, as young people complete their education and move into the labour market. In 2009, about 30 % of the PISA cohort were employed - that is, they had positive earnings in at least one month of the year. This is likely to be predominantly part-time employment while studying.

The employment rate of the above-baseline group is higher than the low-skills group throughout the 11 years examined. For the above-baseline group, the employment rate increases to just over 80 % by 2012, when the cohort are about 18 years old, and flattens off after reaching 90 % around three years later. It stays at about this level, with a slight dip in 2020, which may be (at least partly) due to the effects of the COVID-19 pandemic and the associated policy responses. For those with low skills, the employment rate is lower, and peaks in 2017 at just over 80 %, before falling slightly in 2018 and 2019, and dipping to below 80 % in 2020. Once again, this may be due to the effects of the pandemic. This may also suggest that COVID hit low-skilled youth harder than those with Level 2 or higher skill levels. However, the decrease is already evident before the pandemic in 2018 and 2019, which suggests there may also be other factors underlining this trend.

The right-hand panel of Figure 7 shows the number of months during a year that an individual was employed. The above-baseline group are employed for a higher average number of months in every year. However, unlike the left-hand employment figure, the gap between the low-skills and above-baseline group increases from 2016 onwards. The 2020 dip in employment is also evident in the number of months of employment, but the dip for the low-skills group is more evident than with employment. However, as with employment, the dip for the low-skills group begins before the COVID pandemic in 2019.

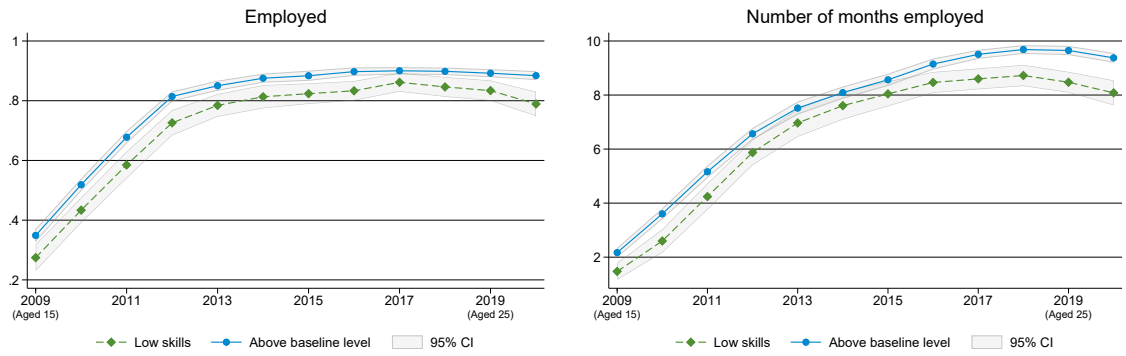

Figure 7: Employment indicators for full sample

Due to data limitations, we do not know the reasons for the lower employment rates among the low-skills group. One possibility is that unemployment rates are higher among the low skilled, which would be consistent with evidence that lower educated and skilled individuals have poorer employment outcomes. It may also be due to other factors, such as differences in family formation patterns and the opportunity costs of returning to work after having children (particularly for women). Therefore, we next decompose these results by gender. We also consider differences in patterns of family formation in Section 4.3.

Figure 8 shows that the employment differences between the low-skills and above-baseline comparison group reflects a much lower employment rate among low-skilled women compared with women in the comparison group. There is a much smaller difference between men in the low-skills group and men in the above-baseline comparison group. Figure 8 also shows that the dip in the employment rate in 2020 was stronger among women in the low-skills group than men in this group. This is consistent with other evidence that suggests women fared worse than men across key labour market measures during COVID-19. For example, the employment rate of women fell more than the employment rate among men, with women being more likely to work in industries affected by the COVID-19 policy response, such as tourism-related industries (Stats NZ, 2020a). There may also have been other factors at play that cannot be measured with the current data. For example, it could be that more women left paid employment due to care responsibilities as early childhood centres were closed or limited to children of essential workers and schools instigated online learning for much of 2020.

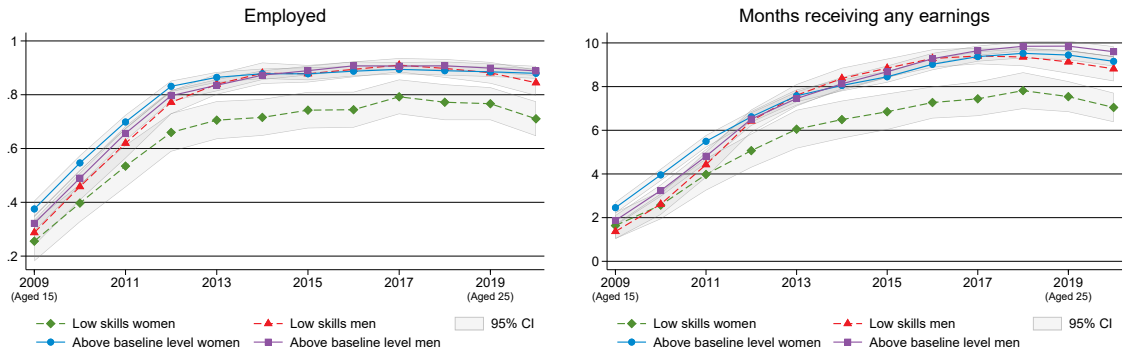

Figure 8: Employment indicators for men and women

Figure 9 shows the share of individuals who are employed in 2020 and also highlights these gender differences. The difference between employment among low-skilled men and the above-baseline group is small and not statistically significant. In contrast, the difference for women is large and statistically significant. Indeed, there is only a small difference between the employment rates of men and women for those with above-baseline skill levels, but low-skilled women are much less likely to be employed than low-skilled men.

Our overall results combining both genders contrast with those of Polidano and C. Ryan (2017), which uses 2003 PISA data linked to the Longitudinal Survey of Australian Youth (LSAY) to track the employment outcomes of Australian PISA participants at age 25. It finds no difference in full-time employment rates at age 25 between those with low-reading proficiency at age 15 and those with medium-reading proficiency. However, this could be because Polidano and C. Ryan (2017) uses low

reading proficiency rather than low reading and/or maths proficiency as we do here. Indeed, Polidano and C. Ryan (2017) does find that low proficiency in mathematics at age 15 is associated with a higher probability of full-time employment at age 25. It may also be due to a relatively lower linkage rate between PISA and LSAY (about 80 % versus 94 % in the present paper) and high sample attrition of LSAY whereby only 25 % of original 2003 respondents remained in the sample by age 25. In addition, the finding of Polidano and C. Ryan (2017) of no difference in employment rates is consistent with our current results of no statistically significant differences for men. However, while Polidano and C. Ryan (2017) includes gender as a control variable, it does not produce separate results for men and women.

Figure 9 also shows the differences in employment in 2020 by ethnicity. The above-baseline group has higher employment rates than the low-skilled group for NZ Europeans, Māori and Pacific Peoples, although the difference is not statistically significant in the case of Pacific Peoples. The employment gap between the low-skills and above-baseline group is larger for Māori than for NZ Europeans.

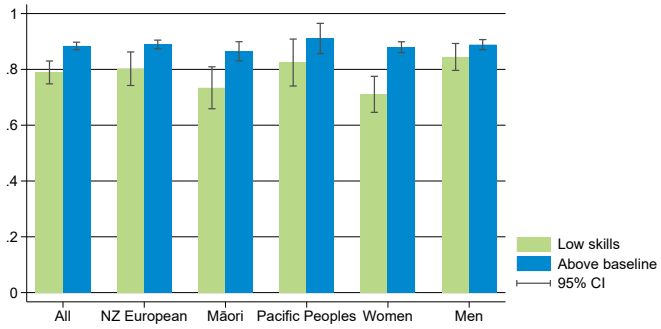

Figure 9: Share of young people employed in 2020

Occupation

Next, we examine occupational differences. This information comes from Census 2018, and therefore has a lower linkage rate than administrative data sources in the IDI.

Those in the low-skills group are more likely to be labourers and machinery operators and drivers than the above-baseline group. They are less likely to be professionals and clerical and administrative workers, which is as expected as these are the types of roles that require proficiency in the kind of reading and mathematics skills measured by PISA. Decomposing these results by gender reveals that there are some differences for women. Women with low skills are more likely to be labourers and sales workers and less likely to be professionals than women in the above-baseline group.

These results are consistent with Polidano and C. Ryan (2017) using 2003 PISA data for Australia. It finds that low reading proficiency is associated with lower occupational status at age 25, where occupation status measures the level of prestige or social desirability of an occupation, accounting for social standing of people employed in different occupations in addition to their earning capacity.

Table 3: Occupations

	All		Women		Men	
	(1) Low s.	(2) Above b.	(3) Low s.	(4) Above b.	(5) Low s.	(6) Above b.
Labourers	0.19*	0.07	0.14*	0.04	0.23*	0.11
Technicians and Trades Workers	0.16	0.13	0.05	0.06	0.22	0.20
Sales Workers	0.12	0.12	0.22*	0.13	0.07	0.10
Managers	0.12	0.11	0.08	0.09	0.14	0.12
Community and Personal Service Workers	0.12	0.11	0.20	0.15	0.07	0.08
Machinery Operators and Drivers	0.11*	0.04	0.01	0.01	0.17*	0.06
Professionals	0.11*	0.31	0.17*	0.37	0.08*	0.25
Clerical and Administrative Workers	0.07*	0.11	0.13	0.16	0.03*	0.07

Notes: This table compares average outcomes of students with low skills and those with above baseline skills for different groups of the population. * indicates that the difference between skill groups is statistically significant at the 5 % level. Occupational information for 1362 women and 1500 men comes from the 2018 census.

Earnings

We now examine earnings, based on IR data. Once again, we consider the low-skills group compared with the above-baseline group in total and then by gender. All earnings are measured in 2020 prices using the consumer price index to adjust for inflation.

The average earnings of those in the low-skills group are slightly higher than those in the above-baseline group when they are very young, likely reflecting that more of the low-skills group would have been working full-time while many of those in the above-baseline group would have studying and therefore not working or working part-time. However, those in the above-baseline group begin to out-earn their lower-skilled compatriots when they are about 22 years old. This roughly aligns with the education results presented in Section 4.1, whereby rates of study begin to fall at about age 21 for the above-baseline group as young people begin to complete their tertiary studies and enter the labour market. The earnings gap between these groups continues to grow over time, with the above-baseline group earning approximately 27 % more than the low-skills group by the time they are 25 in 2019. It is likely that this gap would continue to increase as the cohort enters their prime-earning years. Indeed, (Meehan, Pacheco, and Schober, 2022) follows adults with low literacy and numeracy skills (as measured by the OECD's Programme for the International Assessment of Adult Competencies) and this widening of the earnings gap by age between the low-skills and above-baseline groups is even more evident. This would also be consistent with international evidence. For example, Lin, Lutter, and Ruhm (2018) primarily using data from the US National Longitudinal Survey of Youth 1979 finds that labour market returns to cognitive skills rise with age.

More generally, the positive association between skills and earnings is consistent with international evidence. For example, Dougherty (2003) uses US data from the National Longitudinal Survey of Youth which provides test scores from the Armed Services Vocational Aptitude test and finds that numeracy skills are positively related to earnings both directly and through higher college attainment. McIntosh and Vignoles (2001) use data from the British National Child Development Study and UK International Adult Literacy Survey data and, focusing on the bottom-end of the skills distribution, finds that those with low skills are more likely to be employed than those with the lowest skill level, and if employed, earn more than those with the lowest level of skills. Similarly, Vignoles, De Coulon, and Marcenaro-Gutierrez (2011) use data from the British Cohort Study and National Child Development Study and find that literacy and numeracy skills are positively related to earnings at age 34.

Returning to our NZ results, it appears that earnings growth of the low-skills group slowed more than that of the above-baseline group during 2020. While this is possibly due to the COVID-19 pandemic and the associated policy response, it is not clear whether this is the case. First, the slowdown in earnings growth may at least partly reflect the natural earnings progression as earnings growth among the low-skills group had been progressively slowing for several years before the pandemic. In addition, Dasgupta and Plum (2022) finds that adults with low skills (as measured by the OECD's Programme of International Assessment of Adult Competencies, PIAAC) did not have slower wage growth than other adults during the COVID period in NZ, unlike the GFC, where low-skilled adults did have slower wage progression.

Decomposing this by gender once again highlights that the differences for women are larger. The

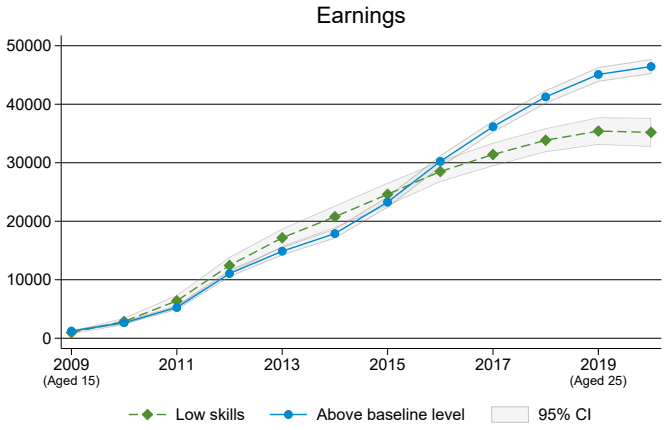

Figure 10: Earnings

left-hand panel of Figure 11 shows men in the low-skills group out-earn men in the above-baseline group until they are about 23 years old in 2017. After this point, above-baseline men have higher average earnings than low-skilled men, with the gap increasing over time. In contrast, low-skilled women have lower earnings than above-baseline women throughout the whole time period, with the gap widening from when they are about 21 years old in 2015.

Since part of this pattern for women may reflect the lower employment rates among low-skilled women (discussed above), the right-hand panel of Figure 11 examines earnings only for those who are working. This reveals a similar pattern as the left-hand panel. Low-skilled women earn a similar amount to above-baseline women until 2015, at which point a gap between the low-skilled and above-baseline group opens up and increases over time.

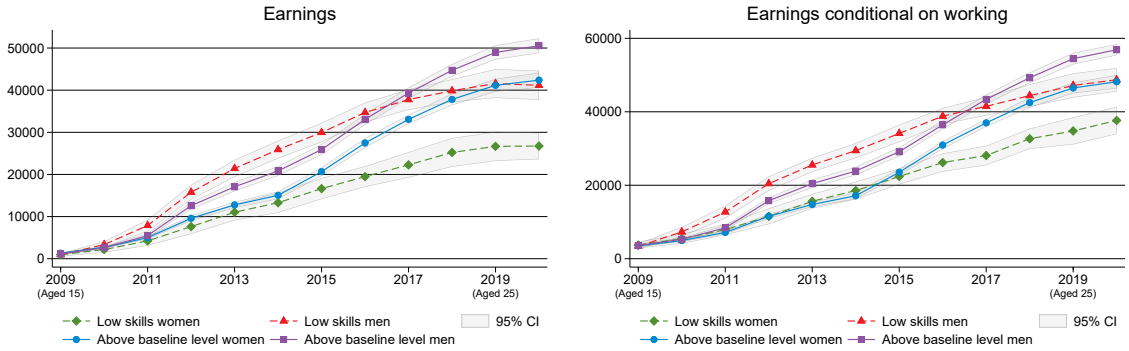

Figure 11: Earnings for men and women

These gender differences are also reflected in Figure 12, which shows average earnings in 2020 disaggregated by gender and ethnicity. Men with above-baseline skills have the highest average earnings, followed by women with above-baseline skills. Women with low skills have by far the lowest average earnings.

In terms of ethnicity, Figure 12 shows that above-baseline NZ European men have the highest average earnings. The average earnings of above-baseline Māori and Pacific Peoples are lower than those of above-baseline NZ Europeans, although the difference is not statistically significant in the case of Pacific Peoples. Indeed, the average earnings of NZ Europeans in the low-skills group are very

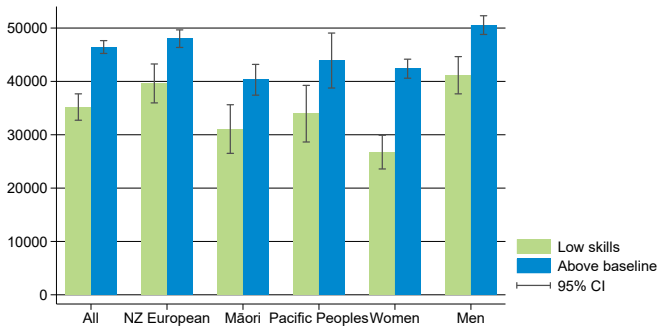

Figure 12: Average earnings in 2020

similar to the average earnings of Māori in the above-baseline group. Māori in the low-skills group have the lowest average earnings. The lower earnings of Māori and Pacific Peoples compared with NZ Europeans even within skill groups is consistent with existing research highlighting ethnicity pay gaps. For example, Cochrane and Pacheco (2022) find a pay gap between Europeans and Māori of about 19 % for men and 12 % for women, and 24 % for Pacific men and 15 % for Pacific women. For Māori, regardless of gender, approximately 70 % of their pay gap with Europeans can be explained by observable characteristics. In particular, individual and job-related characteristics; as well as educational attainment. Note that close to a third of the pay gap between Māori and Europeans could not be explained, despite the job characteristics accounted for in that analysis. For Pacific Peoples, the portion of the gap that could not be explained was even larger, 73 % and 61 % for men and women respectively.

These ethnicity and gender differences are also highlighted in international research. In particular, Ishikawa and D. Ryan (2002) uses US National Adult Literacy Survey and finds a positive association between basic skills and earnings. The study aims to differentiate between basic skills learned in school from those acquired post-school and find that it is learning in school that matters most. However, it finds that the average extent to which individuals benefit from basic skills acquired in school varies by ethnicity and gender. White men and women benefit the most in terms of higher wages from basic skills acquired in school, followed by black and Hispanic men, and Hispanic and black women benefit the least.

NEET status and benefit receipt

We now investigate NEET status and benefit receipt. A person is considered NEET if, in a given year, they are not enrolled in education (based on Ministry of Education data) and are never employed (i.e. never have positive earnings in any month of the year based on IR tax data).

Overall, the NEET rate is low among both the low-skills and above-baseline group in the first couple of years after PISA 2009, likely reflecting that school is compulsory until age 16, and the vast majority of young people are enrolled in some form of education. The NEET rate starts to increase from 2011, and, in general, continues to increase over time. In terms of the difference between those with low and above-baseline skills, those with low skills are more likely to be NEET. This gap becomes evident in 2011 (age 17) and continues to grow until 2016 (age 22). The gap shrinks in 2017 due to a dip in the NEET rate among the low-skills group, but grows again after 2017. It is unclear why the

NEET rate among the above-baseline group increases monotonically over time while the NEET rate among the low-skills group dips in 2017.

Separating these results out by gender once again highlights that the overall results for the low-skills group are driven by high NEETs rates among women with low skills. There is very little difference in the NEET rate between above-baseline men and women, and the NEET rate for men with low skills is only slightly higher than above-baseline groups, with the difference being more pronounced when they are young. However, women with low skills have a much higher rate of NEET which generally increases over time - by 2019, about a fifth of women with low skills are NEET. As will be discussed in Section 4.3, women in the low-skills group also have much higher fertility rates, which suggests many are NEET due to childcare responsibilities.

To further investigate this possibility Figure 14 presents NEET rates for only those who do not have children. These show that the NEET rate is lower for those without children. Decomposing this by gender shows that this is mostly due to a lower rate of NEET among women with low skills, although it is also somewhat lower among women with above-baseline skills. These findings support the idea that the high NEET rate among women in the low-skills group is due to childcare responsibilities.

Consistent with the employment and earnings results, those with low skills are more likely to receive a benefit payment. The share of those receiving a main benefit increased in 2020, likely due to COVID-19 lockdowns. Both men and women with low skills are more likely to receive a benefit payment than those with above-baseline skills. However, consistent with employment and NEET findings, the share of women with low skills receiving any benefit payments is much higher than the share of men with low skills, with over 40 % receiving benefit payments in several years.

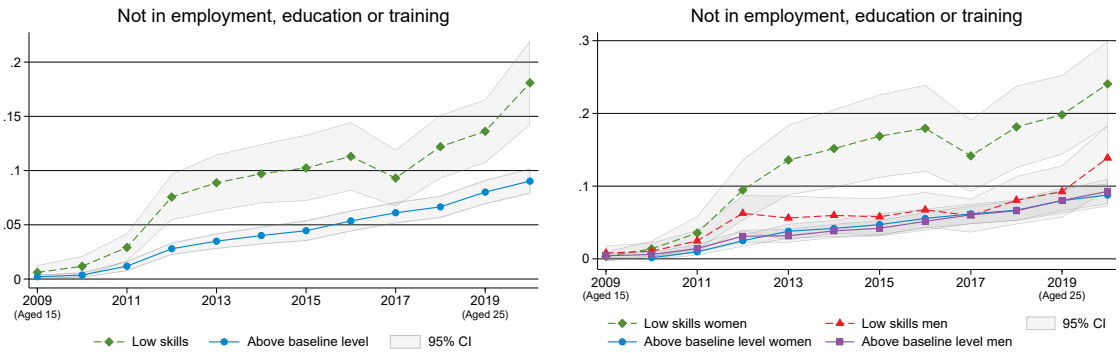

Figure 13: NEET status

Figure 17 examines the share of young people who were ever NEET by ethnicity and gender. In terms of gender differences, there is little difference between the share of above-baseline men and above-baseline women who were ever NEET. However, the share of women with low skills who have ever been NEET is not only much higher than above-baseline men and women, it is also much higher than for men with low skills. In terms of ethnicity, Māori and Pacific Peoples are more likely to have been NEET at some stage than NZ Europeans, with the likelihood of being NEET is higher among those with low skills for all three ethnic groups. Interestingly, the share of Māori with above-baseline skills who have ever been NEET is very similar to the share of NZ Europeans with low skills.

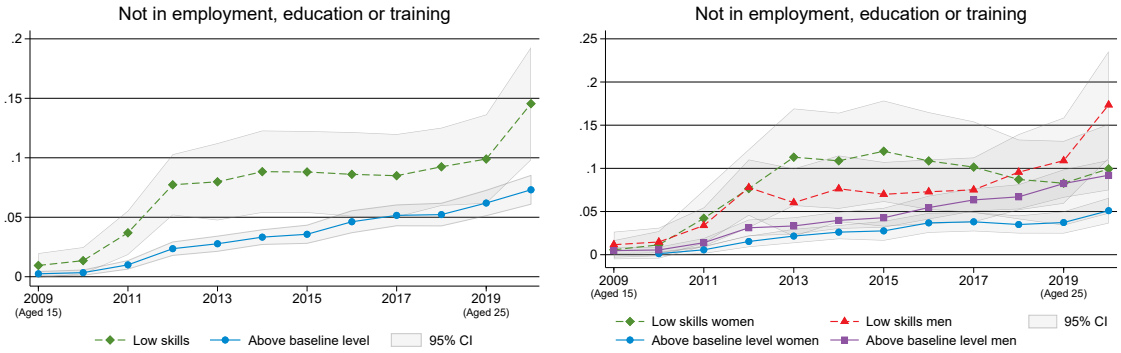

Figure 14: NEET status including only those without children

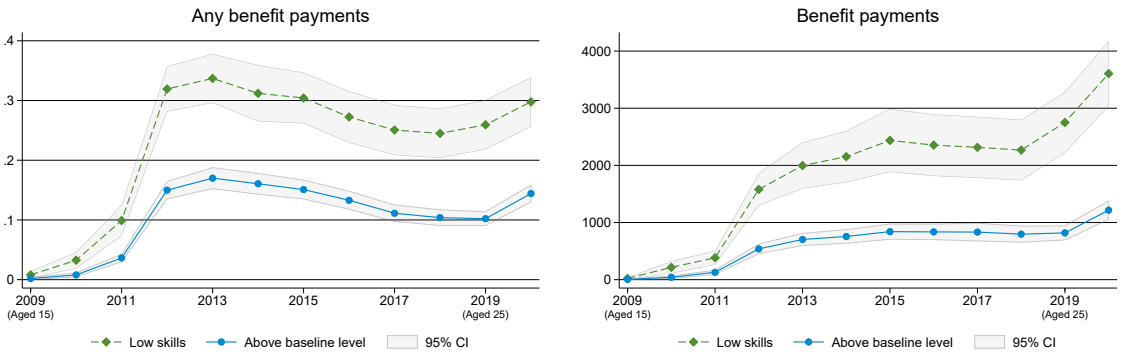

Figure 15: Benefit receipt

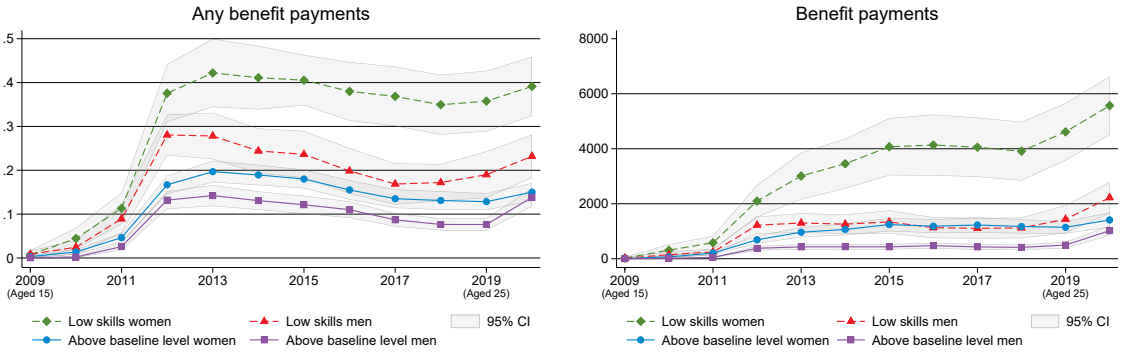

Figure 16: Benefit receipt for men and women

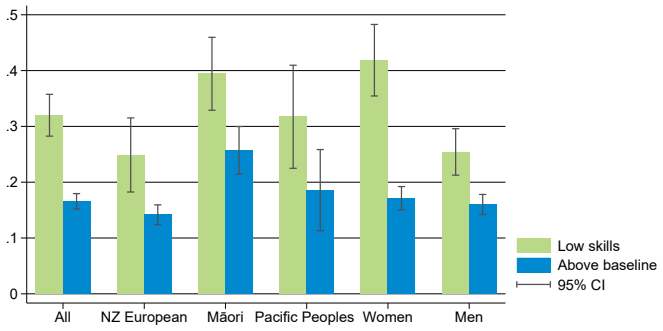

Figure 17: Share of young people who were ever NEET

4.3 Family formation

Some of the labour market outcomes seen in Section 4.2 may reflect family formation patterns, particularly given the observed gender differences. Therefore, this section examines childbearing and marriage patterns. Childbearing is based on Department of Internal Affairs birth records. We record an individual as having had a child if they are listed as parents on a child's birth certificate. This does not, however, necessarily align with child-rearing since a child's biological parents may not be their primary caregiver/s. Moreover, while mothers are always recorded, fathers are not recorded for about 5 % of births (Staninski, 2021). However, it is the only population-wide measure of childbearing available in the IDI. We also use Department of Internal Affairs information to identify whether individuals have ever been married or in a civil union. However, this includes only legal marriages and civil unions, and does not include de facto relationships. We also use relationship status at the time of the first child's birth from DIA birth records information, which does include information on de facto relationships.

The left-hand panel of Figure 18 shows that men in the above-baseline skills group have the lowest average number of children, with less than 0.2 by age 26 in 2020. Women in the low-skills group have the highest average number of children, with over 0.8 by 2020. The lower employment and earnings of women in the low-skills group seen in Section 4.2 is, therefore, likely to at least partly reflect higher rates of childbearing and time spent out of the workforce to raise children. In the other direction, the choice to have children earlier may also reflect the lower opportunity cost of doing so compared with women in the above-baseline group given lower employment and earnings opportunities.

The right-hand panel of Figure 18 presents marriage rates. Up until 2017 (age 23), women in the low-skills group have the highest marriage rates, albeit still less than 10 % have ever been married. After age 23, women in the above-baseline skills group overtake those in the low-skills group and have the highest marriage rates. Above-baseline men have the lowest marriage rates throughout the period investigated, with only one in 10 having been married by 2020 (age 26).

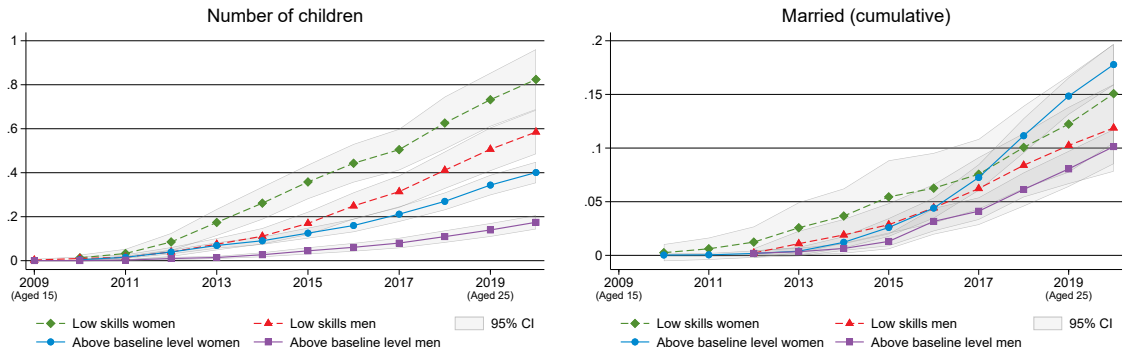

Figure 18: Family formation indicators for men and women

Table 4 shows that for low-skilled women who have had at least one child by the age of 26, they are on average 21.3 years old when their first child is born, while the average age for above-baseline women is 22.6 years, with similar age differences for men. There is no statistically significant difference between the share of low-skilled and above-baseline individuals who are married by 2020.

However, those in the above-baseline group who have children are more likely to have been married or in a de facto relationship when their first child was born.

Table 4: Family formation

	All		Women		Men	
	(1) Low s.	(2) Above b.	(3) Low s.	(4) Above b.	(5) Low s.	(6) Above b.
Number of children in 2020	0.68*	0.29	0.82*	0.40	0.59*	0.17
Age at first birth	21.89*	22.96	21.27*	22.61	22.41*	23.63
Married (cumulative)	0.13	0.14	0.15	0.18	0.12	0.10
Married at first birth	0.12*	0.28	0.11*	0.27	0.12*	0.29
Married or de facto relationship at f.b.	0.59*	0.76	0.55*	0.74	0.63*	0.78

Notes: This table compares average outcomes of students with low skills and those with above baseline skills for different groups of the population. * indicates that the difference between skill groups is statistically significant at the 5 % level.

Figure 19 once again shows that those in the low-skilled group had, on average, more children by 2020 than those in the above-baseline group. It also shows that women in both the low-skills and above-baseline groups were more likely to have children than their male counterparts. In addition, the average number of children in 2020 was much higher for Māori and Pacific Peoples than NZ Europeans. For example, NZ Europeans in the low-skilled group had an average of 0.59 children in 2020, versus 0.83 for Māori in the low-skills group and 0.87 for People Peoples (see Appendix Table 14). This is consistent with national fertility statistics showing that Māori and Pacific Peoples have relatively high fertility rates, with a birth rate of 90.6 per 1000 females aged 15-44 for Māori and 83.2 for Pacific Peoples, versus a total birth rate of 61.7 in 2017 (Ministry of Health, 2019).

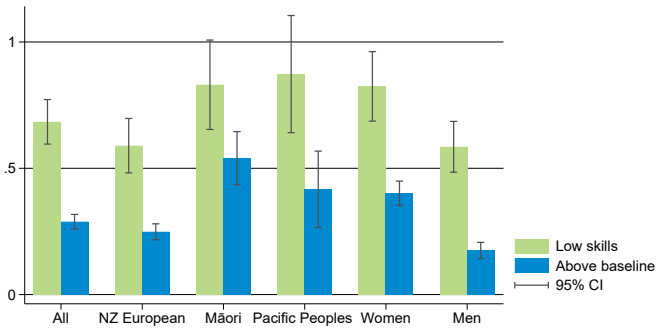

Figure 19: Number of children in 2020

4.4 Health

Existing research highlights that higher literacy levels are associated with a range of health outcomes via a number of potential pathways. For example, people with low literacy tend to be less responsive to traditional health education messages, are less likely to use disease prevention services and are less able to successfully manage chronic disease (Berkman, Sheridan, and Donahue, 2011; Dewalt et al., 2004). As such, this section examines health outcomes for our cohort of young people. We first examine use of general health services, followed by injury rates using ACC data, then mental health outcomes.

General health care use

The rate of hospitalisations and non-admitted secondary care events generally increases over time as the cohort ages (Figure 20). Those in the low-skills group have higher rates of hospitalisation and non-admitted events than those in the above-baseline skills group, although the difference is not statistically significant in some years (Figure 20).

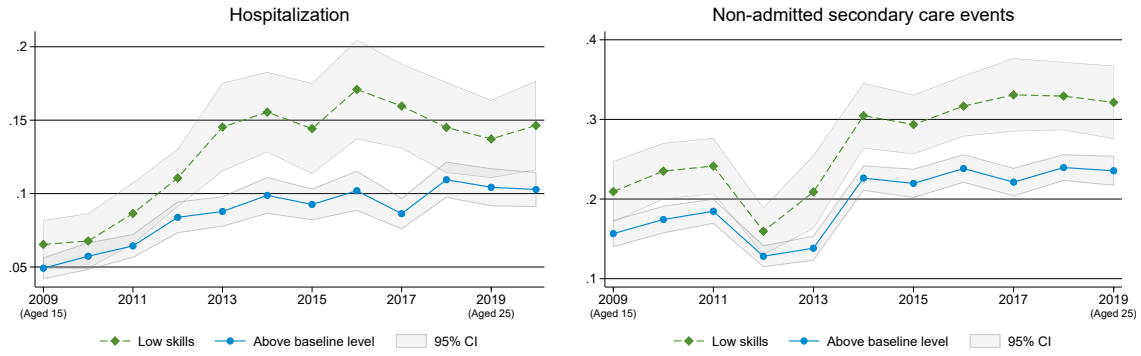

Figure 20: Hospitalisations and secondary care

Part of the reason for higher rates of hospitalisation among the low-skills group could be higher birth rates, as discussed in Section 4.3. To examine this possibility, Table 5 excludes childbirth from the hospitalisation statistics and finds the magnitude of the difference between the low-skills and above-baseline group is similar, and remains statistically significant. Table 5 also examines selected diagnosis groups of hospitalisations and finds that the low-skills group have higher rates of hospitalisation for musculoskeletal and nervous system issues, as well as injuries. In terms of non-admitted secondary care events, the low-skills group have higher rates of emergency department visits, with 69 % having visited the emergency department at least once between 2009 and 2020 versus 59 % of the above-baseline group. While this may indicate poorer health outcomes, it may also partly be due to lower access to primary healthcare resulting in more emergency department visits (Dolton and Pathania, 2016).

Figure 21 shows the share of the cohort who have been hospitalised at any time over the study period by gender and ethnicity. The share of those who have been hospitalised is statistically significantly higher for low-skills group for both men and women. Likewise, the share of those who have been hospitalised is higher among the low-skills group for NZ Europeans, Māori and Pacific Peoples, although the difference is not statistically significant for Pacific Peoples.

Table 5: Health care utilisation

	(1) Low-skills	(2) Above baseline	(3) Difference	(4) p-Value
Hospitalisation	0.59	0.46	0.13	0.000
Hospitalisation (excl. childbirth)	0.52	0.41	0.11	0.000
Selected diagnosis groups				
Musculoskeletal system	0.17	0.11	0.06	0.000
Digestive system	0.11	0.10	0.01	0.314
Injuries	0.10	0.06	0.04	0.006
Ear, nose, mouth and throat	0.09	0.07	0.02	0.161
Nervous system	0.08	0.06	0.02	0.045
Skin, subcutaneous tissue and breast	0.06	0.05	0.02	0.182
Non-admitted secondary care events				
Any events	0.78	0.68	0.10	0.000
Emergency department visits	0.69	0.53	0.15	0.000
Other outpatient visits	0.58	0.51	0.07	0.002

Notes: This table compares average outcomes of students with low-skills (column 1) and those with above-baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means.

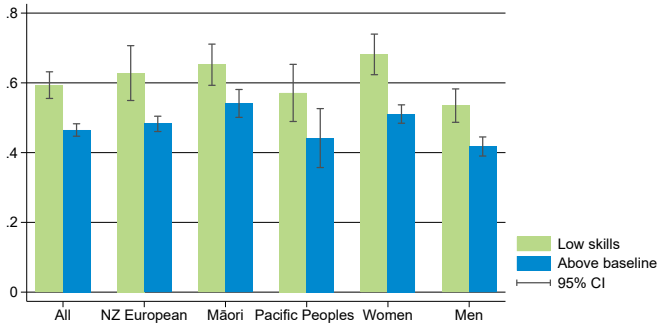

Figure 21: Share of young people with hospitalisations

Injuries

Figure 22 shows the share of young people with any injury in a given year. Overall, there is little difference between the two groups. The low-skills group has slightly higher injury rates than the above-baseline group in all years bar 2017, however, the differences are not statistically significant. One factor to consider that we cannot account for is that ACC claims data likely reflects a combination of actual injury rates and medical care access. Since ACC claims are submitted via medical providers, if the rate at which the low-skills group seeks medical treatment in the event of an injury is lower than for the above-baseline group, the observed injury rates as measured by approved ACC claims may underestimate the true difference between the two groups. This may be the case, for example, because those with lower skills are less aware of and/or less able to access information about their entitlements or have lower access to medical care. As far as we are aware, there is little research comparing actual injury rates with ACC claim rates, and none that compares these rates by skill levels. Poland (2018) appears to be one of the only pieces of NZ research comparing actual injury rates with ACC claim rates. This research links self-reported injuries from the Survey of Family, Income and Employment to ACC claims and finds that about a third of those who report having an injury that stops them doing their usual activities for more than a week do not appear to have received

any form of accident compensation (including medical treatment costs). In addition, the degree of under-reporting varies by age and ethnicity, likely reflecting differences in attitudes and access to healthcare treatment. For example, Māori who experienced an injury were 12 percentage points less likely to have an accepted ACC claim relative to NZ Europeans. Thus, some differences in injury rates as measured by ACC claims may reflect a combination of differences in actual injury rates and differences in the propensity to seek medical treatment in the event of an injury.

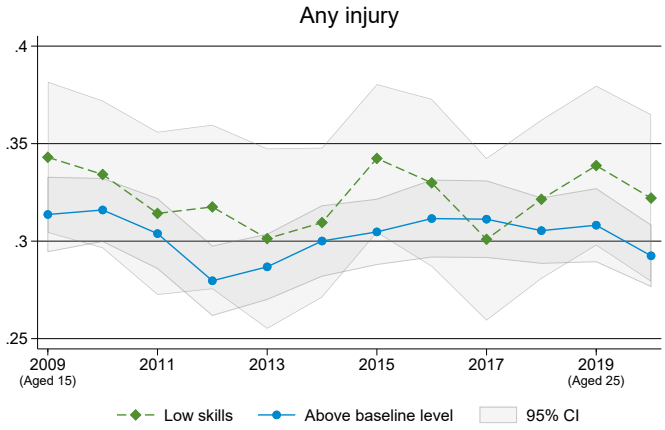

Figure 22: Share of young people with any injury

Table 6 shows the share of injuries in the low-skills and above-baseline groups over the entire 2009-2020 period by injury type. As mentioned, there is no statistically significant difference between the low-skills and above-baseline group in the total rate of injuries, with the majority in both groups having experienced at least one injury during this time period (84 % of low-skills group and 83 % for the above-baseline group). There is also no statistically significant difference in the rate of injuries occurring in the home. However, those with low skills are more likely to have had at least one work injury (43 % versus 29 %). This likely reflects that the low-skills group are more likely to be employed in manual jobs with higher risk of injury. Interestingly, the above-baseline group have a higher rate of sports injuries (56 % versus 50 % for the low-skills group).

Table 6: Injuries

	(1) Low skills	(2) Above baseline	(3) Difference	(4) p-value
Any injury	0.84	0.83	0.01	0.328
Injuries at home	0.59	0.56	0.04	0.097
Work injuries	0.43	0.29	0.14	0.000
Road accidents	0.15	0.11	0.04	0.032
Sport injuries	0.50	0.56	-0.06	0.004

Notes: This table compares average outcomes of students with low-skills (column 1) and those with above-baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means.

Figure 23 provides total injury rate statistics for the entire 2009-2020 period by gender and ethnicity. There are no statistically significant differences between the low-skills and above-baseline groups within any of the demographic groupings. For all injury types, there are also few differences across ethnic groups. By gender, women have lower injury rates overall than men.

Greater differences by skill level are evident when attention is restricted to work injuries (Figure 24). For all gender and ethnicity groups, the low-skills group has a higher rate of work injuries, although the difference is only statistically significant for NZ Europeans and men. Looking across ethnicities, low-skilled NZ Europeans have higher rates of work injuries although the difference between NZ Europeans and Māori is not statistically significant.

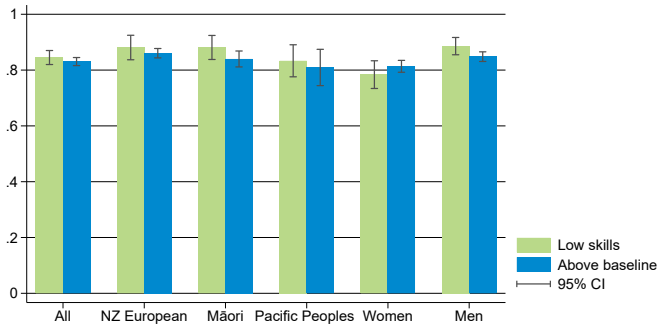

Figure 23: Share of young people with injuries

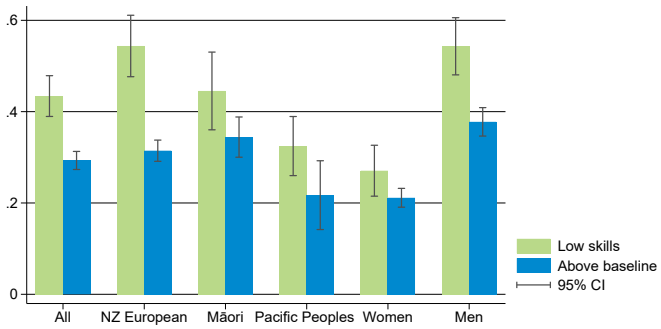

Figure 24: Share of young people with work injuries

Mental health

We now examine mental health outcomes. This is based on a combination of Ministry of Health information within the IDI following the method developed in Bowden et al. (2020). It combines information from pharmaceutical prescriptions, hospitalisations, mortality, and the Programme for the Integration of Mental Health Data (PRIMHD) data. We did not use data from disability support services (Socrates database) because of missing access, but this data source contributes less than 1% of the identified mental health problems in Bowden et al. (2020). As with injury claims data, these data likely reflect a combination of the prevalence of mental health disorders and differences in the propensity to access health services across groups. With mental health, this is likely to be a larger issue than with injury data, particularly among groups where mental health disorders may be stigmatised, making it more difficult to seek medical treatment.

Table 7 shows that there is little difference between the rate of any mental health issues among the low-skills and above-baseline groups, and the difference is not statistically significant. However, those within the low-skills group are more likely to have substance abuse issues, while those in the above-baseline group are more likely to have sleep and eating problems and personality disorders.

Table 7: Mental health disorders

	(1) Low skills	(2) Above baseline	(3) Difference	(4) p-value
Any mental health problem	0.37	0.35	0.02	0.277
Emotional problems	0.16	0.20	-0.04	0.038
Substance	0.15	0.06	0.09	0.000
Depression	0.09	0.09	-0.00	0.967
Sleep problems	0.09	0.13	-0.05	0.001
Anxiety	0.07	0.08	-0.02	0.131
Disruptive behaviours	0.03	0.02	0.01	0.222
Self-harm	0.02	0.02	0.00	0.596
Psychosis	0.02	0.01	0.01	0.086
Bipolar disorders	0.00	0.00	-0.00	0.380
Eating problems	0.00	0.01	-0.01	0.004
Personality disorders	0.00	0.00	-0.00	0.011

Notes: This table compares average outcomes of students with low skills (column 1) and those with above-baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means.

Looking at the prevalence of mental health issues by gender and ethnicity, Figure 25 shows that the only statistically significant difference within these groups is for men, with the low-skills group having higher rates of mental health problems. Looking across ethnicities, Pacific Peoples have much lower recorded rates of mental health issues. However, this may be due to a greater reluctance to seek treatment for mental health issues.

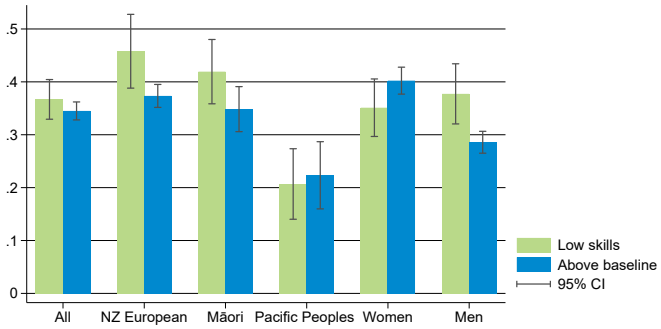

Figure 25: Share of young people with mental health problems

4.5 Crime

This section examines criminal activity outcomes. We use NZ Police data on alleged offending and victimisation and Ministry of Justice court charges data.

The left-hand side of Figure 26 shows the share of individuals who interact with the police as alleged offenders at least once in a given year. For both the low-skills and above-baseline groups, the rate of alleged offending increases with age until 2012 (age 18), then decreases. This is consistent with the well-known age-crime curve whereby the relationship between age and crime is an asymmetric bell-shaped curve with offending peaking in the teenage years and declining from the early 20s (Loeber and Farrington, 2014). The rate of offending is, however, much higher among the low-skills group, with more than 1 in 6 young people being involved in at least one alleged offending activity in 2012. This high rate does, in part, reflect the fact that the police offending data includes low-level offences such as minor traffic infringements. Looking at convictions from the court charges data, where the seriousness and evidence bar is higher than in the police offending data, we see the same age-crime curve pattern although it is much more subdued for those with above-baseline skill levels. The rate of convictions is, as expected, lower than the rate of alleged offending. It also peaks slightly later for the low-skills group (2013 or about age 19), which may reflect delays between offending and conviction as cases make their way through the courts. The prevalence of convictions among the low-skilled group is high, with close to 1 in 10 having at least one conviction in 2013.

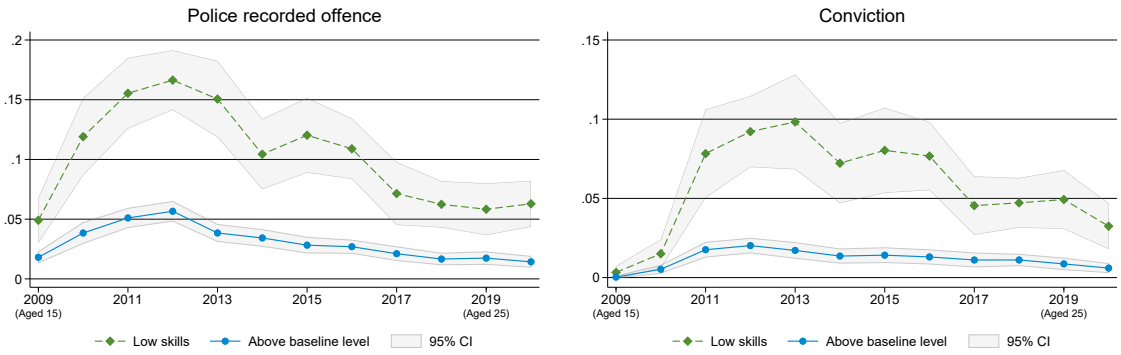

Figure 26: Offences and convictions

Table 8 shows the share of individuals who have at least one recorded offence, conviction or sentence over the entire 2009 to 2020 period. The share of those in the low-skills group who have any alleged police offence is more than double the share among the above-baseline group (44 % versus 19 %). As mentioned, these rates are quite high overall but include low-level offending. Young people in the low-skills group are also more likely to be victims of crime between 2014 and 2020 (23 % versus 19 %), although the difference is only weakly statistically significant. This is consistent with a large literature that finds an overlap between those who are offenders and victims of crime (e.g., Erwin, Hennecke, Meehan, and Pacheco, 2022). The difference in alleged offending is consistent across offence types, with more than double the share of those in the low-skills group having offences against persons, property and the community. The differences are even more stark for convictions, with the low-skills group being more than three times as likely to have a conviction over the 2009-2020 period. More than one in four individuals in the low-skills group have at least one

conviction by 2020 (age 26) compared with 8 % of the above-baseline group. In terms of sentences, the low-skills group are about three times as likely to have received at least one fine than the above-baseline group. The differences in the other sentence types are much more stark. While 13 % of the low-skilled group have received a community work sentence, just 2 % of the above-baseline group have. Similarly, the low-skills group are five times more likely to have received a home or community detention sentence. While virtually none of the above-baseline group have received a prison sentence, 2 % of the low-skills group have.

Table 8: Offending, court charges and victimisation

	(1) Low skills	(2) Above baseline	(3) Difference	(4) p-value
Police recorded offence	0.44	0.19	0.25	0.000
Type of offences				
Offences against persons	0.20	0.07	0.13	0.000
Offences related to property	0.19	0.06	0.13	0.000
Offences against community	0.35	0.14	0.21	0.000
Conviction	0.26	0.08	0.18	0.000
Sentences				
Monetary	0.21	0.07	0.14	0.000
Community work / supervision	0.13	0.02	0.11	0.000
Home or community detention	0.05	0.01	0.04	0.000
Imprisonment	0.02	0.00	0.02	0.000
Victim of crime	0.23	0.19	0.04	0.056

Notes: This table compares average outcomes of students with low skills (column 1) and those with above-baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means. Victimisation refers to the time period 2014 to 2020, all other outcomes cover the entire 2009 to 2020 period.

Figure 27 examines the share of young people who had at least one conviction over the 2009 to 2020 period by gender and ethnicity. As expected, men are much more likely than women to have a conviction. For both men and women, however, the conviction rate is higher among those with low skills. More than a third of men with low skills have had at least one conviction by 2020 (age 26). Looking across ethnicities, Māori have the higher rates of convictions than NZ Europeans, which is consistent with NZ's population justice statistics (see, for example Ministry of Justice, 2021). Within each ethnic group, the low-skills group have higher conviction rates. Interestingly, Māori with above-baseline skill levels have a much higher conviction rate than NZ Europeans with above-baseline skills. As with employment and earnings outcomes, having above-baseline skill levels does not seem to have the same protective effect for Māori.

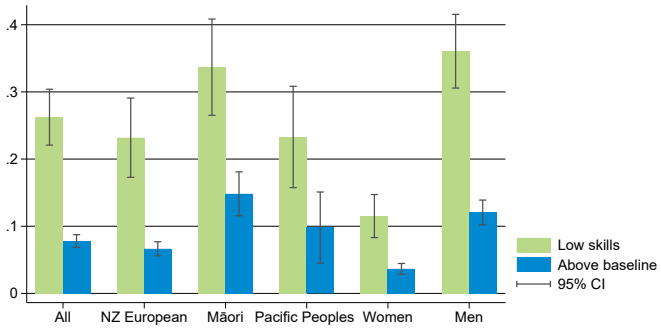

Figure 27: Share of young people with convictions

5 Conclusion

This paper examines the life-course trajectories of a cohort of NZ youth who participated in PISA 2009 when they were 15-years old by tracking their outcomes until 2020, when they are about 26 years old. PISA is a worldwide study that assesses key competencies of 15-year-old students, with a focus on reading, mathematics and science. This paper compares the outcomes of the nearly one-fifth of NZ students who were assessed at below Level 2 in either reading or mathematics (or both), which the OECD considers to be a 'baseline' level of proficiency, with those at or above this baseline. We are able to follow students over time as PISA 2009 data is linked to Stats NZ's IDI, which allows us to examine a range of education, labour market, family formation, health and criminal activity outcomes using administrative data.

As such, this paper adds to the limited evidence on the link between early-life direct measures of skills and life outcomes. We build on the existing literature by examining a range of outcomes, whereas the focus to date has been on labour market outcomes. Moreover, this is one of the few studies that uses direct measures of skills linked to administrative data to track life-course outcomes. This approach has some advantages over longitudinal surveys tracking youth over time, where the possibility of issues related to sample attrition and reporting bias may arise.

The group of students with below Level 2 proficiency have lower rates of participation in, and completion of, further education compared with the above-baseline skills group. From about age 17 years, the rate of enrolment in any form of education or training is higher among the above-baseline group. This gap increases over the next few years, but begins to shrink from about age 21 years, and disappears by age 24. The difference is more stark when attention is restricted to enrolment in bachelor's degrees only, with more than four times as many of the above-baseline group being enrolled in bachelor's degrees when they are in their late teens and early 20s.

In terms of educational attainment, by 2020, 94 % (82 %) of students with above-baseline skills had attained at least a Level 2 (Level 3) qualification, compared with 80 % (56 %) of the low-skills group. The share of those in the above-baseline group who hold bachelor's degrees is more than four times that for the low-skills group (40 % versus 9 %).

The labour market outcomes of the low-skills group are also less favourable than those of the above-baseline group. For young men, the employment rate of those in the low-skills group is similar to that of the above-baseline group throughout the 11 years examined. However, men in the low-skills group out-earn men in the above-baseline group until they are about 23 years old. After this point, above-baseline men have higher average earnings than those in the low-skills group, with the gap increasing over time.

For young women, the labour market differences by skill level are larger. Women in the low-skills group have much lower employment rates than above-baseline women. They also have lower average earnings throughout the 11 year period examined, with the gap widening over time.

There are also differences by ethnicity in educational and labour market outcomes. For Māori, those with above-baseline skills have lower rates of bachelor's degree enrolment and educational attainment than NZ Europeans with above-baseline skills. Labour market outcomes reveal similar results, with Māori having lower employment rates and earnings even within the skill groups. For example, Māori in the above-baseline group have lower average earnings than NZ Europeans in the

above-baseline group - indeed, their average earnings are very similar to those of NZ Europeans in the low-skills group. These differences may be partly due to above-baseline Māori having lower average PISA proficiency scores than above-baseline NZ Europeans. However, the magnitude of these differences suggest that this is not the sole explanation. While factors other than differences in skill levels as measured by PISA may also contribute to these differences, other research (such as Cochrane and Pacheco, 2022; Meehan, Pacheco, and Pushon, 2019) highlights that the educational and earnings gaps between Māori and NZ Europeans are not fully explained by observable characteristics.

Some of these labour market differences, particularly in terms of the observed gender differences, may reflect differences in family formation patterns. Consistent with this, at age 26 in 2020, women in the low-skills group have the highest average number of children, followed by men in the low-skills group. Men in the above-baseline group have the lowest average number of children.

Those in the low-skills group have higher rates of hospitalisation and non-admitted secondary care events than those in the above-baseline group. There is little difference in overall injury rates, although the low-skills group are more likely to suffer work injuries, which is likely due to the higher share working in physical roles. There is also little difference in the overall rate of mental health issues. However, the low-skills group are more likely to have substance abuse issues, while those in the above-baseline group are more likely to have sleep and eating problems and personality disorders.

Finally, we examine criminal activity outcomes. The rate of alleged offending and convictions is higher among the low-skills group. More than a quarter of individuals in the low-skills group have had at least one conviction by 2020 compared with 8 % of the above-baseline group.

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A Additional tables

Table 9: Characteristics of students with a link and no link to the IDI spine

	(1) Linked	(2) Not linked	(3) Difference	(4) p-Value
Female	0.49	0.52	-0.03	0.257
Born in NZ	0.79	0.63	0.16	0.000
Index of economic social and cultural status	0.09	-0.01	0.10	0.151
Ethnicity				
NZ European	0.59	0.45	0.15	0.000
Māori	0.18	0.21	-0.03	0.279
Pacific Peoples	0.08	0.13	-0.05	0.123
Asian	0.12	0.19	-0.07	0.001
Other	0.02	0.02	-0.00	0.792
Highest parental				
Occupational status	13.02	12.91	0.11	0.486
Education in years	52.29	50.06	2.23	0.066

Notes: This table compares average characteristics of students with a link to the IDI spine (Column 1) and those without (2). Column 3 shows the difference between skill groups, Column 4 shows the p-value testing the equality of the two means. The number of observations is 3,972 for highest parental education, 4,182 for parental occupational status because of missing information, and 4,356 for the remaining characteristics.

Table 10: Definition of outcome variables (1)

Outcome	Description
Education enrolment	
Tertiary education	Enrolled in any tertiary education (Source: MoE tertiary qualification enrolment).
Bachelor	Enrolled in bachelor type tertiary education (MoE tertiary qualification enrolments).
Industry training	Indicator for workplace-based training (MoE industry training data).
Targeted training	Enrolled in targeted training programmes (Gateway, Skill Enhancement, Training Opportunities, Foundation Focused Training Opportunities Youth Training; MoE trageted training data).
Any schooling or training	Enrolled in compulsory education, tertiary education, industry training, or targeted training (MoE enrolment data).
Educational attainment	
Level 2 or higher	Attained NZQF level 2 or higher (MoE student qualifications).
Level 3 or higher	Attained NZQF level 3 or higher (MoE student qualifications).
Level 4 or higher	Attained NZQF level 4 tertiary programme or higher (MoE tertiary completions).
University entrance	description what that means (MoE university entrance information).
Bachelor	Completion of bachelor programme (MoE tertiary completions)
Income and employment	
Earnings	Sum of wages, salaries and income from self-employment based on tax data in 2020 prices using the consumer price index (Inland Revenue (IR) derived income data).
Employed	Indicator for having any earnings (IR).
Months receiving earnings	Number of months receiving any earnings (IR).
Occupations	Working in an occupation classified according to ANZSCO v 1.2 major groups (Census 2018).
Not in employment, education or training	Having neither earnings, nor any education enrolment (MoE enrolment data, IR derived income data).
Benefit payments	Sum of benefit payments from the Ministry of Social Development (IR derived income data)
Family formation	
Number of children	Number of children born, where respondent is recorded as a parent (Department of Internal Affairs (DIA) life events).
Age at first birth	Age at the time of the first birth (DIA).
Married	Having married or entered a civil union (DIA).
Married at first birth	Indicator for being married or in a civil union at the time of the first birth (DIA).
Married or de facto relationship at f.b.	Indicator for being in a de facto relationship at the time of the first birth (DIA).

Table 11: Definition of outcome variables (2)

Outcome	Description
Health	
Any injuries	Indicator for injuries after accidents (Source: Accident compensation corporation (ACC) injury claims).
Injuries at home	Accidents that occurred at home (ACC).
Work injuries	Paid from ACC work account or claim occurred at place of work (ACC).
Road accidents	Paid from ACC motor vehicle account (ACC).
Sport injuries	Engaged in recreation/sporting activity at the time of the accident (ACC).
Mental health problems (emotional problems, substance, depression, sleep problems, anxiety, disruptive behaviours, self-harm, psychosis, bipolar disorders, eating problems, personality disorders)	Indicators for mental health problems using various data sources in the IDI following Bowden et al. (2020), including pharmaceutical prescriptions, hospitalisations, death causes, and the Programme for the Integration of Mental Health Data (PRIMHD). We did not use data from disability support services (Socrates database) because of missing access, but this data source contributes less than 1% of the identified mental health problems in Bowden et al. (2020).
Hospitalisation	Indicator for publicly funded hospital events (Source: Ministry of Health (MoH) national minimum dataset)
Hosp. excluding childbirth	Hospitalisation excluding Major Diagnostic Categories (MDC) 14 and 15.
Hospital Diagnoses	
Musculoskeletal system	Hospitalisation for MDC 8.
Ear, nose, mouth and throat	Hospitalisation for MDC 3.
Digestive system	Hospitalisation for MDC 6.
Injuries	Hospitalisation for MDC 21 .
Nervous system	Hospitalisation for MDC 1.
Skin, subcutaneous tissue and breast	Hospitalisation for MDC 9.
Non-admitted secondary care events	Indicator for any non-admitted secondary care event (MoH National Non-Admitted Patient Collection (NNPAC))
Emergency department visits	Emergency department event types (NNPAC)
Other outpatient visits	Outpatient and community referred events (NNPAC).
Crime	
Police recorded offence	Being proceeded against by the police. (Source: NZ Police recorded crime offenders data.)
Offences against persons	Divisions 1-6 of the Australian and New Zealand Standard Offence Classification (ANZSOC, Australian Bureau of Statistics, 2011), capturing acts that result in harm and affect a specific person (Police).
Offences related to property	Divisions 6-9 and 12 of ANZSOC such as robbery and theft (Police).
Offences against community	Divisions 10, 11, 13-16 of ANZSOC include offences against organisations, government and community (Police).
Conviction	Convicted by a court (Ministry of Justice (MoJ) criminal court charges).
Court sentences (monetary, community work or supervision, home or community detention, imprisonment)	Having the respective court sentence. Note that the data only records the five most serious sentences per charge (MoJ).
Victim of crime	Being recorded as crime victim. (Source: NZ Police victimisations).

Table 12: Education of men and women

	(1) Low skills	(2) Above-baseline	(3) Difference	(4) p-value
Women				
Ever enrolled in				
Tertiary education	0.85	0.91	-0.05	0.025
Bachelor	0.29	0.65	-0.36	0.000
Industry training	0.25	0.22	0.03	0.323
Targeted training	0.43	0.17	0.25	0.000
Educational attainment				
Level 2 or higher	0.84	0.96	-0.12	0.000
Level 3 or higher	0.60	0.86	-0.26	0.000
Level 4 tertiary programme or higher	0.40	0.68	-0.28	0.000
University entrance attained	0.14	0.60	-0.45	0.000
Completion of bachelor programme	0.16	0.49	-0.33	0.000
Men				
Ever enrolled in				
Tertiary education	0.77	0.86	-0.09	0.000
Bachelor	0.08	0.45	-0.36	0.000
Industry training	0.42	0.35	0.07	0.032
Targeted training	0.40	0.19	0.22	0.000
Educational attainment				
Level 2 or higher	0.78	0.93	-0.15	0.000
Level 3 or higher	0.53	0.79	-0.26	0.000
Level 4 tertiary programme or higher	0.22	0.50	-0.29	0.000
University entrance attained	0.08	0.44	-0.35	0.000
Completion of bachelor programme	0.04	0.29	-0.25	0.000

Notes: This table compares average outcomes of students with low skills (column 1) and those with above-baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means. N=4356.

Table 13: Education by ethnicity

	(1) Low skills	(2) Above baseline	(3) Difference	(4) p-Value
NZ European				
Ever enrolled in				
Tertiary education	0.84	0.90	-0.05	0.013
Bachelor	0.14	0.57	-0.43	0.000
Industry training	0.48	0.30	0.17	0.000
Targeted training	0.49	0.18	0.31	0.000
Educational attainment				
Level 2 or higher	0.83	0.96	-0.13	0.000
Level 3 or higher	0.59	0.85	-0.26	0.000
Level 4 tertiary programme or higher	0.28	0.61	-0.33	0.000
University entrance attained	0.11	0.56	-0.45	0.000
Completion of bachelor programme	0.08	0.42	-0.33	0.000
Māori				
Ever enrolled in				
Tertiary education	0.80	0.85	-0.05	0.097
Bachelor	0.12	0.38	-0.26	0.000
Industry training	0.37	0.32	0.04	0.280
Targeted training	0.46	0.26	0.20	0.000
Educational attainment				
Level 2 or higher	0.78	0.90	-0.13	0.000
Level 3 or higher	0.51	0.72	-0.21	0.000
Level 4 tertiary programme or higher	0.25	0.45	-0.20	0.000
University entrance attained	0.07	0.31	-0.24	0.000
Completion of bachelor programme	0.06	0.22	-0.16	0.000
Pacific Peoples				
Ever enrolled in				
Tertiary education	0.75	0.81	-0.06	0.292
Bachelor	0.15	0.50	-0.36	0.000
Industry training	0.23	0.22	0.01	0.922
Targeted training	0.32	0.24	0.08	0.274
Educational attainment				
Level 2 or higher	0.79	0.93	-0.15	0.002
Level 3 or higher	0.54	0.71	-0.18	0.010
Level 4 tertiary programme or higher	0.30	0.50	-0.20	0.001
University entrance attained	0.07	0.37	-0.30	0.000
Completion of bachelor programme	0.05	0.32	-0.27	0.000

Notes: This table compares average outcomes of students with low skills (column 1) and those with above baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means. N=4356.

Table 14: Family formation

	(1) Low skills	(2) Above baseline	(3) Difference	(4) p-value
All				
Number of children in 2020	0.68	0.29	0.40	0.000
Age at first birth	21.89	22.96	-1.07	0.000
Married in 2020	0.13	0.14	-0.01	0.646
Married at first birth	0.12	0.28	-0.16	0.000
Married or de facto relationship at f.b.	0.59	0.76	-0.17	0.000
Women				
Number of children in 2020	0.82	0.40	0.42	0.000
Age at first birth	21.27	22.61	-1.34	0.000
Married in 2020	0.15	0.18	-0.03	0.305
Married at first birth	0.11	0.27	-0.16	0.000
Married or de facto relationship at f.b.	0.55	0.74	-0.20	0.001
Men				
Number of children in 2020	0.59	0.17	0.41	0.000
Age at first birth	22.41	23.63	-1.23	0.000
Married in 2020	0.12	0.10	0.02	0.469
Married at first birth	0.12	0.29	-0.17	0.002
Married or de facto relationship at f.b.	0.63	0.78	-0.16	0.011
NZ European				
Number of children in 2020	0.59	0.25	0.34	0.000
Age at first birth	22.33	23.33	-1.00	0.003
Married in 2020	0.13	0.14	-0.02	0.500
Married at first birth	0.10	0.32	-0.22	0.000
Married or de facto relationship at f.b.	0.60	0.81	-0.20	0.001
Māori				
Number of children in 2020	0.83	0.54	0.29	0.009
Age at first birth	21.62	22.03	-0.41	0.418
Married in 2020	0.08	0.11	-0.03	0.198
Married at first birth	0.05	0.11	-0.07	0.044
Married or de facto relationship at f.b.	0.58	0.64	-0.06	0.374
Pacific Peoples				
Number of children in 2020	0.87	0.42	0.46	0.004
Age at first birth	21.60	22.62	-1.02	0.182
Married in 2020	0.20	0.13	0.06	0.223
Married at first birth	0.20	0.27	-0.07	0.524
Married or de facto relationship at f.b.	0.57	0.72	-0.15	0.178

Notes: This table compares average outcomes of students with low skills (column 1) and those with above baseline skills (2). Column 3 shows the difference between skill groups, column 4 shows the p-value testing the equality of the two means.

THE EXPRESSION, EXPERIENCE AND TRANSCENDENCE OF LOW SKILLS IN AOTEAROA NEW ZEALAND

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