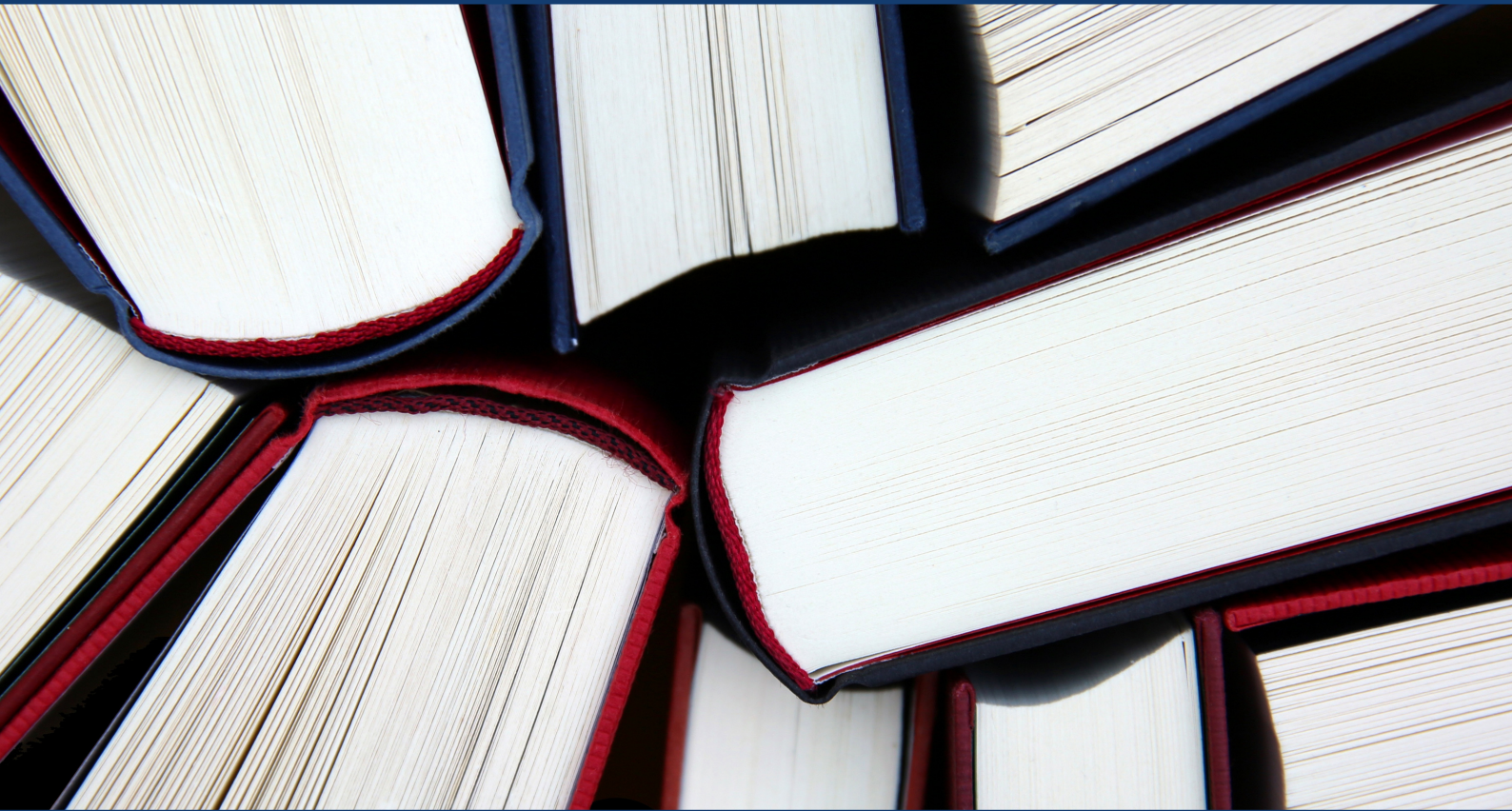


THE EXPRESSION, EXPERIENCE AND TRANSCENDENCE OF LOW SKILLS IN AOTEAROA NEW ZEALAND



AN EMPIRICAL PORTRAIT OF NEW ZEALAND
ADULTS LIVING WITH LOW LITERACY AND
NUMERACY SKILLS

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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>

ABOUT THIS PAPER

The aim of this research paper is to provide a comprehensive portrait of the population living with low literacy and / or numeracy (L/N) skills in NZ. Prior literature argues that “low basic skills levels of adults are a complex policy problem” that does not have “straightforward solutions”. This research paper aims to provide the baseline with which to understand the complex nature and landscape of low L/N skills in NZ.

DISCLAIMER

The views expressed are those of the authors and do not necessarily reflect the views of the organisations involved. 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/>.

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1 Introduction

The aim of this research paper is to provide a comprehensive portrait of the population living with low literacy and / or numeracy (L/N) skills in NZ. As this report will detail, over half a million NZ working-age adults live with low L/N skills based on a definition of being at or below the Level 1 proficiency threshold in the OECD's Programme for International Assessment of Adult Competencies (PIAAC). If the definition is extended to those at or below Level 2 - another commonly used threshold - this number increases to over one million adults living with low L/N skills in NZ (OECD, 2016). Whichever definition is used, the distribution of those living with L/N skills also raises concerns, with Māori and Pacific Peoples being over-represented in these statistics.

Low L/N skills may affect an individual's well-being in a number of inter-related ways. For example, past research has shown that individuals with low L/N skills are more likely to leave school early (Parsons & Bynner, 2005), experience lower levels of labour market attachment (Chiswick, Lee & Miller, 2003; de Baldini Rocha & Ponczek, 2011), have worse health outcomes (Kakarmath et al., 2018), and engage less frequently in social and political activities (Benseman, 2011).

Prior literature also argues that "low basic skills levels of adults are a complex policy problem" that does not have "straightforward solutions" (Windisch, 2015, p.3). This research paper aims to provide the baseline with which to understand the complex nature and landscape of low L/N skills in NZ.

We build an empirical portrait of low L/N adults by linking survey data from the 2014/2015 Programme for the International Assessment of Adult Competencies (PIAAC) with administrative data sources in Stats NZ's Integrated Data Infrastructure (IDI). Our aim is to better understand: Who is the population of interest? What are their demographic, individual and household, labour market, health and justice characteristics? How do their characteristics in these domains compare to those who are not low L/N? How do these portraits vary when disaggregated by age? Or by ethnicity? The remainder of this paper proceeds as follows: Section 2 describes the key data sources used; Section 3 explains the analysis plan; Section 4 presents key results and associated discussion; while Section 5 provides a brief conclusion outlining next steps in the umbrella research programme within which this study sits.

2 Data

To describe the population of interest (NZ adults living with low L/N skills), we begin by using the PIAAC survey (housed within the IDI). This survey serves as our data spine, whereby we then link PIAAC respondents to several administrative databases within the IDI using individuals' unique identifiers. Our main sources of information in the IDI come from the Ministry of Health, the NZ Police, and the Ministry of Social Development.

2.1 PIAAC

PIAAC, administered by the Organisation for Economic Cooperation and Development (OECD), measures proficiency in literacy, numeracy and problem solving in technology rich environments (PSTRE) of the working-age adult population (aged 16 to 65 years). The survey design allows for comparison across countries, languages, and cultures and has been conducted in over 40 countries/economies.

As well as administering these direct assessments of proficiency, PIAAC includes a background questionnaire. This questionnaire collects information on individuals' demographic, workforce, educational and household characteristics allowing us to examine associations between proficiency levels and these characteristics. For this research, we use information on age, gender, ethnicity, educational attainment, work experience, labour force status, household structure and geographic region. These variables are detailed further in Section 3.

There are two limitations of the survey worth noting which are relevant to the present analysis. First, the survey is limited to measuring only specific aspects of literacy and numeracy. For example, literacy is assessed based on understanding, evaluating, using and engaging with written texts (PIAAC Literacy Expert Group, 2009). This assessment does not focus on the capacity to write, a capacity which often features in literacy definitions (Cochrane et al., 2020). Furthermore, while this research is focussed on L/N skills, it is important to keep in mind the potential for individuals with low L/N skills to possess other valuable skills such as verbal or non-verbal communication skills, technical or job-specific skills, and so forth. The second caveat to note is that, in NZ, PIAAC only assesses literacy and numeracy in English. This does not imply that other languages, such as Te Reo Māori and Pacific languages, are not important. Indeed, a number of studies have found fluency in a language linked to your cultural identity can positively contribute to an individual's overall wellbeing (Ministry of Social Development, 2016).

We use PIAAC data to analyse skill proficiency focusing primarily on literacy and numeracy rather than PSTRE. This is because the baseline research builds a comprehensive portrait of low L/N individuals for the purpose of next delving into the impact of L/N interventions in NZ. There are no clear policy

implications for L/N interventions stemming from an analysis of PSTRE. In addition, PSTRE was only administered to a non-random subset of survey respondents, and the path by which individuals were routed into completing the PSTRE module means that the sample is biased towards higher-skilled individuals. Specifically, only those who took the computer-based assessment completed the PSTRE module – while this represented the majority of the PIAAC sample, higher-skilled individuals were over-represented in the computer-based assessment takers, while lower-skilled individuals were over-represented among those who took the paper-based test (Reder, 2020). PIAAC measures both literacy and numeracy skills on a 500-point proficiency scale. The OECD breaks this scale into five proficiency levels, where Level 1 is the lowest proficiency and Level 5 is the highest proficiency. An advantage of the proficiency levels is that they provide an indication of what individuals at a particular level are actually able to do (as outlined in Table 1). For literacy, in NZ about 12% are at or below Level 1 and the majority are at Level 2 or 3 (Table 1). Similarly, for numeracy, about 19% are at or below Level 1 and the majority are at Level 2 or 3. Definitions for each threshold are described in detail in Table 1.

We use the L/N proficiency levels to define not only the target (low-skilled) population but also the comparison group. An individual falls into the low-skill category if they score at or below Level 1 in the respective skill. Individuals who scored above Level 1 comprise the comparison group. Some analysis (for example, Ministry of Education, 2019) defines those below Level 2 as having low L/N skills. However, our choice of Level 1 reflects that over a fifth of the NZ adult population has literacy or numeracy proficiency that is at or below this level, with this share being much higher among some groups such as Māori and Pacific Peoples. Thus, a threshold of Level 1 or below already captures a significant share of the adult population, and limits the focus to who are most likely to benefit from improving their skill levels.

Table 1. Description of literacy and numeracy proficiency levels

Level	PIAAC thresholds	Literacy		Numeracy	
		Level description	Share of sample (%)	Level description	Share of sample (%)
1	At or below Level 1: 0-225	<ul style="list-style-type: none"> Read relatively short digital or print continuous, non-continuous, or mixed tests to locate a single piece of information. Complete simple forms, understand basic vocabulary, determine the meaning of sentences, and read continuous texts with a degree of fluency. 	At or below Level 1: 12.07	<ul style="list-style-type: none"> Complete tasks involving basic mathematical processes in common, concrete contexts where the mathematical content is explicit with little text and minimal distractors. Perform simple processes involving counting, sorting, basic arithmetic operations, understanding simple percent, and locating elements of simple or common graphical or spatial representations. 	At or below Level 1: 19.31
2	226-275	<ul style="list-style-type: none"> Integrate two or more pieces of information based on criteria. Compare, contrast or reason about information and make low-level inferences. Read relatively short digital or print continuous, non-continuous, or mixed tests to locate a single piece of information. 	30.76	<ul style="list-style-type: none"> Perform tasks that require identifying and acting upon mathematical information and ideas imbedded in a range of common contexts where the mathematical content is fairly explicit or visual with relatively few distractors. Interpret relatively simple data and statistics in texts, tables and graphs. 	31.92
3	276-325	<ul style="list-style-type: none"> Understand and respond appropriately to dense or lengthy texts. Understand text structures and rhetorical devices. Identify, interpret or evaluate one or more pieces of information to make appropriate inferences. 	41.12	<ul style="list-style-type: none"> Complete tasks that require an understanding of mathematical information that may be less explicit, embedded in contexts that are not always familiar, and represented in more complex ways. Perform tasks requiring several steps and that may involve a choice of problem-solving strategies and relevant processes. 	33.66
4/5	26-500	<ul style="list-style-type: none"> Make complex inferences and appropriately apply background knowledge as well as interpret or evaluate subtle truth claims or arguments. Perform multiple-step operations to integrate, interpret or synthesise information from complex or lengthy texts that involve conditional and/or competing information. 	16.05	<ul style="list-style-type: none"> Understand a broad range of mathematical information that may be complex, abstract or embedded in unfamiliar contexts. Understand arguments and communicate well-reasoned explanations for answers or choices. 	15.11

Source: OECD Skills matter - Additional Results from the Survey of Adult Skills (OECD, 2019). The share of the sample in each level category are calculated from non-missing observations.

2.2 IDI

As explained earlier, this research uses information from Stats NZ's IDI.¹ The IDI is a large research database containing microdata about individuals and households. It has a wealth of administrative data from a range of government agencies, providing population-level information on outcomes related to employment, health, criminal justice, and public benefit receipt, for example. It also includes numerous Stats NZ surveys, as well as data derived from non-government agencies. Every individual in the IDI is assigned a unique identifier that permits linkages across datasets and allows the researcher to take a longitudinal perspective when appropriate. This enables us to link respondents from the PIAAC survey to administrative data from other government agencies.

For the purposes of this research, we focus on health data (mental health referrals and non-admitted emergency department visits) sourced from Ministry of Health; justice events (prevalence of criminal offending, as well as frequency and seriousness score, and similarly with respect to being a victim of a crime) sourced from NZ Police data; and benefit receipt and intensity obtained from Ministry of Social Development.²

¹ More information on the IDI can be found at the Stats NZ website http://infoshare.stats.govt.nz/browse_for_stats/snapshots-of-nz/integrated-data-infrastructure/idi-data.aspx#gsc.tab=0 (accessed 19 Nov 2020).

² Specific datasets used from Ministry of Health include Programme for the Integration of Mental Health Data and National Non-Admitted Patient Collection Data; from NZ Police include Recorded crime offenders data and Recorded crime victims data; and from Ministry of Social Development, Benefit dynamics data. More detail on these data sources are available at the website in the prior footnote.

3 Analysis plan

As the focus of this paper is to build a comprehensive portrait of the low L/N skill population in NZ, our key means of analysis are descriptive statistics and comparisons. To account for the complex design of PIAAC, all estimates are calculated using the statistical software package *repest* in Stata (Avvisati and Keslair, 2014). This package was specifically designed to take into account PIAAC's replicate sampling weights and multiple imputed variables (i.e. plausible values). The sampling weights are designed to account for any systematic differences in the probability of being selected into the PIAAC sample. This ensures our estimates are representative of the NZ population aged 16 to 65 years old. Furthermore, *repest* takes account of plausible values. Since the aim of PIAAC is to provide group-level comparisons rather than optimal point estimates for individual test-takers, the plausible values are designed to reduce uncertainty and measurement error in group-level comparisons (Khorramdel et al., 2020).

To provide some context, we begin with a comparison of the share of low L/N individuals in OECD countries. We then focus on NZ-specific results and provide a profile of the PIAAC sample, using both PIAAC and IDI information. We then disaggregate the sample based on L/N skill level. We provide results for L/N categories separately, as well as for individuals who fall into the low threshold on either proficiency fronts. We then disaggregate the population by both age and L/N skill level – specifically comparing early working age (16-34) to prime working age (35-54) and exit working age (55 to 65). In a similar fashion, the descriptive analyses are also broken down by ethnicity categories. Our empirical analysis ends with a brief overview of the L/N skill distribution, in aggregate and by ethnicity, to provide more granular detail on the skill profile beyond the dichotomous distinction of low versus not-low skill.

In all descriptive comparisons, to illustrate significant differences across groups in the empirical results, we utilise t-tests. In the case of binary variables, such as low- versus not-low L/N, the t-tests measure statistically significant differences between the category of interest (low L/N) and the other category (not low L/N). In the case of variables with multiple categories, such as ethnicity, the t-tests measure statistically significant differences between the category of interest (say, Māori) and all other categories combined (i.e. non-Māori).

4 Results

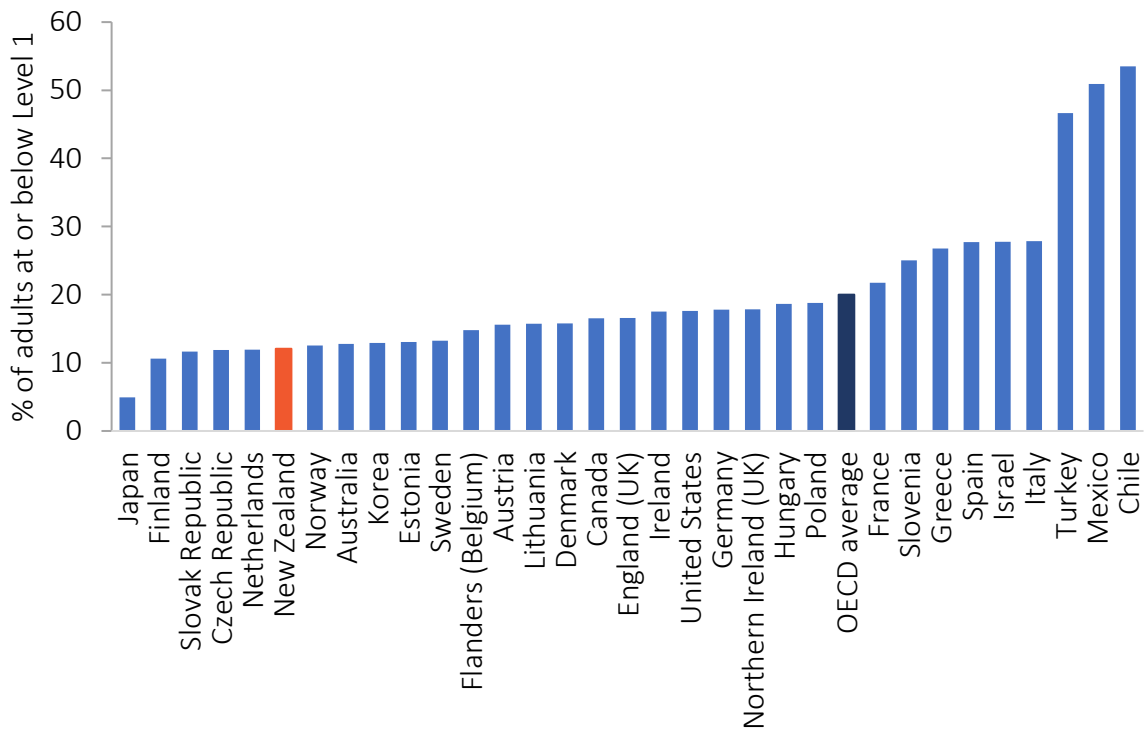
4.1 International comparison

By way of background information, we compare the share of low L/N adults in NZ with other OECD countries (Figure 1). NZ has high levels of literacy compared with other countries. Only five OECD countries have a lower share of adults at or below Level 1 literacy (Panel A). Although NZ does not compare as well in terms of numeracy, the share of adults at or below Level 1 is still less than the OECD average (Panel B).

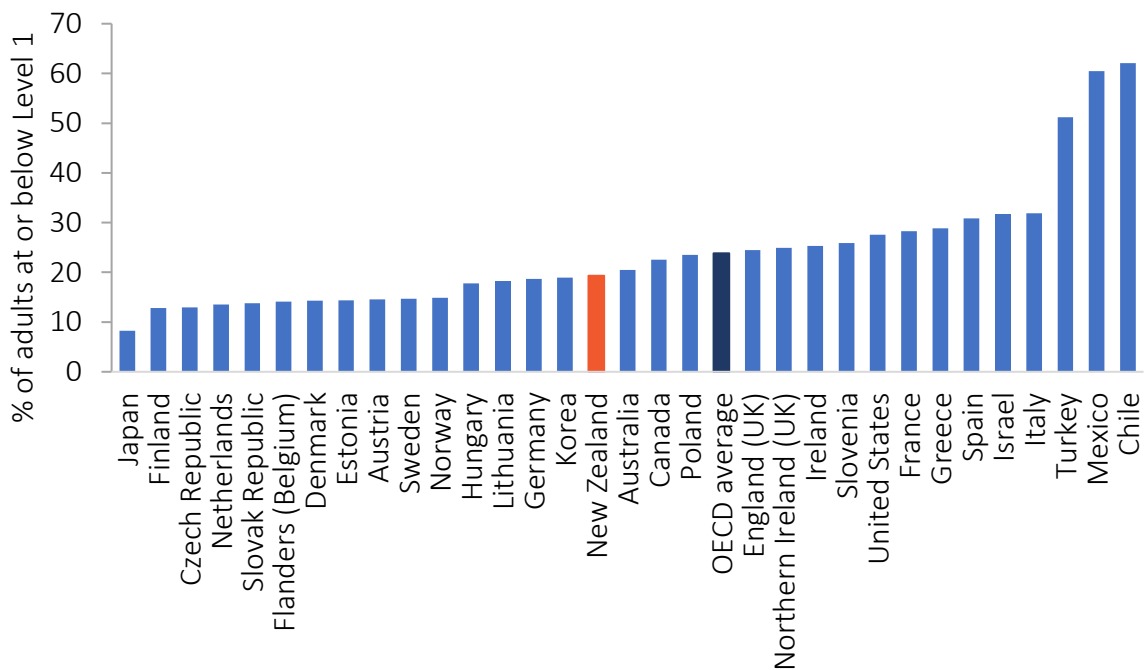
Despite this seemingly strong performance in international performance, it should be noted that this still means that a sizeable share of NZ's working-age population has low L/N skills. As mentioned, approximately one in eight NZ adults has low literacy proficiency and almost one in five has low numeracy proficiency. Furthermore, and as will be discussed, there are substantial differences in the share of those with low L/N skills across population groups. For example, the share is substantially higher among Māori and Pacific Peoples.

Figure 1. Percentage of adults at or below Level 1 literacy and numeracy, by OECD country

A. Literacy



B. Numeracy



Notes: The US data is 2012/2014. The percentage of those at or below Level 1 is calculated as a share of non-missing observations. Source: OECD PIAAC.

4.2 Definitions and descriptives

Table 2 presents descriptive statistics and definitions for variables utilised in this research. We first begin by summarising responses from the PIAAC survey questions and then move on to descriptives from the linked administrative data sets.

In NZ, PIAAC sampled 6,177 individuals representing 2,749,700 individuals aged 16-65 years. About 12 percent have low literacy proficiency (i.e. a proficiency level at or below Level 1), 19 percent have low numeracy proficiency and 21 percent have either low literacy or numeracy proficiency (or both). This highlights the large overlap between those with low literacy and those with low numeracy. Indeed, literacy and numeracy proficiency are highly correlated (correlation coefficient of 0.87), which is consistent with evidence from other countries (Hanushek *et al.*, 2015). In order to understand the numeracy questions in PIAAC, some literacy skills are also required, thus it is perhaps unsurprising that the percent at or below Level 1 for numeracy is higher than that for literacy, and that the vast majority of those who are at or below Level 1 in numeracy are also at or below Level 1 for literacy.

In terms of the characteristics of the sample, the average age of respondents is 40 years old and 52 percent of respondents are female. In terms of ethnicity classification, we have prioritised based on the order of Māori, Pacific Peoples, Asian, MELAA, Other, and then NZ European. The largest ethnic minorities are Māori, Pacific Peoples and Asian. In subsequent analyses, we therefore concentrate on comparing these groups with NZ European, and do not conduct any sub-analysis with the categories of MELAA or Other ethnicity.

Educational characteristics are captured via highest educational qualification, ranging from no school qualification (31 percent of the sample) to holding a masters or doctorate degree (close to 5 percent of the sample). There are a range of variables encompassing labour market characteristics. First, at the time of the survey, the majority of individuals were employed (53 percent full-time and 18 percent part-time), while close to 10 percent were primarily studying, nine percent in a caregiving role, five percent unemployed, and the remaining in categories such as retired, permanently disabled, etc. For employed individuals, the average hourly wage (2014 NZD) was close to \$28, and the standard deviation on this variable signals considerable variation. When we cut the wage distribution into quartiles, we find that 25 percent of respondents earned less than \$16.81 per hour, while 75 percent of respondents earned less than \$30.45 per hour.

In terms of household composition, over half of respondents reported having a child living in the household and roughly two-thirds reported living with a spouse or partner. The remaining PIAAC sourced variables in Table 2 cover self-rated health (where 60 percent report having excellent or very good health); being born in NZ (close to 29 percent of the sample are immigrants); and region.

The next sets of variables are sourced from linking PIAAC to administrative sources in the IDI (as outlined in Section 2) to capture justice events, health events and benefit reciprocity. In the justice space, we present the incidence of being investigated as an offender (since data records began in 2009) or as a victim (since 2014). Both proportions are close to 13 percent. For each perspective, we also derive the average number of offences/victimisations, as well as the mean and maximum seriousness score of offence(s). The score is constructed by the Ministry of Justice and reflects the average number of equivalent days in jail, community service or fines as a result of being convicted for an offence. For example, unlawfully taking a motor vehicle has a seriousness score of 177 (Sullivan et al., 2017).

Table 2. Descriptive profile of PIAAC sample

Variable	Description	Mean (SD)
Female (%)	Percent identifying as female	51.56
Age	Age in years	39.97 (14.23)
Literacy/Numeracy proficiency (%)		
Low literacy	Percent at or below Level 1 in PIAAC literacy proficiency	12.08
Low numeracy	Percent at or below Level 1 in PIAAC numeracy proficiency	19.31
Low literacy and/or numeracy	Percent at or below Level 1 in either PIAAC literacy and/or numeracy	21.05
Prioritised ethnicity (in order of prioritisation) (%)		
Māori	Percent with prioritised ethnicity Māori	13.56
Pacific Peoples	Percent with prioritised ethnicity Pacific Peoples	5.65
Asian	Percent with prioritised ethnicity Asian	11.82
MELAA	Percent with prioritised ethnicity MELAA (Middle Eastern, Latin American or African)	1.00
Other or Unspecified	Percent with prioritised ethnicity Other or Unspecified	2.54
NZ European	Percent with prioritised ethnicity NZ European	65.42
Educational characteristics		
No school	Percent with less than a school qualification	30.96
School	Percent with at most a school qualification	7.46
Post-school	Percent at most a post-school qualification	33.44
Bachelor's	Percent with at most a Bachelor's degree	23.28
Master's or PhD/Doctorate	Percent with a Master's or Doctoral degree	4.87
Labour market characteristics		
Labour force status (%)	Self-reported current labour market state	
Full-time	Percent working at least 30 hours per week (self-employed included)	52.58
Part-time	Percent working between 1 and 29 hours per week (self-employed included)	17.68
Unemployed	Percent not employed but looking for work	5.37
Student	Percent identifying as a pupil or student	9.60
Apprentice	Percent involved in an apprenticeship or work placement programme	0.39
Retired	Percent in retirement or early retirement	2.04
Permanently disabled	Percent permanently disabled	1.92
Domestic tasks/looking after family	Percent fulfilling domestic tasks of looking after children/family	8.64

Variable	Description	Mean (SD)
Average hourly wage (2014 NZD)	Self-reported hourly earnings, including bonuses	27.75 (27.54)
25 th percentile	The hourly wage at which 25% of the respondents fall below	16.81
50 th percentile	The hourly wage at which 50% of the respondents fall below	22.00
75 th percentile	The hourly wage at which 75% of the respondents fall below	30.45
Years of paid work experience	Years of paid work during lifetime (top-coded at 47)	19.04 (13.21)
Household characteristics		
Any children in household (%)	Percent of respondents with at least one child living in the household	56.73
Number of children in household	Average number of children in the household (figure includes households without children)	0.98 (1.36)
Lives with spouse or partner (%)	Percent of respondents living with a spouse or partner	67.22
Other characteristics (%)		
Very good/excellent health	Percent rating health 4 or 5 on the Likert scale (1-5) denoting excellent or very good health	60.26
Born in NZ	Percent of respondents born in NZ	71.16
Region (%)		
Northland	Percent living in the Northland region	3.19
Auckland	Percent living in the Auckland region	36.04
Waikato	Percent living in the Waikato region	9.03
Bay of Plenty	Percent living in the Bay of Plenty region	5.29
Gisborne	Percent living in the Gisborne region	0.99
Hawke's Bay	Percent living in the Hawke's Bay region	3.48
Taranaki	Percent living in the Taranaki region	2.42
Manawatu-Wanganui	Percent living in the Manawatu-Wanganui region	5.00
Wellington	Percent living in the Wellington region	12.89
West Coast	Percent living in the West Coast region	0.66
Canterbury	Percent living in the Canterbury region	11.38
Otago	Percent living in the Otago region	5.21
Southland	Percent living in the Southland region	2.04
Tasman	Percent living in the Tasman region	0.64
Nelson	Percent living in the Nelson region	0.88
Marlborough	Percent living in the Marlborough region	0.86

Variable	Description	Mean (SD)
Justice events		
Investigated for a criminal offence (%)	Percent investigated as an offender (since 2009)	12.85
Maximum seriousness score	Average maximum seriousness score ¹ of offence(s), conditional on being investigated as an offender	160.02 (552.09)
Mean seriousness score	Average seriousness score of offence(s), conditional on being investigated as an offender	74.21 (252.45)
Mean number of offences	Average number of investigated offences, conditional on being investigated as an offender	4.18 (7.89)
Was an alleged victim of a crime (%)	Percent investigated as a crime victim (since 2014)	12.89
Maximum seriousness score	Average maximum seriousness score of offence(s), conditional on being an alleged victim	188.08 (489.65)
Mean seriousness score	Average seriousness score of offence(s), conditional on being an alleged victim	148.89 (355.47)
Mean number of victimisations	Average number of investigated victimisations, conditional on any investigated victimisation	1.43 (1.05)
Health events		
Referral for mental health services (%)	Percent referred for mental health services (since 2008)	13.03
Non-admitted ED visit (%)	Percent with a non-admitted emergency department (ED) visit (since 2007)	53.70
Number of non-admitted ED visits	Average number of non-admitted ED visits, conditional on any visit	2.70 (4.33)
Any accident-related non-admitted hospital visit (%)	Percent with a non-admitted ED visit that was accident-related (since 2007)	33.71
Number of accident-related ED visits	Average number of non-admitted accident-related ED visits, conditional on any visit	2.06 (6.10)
Benefit recipiency		
Receipt of any public benefits (%)	Percent that received any working-age main benefit (since 1990)	41.00
Number of months of benefit receipt	Average number of months of working-age main benefit receipt, conditional on receipt (since 1990)	22.34 (52.81)
Observations (unweighted)	Total number of PIAAC observations	6,177
Observations (weighted)	Total number of weighted ² PIAAC observations	2,749,700

Notes: To account for the complex sample design of PIAAC, all estimates were calculated using the statistical software package *repest* in Stata. Standard deviations are in parentheses. Statistics are calculated using non-missing observations. Unweighted observation counts are randomly rounded to base three and weighted observation counts are rounded to the nearest 100 in accordance with Stats NZ policy. ¹Seriousness scores are constructed by the Ministry of Justice and reflect the average number of equivalent days in jail, days of community service, or fines sentenced as a result of being convicted of a particular offence. ² Sample weights in PIAAC are used to ensure that estimates are nationally representative.

Table 2 also presents a range of health events. Approximately 13 percent of the sample had been referred to a mental health service since 2008. Just over half the sample had a non-admitted ED visit since 2007, and more than half of these were accident-related. For both types of ED visits, we also present the number of visits as a measure of frequency / intensity of downstream health service use.

The final section of Table 2 provides information on the prevalence and duration of benefit receipt. Since those records began in 1990, 41 percent of the PIAAC sample have received any working-age main benefit; and for those that did, the average number of months of receipt was close to 22.

4.3 Profile of the low L/N population

We next breakdown the sample by L/N skill level. As Table 3 shows, we provide a descriptive profile for those that are low literacy versus not; similarly for low numeracy; and then a comparison with individuals who are low in either literacy and numeracy (or both). Across columns (1) to (3), we provide indicators of statistical significance (***, **, *) to denote significance at the 1%, 5% and 10% levels of comparisons presented.

The first key finding from these results are that while levels may differ across the comparisons in columns (1) through to (3), the patterns are very similar regardless of whether we focus on literacy or numeracy separately, or jointly. This is perhaps not surprising given that literacy and numeracy scores are highly correlated (discussed above). The one exception to this pattern is gender. Table 3 shows that there is no statistical difference between the proportion of low literacy versus not low literacy who are women, whereas those who have low numeracy are more likely to be women (a difference that is statistically significant at the one-percent level). This gender difference is likely reflected in the finding for household structure which indicates that a higher proportion of individuals with low numeracy proficiency have children in their household. It is also consistent with cross-country research highlighting that boys have higher numeracy skills than girls and that this gap increases with age, peaking at age 27. In contrast, girls have a small literacy advantage over boys, but this gap closes over time to be negligible by age 27 (Borgonovi et al., 2018).

Given the similarity in patterns across the columns, we focus our description on column (3). Results show that the average age for those with low L/N is higher than for those that are not low L/N. We also find that those who have low L/N skills are more likely to be aged 55 and over relative to those who are not low L/N. This pattern is seen in almost all OECD countries, and is as expected given education levels have increased over time. However, while it is positive that younger NZ adults have higher average skill levels than older adults, there is still a sizeable share of younger adults who have low L/N skills. Almost 11 percent of those aged 16-34 years are at or below Level 1 in literacy, and almost 19 percent are at or below Level 1 in numeracy (Appendix Table A.2). Given the increasing level of skills needed to

navigate the growing level of complexity faced not only in the job market, but in everyday life, it is concerning that a sizeable share of younger adults have low L/N proficiency.

In Appendix Table A.1, we further breakdown L/N skill level across the three age groups of 16-34, 35-54, and 55-65-year-olds. The main finding in this breakdown is that significant differences in some domains (specifically justice and health events) between low and not-low skill are primarily concentrated in the early and prime age groups, and not as evident for the exit working age group.

Returning to Table 3, as expected, low L/N is strongly associated with Māori and Pacific Peoples; and with low educational attainment (49 percent of those with low literacy or numeracy proficiency have no school qualifications). In terms of labour market experience, comparing individuals who are low in either literacy or numeracy relative to not low in either, low-skilled individuals are less likely to be working full-time or be a student; and more likely to be unemployed or permanently disabled. As expected, the average hourly wage is much lower in the group with low L/N, relative to those not low in literacy and/or numeracy. Interestingly, there is no significant difference in number of years of work experience. While those with low L/N may tend to have a more broken work history, they will in general also have spent less time out of the labour force while pursuing education and are also older on average. It may be that these factors are having an offsetting effect. Indeed, Table A.1 which examines differences within the early, prime and exit working age groups shows that those with low L/N have fewer years of work experience within each age group, which suggests the lack of difference at the aggregate level is at least partly due to the interaction of work experience and age.

Table 3. Descriptive profile of PIAAC sample by L/N skill level

Variable	(1) Literacy		(2) Numeracy		(3) Literacy and numeracy	
	Not low	Low	Not low	Low	Not low in literacy and numeracy	Low in literacy and/or numeracy
Female (%)	52.03	49.74	50.42	57.36***	50.66	55.88**
Age	39.60	42.11***	39.61	41.11**	39.54	41.27***
Age groups (%)						
Early working age (16 – 34)	38.62	33.90*	38.23	37.29	38.47	36.48
Prime working age (35 – 54)	43.24	39.51	44.13	37.19***	44.07	37.98***
Exit working age (55 – 65)	18.14	26.59***	17.64	25.52***	17.46	25.53***
Prioritised ethnicity (%)						
Māori	12.78	21.43***	11.38	24.06***	11.33	23.18***
Pacific Peoples	4.11	17.76***	3.27	16.12***	3.19	15.36***
Asian	11.14	18.56***	11.61	13.8***	11.24	15.03***
MELAA	1.02	1.02	0.95	1.31	0.95	1.28
Other or Unspecified	0.74	0.12***	0.77	0.27**	0.77	0.28**
NZ European	70.2	41.11***	72.02	44.43***	72.51	44.88***
Educational characteristics						
None	27.62	55.20***	26.37	49.89***	26.16	48.77***
School	7.62	6.28	7.4	7.70	7.41	7.65
Post-school	33.92	29.99	33.54	33.08	33.43	33.5
Bachelor's	25.39	7.82***	26.85	8.47***	27.08	9.09***
Master's or PhD	5.45	0.70***	5.85	0.86***	5.68	0.96***
Labour market characteristics						
Labour force status (%)						
Full-time	54.04	41.88***	55.68	39.62***	55.50	41.59***
Part-time	17.92	15.93	17.92	16.68	18.00	16.48
Unemployed	4.54	11.45***	4.06	10.87***	4.07	10.28***
Student	10.10	5.98***	9.97	8.06*	10.06	7.89*
Apprentice	0.42	0.16	0.43	0.21	0.44	0.19
Retired	1.83	3.56**	1.83	2.91	1.81	2.90*

Variable	Literacy (1)		Numeracy (2)		Literacy and numeracy (3)	
	Not low	Low	Not low	Low	Not low in literacy and numeracy	Low in literacy and/or numeracy
Permanently disabled	1.27	6.64***	1.00	5.75***	0.99	5.39***
Domestic tasks/looking after family	8.34	10.87*	7.64	12.84***	7.70	12.16***
Average hourly wage (2014 NZD)	28.63	19.68***	29.11	20.62***	29.29	20.65***
Years of paid work experience	19.12	18.46	19.26	18.09*	19.21	18.38
Household characteristics						
Any children in household (%)	56.61	57.61	55.78	60.80**	55.95	59.73
Number of children in household	0.98	1.03	0.96	1.12**	0.96	1.10*
Lives with spouse or partner (%)	68.20	59.88	69.17	58.85***	69.31	59.20***
Other characteristics (%)						
Very good/excellent health	62.19	46.17***	63.46	46.86***	63.64	47.57***
Born in NZ	72.53	61.19***	71.98	67.72**	72.31	66.83***
Region (%)						
Northland	3.22	2.95	3.13	3.42	3.16	3.32
Auckland	35.19	42.2**	35.14	39.8**	34.92	40.23**
Waikato	8.83	10.51	8.52	11.16*	8.5	11
Bay of Plenty	5.46	4.04	5.46	4.58	5.44	4.73
Gisborne	0.98	1.07	0.91	1.36	0.91	1.32
Hawke's Bay	3.5	3.29	3.44	3.63	3.45	3.59
Taranaki	2.33	3.04	2.27	3.05	2.26	3.02
Manawatu-Wanganui	5.12	4.16	5.11	4.54	5.17	4.38
Wellington	13.51	8.41***	13.86	8.88***	13.93	9.01***
West Coast	0.61	1.04	0.56	1.08	0.57	1.00
Canterbury	11.43	10.87	11.58	10.44	11.63	10.35
Otago	5.28	4.76	5.36	4.63	5.4	4.52
Southland	2.07	1.84	2.11	1.78	2.11	1.78
Tasman	0.66	0.45	0.67	0.51	0.67	0.5
Nelson	0.94	0.48*	0.97	0.52	0.99	0.49*
Marlborough	0.85	0.88	0.91	0.63	0.88	0.77

Variable	Literacy (1)		Numeracy (2)		Literacy and numeracy (3)	
	Not low	Low	Not low	Low	Not low in literacy and numeracy	Low in literacy and/or numeracy
Justice events						
Investigated for a criminal offence (%)	11.78	22.78***	10.78	22.81***	10.70	22.10***
Maximum seriousness score	137.27	245.70	139.46	200.83	136.94	202
Mean seriousness score	73.51	76.87	75.56	71.64	76.02	70.95
Mean number of offences	3.89	7.18***	3.19	6.15***	3.13	6.09***
Was an alleged victim of a crime (%)	12.70	16.44**	12.32	16.62***	12.31	16.30***
Maximum seriousness score	190.49	174.23	183.98	200.63	185.78	194.45
Mean seriousness score	150.60	139.08	150.44	144.05	151.76	24.17
Mean number of victimisations	1.43	1.47	1.39	1.56	1.4	1.54
Health events						
Any referral for mental health services (%)	12.49	19.01***	11.73	19.77***	11.73	19.10***
Non-admitted ED visit (%)	53.73	62.03***	52.69	63.23***	52.65	62.53***
Number of non-admitted ED visits	2.52	4.01***	2.4	3.9***	2.38	3.86***
Any accident-related non-admitted hospital visit (%)	33.66	39.50**	33.25	38.51**	33.20	38.72***
Number of accident-related ED visits	1.95	2.80	1.97	2.42	1.95	2.45
Benefit recipiency						
Receipt of any public benefits (%)	40.08	54.26***	38.55	55.36***	38.51	54.11***
Number of months of benefit receipt	19.29	48.13***	16.61	43.53***	16.51	46.26***
Observations						
Observations (unweighted)	5,316	759	48,114	1,260	4,716	1,359
Observations (weighted)	2,371,900	325,400	2,176,400	520,900	2,129,500	567,800

Notes: To account for the complex sample design of PIAAC, all estimates were calculated using the Stata ado *repest*. Unweighted observation counts are randomly rounded to base three and weighted observation counts are rounded to the nearest 100 in accordance with StatsNZ policy. Statistics are calculated using non-missing observations. Proficiency scores are measured on a 500-point scale and divided into Levels 1-5. Low skill is defined as being at level 1 or below. ***, **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively, for t-tests comparing the mean for those with low L/N versus not low.

Table 3 also illustrates that those with low L/N are more likely to be migrants. This is perhaps unsurprising since PIAAC was administered in English in NZ and there is a high share of non-native English speakers among migrants. Further, regional differences are limited to the two main urban cities – Auckland and Wellington. A higher proportion of the low-skill population live in Auckland; and the converse is true for Wellington. The former of these findings aligns with the higher prevalence of Pacific Peoples in the low-skill group, as a higher proportion of the Pacific population of NZ resides in Auckland.

In terms of the administrative data variables of interest, a number of interesting patterns are evident. For example, nearly a quarter of the low L/N population has been investigated for a criminal offence (since 2009), the comparable number in the not low-skill population is close to half of that (12 percent). The low L/N population has a higher proportion of individuals who have been a victim of a crime – 17 percent compared to 13 percent for the not low-skill population, based on data since 2014.

Using PIAAC data, we find that those with low L/N proficiency are less likely to have very good or excellent self-rated health status. Consistent with this, the administrative data also shows that they access health services more frequently. Mental health referrals are higher for the low L/N population, relative to the non-low-skill group (20 percent versus 12 percent). The relationship between low literacy and mental health is a complicated one, as acknowledged in Sentell et al. (2003). Low literacy can act as an obstacle to effective health care, and poor mental health can also lead to a decline in literacy proficiency as well as reduced opportunities for education and training. Table 3 also shows that non-admitted ED visits are more likely for the low L/N population, relative to the non-low-skill group. Although, it should be noted that reasons for ED use are multifaceted and are only partially explained by lack of access to adequate primary healthcare. Other reasons relate to demographic and societal changes, such as an ageing population, changing prevalence of chronic conditions, and changes in household characteristics that lead to an increase in loneliness and reduced family support (Van den Heede and Vand de Voorde, 2016).

The final set of findings in Table 3 relate to benefit receipt. As expected, and in alignment with results regarding unemployment status earlier in the table, we find the prevalence and intensity of benefit receipt is greater for the low L/N population, relative to the non-low-skill group. For example, the number of months of benefit receipt is more than double, 53 months versus 19 months (and the difference is significant at the one-percent level).

4.4 A closer look at the low L/N population by ethnicity

The next set of results (Table 4) disaggregates skill comparisons across the ethnicity dimension. As detailed above, we use prioritised ethnic groups and restrict attention to people identifying as Māori, Pacific Peoples, Asian or NZ European due to the small number identifying as MELAA and Other ethnicity.

A few novel findings emerge. First, it is apparent that the finding discussed above that low L/N individuals are likely to be old, holds across all ethnicities. Across all prioritised ethnicity groups, average respondent ages are higher for those who have low literacy and/or numeracy compared to those who do not. As discussed above, this is as expected. Second, Table 4 illustrates a trade-off between work experience and educational attainment, which is observable for NZ European, Pacific Peoples, and Asian respondents (and the difference is statistically significant for NZ European, potentially due to the larger sample size). Specifically, low L/N individuals tend to have lower levels of educational attainment compared to non-low-skilled individuals, but relatively more years of paid work experience. As discussed above, while it is likely low L/N individuals have had more broken work patterns due to, for example, greater periods in unemployment, this is likely offset by the fact that they are, on average, older and tend to have spent less time out of the labour force while pursuing education. This pattern does not appear to hold for Māori respondents, which could partly be due to the smaller difference in the average age – low L/N Māori are, on average, 2.6 years older than those who are not low L/N, versus 4 years for NZ Europeans and Asians, and 4.5 years for Pacific Peoples. Third, in terms of household characteristics and children in the household, there appear to be no significant differences between low and not low-skill individuals, regardless of ethnicity.

Finally, it is worth interpreting Table 4 with caution when interpreting the far fewer statistically significant differences detected across skill subgroups whose prioritised ethnicity is Pacific Peoples or Asian. It should be noted that the magnitude of the differences between the low and not-low L/N groups for these ethnicities is consistent with expectations and with the observations within other ethnic groups. For example, low L/N Pacific Peoples are less likely to be employed than Pacific Peoples who are not low L/N, although this difference is not statistically significant. Likewise, low L/N Pacific Peoples are more likely to have been investigated for a criminal offence, an alleged victim of a crime, and to have visited the ED, but these differences are not statistically significant. This is likely due to the relatively small sample size in these groups, and thus the estimates are less precise and the t-tests have less power. While these differences are in line with the results for the two largest ethnic groups of NZ European and Māori, there are not enough observations to conclude with a high degree of accuracy that variable means are statistically different from zero.

Table 4. Descriptive profile of PIACC sample by Ethnicity category and L/N skill level

Variable	NZ European		Māori		Pacific Peoples		Asian	
	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy
Female (%)	50.35*	55.53	55.14	58.93	54.51	52.38	48.47	55.76***
Age	41.24	45.28***	35.39	37.94**	33.35	37.86**	34.30	38.33***
Age groups (%)								
Early working age (16 – 34)	33.55	25.8***	51.09	44.66	55.61	45.71	53.4	45.52
Prime working age (35 – 54)	45.22	38.25**	40.69	36.26	36.95	38.97	41.28	39.6
Exit working age (55-65)	21.23	35.95***	8.22	19.08***	7.44	15.32**	5.32	14.88***
Educational characteristics								
None	25.33	46.31***	34.00	54.81***	38.81	61.58***	21.39	34.12**
School	8.06	9.79	7.11	6.47	9.72	6.69	2.78	3.18
Post-school	35.18	36.83	40.33	34.73	30.52	27.18	15.34	28.04**
Bachelor's	25.98	6.33***	16.34	3.99***	17.92	4.55***	47.17	30.48**
Master's or PhD	5.23	0.73***	2.2	0.00***	2.92	0.00***	12.3	3.82***
Labour market characteristics								
Labour force status (%)								
Full-time	56.68	44.75***	50.67	29.69***	49.51	46.79	54.69	46.59
Part-time	19.99	19.17	12.79	12.93	8.16	12.59	13.9	17.71
Unemployed	3.15	8.76***	7.20	16.91***	7.32	9.86	5.17	5.79
Student	8.53	4.39***	10.81	13.22	18.33	5.71***	16.67	10.57*
Apprentice	0.34	0.21	0.87	0.42	1.19	0.00	0.45	0.00***
Retired	2.28	4.03	0.42	0.92	0.72	0.78	0.73	3.9
Permanently disabled	1.04	6.06***	1.57	5.61***	0.51	4.78***	0.07	3.24***
Domestic tasks/looking after family	6.71	9.27	13.52	16.7	11.4	16.61	6.95	10.14
Average hourly wage (2014 NZD)	31.12	20.43***	23.54	20.18***	24.82	22.4	23.8	20.01**
Years of work experience	21.15	23.02**	15.15	14.84	13.83	14.98	11.59	13.31

Variable	NZ European		Māori		Pacific Peoples		Asian	
	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy
Household characteristics								
Any children in household (%)	53.66	46.83	68.41	70.88	72.87	77.24	52.71	58.81
Number of children in household	0.87	0.62***	1.51	1.54	1.68	1.92	0.8	0.88
Lives with spouse or partner (%)	72.64	64.10***	57.71	47.87**	54.21	58.13	64.66	65.68
Other characteristics (%)								
Very good/excellent health	65.97	47.01***	51.81	40.53***	44.69	48.18	65.07	58.15
Born in NZ	79.35	84.48**	97.07	99.37***	56.53	31.97***	10.74	3.51***
Region (%)								
Northland	2.82	2.76	8.82	8.16	1.4	1.02	0.44	0.36
Auckland	29.93	23.69**	26.9	28.69	64.8	74.86*	63.16	66.38
Waikato	8.66	13.62**	13.05	15.92	4.81	3.28	4.56	3.63
Bay of Plenty	5.14	3.94	10.59	9.23	1.43	0.95	3.45	3.91
Gisborne	0.89	0.94	1.89	3.88	0.00	0.00	0.35	0.00
Hawke's Bay	3.40	4.59	7.47	5.72	2.07	0.88	0.77	0.83
Taranaki	2.47	4.90	2.42	2.89	0.91	0.35	0.59	1.02
Manawatu-Wanganui	5.74	5.13	7.00	6.14	0.66	1.23	1.42	3.3
Wellington	14.79	8.47***	8.53	7.3	13.63	9.39	14.78	12.58
West Coast	0.76	2.30	0.25	0.00***	0.00	0.00	0.00	0.00
Canterbury	13.6	15.77	5.85	6.68	5.21	5.19	7.14	6.12
Otago	6.36	8.61	3.5	1.79	3.1	1.41	1.71	0.69
Southland	2.46	3.01	1.87	1.08	0.18	0.91	0.98	0.46
Tasman	0.86	1.02	0.23	0.25	1.05	0.03***	0.00	0.00
Nelson	1.15	0.51	0.58	0.44	0.00	0.46***	0.30	0.62
Marlborough	0.95	0.74	1.04	1.82	0.75	0.04	0.35	0.10

Variable	NZ European		Māori		Pacific Peoples		Asian	
	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy	Not low in literacy and numeracy	Low in literacy and/or numeracy
Justice events								
Investigated for a criminal offence (%)	8.83	16.69***	24.52	38.15***	22.83	30.21	5.85	6.29
Maximum seriousness score	145.74	152.28	132.51	267.96	62.51	193.98**	177.5	58.6
Mean seriousness score	79.1	73.42	63.63	77.07	29.59	65.99	163.08	30.72
Mean number of offences	2.84	5.83***	4.19	7.22**	2.84	5.25**	2.14	2.65
Was an alleged victim of a crime (%)	11.75	16.2**	17.95	21.6	16.94	15.51	9.54	10.02
Maximum seriousness score	162.83	196.66	299.49	234.49	170.13	145.11	170.65	130.5
Mean seriousness score	15.06	54.07	48.79	27.01**	39.06	40.68	27.5	33.88
Mean number of victimisations	1.34	1.48	1.7	1.84	1.51	1.27	1.25	1.28
Health events								
Any referral for mental health services (%)	11.59	18.63***	19.29	32.9***	12.56	14.49	5.47	4.39
Non-admitted ED visit (%)	53.42	64.37***	61.58	69.54*	61.05	67.16	37.21	43.03
Number of non-admitted ED visits	2.32	3.94***	3.24	4.55**	2.51	3.91**	1.62	2.21
Any accident-related non-admitted hospital visit (%)	35.34	43.36***	37.34	45.64**	37.11	35.56	15.41	19.66
Number of accident-related ED visits	2.04	3.07	2.11	2.3	2.46	1.72	0.93	1.42
Benefit reciprocity								
Receipt of any public benefits (%)	36.82	52.54***	64.83	75.76***	56.74	60.63	18.93	19.93
Number of months of benefit receipt	13.75	43.16***	45.15	81.86***	24.54	41.18**	3.64	7.02
Observations								
Observations (unweighted)	3,276	588	741	405	171	198	453	150
Observations (weighted)	1,544,100	254,800	241,400	131,600	68,000	87,200	239,300	85,300

Notes: To account for the complex sample design of PIAAC, all estimates were calculated using the Stata ado *repest*. Unweighted observation counts are randomly rounded to base three and weighted observation counts are rounded to the nearest 100 in accordance with StatsNZ policy. Statistics are calculated using non-missing observations. Proficiency scores are measured on a 500-point scale and divided into Levels 1-5. Low skill is defined as being at level 1 or below. *, **, *** represent statistical significance at the 1%, 5% and 10%, respectively, for t-tests comparing the mean for those with low L/N versus not low within each respective ethnic group.

4.5 A closer look at the distribution of L/N proficiency

The final set of results in building an empirical portrait of the low L/N skill population in NZ provide greater detail on the distribution of literacy and numeracy proficiency, thus permitting a more granular view beyond the dichotomous breakdown of low and not low skill. Table 5 presents a detailed summary of PIAAC competency scores for literacy and numeracy disaggregated by ethnicity. Alongside overall averages, we present quartile threshold points as well as the proportion of the sample that scored below Level 1, at Level 1, and the combined low skill definition of at or below Level 1. All estimates are presented for the full PIAAC sample, as well as for prioritised ethnicity subgroups. The equivalent table broken down by age groups is presented in appendix Table A.2.

Examining mean scores, NZ Europeans have the highest average literacy score, while Pacific Peoples are at the other end of the spectrum. This pattern is mirrored with the mean numeracy score. Of further note is the breakdown of the low skill population into those below Level 1 and those at Level 1. We find that, irrespective of ethnic subgroup being viewed, there is a greater proportion of the sample that is at Level 1 rather than below it. However, it does stand out that the proportion of each ethnic sample that is below Level 1 (in literacy) is below five percent for NZ European, Māori and Asian, but above 10 percent for Pacific Peoples. This ethnic subgroup again stands out when viewing the lowest slice of the skill distribution in numeracy proficiency, equating to more than 20 percent of their population in the PIAAC sample.

As discussed, there is a higher proportion of people scoring at or below Level 1 in numeracy than in literacy, and this finding holds across all ethnicities. It also stands out that more than a fifth of Pacific Peoples are below Level 1 in numeracy compared with just 2.5 percent of NZ Europeans. In addition, more than half of Pacific Peoples are at or below Level 1 in numeracy compared with about 13 percent for NZ Europeans, while the comparative figure for is 35 percent for Māori and 22 percent for Asians.

Equating these shares into numbers to better illustrate the magnitude of the issue, out of the almost 2.7 million adults aged 16-65 in NZ, there are about 326,000 with literacy levels at or below Level 1, and about 521,000 with numeracy levels at or below Level 1. If the stark differences in ethnicity were eliminated so that all groups had the same share at or below Level 1 as NZ Europeans, these numbers would be reduced to 201,000 and 347,000 respectively.

Table 5. Literacy and numeracy distribution for PIAAC sample by ethnic group

Variable	NZ European	Māori	Pacific Peoples	Asian	Total
Literacy					
Literacy score	289.85 (43.59)***	264.85 (45.83)***	239.43 (51.80)***	267.89 (49.22)***	280.67 (47.39)
25 th percentile	263.21	236.01	206.44	237.72	252.02
50 th percentile	292.21	265.48	241.71	272.62	284.33
75 th percentile	319.66	295.97	274.73	302.03	313.39
Literacy below level 1 (%)	1.22***	3.54	11.61***	4.67*	2.57
Literacy at level 1 (%)	6.22***	15.16***	25.61***	13.93***	9.49
Literacy at or below level 1 (%)	7.44***	18.70***	37.22***	18.60***	12.07
Observations (unweighted)	3,864	1,146	369	606	6,075
Observations (weighted)	1,798,900	373,000	155,200	324,600	2,697,400
Numeracy					
Numeracy score	281.59 (50.20)***	247.82 (52.64)***	219.96 (55.71)***	264.70 (55.18)**	271.13 (54.37)
25 th percentile	249.58	212.60	182.66	230.83	237.05
50 th percentile	283.64	249.58	219.68	267.64	274.28
75 th percentile	315.76	284.13	258.65	303.93	308.57
Numeracy below level 1 (%)	2.46***	8.91***	21.14***	6.03	4.87
Numeracy at level 1 (%)	10.40***	24.70***	32.96***	16.12	14.44
Numeracy at or below level 1 (%)	12.87***	33.60***	54.10***	22.15	19.31
Observations (unweighted)	3,864	1,146	369	606	6,075
Observations (weighted)	1,798,900	373,000	155,200	324,600	2,697,400

Notes: To account for the complex sample design of PIAAC, all estimates were calculated using the Stata ado *repest*. Standard deviations are in parentheses. Unweighted observation counts are randomly rounded to base three and weighted observation counts are rounded to the nearest 100 in accordance with StatsNZ policy. Statistics are calculated using non-missing observations. Proficiency scores are measured on a 500-point scale and divided into Levels 1-5. Low skill is defined at or below level 1. ***, **, * represent statistical significance at the 1%, 5% and 10%, respectively, for t-tests comparing the mean for the specified ethnicity with the combined mean for all other ethnicities.

5 Conclusions

This research paper provides an empirical portrait of NZ's adult population living with low L/N skills. We use data from the OECD's PIAAC Survey of Adult Skills. This is a representative survey of NZ's working-age population (aged 16-65 years old) that measures L/N proficiency as well as collecting a range of background information on respondents. We link this survey information with data from Stats NZ's Integrated Data Infrastructure (IDI) to provide additional information on offending and victimisation, health service use and welfare benefit receipt.

We define the low L/N population as those with a proficiency score at or below Level 1 according to the OECD classification system. By this definition, almost 570,000 adults have low proficiency in literacy or numeracy. In practical terms, this means that more than one in five NZ adults finds everyday tasks such as reading and understanding job advertisements challenging.

In addition to the magnitude of the aggregate numbers living with low L/N skills, this research highlights the stark inequalities in the distribution of L/N skills across the population, with a focus on the large gaps by ethnicity. The share of low L/N adults among Pacific Peoples is particularly high. In literacy, about a third have low literacy skills, and over a half have low numeracy skills. In contrast, just 7.4% of NZ Europeans have low literacy skills and 12.9% have low numeracy skills. There are also large gaps between Māori and NZ Europeans – 18.7% of Māori have low literacy skills and 33.6% have low numeracy skills.

Turning to age, the share of low L/N individuals is lower among younger adults than older ones. This pattern is seen in most OECD countries and is as expected given rising education levels. However, it is still the case that 11% of those aged 16-34 years old have low literacy proficiency, and almost 19% have low numeracy. Given the increasing level of skill needed to navigate the growing level of complexity faced not only in the job market, but in everyday life, it is concerning that a reasonable share of younger adults have low L/N proficiency.

Our analysis also looked at the relationship between low L/N skills and a number of factors that are suggestive of the potential consequences of these proficiency levels. For example, those with low L/N skills have worse labour market outcomes, are more likely to have been investigated for a criminal offence and also to have been a victim of an alleged crime, have poorer self-rated health, access health services more frequently, and have greater prevalence and intensity of welfare benefit receipt.

This research is the first piece of empirical work undertaken as part of the five-year research programme 'The expression, experience and transcendence of low skills in Aotearoa NZ'. Future

empirical work will apply analytical data techniques to PIAAC and IDI data to examine the potential drivers and consequences of low L/N skills in more detail. For example, we will take a closer look at the labour market returns to skills in NZ; the role of skills in NZ's ethnicity and gender wage gaps; whether L/N interventions improve outcomes (such as educational, justice sector and labour market outcomes); and the relationship between skills and resilience to shocks with a focus on the impact of Covid-19. Qualitative research to better understand the lived experiences of those with low L/N skills also forms an integral part of this research programme. This qualitative research will provide a more holistic view on barriers and protective factors for low L/N and its impact on people's wellbeing.

6 References

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7 Appendix

Table A.1 Descriptive profile of PIACC sample by Age category and L/N skill level

Variable	Early Working Age (16 – 34)		Prime Working Age (35 – 54)		Exit Working Age (55 – 65)	
	Not low in literacy or numeracy	Low in literacy and/or numeracy	Not low in literacy or numeracy	Low in literacy and/or numeracy	Not low in literacy or numeracy	Low in literacy and/or numeracy
Female (%)	49.68	55.66*	52.36	54.25	48.52	58.64**
Age	24.69	24.03*	44.58	45.19*	59.53	60.06**
Prioritised ethnicity (%)						
Māori	15.05	28.37***	10.47	22.13***	5.34	17.32***
Pacific Peoples	4.62	19.25***	2.68	15.76***	1.36	9.22***
Asian	15.6	18.75	10.53	15.67**	3.42	8.76**
MELAA	1.29	1.89	0.88	0.78	0.41	1.14
Other or Unspecified	0.20	0.00***	1.06	0.47	1.3	0.39*
NZ European	63.24	31.74***	74.39	45.19***	88.17	63.18***
Educational characteristics						
No school	35.71	50.00***	20.69	45.46***	18.47	51.93***
School	8.92	10.74	5.8	6.37	7.99	5.04
Post-school	27.19	30.94	35.69	34.57	41.71	35.64
Bachelor's	25.53	7.94***	29.65	11.60***	24.19	7.04***
Master's or PhD	2.57	0.38***	7.70	1.93***	7.40	0.35***
Labour market characteristics						
Labour force status (%)						
Full-time	45.99	30.70***	63.47	53.41***	56.37	39.53***
Part-time	14.39	17.90	20.11	14.8**	20.65	16.94
Unemployed	4.67	10.90***	3.18	10.03***	4.96	9.75**
Student	24.37	19.78*	1.51	1.78	0.09	0.00
Apprentice	1.1	0.52	0.03	0.01	0.00	0.00
Retired	0.00	0.00	0.41	0.48	9.33	10.64

Variable	Early Working Age (16 – 34)		Prime Working Age (35 – 54)		Exit Working Age (55 – 65)	
	Not low in literacy or numeracy	Low in literacy and/or numeracy	Not low in literacy or numeracy	Low in literacy and/or numeracy	Not low in literacy or numeracy	Low in literacy and/or numeracy
Permanently disabled	0.26	1.77**	1.05	5.27***	2.45	10.77***
Domestic tasks/looking after family	7.99	14.42***	8.87	12.24*	4.15	8.83*
Average hourly wage (2014 NZD)	22.67	19.86	32.22	20.86***	37.81	21.47*
Years of paid work experience	6.95	5.23***	22.62	20.04***	35.91***	32.32***
Household characteristics						
Any children in household (%)	44.76	61.06***	76.11	70.78*	27.68	38.97**
Number of children in household	0.83	1.32***	1.34	1.30	0.23	0.36
Lives with spouse or partner (%)	45.17	38.67*	84.65	71.6***	87.27	73.95***
Other characteristics (%)						
Very good/excellent health	63.58	52.73***	64.05	46.66***	62.75	41.54***
Born in New Zealand	71.44	66.69	69.97	62.88**	80.13	72.93*
Region (%)						
Northland	2.05	1.99	3.27	3.73	5.46	4.65
Auckland	38.16	45.09*	35.24	38.01	26.46	36.5**
Waikato	8.18	12.18	9.12	10.71	7.65	9.72
Bay of Plenty	5.42	6.10	5.21	4.25	6.08	3.43
Gisborne	0.82	1.18	0.81	1.38	1.35	1.42
Hawke's Bay	3.07	40.00	3.27	3.90	4.80	2.50*
Taranaki	1.58	2.12	2.74	3.07	2.60	4.27
Manawatu-Wanganui	5.56	4.8	4.15	4.04	6.89	4.29*
Wellington	13.55	7.71***	14.13	8.66***	14.32	11.42
West Coast	0.39	0.1	0.59	1.93	0.96	0.89
Canterbury	11.52	8.66	11.33	10.42	12.65	12.73
Otago	5.39	3.40	5.33	5.50	5.63	4.63
Southland	1.96	1.04*	2.46	2.27	1.58	2.13
Tasman	0.44	0.22	0.89	0.89	0.64	0.34
Marlborough	0.89	0.61	0.59	0.76	1.62	1.01

Variable	Early Working Age (16 – 34)		Prime Working Age (35 – 54)		Exit Working Age (55 – 65)	
	Not low in literacy or numeracy	Low in literacy and/or numeracy	Not low in literacy or numeracy	Low in literacy and/or numeracy	Not low in literacy or numeracy	Low in literacy and/or numeracy
Justice events						
Investigated for a criminal offence (%)	17.66	33.23***	7.50	20.37***	3.46	8.75**
Maximum seriousness score	152.95	244.77	120.39	151.83	47.19	143.67
Mean seriousness score	87.16	66.33	59.54	64.24	40.93	119.78
Mean number of offences	3.36	7.51***	2.94	4.95*	1.59	2.40
Was an alleged victim of a crime (%)	15.64	22.53***	11.24	14.94*	7.68	9.42
Maximum seriousness score	252.08	187.12	127.54	236.53*	103.37	120.23
Mean seriousness score	192.78	114.94***	117.25	189.72	95.06	113.49
Mean number of victimisations	1.49	1.66	1.32	1.50	1.23	1.24
Health events						
Any referral for mental health services (%)	15.29	27.19***	10.55	16.52***	6.85	11.4*
Non-admitted ED visit (%)	54.74	62.74**	49.86	63.66***	55.09	60.53
Number of non-admitted ED visits	2.90	4.28***	2.10	3.76***	2.02	3.46***
Any accident-related non-admitted hospital visit (%)	37.15	42.46	30.17	37.55**	32.15	35.10
Number of accident-related ED visits	2.17	2.65	1.75	2.39	1.96	2.28
Benefit reciprocity						
Receipt of any public benefits (%)	39.07	54.07***	43.00	59.54***	25.95	46.09***
Number of months of benefit receipt	11.00	30.74***	20.85	57.96***	17.70	51.04***
Observations (unweighted)	1,890	501	1974	504	849	351
Observations (weighted)	819,200	207,200	938,500	215,600	371,800	145,000

Notes: To account for the complex sample design of PIAAC, all estimates were calculated using the Stata ado *repest*. Standard deviations are in parentheses. Unweighted observation counts have been randomly rounded to base three and weighted observation counts have been rounded to the nearest 100 in accordance with StatsNZ policy. Means are calculated using non-missing observations. p-values: ***, **, * represent statistical significance at the 1%, 5% and 10%, respectively, for t-tests comparing binary variables with the omitted category, and multiple category variables with all the other relevant categories combined (e.g., the mean for 'Europeans' is compared with the combined mean for all other ethnicities).

Table A.2 Literacy and numeracy distribution for PIAAC sample by age group

Variable	Early Working Age (16 – 34)	Prime Working Age (35 – 54)	Exit Working Age (55 – 65)	Total
Literacy				
Literacy score	281.85 (45.74)	284.68 (47.46)***	269.41 (48.68)***	280.67 (47.39)
25 th percentile	254.16	256.09	240.54	252.02
50 th percentile	285.31	288.48	273.18	284.33
75 th percentile	313.45	317.51	303.21	313.39
Literacy below level 1 (<176 points) (%)	2.26	2.15	4.14***	2.57
Literacy at level 1 (176-<226 points) (%)	8.49	8.99	12.60***	9.49
Literacy at or below level 1 (<226 points) (%)	10.75*	11.14	16.74***	12.07
Observations (unweighted)	2,391	2,478	1,203	6,075
Observations (weighted)	1,026,400	1,154,200	533,900	2,697,400
Numeracy				
Numeracy score	271.09 (52.53)	276.30 (54.29)***	259.64 (56.30)***	271.13 (54.37)
25 th percentile	237.59	242.51	224.99	237.05
50 th percentile	274.80	279.26	263.29	274.28
75 th percentile	307.99	312.95	298.09	308.57
Numeracy below level 1 (<176 points) (%)	4.40	4.17*	7.38***	4.87
Numeracy at level 1 (176-<226 points) (%)	14.53	12.61**	18.35**	14.44
Numeracy at or below level 1 (<226 points) (%)	18.93	16.78***	25.73***	19.31
Observations (unweighted)	2,391	2,478	1,203	6,075
Observations (weighted)	1,026,400	1,154,200	533,900	2,697,400
Observations (unweighted)	2,274	2,268	969	5,508
Observations (weighted)	973,800	1,064,900	423,000	2,461,700

Notes: To account for the complex sample design of PIAAC, all estimates were calculated using the Stata ado *repest*. Standard deviations are in parentheses. Unweighted observation counts have been randomly rounded to base three and weighted observation counts have been rounded to the nearest 100 in accordance with StatsNZ policy. Means are calculated using non-missing observations. p-values: ***, **, * represent statistical significance at the 1%, 5% and 10%, respectively, for t-tests comparing binary variables with the omitted category, and multiple category variables with all the other relevant categories combined (e.g., the mean for ‘Europeans’ is compared with the combined mean for all other ethnicities).

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