



Digital inclusion and wellbeing in New Zealand

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Disclaimer

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Abstract

We examine: (i) which groups have a lower likelihood of being digitally included in New Zealand, and (ii) how digital inclusion relates to wellbeing. Using four large-scale surveys, we identify several groups whose members are prone to relatively low internet access: people living in social housing; disabled individuals; Pasifika; Māori; people living in larger country towns (10,000-25,000 people); older members of society (particularly those aged over 75 years); unemployed people and those not actively seeking work. Those in social housing and disabled people are particularly disadvantaged with respect to internet access. Disabled people are also at greater risk than others from a virus infection or other internet interference. We identify a number of associative (but not necessarily causal) relationships between internet access and wellbeing. Those with internet access tend to have higher wellbeing and richer social capital outcomes (e.g. voting) than those without access. For adolescents, as internet use on weekdays outside of school increases, students' subjective wellbeing declines; once daily internet use exceeds about two hours, we find no positive association between internet use and adolescents' wellbeing. These results are of particular interest given that 15% of 15-year olds (including 27% of Māori students) report using the internet for more than 6 hours per day on a weekday outside of school, while over half report more than two hours' use.

JEL codes

H42, H54, I31

Keywords

Internet, digital inclusion, wellbeing, social capital

Summary haiku

Internet access:

A good thing that fades like snow

And some groups miss out

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Executive Summary

We examine two main questions relating to internet (and other ICT) access:

- Which groups have a lower likelihood of being digitally included in New Zealand (and why)?
- How does digital inclusion relate to waiora/wellbeing?

In examining the first question, we pay particular attention to the situation for Māori and Pasifika relative to other ethnic groups.

Existing research examines aspects of who is digitally excluded. It is, however, important also to examine how access relates to people's wellbeing alongside their access and use. Our second question starts to address whether internet access is beneficial for specific communities.

Methodology

We use four large-scale surveys of New Zealanders that include information on internet availability. Some of the surveys also include information on availability of other ICT related items and on internet use. The surveys are:

- New Zealand Crime and Victims Survey (NZCVS, surveyed in 2018);
- New Zealand Electoral Survey (NZES, 2017);
- Programme for International Student Assessment (PISA, 2015);
- Programme for the International Assessment of Adult Competencies (PIAAC, 2014/15).

We place most emphasis on NZCVS and NZES as they are the most recent of the surveys. We also consider PISA as it includes adolescents as well as containing added information on how adolescents use the internet. The surveys are each well sampled but all the figures must nonetheless be treated as having some degree of sampling error.

Access to the internet

A number of groups are prone to relatively low access to the internet, including:

- People living in social housing;
- People with disabilities;
- Pasifika;
- Māori;
- People living in larger country towns (10,000 – 25,000 people);
- Older members of society, particularly those aged over 75 years; and
- Unemployed people and those not actively seeking work.

The first two of these groups – those in social housing and people with disabilities – appear to be particularly disadvantaged with respect to internet access. Pasifika students (in 2015) also reported substantially lower rates of internet access than did students of other ethnicities.

Just 69% of those living in Housing NZ (or local equivalent) social housing report having access to the internet, compared with 91% reporting access across all respondents (in the 2017 NZES).

Only 71% of people with disabilities report having access to the internet (in the 2017 NZES). In the 2018 NZCVS, 17% of people with disabilities indicate having no internet access compared to the full sample where just 5% have no internet access.

These large gaps in internet access for those who live in social housing and for people with disabilities are potentially amenable to policy interventions. Most social housing is owned by the state, local authorities or NGOs. The social housing provider could take the initiative to install WiFi (or other technologies) to enable internet access by tenants. Provision of such infrastructure may be considered of similar importance to provision of water, sewerage and electricity to these tenants. Such provision is also likely to improve internet access rates for Pasifika students.

Similarly, many people with disabilities are already subject to some form of care by state agencies or NGOs. These authorities may consider enabling internet use for their clients as a key intervention to improve the opportunities for those with disabilities to connect with the rest of society.

People with disabilities are also at greater risk than others from an internet violation (i.e. a virus infection or other internet interference). Other at-risk groups include individuals who are not actively seeking work, unemployed, Māori, Pasifika, younger people, and those who are studying.

Wellbeing and internet use

We investigate the association between various wellbeing indicators and internet use. As we have used cross-sectional data we cannot draw causal conclusions on the nature of these associations. Our key findings are:

- NZCVS (adult) data indicate that those who do not have internet access tend to have lower subjective wellbeing than those who do have access.
- NZES (adult) data show a similar relationship (using a proxy variable for wellbeing) when we do not control for other (e.g. demographic) factors, but we find no relationship once we control for these other factors.

- NZES data show that people without internet access are less engaged in civic activities such as voting in general elections and making submissions to government.
- PISA (adolescent) data indicate that those without internet access tend to have lower subjective wellbeing than those with access (which may reflect family circumstances).
- PISA data also indicate that as internet use on weekdays outside of school increases, students' subjective wellbeing declines; once daily internet use exceeds about two hours, we find no positive association between internet use and wellbeing.

The PISA data show that 15% of 15-year olds (including 27% of Māori students) report using the internet for more than 6 hours per day on a weekday outside of school, while over half report more than two hours' use.

Recommendations and policy considerations

We recommend that policy consideration be given to two particularly at-risk groups: social housing residents, and individuals with disabilities. A range of policy interventions already addresses issues faced by each of these groups. There appears to be a strong case that interventions be extended to enabling internet access for these individuals.

Those who work with youth (and their family members) may wish to give consideration to assessing the effects of prolonged use of the internet by adolescents. Our associative results – while not establishing a causal link – highlight a potential concern relating to wellbeing outcomes for those with prolonged internet use. We recommend further investigation of the wellbeing effects of extended use of the internet – both for adolescents and, if the data is available, for children and adults.

We also recommend further analysis of emerging and future PISA, NZCVS and PIAAC data relating to internet (and ICT) access and use. These analyses will be able to leverage the links that these surveys will shortly have to Statistics NZ's Integrated Data Infrastructure (IDI). By linking the survey results to prior characteristics of the surveyed individuals and of their localities (via the IDI), researchers will be able to better control for personal and other traits that affect both wellbeing and internet (and other ICT) access and use.

1 Introduction

Advances in information and communications technologies (ICTs), including the internet, have led to advances in life expectancy, GDP, life satisfaction, and environmental sustainability (Bughin et. al. 2019). Access to the internet is fundamental to the effective digitalisation of New Zealand. Accordingly, the New Zealand government has set strategic priorities relating to the digital domain including internet access (Ministry of Business, Innovation & Employment & Stats NZ, 2019).

While there has been prior research on internet access and use in New Zealand (Strickland & Evans 2018, InternetNZ 2017, MBIE 2015, Statistics New Zealand 2018a, Statistics New Zealand 2017, Statistics New Zealand 2018b and Digital Inclusion Research Group 2017), there has been little research examining the relationship between internet access and wellbeing either in New Zealand or globally. According to Bughin et. al. (2019) ICTs (including access to the internet) may be neither good nor bad per se, but ICT access unequally impacts different parts of the population. We provide information both on internet access and use across population segments in New Zealand, and on the relationship between internet use and wellbeing.

Our focus is on two main questions relating to ICT access, with our principal focus being on internet access:

- Which groups have a lower likelihood of being digitally included in New Zealand (and why)?
- How does digital inclusion relate to waiora/wellbeing?

In examining the first of these questions, we pay particular attention to the situation for Māori and Pasifika relative to other ethnic groups.

We draw on a variety of domestic data sources to explore these questions. The most recently surveyed datasets include the New Zealand Crime and Victims Survey (NZCVS, surveyed in 2018) and the New Zealand Electoral Survey (NZES, surveyed in 2017). We also analyse the most recently available dataset relating to adolescents, the Programme for International Student Assessment (PISA, surveyed in 2015).¹ In the Appendix we also present results from the Programme for the International Assessment of Adult Competencies (PIAAC, surveyed in 2014/15). Each survey includes questions about internet access; the NZCVS, PISA and NZES have questions that we use also to examine the relationship between internet access and subjective wellbeing (waiora).

Using this data, we provide information about the digital divide in New Zealand. Our focus is on the difference between those who have internet access and those who do not. We find that

¹ Results of the 2018 PISA survey are scheduled for release in late 2019.

Māori, Pasifika, those living in social housing, unemployed people, those not actively seeking work, disabled individuals, those living in larger country towns and older members of society are less likely to have internet access. The largest gaps in internet access are for those who identify as living in social housing, being disabled, unemployed, and/or in older age groups. These findings are broadly consistent across surveys (where similar information is collected).

Using PISA, NZCVS and NZES data, we infer the correlation between subjective wellbeing and internet access (and other forms of digital inclusion). The PISA data indicate that, while internet access is associated with higher subjective wellbeing among students, this effect reduces as more time is spent on the internet. The NZCVS data show that amongst adults, lower life satisfaction is associated with a lower likelihood of internet access. Unlike the PISA data, the NZCVS associations do not control for other characteristics of individuals. For the adult population in NZES, we again find a difference in (a proxy measure of) wellbeing between those with and without internet access when we do not control for other factors, but this relationship disappears once we control for demographic and other influences. However the NZES data show that those with internet access have higher rates of voting in general elections and are much more active in other forms of civic participation than are those without internet access. Thus internet access appears to be positively correlated with these aspects of social capital.

One feature of the NZCVS is that it provides data on which segments of the population are most at risk of having their computer infected by a virus or being otherwise interfered with; we refer to these as occurrences of 'internet violation'. Māori and Pasifika are more at risk of internet violation than other ethnicities. In addition, people who are disabled, not actively seeking work and/or with low subjective wellbeing having heightened risk of internet violation.

The remainder of this report contains a brief literature review that highlights gaps in existing knowledge, a data section which provides a brief description of the datasets used and relevant questions from those datasets (with further information provided in the Appendix) and a methodology section. We present our results relating to digital inclusion (principally related to internet access) in section 5 (with further details provided in the Appendix), and our wellbeing-related results are presented in section 6. A concluding section discusses potential avenues for further research relevant to the promotion of digital inclusion policies in New Zealand.

2 Literature Survey

The literature on internet access in New Zealand deals with topics that include who has access to the internet, the quality of internet connection, how people use their internet and internet

security. In this report, we are primarily interested in who has access to the internet and the relationship between internet and wellbeing.

There has been considerable research which looks at the digital divide, both globally and in New Zealand. One category of research looks at the groups in society that make most use of the internet. For example, French, Quinn & Yates (2018) find that education is a predictor of internet use in the UK. Studies have also found a relationship between age and use of the internet; a commonly found result is that internet use diminishes with age, especially for those aged 65 and older (Andrade et. al. 2017, Stephanie 2018, Smith et. al. 2016 and Auckland University of Technology 2018). A related issue, that it is difficult to answer with the data currently at hand, is whether this is an age effect or a cohort effect; for instance, it is conceivable that internet access for people aged over 75 may be commensurate with the rest of the population in one to two decades' time as the current 50-60 year old age-group moves into later life.

Studies show that New Zealand has a relatively high proportion of people with access to the internet (Strickland & Evans 2018, InternetNZ 2017, MBIE 2015, Statistics New Zealand 2018a, Statistics New Zealand 2017, Statistics New Zealand 2018b and Digital Inclusion Research Group 2017). These studies indicate that further research is nevertheless still required to look at the relationship between internet connection and certain demographics, for instance the rural vs urban divide and internet access according to disability status. We provide a more in depth demographic breakdown here, using the demographic groups available in PISA, NZES, NZCVS and PIAAC.

One issue of policy interest for which data has been somewhat lacking in recent studies is analysis of internet access for Māori, Pasifika and other ethnic groups in New Zealand. A study by MBIE (2015) found that internet access for Māori was lower than for other groups in New Zealand, mirroring a prior finding by Greenbrook-Held & Morrison (2011) who also found low access rates for Pasifika.

Bughin et. al. (2019) examined the relationship between technology and wellbeing globally, highlighting the many benefits of access to the internet and other aspects of ICTs. One more cautionary study relating to adolescents in England is that by Przybylski and Weinstein (2017). They show that while a small amount of screen use (such as use of the internet) is associated with improved mental health, screen use of longer than one to two hours is associated with poorer adolescent mental health outcomes. There is little or no research exploring similar relationships in New Zealand. Indeed, perhaps the biggest gap in the internet-related literature for New Zealand is analysis of the relationship between internet access and wellbeing.

This report aims to close the gaps in the literature with regard to how internet access varies across demographic groups. We also provide evidence of the relationship between wellbeing, internet access and intensity of internet access in New Zealand. Related to wellbeing issues, we present new findings on the groups within society that are most at risk of internet crime, an area that has hitherto been understudied both in New Zealand and globally.

3 Data

The surveys primarily used for this analysis include the Programme for International Student Assessment (PISA, 2015), the New Zealand Electoral Survey (NZES, 2017) and the New Zealand Crime and Victim Survey (NZCVS, 2018). Each survey includes questions about internet access and each has questions that enable us to examine correlations of internet access with subjective wellbeing. In the Appendix, we also discuss the (more dated) Programme for the International Assessment of Adult Competencies (PIAAC, 2014) survey.

In this section, we briefly outline the three main surveys used. The Appendix provides further details on the survey questions used from each of these surveys.

3.1 PISA

PISA is an international survey of 15 year olds conducted by the Organisation for Economic Co-operation and Development (OECD), involving both OECD member and OECD non-member countries. It collects demographic and academic information on these students. The information includes questions on internet access and access to devices with internet access; in some countries it also includes questions on subjective wellbeing. We use the 2015 PISA survey, which is the most recent PISA survey with information that is publicly available. To make sure the results used are adjusted appropriately for population proportions, sample weights are applied to the descriptive statistics, supplied by PISA in their dataset. The demographic variables of interest include gender, parent post school education level, and ethnicity. There is a total of 4,520 observations in the 2015 New Zealand PISA dataset available. Surveys were administered at school with students entering their responses via computer.

As New Zealand did not include the question about subjective wellbeing (SWB) for students in its study, we use the 2015 PISA data for Great Britain to formulate a proxy SWB variable for New Zealand (see the Methodology section for the approach adopted).

3.2 NZES

NZES is a study which posts questionnaires across the country to randomly selected registered people with the right to vote in New Zealand. For each election since 1990, NZES has been

conducted and within each survey there is a subsample of individuals who have answered the questionnaire in prior election years. We focus on the 2017 survey for the majority of descriptive statistics and for the wellbeing association but also use the longitudinal nature of the data, analysing internet access for individuals in 2011, 2014 and 2017. The demographic information we use from NZES includes ethnicity, gender, age, education, working situation, whether the person is self-employed, the type of area a person is residing in, voting activity, income and housing situation. The questions we consider for the longitudinal analysis remain the same across the 2011, 2014 and 2017 datasets. The sample size for the 2017 survey respondents is 3,455. The longitudinal sample size (across the 2011, 2014 and 2017 NZES respondents) is 536. For the descriptive statistics, we use the sampling weights provided in the datasets. We construct an indicator relating to (lack of) wellbeing based on a range of responses to questions in the survey (see the Methodology section for the approach adopted).

3.3 NZCVS

NZCVS is an annual survey that collects information about New Zealanders' experience of crime. The dataset we use is from 2018; it surveyed 8,000 people aged 15 years and over (each by an interviewer). We focus on the survey's question about whether an individual's computer or internet enabled device had been infected or interfered with, to determine: (a) who has access to the internet, and (b) the groups of people who are most at risk of internet violation. We also relate these results to the reported life satisfaction across different demographic groups.

4 Methodology

4.1 PISA

For each dataset used in this study, we created summary statistics of internet access or internet use broken down by demographic variables available in each survey. PISA has two internet variables, time spent on the internet and access to the internet. Using the ICT familiarity questionnaire we determined who had spent time on the internet at school on weekdays, and outside of school on weekdays and on weekends. For each category, we identified students who spent no time on the internet, and then grouped others into their respective reported online times (or into the 'unknown' internet group).

To determine internet access at home and at school, we again used the ICT familiarity questionnaire. An individual was defined as having internet access at home if they had internet connection at home or if they had a cell phone with internet access or both. An individual was defined as having access to the internet at school if they had internet-connected school computers or internet connection via a wireless network or both. For both home and school,

these categories were then broken down to internet access is available and the student uses it, internet access is available and the student does not use it, and the student does not have internet access.

The demographic variables we used from PISA were gender and ethnicity. For gender, respondents had the choice of being male or female. We report the proportion of each gender according to time spent on the internet and internet access. For ethnicity, the data has Māori, Pacific, Asian, Other and Pākehā options. As students can say they are more than one of these options, we split the ethnicity categories into: Māori, Pacific, Asian, Other, Pākehā, Pākehā and Māori, all other combinations, and unknown. As with the gender statistics, the number and proportion for each ethnicity was reported for time spent on the internet and internet access. All results were weighted using the 2015 PISA sampling weights.

To analyse the correlation between wellbeing and internet access, we ran an ordinary least squares (OLS) regression of estimated subjective wellbeing (SWB) on internet use and other correlates using the 2015 PISA data from New Zealand. PISA contains a subjective wellbeing question but this question was not asked in New Zealand in 2015 (or in the 2018 survey). Instead, we used the United Kingdom (UK) wellbeing results to construct a proxy for New Zealand students' SWB.

To do so, we first ran an OLS regression of UK wellbeing against a variety of variables within PISA that are hypothesised to be related to SWB, selecting variables which were statistically significant (in the UK wellbeing regression) at the 1 percent level. The variables selected were: home possessions, sense of belonging, value of cooperating, parental support, instrumental motivation and test anxiety. The UK regression is reported in the Appendix.

We created a proxy subjective wellbeing variable for New Zealand students using the UK regression coefficients applied to the corresponding New Zealand data. We then ran an OLS regression of this SWB proxy against ICT-related variables and student demographic variables.

ICT variables comprised: time spent on the internet at school on weekdays and outside of school on weekdays and on weekends, desktop at home, laptop at home, tablet at home, internet connection at home, cell phone with internet access at home, desktop at school, laptop at school, tablet at school, computer at school with internet, wireless internet connection at school, age first used a digital device, age first used a computer, and age first used the internet.

Demographic variables comprised: age, gender, ethnicity, mother education attainment and father education attainment.

4.2 NZES

The NZES data was used to produce summary statistics relating to internet use together with regression results relating to the association between internet access and wellbeing. The

summary statistics produced are for 2017 and we also utilise longitudinal data for 2011, 2014 and 2017. The longitudinal results are presented in the appendix.

For the 2017 summary statistics, we examined internet access in relation to available demographic variables. Respondents were included in the internet access group if they had one or more of the following: internet at work, internet at home, internet on mobile or internet somewhere else and did not say they had no access to the internet. Respondents who only said they had no access to the internet were put in the no internet access group. All others were placed in the unknown internet group.

The 2017 summary statistics include the number and the proportion of people within each demographic who did or did not have access to the internet. Demographic groups of variables included ethnicity, gender, age, education, working situation, the type of area a person is residing in, and housing situation. Separately, we present summary statistics relating to internet access according to voting and other forms of civic participation. All results are weighted using the sample weights provided.

The longitudinal summary statistics detail the proportion of people according to age, ethnicity and work status who did or did not have access to the internet. In addition we show, for the longitudinal sample, the pattern of internet access for respondents over the past three waves of the survey (i.e. 2011, 2014, 2017). As expected, this reveals considerable persistence in internet uptake but also shows cases in which an individual loses internet access across time.

To analyse whether there was a correlation between wellbeing and internet access, we ran a regression between a dissatisfaction variable (i.e. a proxy for lack of wellbeing) and internet access using 2017 NZES data. The dissatisfaction variable was formed as the first principal component of 12 variables from the 2017 NZES that we believed could signal general dissatisfaction of an individual. The questions we used are shown in the Appendix.

Each of the scales from the questions were coded to be in the same direction for which 1 is least dissatisfied and 4 or 5 is most dissatisfied. All of the variables used in the analysis had positive loadings (as expected); the first principal component had an eigenvalue of 2.65, so explained 22% of the variance across the 12 variables. This suggests that while the derived variable is likely to be correlated with respondents' generalised dissatisfaction it may not be a strong summary measure. Using OLS, we regressed the dissatisfaction variable against internet access plus a range of demographic variables: gender, age, self-employment, working situation, ethnicity, income, and education level.

4.3 NZCVS

The NZCVS 2018 data includes information on no internet access based on an internet related question. We defined no internet as those who answered not applicable to a question about

whether their computer or internet connect device had been infected or interfered with. Not applicable came with the added explanation in the survey that no one in the house has owned a computer or internet-enabled device in the last 12 months.

The summary statistics show the proportion of people who answered this question with regards to life satisfaction and demographics. The demographic information used includes ethnicity, sex, age, household income, employment status and disability status. The results are not weighted and the counts have been randomly rounded to base three using the rules defined by Statistics NZ. (The results do not include respondents who responded don't know or refused to answer.)

5 Results: Internet Access

5.1 PISA

We use the PISA data to examine internet access of 15 year olds in terms of time spent online at school and at home, plus internet access at school and at home. We break the statistics down by gender and ethnicity using sampling weights. Recall that the data refer to 2015, so some patterns may have changed in the interim.

Table 1 and Table 2 show access to the internet broken down by gender. We find a reported gender difference in access at school with males (76.54%) reporting less access than females (81.45%). There is little difference in access at home. Similarly, there is little difference between males and females in terms of time spent on internet outside of school. The notable difference is for time spent on the internet at school, with 80% of females, compared with 74% of males, spending time on the internet (see Table 3 to Table 5).

Table 1: Internet access at home by gender

	Yes and use it	Yes but don't use it	No	No response	Total*
Female	85.99%	1.04%	0.89%	12.08%	26966
Male	84.60%	1.04%	1.22%	13.14%	27309
Total	85.29%	1.04%	1.06%	12.62%	54274

* Total numbers in all PISA and NZES tables are after applying sampling weights

Table 2: Internet access at school by gender

	Yes and use it	Yes but don't use it	No	No response	Total
Female	81.45%	4.49%	0.86%	13.20%	26966
Male	76.54%	6.59%	1.95%	14.92%	27309
Total	78.98%	5.55%	1.41%	14.07%	54274

Table 3: Time spent on internet at school by gender

	No time	Time spent	No response	Total
Female	5.61%	80.02%	14.37%	26966
Male	10.08%	73.91%	16.01%	27309
Total	7.86%	76.94%	15.20%	54274

Table 4: Time spent on internet outside school on weekdays by gender

	No time	Time spent	No response	Total
Female	1.92%	83.77%	14.31%	26966
Male	1.77%	82.35%	15.87%	27309
Total	1.85%	83.06%	15.10%	54274

Table 5: Time spent on internet on weekends by gender

	No time	Time spent	No response	Total
Female	1.94%	83.19%	14.87%	26966
Male	1.65%	81.98%	16.37%	27309
Total	1.79%	82.58%	15.62%	54274

Table 6 and Table 7 report internet access at school and outside of school, broken down by ethnicity. Table 6 shows internet access at home. Pasifika students report far lower internet access rates at home (74%) than do students of all other ethnicities; Pākehā students have the

highest rate of home access, approximately 6 percentage points higher than the Māori access rate.² Similarly, Pasifika students report much lower internet access at school than do other students (although the high “no response” rate for Pasifika students may influence the Pasifika results). Again Māori students lag Pākehā students in this respect, lagging by nine percentage points in school internet use. The lagging rates of particularly Pasifika internet access (and, to a lesser but still material extent, Māori access) at school – if reported accurately – is of special concern given these students’ comparative lack of internet access at home.

When we examine the amount of time spent on the internet (Table 8 to Table 10), we observe the same patterns. Pasifika students are much less likely to report spending any time on the internet both at school and at home (on weekdays and weekends) than do students of other ethnicities. Māori students lag Pākehā students in spending any time on the internet whether at school or at home, with the gaps between use rates being about seven percentage points in each case.

Table 6: Internet access at home by ethnicity

	Yes and use it	Yes but don't use it	No	No response	Total
Māori	85.05%	1.65%	3.98%	9.31%	4,215
Pasifika	71.62%	2.36%	1.58%	24.45%	3,545
Asian	85.25%	0.41%	0.44%	13.90%	6,492
Pākehā	90.98%	0.86%	0.75%	7.42%	28,901
Māori and Pākehā	88.98%	1.20%	0.93%	8.89%	4,391
Other	79.95%	0.00%	0.00%	20.05%	680
All other combinations	80.18%	1.80%	1.38%	16.65%	4,675
Unknown	10.02%	0.00%	0.00%	89.98%	1,373
Total	85.29%	1.04%	1.06%	12.62%	54,274

² Those of “unknown” ethnicities appear have an extraordinarily high “no response” to the internet questions. These are likely to be students who answer the survey questions incompletely and so are not discussed here.

Table 7: Internet access at school by ethnicity

	Yes and use it	Yes but don't use it	No	No response	Total
Māori	75.42%	6.72%	3.69%	14.17%	4,215
Pasifika	66.40%	5.87%	1.24%	26.49%	3,545
Asian	78.63%	4.47%	1.75%	15.16%	6,492
Pākehā	84.60%	5.76%	1.25%	8.39%	28,901
Māori and Pākehā	82.35%	5.72%	1.15%	10.78%	4,391
Other	73.09%	4.73%	0.00%	22.18%	680
All other combinations	75.73%	5.68%	0.85%	17.74%	4,675
Unknown	8.98%	1.04%	0.00%	89.98%	1,373
Total	78.98%	5.55%	1.41%	14.06%	54,274

Table 8: Time spent on the internet at school by ethnicity

	Time spent	No time spent	No response	Total
Māori	75.12%	9.83%	15.05%	4,215
Pasifika	58.71%	10.16%	31.13%	3,545
Asian	76.55%	8.42%	15.03%	6,492
Pākehā	82.93%	7.78%	9.29%	28,901
Māori and Pākehā	80.11%	7.97%	11.92%	4,391
Other	69.42%	4.06%	26.52%	680
All other combinations	74.20%	6.35%	19.45%	4,675
Unknown	8.31%	1.71%	89.98%	1,373
Total	76.94%	7.86%	15.20%	54,274

Table 9: Time spent on the internet outside school on weekdays by ethnicity

	Time spent	No time spent	No response	Total
Māori	82.62%	1.66%	15.72%	4,215
Pasifika	66.08%	3.34%	30.58%	3,545
Asian	83.62%	1.09%	15.29%	6,492
Pākehā	89.33%	1.45%	9.22%	28,901
Māori and Pākehā	85.20%	3.20%	11.60%	4,391
Other	75.70%	1.32%	22.98%	680
All other combinations	77.10%	3.70%	19.20%	4,675
Unknown	10.65%	0.00%	89.35%	1,373
Total	83.06%	1.85%	15.10%	54,274

Table 10: Time spent on the internet on the weekend by ethnicity

	Time spent	No time spent	No response	Total
Māori	82.18%	1.70%	16.12%	4,215
Pasifika	64.76%	3.97%	31.26%	3,545
Asian	82.82%	1.08%	16.10%	6,492
Pākehā	88.98%	1.41%	9.62%	28,901
Māori and Pākehā	85.58%	2.72%	11.70%	4,391
Other	74.19%	1.32%	24.49%	680
All other combinations	76.71%	3.36%	19.93%	4,675
Unknown	8.61%	0.00%	91.39%	1,373
Total	82.58%	1.80%	15.62%	54,274

In the Appendix, we report additional tables using the PISA data relating to the amount of time spent on the internet per day by students (according to gender and ethnicity). As with the tables in this section, we include separate tables for internet use at school, internet use outside of school on weekdays, and internet use per day on weekends. Of those who responded, approximately 38% of students use the internet for at least four hours per weekday outside of school, while 51% of students use the internet for at least four hours per weekend day. In each case, females are slightly more likely than males to be using the internet for these prolonged periods per day.

In terms of ethnicity, one feature that stands out is that internet use outside of school for over six hours per day (on weekdays and weekends) is most predominant amongst Māori

students: 27% of Māori students report using the internet outside of school on weekdays for over six hours per day, with this rate rising to 32% on weekends. We have no information on what types of material are being accessed by these prolonged internet users, and further research on the internet use of prolonged users is warranted.

5.2 NZES

Table 11 to Table 18 report descriptive statistics for different demographic groups and their internet access using 2017 NZES data. The definition of internet access for this dataset is whether an individual ticked yes to one or more of: having access to the internet at work, having access to the internet at home, having access to the internet on mobile or having access to the internet somewhere else, without ticking yes to having no access to the internet. The no internet category is applied to individuals who ticked no access to the internet and did not tick yes to any form of internet access. All data were weighted using the sample weights provided by NZES.

Table 11 shows the breakdown of access to the internet in 2017 by ethnicity. It shows that, of the identified ethnicities, Māori (12.23%) and Pasifika (10.55%) are the most likely not to have internet access.

In Table 12 we see that there is little disparity between males and females. Those who identified as gender diverse (and those who did not identify their gender) have a much higher proportion without access to the internet (22.11% and 18.59% respectively) but the number of individuals in these groups is low (7 and 81 respectively).

Table 13 reports access to the internet broken down by age. Access to the internet decreases as the age group gets older, sharply so beyond age 65. By comparison with the youngest cohort (which has over 99% access) over 35% of those who are over 75 years old have no internet access.

Table 11: Ethnicity and access to the internet

Ethnicity	No Internet	Internet	Unknown	Total
European	8.89%	90.49%	0.61%	2609
Māori	12.23%	87.13%	0.64%	336
Pasifika	10.55%	89.45%	0.00%	81
Asian	2.67%	97.33%	0.00%	199
Other	13.34%	86.66%	0.00%	18
No Response	10.43%	87.74%	1.83%	203
Total	9.00%	90.36%	0.64%	3445

Table 12: Gender and access to the internet

Gender	No Internet	Internet	Unknown	Total
Male	8.45%	91.10%	0.45%	1636
Female	9.00%	90.27%	0.73%	1721
Gender diverse	22.11%	77.89%	0.00%	7
Non response	18.59%	78.49%	2.92%	81
Total	9.00%	90.36%	0.64%	3445

Table 13: Age and access to the internet

Age	Internet	No internet	Unknown	Total
<26	99.17%	0.18%	0.65%	425
26-45	96.33%	3.67%	0.00%	1053
46-65	92.33%	7.06%	0.61%	1146
66-75	85.68%	13.88%	0.44%	487
>75	60.34%	36.54%	3.12%	334
Total	90.36%	9.00%	0.64%	3445

Table 14 reports access to the internet, broken down by education level. It shows a trend that the higher qualification an individual has, the more likely it is that they will have internet access. Those with no qualification have the lowest proportion of individuals with access to the internet at 72.50%. This result may be partly explained by age since individuals in the oldest cohorts have fewer qualifications than those in younger cohorts. All groups with university level qualifications have at least 98% of individuals with access to the internet.

In Table 15, we show access to the internet broken down by work situation. Those working full time (98.07%) and those studying at university or at another institution (98.86%) have the highest proportions of people with access to the internet. Surprisingly, those who are self-employed have a lower proportion with access to the internet (91.74%) than those who are employed full-time or part-time. Those who are retired (74.65%) and the disabled (71.17%) have the least access.

Table 14: Education level and access to the internet

Education	No Internet	Internet	Unknown	Total
No Qualification	25.61%	72.50%	1.89%	636
School Certificate/Level 1	14.36%	85.33%	0.31%	333
Sixth Form Certificate Level 2	1.99%	98.01%	0.00%	200
University Entrance	3.51%	96.49%	0.00%	130
Higher School Certificate	2.56%	97.44%	0.00%	73
University Entrance Bursary	15.43%	84.57%	0.00%	91
Bursary or School Level 3	0.09%	99.91%	0.00%	124
Another secondary qualification New Zealand	25.34%	74.45%	0.20%	55
Another secondary qualification overseas	2.64%	97.36%	0.00%	111
No Response	21.36%	76.84%	1.80%	131
National Certificate Level 4 post school	4.48%	94.55%	0.97%	357
Poly Tech	3.08%	96.26%	0.66%	333
Undergrad	0.31%	99.56%	0.14%	559
Masters Hons	0.67%	99.33%	0.00%	271
Doctorate	0.00%	98.94%	1.06%	41
Total	9.00%	90.36%	0.64%	3445

Table 15: Position inside or outside the workforce and access to the internet

Job	No Internet	Internet	Unknown	Total
Working full time	1.69%	98.07%	0.24%	1568
Working part time	5.66%	94.16%	0.18%	555
Self-employed	7.83%	91.74%	0.44%	564
Unemployed	11.55%	88.38%	0.06%	146
Retired	24.19%	74.65%	1.17%	728
Disabled	27.30%	71.17%	1.52%	141
At school or university	0.66%	98.86%	0.48%	210
Working unpaid outside the home	6.37%	92.85%	0.77%	90
Working unpaid inside the home	4.59%	94.47%	0.94%	167
Total	8.47%	92.55%	0.51%	4107

In Table 16, we report access to the internet broken down by the type of area in which an individual resides. Those living in a major city, defined as a place which has more than 100,000 people, have the highest proportion of people with access to the internet (92.73%). While it might be expected that those in a rural area or settlement would have the lowest proportion of people with access to the internet, it is those in larger country towns (10,000-25,000 population) who have the lowest proportion (87.44%).

Access to the internet broken down by housing situation is reported in Table 17. Those who rent a house or flat from HNZA or the local (social housing) equivalent have the lowest proportion of people with internet access (69.36%). This is considerably lower than the other categories. By contrast, those who own a house or flat with a mortgage have the highest proportion with access to the internet (96.17%).

Table 16: Area residing in and internet access

Area residing in	Internet	No Internet	Unknown	Total
Rural area or settlement (under 10,000 population)	90.39%	8.25%	1.36%	486
Country town (under 10,000 population)	88.59%	10.85%	0.56%	394
Larger country town (10,000- 25,000 population)	87.44%	12.16%	0.40%	274
Large town (over 25,000 population)	90.46%	9.33%	0.22%	603
Major city (over 100,000 population)	92.73%	6.74%	0.53%	1563
Total	91.03%	8.38%	0.60%	3321

Table 17: Housing situation and internet access

Housing situation	Internet	No internet	Unknown	Total
Own a house or flat mortgage free	87.12%	12.12%	0.75%	1,144
Own a house or flat with a mortgage	96.17%	3.45%	0.38%	950
Rent a house privately as a family	94.07%	5.61%	0.31%	407
Rent a house or flat from HNZC or local equivalent	69.36%	30.15%	0.49%	124
Board or live in a hotel, hostel, rest home, or temporary	80.69%	15.17%	4.14%	92
Rent a house with a group of individuals	91.92%	8.08%	0.00%	170
Live with parents or other family members	94.17%	5.50%	0.33%	414
Total	90.88%	8.54%	0.58%	3302

Table 18 shows the engagement of people with and without internet access in terms of voting behaviour (in each of general and local government elections) and other forms of civic participation (defined as one or more of: signing a petition, making a select committee submission, making a royal committee submission or consulting with government). Each of these activities can be considered as separate social capital outcomes. People with internet have a higher turnout in general (but not local) elections than people without internet, and are much more likely to engage in other forms of civic participation. These results do not control for other characteristics of the individual. In section 6, we further investigate the relationship between internet access and these social capital outcomes, and also examine the relationship of internet access with generalised dissatisfaction of an individual.

Table 18: Voting, civic participation and internet access

Activity	Internet	No internet
General election 2017		
Cast a vote	83.36%	73.36%
Chose not to cast a vote	8.64%	12.14%
Didn't manage to vote	5.74%	8.50%
No Response	2.25%	6.00%
Total	100%	100%
Local elections 2016		
Voted	49.81%	51.27%
Did not vote	31.25%	27.90%
Don't know or can't remember	18.95%	20.83%
Total	100%	100%
Other civic participation*		
Yes	40.34%	19.21%
No	51.78%	62.29%
Unknown	7.88%	18.50%
Total	100%	100%

We provide extra information, based on the longitudinal NZES information for 2011, 2014 and 2017 in the Appendix. Table A14 reports the pattern of internet access for individuals who are observed in each wave of the longitudinal sample. It shows considerable persistence in internet access, so that once an individual gains access, they are very likely to retain access. A small portion of respondents lose access in one or more waves. More common is a rump of respondents who have never had internet access. This group comprises 8.5% of the sample (using 2017 sample weights).

Other Appendix tables detail internet access in 2011, 2014 and 2017 based on work situation, ethnicity and age. For ethnicity, we base the categories on the 2011 information (i.e. their ethnicity in 2011), while for work situation and age we report access based on their current status. (Note there are small numbers for some categories, and in these cases the proportions of people having internet access should be ignored.)

Notable points from the Appendix tables include part-time workers substantially increasing internet access from 2011 to 2014 (and further again in 2017). The work situation table shows an increase followed by a decrease in internet access of retirees over the period. When we examine the same issue by age, we find a steady increase in internet access for the 66-75 year age group, while the over 75 year age group records an increase and then a decrease in internet access over the two intervals (2011-2014 followed by 2014-2017).

5.3 NZCVS

Table 19 to Table 24 provide descriptive statistics for different demographic groups and their internet access using 2018 NZCVS data. As part of the response to the question: 'In the last 12 months, has a computer or internet-enabled device belonging to you or anyone else living in your household, been *infected* or *interfered* with, for example by a virus or someone accessing it without permissions?' there is a possible response of 'Not applicable – Nobody in this household has owned a computer or Internet-enabled device in the last 12 months'. This category is used here to represent those who do not have access to the internet. The results for this question are shown for a variety of demographic groups.³

Each of the NZCVS tables presents three categories (plus 'don't knows'). The third group in each table reports those having no internet access over the previous 12 months. This corresponds to our no internet access groups for NZES and PISA. The first group in each table is also of policy interest: this group reports having had an internet-related violation such as a virus infection or unauthorised access over the past year.

³ All data were randomly rounded to base three using rules defined by Statistics NZ.

Table 19 shows responses broken down by ethnicity. The highest proportion of individuals who do not have access to the internet are those who identify as Pasifika (7.9%). By contrast Māori and Europeans report very similar internet access. Māori and Pasifika are the most likely to report an internet violation.

In Table 20, we show responses broken down by sex. The results show no gender divide for internet access with males and females having the same proportion of individuals without access to the internet (5.4%). Males and females also show the same rate of internet violation over the year.

Responses according to age are reported in Table 21. Consistent with NZES, as age increases, the proportion of those without access to the internet increases. For example, 0.9% of 15 to 19 year olds do not have access to the internet whereas 15.8% of those 65 years have no internet access. There is no clear trend in rates of internet violation by age, although there may be some need to ensure that the youngest users (with a comparatively high 5.1% violation rate) are made fully aware of the risks that may arise from internet use.

Table 19: Ethnicity and internet issue

Ethnicity	Violation: Yes	Violation: No	No internet	Don't Know	Total
European	3.9%	90.2%	5.4%	0.6%	5442
Māori	5.3%	89.2%	5.0%	0.5%	2304
Pasifika	5.1%	86.9%	7.9%	0.2%	492
Asian	2.4%	95.8%	1.2%	0.7%	759
Other	1.6%	94.4%	2.4%	1.6%	126
Total	4.1%	90.4%	5.0%	0.6%	9123

*In all NZCVS tables, no internet means nobody in the household has owned a computer or internet-enabled device in the last 12 months. To ensure confidentiality all cells are random rounded to base three using the rules defined by Stats NZ.

Table 20: Sex and internet issue

Sex	Violation: Yes	Violation: No	No internet	Don't Know	Total
Female	3.9%	90.2%	5.4%	0.6%	4608
Male	3.9%	90.2%	5.4%	0.6%	3423
Total	3.9%	90.2%	5.4%	0.6%	8031

Table 21: Age and internet issue

Age groups	Violation: Yes	Violation: No	No internet	Don't Know	Total
15-19 Years	5.1%	93.7%	0.9%	0.3%	333
20-29 Years	3.2%	94.4%	2.0%	0.4%	1176
30-39 Years	4.0%	94.0%	1.3%	0.8%	1410
40-49 Years	5.8%	91.1%	2.4%	0.7%	1353
50-59 Years	4.1%	92.5%	3.0%	0.4%	1407
60-64 Years	3.4%	89.6%	6.1%	1.0%	624
65 Years and Over	2.4%	81.2%	15.8%	0.6%	1725
Total	3.9%	90.2%	5.4%	0.7%	8028

Table 22 shows responses according to household income (similar results are found when using personal income in place of household income). As household income increases above \$20,000, the proportion of people with access to the internet increases. The group with the highest proportion of people without access to the internet is the \$10,001 to \$20,000 a year group (21.1%). This group may include substantial numbers of single older New Zealanders as the single rate of New Zealand Superannuation is just below \$20,000 p.a. It is also likely to include a substantial number of beneficiaries under the age of 65 (for instance, the annual net rate of unemployment benefit for a single parent with children is less than \$15,000 p.a.).

Table 23 reports responses according to employment status. The group with the highest proportion of people without access to the internet are those who are retired (17.3%) and those not actively seeking work (16.6%). These proportions are much higher than for those who are unemployed (5.2%). By contrast, only 1.0% of those studying and 1.9% of those employed do not have access to the internet. Those who are not actively seeking work are most at risk of an internet violation (7.3%) followed by people who are unemployed (5.7%). Consistent with the age results, people who are studying are also at heightened risk of internet violation (5.2%).

Table 24 shows responses broken down by disability status. There is a large difference between those who are disabled (17.2%) and those who are not disabled (4.7%) with regards to the proportion of individuals who do not have access to the internet. This is likely to be of policy concern since one might anticipate that disabled people (and especially physically disabled people) could benefit most from internet access. Furthermore, disabled people are more likely than others to have received an internet violation, emphasising their at-risk status with respect to secure internet access.

Table 22: Household income and internet issue

Household income	Violation: Yes	Violation: No	No internet	Don't Know	Total
\$10,000 or less	4.5%	91.9%	2.8%	0.8%	357
\$10,001 - \$20,000	4.4%	73.8%	21.1%	0.6%	474
\$20,001 - \$30,000	3.4%	81.7%	14.4%	0.6%	1017
\$30,001 - \$40,000	3.2%	87.7%	8.5%	0.7%	744
\$40,001 - \$50,000	4.3%	90.1%	5.2%	0.4%	699
\$50,001 - \$60,000	4.0%	92.5%	2.7%	0.9%	702
\$60,001 - \$70,000	4.0%	92.1%	3.2%	0.7%	696
\$70,001 - \$100,000	3.2%	94.5%	1.6%	0.7%	1299
\$100,001 - \$150,000	3.9%	94.8%	0.8%	0.5%	1230
\$150,001 or more	4.8%	94.5%	0.4%	0.4%	810
Total	3.9%	90.3%	5.4%	0.6%	8028

Table 23: Employment status and internet issue

Employment status	Violation: Yes	Violation: No	No internet	Don't Know	Total
Employed	4.0%	93.7%	1.9%	0.5%	4986
Unemployed	5.7%	88.0%	5.2%	1.1%	369
NILF - Retired	2.5%	79.5%	17.3%	0.8%	1431
NILF - Home or caring duties	2.6%	91.6%	4.5%	1.3%	465
NILF - Studying	5.2%	93.9%	1.0%	0.0%	309
NILF - Not actively seeking work	7.3%	74.6%	16.6%	1.5%	204
Other (not specified)	4.5%	89.8%	5.3%	0.4%	246
Total	3.9%	90.2%	5.4%	0.6%	8010

Table 24: Disability status and internet issue

Disability status	Violation: Yes	Violation: No	No internet	Don't Know	Total
Disabled	6.7%	75.2%	17.2%	0.5%	447
Not disabled	3.7%	91.0%	4.7%	0.6%	7581
Total	3.9%	90.2%	5.3%	0.6%	8028

6 Results: Wellbeing and the Internet

In this section we report relationships between internet access, internet use and indicators of wellbeing. Each of the PISA, NZES and NZCVS surveys are used to shed light on these relationships.

6.1 PISA

Table 25 reports the results of a regression of the subjective wellbeing (SWB) proxy variable against internet access, other ICT variables and demographic variables.⁴

The coefficients should not be used to indicate causal relationships; rather they demonstrate associations of wellbeing with internet use and availability. The results indicate that students who have use of a desktop at home, laptop at home, tablet at home or wireless internet at school are better off in terms of wellbeing than are those who do not have these items. Similarly, those who access the internet outside of school on weekdays have higher wellbeing relative to those who do not. These results may reflect family circumstances rather than ICT access per se.

Potentially of more policy interest is the finding that the positive relationship between wellbeing and internet access outside of school on weekdays declines monotonically the more time an individual spends online during a week day outside of school (see Table 25). No significant relationship is found between SWB and time spent on the internet outside of school on weekends or at school on weekdays.

The results relating to internet use at home on weekdays (for those who have internet access) suggest that while access to the internet may be beneficial, the beneficial association declines as students spend longer online (see Figure 1). Our results indicate no beneficial association once students are online for over two hours per weekday outside of school (and no benefits of use on weekends).⁵ These results are similar to the results relating to overall screen-time use for UK adolescents reported by Przybylski and Weinstein (2017).

Our findings may suggest that students limit their time spent on the internet outside of school on weekdays to less than two hours. In this light, it is worth highlighting the actual time that students report spending on the internet each day. These results are shown in the Appendix Table A9. Approximately 15% of 15 year olds (including 27% of Māori students) report using the internet for more than 6 hours a day (on a weekday outside of school), while over half report more than two hours' use.

⁴ The demographic variables which are included in the equation are not reported; they are available on request.

⁵ For internet use at home on weekdays, we do not reject the null hypothesis of equal coefficients for 1-30 minutes per day and 31-60 minutes per day ($p=0.5824$), 1-2 hours per day ($p=0.1315$) and unknown time per day ($p=0.4922$); we conclusively reject equal coefficients for 1-30 minutes per day and each of the longer usage periods ($p=0.0202$, $p=0.0012$ and $p<0.001$ respectively).

Figure 1: Relationship between subjective wellbeing and time spent on internet outside of school on weekdays

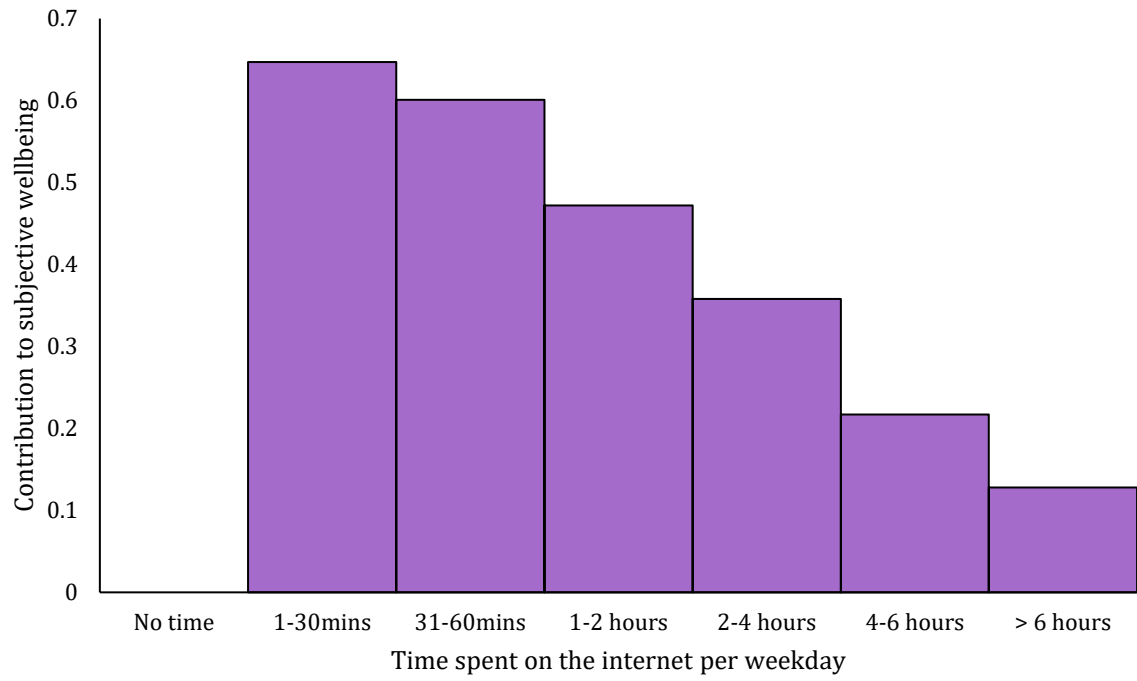


Table 25: The relationship between wellbeing and internet and ICT access

Variable	Coefficient (Standard error)
Time spent on internet at school (base category = no time spent)	
1-30 minutes per day	-0.030 (0.075)
31-60 minutes per day	-0.014 (0.078)
1-2 hours per day	-0.084 (0.081)
2-4 hours per day	-0.046 (0.089)
4-6 hours per day	-0.087 (0.109)
Over 6 hours per day	-0.028 (0.123)
Unknown	0.030 (0.299)
Time spent on internet at home weekdays (base category = no time spent)	
1-30 minutes per day	0.674** (0.199)
31-60 minutes per day	0.601** (0.194)
1-2 hours per day	0.472* (0.193)
2-4 hours per day	0.358 (0.194)
4-6 hours per day	0.217 (0.197)
Over 6 hours per day	0.128 (0.202)
Unknown	0.447 (0.356)
Time spent on internet at home weekends (base category = no time spent)	
1-30 minutes per day	0.109 (0.199)
30-60 minutes per day	0.242 (0.197)
1-2 hours per day	0.286 (0.195)
2-4 hours per day	0.292 (0.195)
4-6 hours per day	0.246 (0.197)
Over 6 hours per day	0.197 (0.199)
Unknown	0.382 (0.296)
Available desktop at home which is used	0.149** (0.040)
Available laptop at home which is used	0.231**

	(0.049)
Available tablet at home which is used	0.080*
	(0.041)
Available Internet connection at home which is used	0.069
	(0.092)
Available cell phone at home with internet access which is used	-0.027
	(0.042)
Available desktop at school which is used	0.052
	(0.053)
Available laptop at school which is used	0.046
	(0.041)
Available tablet at school which is used	-0.031
	(0.048)
Available computer at school with internet which is used	-0.058
	(0.063)
Available wireless internet connection at school which is used	0.198**
	(0.053)
Age first used a digital device: 7-9 years old	-0.018
	(0.053)
Age first used a digital device: 10-12 years old	-0.037
	(0.060)
Age first used a digital device: 13 years old or older	-0.047
	(0.090)
Have never used a digital device	-0.131
	(0.335)
Unknown age first used a digital device	0.405
	(0.236)
Age first used a computer: 7-9 years old	-0.020
	(0.054)
Age first used a computer: 10-12 years old	-0.131
	(0.078)
Age first used a computer: 13 years old or older	-0.050
	(0.129)
Have never used a computer	0.194
	(0.561)
Unknown age first used a computer	-0.144
	(0.264)
Age first used the internet: 7-9 years old	-0.044
	(0.059)
Age first used the internet: 10-12 years old	-0.016
	(0.071)
Age first used the internet: 13 years old or older	-0.176
	(0.116)
Have never used the internet	-0.746
	(0.456)
Unknown age first used the internet	-0.174
	(0.259)
Number of observations	4,001
Adjusted R^2	0.0787

* $p < 0.05$; ** $p < 0.01$. Demographic controls are included (but not reported) for ethnicity, gender, father's education, mother's education.

6.2 NZES

The relationship between wellbeing and internet access is investigated using NZES based on a principal component dissatisfaction variable constructed using the process described in our Methodology section. We also examine the relationship between wellbeing and three outcome variables related to social capital: whether the respondent voted in the 2017 general election, whether they voted in the 2016 local body elections, and whether they have undertaken some other form of civic participation in the 12 months leading up to the 2017 survey (where civic participation includes signing a petition, making a select committee submission, making a royal committee submission and/or consulting with government).

On average, we find that people without internet access record higher dissatisfaction than do people with internet access (4.152 vs 3.802 respectively). A regression (without other added control variables) of the dissatisfaction variable on internet access shows a significant positive relationship between dissatisfaction and no internet access. However the lack of demographic and other controls means that this raw regression may not provide an accurate picture of the relationship between wellbeing and internet access.

In column 1 of Table 26 we show the results from an OLS regression of the dissatisfaction variable on internet access plus demographic variables. The coefficients indicate associations, and again we cannot draw causal conclusions from them. Demographics controlled for in this regression (but not reported) include gender, working situation, education level, age, income level and ethnicity.

The results indicate that the wellbeing (dissatisfaction) of those who are without internet (and those with unknown internet status) is not different to that of people with internet once we control for demographic and other factors. One possible reason for lack of a clear result here is that the proxy dissatisfaction variable may not be an adequate representation of (a lack of) wellbeing. However the (unreported) results for the demographic controls in the estimated equation are consistent with other SWB findings. For instance: those who identify as Māori are more dissatisfied than those who identify as European, and lower income groups are more dissatisfied than are the highest income groups. These results signal that the principal component variable is likely to be a reasonable measure of dissatisfaction.

Another possible reason for lack of a clear result is that we are testing the relationship between internet access and wellbeing (dissatisfaction). The PISA results suggest that this relationship may depend on the extent of internet access by users, with any positive association between access and wellbeing tailing off sharply as daily internet use increases. We have no measure of intensity of use in the NZES data so our result may reflect an offsetting combination of positive effects for low internet users and negative effects for higher internet users.

Columns 2, 3 and 4 of Table 26 investigate the relationship of internet access with the three social capital outcome variables. In each case, we estimate a logit regression testing whether (lack of) internet access is associated with the social capital outcome. Demographic variables (as above) are included but not reported. Results for the internet variables are reported as odds ratios: a coefficient less than one means that individuals in that category are less likely to engage in the social capital outcome than are other individuals. (The significance test relates to whether the coefficient is different from one.)

We find that those without internet access were (statistically significantly) less likely to vote in the 2017 general election and less likely to be involved in various other forms of civic participation. There is no significant relationship of internet access and voting in the 2016 local body elections. The general election and civic participation results are consistent with the idea that people who are not engaged with others through the internet are also less engaged via more formal aspects of social capital such as civic participation.

Table 26: Relationship between internet access, wellbeing and social capital indicators

Variable	Dissatisfaction	GE Vote	LE Vote	Civic Part
No internet access	0.078 (0.074)	0.460* (0.142)	1.035 (0.202)	0.634** (0.102)
Internet access unknown	0.051 (0.229)	0.334 (0.265)	0.774 (0.420)	1.775 (0.843)
Number of observations	2,127	3,256	2,697	3,241
OLS: Adjusted R^2	0.1735	0.1411	0.0985	0.0709
Logit: pseudo R^2				

Dissatisfaction is the principal component variable described in section 4; the *Dissatisfaction* regression is estimated using OLS. *GE Vote* is a binary variable with 1= voted in 2017 general election (0 otherwise), estimated using logit regression. *LE Vote* is a binary variable with 1= voted in 2016 local election (0 otherwise), estimated using logit regression. *Civic Part* is a binary variable with 1= someone who signed a petition, made a select committee submission, made a royal committee submission and/or consulted with the government in the 12 months leading up to the 2017 survey (0 otherwise), estimated using logit regression. Logit results are presented as odds ratios (so a coefficient >1 indicates a positive relationship) with pseudo R^2 as the measure of goodness of fit. In each case, unreported demographic variables are included for gender, age, work status, ethnicity, income, qualifications. Standard errors are in brackets; * p<0.05; ** p<0.01.

6.3 NZCVS

Table 27 reports NZCVS responses broken down by reported life satisfaction (which is measured on a 0 to 10 scale, similar to that used in New Zealand’s General Social Survey). Those with the lowest level of life satisfaction (0-6) have the highest likelihood of no internet access (8.0%). This mirrors the PISA result in which no internet access is associated with lower subjective wellbeing. The rate of internet access appears unrelated to wellbeing for those whose life satisfaction ranges from 7 to 9. Those reporting life satisfaction of 10 have slightly lower rates of internet access, but this association likely reflects age, with retired people generally having high life satisfaction and lower rates of internet access.

It is notable from Table 27 that the rate of internet violations decreases as life satisfaction increases. This suggests that people who are more vulnerable in general (i.e. who have lower life satisfaction) are also those who are more vulnerable to internet violations.

Table 27: Life satisfaction and internet issue

Life satisfaction	Violation: Yes	Violation: No	No internet	Don't Know	Total
0-6	5.6%	85.3%	8.0%	1.1%	1068
7	4.7%	89.7%	4.9%	0.7%	1221
8	3.8%	91.1%	4.6%	0.6%	2448
9	3.4%	91.6%	4.7%	0.3%	1545
10	2.6%	91.3%	5.6%	0.6%	1725
Total	3.8%	90.2%	5.3%	0.6%	8007

7 Conclusions

Our findings relating to internet access and exclusion replicate a number of existing findings for New Zealand. In particular, we find that Pasifika, Māori, those living in larger country towns, and older members of society are comparatively less likely to have internet access.

With respect to older people, the gap in access is much greater for those aged over 75 years than for those aged between 65 and 74 years old. This may suggest that the lack of internet access for those over 75 years is more of a cohort than an age effect – i.e. as the current 65-74 year olds graduate to the over 75 year category, internet access rates may not reduce sharply in the way that is currently observed. Hence a watching brief may be all that is required to monitor internet access rates as people in their sixties continue to age.

We find also that people living in social housing, unemployed people, those not actively seeking work, and disabled individuals are more likely than others to lack internet access. Some people who are unemployed and some who are not actively seeking work may be disengaged from other aspects of society. They are also likely to suffer severe financial constraints, so their lack of internet access is not surprising. Their lack of access may also not be particularly amenable to policy intervention other than by helping these individuals find secure employment.

The very large gaps in internet access for those who live in social housing and for people who identify as being disabled are perhaps the most disturbing. However, these gaps are also potentially amenable to policy interventions.

Most social housing is owned by the state (Housing NZ) or by local authorities or NGOs. In each case, the social housing provider – as opposed to the tenants (who may well suffer from multiple forms of disadvantage) – could take the initiative to install WiFi (or other technologies) to enable internet access by tenants. In the modern age, provision of such infrastructure may be considered similar to provision of water, sewerage and electricity, and may be particularly valuable to marginalised tenants. Such provision may also help to address the lower rates of internet access for Pasifika (and Māori) students.

Many people who are disabled are already subject to some form of care by the authorities (e.g. DHBs) and/or NGOs that deal with specific forms of disability. These authorities may consider enabling internet use for their clients as a key intervention designed to improve the opportunities for disabled people to connect with the rest of society.

Our work examining the connections between internet access, internet use and wellbeing indicate certain associations between internet access and wellbeing – but these associations are not necessarily causal. The NZCVS data indicate that those who do not have internet access tend to have lower wellbeing than those who do have access. The NZES data reveal a similar relationship when we do not control for other factors but that relationship is not found to be present when we control for demographic and other factors. The NZES data do show, however, that those without internet access are less engaged in civic activities such as voting in general elections and in making submissions to government, even after we control for other factors.

Perhaps our most intriguing result with respect to wellbeing concerns the association between subjective wellbeing and internet use by adolescents outside of school on weekdays. This work, based on the PISA data for 15 year olds, controls for other demographic influences. We find that those without internet access tend to have lower wellbeing than those with access (a result which may reflect family circumstances). For those who do access the internet on weekdays outside of school, we find that increases in daily internet use are associated with

decreases in levels of wellbeing. Once daily internet use (on weekdays outside of school) exceeds about two hours, we find no positive association of internet use and wellbeing.

Interpretation of this result requires caution because it could, for instance, be that those with poor wellbeing choose to lock themselves away from direct human contact and instead interact with the world through the internet. However, from an intuitive angle, the proportion of youth who report extended internet use on weekdays (outside of school) may well be of concern. We find that 15% of 15 year olds (including 27% of Māori students) report using the internet for more than 6 hours per day on a weekday outside of school, while over half report more than two hours' use.

We recommend further investigation of the wellbeing effects of such extended use of the internet – both for adolescents and, if the data were available, for children and adults. As always, the issues of causality pose a problem for such research. However, scheduled new surveys offer avenues to address some of these issues. Three recent and scheduled surveys, in particular, offer promise since all three will be linked into Statistics New Zealand's Integrated Data Infrastructure (IDI) that contains a wealth of information about surveyed individuals to which the relevant surveys can be linked.

The first of these surveys is the 2018 NZCVS – i.e. the survey used here. The responses to this survey are currently being linked into the IDI. Future NZCVS surveys will similarly be linked to the IDI. The second set of surveys are the 2018 and scheduled 2021 PISA surveys. The 2018 survey is expected to be linked into the IDI in early 2020. The third survey is the scheduled PIAAC second cycle survey to be conducted over 2021/22 (with results released in 2023).

By linking these survey results into other (especially prior) characteristics of the surveyed individuals, we will be able to control much better for personal and locational traits that affect both wellbeing and internet (and other ICT) use. While the internet survey data will be cross-sectional, it will be possible to use statistical techniques such as propensity score matching to compare the wellbeing outcomes for otherwise similar individuals who have different internet use and access. From an internet access stance, we will also be able to control much better for geographical and other characteristics when examining the types of people who do not have access. Doing so will enable consideration of more specific policies that are targeted at groups who may benefit from internet use but who do not currently access the internet.

Studies across a wide range of social policies in New Zealand have benefitted from analysis of specific survey data linked into the IDI. We expect that similar benefits will arise from a focused set of studies relating to the internet (and to broader ICT use) using the surveys outlined above.

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Appendix - PISA Data

Internet and other digital questions:

Question	Response Options
<p>Are any of these devices available for use at home?</p> <ul style="list-style-type: none"> • Desktop Computer • Portable laptop, or notebook • Tablet computer • Internet connection • Cell phone with internet access 	<p>For each device the following options were available:</p> <ul style="list-style-type: none"> • Yes, and I use it • Yes, but I don't use it • No
<p>Are there any of these devices available for you to use at school?</p> <ul style="list-style-type: none"> • Desktop computer • Portable laptop, or notebook • Tablet computer • Internet-connected school computers • Internet connection via wireless network 	<p>For each device the following options were available:</p> <ul style="list-style-type: none"> • Yes, and I use it • Yes, but I don't use it • No
<p>How old were you when you first used a digital device?</p>	<ul style="list-style-type: none"> • 6 years old or younger • 7-9 years old • 10-12 years old • 13 years old or older • I had never used a digital device until today
<p>How old were you when you first used a computer?</p>	<ul style="list-style-type: none"> • 6 years old or younger • 7-9 years old • 10-12 years old • 13 years old or older • I had never used a computer until today
<p>How old were you when you first accessed the Internet</p>	<ul style="list-style-type: none"> • 6 years old or younger • 7-9 years old • 10-12 years old • 13 years old or older • I have never used the Internet
<p>During at typical weekday, for how long do you use the internet at school?</p>	<ul style="list-style-type: none"> • No time • 1-30 minutes per day • 31-60 minutes per day • Between 1 hour and 2 hours per day • Between 2 hours and 4 hours per day • Between 4 hours and 6 hours per day • More than 6 hours per day
<p>During a typical weekday, for how long do you use the internet outside school?</p>	<ul style="list-style-type: none"> • No time • 1-30 minutes per day • 31-60 minutes per day • Between 1 hour and 2 hours per day • Between 2 hours and 4 hours per day • Between 4 hours and 6 hours per day • More than 6 hours per day
<p>On a typical weekend day, for how long do you use the internet outside of school?</p>	<ul style="list-style-type: none"> • No time • 1-30 minutes per day • 31-60 minutes per day • Between 1 hour and 2 hours per day • Between 2 hours and 4 hours per day • Between 4 hours and 6 hours per day • More than 6 hours per day

Wellbeing Indicators:

Question	Response options
Overall, how satisfied are you with your life as a whole these days? [Available for UK; not NZ.]	Sliding bar ranging 0-10 from 0, not at all satisfied to 10, completely satisfied
Home possessions which includes compiled variables for: wealth, cultural possessions, home education resources, ICT resources and how many books are in the respondents home	<p>The wealth variable uses a combination of household possessions. These household possessions include:</p> <ul style="list-style-type: none"> • a room of their own • a link to the internet • a dishwasher • 3 country specific wealth items <p>And the number of the following in their home:</p> <ul style="list-style-type: none"> • Cell phones with internet access • Computers • Cars • Rooms with a bath or shower • E-book readers <p>The cultural possessions at home uses a combination of household possessions. These household possessions include:</p> <ul style="list-style-type: none"> • Classic literature • Books of poetry • Works of art • Books on art, music, or design • Musical instruments <p>Home educational resources uses a combination of household possessions. These household possessions include:</p> <ul style="list-style-type: none"> • A desk to study at • A quiet place to study • A computer you can use for school work • Educational software • Books to help you with school work • A dictionary • Technical reference books <p>The ICT resources variable includes:</p> <ul style="list-style-type: none"> • Educational software • A link to the internet • Cell phones with internet access • Computers • Tablet computers • E-book readers
Sense of belonging which attempts to summarise a student's sense of belonging to school using 6 trend items. The answering format is a four point Likert scale with the belonging categories "strongly agree", "agree", "disagree", and "strongly disagree". A higher score or weighted likelihood estimate is related to a higher sense of belonging at school. It is adjusted to have a mean of 0 and a standard deviation of 1.	<p>The following items are included in this variable:</p> <ul style="list-style-type: none"> • I feel like an outsider (or left out of things) at school • I make friends easily at school • I feel like I belong at school • I feel awkward and out of place at school • Other students seem to like me • I feel lonely at school

<p>Value of cooperating uses an answering format which is a four point Likert scale with the belonging categories “strongly agree”, “agree”, “disagree”, and “strongly disagree”.</p>	<p>The value cooperation variable includes the following:</p> <ul style="list-style-type: none"> • I prefer working as part of a team to working alone • I find that teams make better decisions than individuals • I find that teamwork raises my own efficiency • I enjoy cooperating with my peers
<p>Parent’s emotional support uses an answering format which is a four point Likert scale with the belonging categories “strongly agree”, “agree”, “disagree”, and “strongly disagree”.</p>	<p>The parent’s emotional support variable includes the following:</p> <ul style="list-style-type: none"> • My parents are interested in my school activities. • My parents support my educational efforts and achievements. • My parents support me when I am facing difficulties at school. • My parents encourage me to be confident.
<p>Instrumental motivation uses an answering format which is a four point Likert scale with the belonging categories “strongly agree”, “agree”, “disagree”, and “strongly disagree”.</p>	<p>The instrumental motivation question includes the following:</p> <ul style="list-style-type: none"> • Making an effort in my school science subject(s) is worth it because this will help me in the work I want to do later on • What I learn in my subject(s) is important for me because I need this for what I want to do later on. • Studying my subject(s) is worthwhile for me because what I learn will improve my career prospects. • Many things I learn in my subject(s) will help me to get a job.
<p>Test anxiety uses an answering format which is a four point Likert scale with the belonging categories “strongly agree”, “agree”, “disagree”, and “strongly disagree”.</p>	<p>The test anxiety question includes the following:</p> <ul style="list-style-type: none"> • I often worry that it will be difficult for me taking a test. • I worry that I will get poor at school. • Even if I am well prepared for a test I feel very anxious • I get very tense when I study for a test • I get nervous when I don't know how to solve a task at school.

Demographic indicators:

Question	Response options
Are you female or male?	<ul style="list-style-type: none"> • Female • Male
Does your mother have any of the following qualifications?	<ul style="list-style-type: none"> • ISCED level 6 • ISCED level 5A • ISCED level 5B • ISCED level 4
Does your father have any of the following qualifications?	<ul style="list-style-type: none"> • ISCED level 6 • ISCED level 5A • ISCED level 5B • ISCED level 4
Ethnicity based question, respondents picked all options that encapsulated their ethnicity	<ul style="list-style-type: none"> • Māori • Pasifika • Asian • Pākehā • Other

United Kingdom SWB regression (PISA 2015 data)

Variable	Coefficient (Standard error)
Constant	7.151** (0.020)
Home Possessions	0.080** (0.019)
Sense of belonging	0.595** (0.021)
Value cooperating	0.248** (0.018)
Parental support	0.566** (0.019)
Instrumental motivation	0.083** (0.018)
Test anxiety	-0.554** (0.019)
Number of observations	12,606
Adjusted R^2	0.2760

* p<0.05; ** p<0.01.

Appendix – NZES Data

Internet and other digital questions:

Question	Response options
No access to the internet	<ul style="list-style-type: none"> • Yes
Access to the internet at work	<ul style="list-style-type: none"> • Yes
Access to the internet at home	<ul style="list-style-type: none"> • Yes
Access to the internet on a mobile device	<ul style="list-style-type: none"> • Yes
Access to the internet somewhere else	<ul style="list-style-type: none"> • Yes

Demographic indicators:

Question	Response options
Respondent's gender	<ul style="list-style-type: none"> • Male • Female • Transsexual or transgender
Age in years	Scale response
Working full-time for pay or other income	<ul style="list-style-type: none"> • Yes • No
Working part-time for pay or other income	<ul style="list-style-type: none"> • Yes • No
Unemployed, laid off, looking for work	<ul style="list-style-type: none"> • Yes • No
Retired	<ul style="list-style-type: none"> • Yes • No
Disabled, unable to work	<ul style="list-style-type: none"> • Yes • No
At school, university, or other educational institution	<ul style="list-style-type: none"> • Yes • No
Working unpaid outside the home	<ul style="list-style-type: none"> • Yes • No
Working unpaid within the home	<ul style="list-style-type: none"> • Yes • No
For whom do you work, or did you last work if currently unemployed	<ul style="list-style-type: none"> • I am/was self-employed • A private company or business • A state or public agency or enterprise, central or local • A mixed public/private, or non-profit organisation • I have never been in paid employment • Don't know
Main ethnicity	<ul style="list-style-type: none"> • European • Maori • Pasifika • Asian • Kiwi or New Zealand • Other

Household income between 1 April 2016 and 31 March 2017	<ul style="list-style-type: none"> • No income • \$23,800 or Less • \$23,801-\$35,699 • \$35,700-\$62,199 • \$62,200-\$76,999 • \$77,000-\$93,599 • \$93,600-\$136,599 • \$136,600-\$180,199 • \$180,200 or over • Don't know
Highest qualification	<ul style="list-style-type: none"> • No qualification • Level 1 • Level 2 • University Entrance • Higher School Certificate • University Entrance Bursary • Bursary or School Level • Another secondary qualification in New Zealand • Another secondary qualification overseas • No Response • National Certificate Level 4 post school • Polytechnic • Undergraduate • Masters/Honours • Doctorate
Did you vote or not vote?	<ul style="list-style-type: none"> • Cast a vote • Chose not to vote • Didn't manage to vote • No Response
Size of area usually lived in	<ul style="list-style-type: none"> • A rural area or settlement (under 100,000 population) • A country town (under 10,000 population) • A larger country town (10,000-25,000 population) • A large town (over 25,000 population) • A major city (over 100,000 population)
What is your current housing status?	<ul style="list-style-type: none"> • Own a house or flat mortgage free • Own a house or flat with a mortgage • Rent a house privately as a family • Rent a house or flat from HNZC or local equivalent • Board or live in a hotel, hostel, rest home or temporary housing • Rent a house with a group of individuals • Live with parents or other family members
Did you vote in the most recent local elections?	<ul style="list-style-type: none"> • Yes • No • Don't know

Have you signed a petition (hard copy, not online)?	<ul style="list-style-type: none"> • Have done in last five years • Have not done in last five years, but did consider doing • Have not done in last five years and did not consider doing • Don't know
Have you made a select committee submission?	<ul style="list-style-type: none"> • Have done in last five years • Have not done in last five years, but did consider doing • Have not done in last five years and did not consider doing • Don't know
Have you made a royal committee submission?	<ul style="list-style-type: none"> • Have done in last five years • Have not done in last five years, but did consider doing • Have not done in last five years and did not consider doing • Don't know
Have you taken part in consultation with the government?	<ul style="list-style-type: none"> • Have done in last five years • Have not done in last five years, but did consider doing • Have not done in last five years and did not consider doing • Don't know
<ul style="list-style-type: none"> • If NZ Māori are you registered with your iwi organisation? 	<ul style="list-style-type: none"> • Yes • No • Don't know

Questions used in the principal component analysis for NZES

Question	Response
Does it make a difference who is in power?	1 it doesn't make any difference who is in power, 2 it makes very little difference who is in power, 3 it makes some difference who is in power, 4 it makes a reasonable amount of difference who is in power, 5 it makes a big difference who is in power, 9 don't know
Does voting make any difference to what happens?	1 voting won't make any difference to what happens, 2 voting won't make much difference to what happens, 3 voting can make some difference to what happens, 4 voting can make a reasonable amount of difference to what happens, 5 voting can make a big difference to what happens, 9 don't know
How satisfied with how democracy works in NZ?	1 very satisfied, 2 fairly satisfied, 3 not very satisfied, 4 not at all satisfied, 9 don't know
How good a job has the government done over the last three years?	1 a very good job, 2 a fairly good job, 3 a fairly bad job, 4 a very bad job, 9 don't know

In the last 12 months has the state of the NZ economy got better or worse?	1 Got a lot better, 2 got a little better, 3 stayed about the same, 4 got a little worse, 5 got a lot worse, 9 don't know
I don't think politicians and public servants care what people like me think	1 strongly agree, 2 agree, 3 neither, 4 disagree, 5 strongly disagree, 9 don't know
My vote really counts in elections	1 strongly agree, 2 agree, 3 neither, 4 disagree, 5 strongly disagree, 9 don't know
How likely is it that your household's income could be severely reduced in	1 Very likely, 2 somewhat likely, 3 somewhat unlikely, 4 very unlikely, 9 don't know
How widespread or unusual is corruption among politicians and public servants	1 Very widespread, 2 quite widespread, 3 quite unusual, 4 very unusual, 9 don't know
How likely is it that your household's income could be severely reduced in 12 months?	1 Very likely, 2 somewhat likely, 3 somewhat unlikely, 4 very unlikely, 9 don't know
In the last 12 months has the state of the NZ economy got better or worse?	1 Got a lot better, 2 got a little better, 3 stayed about the same, 4 got a little worse, 5 got a lot worse, 9 don't know
Over the next ten years how likely are you to improve your standard of living?	1 very likely, 2 somewhat likely, 4 very unlikely, 9 don't know

Appendix - NZCVS data

Internet question:

Question	Response options
In the last 12 months, has a computer or Internet-enabled device belonging to you or anyone else living in your household, been infected or interfered with, for example by a virus or someone accessing it without permissions?	<ul style="list-style-type: none"> • Yes – how many times? • No • Not applicable – Nobody in this household has owned a computer or Internet enabled device in the last 12 months • Don't know

Wellbeing question:

Question	Response options
Life Satisfaction	<ul style="list-style-type: none"> • 0 (least satisfied) to 10 (most satisfied)

Demographic Indicators:

Variable	Response options
Ethnicity	<ul style="list-style-type: none"> • European • Māori • Pasifika • Asian • Other
Sex	<ul style="list-style-type: none"> • Female • Male
Age groups	<ul style="list-style-type: none"> • 15-19 years • 20-29 years • 30-39 years • 40-49 years • 50-59 years • 60-64 years • 65 years and over
Personal Income	<ul style="list-style-type: none"> • \$10,000 or less • \$10,001-\$20,000 • \$20,001-\$30,000 • \$30,001-\$40,000 • \$40,001-\$50,000 • \$50,001-\$60,000 • \$60,001-\$70,000 • \$70,001-\$100,000 • \$100,001 or more

Household Income	<ul style="list-style-type: none">• \$10,000 or less• \$10,001-\$20,000• \$20,001-\$30,000• \$30,001-\$40,000• \$40,001-\$50,000• \$50,001-\$60,000• \$60,001-\$70,000• \$70,001-\$100,000• \$100,001-\$150,000• \$150,000 or more
Employment status	<ul style="list-style-type: none">• Employed• Unemployed• Not in Labour Force (NILF) – retired• NILF-Home or caring duties• NILF-Studying• NILF-Not actively seeking work• Other (not specified)
Disability status	<ul style="list-style-type: none">• Disabled• Not disabled

Appendix – PIAAC data

The PIAAC survey collects information on cognitive and workplace skills needed within the adult population in over 40 countries. It is administered every ten years, with the latest information being collected from April 2014 to March 2015. The survey had a sample size of 6,177 and was administered via a computer with an option for it to be administered by pen and paper. There are questions on demographics and computer access inside and outside of work which we report here. We show whether respondents used a computer inside or outside work broken down by demographic group. The demographic groups include: gender, education level, working status and whether they were self-employed or not; in each case sampling weights are used.

Internet and other digital questions:

Question	Response options
Have you ever used a computer? This includes mobile phones and other hand-held electronic devices that are used to connect to the Internet, check emails etc	<ul style="list-style-type: none"> • Yes • No
Do you use a computer in your everyday life now outside work?	<ul style="list-style-type: none"> • Yes • No
Has the respondent experience with computer	<ul style="list-style-type: none"> • Yes • No

Wellbeing indicators:

Question	Response options
Is the respondent male or female?	<ul style="list-style-type: none"> • Male • Female
Which of the qualifications on this card is the highest you have obtained?	<ul style="list-style-type: none"> • No formal qualification or below ISCED 1 • ISCED 1 • ISCED 2 • ISCED 3C shorter than 2 years • ISCED 3C 2 years or more • ISCED 3A-B • ISCED 3 (without distinction A-B-C, 2y+) • ISCED 4C • ISCED 4A-B • ISCED 4 (without distinction A-B-C) • ISCED 5B • ISCED 5A, bachelor degree • ISCED 5A, master degree • ISCED 6 • Foreign qualification

Please look at this card and tell me which ONE of the statements best describes your current situation. If more than one statement applies to you, please indicate the statement that best describes how you see yourself	<ul style="list-style-type: none"> • Full-time employed (self-employed, employee) • Part-time employed (self-employed, employee) • Unemployed • Pupil, student • Apprentice, internship • In retirement or early retirement • Permanently disabled • In compulsory military or community service • Fulfilling domestic tasks or looking after children/family • Other
In this job are you working as an employee or are you self-employed?	<ul style="list-style-type: none"> • Employee • Self-employed

PIAAC Results

Table A1: Gender and computer use

	Response	Male	Female	Total
Use computer inside or outside work	Yes	88.11%	90.54%	89.36%
	No	11.89%	9.46%	10.64%
Use computer outside work	Yes	85.78%	88.99%	87.44%
	No	14.15%	10.99%	12.51%
	Not Stated	0.07%	0.02%	0.05%
Experience using a computer	Yes	96.96%	97.98%	97.49%
	No	2.90%	1.88%	2.38%
	Not Stated	0.14%	0.14%	0.14%
Total		1332091	1417628	2749719

* In all PIAAC tables, total numbers are after applying sampling weights

Table A2: Highest educational attainment and use of computers in everyday life outside work

	Use computer	Don't use computer	Not Stated	Total
ISCED 1	47.70%	52.30%	0.00%	49168
ISCED 2	69.38%	30.62%	0.00%	284050
ISCED shorter than 2 years	81.48%	18.52%	0.00%	248009
ISCED 3C 2 years or more	85.12%	14.73%	0.15%	202712
ISCED 3A-B	92.14%	7.86%	0.00%	406932
ISCED 4C	87.07%	12.93%	0.00%	236709
ISCED 5B	89.29%	10.71%	0.00%	363230
ISCED 5A, bachelor degree	96.86%	2.96%	0.19%	493265
ISCED 5A, master degree	97.76%	2.24%	0.00%	210974
ISCED 6	100.00%	0.00%	0.00%	25356
Foreign qualification	84.58%	15.42%	0.00%	175767
Don't Know	31.10%	68.90%	0.00%	1653
Total	87.44%	12.51%	0.05%	2697826

Table A3: Highest educational attainment and the use of computers inside and outside work

	Use Computer	Don't use computer	Total
ISCED 1	50.35%	49.65%	49168
ISCED 2	75.04%	24.96%	284050
ISCED shorter than 2 years	85.91%	14.09%	248009
ISCED 3C 2 years or more	89.05%	10.95%	202712
ISCED 3A-B	95.26%	4.74%	406932
ISCED 4C	92.00%	8.00%	236709
ISCED 5B	93.84%	6.16%	363230
ISCED 5A, bachelor degree	99.03%	0.97%	493265
ISCED 5A, master degree	99.62%	0.38%	210974
ISCED 6	100.00%	0.00%	25356
Foreign qualification	88.00%	12.00%	175767
Don't Know	49.58%	50.42%	1653
Total	91.08%	8.92%	2697826

Table A4: Highest educational attainment and computer experience

	Computer experience	No computer experience	Not Stated	Total
ISCED 1	76.35%	23.65%	0.00%	49168
ISCED 2	93.42%	6.51%	0.07%	284050
ISCED shorter than 2 years	97.26%	2.62%	0.12%	248009
ISCED 3C 2 years or more	98.46%	1.39%	0.15%	202712
ISCED 3A-B	99.10%	0.90%	0.00%	406932
ISCED 4C	97.69%	2.31%	0.00%	236709
ISCED 5B	98.39%	1.43%	0.18%	363230
ISCED 5A, bachelor degree	99.47%	0.06%	0.47%	493265
ISCED 5A, master degree	100.00%	0.00%	0.00%	210974
ISCED 6	100.00%	0.00%	0.00%	25356
Foreign qualification	94.76%	5.24%	0.00%	175767
Don't Know	49.58%	50.42%	0.00%	1653
Total	97.49%	2.38%	0.14%	2697826

Table A5: Current work situation and the use of computers in everyday life outside work

	Use computer	Don't use computer	Not Stated	Total
Full time employed (self-employed, employee)	89.11%	10.86%	0.03%	1418637
Part-time employed (self-employed, employee)	89.02%	10.82%	0.16%	476979
Self-employed	89.55%	10.18%	0.27%	345128
Unemployed	76.64%	23.36%	0.00%	144921
Pupil, student	96.99%	3.01%	0.00%	258947
Apprentice, internship	90.25%	9.75%	0.00%	10405
In retirement or early retirement	81.84%	18.16%	0.00%	54956
Permanently disabled	51.13%	48.87%	0.00%	51690
Fulfilling domestic tasks or looking after children/family	80.87%	19.13%	0.00%	233094
Other	80.55%	19.45%	0.00%	48195
Total	87.68%	12.25%	0.07%	3042954

Table A6: Current work situation and the use of computers inside and outside work

	Use Computer	Don't use computer	Total
Full time employed (self-employed, employee)	94.16%	5.84%	1418637
Part-time employed (self-employed, employee)	92.92%	7.08%	476979
Self-employed	94.86%	5.14%	345128
Unemployed	79.21%	20.79%	144921
Pupil, student	97.18%	2.82%	258947
Apprentice, internship	90.25%	9.75%	10405
In retirement or early retirement	82.71%	17.29%	54956
Permanently disabled	51.13%	48.87%	51690
Fulfilling domestic tasks or looking after children/family	81.94%	18.06%	233094
Other	82.15%	17.85%	48195
Total	91.51%	8.49%	3042953

Table A7: Current work situation and computer experience

	Computer experience	No computer experience	Not stated	Total
Full time employed (self-employed, employee)	98.19%	1.69%	0.13%	1418637

Part-time employed (self-employed, employee)	97.82%	1.92%	0.26%	476979
Self-employed	97.73%	2.00%	0.27%	345128
Unemployed	94.84%	5.16%	0.00%	144921
Pupil, student	99.88%	0.12%	0.00%	258947
Apprentice, internship	100.00%	0.00%	0.00%	10405
In retirement or early retirement	91.54%	8.46%	0.00%	54956
Permanently disabled	81.91%	17.52%	0.57%	51690
Fulfilling domestic tasks or looking after children/family	96.37%	3.44%	0.19%	233094
Other	96.98%	3.02%	0.00%	48195
Total	97.51%	2.33%	0.15%	3042954

Appendix - PISA: Additional Tables

Time spent on the Internet per day	Female	Male	Total
No time	5.61%	10.08%	4266
1 min to 30 min	23.88%	24.17%	13040
31 min to 1 hour	19.47%	19.60%	10602
1 to 2 hours	17.57%	14.13%	8596
2 to 4 hours	10.45%	8.52%	5146
4 to 6 hours	5.10%	3.85%	2427
Over 6 hours	3.54%	3.64%	1950
No Response	14.37%	16.01%	8248
Total	100%	100%	54274

Table A8: Male and female internet use at school

Table A9: Male and female internet use outside of school on weekdays

Time spent on the Internet per day	Female	Male	Total
No time	1.92%	1.77%	1002
1 min to 30 min	2.97%	3.53%	1767
31 min to 1 hour	5.35%	6.99%	3350
1 to 2 hours	15.20%	15.5%	8330
2 to 4 hours	27.11%	24.75%	14068
4 to 6 hours	18.54%	16.87%	9607
Over 6 hours	14.61%	14.71%	7956
No Response	14.31%	15.87%	8194
Total	100%	100%	54274

Table A10: Male and female internet use outside of school on weekends

Time spent on the internet per day	Female	Male	Total
No time	1.94%	1.65%	974
1 min to 30 min	2.77%	3.52%	1708
31 min to 1 hour	4.23%	5.92%	2757
1 to 2 hours	10.21%	10.11%	5513
2 to 4 hours	21.09%	21.17%	11467
4 to 6 hours	21.47%	17.12%	10465
Over 6 hours	23.42%	24.15%	12911
No Response	14.87%	16.37%	8479
Total	100%	100%	54274

Table A11: Ethnicity and internet use at school

Time spent on the internet per day	Māori	Pasifika	Asian	Pākehā	Māori and Pākehā	Other	All other combinations	Unknown	Total
No time	9.83%	10.16%	8.42%	7.78%	7.97%	4.06%	6.35%	1.71%	4266
1 min to 30 min	24.48%	17.60%	29.46%	25.70%	21.58%	11.96%	21.03%	2.23%	13040
31 min to 1 hour	13.40%	13.68%	16.69%	22.12%	22.73%	25.07%	19.06%	1.04%	10602
1 to 2 hours	13.88%	12.53%	14.11%	17.53%	15.89%	13.57%	16.46%	1.85%	8596
2 to 4 hours	5.76%	7.35%	9.67%	10.49%	10.65%	12.94%	8.20%	3.18%	5146
4 to 6 hours	9.17%	4.01%	3.65%	4.20%	5.31%	2.45%	4.22%	0.00%	2427
Over 6 hours	8.43%	3.54%	2.98%	2.88%	3.96%	3.44%	5.23%	0.00%	1950
No response	15.05%	31.13%	15.03%	9.29%	11.92%	26.52%	19.45%	89.98%	8248
Total	100%	100%	100%	100%	100%	100%	100%	100%	54274

Table A12: Ethnicity and internet use outside school on weekdays

Time spent on the internet per day	Māori	Pasifika	Asian	Pākehā	Māori and Pākehā	Other	All other combinations	Unknown	Total
No time	1.66%	3.34%	1.09%	1.45%	3.20%	1.32%	3.70%	0.00%	1002
1 min to 30 min	5.37%	3.43%	2.32%	3.59%	2.79%	1.26%	2.14%	0.00%	1767
31 min to 1 hour	5.20%	7.52%	5.43%	6.70%	6.16%	4.47%	5.47%	1.26%	3350
1 to 2 hours	8.33%	9.79%	13.79%	18.75%	15.09%	11.00%	11.29%	3.82%	8330
2 to 4 hours	21.31%	13.80%	27.61%	29.37%	22.97%	27.91%	25.15%	1.83%	14068
4 to 6 hours	15.52%	12.90%	17.67%	19.18%	21.44%	15.32%	15.65%	1.94%	9607
Over 6 hours	26.88%	18.64%	16.80%	11.73%	16.75%	15.74%	17.40%	1.81%	7956
No response	15.72%	30.58%	15.29%	9.22%	11.60%	22.98%	19.20%	89.35%	8194
Total	100%	100%	100%	100%	100%	100%	100%	100%	54274

Table A13: Ethnicity and internet use outside school on weekends

Time spent on the internet per day	Māori	Pasifika	Asian	Pākehā	Māori and Pākehā	Other	All other combinations	Unknown	Total
No time	1.70%	3.97%	1.08%	1.41%	2.72%	1.32%	3.36%	0.00%	974
1 min to 30 min	4.85%	3.11%	3.05%	3.13%	4.08%	0.00%	2.41%	0.00%	1708
31 min to 1 hour	5.21%	6.37%	3.03%	5.98%	3.19%	1.26%	4.81%	1.04%	2757
1 to 2 hours	6.59%	8.72%	6.24%	11.86%	13.46%	12.81%	8.02%	2.77%	5513
2 to 4 hours	17.51%	10.33%	20.99%	24.74%	18.76%	22.84%	18.08%	1.83%	11467
4 to 6 hours	16.12%	14.99%	22.20%	20.40%	20.45%	20.04%	18.51%	1.16%	10465
Over 6 hours	31.89%	21.25%	27.31%	22.87%	25.64%	17.23%	24.88%	1.81%	12911
No Response	16.12%	31.26%	16.10%	9.62%	11.70%	24.49%	19.93%	91.39%	8479
Total	100%	100%	100%	100%	100%	100%	100%	100%	54274

Appendix - NZES: Longitudinal Tables

Table A14: Internet in 2011, 2014 and 2017 using different sampling weights (percentages represent the percentage of total sample)

	Using 2011 sample weights	Using 2014 sample weights	Using 2017 sample weights
Y,Y,Y	85.65%	82.52%	79.21%
N,N,N	5.29%	5.83%	8.51%
N,N,Y	1.70%	1.01%	1.91%
N,Y,N	1.65%	1.81%	2.87%
Y,N,N	0.32%	0.71%	1.37%
Y,Y,N	1.56%	2.05%	1.74%
Y,N,Y	0.25%	0.27%	0.31%
N,Y,Y	2.33%	4.33%	2.68%
Unknown	2.95%	2.47%	3.31%
Total	390	479	450

* Total numbers are after applying sampling weights. N and Y refer to no internet and internet for each year. For example, N, N, N refers to those who have no internet in 2011, 2014 and 2017 and N, Y, N refers to those who have no internet in 2011 and 2017 but have internet in 2014.

Table A15: Internet access in 2011, 2014 and 2017 and work in 2011, 2014 and 2017 (percentages represent the percentage of demographic group)

	Year	Internet	No Internet	Unknown	Total
Working full time	2011	96.64%	3.36%	0.00%	204
	2014	95.08%	4.72%	0.21%	231
	2017	96.38%	2.24%	1.38%	192
Working part time	2011	87.68%	12.32%	0.00%	68
	2014	91.37%	5.56%	3.08%	96
	2017	96.37%	3.63%	0.00%	69
Unemployed	2011	89.58%	10.42%	0.00%	6
	2014	78.03%	21.97%	0.00%	6
	2017	79.32%	20.68%	0.00%	7

Disabled	2011	76.69%	23.31%	0.00%	15
	2014	96.11%	2.88%	1.01%	24
	2017	58.73%	40.94%	0.33%	28
At school, university or other	2011	94.31%	5.69%	0.00%	16
	2014	100.00%	0.00%	0.00%	8
	2017	100.00%	0.00%	0.00%	6
Retired	2011	63.65%	36.35%	0.00%	69
	2014	76.43%	22.26%	1.31%	85
	2017	71.05%	28.71%	0.25%	143
Unpaid inside the home	2011	97.77%	2.23%	0.00%	27
	2014	95.63%	4.37%	0.00%	32
	2017	92.56%	7.44%	0.00%	21
Unpaid outside the home	2011	95.62%	4.38%	0.00%	8
	2014	93.86%	6.14%	0.00%	14
	2017	89.22%	10.78%	0.00%	10
Self-employed	2011	91.01%	8.99%	0.00%	84
	2014	89.13%	10.47%	0.40%	104
	2017	91.39%	8.61%	0.00%	96
Total	2011	89.18%	10.82%	0.00%	497
	2014	90.74%	8.40%	0.87%	600
	2017	86.92%	12.54%	0.54%	573

* Total numbers are after applying sampling weights

Table A16: Internet access in 2011, 2014 and 2017 and 2011 ethnicity (percentages represent the percentage of each ethnicity group)

	Year	Internet	No Internet	Unknown	Total
European	2011	88.61%	11.39%	0.00%	304
	2014	92.32%	7.38%	0.30%	304
	2017	89.13%	9.98%	0.89%	304
Māori	2011	78.46%	21.54%	0.00%	21
	2014	83.26%	16.53%	0.22%	21
	2017	80.94%	18.59%	0.46%	21
Pasifika	2011	34.91%	65.09%	0.00%	5
	2014	36.52%	63.48%	0.00%	5
	2017	92.89%	7.11%	0.00%	5
Asian	2011	100.00%	0.00%	0.00%	14
	2014	92.33%	0.00%	7.67%	14
	2017	100.00%	0.00%	0.00%	14
Other	2011	100.00%	0.00%	0.00%	14
	2014	100.00%	0.00%	0.00%	14
	2017	100.00%	0.00%	0.00%	14
European and Māori	2011	95.34%	4.66%	0.00%	16
	2014	95.34%	4.20%	0.47%	16
	2017	99.32%	0.68%	0.00%	16
All Other Combinations	2011	96.92%	3.08%	0.00%	5
	2014	97.77%	2.23%	0.00%	5
	2017	97.77%	2.23%	0.00%	5
No Response	2011	96.20%	3.80%	0.00%	11
	2014	100.00%	0.00%	0.00%	11
	2017	99.50%	0.50%	0.00%	11
Total	2011	88.87%	11.13%	0.00%	390
	2014	91.88%	7.59%	0.53%	390
	2017	90.35%	8.93%	0.72%	390

* Total numbers are after applying sampling weights

Table A17: Internet access in 2011, 2014 and 2017 and age in 2011, 2014 and 2017 (percentages represent the percentage of each age group)

	Year	Internet	No Internet	Unknown	Total
< 26	2011	94.58%	5.42%	0.00%	16
	2014	100.00%	0.00%	0.00%	12
	2017	100.00%	0.00%	0.00%	2
26-45	2011	96.56%	3.44%	0.00%	129
	2014	97.71%	0.00%	2.29%	129
	2017	89.62%	10.38%	0.00%	92
45-65	2011	93.58%	6.42%	0.00%	171
	2014	95.13%	4.54%	0.33%	216
	2017	93.97%	4.58%	1.45%	190
66-75	2011	65.83%	34.17%	0.00%	48
	2014	84.39%	13.96%	1.65%	68
	2017	87.82%	12.18%	0.00%	90
> 75	2011	57.14%	42.86%	0.00%	25
	2014	62.33%	37.67%	0.00%	48
	2017	51.71%	47.84%	0.46%	77
Total	2011	88.87%	11.13%	0.00%	390
	2014	90.02%	7.80%	1.00%	479
	2017	84.63%	14.68%	0.69%	450

* Total numbers are after applying sampling weights

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