MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

Updating the Adult Literacy and Life Skills Survey

Estimating change in skills distribution

since 2006

Author
David Earle, Chief Research Analyst
Email: david.earle@minedu.govt.nz
Telephone: 04-463 8524

Published by
MINISTRY OF EDUCATION

This report is available from the Ministry of Education's Education Counts website:
www.educationcounts.govt.nz.

May 2015

UPDATING THE ADULT LITERACY AND LIFE SKILLS SURVEY

SUMMARY

New Zealand is currently participating in the Programme for the International Assessment of Adult Competencies (PIAAC). PIAAC includes an international survey of adult skills which will update information on the literacy and numeracy skills of the adult population – last surveyed in 2006 in the Adult Literacy and Life Skills (ALL) Survey. The PIAAC survey results will be available in July 2016. This gives us an opportunity to trace the shift in skills in the eight years between the two surveys.

This paper firstly estimates the effect of population changes since 2006 on the skills distribution of the population. This provides a new estimate of the results of the ALL survey taking account of population changes since 2006 This will aid understanding of how much of the change between ALL and PIAAC is likely to be due to the changing characteristics of the population.

Secondly, the paper estimates the reach of adult literacy and numeracy programmes by skills levels in the adult population. This will help us assess the effects we might expect these programme to have on the overall skills distribution of the population.

Our modelling finds that the changes in the age structure, education and other characteristics of the population since 2006 will have little to no overall effect on the distribution of skills. While there have been considerable shifts in the age structure and characteristics of the adult population, these are likely to cancel each other out in terms of effect on average numeracy and literacy skills. Shifts are more likely to be noticeable for specific sub groups.

From 2010 to 2013, around 275,000 adults were assessed for reading or numeracy or both on the Literacy and Numeracy for Adults Assessment Tool. Most of these people would have participated in, or had access to, literacy and numeracy provision, and in doing so, had the opportunity to improve their literacy and numeracy skills.

Analysis suggests that impact of this provision on the literacy and numeracy skills across the total adult population is likely to be noticeable but relatively small. The scores of the adults who have been assessed can be translated into ALL proficiency levels and compared with the projected distribution of skills in the total population. From this it is estimated that around 10% of the adult population with ALL level 1 document literacy skills were assessed in reading and 15% of the population with ALL level 2 scores. For numeracy, the figures are 11% for each level.

Introduction

New Zealand is currently participating in the Programme for the International Assessment of Adult Competencies (PIAAC). PIAAC includes an international survey on the literacy, numeracy and problem-solving skills on adults (aged 16 to 65). New Zealand PIAAC survey results will be released in July 2016. It will update the literacy and numeracy results[i] from the 2006 Adult Literacy and Life Skills (ALL) Survey.

The PIAAC data will enable us to assess the shift in skills since the ALL survey. In the eight years since the ALL survey, there have been significant changes in the age, place of birth and ethnic distribution of the New Zealand population, and educational attainment has increased.

There has also been a concerted focus on embedding literacy and numeracy in lower-level tertiary education.

This paper firstly estimates the effect of population changes since 2006 on the skills distribution of the population. This provides a new estimate of the results of the ALL survey taking account of population changes since 2006 This will aid understanding of how much of the change between ALL and PIAAC is likely to be due to the changing characteristics of the population.

Secondly, the paper estimates the reach of adult literacy and numeracy programmes by skills levels in the adult population. This will help us assess the effects we might expect these programme to have on the overall skills distribution of the population.

This paper presents the results of a model using the New Zealand General Social Survey 2012 (GSS). Factors that are strongly related to literacy and numeracy in the 2006 ALL survey were used to predict competency levels in the population as shown in the 2012 GSS. It also uses the data from the Literacy and Numeracy for Adults Assessment Tool to estimate the magnitude of impact of recent literacy and numeracy provision.

Estimating the distribution of skills in 2012

In the ALL survey, literacy and numeracy skills are expressed as a continuous scale score, which is then grouped into proficiency levels. Level 1 is the lowest level and level 5 the highest level of proficiency.

Analysis of the ALL data identified several factors that are strongly related to literacy and numeracy scores (Lane, 2010, 2011). For adults aged 25 to 65, the main factors were:

- level of education
- first language and main language spoken at home
- computer use at work and at home.

Other significant factors included labour force status, occupation, industry, income, age, gender and ethnicity.

For young people aged 16 to 25, the main factors were:

- language spoken most often at home
- Māori or Pasifika ethnic identification
- educational participation and achievement
- home computer use
- library use.

To estimate the distribution of skills in 2012, we have selected factors shown to be strongly related to literacy and numeracy in the ALL survey. We have developed a regression model using these factors and then applied the model to the 2012 GSS to predict literacy and numeracy scores for each individual. This follows the approach outlined in Yamamoto (2013).[ii]

The factors for the model were selected on the basis that they were measured in a comparable way in both surveys and the relationship of the factor to literacy and numeracy skills is likely to have remained constant over the time period. Examples where the relationship may have changed include labour market status (changes in employment and unemployment rates between 2006 and 2012 mean that the average skills of people in these group will also have changed) and computer use (as more people use computers, the distribution of skills of those who do and don't use computers will also change).

The factors used in the model[iii] were:

- age
- having Māori, Pasifika and/or Asian ethnicity
- highest educational qualification
- being born in New Zealand or overseas.

The last factor was the closest we could get to first or home language across the two surveys.[iv]

Population changes from 2006 to 2012

From 2006 to 2012 there was considerable change in the age structure of the population. Figure 1 shows the number of people in the population in each year (on the left) and the age groups as a proportion of the population aged 16 to 65 (on the right).

Figure 1
Changes in population size and distribution from 2006 to 2012
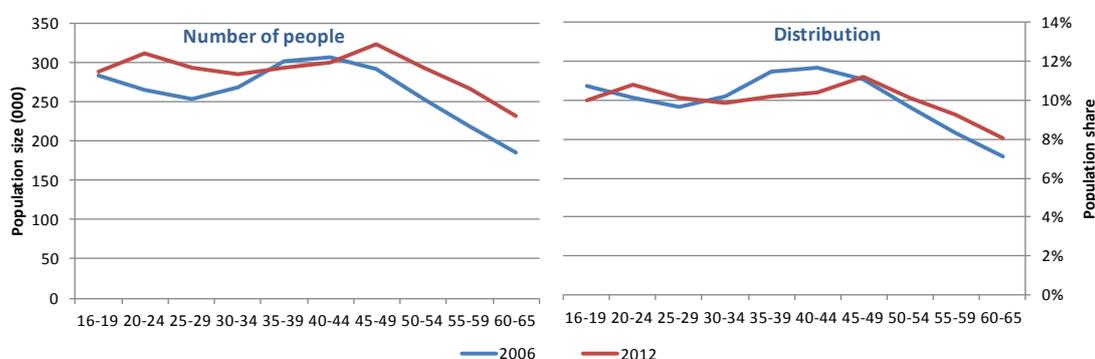
In 2006, the largest population group was aged 35 to 49. As would be expected, in 2012 this large group shows up as 6 years older. The result of this is that the number of people aged 45 to 65 in 2012 had increased by 12% compared with the same age group in 2006. There has also been growth in the population aged under 30. This age group grew in size by 11% from 2006 to 2012.

From 2006 to 2012, the population aged 16 to 65 grew by 10% overall. Looking at the distribution of age groups provides a way of looking at changes, while adjusting for the different population sizes. From 2006 to 2012, the proportion of people aged 16 to 29 only increased from 30% to 31%, the proportion aged 30 to 44 decreased from 33% to 30% and the proportion aged 45 to 65 increased from 36% to 39%.

There were also changes in other characteristics of the population, once the change in the age structure of the population is taken into account. Figure 2 shows the proportions of each age group by selected groups or characteristics.

The proportion of people with Māori ethnicity has increased, particularly in the under 25 year old age group. The proportion with Pasifika ethnicity has increased most in the age 45 to 54 year age group. The proportion with Asian ethnicity has increased in the 25 to 39 year old age group. The proportion of people born overseas has increased in the 25 to 49 year old age group.

In Figure 2, the bottom two graphs look at two specific levels of educational attainment, which have a reasonable alignment with skill levels. For people with English as a first language, those

with bachelors degrees and above are more likely to have higher literacy and numeracy skills and those with lower secondary or no qualifications are more likely to have the lowest level of literacy and numeracy skills (Earle, 2009; Smyth & Lane, 2009). There has been an increase in the proportion of the population with bachelors degrees and above and a decrease in the proportion with lower secondary school or no qualifications.

Figure 2
Comparison of proportion of population by age group by selected characteristics in 2006 and 2016


What is the effect of population changes on literacy and numeracy skills?

We used the models of literacy and numeracy developed from the ALL survey (discussed above) to predict the effect of population change from 2006 to 2012 on distribution of skills in the 16 to 65 year old age group in 2012. This was achieved by applying the model to the 2012

General Social Survey. This provides a new estimate of the results of the ALL survey taking account of population changes since 2006.

Figure 3 shows the distribution of mean document literacy[v] and numeracy scores by age group in 2006[vi] and compares this with the predicted distribution for 2012. The shaded areas indicate the 95% confidence intervals.

Figure 3

Distribution of mean document literacy and numeracy scores by age group in 2006 and 2012
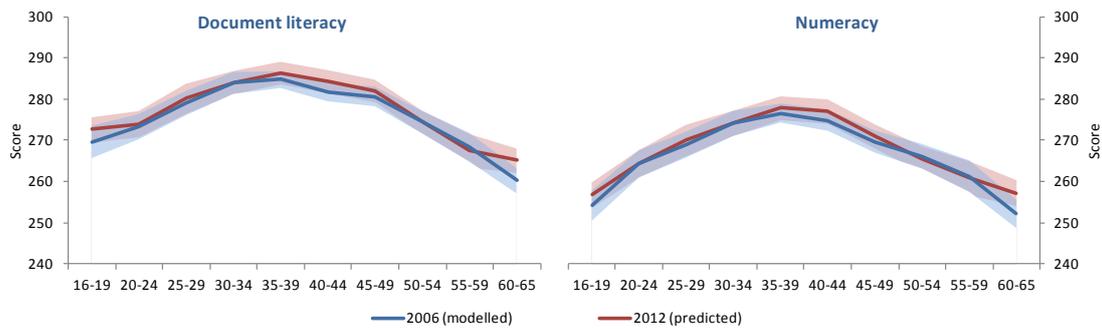
The 2012 values show whether changes in the population, as listed above, are likely to affect the average skills in each age group. There is a small increase for those aged 35 to 49 from 2006 to 2012 in both skills, but it is not statistically significant. The results for other age groups are fairly much identical.[vii]

These results suggest that the changes in the population listed above will have cancelled each other out in terms of shifts in overall skills. While there has been an increase in educational level, there has also been an increase in the proportion of the population born overseas. The latter is a proxy for the proportion who speak English as a second or other language, who are likely to have lower literacy and numeracy proficiency in English.

Figure 4 shows the predicted changes across the population aged 16 to 65. The left graph shows the mean literacy and numeracy scores and the right graph shows the distribution by ALL levels.

Figure 4

Distribution of mean literacy and numeracy scores and levels in 2006 and 2012
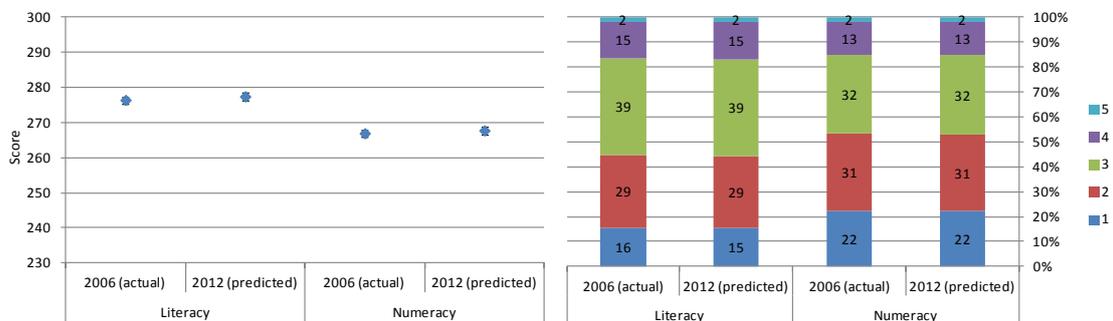

The results indicate that there will have been minimal change over the six year period. The mean scores are very close. There is no change in the distribution of skill levels.

While the population changes are predicted to have very little effect on the overall results, it is possible that there may have been greater change for specific subgroups. For example, Figure 5 shows the predicted average document literacy scores in 2006 and 2012 for the total population, Māori and Pasifika. The modelling suggests that there will have been be little change in the scores for men. For women, there may be an increase in scores, with a fairly large increase predicted for Pasifika women.

Figure 5
Comparison of average document literacy scores for total population, Māori and Pasifika by gender 2006 and 2012
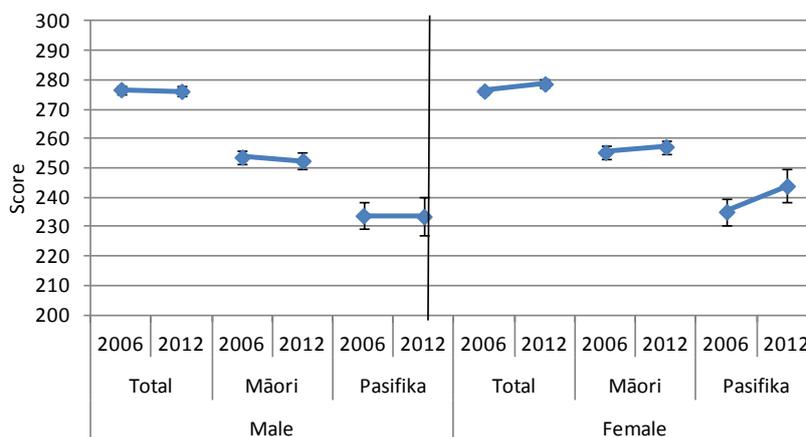
How much effect are literacy and numeracy programmes likely to have had?

The analysis above made no allowance for increased participation in adult literacy and numeracy programmes. From 2006 to 2012, the government increased the amount of adult literacy and numeracy provision, particularly through embedding provision within level 1 to 3 certificates in tertiary education. This has been accompanied by the implementation of a Literacy and Numeracy for Adults Assessment Tool since 2010 (Tertiary Education Commission, 2012).

The results from the Assessment Tool provide the best available indicator of the number of people reached by literacy and numeracy programmes. From 2010 to April 2014, 275,000 individuals aged 16 to 65 were assessed at least once. Of these, 247,000 were assessed for reading and 203,000 for numeracy. It can be assumed that most of these assessments were connected with a programme, or the offer of a programme, which provides the opportunity for these people to improve their literacy and numeracy skills.

The Assessment Tool results are expressed in six steps, which are related to the Adult Literacy and Numeracy Learning Progressions. The underlying scores can be translated to scores in the ALL survey and from there, ALL levels can be assigned (Earle, 2014). So it is then possible to look at the skill levels of those people who have been assessed using the ALL proficiency scale.

Figure 6 shows the distributions of learners who were assessed from 2010 to 2014. The left graph looks at reading and document literacy and the right graph at numeracy. Each graph shows the distribution by steps in the learning progressions and then the translation of this to ALL levels.

Figure 6

Distribution of Assessment Tool steps and ALL levels for learners assessed from 2010 to 2013
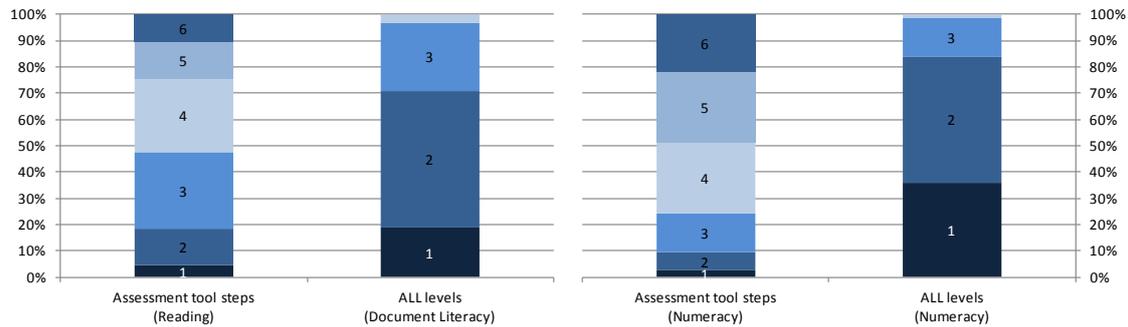
The results show that 19% of learners assessed for reading would have been in level 1 document literacy in the ALL survey and 52% would have been in level 2. For those assessed in numeracy, 36% would have been in level 1 numeracy in the ALL survey and 48% would have been in level 2.

Having translated the learning progression steps to ALL levels, it is then possible to compare the number of learners assessed at each ALL level with the estimated number of people in the same ALL level in the population in 2012. This is shown as population proportions in Figure 7.

Figure 7

Comparison of assessed learners with total population in 2012 by ALL levels
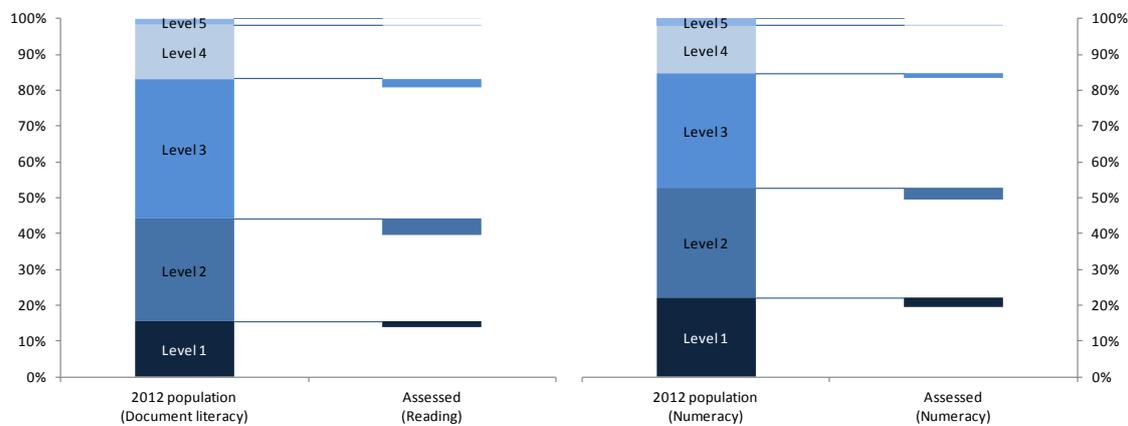
For literacy, the predictive model estimates that around 15% of the population in 2012 would have skills at level 1 based on population changes alone. The Assessment Tool data shows that the number of people assessed by the Tool who were at ALL level 1 before starting any literacy or numeracy programme is around 11% of the estimated total population at this level.

Around 29% of the adult population are estimated to have literacy skills at ALL level 2. The number of people assessed by the Tool who were at ALL level 2 represents about 15% of this group.

In the case of numeracy, it is estimated that around 22% of the adult population have skills at ALL level 1 and 11% of this group were assessed with the Tool. And around 31% of the population had numeracy skills at ALL level 2, of which 11% had been assessed with the Tool in numeracy.

It is not possible to estimate the proportion of people who were assessed with the Tool who may have increased their skills through literacy or numeracy programmes. Only around 40% of all the people assessed had more than one assessment in the same skill. Also, most second assessments are done within the period of the same programme. International evidence suggests that increases in skills occur mostly after the programme is completed, as people put their skills into practice (Reder, 2012). Such increases would only be captured for people who subsequently enrol in further programme with literacy or numeracy support.

This analysis suggests that while there has been significant growth in provision, and a large number of people have had the opportunity to benefit from this, it has still only reached a small proportion of people with lower levels of literacy and numeracy.

Further uses of this approach

This approach to modelling literacy and numeracy scores can be used to add a literacy or numeracy skill variable to other surveys and explore the relationship of skills to variables in those surveys. Some examples using the General Social Survey variables are shown in Figure 8.

Figure 8
Selected social outcomes by estimated document literacy levels

Source: Statistics New Zealand, *General Social Survey 2012* (modelled results)
Notes:
1. For more details on the economic living standards index, see http://www.msd.govt.nz/about-msd-and-our-work/publications-resources/monitoring/living-standards/index.html
2. Question for access to public facilities is "How many of the facilities (such as shops, schools, post shops, libraries, medical services) that you want to go to can you easily get to?"
3. Question for satisfaction with housing is "How do you feel about where you are currently living?"
4. Question for frequency of meeting friends is "In the last four weeks, how often have you seen any friends who don't live with you?"

These results show that there is a moderate relationship between literacy and economic living standards. There is a weak relationship with access to public facilities and housing satisfaction. There appears to be little connection with social connections with friends, with people with higher literacy perhaps having less frequent social connections than those with lower literacy.

This method can also be used to look at smaller population groups that were either not identified in the ALL survey or were too small to analyse. There is potential for this to be done using the census data (via the confidential unit record file). From that, it should be possible to provide estimates of skill level at a local or regional level and also for groups such as iwi.

Once the PIAAC results are available, the methods used in this paper can be used to explore the actual changes since the ALL survey. In particular, they can be used to look at the how much of the change over time is due to population changes and how much represents shifts in skills.

References

Earle, D. (2009). *How well do qualifications predict literacy and numeracy*. Wellington: Ministry of Education.

Earle, D. (2014). *Measures of Adult Literacy and Numeracy: comparing the Adult Literacy and Life Skills Survey and the Literacy and Numeracy for Adults Assessment Tool* (No. 2014/01). Wellington.

Lane, C. (2010). *Adult literacy and numeracy in New Zealand – Key factors An analysis from the Adult Literacy and Life Skills Survey*. Wellington.

Lane, C. (2011). *Factors linked to young adult literacy: comparing the skills of the young with those of their elders*. Wellington: Ministry of Education.

Reder, S. (2012). *The Longitudinal Study of Adult Learning: Challenging Assumptions*. Montreal, QC.

Smyth, R., & Lane, C. (2009). *Skills and education: How well do educational qualifications measure skills?* Wellington: Ministry of Education.

Tertiary Education Commission. (2012). *Adult Literacy and Numeracy Implementation Strategy*. Wellington.

Yamamoto, K. (2013). Small Area Proficiency Estimation: extenstion of the PIAAC population modeling for proficiency estimation without direct asssessment. In *PIAAC International Research Conference: The Importance of Skills and How to Assess Them*. Washington DC: OECD and ETS.

Notes

[i] Problem solving in PIAAC has been redeveloped and is not comparable with problem solving as measured in ALL.

[ii] The ALL survey and the GSS use different approaches to population weighting. One result is that the ALL survey shows similar rates of qualification attainment for 2006 as the GSS does for 2012. To adjust for these differences in methodology, the populations in each survey were standardised by age and qualification level using data from the Household Labour Force Survey for 2006 and 2012 respectively.

[iii] Ordinary least squares regression was used for modelling and predicting the mean scale scores. While this method produced valid mean values it did not provide robust measures of distribution. Therefore multinomial logistic regression was used to predict literacy and numeracy levels. In both cases, the model specification used was:

Lit(or num) = Age + Māori + Pasifika + Asian + education attainment + NZ born + NZ born*Asian + NZ born * Pasifika

Age was categorised in 5 year groups. Māori, Pasifika, Asian and NZ born were binary variables.

[iv] A single model was applied across all age groups from 16 to 65. The model is likely to be less valid for young people aged under 25. For simplicity of presentation it was decided not to run a separate model for this age group.

[v] The ALL survey included two measures of literacy. Document literacy measured the ability to read and understand discontinuous texts (such as charts, maps, tables, job applications, payroll forms and timetables). Prose literacy measured the ability to read continuous texts (such as news stories, editorials, brochures and instruction manuals). The two measures were highly correlated. Document literacy has been used in this paper. In the PIAAC survey, these measures have been combined into a single literacy measure.

[vi] The 2006 results have been generated by applying the model to the ALL data set. The mean values are the same as the original values in the ALL survey. By using modelled values, the confidence intervals are generated in the same way as the 2012 results.

[vii] There are also some differences for people age 16 to 19 and 60 to 65. It is unclear whether these are the result of changes in the population or the relative fit of the model at the extremes. Also the factors used in the model are not as strong in predicting the literacy and numeracy of young people.