Analysis of New Zealand Data from the International Adult Literacy Survey

Demographic Predictors of Low Literacy Proficiency

Final Report

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Executive Summary

The International Adult Literacy Survey (IALS) was undertaken in New Zealand in 1996. This survey's purpose was to survey a representative sample of the population with regard to their demographic characteristics and literacy skills, with the aim of providing an indication of literacy proficiency for any one country participating. The IALS used five levels of literacy proficiency where a score of two or below indicated a low literacy level, and those at 3 or above were assumed to have what was termed 'functional literacy' – the literacy skills necessary to function adequately within today's economic market.

The present report extends the analysis of the NZ IALS data with the primary aim of determining which demographic characteristics could predict low literacy proficiency levels (as indicated by the IALS). The 1996 Census and the 2001 Census were used in combination with the IALS to build a statistical model which in turn derived predictions of the number and proportions of those at Levels 1 and 2 literacy proficiency for 1996, 2001, and 2004. Predictions of proportions of people at these literacy levels by region (territorial land authority areas) were also made for these years.

Proportions and numbers of those of literacy levels 1, 2 and 3 or more separately who were participating in an adult training course were derived from the 1996 IALS, and adjusted for the 1996 Census and the 2001 Census. The main pattern that was noted that participation in adult training increased as literacy proficiency increased. Furthermore, it was noted that those most likely to be participating in adult training, were also most likely to be engaged in full-time work regardless of literacy level. It was also interesting to note that those employed within the higher occupational categories, the professional and business occupations, were also the most likely to participate in adult training. Interestingly therefore, those with the higher literacy levels, in those occupations that encourage literacy practices, are the most likely to indulge in adult training opportunities.

Ethnicity was another interesting demographic characteristic influencing participation in adult training programmes. Those with a level 1 literacy proficiency are similar in their participation rates across ethnicities, whereas those within level 2 show an extremely high participation rate of Pacific Peoples over and above the other ethnic groups. What exactly these courses are by ethnicity is an area still to be researched.

In terms of predictive variables, the strongest predictor found by the model was educational attainment. This predictor variable was the strongest overwhelmingly for all three categories of literacy, prose, document and quantitative. The other predictor variables however, did not show the same split in their predictive power, and while some were seen to be stronger than others, the classification trees method used implies that those variables that are close to each other in position within the tree are not necessarily different in their strength of predictive effect (thus, they may have similar effects on literacy proficiency, but the tree just chose to split one variable before it attempted the second one).

However, an interesting pattern was apparent within the second strongest predictor variable, Ethnicity. Ethnicity was the next strongest predictor for low literacy proficiency levels after educational attainment for all three categories of literacy as measured by the IALS. It is important to note however, that in other studies, a confounding influence on the importance of ethnicity on literacy proficiency is language proficiency. Since the IALS measures literacy in English only for the NZ sample, it is possible that the effect of Ethnicity in predicting subsequent literacy levels is confounded by English not being the first language of certain respondents.

After these two predictor variables, differences became apparent between the three literacy categories in terms of predictors of low literacy levels. Also, the predictor variables themselves were very similar in their position within the tree, suggesting that they did not differ greatly from one another in their predictive value. However, variables of interest within the NZ sample included four labour force factors: labour force participation, occupation type, industry type, and income level.

Labour force participation showed a strong association with literacy proficiency overall, with those in Level 1 more likely to be not working or looking for work, than to be in work. Within Level 2 literacy proficiency, there were similar proportions of the sample within each of the four categories: full-time, part-time, looking for work and no work. Those of levels 3 and above were most likely to be in work, than to be looking for or not in work.

Occupational and industry type was also associated with literacy proficiency overall. It was found that those within an 'unskilled' occupation are more likely to have level 1 literacy proficiency than any other level. Those in level 2 however, while a proportion are situated within unskilled occupations, are a lot more likely to be found within professional, clerical, service and skilled occupations than those in level 1. Within industry, it was found that those with a level 1 literacy proficiency were most likely to be found working within the Manufacturing and Agriculture, Hunting and Fishing industries and least likely in the Business industry (the exact opposite pattern was found for those with a literacy level of 3 or above). Those with level 2 literacy proficiency were found to be similar across most of the industry types; however the most common industries were Agriculture, Manufacturing, Construction and Trade, while the least common were Communications, Business and the Social Industries.

As a matter of interest, the associations of health (as measured by the IALS) and literacy proficiency were explored. It was found that learning disabilities and 'other' disabilities or health impairments that had been prevalent for six months or more, were the strongest indicators of low literacy proficiency levels out of all the health factors measured here. While vision and speech impairments also were found to be associated with later literacy level, hearing impairments had no direct effect on literacy proficiency. However, they did exude an effect on educational attainment, thus the effect on literacy proficiency may be indirect.

This report outlines the IALS and criticisms of its approach before moving on to objectives of the current project. The various methods used in the design of the statistical model are summarised which is followed by a discussion of the results. Here, proportions analyses comparing the 1996 sample with the 1996 population

through the Census data are described and the results from the analyses of the 1996 IALS NZ data presented. Each of the predictor variables determined to be important in predicting later literacy proficiency levels 1 and 2 are then discussed in-depth, with reference to international literature. Predictions of regional proportions are then displayed with the help of GIS software. This report concludes with a discussion of the limitations of the statistical model, future research proposals and a summation of the information presented.

This report was commissioned by the Ministry of Education in association with the Tertiary Education Commission and the Department of Labour in May 2004, who were seeking analysis of New Zealand (NZ) data from the IALS and other sources to provide new information on characteristics of adults with foundation learning needs. The aim of this current project is to help build a picture of the patterns in the current adult population of foundation level skills, specifically those foundation level skills at the lower levels (levels 1 and 2). This analysis is to inform foundation learning provision initiatives, specifically in the areas of improving access to foundation learning and the development of indicators to help with targeting and allocating funding.

Overview of International Adult Literacy Survey

The International Adult Literacy Survey was undertaken in NZ in 1996. This survey was born out of the concern of policy makers worldwide over the increasing demand for higher levels of literacy skills to match global economic growth and the increasing demands of "knowledge-economy" jobs (OECD, 2000). The IALS was developed as a way in which to identify and describe the nature and magnitude of literacy issues faced by countries and the factors that influence these, providing the first ever reliable and comparable estimates of the levels and distributions of literacy skills across the adult population (OECD, 2000).

Specifically with reference to NZ, The Ministry of Education 'Skills and Education' Discussion Paper (2002) argues that while continued growth in job opportunities is expected, this growth will be increasingly hampered by shortages of people with the appropriate skills. Essential skills for the present and future labour market include literacy skills such as reading, writing, and numeracy which provides a foundation on which further learning and training can be achieved (Ministry of Education, 2002). This leads to the argument that a key priority therefore, must be the raising of the skills of those adults with pressing literacy needs.

Within the IALS survey, literacy was defined as "the ability to understand and employ printed information in daily activities, at home, at work and in the community – to achieve one's goals, and to develop one's knowledge and potential" (OECD, 2000, px). Literacy was measured within three domains: prose, document, and quantitative. Prose literacy denotes the "knowledge and skills needed to understand and use information from texts including editorials, news stories, brochures, and instruction manuals" (px). Document literacy relates to "the knowledge and skills required to locate and use information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables and charts" (px) and quantitative literacy refers to "the knowledge and skills required to apply arithmetic operations, either alone or sequentially, to numbers embedded in printed materials, such as balancing a chequebook, figuring out a tip, completing an order form, or determining the amount of interest on a loan from an advertisement" (px).

Literacy ability in each domain was expressed by a score ranging from 0-500 (or as levels 1-5). Membership at a certain level meant that that was the point at which a person had an 80% chance of successful performance from among the set of tasks of

varying difficulty within that literacy domain. These five levels were further defined as below (pxi):

Level 1: "persons with very poor skills, where the individual may, for example, be unable to determine the correct amount of medicine to give a child from information printed on the package".

Level 2: "respondents can deal only with material that is simple, clearly laid out, and in which the tasks involved are not too complex. It denotes a weak level of skill, but more hidden than Level 1. It identifies people who can read, but test poorly. They may have developed coping skills to manage everyday literacy demands, but their low level of proficiency makes it difficult for them to face novel demands, such as learning new job skills".

Level 3: "Considered a suitable minimum for coping with the demands of everyday life and work in a complex, advanced society. It denotes roughly the skill level required for successful secondary school completion and college entry. Like higher levels, it requires the ability to integrate several sources of information and solve more complex problems".

Level 4 & 5: "Respondents who demonstrate command of higher-order information processing skills".

The IALS surveyed a nationally representative sample of adult New Zealanders of working age (16-65 years). (Proportion analyses were carried out in the present study to determine the representativeness of the sample. These results are described in a later section). Further in-depth description of the IALS and its methodology can be found in "Literacy in the Information Age: Final Report of the International Adult Literacy Survey" published by the OECD in 2000.

Criticisms of IALS

While the IALS has highlighted the prevalence of literacy skills of many countries around the world, its methodology and approach have been criticised by some, not least of whom are Hamilton and Barton, authors of a paper entitled "The International Adult Literacy Survey: What does it really measure?" in 2000. Hamilton and Barton's (2000) criticisms are threefold: the IALS provides only a partial picture of literacy; culture is treated as bias; and the test items do not represent the real-life items as claimed. These criticisms are put forward from the approach of the "new literacy studies", an approach based upon the belief that literacy only has meaning within its particular context of social practice and does not transfer unproblematically across contexts. This is in contrast to the IALS approach which assumes consistency of skills across contexts, for example, the skill of reading is the same when reading a book in a library, as opposed to reading a poster in a noisy street. Hamilton and Barton (2000) argue that there are different literacy practices in different domains of social life, such as education, religion, workplaces, public services, families, and the community. It is argued that these differences between situations can help reveal the meanings, values and uses that literacies have for people in their everyday lives and that this

understanding of different contexts must be taken into account when discussing literacy (Hamilton & Barton, 2000).

The issue of culture being seen as a bias is also contested by Hamilton and Barton (2000). It is argued that in the IALS the tasks are seen as culturally-neutral which in Hamilton and Barton's (2000) view does not take into account the complexities of cross-cultural comparisons. Any literacy practice that is not recognised beyond a particular cultural group was not used to generate test items for the IALS as this would constitute cultural bias, however, the new literacy studies perspective sees literacy as constituted by its cultural context (Hamilton & Barton, 2000) Therefore, in searching for cultural neutrality it is argued that the IALS directs attention away from the factors that are essential for understanding literacy and its social situation, making the test items themselves not real life tasks, but proxy measures of literacy. Hamilton and Barton (2000) argue also that the IALS makes generalised claims about causality from descriptive correlations and differences and question its appearance of objectivity by stating that it does not allow other research paradigms to interpret the results in their own ways.

In discussing that literacy as tested in the IALS is not equivalent to real-life items, Hamilton and Barton (2000) argue that the levels 0-5 used in the IALS are arbitrary and are not based on people's actual lived practices. The authors state that people's own judgments of their literacy proficiency are more positive and while the IALS reports this as self-delusion, they would argue that the IALS is measuring something other than everyday literacy practices.

Hamilton and Barton (2000) conclude that the IALS is really measuring "artificially constructed *test literacy*, sampling a transnational culture and tapping people's participation in the global economy. This is *a literacy*, but it is not *literacy*" (p385). It is important to keep Hamilton and Barton's (2000) criticisms in mind when working with or reading the IALS data, and that these limitations do limit the usefulness of the data when working with for example, a specific cultural group. It would be necessary in this author's opinion, if working with a specific cultural group, for further work to be done into what literacy means for them, and also what their real-life literacy practices are in order to allow for engagement and relevance of a proposed literacy intervention for this group to occur. However, the IALS provides useful general correlations and statistics that can help governments to target aspects of their population who are low in literacy (as has been measured here by the IALS and which Hamilton & Barton (2000) do also acknowledge as "*a literacy*" (p385)).

The IALS (OECD, 2000) does state that while the results indicate significant correlations between factors, they do not provide information about the relative importance of the different factors in predicting literacy proficiency. The IALS goes further to state that it is

> "not possible to make strong causal inferences from bivariate relationships among variables because the predictor variables themselves are probably interrelated. For example, people with high occupational status are likely to read more often at work. In such cases the strength of the bivariate relationship between the outcome

and the predictor variable does not necessarily reflect the true influence of the predictor, because it partially reflects the influences of other unobserved variables" (p54).

This is an important comment as Hamilton and Barton (2000) express their concern that results from the IALS can be interpreted as causal in their direction, where in fact, they are associations only (as is the analysis presented in this report). It is important therefore, for readers to keep this in mind when interpreting data from the IALS.

The IALS however did find that in all countries, bar three, the main predictor of literacy proficiency was educational attainment (OECD, 2000). Non-native language status was also a significant predictor in all English-speaking countries including NZ. Age was also fairly important in most countries, however, it was not found to factor largely in NZ. Labour force participation and occupational status were found to be important variables in NZ.

Objectives of Current Project

The objectives of the current analysis were:

1. To identify the variables most strongly associated with low literacy (Levels 1 and 2 separately) from the 1996 IALS.

2. To build a statistical model from the 1996 IALS data using the 1996 Census as a quality assurance tool to determine predictive demographic variables of low literacy levels.

3. To provide predictions of proportions of literacy levels 1 and 2 by territorial land authority regions.

4. To provide numbers and proportions of adults of literacy levels 1 and 2 participating and not participating in adult learning by type of provider, age, sex, ethnicity, labour force status, highest qualification, whether English is the first or second language, whether born in NZ, occupation type, and industry type.

Methods

The total number in the sample for the New Zealand IALS was 5720, with 3311 completing the full survey (58%) and 922 providing only basic demographic data. In the IALS analysis literacy scores were imputed for the 922 partial completions and they were then included in the whole sample. Their data was excluded for this study since they did not represent independent information beyond the 3311 completing the full survey.

The analyses from the 1996 IALS provided weights to scale the survey counts to population estimates (see OECD final report page 118 for a more in-depth discussion). These weights were used here to construct population estimates, but statistical modelling used the individual survey counts so that one observation always represented one independent observation. All analyses used the software 'R' Version 1.9.0 (R Development Core Team, 2004).

Instruments

This analysis made use of four instruments, the 1996 IALS, the 1996 Census, the 2001 Census and the Education and Training Survey supplement to the 1996 Household Labour Force Survey (HLFS).

The 1996 IALS has been described above in the overview.

The 1996 and 2001 Census' provide a source of demographic, social and economic data that relates to the entire population of NZ at a single point in time (Statistics NZ, 2001a).

The Education and Training Survey supplement of the HLFS (Statistics NZ, 2001b) asked people about their participation in the last 12 months in study towards an educational qualification, as well as any in-house or external training they may have undertaken. These results were used to further validate the proportions analyses.

Variable Definition

The variables used in the following analysis were chosen based on two factors: their theoretical importance in that they had been found elsewhere to either relate to or to predict literacy levels, and because measurement of these variables was available in both the 1996 IALS and the 1996 Census data, allowing for independent validation or use to extrapolate or refine the IALS estimates.

The variables used in this first phase of analysis were: Gender, Age, Marital Status, Employment Income (EIncome), Government Income (income from government or state sources such as social assistance or the unemployment benefit, excluding pensions), Language, Ethnicity, Education, Mother's Education (Mum Educ), Father's Education (Dad Educ), Education Type (Educ Type), Present Work Status (Work Now), Past Work Status (Work Last), Full or Part Time Work (Work Time), Hours of Work (Work Hrs), Number of Weeks Worked (Work Wks), Primary Industry (ISICR), Primary Occupation (ISCOR), Training or Education combined with Number of Courses Taken (Adlt Ed No), and Type of Training or Education (Adlt Ed Type). For further explanation of the variables, see Appendix A.

The detailed variables in the survey were combined in some instances to give reasonable counts in cells of cross-tabulations. In some cases, survey questions were combined, usually by incorporating a null response to an introductory question into a

subsequent condition question, for example AdltEdNo incorporates whether a course was attended (Yes, No) with the number of courses attended.

The three literacy measures were combined to form single measures of low literacy. As a single measure of low literacy, LoLit was defined as 1 if the sum of PROSE, DOC and QUANT was less than or equal to 6. If otherwise it was defined as 0. LoLit measures whether the average literacy measure is less than or equal to 2. Another, AvgLit, was defined as 'Lvl 1' if the sum of PROSE, DOC, and QUANT was less than 4, 'Lvl 2' if the sum was less than 7, and '>2' if it was higher.

Strength of Association Analysis

Given the sample size, differences between proportions of 3% or more are determined to be statistically significant; however, it is the authors' opinion that, in a survey of this nature, a difference of 10% or more is required for practical significance. Therefore this report focuses on the absolute size of an effect and comments on statistical significance have largely been avoided, except in the instances of differences between small sub groups, for example in multiway tables.

Table 1, Table 2, and Table 3 (see Appendix B) show the percentage of people who scored a 1 or 2 on the IALS literacy assessment by each variable for each of the three categories of literacy. A large difference between these percentages, shown by a large standard deviation, indicates that there is a strong association of that variable with literacy levels 1 and 2. The variables are in order of increasing standard deviation, so, in general, the later variables have the highest association with the literacy levels in question, although it must be noted that small numbers in a category can also increase the standard deviation.

The chi square statistic tests the hypothesis that the proportions are equal. In general, the sample size is so large that even unimportant differences are not consistent with random variation.

The standard deviations are generally higher for the prose literacy category, showing that prose literacy is more highly associated with the variables than the other two categories, document and quantitative. Over all three categories however, the variables that consistently show a stronger association with lower literacy levels are Education Type (Academic or Other) and Education (Lower Secondary, Upper Secondary, Non University or University Education).

Loglinear models

The strength of association analysis explored the association between literacy and all individual variables. In some cases the association between pairs of variables and literacy were a priori of interest. Log linear models were used to analyse the interactions between these variables, and because counts in the resulting three way tables were sometimes quite small, statistical significance was used in their assessment.

Classification Trees

Variables might be expected to be correlated amongst themselves, something which a one variable at a time analysis will not show. Classification trees or recursive partitioning was used to explore more general multidimensional relationships. In this every variable is checked for association with literacy, and the one most strongly related is used to partition the sample into two groups. The literacy of these two groups will differ as much as it is possible to achieve with a partition on one variable. The process is repeated with each new group separately, giving a sequence of partitions which stops either when a group is too small for further splits to be meaningful, or when a group is the same level of literacy.

The resulting tree is far too large because after a point the splits reflect peculiarities of the sample that would not be properties of the population. Cross-validation finds this point by splitting the sample randomly into tenths. Each tenth is omitted in turn and the nine-tenths remaining are used to construct a tree. The tree is then used to classify the omitted one-tenth, and this process is repeated for each tenth. The tree can then be pruned to the point where cross validation shows the additional splits are not decreasing the error rate and the trees provide an illustration of the variables important in predicting literacy (Breiman, Friedman, Olshen, & Stone, 1984).

Statistical predictions

Any set of demographic properties will belong to a final group of the tree, and the cross validation process will estimate the probability of a member of that group being of low literacy. Census data provided counts of individuals in each of the demographic groups defined by the tree for each Territorial Local Authority (TLA). Combining these counts with the proportion estimates from the tree provided estimates of the proportions of low literacy in each TLA from the 1996 and 2001 census. These estimates assume that the associations between demographic variables and literacy found in the survey do not change over time and hold true at the small scale of the TLA. Estimates for 2004 were found by linear extrapolation from 1996 through 2001.

Attempting the same process with the proportions involved in adult education courses showed that none of the available variables led to a tree that made useful predictions. In this case there can be no basis for making any prediction beyond saying that every TLA has the same literacy level as the general population, or that the future proportions are the same as the current ones. These proportions have been applied to changed sizes of the demographic groups as indicated by the 1996 and 2001 censuses to obtain estimates of the total numbers in those groups.

Results and Discussion

Proportions Analysis – Quality Control

> The 1996 IALS and the 1996 Census were compared across demographic variables to determine if proportions of the sample used in the IALS sample were similar to the proportions of the NZ population. The raw data from each survey were used in the comparisons and it was generally found that the IALS was similar proportionally to the 1996 Census.

Proportion tables can be found in Appendix C. General similarity was also found between proportions when using the weighted versions of the IALS data in comparisons.

There were a few differences worth noting however. The education category showed a few large differences between weighted proportions used in the IALS and proportions from the 1996 and the 2001 Census. The level of lower secondary returns a weighted proportion of the sample of 48.57% for the IALS, however, the 1996 Census and the 2001 Census return proportions of 43.26% and 37.22% respectively. This suggests that the IALS survey over-sampled this area of the population a little, but the 2001 census drop is presumably a consequence of the increase in the school leaving age at about the time of the survey. This could have implications for the future shaping of this predictive model in that there is no way of knowing how the additional year at school might have improved the literacy of students affected.

In the ethnicity category, the weighted IALS data returned a proportion of 77.3% for European, 12.0% for Maori, 4.3% for Pacific Peoples, 5.2% for Asian Peoples and 1.1% for Other. The 1996 Census data returned 79.6% in the European category, followed by 14.5% Maori, 5.6% Pacific Peoples, and 4.8% Asian Peoples. As can be seen here, these proportions were similar across the two surveys.

The employment category was similar in that while there were differences between the weighted IALS proportion of 20.95% for Not in Labour Force/Not Available and the Census proportion of 36.57%, this may be due to the amalgamation of categories used here, rather than any differences in sampling. This difference could also be due to the different instruments used. Both the 1996 Census and the HLFS use sets of several questions to derive labour force status, as opposed to the one question used in the IALS.

In the category marital status, the weighted level "Widowed" differed from the proportion found in the 1996 Census by 4.42% (1.5% for IALS, 5.92% for the Census). However those aged over 65 were omitted from the IALS survey. Also, the value of Marital Status on predicting literacy levels 1 and 2 was low, so it is unlikely that including more respondents that fit the Widowed category would influence the data much.

The Education and Training Survey (ETS) for the September quarter of 1996 was also used for proportional comparison purposes at this first stage of analysis. Comparison of the proportions of those of working age who have engaged in some form of training in the last 12 months for the ETS compared with the IALS data on this variable returned similar results (40% and 41.23% respectively).

1996 Survey – Extended Analysis

An in-depth analysis of the 1996 IALS NZ data took place to investigate two aims:

1. The number and proportion of adults of literacy levels 1 and 2 (separately) who are participating in adult learning by age, sex, ethnicity, labour force status, highest qualification, whether English is the first or second language, whether born in NZ, occupation type and industry type.
2. The number and proportion of adults of literacy levels 1 and 2 (separately) who are not participating in adult learning by age, sex, ethnicity, labour force status, highest qualification, whether English is the first or second language, whether born in NZ, occupation type and industry type.

An attempt was also made extrapolate these proportions to 2001 and to provide estimates for territorial land authorities. Unfortunately there were no demographic variables showing a sufficiently strong association with literacy to provide estimates much better than simply assuming the proportions remained constant. Predictions of numbers in each category using 1996 and 2001 census demographic data are shown Appendix D and E.

As the three measures of literacy are highly correlated (see Table 1 and Table 2 which show a high level of agreement between the three measures (33.5% + 46.8% = 80.3% agreement), it is possible to combine these three measures into one measure of literacy ability.

Table 1. Commonality of agreement (%) between the three categories of literacy when prose level is <=2 as measured by the 1996 IALS.

	Quantitative	
Document	**<=2**	**>=3**
<=2	33.5	2.3
>=3	1.1	3.0

Table 2. Commonality of agreement (%) between the three categories of literacy when prose level is >=3 as measured by the 1996 IALS.

	Quantitative	
Document	**<=2**	**>=3**
<=2	7.2	2.9
>=3	3.2	46.8

Thus, the analysis of number and proportion of adults participating or not participating in adult learning by the different variables were simplified into average levels of literacy ability using the variables defined in the Methods section. If there have been notable differences between the three dimensions within any one variable this is noted in the discussion below Table 4. Table 3 provides a description of the proportions of those attending a course for demographic variables by literacy level (levels 1, 2 or 3+) The numbers associated with these proportions applied to the 1996 IALS and the 1996 and 2001 Census counts together with sources of data can be found in Appendix D. Table 4 provides a description of the proportions of those not attending a course for demographic variables by literacy level (levels 1, 2 or 3+) The numbers associated with these proportions and sources of data can be found in Appendix E.

There are some interesting patterns that can be seen for those who are more likely to participate in a form of adult training.

> The main pattern that can be noted is that participation in adult training increases as literacy proficiency increases. This pattern does not change regardless of the demographic variable under consideration.

The analysis of the 1996 IALS (OECD, 2000) found the same pattern where participation in adult education gradually increased as literacy proficiency increased (with those at the lowest levels participating least in adult training). A type of vicious circle was also noted in the IALS, where in NZ generally, it appears that the likelihood of receiving employer financial support for training is positively related to use of workplace literacy skills. Therefore, the more workplace literacy skills are used the more likely that the employee is to receive support from their employer for education and training. However, if the person has low literacy proficiency to begin with, they would likely not do well within a job that required high levels of workplace literacy; therefore, they would not generally attain this type of job and would thereby be excluded from receiving the employer-provided training that they may be the most in need of receiving. This training could lead to an increasing gap between those in the higher levels of literacy proficiency improving through training, while those at the lower levels do not gain access to that training. However, as the OECD (2000) point out, inequality in access to adult education is likely not the only reason for inequality in literacy proficiency (perhaps not even the most important). In the instance of one country at least, while there is inequality in the Czech Republic, this country has relatively low adult training participation rates when compared to other countries.

When looking at the age variable, it can be seen that across the three literacy proficiency levels, belonging to the younger age group (between 16-25) means a respondent is more likely to participate in an adult training course. By way of contrast, those in the 56-65 age group were consistently found to have the lowest level of participation in adult training. The middle age groups 26-55 were generally similar in their participation rates within a literacy level, as well as showing a consistent increase across the literacy levels as mentioned above. This increase however, did not allow their participation rates to ever go beyond the middle range for their particular

level of literacy proficiency. While age has been found to be a major determinant of literacy proficiency in most countries, (being negatively correlated with literacy skills), for NZ this variable was not found to be a significant predictor of literacy proficiency within this analysis or the IALS analysis (OECD, 2000).

The gender variable outlined that males with a literacy proficiency level of 1 were more likely to be participating in an adult training course than females of that same level. However, this distinction was reversed when looking at the data for level 2, where women are more likely than men to be taking an adult training course. Those who attained a literacy proficiency level of 3 or above however, were similar in participation across gender. This is an interesting finding and further analyses would be necessary to determine the influences that are interacting with gender to produce these differences across literacy proficiency level when combined with participation rates in adult training.

Participation in adult training by ethnicity shows some interesting differences and similarities.

> Those who fall with level 1 show similar participation rates across ethnicities, whereas those within level 2 show one particularly striking difference. This difference is the extremely high participation rate in adult training of Pacific Peoples over and above other ethnic groups within this level.

Differences among ethnic groups in those of level 3 and above are still evident, with Pacific Peoples still being the highest participator in adult training, but the other ethnic groups are catching up, particularly those who identify as Maori or Asian Peoples. Overall, although sometimes the differences were slight, it appears that those who identify as European are the ethnic group less likely to be involved in some form of adult training.

Interestingly, a pattern emerged across all the literacy levels with regard to the interaction of labour force participation and participation in adult training.

> It appears that any one person of those participating in adult training is most likely to be in full-time work regardless of literacy proficiency level.

However, overall, the majority of those of a literacy proficiency of three or above, are more likely to be participants than non-participants in adult training regardless of labour force participation status. Those within this literacy level, have participation rates of over 50% for those who are in full-time work, part-time work or no work.

> The lowest rates of participation are seen in those looking for work (with the exception of those with a literacy level of 1).

These patterns of participation for those in work or no work could be a consequence of employer-led or employer-offered training programmes, or indeed, for the "no work" category, the consequence of high numbers of students within that grouping.

> The participation rates by occupation type and literacy proficiency level show that there is greater participation in adult training programmes of those with higher literacy levels and those within the higher skilled occupations.

The types of occupation outlined here were derived from categories in the 1996 Census and the IALS and were grouped together based on similarities in literacy proficiency among similar occupational types. The Professional grouping includes Legislators, Senior Officials, Managers, Professionals, Technicians and Associate Professionals. The Clerical group is made up of Clerks. The Service group includes those who work as Service Workers, Shop & Market Sales Workers and Craft and Related Trades Workers. The Skilled group includes Skilled Agricultural and Fishery Workers as well as Plant and Machine Operators and Assemblers. Finally, the Unskilled occupational category is composed of those in Elementary Occupations. The pattern seen in Table 3 suggests that those in employment within the higher-skilled occupations (Professional, Clerical, and thirdly Service) and with the higher levels of literacy proficiency are the most likely to be participating in some form of adult training.

Table 3. Average proportion of adults of literacy levels 1, 2, and 3+ from the 1996 IALS who are participating in adult learning by age, sex, ethnicity, labour force status, highest qualification, whether English is the first or second language and whether born in NZ.

	Proportion of Adults Participating in Training		
	Level 1	**Level 2**	**Level 3 and above**
Age			
16-25	66	66	82
26-35	31	44	63
36-45	25	43	61
46-55	30	33	55
56-65	11	18	48
Gender			
Male	39	40	65
Female	29	46	63
Ethnicity			
European	32	41	63
Maori	37	45	71
Pacific	33	78	79
Asian	29	49	73
Other	38	25	65
Work			
Fulltime	38	48	67
Parttime	28	45	63
Looking	38	28	44
None	27	34	56
Education			
Lwr2ndry	30	38	53
Upr2ndry	49	52	66
Non Uni	38	47	69

Uni	41	63	75
Language			
English	34	40	62
Maori	27	58	70
Other	32	55	76
Born in NZ			
Yes	35	42	65
No	28	47	60
Occupation			
Professional	49	58	75
Clerical	59	49	65
Service	42	49	64
Skilled	30	33	52
Unskilled	30	53	64
Industry			
Agriculture	34	32	48
Manufacturing	29	43	56
Construction	38	35	50
Trade	53	53	71
Communication	21	38	66
Business	61	44	72
Social	38	58	74

N.B. All interactions were significant at $p < .05$ except for gender where $p = .058$.

Table 4. Average proportion of adults of literacy levels 1, 2, and 3+ from the 1996 IALS who are not participating in adult learning by age, sex, ethnicity, labour force status, highest qualification, whether English is the first or second language and whether born in NZ.

	Proportion of Adults Not Participating in Training		
	Level 1	Level 2	Level 3 and above
Age			
16-25	34	34	18
26-35	69	56	37
36-45	75	57	39
46-55	70	67	45
56-65	89	82	52
Gender			
Male	61	60	35
Female	71	54	37
Ethnicity			
European	68	59	37
Maori	63	55	29
Pacific	67	22	21
Asian	71	51	27
Other	62	75	35
Work			
Fulltime	62	52	33
Parttime	72	55	37
Looking	62	72	56
None	73	66	44
Education			
Lwr2ndry	70	62	47
Upr2ndry	51	48	34
Non Uni	62	53	31

Uni	59	37	25
Language			
English	66	60	38
Maori	73	42	30
Other	68	45	24
Born in NZ			
Yes	65	58	35
No	72	53	40
Occupation			
Professional	51	42	25
Clerical	41	51	35
Service	58	51	36
Skilled	70	67	48
Unskilled	70	47	36
Industry			
Agriculture	66	68	52
Manufacturing	71	57	44
Construction	62	65	50
Trade	47	47	29
Communication	79	62	34
Business	39	56	28
Social	62	42	26

N.B. All interactions were significant at p <.05 except for gender where p = .058.

Associations between industry, literacy proficiency and participation rates generally found the same pattern. The categories of industry were combined as below: Agriculture etc refers to the Agriculture, Hunting, Forestry and Fishing category; Mining, Quarrying, and Manufacturing make up the 'Manufacturing' category; Electricity, Gas, Water and Construction are combined to form the 'Construction' category; Wholesale and Retail Trade make up the 'Trade' category; Transport, Storage and Communications make up the 'Communications' category; Financing, Insurance, Real Estate and Business are combined to form the 'Business' category; and Community, Social and Personal Services make up the 'Social' category. Across all the literacy levels, those industries with the highest rates of participation in adult training were Business, Trade, and Social industries in varying orders. Construction was also the third most important industry for participation rates for those of level 1.

> Within education, it appears that a person is more likely to be participating in an adult training course if they have achieved an upper secondary education or higher.

With those in level 1 participants were more likely to be involved or to have been recently involved in a training course if they had an upper secondary education, followed by a university education, a non-university education and finally, a lower secondary education. This pattern of higher education being more likely to be found in participants of a course was also seen in those with literacy proficiency levels of 2 and 3+ where a university education was the highest predictor, followed by upper secondary and non-university education for both (although in different rank orders respectively) and finally, lower secondary education.

Interestingly, if English was not the primary language of the respondent, they were more likely to be a participant in adult training assuming their literacy proficiency level was either at 2 or above. At level 1 however, the language primarily spoken by the respondent does not appear to be a discriminating factor as to training course participation.

When reviewing participation rates of those born in NZ, it is more likely across all the literacy levels for a person to participate in adult training if they were born in NZ. This is most pronounced for those in literacy level 1; however, the same pattern is seen for the other levels, although the numbers are more similar.

In its discussion of participation rates in adult education and training, the IALS analysis (OECD, 2000) generally states that while associations between literacy proficiency and adult education and training may be statistically significant, practically they are quite small when compared with the strength of the relationships between other factors, such as literacy proficiency and educational attainment.

Furthermore, in the IALS analysis of NZ, NZ was ranked as the top country with regard to the estimated amount of hours of job-related education and training that was available per adult (thought to provide a measure of the overall formal adult education effort). However, the OECD (2000) go on to state that data within all countries show there are large groups that are outside this "emerging learning society", who are often

the ones most in need of the skills. The low participation rate of the Level 1 literacy group shown here reinforces this conclusion. One recommendation made by the OECD (2000) is for research into these groups' readiness to engage with adult learning.

Further analysis of the characteristics of those who were taking adult training courses also took place, with a particular focus on those of low literacy.

> The present analysis investigated whether there were specific demographic predictors that could describe those people of literacy levels 1 and 2 who had enrolled in a course since the August before the 1996 IALS survey (for the NZ data only). Classification trees were developed to investigate possible predictors (see Figure 1 and Figure 2). It was found that overall the demographic variables were only weakly related to whether people took courses.

It was also found that using these trees only gave a 15% improvement over the statement that no-one took a course, although there are groups of factors where the association is strong enough to be of interest. It is recommended however, that these trees should be interpreted with appropriate caution.

In Figures 1 and 2 below, if the stated condition is true the decision moves left, otherwise right. Yes' at an end point indicates that the majority of that group did attend a course. The numbers at the end point show the number attending (right) and not attending (left) in that group. A ratio of 889/564 (=1/0.63) for the combined levels or 368/172 (=1/0.47) for level 1 indicates no discrimination. Because there are some quite large groups where the proportions are not very different from this discrimination overall is not particularly good.

The first branch to the right of both trees is an expected result as it picks out those whose status is 'Student', or 'WorkNow'='d', thus all of these people will be attending adult training of some type. There are 81 people in this category, 78 of whom are attending a course.

For the combined group of Levels 1 and 2 (Figure 1) the next most important predictor for those with low course attendance after whether they were in work now, was one of the three lower skilled occupational categories.

For level 1 alone (Figure 2), the 'Work Hours' group that did not attend any adult training includes the large number of people who did not work any hours at all (most probably therefore, this is the retired and the homemaker group). The small 'Yes' group that can be seen after the occupational (ISCOR) predictor is those that are professional or clerical workers who are either working very few hours or 30-40 hours per week.
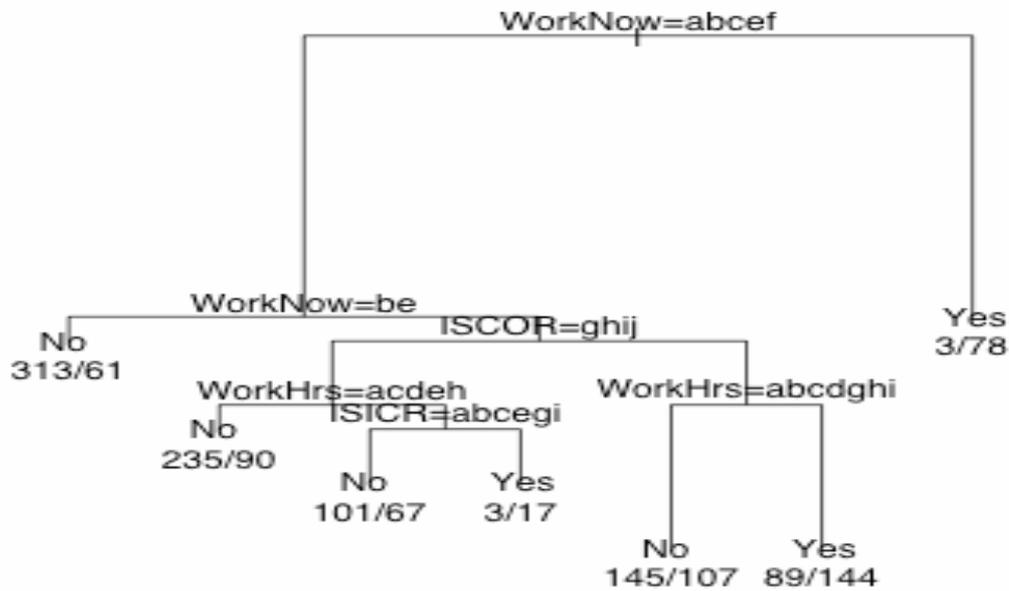
Figure 1. Demographic predictor variables for those adults taking a training course of literacy proficiency levels 1 and 2 combined.
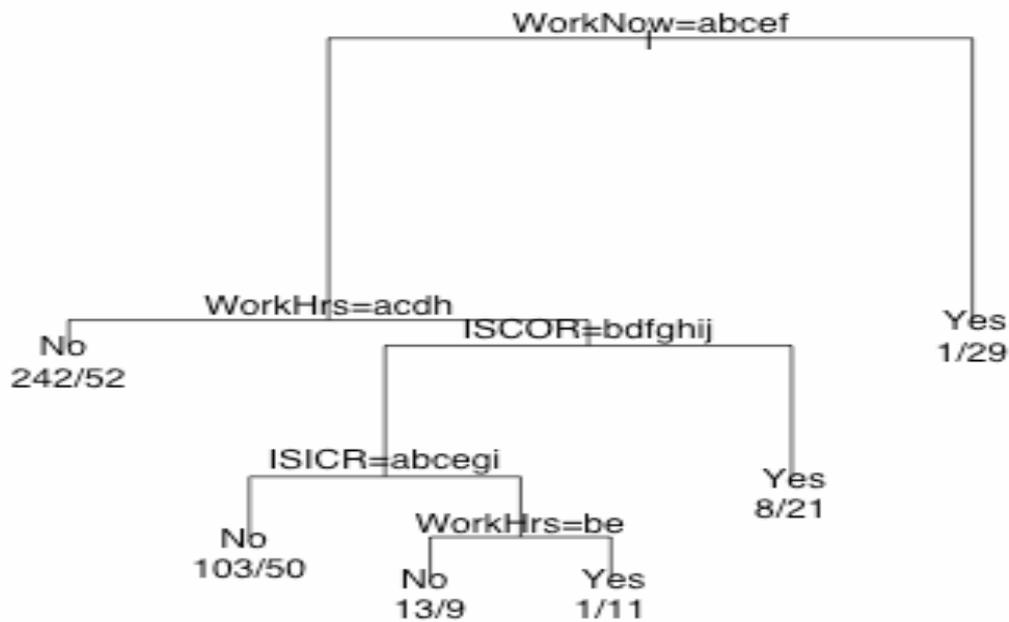
Figure 2. Demographic predictor variables for those adults taking a training course of literacy proficiency level 1.

Analysis of the 1996 IALS also took place with regard to the type of provider and the type of course. Table 5 shows the total average number of individuals in the NZ population by literacy level who were taking courses from a particular provider. The

same person may be counted twice if they took a course with two different providers, and on rare occasions, the same course may be counted in two categories. Table 6 shows the distribution of course types across the different literacy levels. Since individuals could take courses of different types the percentages add to a little over 100 in certain cases.

Table 5. Average overall proportion (%) of the 1996 population engaged in adult learning by type of provider and literacy proficiency level.

	Level 1	Level 2	Level 3, 4 &5
University	31	33	44
Commercial	34	40	39
Equipment Supplier	7	10	9
Non-Profit Org	22	12	16
Parent Company	19	27	22
Other	19	13	12

> For those of level 1 literacy proficiency, the major providers of adult training were commercial providers, followed closely by universities. Those of level 2 followed the same pattern, whereas those with level 3 literacy proficiency and above were more likely to turn to a university provider for adult training, followed by a commercial provider.

For those of level 1 literacy proficiency, non-profit organisations were their third most popular choice, but for levels 2 and above, a parent company was their third most popular choice. Least popular for all levels was the equipment supplier provider.

Table 6. Average overall proportion (%) of the 1996 population engaged in adult learning by of type of course and literacy proficiency level.

	Level 1	Level 2	Level 3, 4 & 5
Uni degree, diploma, certificate	6	10	19
College diploma, certificate	14	11	7
Trade, vocational diploma, certificate	11	6	7
Apprenticeship certificate	4	3	0
School diploma	10	6	5
Professional or career upgrading	35	55	55
Other	30	22	24

> The main type of course engaged in across all the literacy proficiency levels were those that provided professional or career upgrading.

With the exception of the 'other' category, the next most popular category (and only slightly) for levels 1 and 2 was the college diploma or certificate courses, while for those with higher literacy levels, the university degree/diploma/certificate courses were more engaged in. Interestingly, the lowest rates of participation across all three literacy levels were shown in those courses that provided apprenticeship certificates in 1996.

Statistical Modelling

Classification Trees

The Classification Tree predicting literacy levels for Prose Literacy is shown in Figure 3 below. Classification Trees for the Document and Quantitative categories were also obtained for literacy levels 1 and 2 and these can be found in Figures 4 and 5 respectively. The cross-validated error rate (xerror) for the Prose tree is 30% (see Appendix F for error tables). This indicates that with any individual drawn randomly from the population the likelihood of that person being classified wrongly would be 30%.

> All the classification trees emphasise the importance of education as the primary predictor of literacy levels 1 and 2 and there are common patterns in the splitting of the variables between the different literacy categories. For example, if an individual had an upper secondary education or higher for prose, document, or the quantitative category, an important indicator of higher literacy level was then ethnicity (white English speakers). The common pattern then ceases. For prose many variables, particularly those related to further education, appear equivalent. For document and quantitative, Eincome (top quintile), and work hours (more than 10) are variables contributing to prediction of higher literacy levels.

However, it is important to note that while ethnicity or other variables may be the first ones to split, since the variables at the bottom of the trees are so close together, another variable might perform almost as well in predicting literacy levels.

> For those with at most lower secondary education, the document and quantitative category trees state that present employment status (looking for work or no job for over 6 months, that is neither retired nor a student) is an important predictor of low literacy, alongside type of occupation and type of education (not academic). The prose literacy category also upholds the importance of type of education, and introduces ethnicity and Eincome (two lower quintiles)
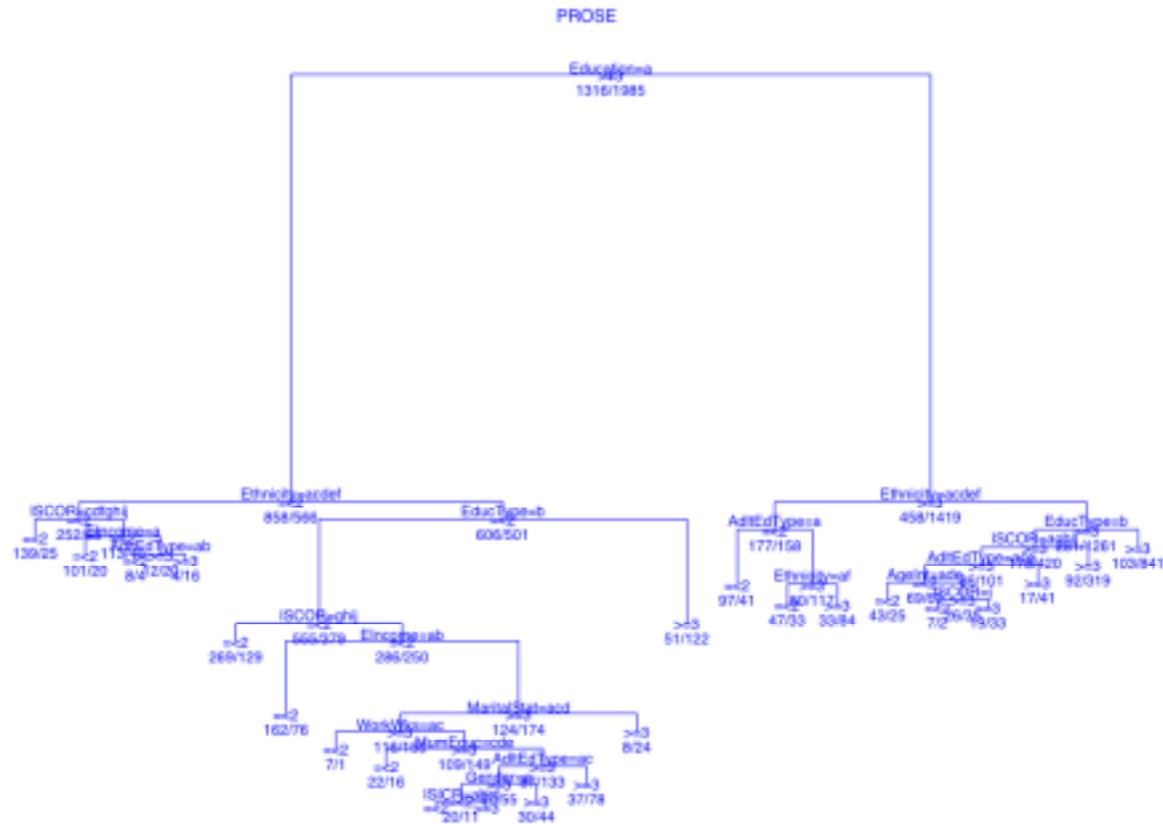
PROSE

Figure 3. Classification Tree for the prediction of literacy levels 1 and 2 in the Prose category of the 1996 IALS for New Zealand.
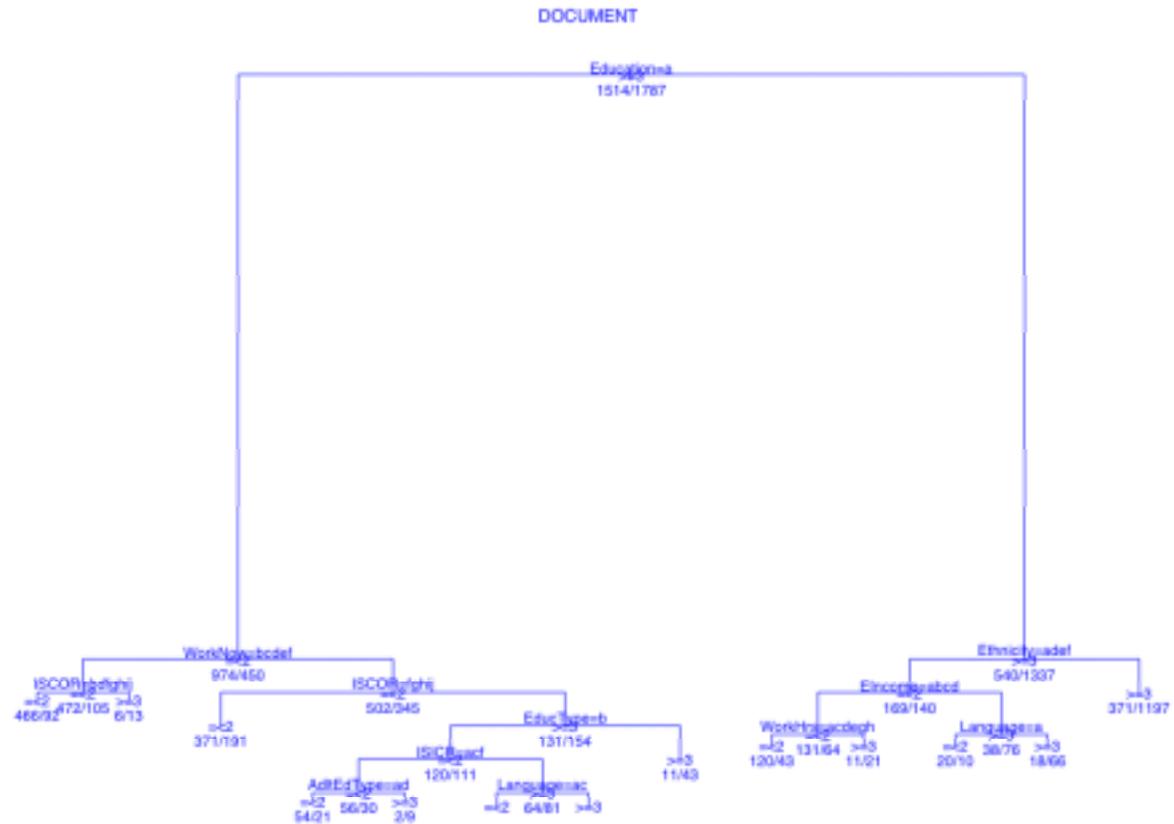
Figure 4. Classification Tree for the prediction of literacy levels 1 and 2 in the Document category of the 1996 IALS for New Zealand.

The cross-validated error (xerror) for this tree is 29% (see Appendix C for error tables).
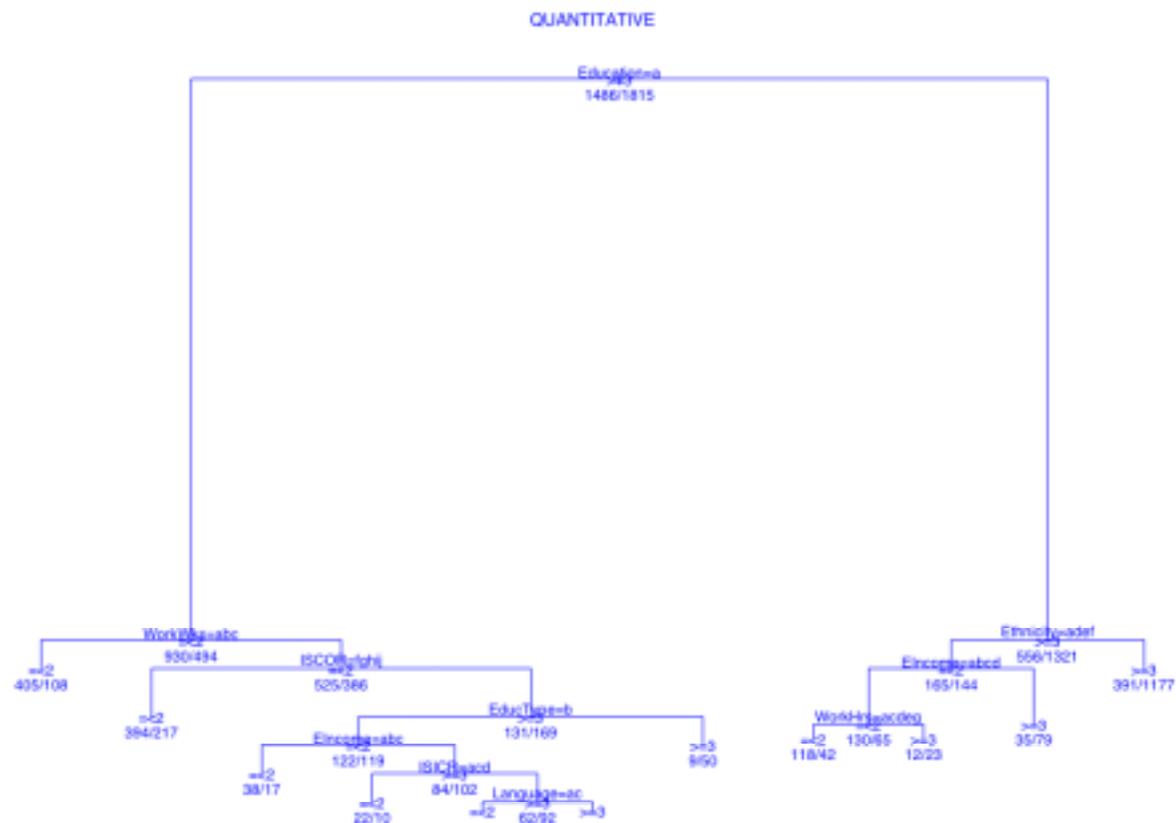
QUANTITATIVE

Figure 5. Classification Tree for the prediction of literacy levels 1 and 2 in the Quantitative category of the 1996 IALS for New Zealand.

The cross-validated error (xerror) for this tree is 29% (see Appendix C for error tables).

Predictor Variables by Strength of Effect Size

Education

When looking at the 1996 IALS data for NZ, there is a pattern in the literacy proficiency of the respondents when listed by educational level for each of the three dimensions of literacy, as well as for the overall average (see Table 7).

Table 7. Average overall proportion (%) of the 1996 population in Level 1, 2, or 3 and above by educational attainment.

	Level 1	Level 2	Level 3, 4 & 5
Lower Secondary	31	37	33
Upper Secondary	9	27	63
Non-University	9	19	73
University	7	15	79

> Overall the majority of respondents who were assessed as having level 1 or 2 literacy proficiency were also within the lower secondary schooling attainment or below level (see Table 7).

This is most pronounced for those in Level 1. In Level 2, while the difference between those with up to lower secondary education and those with an upper secondary education is significantly different, it is not as pronounced a split as that evidenced for Level 1 respondents.

> Those respondents assessed as having a literacy proficiency level of 3 or above show an opposite pattern, with the majority of the population having a tertiary education, and the proportions decreasing per decreasing level of education.

The tables for these figures by each individual dimension of prose, document and quantitative follow the same pattern.

> The main predictor variable for all three dimensions of literacy is the highest level of schooling completed.

This finding is replicated in many studies including the IALS itself where it was concluded that formal educational attainment is the main (and for 17 out of 20 countries the strongest) determinant of literacy proficiency (OECD, 2000). Furthermore, it was noted that on average, literacy scores on the IALS could be increased by about 10 points for every additional year that a respondent had attended school.

Interestingly, in all countries assessed within the IALS framework, adults with more education have as a group, higher average literacy scores, but the benefit of a completed tertiary education as opposed to a secondary education differs dramatically across countries (OECD, 2000). In all countries however, young adults aged 20-25 who have completed secondary school score higher in literacy proficiency on average than those who have not completed secondary school, and in turn, in many countries, those who have completed tertiary education score still higher (OECD, 2000). Data from the IALS (OECD, 2000) also suggests that overall, in NZ, those with tertiary education and those with upper secondary education are similar in their literacy scores, with literacy proficiency scores of those with a tertiary education being slightly higher on average than those with an upper secondary education.

> While education is the strongest predictor of literacy proficiency found in the present analysis, the finding that those with lower secondary education or below can have literacy proficiency levels of 3 or above, indicates that other factors must also contribute to the prediction of levels 1 and 2 literacy scores.

Further evidence for this comes from the finding that countries still differ in literacy at any level of educational attainment. OECD (2000) suggests that home background and educational level of parents can influence the relationship of educational attainment and literacy proficiency. The measurement of the strength of the relationship between parents educational attainment and the respondent's level of literacy skills, suggested that overall within NZ, a young person or an adult could expect to score higher in literacy proficiency if their parents had had 12 years of schooling than someone whose parents had had 8 years of schooling (OECD, 2000). Other studies cite the importance of pre-school education, family environmental factors, and cognitive and developmental level as important influences on later educational attainment and literacy proficiency (Parsons & Bynner, 1998; Baydar, Brooks-Gunn, & Furstenburg, 1993; Siegel, 1990). Literacy acquisition also is not thought to only occur during the years a person spends in formal education, but is maintained and strengthened through regular use in the years beyond school (OECD, 2000). The IALS report concludes that while schooling provides the essential foundation for literacy attainment, it is only through informal learning and the active use of literacy skills in everyday activities (both at home and work) that literacy skills can be maintained and improved (OECD, 2000).

Parsons and Bynner (1998) note that if children lack the necessary experiences that are required to succeed in school, it can become a vicious circle of missing out on basic skills needed to move through education and on to work, which in turn reduces their change of catching up on the basic skills training that they likely have missed. OECD (2000) substantiate this claim by stating that literacy skills acquired by children at home or at school influence opportunities that arise to either pursue education or to move into the labour force, influencing from there what types of jobs they may acquire. OECD (2000) further state that those participating in adult education and training vary in their mean literacy levels, with much of this variation

able to be attributed to the "literate culture" within which a particular person grew up (and the subsequent effect of this culture on educational attainment).

Baydar, Brooks-Gunn and Furstenburg (1993), in their longitudinal study of African-American children, found that preschool cognitive and behavioural functioning were highly predictive of document literacy in young adulthood even when the effects of family environmental characteristics such as living arrangements, quality of home environment, maternal education, and income were controlled for. Further family environmental factors identified as being predictive of later literacy proficiency were family size in early childhood and maternal marital status. Also, in an earlier analysis, Baydar, Brooks-Gunn, and Furstenberg (1993) found that developmental level of the child and educational career of the child were also predictors of document literacy in young adulthood.

The above findings strongly indicate that some factors in early childhood can predict later literacy levels measured in young adulthood, supporting the hypothesis put forward by Baydar, Brooks-Gunn and Furstenberg (1993) about the importance of this developmental period in prediction of later literacy proficiency. This hypothesis is further supported by Siegel (1990) in terms of reading achievement. Weinstein and Walberg (1993) also state that early experiences and current activities powerfully influence young-adult literacy proficiency. They go on to state that environmental advantages early in life can lead to subsequent higher level adult literacy skills. Interestingly, Baydar, Brooks-Gunn and Furstenberg (1993) further found that per-person family income was not associated with young adulthood literacy when the effect of early childhood developmental level was controlled for. They suggest that income may therefore exert its effect on adult literacy through its effect on early childhood cognitive and behavioural development, which again points to the importance of targeting the early childhood developmental level in proactive literacy interventions.

Experiences within education itself have also been found to predict later literacy proficiency. Siegel (1990) in her study on educational experiences from preschool through to high school for a White/Non-Hispanic sample found that the level of students' involvement in nine identified variables was important to their later level of adult literacy. A regression analysis of these nine variables showed that early childhood experiences were an important predictor for adult reading proficiency, as outlined above. The nine predictors identified were educational experiences provided at the pre-school level, educational experiences at the elementary school level combined with home rules (bed times, household chores, homework etc), and educational experiences provided combined with home rules and parental expectations of education (expect their child to do well in school or continue on with further education) were important at the secondary school level. General activities with an academic focus (for example, writing stories, reading, science projects etc) were stated to be important also at all the three levels as is school attendance.

Siegel (1990) states that the more activities taken part in by a person that have an academic focus as opposed to those with a non-academic focus (for example, watching TV or talking on the telephone), can be expected to result in a higher reading achievement at the end of their final year of secondary school. Being held

back a year or placed in remedial classes is predicted to negatively affect later literacy proficiency. Finally, being placed in an advanced stream after pre-school is predicted to positively influence later literacy proficiency.

Similar to Siegel's (1990) finding that non-academic activities may not be helpful in attaining high levels of reading ability, in the final report for the IALS analysis (OECD, 2000), it was shown that literacy scores are positively related to people's daily reading practices, and negatively related to the amount of television they watch (OECD, 1997, cited in OECD, 2000). OECD (2000) went on to suggest that if literacy skills are not used they will deteriorate over time. The IALS final report (OECD, 2000) also states that community activities are therefore important, as they provide a site within which informal learning can take place, i.e., these activities stimulate use of literacy skills, stimulate the development of new skills, and therefore prevent others from being lost due to low use. However, if we are to accept Siegel's (1990) findings, people would benefit most in terms of literacy proficiency (particularly reading proficiency) if those activities were academic-based.

As with Siegel's (1990) finding that parental educational expectations positively influence their child's reading ability (assuming those expectations are for the child to value continuance of education), the IALS (OECD, 2000) also found that teachers who have high expectations of their students' ability to master the curriculum can lead to the results of more effective instruction, reading practices, and use of literacy resources.

> In summary, educational attainment is the strongest predictor of adult literacy proficiency. However, formal educational attainment could be mediated by the effects of early childhood experiences, family situation, cognitive and behavioural developmental level, and experiences of teaching and type of extracurricular activity. There is a great deal of research that situates the beginnings of literacy proficiency in later life at the pre-school and early childhood level, which may be an area for future policy to target when working within a proactive approach.

Ethnicity

> The second most important predictor of adult literacy proficiency levels was Ethnicity.

Overall, the proportions of those in levels 1, 2, and 3+ by ethnic group were similar across the three dimensions. See Table 8 for overall average proportions of ethnic group by literacy proficiency level.

As can be seen in Table 8, those respondents identifying as European were heavily represented in levels 3 and above, while the Pacific Peoples and Asian Peoples were heavily represented in Level 1. Those identifying as Maori were similarly represented across all the levels. While 43% of Europeans fit into either Level 1 or Level 2, 71% of Maori, 76% of Pacific Peoples, and 70% of Asian Peoples fit into these two levels.

Table 8. Average overall proportion (%) of the 1996 population in Level 1, 2, or 3 or more by ethnicity.

	Level 1	Level 2	Level 3, 4 & 5
European	14	29	57
Maori	35	36	30
Pacific Peoples	45	31	24
Asian Peoples	48	22	30
Other	34	19	46

Through the FRST Literacy and Employment Project currently being carried out in the Wanganui and Districts region, a discussion with an adult literacy provider indicated that there was concern over the lack of Pacific Peoples in adult literacy courses (personal communication, 1 September 2004).

> It would appear from these figures, as well as the predictive value of ethnicity as determined by this model, that future intervention strategies need to particularly focus on those who identify as Maori, Pacific Peoples, or Asian Peoples.

The OECD (2000) points out that there has been growth in the numbers of foreigners, immigrants, and asylum-seekers in many countries since the early 1980's. The ability to speak, write, and participate in the dominant or official language of the new country is purported to be the key to unlocking the social and economic benefits of the said country (OECD, 2000). However, this needs to be tempered by the continuance of the person's own cultural values which include the language of their home country.

> With regard to the IALS in NZ, all the tasks were measured in one of the official languages of NZ, English. Thus, for those who were not as familiar with this language as their NZ-born counterparts may have been, their literacy proficiency may be considered to be low, when it is actually confounded by the issue of language proficiency.

Differences in literacy proficiency for immigrants could also be affected by the differing educational experiences than those respondents from that new country (OECD, 2000).

The OECD final report on the IALS (2000) states that differences in proportions are somewhat less pronounced in NZ, where we have attracted both low and high-literate non-English speaking immigrants. This could explain the results seen in the Asian ethnic group, where those in Level 1 and those in Levels 3, 4 and 5 are significantly

higher than those in Level 2. However, as mentioned previously, the majority of those who identify as Asian Peoples were assessed to have Level 1 literacy proficiency. Perhaps not surprisingly given the findings above, NZ has more native-born persons at levels 3 and 4/5 of literacy proficiency than foreign-born, and more foreign-born (2nd language) persons at level 1 and 2 than native-born at 1 and 2 (OECD, 2000).

Abadzi (1996) puts forward another theory around the potential confound of foreign language proficiency. In Abadzi's (1996) research, two groups were studied, one of which was made up of educated adults who were fluent in languages with scripts different than the scripts they had learned in school. Abadzi hypothesised that the educated group would read a foreign language about as well as they could speak it. However, this was not the case. It was found that although opportunities for practice in the foreign language were abundant because they were living in the foreign country, the continuous effort needed to read a foreign script meant that even perfectly fluent speakers tended to avoid it. Through a self-report methodology, it was reported that this avoidance and disfluency were not due to language problems or to lack of practice, but instead, a difficulty that is perceptual rather than linguistic. It was concluded that foreign readers have trouble deciphering the print before they can determine in which language it is written. Furthermore, they have much greater difficulty reading language written in a different script than that was taught in school. This difficulty was explained in terms of word recognition processes by the brain. It was hypothesised that both adults with low literacy skills and educated readers (indeed adults in general) perceive and process newly learned alphabetic symbols more slowly and less accurately. Abadzi states that as a result of less efficient processing adults may not easily see adjacent symbols as combinations that make a word and may require much longer periods than children to acquire fluency. Thus, while ethnic group differences in literacy in English ability may be able to be explained through differences in language proficiency, they could also potentially be explained through perceptual difficulties in deciphering the written form of the language e.g., if a task is more arduous for a particular person, it may become more difficult especially if there are many tasks of increasing difficulty within which to work through.

> In conclusion, those people who identify as Asian Peoples, Pacific Peoples or Maori would appear to be more at risk of low literacy proficiency (as measured by the IALS) than those who identify as European. With those within the Asian and Pacific Peoples category, caution has to be taken to ensure that literacy proficiency is not confounded with language and perceptual proficiency.

The association between the three variables of education, ethnicity, and literacy proficiency was measured through use of a log-linear model. Table 9 indicates the proportion of respondents with a literacy level of 2 or below, categorised by both educational attainment level and ethnic group. Both ethnicity and education are associated with literacy proficiency, however, the results shown in Table 9 indicate that each of these variables act almost independently of each other. Even within an educational group, there are still large differences between ethnic groups.

Table 9. Interaction effect between educational level and ethnic group on the percentage of respondents with an average literacy proficiency of <=2.

	Lower Secondary	Upper Secondary	Non Uni	University
European	50	21	14	7
Maori	68	44	32	4
Pacific	74	56	40	50
Asian	83	52	67	44
Other	62	30	44	21

As shown in Table 9, all the ethnic groups represented here were most likely to have the majority of their members with low literacy proficiency levels coming under the lower secondary education or below attainment level. This was to be expected, as low educational attainment is associated with the lower levels of literacy proficiency overall. However, while the European and Maori ethnic groups followed similar patterns of decreasing percentages of low literacy in each increasing educational category thereafter, the Pacific and Asian Peoples showed some interesting differences. For the Pacific Peoples, they were more highly represented under university educational attainment than non-university, and for the Asian Peoples they were more highly represented in terms of low levels of literacy proficiency under non-university than upper secondary education. These figures suggest that those Pacific Peoples who are of low literacy proficiency are more likely to participate in a university course, than a non-university course. It is further suggested that those with low literacy proficiency who identify as Asian, are more likely to attend a non-university course than a university course when choosing a type of tertiary education. Although numbers are small in these groups the overall difference between Maori and other non-European groups is certainly statistically significant.

Further analyses were undertaken to ascertain whether those of low literacy proficiency who were looking for work could be differentiated by ethnic group. Table 10 outlines the results.

Table 10. Proportion (%) and number of those looking for work (omitting those not seeking work) by literacy proficiency level and ethnicity.

	Literacy Level <=2		Literacy Level >2	
	%	Count	%	Count
European	1	1499	7	486
Maori	6	127	16	140
Pacific	0	18	21	38
Asian	3	36	20	49
Other	INSUFFICIENT NUMBERS			

While the sample size is insufficient to make comments about the interactions between these factors for the non-European groups individually, patterns can be suggested for future research to possibly extend. It appears that there are more Non-European peoples looking for work regardless of literacy level. Also, the results suggest that there are more people looking for work within the higher literacy levels

than there are within the lower literacy levels. This may be due to availability of certain occupations (growth in higher-skilled, white-collar jobs), ability to work, and any number of social, cultural, and/or economic factors either working independently or in conjunction with the effect of literacy proficiency.

Here, the commonalities between the three classification trees end and predictors begin to be grouped by their strength in predicting low levels of literacy (present employment i.e., looking for work or no job for over six months that is neither retired nor a student, type of occupation and type of education (non-academic) for the document and quantitative scales). Type of education and income (two lower quintiles) are also predictors for low levels of literacy proficiency as measured by the prose scale. The factors that have been found to predict high levels of document and quantitative literacy are income (upper quintile) and work hours. All of these factors are discussed in the following summaries if not covered previously.

Labour Force Participation

Overall, in further analysis of the employment data from the 1996 IALS, the proportions of those in literacy levels 1, 2, and 3+ were similar across the three dimensions for the different work status categories. See Table 11 below for overall average proportions of labour force participation by literacy proficiency level.

Table 11. Average overall proportion (%) of the 1996 population in Level 1, 2, or 3 or above by level of labour force participation.

	Level 1	Level 2	Level 3, 4 & 5
Full-Time	14	28	58
Part-Time	14	29	57
Looking for work	53	33	14
Not working	29	30	41

> Those respondents assessed as having a level 1 literacy proficiency were significantly more likely to be either looking for work or not working than to be in full-time or part-time work. Generally, those whose assessment placed them at level 2, performed similarly across the four categories of labour force participation (see Table 11).

For those whose assessment placed them at a literacy level of 3 or above, they were significantly more likely to be in full or part-time work than they were to be either looking for work or not working at all. However, it is worthwhile to note that those who make up the 'not working' category also include students and those who are retired.

The literature on adult literacy generally assumes a link between low literacy and unemployment (Berlin & Sum, 1988, Raudenbush & Kasim, 1998, NCES, 2000, all cited in OECD, 2000; Kirsch, Jungeblut, Jenkins, & Kolstad, 2002; Griffin, Pollock, Corneille, & Fitzpatrick, 1997). However, there are also arguments that question the strength of this association (Black, 2004). Black's (2004) approach is situated within

the 'new literacy studies' and involves analysing how literacy is used and valued by people in different social contexts from their own perspectives. Black (2004) states that beliefs around literacy form a discourse which has ideological and political implications, some of which become taken for granted and are accepted as apolitical truths. He argues that the relationship between literacy skills and economic wellbeing is one of these dominant beliefs that is simply not 'true'. Black's research incorporated the use of two case studies: one of these was 27 interviews with unemployed people referred to a literacy programme, while the second was an analysis of the literacy practices of council workers and their managers. It is argued that while the respondents in both case studies would formally (if tested) be found to be low in literacy skills, this had not prevented them from working in the past as they had developed various coping strategies, such as nominating one member of the team who could calculate to do the invoicing.

Nevertheless, counter to Black (2004), in arguments against this reasoning that therefore literacy skills are not necessarily needed for employment, questions are raised such as "But how would they cope if they are alone?" "What happens if they want a higher paid job or a job with more responsibility or challenge?" "How would they cope if their job became more technological and required a higher skill base than they had?" "How would they cope if others did not have the time to help or support them?"

Further, Black (2004) argues that on the basis of these case studies, there is a causal relationship between literacy, numeracy, and (un)employment, but the relationship is the opposite to the one usually expected. He states that it is the economic conditions that cause the literacy and numeracy problems arguing that the responsibility for productivity and efficiency is centred on the worker, which in turn 'produces' and 'inflates' literacy and numeracy problems. The authors of this present study would argue that while the direction of the association between literacy and (un)employment cannot as yet be determined, changing jobs (up-skilling) requires changes in employees. We would agree with Black (2004) that changes in the workplace have led to the increased focus on an emerging literacy skills deficit, but would further argue that just because this deficit may not have been evidenced before in an individual's capability to do their job, this does not mean that it did not exist, but just means that those skills were not important at the level that their previous job was at, or the individual was able to use coping strategies to compensate for lack of skills in this particular area.

The above argument outlines that therefore, in today's increasing knowledge economy, those with low literacy proficiency are more likely to be in jobs that do not involve high-level literacy skills. Therefore, it could be hypothesised that those occupations that require high-level literacy skills such as professional or business occupations would have a low proportion of those with level 2 literacy or below within their ranks. Analysis was undertaken to investigate whether those who have low literacy levels are indeed overrepresented in the lower-skilled occupations. Table 12 outlines the type of occupation by literacy proficiency level.

Table 12. Average overall proportion (%) of the 1996 population in Level 1, 2, or 3 or above by occupation type.

	Level 1	Level 2	Level 3, 4 & 5
Professional	6	17	77
Clerical	8	30	61
Service	13	35	52
Skilled	25	34	41
Unskilled	36	32	32

The higher the level of literacy the more likely a particular person is to be in an occupation that is not unskilled work. If in an unskilled occupation, it is more likely that any one particular person will be in level one literacy than in any other level (see Table 12).

There are significant differences between those in Level 1 and those in Level 2 across the occupational types in that while it becomes increasingly likely that those with level 1 proficiency will be in unskilled work, those in level 2 are a lot more likely to be participating in professional, clerical, service, and skilled work than their Level 1 counterparts. This could be explained by the definition of a Level 2 literacy proficiency in the IALS which states that those in Level 2 while able to read etc. at a weak level, can only deal with material that is clear-cut and simple, so they may have developed unique coping skills to manage everyday literacy demands (OECD, 2000). These may include for example, approaching or delegating other workers to do the literacy tasks (Black, 2004). As expected, those found to have a literacy proficiency of 3 or above, are heavily situated within the professional occupations, with the unskilled occupations showing the lowest levels of participation by those with this level of literacy proficiency.

The occupational composition of the workforce has shifted towards white-collar jobs and has declined for blue-collar jobs in all sectors of the economy overall (OECD, 2000). While there is a relationship espoused here between higher skilled occupations and higher levels of literacy, the relationship can be seen as circular. An occupation that requires high levels of literacy, also allows an environment where a lot of reading, writing, and numeracy skills are used regularly. As the IALS points out (OECD, 2000), often these reciprocal relationships reinforce one another, with skills learned in formal schooling facilitating the ability to engage in more complex activities in the workplace, which in turn build literacy skills themselves. When looking at NZ's performance on the IALS writing at work index (which gives an indication of the variety of literacy experiences, with a higher index indicating a greater variety of literacy experiences), those with a level 1 literacy proficiency are at the lowest end of the scale, while those at level 3 and above nearly double the performance of those at level 1.

The data analysed here corresponds with the overall findings of the IALS (OECD, 2000) which found that white-collar, high-skilled occupational categories correspond with higher literacy proficiency levels (OECD, 2000).

OECD (2000) go on further to state that while participation in the labour force, formal adult education, and informal learning at work are significantly associated with literacy proficiency in most countries, this result is attributable to an extent to the strength of the relationship between literacy and type of occupation held.

A three-way contingency table was constructed to investigate the possibility of an interaction between educational attainment and occupational type on literacy proficiency (see Table 13).

Table 13. Interaction effect between educational level and occupational type on the proportion of NZ with an average literacy proficiency of <=2.

	Lower Secondary	Upper Secondary	Non Uni	University
Professional	33	14	8	5
Clerical	25	20	11	15
Service	52	28	21	7
Skilled	58	26	30	11
Unskilled	69	38	60	33

> Respondents were more likely to be in unskilled occupations, regardless of educational attainment if they were of a literacy level that was equal to or less than 2.

Interestingly, those of a literacy level of 2 or below, that fitted into the unskilled occupational category were significantly more likely to have either a lower secondary education or a non-university education, than either an upper secondary education or a university education. One possibility is that those who have not attained a literacy proficiency level of 3 or over are either leaving school early or are over-represented in vocational courses (non-university) where efforts at enhancing literacy proficiency may best be focused.

> While education and literacy proficiency are highly associated with one another, each of these variables has some association with labour force participation that is independent of the other's effect (see Table 14).

Table 14. Interaction effect between educational level and labour force participation on the percentage of respondents with an average literacy proficiency of <=2.

	Lower Secondary	Upper Secondary	Non Uni	University
Full-Time	48	34	14	6
Part-Time	44	20	18	8
Looking	77	45	50	85
Not working	62	28	24	12

For those with a literacy proficiency level of less than 2, whether in full-time or part-time work or indeed if not working, they were more likely to have a lower secondary education, than upper secondary, a non-university or a university education (in decreasing order). Those who had a lower secondary education were significantly more likely to be looking for work than any of the other categories. This finding was the same for all the educational attainment levels with, interestingly, those with a university education endorsing the 'looking for work' category more so than any other (therefore, those with low literacy levels and a university education are more likely to be looking for work). Those who are not working are most likely to have attained a lower secondary education, and least likely to have attained a university education.

As has been outlined in Tables 13 and 14, educational attainment not only interacts with work status for those of a literacy level <=2, but also the type of occupation that an individual works within once they have attained that position. OECD (2000) note that literacy proficiency level has an substantial effect on earning ability in many of the countries surveyed, although this effect was found to depend in part on educational attainment level. It appears that the higher the occupation, the higher the wages, thus as the IALS final report states (OECD, 2000), labour market rewards are associated with education, skills and experience. It is important to remember however, that all of these interactions are further influenced by conditions of supply and demand of any given country's economy (OECD, 2000).

An analysis of literacy proficiency levels by type of industry was also investigated. Table 15 outlines the results of this analysis.

Table 15 Average overall proportion (%) of the 1996 population in Level 1, 2, or 3, 4, & 5 by industry.

	Level 1	Level 2	Level 3, 4 & 5
Agriculture etc	22	32	47
Manufacturing	24	34	42
Construction	12	35	53
Trade	11	33	56
Communications	13	23	64
Business	9	22	70
Social	11	23	66

Table 15 shows that those with level 1 literacy proficiency are most likely to be working within the 'Manufacturing' or 'Agriculture etc' industries. They are least likely to be working within the Business industries. Interestingly, those in the higher literacy proficiency levels show the exact opposite pattern, being most likely to be working within the Business industries and least likely to be found working in either the 'Manufacturing' or 'Agriculture etc' industries. Those of level 2 literacy proficiency were generally similar across the majority of industry categories. They were generally more likely to be either within the 'Agriculture etc', 'Manufacturing', 'Construction' or 'Trade' industries, than in the 'Communications', 'Business' and 'Social' industries.

The IALS final report (OECD, 2000) states that higher levels of literacy proficiency in the workforce are associated with larger proportions of knowledge jobs in the economy. Similar to the results found in Table 15, the IALS (OECD, 2000) found that literacy skills positively influence the probability of being in a white-collar high-skilled position and negatively influence the probability of being in a blue-collar position. The IALS further states that in almost all of the countries surveyed, employment has risen the quickest in business industries, followed by social industries, thus, creating a gap for those with high literacy proficiency levels. Changes worldwide suggest that while structural changes have been taking place in labour markets, the unemployment rates of those with low educational qualifications has been increasing (OECD, 1997, cited in OECD, 2000).

The OECD final report on the IALS (2000) states that the combined effect on literacy proficiency of 4 labour-market variables is substantial in most countries. These variables are labour force participation, occupation, industry, and frequency of reading memos at work (a measure of informal learning or use of literacy in a real-life situation). However, it is stated that industry itself does not exert any meaningful influence on literacy proficiency level in any of the countries surveyed, once labour force participation and occupation category are held constant. This suggests that industry as one of the four variables may have a small independent effect, if indeed any. The final report goes on to state that while literacy proficiency is a clear factor in the likelihood of securing employment, the reverse relationship is probably just as likely to be true.

Effects of health issues on literacy proficiency levels

A log linear analysis of three-way contingency tables was used to measure any association between health issues and literacy proficiency, taking into account the associations with educational attainment. Tables 16-20 show the associations between literacy proficiency and differing health impairments respectively. Further explanation of the variables used in these tables can be found in Appendix A.

Table 16. Proportion (%) of low literacy (Levels 1 & 2 combined) individuals classified by educational attainment level and existence of an eye problem that could not be corrected by glasses.

	Vision Impairment?		
	Yes	**No**	**Margin**
Lwr2ndry	69	52	54
Upr2ndry	40	23	25
Non-Uni	21	16	17
University	12	9	10

Table 16 shows those respondents who are of either literacy level 1 or 2, who self-reported an eye problem that could not be corrected by glasses, by educational attainment level. The proportion of those with low literacy is uniformly higher in the group with eye problems. There is also a difference between the two columns with the

effect of the problem decreasing by increasing educational level; however, this may be a sampling effect.

Table 17. Proportion (%) of low literacy (Levels 1 & 2 combined) individuals classified by educational attainment level and existence of a hearing problem.

	Hearing Impairment?		
	Yes	No	Margin
Lwr2ndry	56	53	54
Upr2ndry	23	25	25
Non-Uni	11	17	17
University	7	10	10

Similarly, Table 17 describes those respondents who are of either literacy level 1 or 2, who self-reported a problem with their hearing, by educational attainment level. The figures across the two conditions (hearing problem vs. no hearing problem) are similar, indicating that there is no evidence of any effect of hearing problems on literacy proficiency from this sample. However, in further analyses (not outlined here), hearing was found to have an effect on educational attainment.

Table 18 describes those respondents of either literacy level 1 or 2, who self-report a speech impairment by educational attainment level. There is evidence that the proportion of respondents with low literacy proficiency is higher in the group with speech impairments. However, this effect looks uneven. This could be due to a sampling effect as the numbers were small in this group.

Table 18. Proportion (%) of low literacy (Levels 1 & 2 combined) individuals classified by educational attainment level and existence of a speech problem.

	Speech Impairment?		
	Yes	No	Margin
Lwr2ndry	72	53	54
Upr2ndry	24	25	25
Non-Uni	26	16	17
University	11	10	10

Below, in Table 19, there is a strong association of learning disability with low literacy proficiency. An association of learning disability with educational attainment was also found.

Table 19. Proportion (%) of low literacy (Levels 1 & 2 combined) individuals classified by educational attainment level and existence of a learning disability.

	Learning Disability?		
	Yes	No	Margin
Lwr2ndry	80	51	54
Upr2ndry	52	24	25
Non-Uni	45	16	17
University	21	9	10

Fawcett (2003) studied the effect of asking several questions from the IALS on the affect of learning disabilities on literacy proficiency with a smaller British sample. Two of these questions were "Did you ever have a learning disability" (upon which the above table's data is based) and "Do you have this problem now?" Fawcett (2003) found that the persistence of self-reported learning disability (SRLD) was higher for those at a level 1 literacy proficiency level than for any of the other levels.

Furthermore, the least persistent problems were at level 4, with no problems reported at level 5. Fawcett (2003) also found that while 25% of those with learning disabilities were at level 1, they no longer defined themselves in terms of their disability. This was interpreted as meaning that their learning disability had little influence on their lives (i.e. did not affect their literacy use perhaps because there was a general lack of literacy practices engaged in, therefore literacy proficiency was not seen as a problem). The author goes on to state that the idea of being 'learning disabled' may be a factor that becomes less emphasised upon leaving school, as the person is no longer required to routinely undertake what may be challenging literacy tasks (Fawcett, 2003). This interpretation also links in with Black (2004) who stated that those of low literacy proficiency generally have higher estimates of their ability than is found through formal testing.

Furthermore, with the lack of those with SRLD at Level 5, Fawcett (2003) suggested that once a certain threshold of literacy skill has been passed, it becomes easier to overcome the difficulties the person is likely to have faced in learning at school.

Finally, as can be seen in Table 20, there is a strong association between 'other' disabilities and health problems of six months or more and literacy proficiency and an equally strong association of this health factor with educational attainment. 'Other' disability or health problem referred to a self-reported impairment that did not fit the criteria presented previously to be categorised as an eye, hearing, speech or learning disability.

Table 20. Proportion (%) of low literacy (Levels 1 & 2 combined) individuals classified by educational attainment level and existence of an 'other' disability or health problem that lasted for six months or more.

	'Other' Disability/Health Impairment?		
	Yes	**No**	**Margin**
Lwr2ndry	62	51	54
Upr2ndry	31	24	25
Non-Uni	22	16	17
University	10	10	10

In conclusion, the results presented here suggest that learning disability and 'other' disabilities or health impairments prevalent for six months or more, are the strongest indicators of low literacy proficiency levels when looking at health factors. Eye impairments and speech impairments also seem to have an effect on subsequent literacy level, but interestingly, hearing impairments, have no direct effect on literacy proficiency. However, this effect may be indirectly felt through its influence on educational attainment.

Regional Proportions of Low Literacy Levels – 1996, 2001, 2004

The classification trees were applied to demographic data from the 1996 and 2001 Censuses to provide estimates of the proportion of low literacy individuals for each Territorial Land Authority in NZ for those years Predicted proportions for Levels 1 and 2 combined are shown for 1996, 2001 and 2004 in Figure 6. Proportions and predicted proportions for Level 1 only are shown for 1996, 2001, and 2004 in Figure 7. The maps do not give estimates of proportions of Level 2 alone because the larger numbers in the combined group (Level 1 & 2) make it more accurate to model. However, the total counts and estimated proportions by region can be found in Appendix G, where estimates for each territorial land authority by literacy level 1 and 2 or by level 1 only are outlined for 1996, 2001 and 2004.

Extrapolation using the 2001 Census required an assumption that the associations found in 1996 would continue until 2001. The regional estimates for 2004 have been formed by extrapolating linearly from the 1996 and 2001 figures. The legends correspond to the proportion of people in each territorial land authority who are considered to be of low literacy proficiency (Levels 1 and 2) when averaged across all three literacy domains (prose, document and quantitative).

It is important to state again that while a statistically significant difference is technically deemed to be one greater than 3%, practical significance is considered to be a difference of 10% or higher. Also, as an explanatory note, the proportions listed in the legends and Appendix G are, if multiplied by 100, the percentage of the total population for that TLA.

Legend
- 0.451 - 0.496
- 0.401 - 0.450
- 0.351 - 0.400
- 0.301 - 0.350
- 0.267 - 0.300
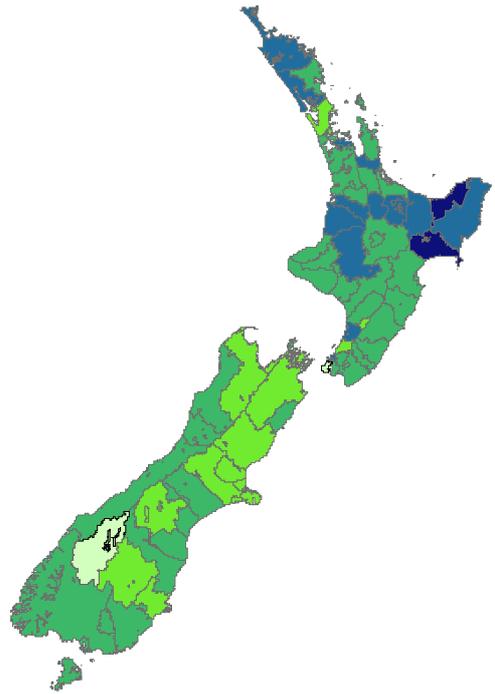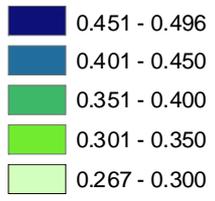
Proportions in Level 1 and 2 by Territorial Authority for 1996
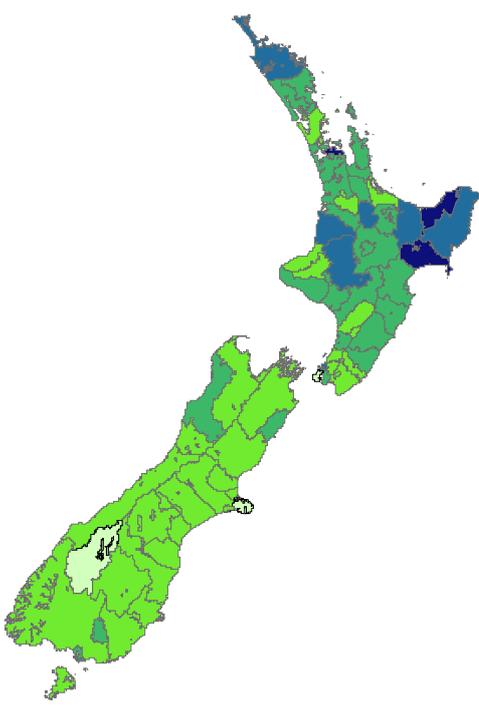
Predicted Proportions in Level 1 and 2 for 2001
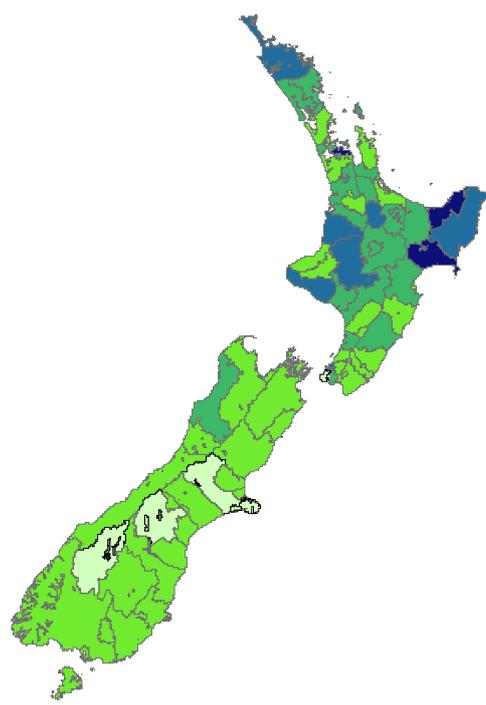
Predicted Proportions in Level 1 and 2 for 2004

Figure 6. Proportions and predicted proportions of level 1 & 2 literacy proficiency by region in NZ for 1996, 2001 and 2004.

Legend

	0.226 - 0.275
	0.201 - 0.225
	0.176 - 0.200
	0.151 - 0.175
	0.127 - 0.150
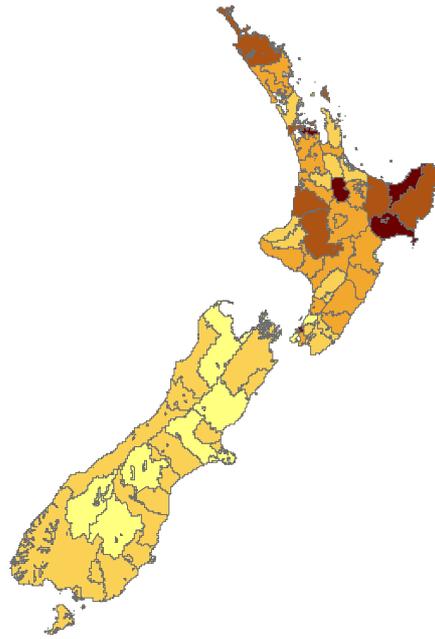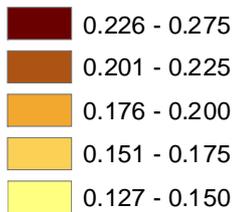
Proportions in Level 1 by Territorial Authority
for 1996
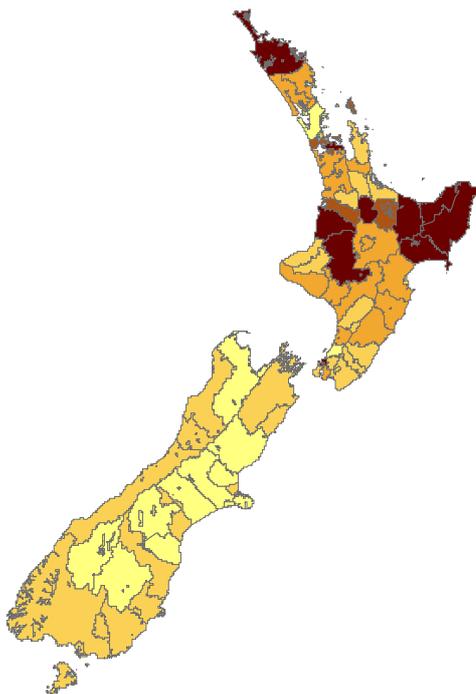
Predicted Proportions in Level 1 for
2001
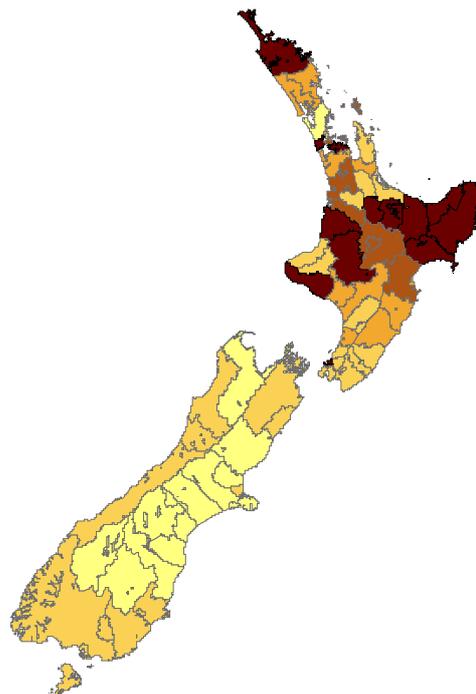
Predicted Proportions in Level 1 for
2004

Figure 7. Proportions and predicted proportions of level 1 literacy proficiency by
region in NZ for 1996, 2001 and 2004.

Figure 8 below gives an illustration of the change between 1996 and 2001 in predicted
proportions of the population with literacy levels 1 and 2 by territorial authority areas.

These proportions reflect changes in the demographic predictors thought to predict particular literacy levels which, according to the model, also reflect changes in the proportion of particular literacy levels (with the assumption that these proportions have not changed over time). Generally, there has been a slight improvement in the North Island during this five year period, with the exception of Palmerston North which had a very slight increase (however, the proportion of people with literacy levels of 1 and 2 in this authority was low to begin with).

The changes seen in Figure 8 reflect changes in the variables that the model used as predictors and show literacy proficiency changes to the extent that the model is still correct in 2001. It is important to note that small changes that occurred at critical time points, for example, a change from 0.040 to 0.041 from 1996 to 2001, could look like a huge difference in the proportion distribution, when in actuality it is not.

Change in proportions

- 0.041 - 0.070
- 0.021 - 0.040
- 0.011 - 0.020
- 0.001 - 0.010
- -0.014 - 0.000
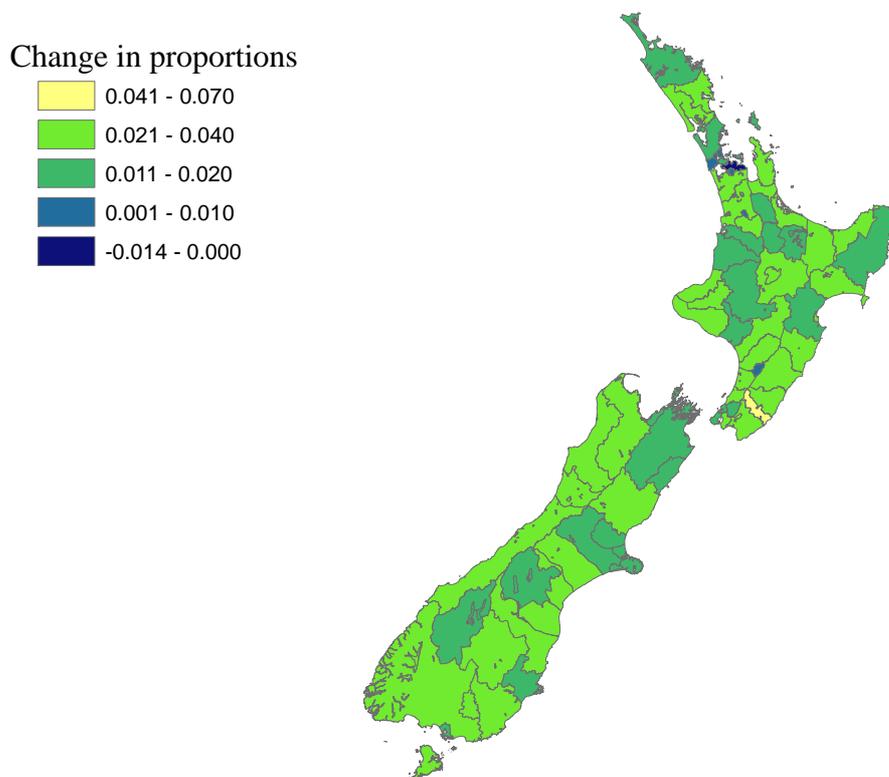
Change (2001 – 1996) in predicted proportions of the population with literacy levels 1 or 2 by Territorial Authority.

Figure 8. Change in predicted proportions of level 1 and 2 literacy proficiency by region in NZ from 1996 to 2001.

Limitations

Extrapolation using the 2001 Census required an assumption that the associations found in 1996 would continue until 2001. Interpretation of the data gained from use of the 2001 Census must take into account that control for changes over time has not occurred and indeed, those possible changes over time that would affect the association have not been identified nor tested as to their effects on this association. Challenges to this assumption include changes that have been made within the school system such as the raising of the school leaving age and changes to assessment procedures (i.e. NCEA Levels introduction) which could have impacts on the validity of the predictions that will be made. Another change includes an increase in the employment rate nationally. The prediction model assumes that the literacy of employed people remains constant, not that as unemployment falls less literate people obtain jobs.

Lack of response limits the validity of any survey. Those who completed the full survey make up 3311 respondents (58% of the sample), so an important assumption has to be that the 42% who did not respond did not differ in any consistent way from those who did. Although the demographics of respondents matched Census data there is still the possibility of associations between variables differing. The IALS did record very basic demographic information from 922 (16%) non respondents, but the final data could have been improved if even a rough assessment of literacy proficiency had been extracted from these 922 respondents. This suggestion is explained in more detail under the Recommendations section (see Appendix H). It is a limitation of the sample that just over one-fifth of the respondents had imputed literacy scores.

A further limitation of the analysis thus far is that the techniques used to date have been chosen for their exploratory strength. There are potentially more powerful predictive tools. However, a logistic regression was carried out using a limited selection of variables, and it performed comparably but no better to the classification trees at classifying respondents at literacy levels 1 and 2. Also, it is important to note that, as with all predictions, the imprecision of the estimates arrived at in the regional analyses particularly tends to move these predicted values closer to the mean.

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Furthermore, it is also important to note that the relationships outlined here are not causal, but correlational. For example, while the number of weeks in work during the last 12 months may predict a certain literacy level, it is probable that a certain literacy level may affect the number of weeks that a person is able to work in the last year.

Therefore, it is important to consider all possible directions of influence when interpreting these results.

Finally, there are discrepancies between two data sources used in this analysis in the way within which employment factors are measured. The IALS required international comparability, which sometime meant that their questions did not match New Zealand data. For example the survey the question "What is your current work situation?" and gives possible answers of "employed", "retired", "unemployed/looking for work", "student", "homemaker" or "other". Dependent on the respondent's answer, they could then be asked questions such as "Did you work at a job or business at any time in the past 12 months?" "When did you last work at a job or business?" "Do/did you work mostly full-time or part-time?"
The 1996 Census however, asks the question differently. Here, it is asked "In the 7 days that ended on Sunday 3 March, which of these did you do?" and gives answers which include "you worked for pay, profit or income for an hour or more", "you worked in a family business or family farm without pay", "you work in a job, business or farm, but you were absent for some reason last week" or "none of these". It then goes on to ask (dependent on the answer to the above), whether the person had one job or more than one in those 7 days, "in that job, which one of these were you" (answers being a paid employee, self-employed and not employing any other person, an employer of other person(s) in your own business, working in a family business or family farm without pay. The 1996 Census also asks as one of its questions "How many hours, to the nearest hour, do you usually work each week?" For this report judgments were made to match categories as well as possible, but possible associations can only be weakened if these judgments were inaccurate.

Future Research

This exploration of the data gave rise to further questions that could be addressed through potential future projects. These proposed questions include:

- Are there differences in demographic characteristics between those that completed secondary school (or have NCEA Level 2 or higher) and have low literacy, and those that did not complete secondary school (or have NCEA Level 2 or higher) and have low literacy?

- Are there people for whom educational level is an overwhelming predictor and others for whom it is not as important? Are we able to identify or predict, based on demographic characteristics, those people who are most in need of educational support for future literacy skill level?

- Furthermore, in its analysis of NZ, NZ was ranked as the top country with regard to the estimated amount of hours of job-related education and training that was available per adult (thought to provide a measure of the overall formal adult education effort). However, the OECD (2000) go on to state that data within all countries show there are large groups that are outside this "emerging learning society", who are often the ones most in need of the skills. One recommendation made by the OECD (2000) is for research into these

groups' readiness to engage with adult learning. Future projects could focus on those that are not accessing adult training opportunities, who they are, why this is so, and how the access can be achieved for this sub-group.

- One possibility is that those who have not attained a literacy proficiency level of 3 or over are either leaving school early or are over-represented in vocational courses (non-university) where efforts at enhancing literacy proficiency may best be focused. In-depth research into whether this move toward non-university courses for those of low literacy is indeed happening as well as developing of ways in which literacy practices could be worked into the framework of the courses offered (if it is happening), could be significant future projects for focusing interventions on those with the lowest levels of literacy proficiency.

Recommendations for future surveys of the 1996 IALS ilk were also derived from the analysis of this project. These are outlined in Appendix H.

Conclusions

The first two objectives of the present analysis were to identify the variables most strongly associated with low literacy (Levels 1 and 2 separately) from the 1996 IALS and to build a statistical model from which those variables that most strongly predict literacy levels one and two could be determined. Through the building of classification trees, it was found that educational attainment level was the strongest predictor of subsequent adult literacy proficiency. However, it was also noted that the effect of educational attainment could be mediated by a variety of other factors, not least of which were early childhood family and school experiences.

The predictor of secondary strength was Ethnicity. In this analysis it was found that those people who identify as Asian Peoples, Pacific Peoples or Maori would appear to be more at risk of low literacy proficiency (as measured by the IALS) than those who identify as European. However, it was also noted that the IALS measured proficiency in English literacy only and that within the Asian and Pacific Peoples category especially, caution has to be taken to ensure that literacy proficiency is not confounded with language and perceptual proficiency.

After these two factors it was found that the predictive effects of the other variables were similar in their predictive strength. To predict membership of level 1 or 2 literacy levels, labour force participation, and type of occupation seemed to be pertinent also.

The model has also been used to provide regional predictions at the TLA level, of proportions of those at the lower two literacy levels living in those areas. The analysis has also provided numbers and proportions of those adults participating and not participating in adult training courses by various demographic factors. However, due to the limitations of the predictive model outlined earlier in this report, it is necessary for further research to be undertaken into the strengths of these associations between

the demographic variables and the lower two literacy proficiency levels. This report has however, highlighted areas of interest that future research can expand on.

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Appendix A

Variable Descriptions

Code Name	IALS name/ Question Number	Translation	Levels (correspond to alphabetical indicators on classification trees)
Gender	GENDER	Gender of respondent	M, F
Age	AGEINT	Age group of respondent	16:25, 26:35, 36:45, 46:55, 56:65
Marital Status	MARITALS	Marital Status of respondent	Single, Married, Widowed, Separate
EIncome	J30	Income gleaned from wages, salary, or self-employment	None, Q1, Q2, Q3, Q4, Q5, DK/Ref
Govt Income	J1B	Income from government or state sources (including social support, unemployment benefit and excluding pensions)	Yes, No
Language	B13L1, B13L2	Speaks English only, +Maori, +other	One, Maori, Other
Ethnicity	B18M1	White = English	Asian, English, Europe, Maori, Other, Pacific
Education	A8	Highest Level of Schooling Completed	Lwr2dry, Upr2dry, NonUni, University
Mum Educ	C5	Mother's Education None = Lwr2dry na = Cannot answer	Lwr2dry, Upr2dry, NonUni, University
Dad Educ	C11	Father's Education None = Lwr2dry na = Cannot answer	Lwr2dry, Upr2dry, NonUni, Univ
Educ Type		Type of Education Achieved	Academic, Other
Work Now	D1	State of employment now	Employed, Retired, Looking, Student, Home, Other)
Work Last	D1 & D2	When the respondent last worked Now=Employed	Now, 12mths, 5yrs, >5ysr
Work Time	D5	Whether the respondent worked mainly full-time or part-time	Not, Full, Part
ISICR	ISICR	Industrial Classification of respondent's primary employment	Agricultural Hunting Forestry & Fishing, Mining & Quarrying, Manufacturing, Electricity Gas & Water, Construction, Wholesale & Retail Trade, Transport Storage & Communications, Financing Insurance Real Estate & Business, Community Social & Personal
ISCOR	ISCOR	Occupational Classification of respondent's primary occupation	Armed Forces, Legislators Senior Officials & Managers, Professionals, Technicians & Associate

			Professionals, Clerks, Service Workers & Shop & Market Sales Workers, Skilled Agricultural & Fishery Workers, Craft & Related Trades Workers, Plant & Machine Operators & Assemblers, Elementary Occupations
Work Hrs	D13	How many hours per week worked at primary job	None, <10, 10-21, 21-30, 31-40, 41-50, 51-60, >60, na
Work Wks	D14	How many weeks worked during last 12 months (at all jobs including time off for vacation, maternity leave, illness, strikes and lockouts)	None , <6wks , to3mths , 3-6mths , 6-9mths , 9-12mths , na
Adlt Ed No	F1, F2	Training or Education received and how many courses in the last twelve months	None, 1, 2, 3, >3
Adlt Ed Type	F5M1	Reason for taking training or education	None, Tertiary, Trade, Professional, Other

Appendix B

Prose Literacy Chi-Square Statistics

Document Literacy Chi-Square Statistics

Quantitative Literacy Chi-Square Statistics

Prose Literacy	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation		% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
Gender				**Marital Status**			
Male	45.1	19.15	4.77	Widowed	57.5	29.19	8.85
Female	38.3			Separated	47.0		
Age				Single	42.7		
16-25	41.3			Married	36.5		
26-35	41.3			**Work Time**			
36-45	34.4	52.61	6.72	Not	51.5	117.60	9.42
46-55	41.3			Part-Time	37.2		
56-65	53.0			Full-Time	33.8		
Work Hours				**ISICR**			
None	51.5			1	48.5		
<10	40.5			2	38.5		
10-20	32.9			3	50.2		
21-30	31.2			4	35.7		
31-40	33.0	130.33	7.18	5	48.7	144.7	10.6
41-50	34.2			6	38.8		
51-60	36.4			7	32.3		
>60	48.5			8	20.2		
Na	39.6			9	24.7		
Work Weeks				**EIncome**			
None	51.5			Quintile 1	44.8		
<6 weeks	42.2			Quintile 2	40.5		
To 3 months	40.7			Quintile 3	39.1		
3-6 months	41.7	128.93	7.55	Quintile 4	34.2	213.4	11.7
6-9 months	38.5			Quintile 5	21.4		
9-12 months	33.1			None	58.5		
Na	55.0			DK/Refused	48.9		

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	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation		% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
Govt Income				**WorkNow**			
Yes	52.0	72.2	11.7	Looking	67.7	163.0	14.9
No	35.5			Employed	33.5		
AdltEdType				Student	36.3		
None	50.7	249.8	12.3	Retired	57.3		
Trade	44.3			Home maker	49.6		
Professional	25.8			Other	67.5		
Tertiary	22.6			**Mum Educ**			
Other	29.4			Lwr2dry	38.7	173.0	15.4
WorkLast				Upr2dry	32.6		
Now	33.5	149.0	13.1	NonUni	24.5		
12 months	42.5			Univ	22.3		
5 years	53.0			na	60.8		
>5 years	63.9			**Language**			
Ethnicity				One	38.9	48.2	15.4
European	48.9	216.2	13.3	Maori	64.1		
Maori	62.0			Other	36.0		
Pacific	70.4			**Dad Educ**			
Asian	68.8			Lwr2dry	40.1	212.2	15.9
English	35.9			Upr2dry	29.6		
Other	50.9			NonUni	26.5		
AdltEdNo				Univ	20.5		
None	53.4	249.6	14.7	na	61.0		
1	32.2			**ISCOR**			
2	27.3			0	25.0	326.1	18.6
3	17.9			1	21.0		
>3	17.5			2	14.6		

	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
ISCOR cont.			
3	17.0		
4	26.6		
5	39.5		
6	47.8		
7	51.3		
8	60.5		
9	65.7		
Education			
Lwr2dry	61.1		
Upr2dry	33.0	586.0	20.0
NonUni	22.1		
Univ	15.9		
Educ Type			
Academic	52.5	354.1	23.2
Other	19.7		

Document Literacy	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation		% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
Gender				**Work Wks**			
Male	26.7	6.52	2.09	*None*	31.5	70.24	3.57
Female	29.6			*<6 wks*	32.2		
Language				*To 3 months*	34.1		
One	28.6	12.70	2.85	*3-6 months*	31.0		
Maori	28.2			*6-9 months*	31.1		
Other	23.5			*9-12 months*	25.0		
Marital Status				*na*	25.0		
Single	26.3	5.57	2.96	**Age**			
Married	28.3			*16-25*	29.2	57.77	3.58
Separated	30.2			*26-35*	25.9		
Widowed	23.3			*36-45*	25.5		
WorkTime				*46-55*	30.7		
Not	31.5	60.52	3.14	*56-65*	34.1		
Part-Time	29.0			**Work Last**			
Full-Time	25.3			*Now*	25.6	90.94	4.19
Work Hrs				*12 months*	31.4		
None	31.5	68.11	3.23	*5 years*	35.8		
<10	30.6			*>5 years*	30.6		
10-20	24.6			**Adlt Ed Type**			
21-30	30.4			*None*	31.9	100.36	4.48
31-40	24.1			*Trade*	27.6		
41-50	24.7			*Professional*	23.7		
51-60	30.3			*Tertiary*	20.2		
>60	32.3			*Other*	23.5		
Na	28.3						

	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation		% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
Govt Income				**AdltEdNo Cont.**			
Yes	32.6	43.67	4.57	*1*	27.6	122.59	6.74
No	26.1			*2*	18.6		
Ethnicity				*3*	16.9		
Europe	31.1	46.90	5.83	*>3*	20.3		
Maori	34.7			**Dad Educ**			
Pacific	23.1			*Lwr2dry*	30.5	109.04	6.74
Asian	21.4			*Upr2dry*	25.6		
English	28.1			*NonUni*	17.4		
Other	20.0			*Univ*	18.8		
Work Now				*na*	32.4		
Looking	34.4	104.72	5.84	**Mum Educ**			
Employed	25.6			*Lwr2dry*	29.2	99.64	6.76
Student	27.9			*Upr2dry*	24.8		
Retired	38.8			*NonUni*	15.6		
Home Maker	32.7			*Univ*	24.6		
Other	23.4			*na*	33.8		
EIncome				**ISCOR**			
Quintile 1	30.4	157.0	5.9	*0*	25.0	170.0	9.1
Quintile 2	30.7			*1*	18.9		
Quintile 3	32.2			*2*	13.5		
Quintile 4	24.8			*3*	13.9		
Quintile 5	17.2			*4*	29.0		
None	33.7			*5*	33.3		
DK/Refused	32.8			*6*	30.9		
Adult Ed No				*7*	33.8		
None	32.9			*8*	34.2		

	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
ISCOR Cont.			
9	39.9		
ISICR			
1&2	33.70		
3	30.25		
4	7.14		
5	26.89	79.9	9.3
6	35.43		
7	22.56		
8	17.38		
9	21.69		
Education			
Lwr2dry	38.1		
Upr2dry	26.8	401.1	11.3
NonUni	19.7		
Univ	11.3		
Educ Type			
Academic	18.3	199.4	11.8
Other	35.0		

Quantitative Literacy	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation		% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
Marital Status				**Work Hrs Cont.**			
Single	27.2			<10	32.0		
Married	27.9	6.39	0.97	10-20	28.9		
Separated	29.4			21-30	32.1		
Widowed	28.8			31-40	24.4		
Language				41-50	24.0	58.98	3.70
One	28.5			51-60	22.6		
Maori	27.6	7.82	2.34	>60	30.3		
Other	24.1			na	30.2		
Work Wks				**Age**			
None	31.0			16-25	30.4		
<6 wks	32.2			26-35	27.2		
To 3 months	30.1			36-45	25.1		
3-6 months	31.6	57.88	2.60	46-55	27.3	38.53	3.76
6-9 months	33.3			56-65	34.8		
9-12 months	25.2			**WorkTime**			
Na	30.0			Not	31.0		
Work Last				Part-Time	31.6	61.44	4.05
Now	26.1			Full-Time	24.4		
12 months	29.8			**Adlt Ed Type**			
5 years	32.0	76.21	2.99	None	31.5		
>5 years	32.8			Trade	28.6		
Gender				Professional	23.5	78.28	4.16
Male	25.5	21.79	3.46	Tertiary	21.3		
Female	30.4			Other	24.1		
Work Hrs				**Govt Income**			
None	31.0			Yes	33.3	59.22	5.23

	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation		% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
Govt Income Cont.				**Ethnicity**			
No	25.9			*Europe*	17.8		
Work Now				*Maori*	34.4		
Looking	32.3			*Pacific*	26.9	48.75	6.55
Employed	26.1			*Asian*	17.9		
Student	26.3	72.83	6.17	*English*	28.3		
Retired	38.2			*Other*	21.8		
Home Maker	32.5			**AdltEdNo**			
Other	20.8			*None*	32.4		
ISICR				*1*	28.2		
1	30.4			*2*	19.5	100.63	6.79
2	15.4			*3*	16.9		
3	30.5			*>3*	18.6		
4	28.6			**Mum Educ**			
5	26.9	56.16	6.27	*Lwr2dry*	28.9		
6	34.6			*Upr2dry*	24.8		
7	24.8			*NonUni*	20.8	90.12	6.84
8	17.7			*Univ*	17.0		
9	22.5			*na*	34.5		
EIncome				**Dad Educ**			
Quintile 1	31.3			*Lwr2dry*	30.8		
Quintile 2	31.7			*Upr2dry*	21.9		
Quintile 3	31.7			*NonUni*	20.1	113.75	6.91
Quintile 4	27.0	159.6	6.3	*Univ*	17.4		
Quintile 5	15.4			*na*	33.2		
None	32.9			**ISCOR**			
DK/Refused	32.8			*0*	25.0		

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	% in Literacy Levels 1 & 2	Chi Square	Standard Deviation
ISCOR Cont.			
1	14.8		
2	14.9		
3	16.3		
4	29.8		
5	36.6	156.14	8.51
6	29.7		
7	33.8		
8	35.3		
9	30.8		
Education			
Lwr2dry	36.9		
Upr2dry	27.9	338.3	10.9
NonUni	20.4		
Univ	11.3		
Educ Type			
Academic	18.7	181.2	11.3
Other	34.7		

Appendix C

Proportions –IALS and Census Data

Age (n=4223 for IALS and n=2338122 for Census)

Age Group	IALS		Census	
	Number	Proportion (%)	Number	Proportion (%)
16-25	757	17.93%	536397	22.94%
26-35	1113	26.36%	571728	24.45%
36-45	1017	24.08%	529275	22.64%
46-55	761	18.02%	415218	17.76%
56-65	575	13.62%	285504	12.21%

N.B. There were 151,452 Not Specified in the 1996 Census

Gender (n=4223 for IALS and n=3618306 for Census)

Gender	IALS		Census	
	Number	Proportion (%)	Number	Proportion (%)
Male	1821	43.12%	1777464	49.12%
Female	2402	56.88%	1840842	50.88%

Ethnicity

Ethnicity	IALS		Census	
	Number	Proportion	Number	Proportion
Maori	453	10.7%	Unknown	12%
European	3023	71.69%	Unknown	84%
Other	747	17.69%	Unknown	3%

N.B. The Census figures were obtained from the Statistics NZ website http://www.stats.govt.nz. The IALS ethnicity category had a "white" response that was endorsed by 3023 respondents. Because of the large number of respondents in this category, it was assumed that "white" was comparable to "European".

While there are differences in proportions between the IALS and the Census, this could be due to the different way in which each of the surveys asked the Ethnicity question i.e. the IALS asked for ancestry, while the Census asked for which ethnic group the respondents belonged to.

Schooling (n=4223 for IALS, 2,786,220 for 1996 Census and 2,889,537 for 2001 Census)

Education Level	IALS		1996 Census		2001 Census	
	Number	Proportion	Number	Proportion	Number	Proportion
Lower 2ndry	1828	43.29%	1205424	43.26%	1075488	37.22%
Upper 2ndry	1101	26.07%	605568	21.73%	606639	20.99%
Vocational Qualification	711	16.84%	493581	17.72%	507891	17.58%
First Uni Degree	341	8.07%	149898	5.38%	199932	6.92%
Post grad Degree	188	4.45%	74343	2.67%	92151	3.19%
Not Defined/ Specified	54	1.28%	257403	9.24%	407439	14.10%

N.B. These numbers must be interpreted with caution as the questions were not similar (IALS asked for highest level of schooling while the Census asked for the highest qualification gained) and the categories for responses were not the same either. However, the categories that have been combined where deemed appropriate are listed below for review.

- ISCED Levels 0-2 were combined and the levels of "No Qualification" and "School Certificate Qualification" were combined for the Census to give the Lower 2ndry category.
- ISCED Level 3 made up the Upper 2ndry category for the IALS, while the levels of "Overseas School Qualification", "Sixth Form Qualification", "Higher School Qualification", and "Post School Qualification Not Specified" were combined for the Census.
- ISCED Level 5 made up the Vocational Qualification category for the IALS, while the levels of "Advanced Vocational Qualification", "Intermediate Vocational Qualification", "Skilled Vocational Qualification", and "Basic Vocational Qualification" were combined for the Census.
- ISCED Level 6 made up the First Uni Degree category for the IALS, while the level of "Bachelor Degree" was the Census level used.
- ISCED Level 7 made up the Post Grad Degree category for the IALS while the level of "Higher Degree" was the Census level used.
- ISCED Level 9 was combined with the levels of "DK/Refused", "Not Stated" and "Not Applicable" for the IALS and the levels of "School Qualification Not Specified" and "Not Specified" were combined for the Census to give the Not Defined/Specified category.

Post School Qualification Not Specified was included in the Upper 2ndry category to keep the proportions similar considering it was unknown whether this level would fit under either Upper 2ndry or Vocational Qualification. However, if it were to be moved into Vocational Qualification, the proportions would change to 15.35% for the Census in Upper 2ndry and 24.10% for the Census in Vocational Qualification.

Employment Status (n=4223 for IALS and n=2786217 for Census)

Status	IALS		Census	
	Number	**Proportion (%)**	**Number**	**Proportion (%)**
Employed	2224	52.66%	1630809	58.53%
Unemployed/Looking for work	186	4.40%	136506	4.90%
Not in Labour Force/ Not Available	891	21.10%	1018902	36.57%
Not Stated	922	21.83%	0	0%

N.B. The unemployed category was slightly different across the IALS and Census. The IALS called it 'Unemployed/Looking for work' while the Census named it 'Unemployed and actively seeking work'. The IALS categories of 'Retired', 'Student', 'Homemaker' and 'Other', and the Census categories of 'Not in Labour Force' and Not Available' were combined respectively to give the category of "Not in Labour Force/Not Available".

Occupation (n=4223 for IALS and n=2951817 for Census)

Occupation	IALS		Census	
	Number	**Proportion**	**Number**	**Proportion**
Legislators, Administrators and Managers	291	6.89%	188979	6.40%
Professionals	363	8.60%	191466	6.49%
Technicians and Associate Professionals	294	6.96%	177597	6.02%
Clerks	376	8.90%	216468	7.33%
Service and Sales Workers	415	9.83%	226080	7.66%
Agriculture and Fishery Workers	249	5.90%	153603	5.20%
Trades Workers	195	4.62%	148974	5.05%
Plant and Machine Operators and Assemblers	266	6.30%	135627	4.59%
Elementary Occupations	143	3.39%	111285	3.77%
Unidentifiable/Not Specified/Not Applicable	1631	38.62%	1236144	41.88%

Industry classification for primary employment (n=4223 for IALS and n=2786223 for Census)

Industry	IALS		Census	
	Number	**Proportion (%)**	**Number**	**Proportion (%)**
Agriculture, Hunting, Forestry and Fishing	270	6.39%	150105	5.39%
Mining & Quarrying	13	0.31%	4086	0.15%
Manufacturing	400	9.47%	232527	8.35%
Electricity, gas and water	14	0.33%	8910	0.32%
Construction	119	2.82%	94038	3.38%
Wholesale and retail trade	477	11.30%	294396	10.57%
Transport, storage and communications	133	3.15%	86610	3.11%
Financing, Insurance, Real Estate and Business	282	6.68%	214041	7.68%
Community, Social and Personal Services	890	21.08%	445011	15.97%
Unidentifiable/Not Specified/Not Employed	1625	38.48%	1256499	45.10%

N.B. IALS has a Community and Personal Services Category, while the Census splits this into three with 'Health and Community Services', 'Cultural and Recreational Services', and 'Personal and Other Services'. The Census also has three further categories that have been amalgamated within the developed "Community, Social and Personal Services category (government admin and defence, education, and accommodation, cafes and restaurants). The Unidentifiable/Not Specified section includes the IALS levels of "Don't Know/Refused", "Not Applicable" and "Not Stated" and the Census levels of "Unidentifiable/Not Specified" and "Not Employed".

Income (n=4223 for IALS and n = 2786229 for Census [taking into account complete total of adult respondents])

	IALS		Census	
Income Level	**Number**	**Proportion**	**Number**	**Proportion**
Zero/Loss	689	16.34%	137562	4.94%
$1-$25000	335	7.93%	1564566	56.15%
$25001-$50000	518	12.27%	641643	23.03%
$50001-$75000	435	10.30%	?	?
$75001-$100000	500	11.84%	?	?
$100001+	693	16.41%	39069	1.40%
Not Specified/DK/Refused	1053	24.93%	258768	9.29%

The differences seen within the proportions columns of this table between the IALS and Census are likely to be attributable to lack of knowledge regarding the income level splits used in the IALS. A quintile split on the levels of income from the Census has not produced comparable levels in this case.

Marital Status (n=4223 for IALS and n=2786220 for Census)

	IALS		Census	
Status	**Number**	**Proportion (%)**	**Number**	**Proportion (%)**
Married	1949	46.15%	1345578	48.29%
Widowed	73	1.73%	164973	5.92%
Divorced/Separated	364	8.62%	245661	8.82%
Other (Never Married and Single)	912	21.60%	844185	30.30%
Not specified	925	21.90%	185823	6.67%

N.B. Marital Status for the Census is taken from the table 'Marital Status – Legal for NZ adult'

Appendix D

	Counts of Adults Participating in Courses								
	Estimated from IALS survey weights			Estimated Total Counts Adjusted for 1996 Census			Estimated Total Counts Adjusted for 2001 Census		
	Level 1	Level 2	Level 3+	Level 1	Level 2	Level 3+	Level 1	Level 2	Level 3+
Age									
16:25	65,000	111,000	244,000	62,000	105,000	231,000	58,000	99,000	219,000
26:35	35,000	76,000	204,000	33,000	70,000	190,000	30,000	65,000	176,000
36:45	23,000	65,000	210,000	21,000	59,000	192,000	23,000	64,000	208,000
46:55	30,000	46,000	117,000	28,000	44,000	111,000	32,000	50,000	126,000
56:65	9,000	17,000	56,000	9,000	17,000	55,000	10,000	19,000	64,000
Gender									
Male	83,000	141,000	403,000	82,000	139,000	397,000	84,000	142,000	405,000
Female	79,000	173,000	429,000	71,000	156,000	386,000	74,000	162,000	402,000
Ethnicity									
European	82,000	221,000	717,000	77,000	207,000	673,000	77,000	207,000	672,000
Maori	43,000	52,000	67,000	41,000	49,000	63,000	41,000	49,000	63,000
Pacific	17,000	24,000	15,000	19,000	26,000	16,000	22,000	31,000	19,000
Asian	15,000	17,000	25,000	15,000	16,000	24,000	22,000	23,000	35,000
Other	5,000	2,000	9,000	1,000	0	3,000	2,000	1,000	5,000
Work									
Full time	76,000	191,000	540,000	67,000	186,000	505,000	71,000	178,000	505,000
Part time	15,000	50,000	140,000	15,000	48,000	134,000	15,000	48,000	135,000
Looking	21,000	10,000	6,000	27,000	12,000	8,000	28,000	13,000	9,000
No work	50,000	64,000	145,000	44,000	45,000	134,000	43,000	55,000	126,000
Education									
Lwr2dry	114,000	172,000	216,000	92,000	138,000	174,000	82,000	123,000	154,000
Upr2dry	29,000	84,000	251,000	22,000	63,000	187,000	22,000	64,000	192,000
NonUni	12,000	35,000	201,000	7,000	19,000	107,000	9,000	24,000	139,000

Univ	7,000	23,000	164,000	18,000	61,000	425,000	20,000	70,000	491,000
Language									
English	121,000	228,000	646,000	117,000	220,000	625,000	117,000	221,000	627,000
Maori	19,000	33,000	35,000	11,000	19,000	20,000	11,000	19,000	20,000
Other	23,000	53,000	151,000	22,000	52,000	148,000	26,000	62,000	175,000
Born in NZ									
Yes	127,000	253,000	688,000	114,000	226,000	616,000	115,000	228,000	621,000
No	35,000	61,000	143,000	39,000	69,000	161,000	44,000	76,000	179,000
Occupation									
Professional	19,000	63,000	362,000	17,000	56,000	319,000	19,000	64,000	370,000
Clerical	14,000	42,000	114,000	10,000	32,000	86,000	10,000	32,000	86,000
Service	28,000	87,000	171,000	21,000	64,000	126,000	21,000	66,000	130,000
Skilled	32,000	50,000	92,000	21,000	33,000	61,000	21,000	32,000	59,000
Unskilled	14,000	22,000	26,000	12,000	19,000	22,000	11,000	17,000	20,000
Industry									
Primary	15,000	20,000	44,000	11,000	15,000	34,000	10,000	14,000	32,000
Manufacturing	25,000	52,000	84,000	16,000	34,000	56,000	16,000	33,000	54,000
Construction	5,000	15,000	32,000	5,000	13,000	27,000	5,000	14,000	29,000
Trade	24,000	69,000	161,000	17,000	50,000	117,000	18,000	53,000	123,000
Communications	3,000	10,000	49,000	2,000	8,000	37,000	2,000	8,000	38,000
Business	11,000	20,000	103,000	11,000	21,000	108,000	13,000	24,000	125,000
Social	24,000	80,000	292,000	18,000	60,000	218,000	21,000	69,000	251,000

N.B. Note statistical significance is not relevant as changes from 1996 to 2001 reflect census counts only. There is no sampling variability involved.

For the categories of each demographic variable and level of literacy the IALS survey provided estimates of the proportion attending training courses. Using the survey weights these were converted into estimates of numbers.

These proportions could also be multiplied by census counts of people in each category of the demographic variables as counted in the 1996 and 2001 censuses. The estimates show the effect of changes in the size of demographic categories, but assume that the proportion at each literacy level and attending courses has remained constant in each category. These notes are relevant also for the table outlined in Appendix E.

Appendix E

	Counts of Adults Not Participating in Courses								
	Estimated from IALS survey weights			Estimated Total Counts Adjusted for 1996 Census			Estimated Total Counts Adjusted for 2001 Census		
	Level 1	Level 2	Level 3+	Level 1	Level 2	Level 3+	Level 1	Level 2	Level 3+
Age									
16:25	34,000	56,000	54,000	32,000	53,000	52,000	30,000	50,000	49,000
26:35	80,000	95,000	121,000	74,000	88,000	112,000	69,000	82,000	104,000
36:45	71,000	87,000	133,000	65,000	80,000	122,000	70,000	86,000	132,000
46:55	69,000	96,000	95,000	65,000	91,000	90,000	74,000	103,000	102,000
56:65	76,000	78,000	62,000	75,000	77,000	61,000	86,000	88,000	70,000
Gender									
Male	133,000	208,000	219,000	131,000	204,000	215,000	134,000	208,000	219,000
Female	197,000	205,000	247,000	177,000	184,000	222,000	185,000	192,000	232,000
Ethnicity									
European	176,000	322,000	421,000	165,000	302,000	395,000	165,000	302,000	395,000
Maori	74,000	62,000	27,000	70,000	58,000	25,000	70,000	58,000	25,000
Pacific	35,000	7,000	4,000	38,000	7,000	4,000	46,000	9,000	5,000
Asian	38,000	17,000	9,000	36,000	16,000	9,000	52,000	24,000	13,000
Other	7,000	5,000	5,000	2,000	1,000	2,000	4,000	2,000	3,000
Work									
Full time	122,000	204,000	263,000	108,000	187,000	244,000	114,000	191,000	246,000
Part time	39,000	61,000	81,000	36,000	58,000	78,000	38,000	59,000	78,000
Looking	34,000	24,000	8,000	44,000	31,000	12,000	46,000	33,000	11,000
No work	134,000	122,000	113,000	118,000	110,000	103,000	117,000	106,000	98,000
Education									
Lwr2dry	265,000	282,000	193,000	213,000	227,000	155,000	189,000	202,000	138,000
Upr2dry	30,000	78,000	129,000	23,000	58,000	96,000	23000	60,000	99,000
NonUni	20,000	39,000	89,000	11,000	21,000	47,000	14,000	27,000	61,000

Univ	10,000	14,000	55,000	25,000	36,000	143,000	29,000	41,000	165,000
Language									
English	230,000	344,000	401,000	222,000	333,000	388,000	223,000	334,000	389,000
Maori	53,000	25,000	15,000	29,000	14,000	8,000	31,000	14,000	9,000
Other	47,000	43,000	49,000	46,000	43,000	48,000	54,000	51,000	57,000
Born in NZ									
Yes	240,000	344,000	371,000	214,000	307,000	332,000	216,000	310,000	335,000
No	90,000	69,000	95,000	101,000	77,000	106,000	112,000	85,000	118,000
Occupation									
Professional	19,000	47,000	123,000	17,000	41,000	108,000	20,000	48,000	126,000
Clerical	9,000	44,000	61,000	7,000	34,000	47,000	7,000	34,000	47,000
Service	39,000	92,000	94,000	29,000	67,000	69,000	30,000	70,000	72,000
Skilled	77,000	101,000	86,000	51,000	67,000	57,000	49,000	65,000	56,000
Unskilled	33,000	19,000	15,000	28,000	17,000	13,000	26,000	15,000	12,000
Industry									
Primary	28,000	43,000	49,000	21,000	32,000	37,000	20,000	31,000	35,000
Manufacturing	61,000	70,000	66,000	40,000	46,000	43,000	39,000	44,000	42,000
Construction	9,000	28,000	32,000	7,000	24,000	27,000	8,000	25,000	29,000
Trade	21,000	62,000	66,000	15,000	45,000	48,000	16,000	47,000	51,000
Communications	12,000	17,000	26,000	9,000	12,000	19,000	9,000	13,000	20,000
Business	7,000	25,000	39,000	7,000	26,000	41,000	8,000	30,000	48,000
Social	40,000	59,000	102,000	30,000	44,000	76,000	34,000	50,000	88,000

Appendix F

	Total Counts of Adults Participating and Not Participating in Courses for Appendices D and E		
	1996 IALS	**1996 Census**	**2001 Census**
Age			
16:25	564000	535000	505000
26:35	611000	567000	526000
36:45	589000	539000	583000
46:55	453000	429000	487000
56:65	298000	294000	337000
TOTAL	**2515000**	**2364000**	**2438000**
Gender			
Male	1187000	1168000	1192000
Female	1330000	1196000	1247000
TOTAL	**2517000**	**2364000**	**2439000**
Ethnicity			
European	1939000	1819000	1818000
Maori	325000	306000	306000
Pacific	102000	110000	132000
Asian	121000	116000	169000
Other	29000	9000	17000
TOTAL	**2516000**	**2360000**	**2442000**
Work			
Full time	1396000	1297000	1305000
Part time	386000	369000	373000
Looking	103000	134000	140000
No work	628000	554000	545000
TOTAL	**2513000**	**2354000**	**2363000**
Education			
Lwr2dry	1242000	999000	888000
Upr2dry	601000	449000	460000
NonUni	396000	212000	274000
Univ	273000	708000	816000
TOTAL	**2512000**	**2368000**	**2438000**
Language			
English	1970000	1905000	1911000
Maori	180000	101000	104000
Other	366000	359000	425000
TOTAL	**2516000**	**2365000**	**2440000**
Born in NZ			
Yes	2023000	1809000	1825000
No	493000	553000	614000
TOTAL	**2516000**	**2362000**	**2439000**
Occupation			
Professional	633000	558000	647000
Clerical	284000	216000	216000

Service	511000	376000	389000
Skilled	438000	290000	282000
Unskilled	129000	111000	101000
TOTAL	**1995000**	**1551000**	**1635000**
Industry			
Primary	199000	150000	142000
Manufacturing	358000	235000	228000
Construction	121000	103000	110000
Trade	403000	292000	308000
Communications	117000	87000	90000
Business	205000	214000	248000
Social	597000	446000	513000
TOTAL	**2000000**	**1527000**	**1639000**

Appendix G

Error Tables for Prose, Document, and Quantitative Classification Trees

Prose

Root node error: 1316/3301 = 0.4

n=3301 (922 observations deleted due to missing)

	CP	nsplit	rel error	xerror	xstd
1	0.2219	0	1.00	1.00	0.021
2	0.0270	1	0.78	0.78	0.020
3	0.0213	3	0.72	0.81	0.020
4	0.0190	5	0.68	0.79	0.020
5	0.0106	7	0.64	0.78	0.020
6	0.0034	8	0.63	0.76	0.020
7	0.0030	13	0.62	0.74	0.020
8	0.0030	22	0.59	0.74	0.020

Document

Root node error: 1514/3301 = 0.46

n=3301 (922 observations deleted due to missing)

	CP	nsplit	rel error	xerror	xstd
1	0.3461	0	1.00	1.00	0.019
2	0.0221	1	0.65	0.65	0.017
3	0.0076	3	0.61	0.62	0.017
4	0.0066	8	0.57	0.62	0.017
5	0.0046	10	0.56	0.61	0.017
6	0.0040	12	0.55	0.64	0.017

Quantitative

Root node error: 1486/3301 = 0.45

n=3301 (922 observations deleted due to missing)

	CP	nsplit	rel error	xerror	xstd
1	0.2934	0	1.00	1.00	0.019
2	0.0219	1	0.71	0.71	0.018
3	0.0128	3	0.66	0.67	0.018
4	0.0074	5	0.64	0.67	0.018
5	0.0071	6	0.63	0.65	0.018
6	0.0047	9	0.61	0.65	0.018
7	0.0040	10	0.60	0.68	0.018

Appendix H

Territorial Land Authority (TLA) Regional Proportions of Low Literacy	
Based on 1996 Census	
TLA	**Proportion**
Far North	0.446
Whangarei	0.396
Kaipara	0.414
Rodney	0.349
North Shore	0.331
Waitakere	0.397
Auckland	0.375
Manukau	0.452
Papakura	0.410
Franklin	0.385
Thames - Coromandel	0.388
Hauraki	0.414
Waikato	0.407
Matamata - Piako	0.384
Hamilton	0.360
Waipa	0.371
Otorohanga	0.418
South Waikato	0.448
Waitomo	0.439
Taupo	0.407
West BOP	0.380
Tauranga	0.377
Rotorua	0.410
Whakatane	0.434
Kawerau	0.498
Opotiki	0.490
Gisborne	0.444
Wairoa	0.492
Hastings	0.398
Napier	0.385
Central Hawkes Bay	0.395
New Plymouth	0.377
Stratford	0.394
South Taranaki	0.411
Ruapehu	0.434
Wanganui	0.397
Rangitikei	0.401
Manawatu	0.376
Palmerston North	0.346
Tararua	0.400
Horowhenua	0.419
Kapiti Coast	0.350
Porirua	0.432

Upper Hutt	0.360
Lower Hutt	0.379
Wellington	0.308
Masterton	0.391
Carterton	0.383
South Wairarapa	0.388
Tasman	0.349
Nelson	0.346
Marlborough	0.360
Kaikoura	0.384
Buller	0.397
Grey	0.381
Westland	0.379
Hurunui	0.352
Waimakariri	0.357
Christchurch	0.345
Banks Peninsula	0.318
Selwyn	0.332
Ashburton	0.372
Timaru	0.373
Mackenzie	0.342
Waimate	0.379
Waitaki	0.377
Central Otago	0.358
Queenstown – Lakes	0.303
Dunedin	0.334
Clutha	0.386
Southland	0.381
Gore	0.391
Invercargill	0.390

Appendix I

Recommendations for Future Adult Literacy Surveys

Recommendations are made here in relation to future surveys of the 1996 IALS ilk in New Zealand.

One such recommendation relates to changes in the rate of unemployment since 1996. The amount of people in employment is higher now than in 1996 when the IALS was carried out. If the literacy rate is assumed to be similar across this time gap, it can be assumed that those with low literacy have been pulled into the workforce. This raises several pertinent questions that further surveys could look into such as:

- Do those who are employed now have on average lower literacy levels than previous years?

- Have there been changes across the population in terms of literacy levels in employment or certain occupations?

- Has engaging in employment helped the literacy skills of those who otherwise (from the 1996 IALS data and unemployment rates) would have been unemployed and not expected to make use of those skills (at least to the same degree)?

Other pertinent recommendations and questions include:

- Has there been a change in literacy levels of those required to stay in school for longer periods (i.e. does staying at school until you are 16 as opposed to leaving when you are 15 improve your subsequent literacy level upon leaving school)?

- The total number in the sample for the New Zealand IALS was 5720, with 4223 (74%) respondents who completed either all or part of the survey. Those who completed the full IALS NZ survey make up 3311 respondents (58% of the total sample). The final data file could have been improved via more useful information being extracted from those 922 respondents who chose not to participate fully in the survey. One suggestion that it is believed would greatly improve the usefulness of the survey is for future surveys to have interviewers who make an assessment of the literacy level of the person they are speaking with, if that person does not wish to fully participate in the survey. This assessment by the interviewer could take the form of a few standard questions, thus removing the need for pure subjective judgment. The information gleaned on literacy levels (rather than imputed literacy levels later judged based on the sample who did respond fully) could then be used to ascertain whether the sample who did not respond fully is different in any systematic way to those who did, thus giving more validity to the data derived from the analysis. It is a limitation of the sample used here and in the IALS that just over one-fifth of the respondents had imputed literacy scores.

- It was also noted that Pacific Peoples participation rates in adult training is significantly higher than any other ethnic group for level 2 literacy proficiency and above. It would be interesting to investigate what type of adult training this particular ethnic group appears to be drawn towards, as considering this group also has lower levels of literacy proficiency overall when compared to European and Maori, these courses could provide a gateway within which to implement and provide access to some literacy training if needed.

- As a recommendation to inform policy, adequate figures on adult literacy levels and prevalence in New Zealand could be best obtained through literacy surveys being undertaken on a regular basis, perhaps over the next five years. This regular survey would need to involve an instrument that is able to test literacy as defined by the IALS without the need for a multi-hour long interview. This type of survey could be included within the 3 monthly HLFS for example.

- Finally, in this analysis, differences in participation rates for adult training courses were found between gender and literacy proficiency level. Males in level 1 were more likely to be participating, while in level 2, females were more likely to be the ones participating in an adult training programme. However, once level 3 or above literacy proficiency was gained, the amount of participation was similar across gender. Further analyses are needed to determine if this effect can be replicated and, if so, to determine the influencing factors that affect this difference.