



# New Zealand socio-economic index 2013

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# Contents

<b>Acknowledgements</b> .....	<b>8</b>
<b>Abbreviations used in this report</b> .....	<b>9</b>
<b>Executive summary</b> .....	<b>10</b>
Using NZSEI-13 .....	11
<b>1 Introduction and background to the report</b> .....	<b>12</b>
1.1 Development of NZSEI .....	12
1.2 Issues for resolution in NZSEI-13 study .....	17
1.3 Planned validation of NZSEI-13 .....	19
1.4 Summary .....	20
<b>2 NZSEI-13 dataset</b> .....	<b>21</b>
2.1 Construction of the variables for NZSEI-13 .....	21
2.2 Selected demographic data .....	26
2.3 Summary and discussion .....	38
<b>3 Construction of NZSEI-13 scale</b> .....	<b>40</b>
3.1 Statistical algorithm used in the construction of NZSEI-13 scale .....	40
3.2 Inflating part-time incomes .....	41
3.3 Assessment of potential understatement of income of self-employed workers .....	41
3.4 NZSEI-13 scores .....	42
3.5 Overall effect of including part-time workers .....	43
3.6 Dividing NZSEI-13 scores into socio-economic groups .....	44
3.7 Summary and discussion .....	45
<b>4 Assessing the finalised NZSEI-13</b> .....	<b>46</b>
4.1 Comparison between NZSEI-13 and NZSEI-06 .....	46
4.2 Analyses by sex .....	47
4.3 Analyses by ethnicity .....	49
4.4 Analyses by rurality .....	57
4.5 Analyses by region .....	59
4.6 Analyses by country of birth .....	61
4.7 Summary and discussion .....	63
<b>5 Construct validation of NZSEI-13</b> .....	<b>65</b>
5.1 Smoking prevalence .....	65
5.2 Housing tenure .....	69
5.3 Deprivation .....	72
5.4 Summary and discussion .....	75
<b>6 Imputing NZSEI-13 scores in the absence of occupational data</b> .....	<b>76</b>

6.1 Imputing NZSEI-13 scores: results.....	76
6.2 Comparison of actual and imputed scores.....	79
6.3 Validation against health and socio-economic correlates.....	80
6.4 Summary and discussion .....	82
<b>7 Conclusion .....</b>	<b>83</b>
7.1 Advantages of NZSEI-13 as a measure of socio-economic status.....	83
7.2 Limitations of NZSEI-13.....	84
7.3 Future work.....	84
<b>8 References.....</b>	<b>86</b>
<b>Appendix I: Occupation by sex.....</b>	<b>88</b>
<b>Appendix II: Occupations of waged and self-employed workers .....</b>	<b>92</b>
<b>Appendix III: Final NZSEI-13 scores .....</b>	<b>96</b>
<b>Appendix IV: NZSEI-13 groups and final scores.....</b>	<b>102</b>
<b>Appendix V: Using NZSEI-13.....</b>	<b>106</b>
Coding occupation .....	106
Coding NZSEI-13.....	106
Coding those not in the workforce.....	107



# List of tables and figures

## Tables by chapter

<b>1 Introduction and background to the report</b> .....	<b>12</b>
1 NZSEI-06 results aggregated at ANZSCO sub-major group (two-digit level), 2006 Census.....	14
2 Distribution of workforce over NZSEI groups, 2006 Census .....	16
<b>2 NZSEI-13 dataset</b> .....	<b>21</b>
3 Educational classifications converted to years of education, 2013 Census .....	21
4 Highest qualification and years of education, workers aged 21–69 years, 2006 and 2013 Censuses .....	22
5 Proportion of workers in various income bands, workers aged 21–69 years, 2006 and 2013 Censuses.....	23
6 Income bands and assigned mid points, 2013 Census .....	24
7 Income by occupation, workers aged 21–69 years, 2013 Census .....	26
8 Income distribution by ethnicity, workers aged 21–69 years, 2013 Census.....	27
9 Highest qualifications by ethnicity, workers aged 21–69 years, 2013 Census.....	28
10 Occupation by ethnicity, workers aged 21–69 years, 2013 Census.....	29
11 Income distribution by rurality, workers aged 21–69 years, 2013 Census .....	30
12 Highest qualifications by rurality, workers aged 21–69 years, 2013 Census .....	31
13 Occupation by rurality, workers aged 21–69 years, 2013 Census .....	32
14 Income distribution by region, workers aged 21–69 years, 2013 Census .....	33
15 Highest qualifications by region, workers aged 21–69 years, 2013 Census .....	34
16 Occupation by region, workers aged 21–69 years, 2013 Census .....	35
17 Income distribution by country of birth, workers aged 21–69 years, 2013 Census .....	36
18 Highest qualifications by country of birth, workers aged 21–69 years, 2013 Census.....	37
19 Occupation by country of birth, workers aged 21–69 years, 2013 Census .....	38
<b>3 Construction of NZSEI-13 scale</b> .....	<b>40</b>
20 Comparison of beta values, NZSEI-13, NZSEI-06, NZSEI-96, NZSEI-91, ANU4, AUSEI06, and ISEI-88 .....	43
21 NZSEI-13 scores, full-time workers, and full-time and part-time workers combined .....	44
22 Suggested SES group divisions, six, four (quartile), and 10 (decile) groups.....	45
<b>4 Assessing the finalised NZSEI-13</b> .....	<b>46</b>
23 Differences in mean income and education, males compared with females.....	49
24 Differences in mean income, European ethnic group compared with Māori, Pacific, Asian, and MELAA.....	55
25 Differences in mean education, European ethnic group compared with Māori, Pacific, Asian, and MELAA.....	56

26 Differences in mean income and education, urban compared with rural.....	59
27 Differences in mean income and education, Auckland compared with the rest of New Zealand.....	61
28 Differences in mean income and education, workers born in New Zealand (NZ) compared with workers born overseas.....	63
<b>5 Construct validation of NZSEI-13 .....</b>	<b>65</b>
29 Odds ratios for smoking, NZSEI-13 continuous measure .....	68
30 Odds ratios for living in an owned home, NZSEI-13 continuous measure .....	71
31 Regression coefficients for scores on the NZDep2013 scale, NZSEI-13 continuous measure .....	74
<b>6 Imputing NZSEI-13 scores in the absence of occupational data .....</b>	<b>76</b>
32 Distribution of people with an occupation, by age-band and qualification, 2013 Census.....	77
33 Imputed mean NZSEI-13 scores, for each age/qualification category.....	78
34 Mean error (absolute difference) between imputed and actual NZSEI-13 scores...80	
<b>7 Conclusion .....</b>	<b>83</b>
<b>8 References.....</b>	<b>86</b>
A1 Occupation by sex, workers aged 21–69 years, 2013 Census .....	88
A2 Occupations of waged and self-employed workers, full- and part-time workers aged 21–69 years, 2013 Census.....	92
A3 Final NZSEI-13 scores, ANZSCO major, sub-major, and minor group level .....	96
A4 NZSEI-13 groups and final scores .....	102
A5 Suggested imputed NZSEI-13 scores for those not in the workforce, based on age and highest qualification .....	108

## Figures by chapter

<b>1 Introduction and background to the report.....</b>	<b>12</b>
1 Representation of NZSEI path model.....	13
<b>2 NZSEI-13 dataset .....</b>	<b>21</b>
<b>3 Construction of NZSEI-13 scale.....</b>	<b>40</b>
2 Difference between waged and self-employed incomes for minor group occupations.....	42
<b>4 Assessing the finalised NZSEI-13.....</b>	<b>46</b>
3 NZSEI-06 scores versus NZSEI-13 scores, ANZSCO minor group .....	46
4 Comparison of male and female NZSEI-13 scores, ANZSCO minor group .....	47
5 Mean values for income, years of education, and age, males compared with females for each occupation (ANZSCO minor group) .....	48
6 NZSEI-13 scores (ANZSCO minor group), comparison of ethnicities .....	50

7 Mean income (\$000s) for ANZSCO minor group occupations, comparison of ethnicities .....	51
8 Mean years of education for ANZSCO minor group occupations, comparison of ethnicities .....	52
9 Mean age (years) for ANZSCO minor group occupations, comparison of ethnicities .....	53
10 Comparison of urban and rural NZSEI-13 scores, ANZSCO minor group .....	57
11 Mean values for income, years of education, and age, urban compared with rural for each occupation (ANZSCO minor group) .....	58
12 Comparison of Auckland and rest of New Zealand NZSEI-13 scores, ANZSCO minor group .....	60
13 Mean values for income, years of education, and age, Auckland compared with the rest of New Zealand for each occupation (ANZSCO minor group).....	61
14 NZSEI-13 scores for workers born overseas and workers born in New Zealand, ANZSCO minor group.....	62
15 Mean values for income, years of education, and age, workers born overseas vs workers born in New Zealand (ANZSCO minor group).....	63
<b>5 Construct validation of NZSEI-13 .....</b>	<b>65</b>
16 Smoking prevalence, by NZSEI-13 SES group.....	66
17 Smoking prevalence, by NZSEI-13 SES group, sex, and ethnicity .....	67
18 Odds ratios for smoking, NZSEI-13 categorical measure .....	68
19 Home renting, by NZSEI-13 SES group.....	69
20 Home renting, By NZSEI-13 SES group, sex, and ethnicity .....	70
21 Odds ratios for housing tenure, NZSEI-13 categorical measure .....	71
22 Mean scores on NZDep2013 scale, by NZSEI-13 SES group .....	72
23 Mean scores on NZDep2013 scale, by NZSEI-13 SES group, sex, and ethnicity ..	73
24 Regression coefficients for scores on the NZDep2013 scale, NZSEI-13 categorical measure .....	74
<b>6 Imputing NZSEI-13 scores in the absence of occupational data .....</b>	<b>76</b>
25 Odds ratios for smoking and housing tenure, comparison between actual and imputed NZSEI-13 scores (per 10 units).....	81
26 Regression coefficients for scores on the NZDep2013 scale, comparison between actual and imputed NZSEI-13 scores (per 10 units) .....	82
<b>7 Conclusion .....</b>	<b>83</b>
<b>8 References.....</b>	<b>86</b>

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## Abbreviations used in this report

ANU4	Australian National University occupational status scale 4
ANZSCO	Australian and New Zealand Standard Classification of Occupations
AUSEI	Australian socio-economic index
AUSEI06	Australian socio-economic index 2006
ISEI	International socio-economic index
ISEI-88	International socio-economic index 1988
MELAA	Middle Eastern, Latin American, and African
NZDep	NZDep index of deprivation
NZDep2006	NZDep index of deprivation 2006
NZDep2013	NZDep index of deprivation 2013
NZiDep	New Zealand index of socioeconomic deprivation for individuals
NZSEI	New Zealand socio-economic index
NZSEI-06	New Zealand socio-economic index 2006
NZSEI-13	New Zealand socio-economic index 2013
NZSEI-91	New Zealand socio-economic index 1991
NZSEI-96	New Zealand socio-economic index 1996
NZSCO90	New Zealand Standard Classification of Occupations 1990
NZSCO95	New Zealand Standard Classification of Occupations 1995
SES	Socio-economic status

# Executive summary

This report describes the construction and initial assessment of the New Zealand socio-economic index 2013 (NZSEI-13), which is an update of the New Zealand socio-economic index (NZSEI) using 2013 Census data. Both NZSEI-13 socio-economic scores (ranging from 10–90) and NZSEI-13 socio-economic groups (a six-group classification; NZSEI-13 quartiles; and NZSEI-13 deciles) are described and evaluated.

**Section 1** describes the construction of the previous NZSEI indexes – NZSEI-91 derived from 1991 Census data, NZSEI-96 derived from 1996 Census data, and NZSEI-06 derived from 2006 Census data. The validation of NZSEI-06 is also summarised. Issues to be considered in the development of NZSEI-13 are described. These include validating results for:

- (i) a wider range of New Zealand ethnic groups
- (ii) urban and rural regions
- (iii) Auckland, in comparison to the rest of New Zealand
- (iv) those who are born in New Zealand, in comparison to those born overseas.

**Section 2** describes the variables used to construct NZSEI-13 and cross-tabulates relevant demographic data from the 2013 Census against these variables.

**Section 3** describes the construction of NZSEI-13. This was constructed using data for both full- and part-time workers, with income adjustments for those in part-time work. The beta values obtained during construction of NZSEI-13 are presented for each of the regression paths estimated, and comparisons with NZSEI-06, the Australian socio-economic index 2006 (AUSEI06), and the International socio-economic index (ISEI) are made. The beta values for the education-occupation and the occupation-income paths were found to be very similar to NZSEI-06, and close to AUSEI06 and ISEI values. Pragmatic ways to divide NZSEI-13 scores into discrete categorical occupational socio-economic groups are described in this section. Four-group, six-group, and 10-group categorisations are described.

**Section 4** describes two assessments of the finalised NZSEI-13.

First, a comparison between NZSEI-13 and the earlier NZSEI-06 showed that both scales classified individuals from the 2013 Census almost identically (correlation:  $r > 0.99$ ).

Second, an assessment was undertaken of whether NZSEI-13 methodology assigns scores similarly for males and females, different ethnic groups, urban and rural workers, different regions, and different countries of birth. This showed that, despite some differences in average scores, occupations were classified very similarly by sex-specific, ethnic-specific, region-specific, and country-of-birth-specific scales. This suggests that NZSEI-13 applies to both sexes, these ethnic groups, both urban and rural workers, both workers in Auckland and the rest of New Zealand, and both workers born in New Zealand and workers born overseas.

**Section 5** describes validation of NZSEI-13 against three constructs – smoking, housing tenure, and residential deprivation. NZSEI-13 showed expected socio-economic patterning for each of these outcomes, with results strongest for smoking.

**Section 6** uses a method for imputing NZSEI-13 scores when data on occupation are unavailable, based on the average NZSEI-13 score by age and education.

An evaluation of this method against revealed a moderate correlation between imputed and actual scores ( $r = 0.58$ ), and mean absolute differences between imputed and actual scores ranging from 10-21 points (mean = 12.35) across age-by-education groups. Imputed scores validated well against health and socio-economic correlates – at least as

well (if not better) than actual NZSEI-13 scores. However, this method produced a restricted range of scores compared with the actual NZSEI-13, suggesting that it is unsuitable for the assignment of socio-economic groups.

**Section 7** concludes the report, with a summary of key findings and their implications for future work in the assessment of occupation-based socio-economic status, as well as a discussion of advantages and disadvantages of the scale.

## Using NZSEI-13

Use of NZSEI-13 is not recommended without first understanding the theoretical framework and construction described in this book. However, readers already familiar with this understanding from previous NZSEI versions may wish to refer directly to appendixes III to V for information on how to use NZSEI-13.

**Appendix III** presents a list of NZSEI-13 scores for each ANZSCO major, sub-major, and minor group occupation.

**Appendix IV** presents a list of NZSEI-13 groups for each ANZSCO minor group occupation.

**Appendix V** presents some brief notes on how to use NZSEI-13 and a table of 'imputed' NZSEI-13 scores to be used for individuals for whom there are no occupational data.

# 1 Introduction and background to the report

This report describes the construction of an updated version of the New Zealand socio-economic index (NZSEI), an occupation-based measure of socio-economic status (SES). The original version, NZSEI-91, was derived using 1991 Census data (Davis, McLeod, Ransom, & Ongley, 1997), and there have been two follow-ups: NZSEI-96 was derived using 1996 Census data (Davis, Jenkin, & Coope, 2003), and NZSEI-06 was derived using 2006 Census data (Milne, Byun, & Lee, 2013). This section describes the development of NZSEI, including some results from a previous version (NZSEI-06), and outlines the issues to be tackled in the construction of NZSEI-13.

## 1.1 Development of NZSEI

### Theoretical basis

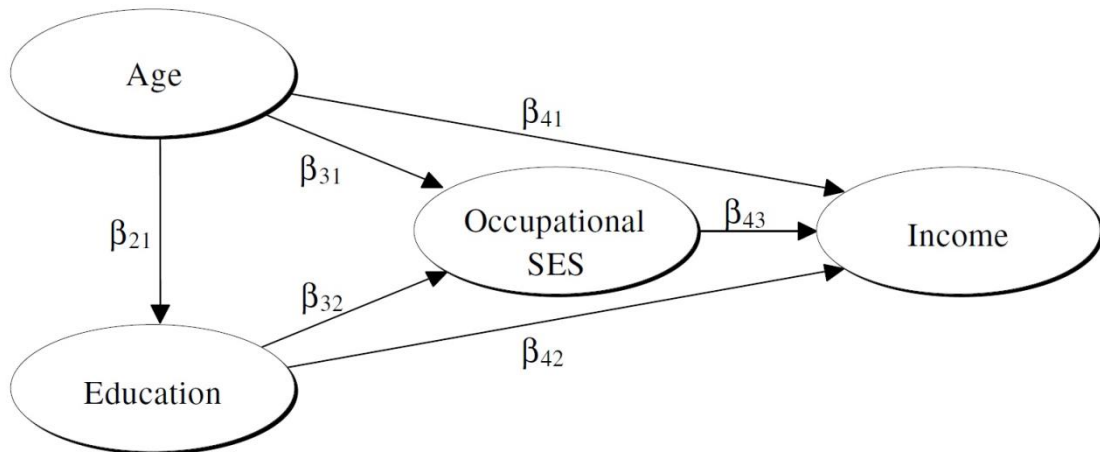
The forerunner of NZSEI was the widely-used Elley-Irving scale (Elley & Irving 1972; 1976; 1985; Irving & Elley, 1977), which assigned occupations into one of six SES groups based on equal weighting of the education level and income associated with each occupation. NZSEI represented an attempt to derive an occupation-based measure of SES for New Zealand that could be used both as a continuous or group measure and was grounded on a conceptual model that differed slightly from the Elley-Irving framework, as described in the 'Statistical algorithm' section, below.

The framework used for NZSEI is the 'returns to human capital' model, which was first developed for the international socio-economic index (ISEI) (Ganzeboom, De-Graaf, Treiman, & De-Leeuw, 1992). This model posits that there is a relationship between cultural capital (ie, education) and material rewards (ie, income) and that this relationship is mediated by occupation. More simply, the 'returns to human capital' model views occupation as the means by which one's education is converted into income. Thus, differences in occupation are likely to represent differences in life chances and opportunity, and on this basis occupation can be used to stratify individuals according to socio-economic status.

### Statistical algorithm

Operationalising the 'returns to human capital' model involves specifying the path model developed for the ISEI by De Leeuw in an appendix to Ganzeboom et al (1992). Using this path model, the estimate of the effect of education on income *that is mediated by occupation* is maximised through iterative regression analysis. Occupational scores that maximise this mediated path are generated in the process. The effect of age is controlled in analyses because of its confounding relationship with education and income (ie, older people tend to have fewer qualifications but higher incomes). The model is represented in figure 1.

**Figure 1**  
Representation of NZSEI path model



The arrows linking the variables are represented in the algorithm as regression coefficients. The model as a whole is represented by a series of linear regression equations. The assumption that the effect of education on income is largely mediated by occupation is implemented by setting  $\beta_{42}$  to zero, and then estimating the values of the unobserved values of occupational score together with the remaining beta coefficients by minimising the residual sum of squares. Once this minimisation is achieved, occupational scores are taken which essentially represent an optimal weighting of education and income, controlling for age. These scores are then scaled to range from 10–90 (to match the ISEI). Note that the approach taken by the NZSEI algorithm contrasts with the Elley and Irving approach, in which the weighting of education and income is not optimised but is instead made equal.

### Construction of NZSEI-91, NZSEI-96, and NZSEI-06

For NZSEI-91, the statistical algorithm was applied to data on age, income, and education from the 1991 Census (Davis et al, 1997) for occupations classified to minor group (three-digit) level of the 1990 version of the New Zealand Standard Classification of Occupations (NZSCO90) (Department of Statistics, 1992). For the updated NZSEI-96, the statistical algorithm was applied to data on age, income, and education from the 1996 Census (Davis et al, 2003) for occupations classified to minor group (three-digit) level of the 1995 version of the New Zealand Standard Classification of Occupations (NZSCO95) (Statistics NZ, 1995). For the updated NZSEI-06, the statistical algorithm was applied to data on age, income, and education from the 2006 Census (Milne et al, 2013) for occupations classified to minor group (three-digit) level of the new occupational classification system of that year – the Australian and New Zealand Standard Classification of Occupation (ANZSCO).

Data on age, income, and education were treated in the following way for each NZSEI scale.

**Age** was coded in years. Only those in the workforce aged 21–69 years were included.

**Income** was taken as the total personal income (before tax) from all sources as recorded in income bands. For the purpose of analysis, a mid-point dollar value was taken for each band, with the mid-point of the upper ‘open-ended’ band assigned based on data on exact income derived from the Household Economic Survey. Log values of income were taken to account for the skewed distribution of incomes.

**Education** was taken as the highest qualification attained, converted into years of education, using a scale provided by the Ministry of Education.

## Results of the occupational scoring exercise

By way of background, construction details and descriptive results are presented here for NZSEI-06 only. Readers are referred to Davis et al (1997; 2003) for construction details and descriptive results for NZSEI-91 and NZSEI-96, respectively.

NZSEI-06 scores were derived by analysing data from 1,690,983 full- and part-time workers aged 21–69 years. Scores were initially calculated for the full-time workforce alone and then recalculated after adding in the part-time workforce. The incomes of part-time workers were inflated to a full-time equivalent. Final scores were assigned to 97 minor group (three-digit) occupations from ANZSCO and scaled to range from 10 (low SES) for Food Preparation Assistants (minor group 851) to 90 (high SES) for Medical Practitioners (minor group 253). The results were also centred (so that the mean was around 50) by taking the square root of the original scores. NZSEI-06 scores for occupations at the sub-major group (two-digit) level of ANZSCO are presented in table 1. Six SES 'groups' were determined from NZSEI-06 scores, in line with the Elley and Irving scale (see table 2).

To test the robustness of NZSEI-06, comparisons were undertaken between scales constructed separately for males and females, and for four ethnic groups: European and Other (including New Zealander), Māori, Pacific, and Asian. These comparisons revealed some minor sex and ethnic differences, but overall the scale classified occupations similarly for males and females, and for these ethnic groups.

**Table 1**

### NZSEI-06 results aggregated at ANZSCO sub-major group (two-digit level)

2006 Census

ANZSCO code	ANZSCO sub-major group	NZSEI-06 aggregated score
11	Chief Executives, General Managers and Legislators	59
12	Farmers and Farm Managers	36
13	Specialist Managers	59
14	Hospital, Retail and Service Managers	43
21	Arts and Media Professionals	59
22	Business, Human Resource and Marketing Professionals	68
23	Design, Engineering, Science and Transport Professionals	67
24	Education Professionals	74
25	Health Professionals	74
26	ICT Professionals	67
27	Legal, Social and Welfare Professionals	72
31	Engineering, ICT and Science Technicians	55
32	Automotive and Engineering Trades Workers	40
33	Construction Trades Workers	36
34	Electrotechnology and Telecommunication Trades Workers	48
35	Food Trades Workers	28

Table 1 continued next page

Table 1 continued

<b>ANZSCO code</b>	<b>ANZSCO sub-major group</b>	<b>NZSEI-06 aggregated score</b>
36	Skilled Animal and Horticultural Workers	35
39	Other Technicians and Trades Workers	38
41	Health and Welfare Support Workers	50
42	Carers and Aides	29
43	Hospitality Workers	31
44	Protective Service Workers	47
45	Sports and Personal Service Workers	47
51	Office Managers and Program Administrators	50
52	Personal Assistants and Secretaries	44
53	General Clerical Workers	44
54	Inquiry Clerks and Receptionists	37
55	Numerical Clerks	47
56	Clerical and Office Support Workers	38
59	Other Clerical and Administrative Workers	47
61	Sales Representatives and Agents	47
62	Sales Assistants and Salespersons	34
63	Sales Support Workers	33
71	Machinery and Stationary Plant Operators	27
72	Mobile Plant Operators	23
73	Road and Rail Drivers	27
74	Storepersons	26
81	Cleaners and Laundry Workers	14
82	Construction and Mining Labourers	30
83	Factory Process Workers	21
84	Farm, Forestry and Garden Workers	25
85	Food Preparation Assistants	10
89	Other Labourers	22

**Source:** Milne et al, 2013

**Table 2**  
**Distribution of workforce over NZSEI groups**  
 2006 Census

Group	NZSEI-06 range	Percent of population
1 - high	71–90	10.8
2	62–70	15.2
3	45–61	21.5
4	34–44	29.4
5	25–33	12.0
6 - low	10–24	11.1

Source: Milne et al, 2013

### Assessment and validation of NZSEI-06

It was possible to compare the scores assigned to individuals by NZSEI-06 (based on ANZSCO) with the scores assigned to individuals by NZSEI-96 (based on NZSCO95). The comparisons revealed that NZSEI-06 assigned socio-economic scores to occupations similarly, but by no means identically, to NZSEI-96 (the scores correlate at  $r = 0.79$ ). The lack of perfect correlation was perhaps not surprising, given that the two scales used different occupational classification systems, and that the relative influence of education and income on final socio-economic scores differed markedly between the two scales.

A more direct comparison between NZSEI-06 and AUSEI06 was possible, given that both scales assigned scores to the same 97 occupations (as classified by ANZSCO). The comparison revealed a strong correlation ( $r = 0.96$ ), supporting the robustness of the scale, and also suggesting a great deal of similarity between the socio-economic structure of the New Zealand and Australian workforces.

NZSEI-06 was tested against 2006 Census data on smoking, housing tenure, motor vehicle access, and residential deprivation to see if it could replicate known socio-economic patterns for these indicators. NZSEI-06 validated well against smoking, housing tenure, and residential deprivation, with results clearest for smoking and residential deprivation (Milne et al, 2013). These patterns were apparent for both males and females of each major ethnic group. However, NZSEI-06 did not validate well against motor vehicle access.

### Extension of NZSEI to individuals outside the labour market

The construction of NZSEI-06 involved developing and testing methods for deriving scores for those not in paid employment. These involved methods to estimate 'occupational potential' (Jones & McMillan, 2001). Under this concept, in the absence of information on occupation, the three variables of age, education, and income can be used to determine occupational SES. While income cannot readily be used to determine SES for those outside of the workforce – since income is affected by employment status – the remaining variables of age and educational level may provide a close approximation of a person's potential position in the occupational hierarchy.

Two methods to estimate occupational potential were undertaken for NZSEI-06, both involving assigning scores solely based on the age and education level of respondents. These included:

- (i) calculating the mean NZSEI-06 scores for each age by education level category
- (ii) regressing NZSEI-06 scores by age and education for those with an occupation.



The two different methods were evaluated by:

- (i) assessing the extent to which each correlated with actual NZSEI-06 scores
- (ii) assessing the mean error between each and the actual NZSEI-06 scores
- (iii) validating the imputed scores against health and socio-economic correlates.

These evaluations revealed that there was a remarkable consistency between the two methods of estimation. The two methods correlated similarly with actual NZSEI-06 scores, had similar mean errors, and each validated well against health and socio-economic correlates – at least as well as (if not better than) actual NZSEI-06 scores.

We will replicate the construction and evaluation of imputation method (i) for NZSEI-13 as it was suggested that this method should be preferred because of its simplicity (Milne et al, 2013, p91).

## 1.2 Issues for resolution in NZSEI-13 study

Issues to be addressed in the development of NZSEI-13 will be testing the applicability for:

- (i) a wider range of New Zealand ethnic groups
- (ii) both urban and rural workers
- (iii) workers in Auckland, in comparison to the rest of New Zealand
- (iv) both workers born in New Zealand and workers born overseas.

### **Testing the applicability of NZSEI-13 for different ethnic groups**

For NZSEI-06, separate socio-economic scales were calculated and compared for European and Other, Māori, Pacific, and Asian, to test if NZSEI-06 applied to all of these ethnic groups. For the development of NZSEI-13, the applicability of NZSEI-13 to an additional ethnic group – Middle Eastern, Latin American, and African (MELAA) – will be tested.

As for the 2006 Census, ethnicity for the 2013 Census was based on self-report, where individuals could identify with more than one ethnic group. Based on these self-reports, individuals were classified as one or more of the following six 'major' ethnic groups:

- European (77.6 percent of 21–69-year-old full- or part-time workers)
- Māori (10.6 percent)
- Pacific (4.6 percent)
- Asian (11.3 percent)
- Middle Eastern, Latin American, and African (MELAA) (1.0 percent)
- Other (2.0 percent).

The number identifying as an 'Other' ethnicity is substantially lower among 21–69-year-old full- and part-time workers in the 2013 Census (2.0 percent) compared with the 2006 Census (14.0 percent), while the number identifying as European is substantially higher in 2013 (77.6 percent) compared with 2006 (68.8 percent). In both the 2006 and 2013 Censuses, the overwhelming majority (>95 percent) of those in the Other ethnic group self-identify as 'New Zealander' (Milne et al, 2013; present data). Further, there is evidence that much of the reduction in the Other group from 2006 to 2013 is because those self-identifying as 'New Zealander' in 2006 change their classification to European in 2013 (Didham, forthcoming).

Noting the large number in the Other ethnic group in 2006, and the similarity between the European and Other ethnic groups in 2006, Statistics New Zealand recommended combining these groups into a 'European and Other (including New Zealander)' ethnic group (Statistics New Zealand, 2007). No such recommendation has been issued for the 2013 Census ethnic data. Preliminary work on this report indicated virtually identical

patterns of age, education, income, and socio-economic scores for the European and the Other ethnic groups to the point where it would be redundant to show both. As such, and in the absence of a recommendation from Statistics New Zealand to combine these two groups, results will be presented for the European ethnic group, but not for the Other ethnic group. Thus just five ethnic groups will be compared.

Note that these five ethnic groups cannot be considered mutually exclusive, as individuals could identify with more than one group. The proportion of 21–69-year-old full- and part-time workers who identify with two or more ethnic groups is:

- 8.2 percent among those identifying as European
- 51.9 percent among those identifying as Māori
- 25.7 percent among those identifying as Pacific
- 4.7 percent among those identifying as Asian
- 10.1 percent among those identifying as MELAA.

One implication of using ethnic data structured in this way is that results of ethnic-specific analyses will necessarily contain data for those who also identify with other ethnic groups (eg 52 percent for Māori, and 26 percent for Pacific). Short of creating many groups representing each different ethnic combination (which would be unwieldy and involve small numbers for some groups), we believe this approach best reflects the multi-ethnic nature of the New Zealand working population. Results need to be interpreted with this in mind, however.

Separate scales will be constructed for each of the five main ethnicities listed above to explore the comparability of NZSEI-13 scores across ethnicities. If occupational scores are patterned similarly across ethnic groups, NZSEI-13 will be considered to be applicable for each.

### **Testing the applicability of NZSEI-13 for urban and rural workers**

For NZSEI-13, separate socio-economic scales will be calculated and compared for urban and rural workers, to test if NZSEI-13 applies to both workforces. As will be shown, there are noticeable differences between urban and rural workers in their distributions of income, education, and occupation. These differences warrant an investigation of whether the socio-economic status of occupations differ for urban versus rural workers.

The proportion of full- or part-time workers aged between 21 and 69 years from the 2013 Census in each type of area was as follows:

- urban (85.1 percent)
- rural (14.9 percent).

### **Testing the applicability of NZSEI-13 for Auckland**

For NZSEI-13, separate socio-economic scales will be calculated and compared for workers in Auckland and elsewhere in New Zealand. Auckland has a distinct profile compared with the rest of New Zealand, and this is becoming more marked over time. Compared with the rest of New Zealand, Auckland has a younger median age, is much more diverse ethnically with half of all migrants arriving in New Zealand living in the Auckland region, and has higher incomes but also a higher percentage of income spent on housing (Statistics New Zealand, 2015).

Given the differences between Auckland and the rest of New Zealand, it is important to determine whether NZSEI-13 is applicable to both regions.

The proportion of full- or part-time workers aged between 21 and 69 years from the 2013 Census who were usually resident in (i) Auckland; and (ii) the rest of New Zealand was as follows:

- Auckland (32.9 percent)
- rest of New Zealand (67.1 percent).

### **Testing the applicability of NZSEI-13 for overseas-born workers**

For NZSEI-13, separate socio-economic scales will be calculated and compared for overseas-born and New Zealand-born workers, to test if NZSEI-13 applies to both. An interesting finding yielded in the development of NZSEI-06 was that the workforce of Asian New Zealanders had double the likelihood of having a tertiary degree, yet often had low incomes (Milne et al, 2006). A subsequent investigation revealed that migrant status (ie, being born overseas) was a key factor in explaining the low income of Asian New Zealand workers (Bolton, 2014).

Given workers born overseas tend to have high levels of education but are often in low-paying occupations (Bolton, 2014), and that workers born overseas comprise a substantial proportion of the New Zealand workforce (see below), it is possible that occupations may be patterned differently for New Zealand-born versus overseas-born workers. This will be investigated.

The proportion of full- or part-time workers aged between 21 and 69 years from the 2013 Census who were born in New Zealand and who were born overseas was as follows:

- born in New Zealand (71.7 percent)
- born outside of New Zealand (28.3 percent).

## **1.3 Planned validation of NZSEI-13**

### **Validation with a health behaviour**

As described above, NZSEI-06 was validated against one health behaviour: smoking. We will replicate the analysis in the current study. As was the case in 2006, data on other health indicators are not available from the 2013 Census, and readily available datasets that do collect information on these constructs (eg the 2014/15 New Zealand Health Survey, Ministry of Health, 2015) do not collect occupational information.

An opportunity to assess data from administrative health sources (eg hospitalisations and pharmaceutical use) has just become available through the addition of both administrative health data and Census 2013 data (including occupation) to the Integrated Data Infrastructure (IDI) (Statistics New Zealand, 2013). Such a wide-ranging investigation is beyond the scope of the current report, but future investigations using the IDI are planned.

### **Validation with correlates of SES**

NZSEI-06 was also validated against other correlates of SES, including motor vehicle access, housing tenure, and an area-based measure of deprivation. NZSEI-13 will be validated against housing tenure and deprivation. It will not be validated against motor vehicle access, as this measure was not found to be strongly associated with occupational status when tested against NZSEI-06.

### **Deprivation**

In New Zealand, a series of socio-economic scales based on deprivation levels in area units have been developed for each of the 1991–2013 Censuses. These are called NZDep91, NZDep96, NZDep2001, NZDep2006, and NZDep2013, respectively (Crampton, Salmond, & Sutton, 1997; Salmond, Crampton, & Sutton, 1998; Salmond &

Crampton 2002; Salmond, Crampton, & Atkinson, 2007; Atkinson, Salmond, & Crampton, 2014).

In the scale version of these indexes, each New Zealand 'meshblock' (geographical units defined by Statistics NZ, typically containing less than 100 people – the mean number in each meshblock was 91 in 2013) is assigned a score from 1 (least deprived) to 10 (most deprived), with roughly the same number of meshblocks in each of the 10 categories. The designation of meshblocks is based on a principal component score derived from census data for nine variables indexing deprivation.

Variables are calculated as proportions for each meshblock, and are listed below in order of decreasing factor loadings for the NZDep2013 (note all factor loadings are relatively similar, ranging from 0.29–0.37):

1 Communication	People aged <65 with no access to the internet at home
2 Income (Benefit)	People aged 18–64 receiving a means-tested benefit
3 Income (Low)	People living in households with income below an income threshold
4 Employment	People aged 18–64 unemployed
5 Qualifications	People aged 18–64 without any qualifications
6 Owned home	People not living in owned home
7 Support	People aged <65 living in a single parent family
8 Living space	People living in households below a bedroom occupancy threshold
9 Transport	People with no access to a car.

NZSEI-06 validated well against the NZDep06 and it is expected that NZSEI-13 will validate well against the NZDep2013. Specifically, we expect to find an 'SES-gradient', whereby lower NZSEI-13 scores are expected to be associated with increasing levels of deprivation.

## 1.4 Summary

NZSEI-13 will be constructed using 2013 Census data and the methodological approach adopted in the development of its predecessor, NZSEI-06.

Validation of NZSEI-13 will focus on smoking, housing tenure, and deprivation. As with NZSEI-06, we will try to derive socio-economic scores for the economically inactive and others for whom no occupational data are recorded. The construction and assessment of NZSEI-13 are described in the following sections of this report.

## 2 NZSEI-13 dataset

This section presents tabulated and cross-tabulated data on the 2013 Census variables used to construct NZSEI-13: education, income, and occupation. These variables will be compared against data from the 2006 Census used for NZSEI-06, and cross-tabulated against sex, ethnicity, rurality, region (Auckland versus the rest of New Zealand), and country of birth, using 2013 Census data. It should be noted that data include those in the workforce (either full- or part-time) aged 21–69 who report their own personal income (n=1,716,147).

### 2.1 Construction of the variables for NZSEI-13

#### Education

As with the previous NZSEI versions, census data on educational qualification need to be converted into years of education for NZSEI-13 statistical algorithm. The conversion for the 2013 Census is the same as for 2006 and is shown in table 3.

**Table 3**  
**Educational classifications converted to years of education**  
2013 Census

2013 Census	
Highest qualification	Years of education
Doctorate degree	20
Master's degree	18
Post-graduate and honours degree	17
Bachelor's degree and level 7 qualification	16
Level 6 diploma	14.5
Level 5 diploma	13.5
Level 4 certificate gained post-school	12.5
Level 3 certificate gained post-school	11.5
Level 2 certificate gained post-school	11.5
Level 1 certificate gained post-school	11.5
Overseas secondary school qualification	12
Level 3 or 4 certificate gained at school	13
Level 2 certificate gained at school	12
Level 1 certificate gained at school	11
No school qualifications	10

**Source:** Statistics New Zealand, 2013 Census; Ministry of Education

Table 4 shows the distribution of male and female workers by highest education qualification for the 2013 Census. The proportion of females with university degrees was

greater than for males (31.2 percent compared with 23.7 percent). Females were less likely than males to have no formal qualifications (11.7 percent compared with 15.3 percent).

**Table 4**  
**Highest qualification and years of education**

Workers aged 21–69 years  
2006 and 2013 Censuses

Highest qualification	2013 Census			2006 Census
	Males	Females	Total	Total
	Percent			Percent
Doctorate degree	1.1	0.8	1.0	0.8
Master's degree	3.6	3.8	3.7	2.8
Post-graduate and honours degree	3.3	5.0	4.1	2.8
Bachelor's degree and level 7 qualification	15.7	21.6	18.6	15.1
Level 6 diploma	4.3	7.0	5.6	6.5
Level 5 diploma	5.5	5.4	5.5	5.0
Level 4 certificate gained post-school	17.2	6.6	12.0	12.7
Level 3 certificate gained post-school	1.9	2.5	2.2	2.8
Level 2 certificate gained post-school	0.9	1.0	1.0	1.6
Level 1 certificate gained post-school	0.3	0.4	0.4	0.4
Overseas secondary school qualification	5.8	5.8	5.8	5.0
Level 3 or 4 certificate gained at school	5.9	5.6	5.8	4.7
Level 2 certificate gained at school	8.6	10.0	9.3	9.2
Level 1 certificate gained at school	10.6	12.7	11.6	12.9
No school qualifications	15.3	11.7	13.6	17.7
<b>Total</b>	100	100	100	100

**Source:** Statistics New Zealand, 2006 and 2013 Censuses

Table 4 also shows the distribution of workers by highest education qualification for the 2006 and 2013 Censuses. There were some small changes to the highest qualification distribution for New Zealanders from 2006 to 2013. The 2013 Census showed an increase in the proportion of workers classified as having a bachelor's degree (from 15.1 percent to 18.6 percent), and an increase in the proportion holding a postgraduate/honours degree, master's degree, or doctoral degree (from 6.4 percent to 8.8 percent). Conversely, there was a noticeable drop in the proportion of the population with no formal qualifications, from 17.7 percent in 2006 to 13.6 percent in 2013.

## Income

Table 5 shows the income distribution for male and female full- and part-time workers as recorded in the 2013 Census. Note that this includes income from all sources, not just income from paid employment. Among workers, proportionately more females (54.0 percent) than males (33.4 percent) were in the bottom half of the income distribution (up to \$40,000 per year). The most commonly reported income band for females was \$40,001–\$50,000 (13.9 percent). For males the most commonly reported income was \$70,001–\$100,000 (15.4 percent).

**Table 5**  
**Proportion of workers in various income bands**

Workers aged 21–69 years  
2006 and 2013 Censuses

2013 Census				2006 Census	
Income	Males	Females	Total	Income	Total
\$NZ	Percent			\$NZ	Percent
Nil income	0.4	0.3	0.4	Nil income	0.4
Loss	0.3	0.5	0.4	Loss	0.5
1–5,000	1.4	3.0	2.2	1–5,000	2.8
5,001–10,000	1.8	4.2	3.0	5,001–10,000	4.1
10,001–15,000	2.6	5.8	4.1	10,001–15,000	5.8
15,001–20,000	3.3	7.0	5.1	15,001–20,000	6.7
20,001–25,000	3.9	7.8	5.8	20,001–25,000	7.9
25,001–30,000	5.2	8.4	6.7	25,001–30,000	9.3
30,001–35,000	6.2	8.1	7.1	30,001–35,000	9.8
35,001–40,000	8.3	8.9	8.6	35,001–40,000	10.5
40,001–50,000	14.6	13.9	14.3	40,001–50,000	14.1
50,001–60,000	12.7	10.3	11.5	50,001–70,000	15.4
60,001–70,000	9.8	7.6	8.8	...	...
70,001–100,000	15.4	9.3	12.5	70,001–100,000	6.9
100,001–150,000	8.3	3.2	5.8	100,001 or more	5.7
150,001 or more	5.5	1.5	3.6	...	...
<b>Total</b>	100	100	100	<b>Total</b>	100

**Source:** Statistics New Zealand, 2006 and 2013 Censuses

Table 5 also compares the income distribution for the 2006 and 2013 Censuses. Fewer of the workforce reported earning up to \$20,000 per year in 2013 (15.2 percent) compared with 2006 (20.3 percent). Additionally, a greater proportion of the full- and part-time workforce in 2013 earned more than \$50,000 (42.2 percent) compared with 2006 (28 percent). Inflation for 2006–13 was just below 20 percent (=19.2 percent, using the annual inflation rates for each year from 2006–13 (first quarter); see [Inflation](#)). This means that earning \$50,000 in 2006 is roughly equivalent to earning \$60,000 in 2013. Using this equivalence, there is evidence for a slight increase in income relative to inflation from 2006 to 2013: 28 percent of the full- and part-time workforce earned more than \$50,000 in 2006, whereas 30.7 percent earned more than \$60,000 (the inflation-adjusted equivalent income) in 2013.

For the NZSEI-13 statistical algorithm, the log of actual income will be used, so a mid-point in each income band was assigned (these mid-points were supplied by Statistics NZ, and were derived from data on actual income). Individuals reporting zero or negative incomes were given a value of \$100 so the log of income could be determined. The mid-points assigned to the income bands are shown in table 6.

**Table 6**  
**Income bands and assigned mid points**  
2013 Census

Income bands (\$NZ)	Mid points (\$NZ)
Nil income	100
Loss	100
1–5,000	1,787
5,001–10,000	7,717
10,001–15,000	13,155
15,001–20,000	17,301
20,001–25,000	21,997
25,001–30,000	27,443
30,001–35,000	32,349
35,001–40,000	37,539
40,001–50,000	44,895
50,001–60,000	54,429
60,001–70,000	64,800
70,001–100,000	81,000
100,001–150,000	120,000
150,001 or more	200,000

**Source:** Statistics New Zealand, 2013 Census

## Occupation

For the 2013 Census, individuals provided details about their occupation. Those working more than one job provided details about their primary occupation only (ie, the occupation in which they worked the most hours).

The distribution of workers aged 21–69 years old by occupation at the major and minor group levels is produced in appendix I. The number of people in each minor group category ranged from over 75,000 in the School Teachers category (251), to just over 2,200 people in the Textile, Clothing, and Footwear Trades Workers category (393).

Sex differences in the number of workers in each occupation were apparent. At the major group level, there was a clear male over-representation for four groups:

- Machinery Operators and Drivers (male : female ratio = 6.4)
- Technicians and Trades Workers (male : female ratio = 4.0)
- Labourers (male : female ratio = 1.7)
- Managers (male : female ratio = 1.7)



There was also a clear female over-representation for three groups:

- Clerical and Administrative Workers (female : male ratio = 3.6)
- Community and Personal Service Workers (female : male ratio = 2.1)
- Sales Workers (female : male ratio = 1.5)

There was approximately the same number of male and female Professionals. Within the major groups, males and females also tended to be concentrated in particular types of occupations. For instance, for individuals classified as Professionals, women were more prevalent in education (except for Tertiary Teaching), health therapy, and nursing occupations, whereas men were more prevalent among Air and Marine Transport Professionals, Engineering Professionals, and Business and Systems Analysts and Programmers.

## Age

Age, in years, is included as a control variable as it is negatively associated with education (younger workers have higher qualifications) but positively correlated with income (older workers earn more). As with the previous scales (NZSEI-91, NZSEI-96, and NZSEI-06) analyses will be restricted to those aged 21–69. Those under the age of 21 years are not included because of the likelihood that young workers first entering the workforce may take on occupations that do not reflect their education and skill level. Those over the age of 69 years are excluded because very few of this group (12.6 percent) are in the workforce. Note that those aged 65–69 years are included because involvement in occupational roles is still relatively common in this group (42.2 percent of 65–69-year-olds are in the workforce), even though the retirement age in New Zealand is 65.

## 2.2 Selected demographic data

This section provides tabulations and cross-tabulations of demographic data from the 2013 Census to provide context for the analyses conducted in subsequent sections of the report.

### Income and occupation

Table 7 shows the income distribution for workers in each major group of occupations in 2013. Managers and Professionals were the two groups with the highest proportion of members earning over \$100,001 – 21.1 percent and 15.4 percent, respectively. Managers also had the highest proportion of members earning \$70,001 and over (38.7 percent), closely followed by Professionals (37.3 percent). At the lower end of the income distribution, 30.8 percent of Community and Personal Service Workers and 28.6 percent of Labourers reported incomes lower than \$20,001. It should be noted that the highest proportion of workers reporting nil or loss incomes were Managers (1.4 percent), and Labourers (1.3 percent).

**Table 7**  
**Income by occupation**  
Workers aged 21–69 years  
2013 Census

Total income (\$NZ)	Occupation (major group)							
	Manager	Professionals	Technical and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators and Drivers	Labourers
	Percent							
Nil	0.8	0.2	0.4	0.2	0.1	0.3	0.4	0.4
Loss	0.6	0.2	0.4	0.4	0.5	0.4	0.3	0.9
1–5,000	1	1.3	1.6	4.5	2	3.1	1.7	4.8
5,001–10,000	1.5	2	2.3	6.3	2.8	5	2.1	5.7
10,001–15,000	2.2	2.5	3.3	8.7	4	6.7	3	7.8
15,001–20,000	2.9	2.9	4.3	10.7	5.2	8.1	4.2	9
20,001–25,000	3.5	3.2	5.5	11	6.3	9.3	5.6	9.4
25,001–30,000	4.4	3.7	7	10.7	7.3	10.3	7.9	10.8
30,001–35,000	5	4	8.4	9.1	8.5	9.7	10	10.6
35,001–40,000	6.6	5.2	10.9	8.4	11.3	9.8	13.5	11.1
40,001–50,000	12.2	11.9	18.4	9.7	20.5	13.4	19.6	13.1
50,001–60,000	11.2	13.1	15.1	6.9	13.7	8.1	13.6	7.2
60,001–70,001	9.4	12.9	9.5	5.3	7.7	4.9	8.5	4.1
70,001–100,000	17.6	21.9	9.6	6.3	6.9	6.1	7.6	3.7
100,001–150,000	12.6	9.4	2.7	1.4	2.2	2.9	1.6	1
150,001 or more	8.5	6	0.7	0.4	1	2.1	0.6	0.5
Total	100	100	100	100	100	100	100	100

**Source:** Statistics New Zealand, 2013 Census

## Income and ethnicity

For this and subsequent ethnic comparisons, we will show results for five major ethnic groups: European, Māori, Pacific, Asian, and MELAA. Table 8 shows the incomes of workers aged 21–69 years for each major ethnic group. For each ethnic group, the most commonly reported income band was \$40,001–\$50,000. The proportions of each ethnic group reporting incomes of \$40,000 or less (the lower half of the income distribution) were 40.2 percent for European, 51.6 percent for Māori, 57 percent for Pacific, 56.2 percent for Asian, and 52.4 percent for MELAA.

**Table 8**  
**Income distribution by ethnicity**

Workers aged 21–69 years  
2013 Census

Total income (\$NZ)	Ethnicity					
	European	Māori	Pacific	Asian	MELAA	Total
	Percent					
Nil income	0.4	0.3	0.3	0.5	0.7	0.4
Loss	0.3	0.4	0.7	0.8	0.7	0.4
1–5,000	1.6	2.3	4.5	4.5	4.5	2.2
5,001–10,000	2.7	3.2	3.7	4.9	4.7	3
10,001–15,000	3.9	4.7	4.1	5.7	5.6	4.1
15,001–20,000	4.9	6.2	5.3	6	6.2	5.1
20,001–25,000	5.5	7	6.5	7	7	5.8
25,001–30,000	6.3	8.5	8.7	8.1	7	6.7
30,001–35,000	6.6	8.5	10.3	8.9	7.3	7.1
35,001–40,000	8	10.5	12.9	9.8	8.7	8.6
40,001–50,000	14.1	15.5	17.1	13.9	13.5	14.3
50,001–60,000	11.9	11.4	10.8	9.8	9.8	11.5
60,001–70,000	9.2	7.8	6.5	6.9	7.2	8.8
70,001–100,000	13.7	9.2	6.2	8.4	10.3	12.5
100,001–150,000	6.7	3.1	1.8	3.3	4.5	5.8
150,001 or more	4.2	1.4	0.7	1.5	2.3	3.6
Total	100	100	100	100	100	100

**Source:** Statistics New Zealand, 2013 Census

## Education and ethnicity

The distribution of workers aged 21–69 years by highest qualification and ethnicity at the time of the 2013 Census is presented in table 9. Almost one-quarter of both Māori (24.8 percent) and Pacific (23 percent) had no school qualification, compared with 12.9 percent

for European, 7 percent for Asian, and 5.5 percent for MELAA. Conversely, only around 1 in 6 Māori (16.2 percent) and 1 in 7 Pacific (13.5 percent) full-and part-time workers had university degrees, compared with 26.5 percent for European, 44.6 percent for Asian, and 44.3 percent for MELAA.

**Table 9**  
**Highest qualifications by ethnicity**

Workers aged 21–69 years  
2013 Census

Highest qualification	Ethnicity					
	European	Māori	Pacific	Asian	MELAA	Total
	Percent					
Doctorate degree	1	0.3	0.2	1.1	2.9	1.0
Master's degree	3.4	1.6	1.3	7.3	7.5	3.7
Post-graduate and honours degree	4.4	2.2	1.6	4.4	5	4.1
Bachelor's degree and level 7 qualification	17.7	12.1	10.4	31.8	28.9	18.6
Level 6 diploma	5.9	3.9	3.3	4.7	4.8	5.6
Level 5 diploma	5.5	4.7	4.2	6	5.1	5.5
Level 4 certificate gained post-school	13.2	11.8	8.2	5.3	6.7	12.0
Level 3 certificate gained post-school	2.1	3.2	3.5	1.7	2.3	2.2
Level 2 certificate gained post-school	1	1.3	1.2	0.6	0.7	1.0
Level 1 certificate gained post-school	0.4	0.5	0.6	0.2	0.2	0.4
Overseas secondary school qualification	3.7	0.4	9.1	19.9	21.8	5.8
Level 3 or 4 certificate gained at school	5.7	7	9.6	5.5	4.6	5.8
Level 2 certificate gained at school	10.3	10.9	11	2.4	2.2	9.3
Level 1 certificate gained at school	12.7	15.4	12.8	2.2	1.8	11.6
No school qualifications	12.9	24.8	23	7	5.5	13.6
Total	100	100	100	100	100	100

**Source:** Statistics New Zealand, 2013 Census

## Occupation and ethnicity

The proportion of each ethnicity by ANZSCO occupation (at the major group level) is given in table 10.

Among Managers, European workers were over-represented (21.0 percent), especially compared with Pacific workers (9.4 percent). Among Professionals, MELAA workers were over-represented (29.8 percent), while Māori and Pacific workers (18.0 percent and 15.2

percent, respectively) were under-represented. There were similar distributions across ethnic groups for Technicians and Trades Workers, Community and Personal Service Workers, and Clerical and Administrative Workers. Asian workers were over-represented among Sales Workers (11.3). Māori and Pacific workers were over-represented among both Machinery Operators and Drivers (9.2 percent and 12.5 percent, respectively), and among Labourers (17.6 percent and 18.7 percent, respectively).

**Table 10**  
**Occupation by ethnicity**  
 Workers aged 21–69 years  
 2013 Census

Major group	Occupation	Ethnicity				
		European	Māori	Pacific	Asian	MELAA
		Percent				
1	Managers	21.0	14.1	9.4	16.6	14.5
2	Professionals	24.9	18.0	15.2	25.1	29.8
3	Technicians and Trades Workers	12.0	11.4	11.0	13.0	14.1
4	Community and Personal Service Workers	8.1	11.4	12.5	8.7	10.7
5	Clerical and Administrative Workers	13.0	11.3	12.5	10.6	8.5
6	Sales Workers	7.9	6.9	8.2	11.3	7.8
7	Machinery Operators and Drivers	4.7	9.2	12.5	4.5	4.4
8	Labourers	8.5	17.6	18.7	10.2	10.2
Total (Workers with specified occupations)		100	100	100	100	100
<b>Source:</b> Statistics New Zealand, 2013 Census						

## Income and rurality

Table 11 shows the income distribution for workers aged 21–69 years by whether they lived in urban or rural areas. In both urban and rural areas, the most commonly reported income band was \$40,001–\$50,000. The proportion of workers reporting incomes of \$70,001 or more was 22.3 percent for urban areas, and 19.5 percent for rural areas.

**Table 11**  
**Income distribution by rurality**

Workers aged 21–69 years  
2013 Census

Total income (\$NZ)	Rurality	
	Urban	Rural
	Percent	
Nil income	0.3	0.9
Loss	0.4	0.8
1-5,000	2.2	2.1
5,001-10,000	3.0	3.2
10,001-15,000	4.0	4.8
15,001-20,000	5.0	5.9
20,001-25,000	5.7	6.3
25,001-30,000	6.7	7.1
30,001-35,000	7.2	7.0
35,001-40,000	8.6	8.7
40,001-50,000	14.3	14.1
50,001-60,000	11.6	11.0
60,001-70,000	8.8	8.4
70,001-100,000	12.7	11.2
100,001-150,000	6.0	5.0
150,001 or more	3.6	3.5
Total	100	100

**Source:** Statistics New Zealand, 2013 Census

## Education and rurality

The distribution of workers aged 21–69 years by region and highest qualification at the time of the 2013 Census is presented in table 12. For rural areas, the qualification level with the greatest proportion of workers was “no school qualifications” (17.6 percent), whereas in urban areas the qualification level with the greatest proportion of workers was “bachelor’s degree and level 7 qualifications” (19.6 percent). In rural areas, only 18.1 percent of workers had university degrees, compared with 29 percent in urban areas.

**Table 12**  
**Highest qualifications by rurality**  
 Workers aged 21–69 years  
 2013 Census

Highest qualification	Rurality	
	Urban	Rural
	Percent	
Doctorate degree	1.0	0.6
Master’s degree	4.0	2.0
Post-graduate and honours degree	4.4	2.7
Bachelor’s degree and level 7 qualification	19.6	12.8
Level 6 diploma	5.5	5.9
Level 5 diploma	5.4	5.7
Level 4 certificate gained post-school	11.7	14.0
Level 3 certificate gained post-school	2.2	2.2
Level 2 certificate gained post-school	1.0	1.1
Level 1 certificate gained post-school	0.4	0.3
Overseas secondary school qualification	6.1	3.7
Level 3 or 4 certificate gained at school	6.0	4.7
Level 2 certificate gained at school	9.0	10.9
Level 1 certificate gained at school	10.9	15.6
No school qualifications	12.9	17.6
Total	100	100

**Source:** Statistics New Zealand, 2013 Census

## Occupation and rurality

The distribution of ANZSCO major group occupations for workers aged 21–69 years by whether they lived in urban or rural areas is shown in table 13. A greater proportion of urban vs rural workers were employed as Professionals (25.3 percent compared with 16.2 percent), Clerical and Administrative Workers (12.8 percent compared with 9.9 percent), and Sales Workers (8.7 percent compared with 5.2 percent). Conversely, a greater proportion of rural vs urban workers were employed as Managers (30.4 percent compared with 17.6 percent) and Labourers (14.9 percent compared with 9.0 percent).

**Table 13**  
**Occupation by rurality**  
 Workers aged 21–69 years  
 2013 Census

Major group	Occupation	Rurality	
		Urban	Rural
		Percent	
1	Managers	17.6	30.4
2	Professionals	25.3	16.2
3	Technicians and Trades Workers	12.3	11.0
4	Community and Personal Service Workers	8.8	6.7
5	Clerical and Administrative Workers	12.8	9.9
6	Sales Workers	8.7	5.2
7	Machinery Operators and Drivers	5.4	5.7
8	Labourers	9.0	14.9
Total (Workers with specified occupations)		100	100
<b>Source:</b> Statistics New Zealand, 2013 Census			



## Income and region

Table 14 shows the income distribution for workers aged 21–69 years usually resident in the Auckland region, in comparison to the rest of New Zealand. For both regions, the largest proportion of workers reported incomes between \$40,001 and \$50,000. The proportion of workers in each region reporting incomes of \$70,001 or more was 25.7 percent for Auckland, and 20.1 percent for the rest of New Zealand.

**Table 14**  
**Income distribution by region**

Workers aged 21–69 years

2013 Census

Total income (\$NZ)	Region	
	Auckland	Rest of New Zealand
	Percent	
Nil income	0.4	0.4
Loss	0.5	0.4
1-5,000	2.5	2.0
5,001-10,000	3.0	3.0
10,001-15,000	3.7	4.4
15,001-20,000	4.3	5.5
20,001-25,000	4.9	6.3
25,001-30,000	5.8	7.2
30,001-35,000	6.5	7.4
35,001-40,000	8.1	8.8
40,001-50,000	13.8	14.5
50,001-60,000	11.7	11.4
60,001-70,000	9.1	8.6
70,001-100,000	13.7	11.9
100,001-150,000	7.2	5.2
150,001 or more	4.8	3.0
Total	100	100

**Source:** Statistics New Zealand, 2013 Census

## Education and region

The distribution of workers aged 21–69 years by region and highest qualification at the time of the 2013 Census is presented in table 15. In Auckland, 9.9 percent of workers had no school qualifications, compared with 15.3 percent elsewhere in New Zealand. A third of Auckland workers (33.8 percent) had a university degree, compared with 24.2 percent elsewhere in New Zealand.

**Table 15**  
**Highest qualifications by region**

Workers aged 21–69 years  
2013 Census

Highest qualification	Region	
	Auckland	Rest of New Zealand
	Percent	
Doctorate degree	1.0	0.9
Master's degree	5.0	3.1
Post-graduate and honours degree	4.6	3.9
Bachelor's degree and level 7 qualification	23.2	16.3
Level 6 diploma	5.3	5.7
Level 5 diploma	5.8	5.3
Level 4 certificate gained post-school	9.7	13.2
Level 3 certificate gained post-school	2.0	2.3
Level 2 certificate gained post-school	0.8	1.0
Level 1 certificate gained post-school	0.3	0.4
Overseas secondary school qualification	8.9	4.3
Level 3 or 4 certificate gained at school	6.4	5.5
Level 2 certificate gained at school	8.1	9.9
Level 1 certificate gained at school	8.8	13
No school qualifications	9.9	15.3
Total	100	100

**Source:** Statistics New Zealand, 2013 Census

## Occupation and region

The distribution of ANZSCO major group occupations for workers aged 21–69 years by whether they lived in Auckland or the rest of New Zealand is presented in table 16. Most occupations were similarly distributed, at least at the major group level. However, a greater proportion of Auckland workers were employed as Professionals (27.0 percent compared with 22.5 percent), while a greater proportion of workers in the rest of the country were employed as Labourers (11.5 percent compared with 6.6 percent).

**Table 16**  
**Occupation by region**  
 Workers aged 21–69 years  
 2013 Census

Major group	Occupation	Region	
		Auckland	Rest of New Zealand
		Percent	
1	Managers	19.7	19.4
2	Professionals	27.0	22.5
3	Technicians and Trades Workers	11.4	12.4
4	Community and Personal Service Workers	7.9	8.8
5	Clerical and Administrative Workers	13.3	12.0
6	Sales Workers	9.1	7.7
7	Machinery Operators and Drivers	5.0	5.6
8	Labourers	6.6	11.5
Total (Workers with specified occupations)		100	100
<b>Source:</b> Statistics New Zealand, 2013 Census			

## Income and country of birth

Table 17 shows the income distribution of workers aged 21–69 years by whether they were born in New Zealand or were born overseas. For both, the largest proportion of workers reported incomes between \$40,001 and \$50,000. The proportions of each group reporting incomes of \$20,000 or less were 14.2 percent for workers born in New Zealand, and 18.1 percent for workers born overseas.

**Table 17**  
**Income distribution by country of birth**

Workers aged 21–69 years

2013 Census

Total income (\$NZ)	Country of birth	
	New Zealand	Overseas
	Percent	
Nil income	0.3	0.5
Loss	0.4	0.6
1–5,000	1.7	3.4
5,001–10,000	2.7	3.8
10,001–15,000	4.0	4.6
15,001–20,000	5.1	5.2
20,001–25,000	5.7	6.0
25,001–30,000	6.7	6.8
30,001–35,000	7.0	7.4
35,001–40,000	8.6	8.6
40,001–50,000	14.6	13.3
50,001–60,000	12.0	10.5
60,001–70,000	9.0	8.2
70,001–100,000	12.7	12.0
100,001–150,000	5.9	5.8
150,001 or more	3.7	3.3
Total	100	100

**Source:** Statistics New Zealand, 2013 Census

## Education and country of birth

The distribution of workers aged 21–69 years by country of birth and highest qualification at the time of the 2013 Census is presented in table 18. The proportion of workers born in New Zealand with no school qualifications (15.7 percent) is twice as much as for workers born overseas (7.8 percent). Additionally, a higher proportion of workers born overseas had a university degree (38.4 percent), in comparison to workers born in New Zealand (23 percent).

**Table 18**  
**Highest qualifications by country of birth**

Workers aged 21–69 years  
2013 Census

Highest qualification	Country of birth	
	New Zealand	Overseas
	Percent	
Doctorate degree	0.6	1.9
Master's degree	2.5	6.7
Post-graduate and honours degree	3.3	6.2
Bachelor's degree and level 7 qualification	16.6	23.6
Level 6 diploma	5.5	5.7
Level 5 diploma	5.4	5.6
Level 4 certificate gained post-school	13.4	8.4
Level 3 certificate gained post-school	2.3	1.9
Level 2 certificate gained post-school	0.9	1.1
Level 1 certificate gained post-school	0.4	0.3
Overseas secondary school qualification	0.3	19.8
Level 3 or 4 certificate gained at school	6.4	4.2
Level 2 certificate gained at school	11.7	3.2
Level 1 certificate gained at school	14.7	3.6
No school qualifications	15.7	7.8
Total	100	100

**Source:** Statistics New Zealand, 2013 Census

## Occupation and country of birth

The distribution of ANZSCO major group occupations for workers aged 21–69 years by country of birth is presented in table 19. Most occupations were similarly distributed, at least at the major group level. However, workers born in New Zealand were slightly over-represented among Managers (20.3 percent compared with 17.6 percent), and Community and Personal Service Workers (13.0 percent compared with 11.0 percent). Workers born overseas were over-represented among Professionals (28.0 percent compared with 22.4 percent).

**Table 19**  
**Occupation by country of birth**  
 Workers aged 21–69 years  
 2013 Census

Major group	Occupation	Country of birth	
		New Zealand	Overseas
		Percent	
1	Managers	20.3	17.6
2	Professionals	22.4	28.0
3	Technicians and Trades Workers	12.0	12.4
4	Community and Personal Service Workers	8.4	8.9
5	Clerical and Administrative Workers	13.0	11.0
6	Sales Workers	8.1	8.3
7	Machinery Operators and Drivers	5.8	4.5
8	Labourers	10.2	9.1
Total (Workers with specified occupations)		100	100
<b>Source:</b> Statistics New Zealand, 2013 Census			

## 2.3 Summary and discussion

This section presents tabulated and cross-tabulated data on the 2013 Census variables used to construct NZSEI-13: education, income, and occupation.

Higher incomes were associated with higher qualification levels, being male, European ethnicity, urban location, Auckland location, and being New Zealand born. Higher qualification levels were associated with being female, Asian and MELAA ethnicity, urban location, Auckland location, and being born overseas.

A number of factors distinguished different occupation groups (at the ANZSCO major group level).

- *Managers* are over-represented among males, those of European ethnicity, those who live in a rural setting, and New Zealand-born workers.
- *Professionals* are more common among those of MELAA ethnicity, those who live in urban areas – particularly Auckland, and those who are born overseas.
- *Technicians and Trades Workers* are over-represented among males.
- *Community and Personal Service Workers* are over-represented among females and those born in New Zealand.
- *Clerical and Administrative Workers* are over-represented among females and those who live in urban areas.
- *Sales Workers* are over-represented among females, and among those of Asian ethnicity.

- *Machinery Operators and Drivers* are over-represented among males, and are more common among those of Māori and Pacific ethnicity.
- *Labourers* are also more common among those of Māori and Pacific ethnicity, and those who live in a rural setting and who live outside of Auckland.

### 3 Construction of NZSEI-13 scale

The construction of NZSEI-13 is presented in this section. This section reports the methods used to inflate the incomes of part-time workers to their full-time equivalent before their inclusion in analyses, and an assessment of the extent to which incomes for self-employed workers are understated. Finally, the division of NZSEI-13 scores into SES groups is described.

#### 3.1 Statistical algorithm used in the construction of NZSEI-13 scale

The ‘returns to human capital’ model used to construct NZSEI-13 was represented by the following linear regression equations. The unit of analysis is the individual respondent, and the variables income ( $I$ ), age ( $A$ ), and education ( $E$ ) are normalised to have mean zero and variance one:

$$I = \beta_{41}A + \beta_{42}E + \beta_{43}O + e_3, \quad (1)$$

$$O = \beta_{31}A + \beta_{32}E + e_2, \quad (2)$$

$$E = \beta_{21}A + e_1, \quad (3)$$

The assumption that the effect of education on income is largely mediated through occupation is implemented by setting  $\beta_{42}$  to zero, and then estimating the values of the unobserved values of occupational score together with the remaining beta coefficients by minimising the residual sum of squares,

$$\sigma_N^2 = \|I - (\beta_{41}A + \beta_{43}O)\|^2 + \|O - (\beta_{31}A + \beta_{32}E)\|^2 + \|E - \beta_{21}A\|^2$$

The coefficient  $\beta_{21}$  can be estimated by minimising the last summand alone, ie by fitting the regression of  $E$  on  $A$ , so the last term can be ignored when estimating the other quantities. These were found by the following iterative process:

1. Start with an initial guess for the occupational scores (eg the average of the  $A$  and  $E$  scores, renormalised to have mean zero and variance one).
2. For these fixed values of  $O$ , minimise the first two terms of  $\sigma_N^2$  over the betas. This amounts to fitting the regressions (1) and (2).
3. For these fixed betas, find the values of  $O$  that minimise:

$$\|I - (\beta_{41}A + \beta_{43}O)\|^2 + \|O - (\beta_{31}A + \beta_{32}E)\|^2.$$

If  $O_i$  is the occupational score of the  $i^{\text{th}}$  group, this amounts to setting

$$O_i = ((\beta_{31} - \beta_{41}\beta_{43})\bar{A}_i + \beta_{32}\bar{E}_i + \beta_{43}\bar{I}_i) / (1 + \beta_{43}^2),$$

where  $\bar{A}_i$ ,  $\bar{E}_i$ , and  $\bar{I}_i$  are, respectively, the mean age, education, and income for the  $i^{\text{th}}$  occupational group.

4. Re-standardise  $O$  to have mean and variance at the individual level (note all individuals in the  $i^{\text{th}}$  group have the same value of  $O$ ).
5. Repeat steps 2 and 3 until convergence.

Note that the full regressions (ie with  $\beta_{42}$  not set to zero) can be refitted using the values of  $O$  obtained at the conclusion of the iterative process described above. However, since



our primary interest is in the occupational scores, we have not done this. The beta values we report are those obtained at the conclusion of the iterative process.

Although conceptually the regressions described above are done at the individual level, as are the standardisations of the *O*'s, the fact that the *O*'s are the same for each individual in a given occupational group means that the calculations can be carried out using only the sizes, means, and standard deviations of each occupational group.

## 3.2 Inflating part-time incomes

Part-time workers were considered to be those working less than 30 hours per week. To incorporate the data for these workers into the construction of NZSEI-13, an adjustment to their income was necessary.

Using the same method used for NZSEI-96 and NZSEI-06 (Davis et al, 2003; Milne et al, 2013), the median number of weekly hours worked by full-time workers was calculated (median = 40 hours) and the income of part-time workers inflated to a full-time equivalent, by multiplying them by 40 divided by number of hours worked. To guard against over-inflation of part-time incomes (eg where part-time incomes are unusually large for the hours worked), part-time workers whose implied hourly incomes were either smaller than the first percentile or larger than the 99th percentile for full-time workers were excluded from the analysis.

## 3.3 Assessment of potential understatement of income of self-employed workers

While some reports suggest that self-employed workers underestimate their incomes (eg Baker, 1993; Bradbury, 1997; Parker, 1997; Pissarides & Weber, 1989), there was no evidence of this when Census 2006 data was analysed for the construction of NZSEI-06 (Milne et al, 2013).

To determine whether the income of self-employed workers was underestimated in the 2013 Census, the mean incomes reported by workers in each minor (three-digit) occupation group were compared between waged and self-employed workers. The inflated incomes of part-time workers were included using the method described above. The number of waged and self-employed workers for each minor (three-digit) occupation group are shown in appendix II.

The mean income differences – expressed as a percentage of the overall mean income for each occupation group – are shown in figure 2, ordered from the occupation group with the largest mean income to that with the smallest mean income for waged workers relative to self-employed workers.

Figure 2 shows that self-employed workers report greater mean incomes than waged workers for the majority (79 out of 97, or 81 percent) of occupation groups. For some occupation groups, mean incomes were substantially higher for self-employed workers. For example, self-employed workers reported mean incomes that were more than 30 percent higher than waged workers for seven occupation groups:

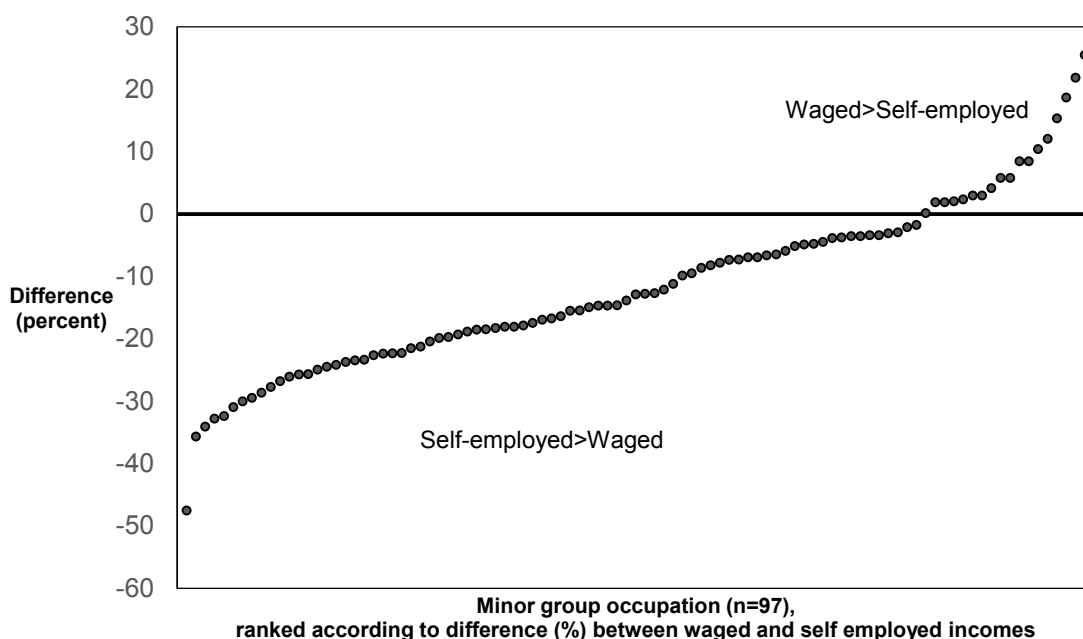
- Legal Professionals (48 percent higher)
- Packers and Product Assemblers (36 percent higher)
- Medical Practitioners (34 percent higher)
- Health Diagnostic and Promotion Professionals (33 percent higher)
- Information and Organisation Professionals (32 percent higher)
- Insurance Agents and Sales Representatives (31 percent higher)
- Delivery Drivers (30 percent higher).

In contrast, there were only two occupation groups for which the mean incomes of waged workers were more than 20 percent higher than the mean income of self-employed workers: Automobile, Bus, and Rail Drivers (25 percent higher), and Air and Marine Transport Professionals (22 percent higher).

Given that self-employed workers reported greater incomes for the majority of occupation groups, this indicates very little evidence of underestimation. This mirrors the findings for 2006 (Milne et al, 2013). As such, and consistent with NZSEI-06, no inflation of incomes for self-employed workers will be undertaken for NZSEI-13. Thus, the finalised scale will include the incomes of full-time workers and equivalised incomes of part-time workers.

**Figure 2**

**Difference between waged and self-employed incomes for minor group occupations**



Source: Statistics NZ, 2013 Census

### 3.4 NZSEI-13 scores

Using the algorithm described in section 3.1, NZSEI-13 scores were derived at the minor group (three-digit) level of ANZSCO for the full-time and part-time workforce, where part-time incomes have been inflated as described in section 3.2. The results were scaled from 10–90 (10 being the lowest socio-economic score and 90 the highest), and centred (so that the mean was around 50) by taking the square root of the original scores. NZSEI-13 scores at the sub-major (two-digit) and major (one-digit) levels of ANZSCO were calculated as the mean of the constituent minor group occupational scores, weighted by the number of people in each occupation. Appendix III provides the full major group (one-digit), sub-major group (two-digit), and minor group (three-digit) NZSEI-13 scores for the finalised scale (including both full- and part-time workers).

The regression coefficients (beta values) for the associations between income, education, and socio-economic status for NZSEI-13 (final scale) are shown in table 20. Relevant beta values for NZSEI-91, NZSEI-96, NZSEI-06, and three international scales (ANU4, AUSEI06, and ISEI-88) are also included in the table for comparison. The beta values are 0.570 for  $\beta_{32}$  (the path from education to socio-economic status, see figure 1) and 0.313 for  $\beta_{43}$  (the path from socio-economic status to income, see figure 1).

These coefficients are very similar to those obtained for NZSEI-06. The path coefficients are also comparable to those obtained for three international scales: ANU4 and AUSEI06 from Australia, and the multinational ISEI-88.

However, as in 2006, NZSEI-13 path coefficients are very different to those obtained for NZSEI-96 and NZSEI-91. Reasons for this are still not clear (for a brief discussion see Milne et al, 2006, p46). However, the weight of evidence from both international and recent New Zealand scales perhaps now suggests that NZSEI-96 and NZSEI-91 coefficients – where the  $\beta_{43}$  path is three times greater than the  $\beta_{32}$  path – represent anomalies.

**Table 20**

**Comparison of beta values**

NZSEI-13, NZSEI-06, NZSEI-96, NZSEI-91, ANU4, AUSEI06, and ISEI-88

Scales	$\beta_{32}$ (education-SES)	$\beta_{43}$ (SES-income)
NZSEI-13	0.570	0.313
NZSEI-06	0.572	0.299
NZSEI-96	0.251	0.789
NZSEI-91	0.230	0.790
ANU4 <sup>(1)</sup>	0.63	0.30
AUSEI06 <sup>(1)</sup>	0.65	0.35
ISEI-88 <sup>(1)</sup>	0.582	0.465

1. From McMillian et al, 2009.

**Note:**  
 AUSEI06 – Australian socio-economic index 2006  
 ANU4 – Australian National University occupational status scale 4  
 ISEI-88 – International socio-economic index 1988  
 NZSEI-91 – New Zealand socio-economic index 1991  
 NZSEI-96 – New Zealand socio-economic index 1996  
 NZSEI-06 – New Zealand socio-economic index 2006  
 NZSEI-13 – New Zealand socio-economic index 2013

### 3.5 Overall effect of including part-time workers

A comparison of the major group (one-digit) NZSEI-13 scores for full-time workers, and full-time and part-time workers combined, is shown in table 21. The difference between NZSEI-13 scores between full-time workers, and full-time and part-time workers combined, was minimal for most sub-major group occupations. The difference was no more than three points for six of eight occupation groups, although larger changes were apparent among:

- Machinery Operators and Drivers (average change = 6 points)
- Labourers (average change = 5 points).

These differences might be considered especially small, given that some of the change can be attributed to the 2.7-point mean difference in scores between the full-time workers scale and the scale including both full- and part-time workers (full-time workers' mean score across occupations = 48.9; full- and part-time workers' mean score = 46.2). There were few changes in relative occupational rank at the sub-major group level between the two scales, and those changes that did occur were small.

Of 43 sub-major group occupations:

- 14 did not change rank
- 15 changed rank by one place
- 8 changed rank by two places
- 5 changed rank by three places
- 1 changed rank by four places (Protective Service Workers were ranked 31st out of 43 on the scale including only full-time workers and 27th out of 43 on the scale including both full- and part-time workers).

**Table 21**  
**NZSEI-13 scores**

Full-time workers, and full-time and part-time workers combined

<b>ANZSCO sub-major group</b>	<b>Occupation</b>	<b>NZSEI-13 full-time workers</b>	<b>NZSEI-13 full-time and part-time workers</b>
1	Managers	56	52
2	Professionals	73	70
3	Technicians and Trades Workers	42	40
4	Community and Personal Service Workers	42	38
5	Clerical and Administrative Workers	48	44
6	Sales Workers	42	39
7	Machinery Operators and Drivers	30	26
8	Labourers	24	21

### 3.6 Dividing NZSEI-13 scores into socio-economic groups

As with previous NZSEI scales, it is desirable to have the option of assigning individuals to discrete socio-economic groups, rather than (or as well as) to scores on a continuous scale. As for NZSEI-06, three different groupings of NZSEI-13 scale are suggested for use by researchers:

- a six-group classification
- a four-group classification representing quartiles
- a 10-group classification representing deciles.

Cut-points for these different socio-economic status (SES) groupings are shown in table 22. Note that, as with NZSEI-06 (Milne et al, 2013) and previous Elley-Irving scales (eg Elley & Irving, 2003), cut-points for the six-group classification were chosen so that roughly 10 percent, 15 percent, 25 percent, 25 percent, 15 percent, and 10 percent of the population are in groups 1 to 6 (highest to lowest SES), respectively. Thus, combining groups 1 and 2 into one group, leaving groups 3 and 4 as is, and combining groups 5 and 6 into one group maps directly onto the four-group (quartile) classification. A full list of SES groupings for all minor group (three-digit) occupations is shown in appendix IV.

**Table 22**  
**Suggested SES group divisions**  
 Six, four (quartile), and 10 (decile) groups

Six group			Quartiles		Deciles	
SES group	NZSEI-13 range	Percent of population	SES group	NZSEI-13 range	SES group	NZSEI-13 range
1	73–90	8.7	1	65–90	1	73–90
2	65–72	13.9	2	48–64	2	68–72
3	48–64	24.2	3	35–47	3	62–67
4	35–47	25.2	4	10–34	4	52–61
5	23–34	17.6			5	47–51
6	10–22	10.4			6	40–46
					7	36–39
					8	30–35
					9	23–29
					10	10–22

### 3.7 Summary and discussion

This section presented details on the construction of NZSEI-13. To create the scale, part-time workers were incorporated into the dataset by inflating part-time incomes to a full-time equivalent. The inclusion of part-time workers made little difference to the scores of occupational groups, with only a few small changes in rank of occupations.

As in NZSEI-06, no income-adjustment was undertaken for self-employed workers because there was little evidence to suggest that the incomes of self-employed workers were underestimated.

Three different convenience ‘splits’ in the hierarchy were suggested for use by researchers who wish to assess socio-economic status as a categorical variable. These splits were:

- a six-group classification
- a four-group classification representing quartiles
- a 10-group classification representing deciles

## 4 Assessing the finalised NZSEI-13

Section 4 presents the results of four tests of the stability and validity of the finalised NZSEI-13. These include:

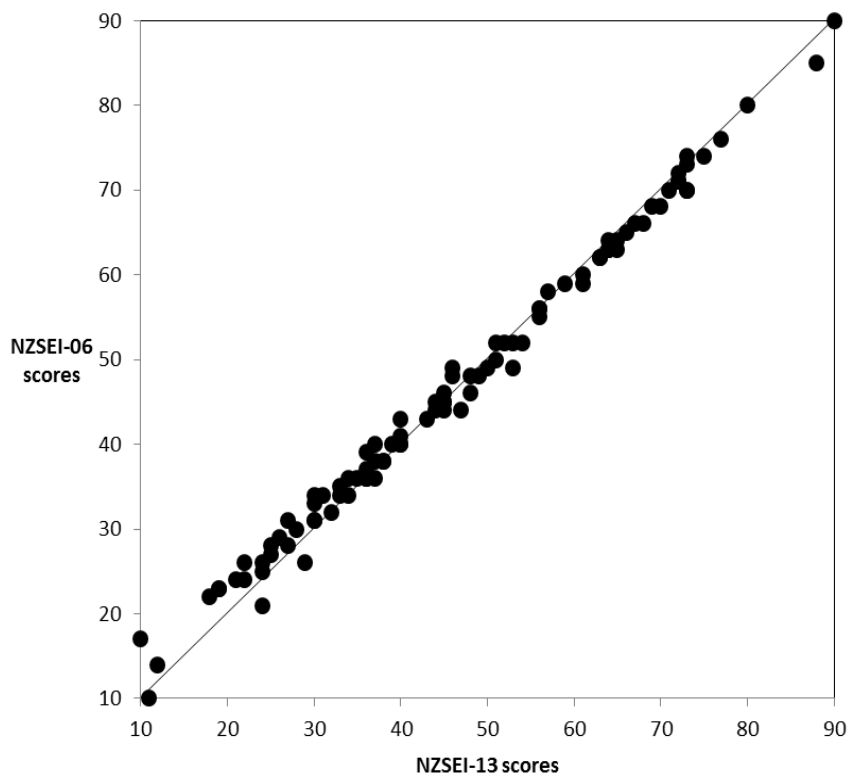
- (i) a comparison between NZSEI-13 and the previous NZSEI-06
- (ii) an assessment of whether NZSEI-13 methodology assigns scores similarly for males and females, and similarly for different ethnic groups
- (iii) an assessment of whether NZSEI-13 methodology assigns scores similarly for those living in urban and rural areas; those living in Auckland and those living elsewhere in New Zealand; and those born in New Zealand and those born overseas
- (iv) an assessment of the construct validation of NZSEI-13 in relation to health and other socio-economic indicators.

### 4.1 Comparison between NZSEI-13 and NZSEI-06

Figure 3 shows a comparison between NZSEI-13 and NZSEI-06 scores assigned to workers using data from the 2013 Census.

**Figure 3**

**NZSEI-06 scores versus NZSEI-13 scores**  
ANZSCO minor group



**Note:** The diagonal line represents the point of equivalent value for NZSEI-06 and NZSEI-13 scores.

The overall correlation between the two scales was 0.996, indicating very high correspondence between the scales. The difference between NZSEI-13 and NZSEI-06 scores was minimal for most minor occupations, for example, two-thirds of the

occupations changed by no more than one point. Larger changes were apparent among some minor occupations, including:

- Floor Finishers and Painting Trades Workers (4 points)
- Hairdressers (4 points)
- Financial and Insurance Clerks (4 points)
- Mobile Plant Operators (4 points)
- Storepersons (4 points)
- Food Process Workers (4 points)
- Packers and Product Assemblers (7 points)
- Miscellaneous Labourers (4 points).

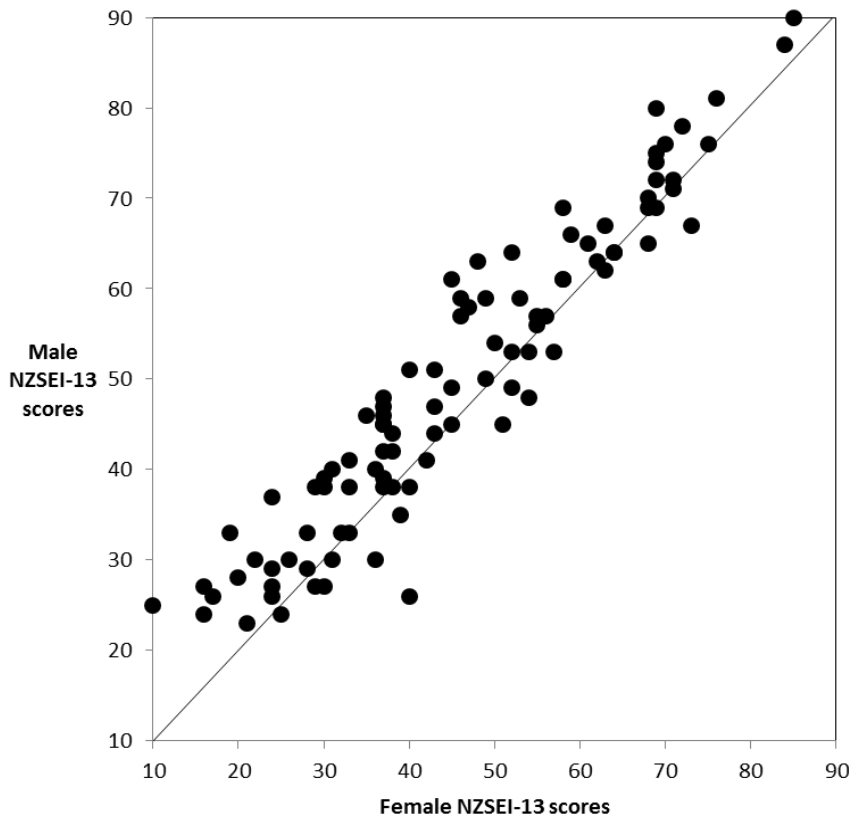
However, even these changes can be considered small. The high correspondence between the scales can be attributed to the fact that both scales had almost the same path coefficients (table 20), and both measure the same occupation groups.

## 4.2 Analyses by sex

Separate analyses by sex were conducted to test the stability of the scale for males and females.

To assess the possibility that the associations between education, income, and occupation may differ for males and females (eg family or childcare responsibilities may prompt some women to take on occupations below their qualifications), the model coefficients from table 20 were used to calculate separate scales for males and females. The minor group (three-digit) sex-specific NZSEI-13 scores are shown in figure 4.

**Figure 4**  
**Comparison of male and female NZSEI-13 scores**  
 ANZSCO minor group



**Note:** Model estimates were used for both male and female scores.

The figure shows that males were assigned higher scores for most (73 out of 97) occupations, and for 17 occupations the difference was 10 points or greater. Females were assigned scores at least 10 points greater than males for only one occupation: Animal Attendants and Trainers, and Shearers (ANZSCO minor group code 361) were assigned a score of 40 for females and 26 for males.

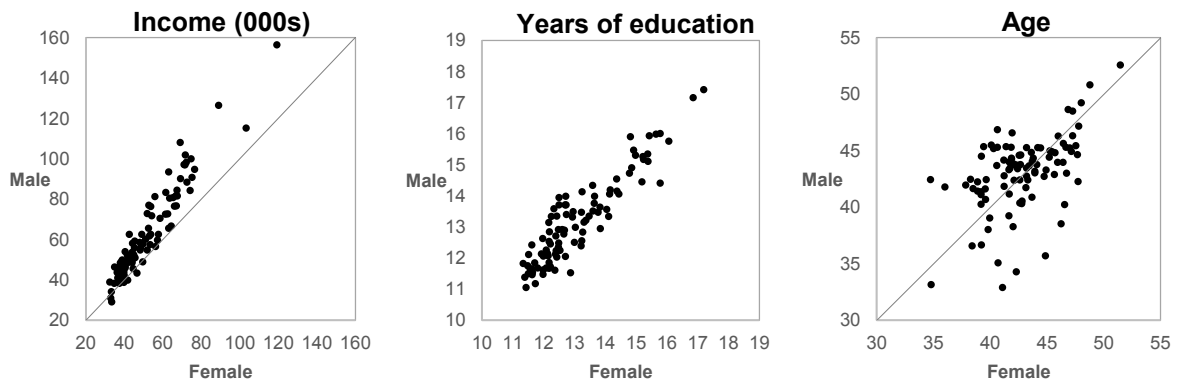
There was a four-point difference in mean male and female scores across occupations (male mean = 49.7, female mean = 45.7). Despite this difference, male and female scores correlated at  $r = 0.95$ , suggesting that the socio-economic structuring of occupations was similar for both sexes.

To investigate reasons for the higher scores assigned to males, figure 5 compares the mean income, years of education, and age for males and females by minor group (three-digit) occupation. This shows that while there were few differences by occupation between males and females in years of education and age, males reported consistently higher incomes for most occupations. This suggests it was primarily because of the income differential that males were assigned higher scores on the sex-specific NZSEI-13 scale. The income differential between males and females was greater for higher-paying occupations.

**Figure 5**

**Mean values for income, years of education, and age**

Males compared with females for each occupation (ANZSCO minor group)



**Source:** Statistics New Zealand, 2013 Census

As the validation section to follow (section 5) will use the six socio-economic groups described in table 22, the absolute and percentage differences between males and females in education and income by socio-economic group is shown in table 23.



**Table 23**  
**Differences in mean income and education**  
 Males compared with females

SES group	Mean income (\$)		Difference in income between sexes (M-F)		Mean education (years)		Difference in education between sexes (M-F)	
	Males	Females	Percent (M-F)/F	\$ (M-F)	Males	Females	Percent (M-F)/F	Years (M-F)
1	103,500	71,200	45	32,300	16.1	15.5	4	0.6
2	80,900	61,100	32	19,800	14.9	15.1	-1	-0.2
3	80,900	61,200	32	19,700	13.4	13.4	0	0
4	55,100	46,800	18	8,300	12.4	12.5	-1	-0.1
5	44,400	37,000	20	7,400	12.0	12.2	-2	-0.2
6	44,900	37,200	21	7,700	11.4	11.4	0	0

The average income was substantially greater for males (compared with females) for all socio-economic groups. This difference was larger – both in absolute and percentage terms – for higher socio-economic groups. For example, the income difference between male and females was \$7,700 (21 percent) for workers in SES group 6, but it was \$32,300 (45 percent) for workers in SES group 1. There were very few differences in the average education levels between males and females across socio-economic groups.

### 4.3 Analyses by ethnicity

In order to determine the applicability of NZSEI-13 to different ethnic groups in New Zealand, the model coefficients from table 18 were used to calculate separate scales for each of the five major ethnic groups: European, Māori, Pacific, Asian, and MELAA. Figure 6 shows ethnic-specific NZSEI-13 scores for each ethnic group by minor group (three-digit) occupation (shown as a series of cross-tabulations).

Figure 6 shows that for most occupations, Asian (mean score across occupations = 57.8) and MELAA (mean score = 58.0) workers were assigned higher NZSEI-13 scores than all other ethnic groups. European workers (mean score = 53.5) were assigned higher scores than either Māori (mean score = 46.8) or Pacific workers (mean score = 44.7), for all occupations.

NZSEI-13 scores for Māori and Pacific workers, and Asian and MELAA workers were similar for most occupations. Pairwise correlations between ethnic-specific scores were all  $r > 0.90$ , suggesting the socio-economic structuring of occupations was similar for each ethnic group. It was noteworthy, however, that the pairwise correlations between Asian and MELAA workers and all other ethnic groups were lower ( $r = 0.91 - 0.93$  and  $r = 0.93 - 0.94$ , respectively) than the pairwise correlations among European, Māori, and Pacific workers (all correlations  $r \geq 0.97$ ).

To investigate reasons for the patterns of ethnic differences in NZSEI-13 scores, figure 7, figure 8, and figure 9 compare the mean income, years of education, and age, respectively, for each ethnic group by minor group (three-digit) occupation (shown as a series of scatterplots).

**Figure 6**  
**NZSEI-13 scores (ANZSCO minor group)**  
Comparison of ethnicities

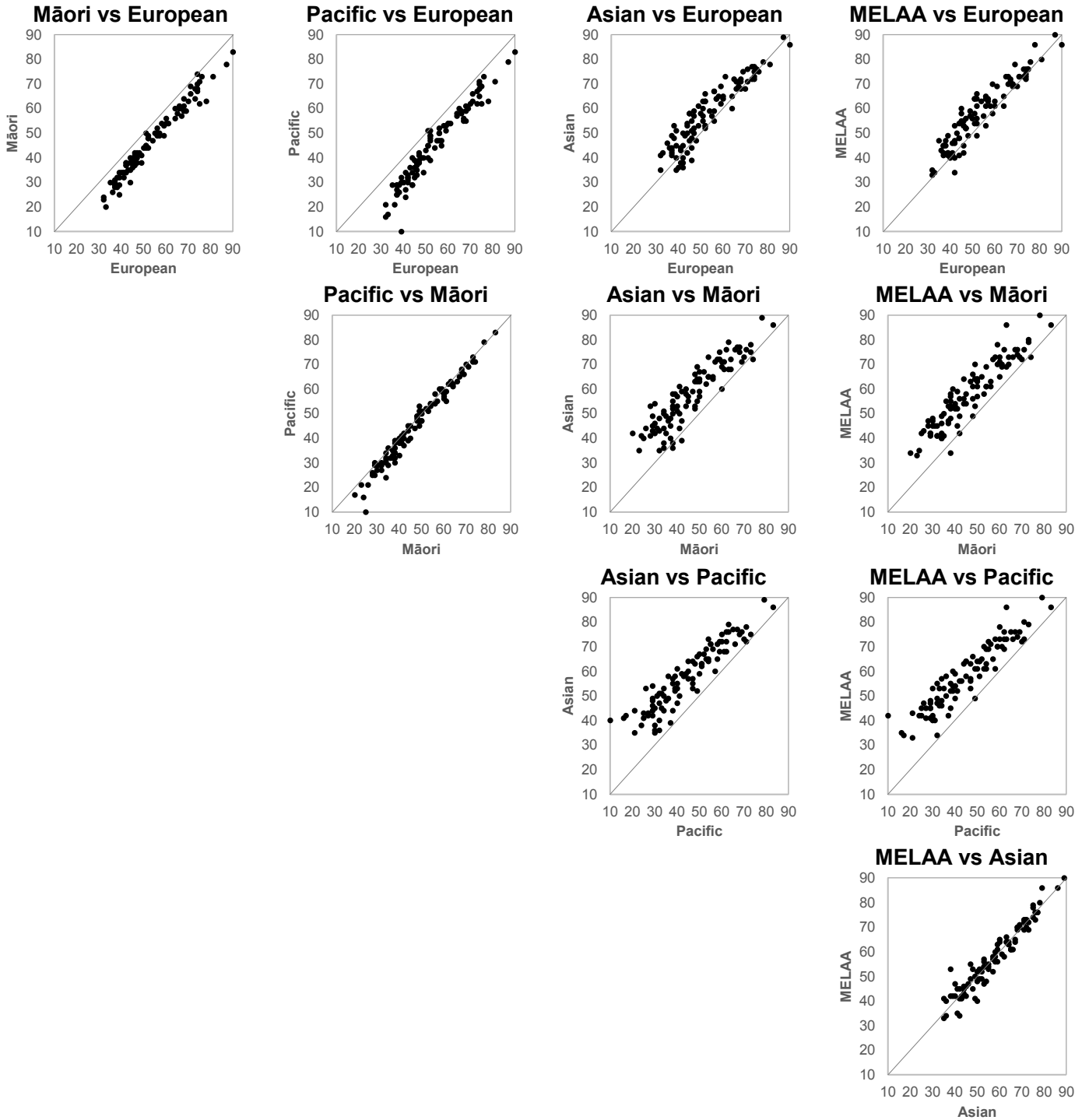
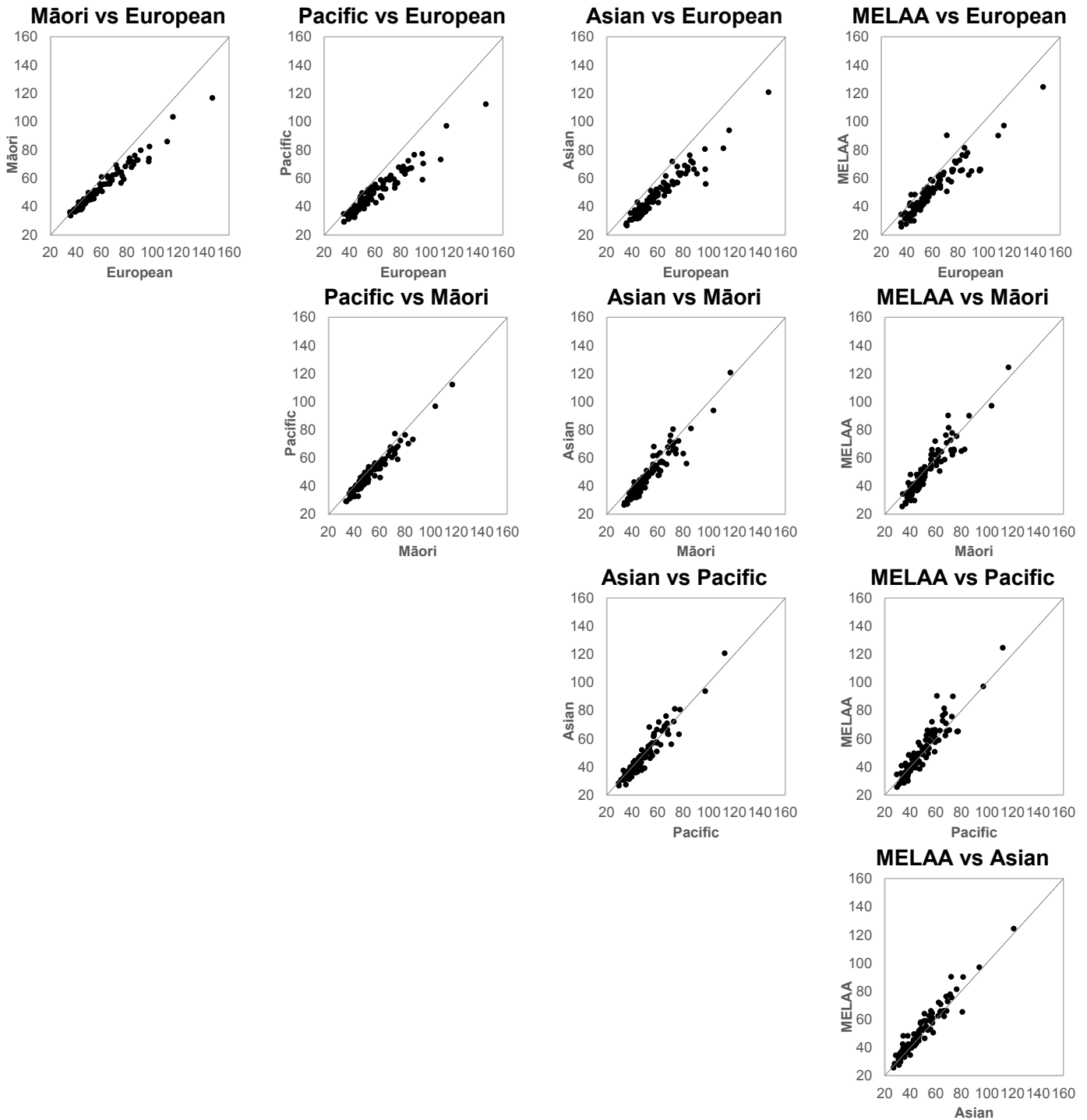


Figure 7 shows that European workers reported higher incomes than every ethnic group, especially for higher-paying occupations. Māori, Pacific, and MELAA workers reported slightly higher incomes than Asian workers for most occupations, and particularly for low-paying occupations. Māori workers reported slightly higher incomes than Pacific workers for most occupations. For low-paying occupations, Māori and Pacific workers reported higher incomes than MELAA workers. For high-paying occupations this relationship is reversed.

**Figure 7**

**Mean income (\$000s) for ANZSCO minor group occupations  
Comparison of ethnicities**

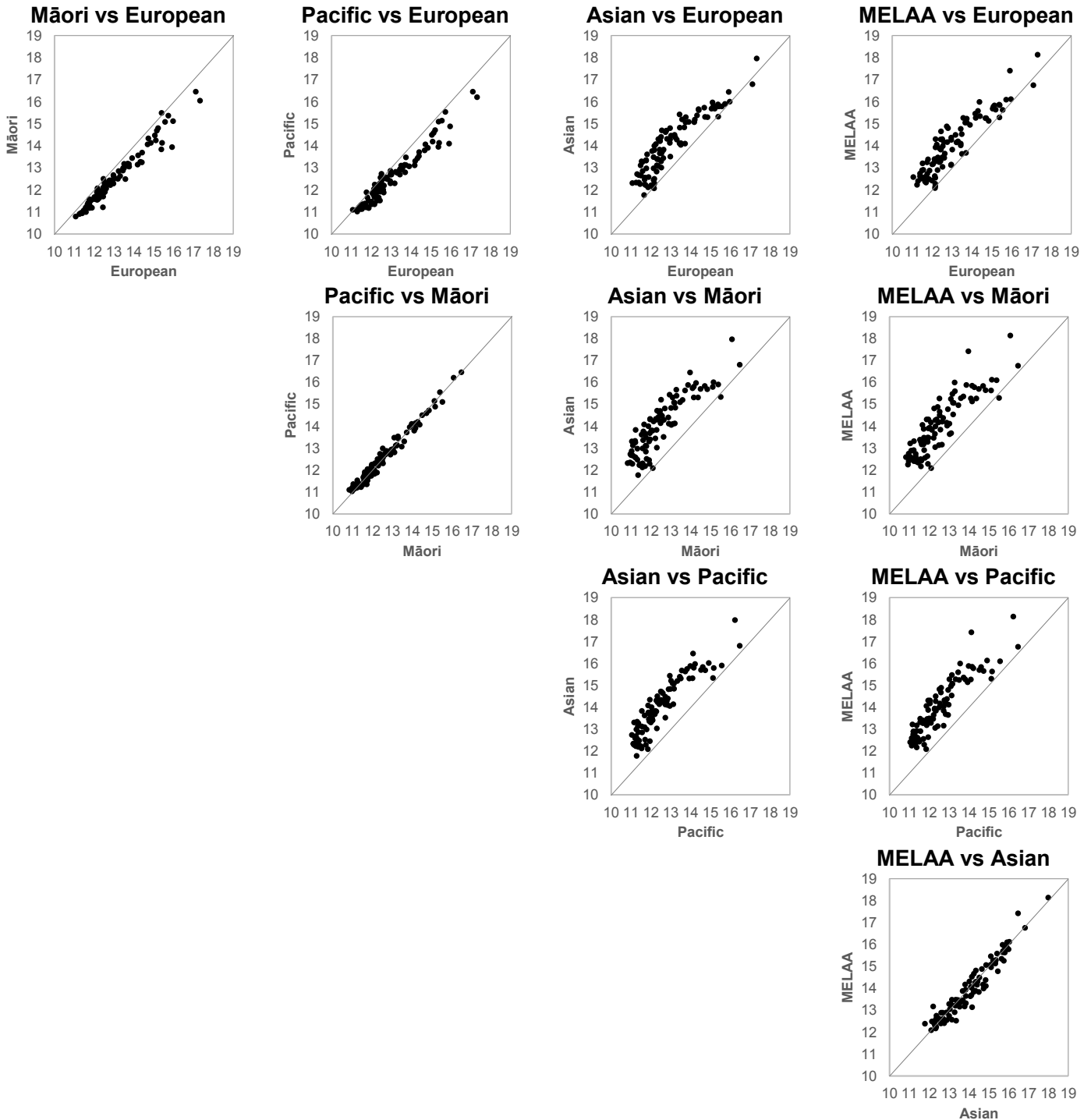


Source: Statistics New Zealand, 2013 Census

Figure 8 shows that, across occupations, Asian and MELAA workers reported higher levels of education than other ethnic groups. European workers reported slightly higher levels of education than either Māori or Pacific workers. Similar levels of education across occupations were reported among Māori and Pacific workers, and among Asian and MELAA workers.

**Figure 8**

**Mean years of education for ANZSCO minor group occupations  
Comparison of ethnicities**

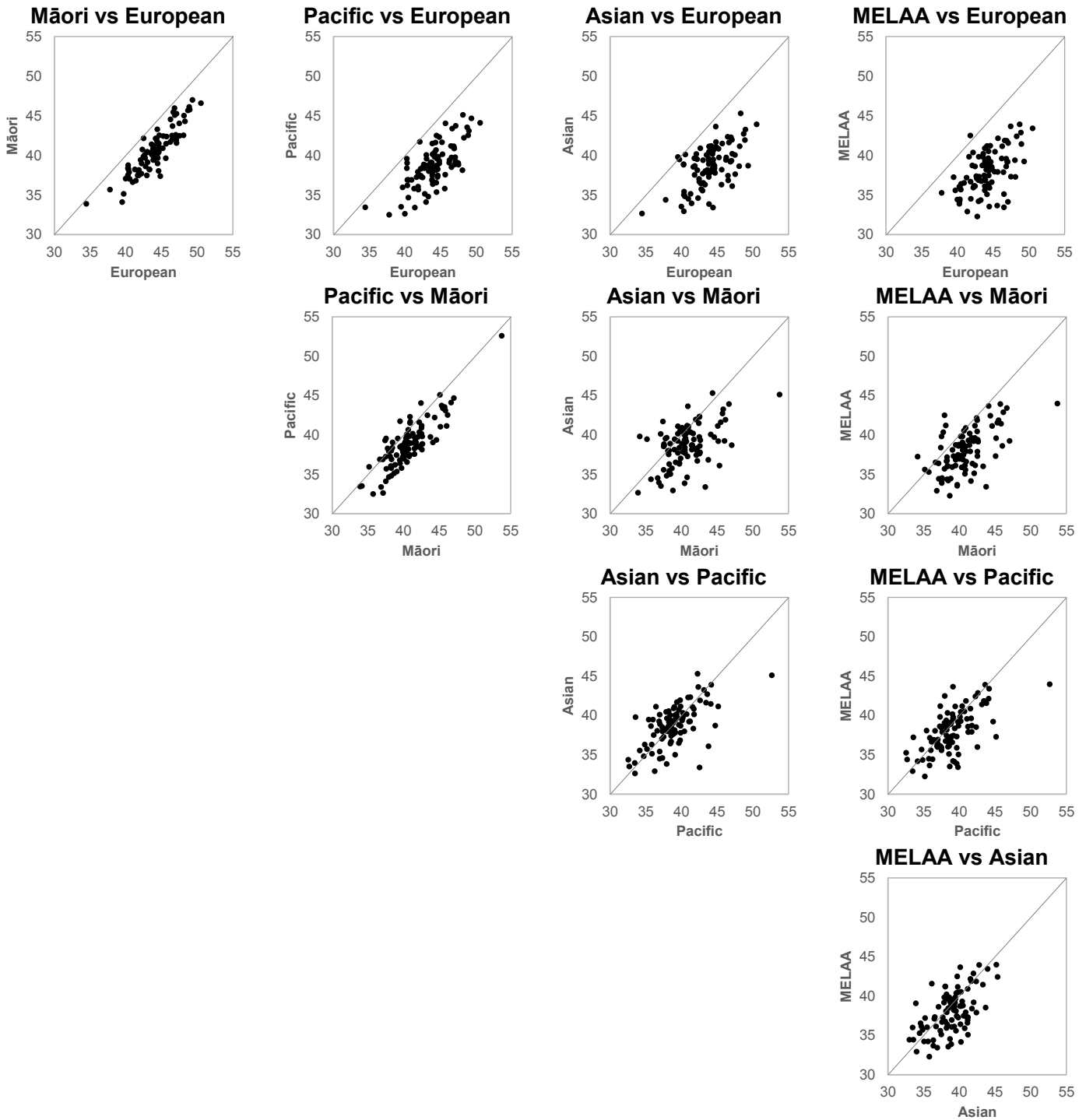


Source: Statistics New Zealand, 2013 Census

Figure 9 shows that, across occupations, the European workforce was older than the Māori, Pacific, Asian, and MELAA workforces. The Māori workforce was older than the Pacific, Asian, and MELAA workforces for most occupations. The Pacific workforce was older than the Asian and MELAA workforces for some occupations, but younger for other occupations. The Asian workforce was older than the MELAA workforce for most occupations.

**Figure 9**

**Mean age (years) for ANZSCO minor group occupations**  
Comparison of ethnicities



Source: Statistics New Zealand, 2013 Census

Considered together, the pattern of findings shown in figures 7–9 suggest that it is primarily because of higher years of education in most minor group occupations that Asian and MELAA workers were assigned higher ethnic-specific NZSEI-13 scores than all other ethnic groups. Note that education contributes more to NZSEI-13 scores than income – the education-SES path ( $\beta_{32} = 0.570$ ) is nearly double the SES-income path ( $\beta_{43} = 0.313$ ). Moreover, a comparison of figure 7 and figure 8 shows that education differences between Asian and MELAA workers and workers in other ethnic groups are larger than the income differences between them, so it seems likely that higher years of education explain the high ethnic-specific NZSEI-13 scores for Asian and MELAA workers.

Fewer years of education for most occupations and lower incomes for most occupations were the likely reason for the low ethnic-specific NZSEI-13 scores assigned to Māori and Pacific workers.

To aid interpretation of the validation section to follow (section 5), which uses the six socio-economic groups, table 24 shows the absolute and percentage differences in income by ethnicity, and socio-economic group, for full- and part-time workers aged 21–69 years from the 2013 Census. Table 25 shows the absolute and percentage differences in education (in years) by ethnicity and socio-economic group.

Within each socio-economic group, European workers reported higher incomes on average than every other ethnic group, mirroring the pattern shown in figure 7. The differences are larger between males.

Differences between European and Māori workers were larger for higher socio-economic groups. For example, the difference between European and Māori male workers was 23 percent for SES group 1 but only 8 percent for SES group 6.

In contrast, differences between European and MELAA workers, and between European and Asian workers, were larger for lower socio-economic groups. For example, the difference between European and MELAA female workers was 24 percent for SES group 6 but only 6 percent for SES group 1. Similarly, the difference between European and Asian female workers was 23 percent for SES group 6 but 11 percent for SES group 1. This relationship is less clear in male workers.

In general, there were large differences between European and Pacific female workers across all socio-economic groups. In males, the difference increased in higher socio-economic groups. For example, in groups 1–3 the difference was between 19 and 21 percent, but in groups 4–6 the difference was between 27 and 29 percent.

Differences in education between ethnic groups were typically less marked than the differences in income shown in table 21. However, as with income, European workers reported higher education than both Māori and Pacific workers for all socio-economic groups. These differences were typically larger for higher socio-economic groups (eg in Pacific males 5 percent for SES group 1, and 2 percent for SES group 6).

In contrast, European workers reported lower education than Asian and MELAA workers for all socio-economic groups. These differences were typically larger for lower socio-economic groups (eg 1–5 percent for SES groups 1–2, and 7–13 percent for SES groups 3–6).

**Table 24****Differences in mean income**

European ethnic group compared with Māori, Pacific, Asian, and MELAA

SES group	Mean income (\$)					Mean difference in income compared with European							
						\$				Percent			
	Ethnic group												
European	Māori	Pacific	Asian	MELAA	Māori	Pacific	Asian	MELAA	Māori	Pacific	Asian	MELAA	
<b>Males</b>													
1	108,600	83,900	77,600	84,500	97,200	24,700	31,000	24,100	11,400	23	29	22	10
2	84,200	67,900	61,400	68,400	72,500	16,300	22,800	15,800	11,700	19	27	19	14
3	84,600	69,000	60,000	59,100	64,100	15,600	24,600	25,500	20,500	18	29	30	24
4	57,600	51,100	45,500	42,500	47,500	6,500	12,100	15,100	10,100	11	21	26	18
5	47,600	42,800	38,500	33,500	36,300	4,800	9,100	14,100	11,300	10	19	30	24
6	47,700	43,700	37,600	35,300	34,400	4,000	10,100	12,400	13,300	8	21	26	28
<b>Females</b>													
1	72,700	65,100	62,000	64,500	68,100	7,600	10,700	8,200	4,600	10	15	11	6
2	62,400	56,500	53,800	56,100	55,200	5,900	8,600	6,300	7,200	9	14	10	12
3	63,100	56,200	52,600	50,900	53,200	6,900	10,500	12,200	9,900	11	17	19	16
4	48,100	44,200	42,000	38,900	40,900	3,900	6,100	9,200	7,200	8	13	19	15
5	38,900	36,700	33,500	29,600	30,700	2,200	5,400	9,300	8,200	6	14	24	21
6	39,900	38,600	32,300	30,900	30,500	1,300	7,600	9,000	9,400	3	19	23	24

**Table 25****Differences in mean education**

European ethnic group compared with Māori, Pacific, Asian, and MELAA

SES group	Mean education (years)					Mean difference in education compared with European							
						Years				Percent			
	Ethnic group												
European	Māori	Pacific	Asian	MELAA	Māori	Pacific	Asian	MELAA	Māori	Pacific	Asian	MELAA	
<b>Males</b>													
1	16.1	15.1	15.3	16.3	16.9	1	0.8	-0.2	-0.8	6	5	-1	-5
2	14.9	14.3	14.2	15.7	15.6	0.6	0.7	-0.8	-0.7	4	5	-5	-5
3	13.3	12.7	12.7	14.6	14.5	0.6	0.6	-1.3	-1.2	5	5	-10	-9
4	12.3	11.9	11.9	13.6	13.4	0.4	0.4	-1.3	-1.1	3	3	-11	-9
5	11.9	11.4	11.4	12.9	12.7	0.5	0.5	-1	-0.8	4	4	-8	-7
6	11.4	11.0	11.2	12.8	12.6	0.4	0.2	-1.4	-1.2	4	2	-12	-11
<b>Females</b>													
1	15.5	15.1	15.0	15.8	16.0	0.4	0.5	-0.3	-0.5	3	3	-2	-3
2	15.1	14.6	14.5	15.7	15.5	0.5	0.6	-0.6	-0.4	3	4	-4	-3
3	13.3	12.9	12.8	14.7	14.7	0.4	0.5	-1.4	-1.4	3	4	-11	-11
4	12.4	12.1	12.2	13.8	14.0	0.3	0.2	-1.4	-1.6	2	2	-11	-13
5	12.1	11.6	11.8	13.1	13.3	0.5	0.3	-1	-1.2	4	2	-8	-10
6	11.3	11.0	11.2	12.3	12.5	0.3	0.1	-1	-1.2	3	1	-9	-11



## 4.4 Analyses by rurality

To assess the possibility that the associations between education, income, and occupation may differ for urban and rural workers, the model coefficients from table 20 were used to calculate separate scales for workers in urban and rural areas. The minor group (three-digit) area-specific NZSEI-13 scores are shown in figure 10.

**Figure 10**

**Comparison of urban and rural NZSEI-13 scores**  
ANZSCO minor group

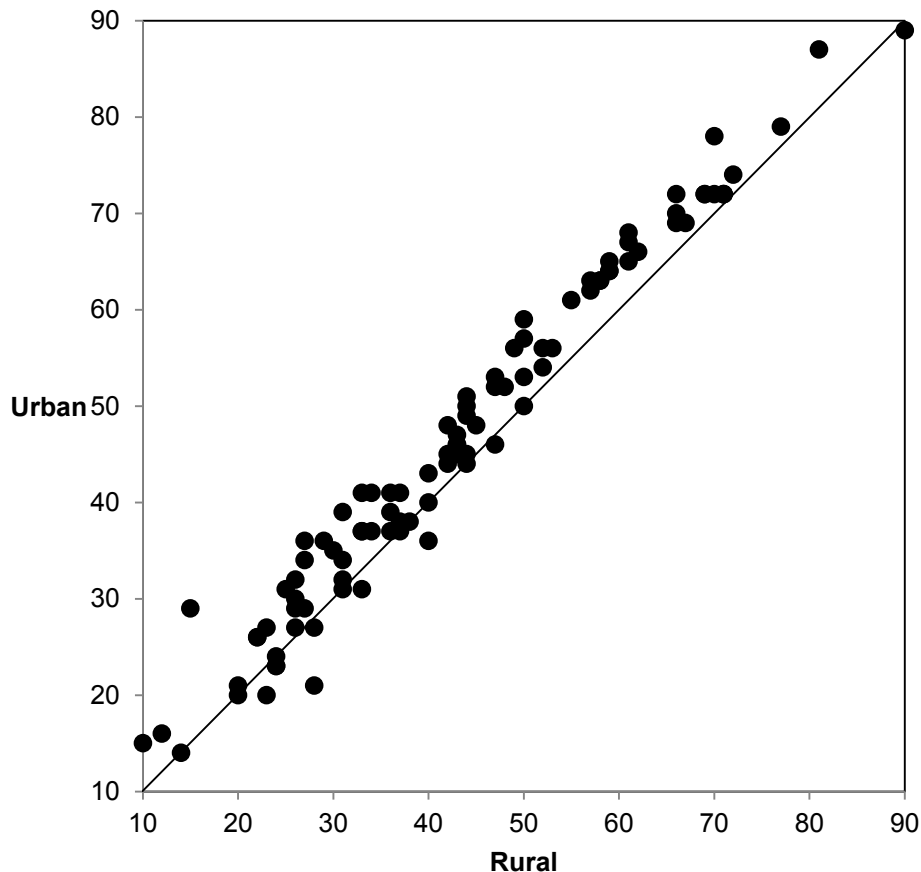


Figure 10 shows that for most occupations (79 out of 97), urban workers were assigned higher NZSEI-13 scores than rural workers. For one occupation the difference was 10 points or greater: Checkout Operators and Office Cashiers (631; 29 vs 15).

There was a 3.3 point difference in mean urban and rural workers' scores across occupations (urban mean = 46.8, rural mean = 43.5). Despite this difference, urban and rural workers scores correlated at  $r=0.98$ , suggesting that the socio-economic structuring of occupations was similar for both regions.

To investigate reasons for the higher scores assigned to urban workers, figure 11 compares the mean income, years of education, and age for workers in urban and rural areas by minor group (three-digit) occupation. This shows that for all but one occupation (Farmers and Farm Managers), the average age of rural workers is older than the average age of urban workers. Both urban and rural workers report similar incomes for lower-paying occupations, but urban workers report higher incomes for most higher-paying occupations.

The biggest difference that can be seen is the higher levels of education among urban workers for nearly all (90 of 97) occupations. The only occupations for which rural workers had higher average years of education were:

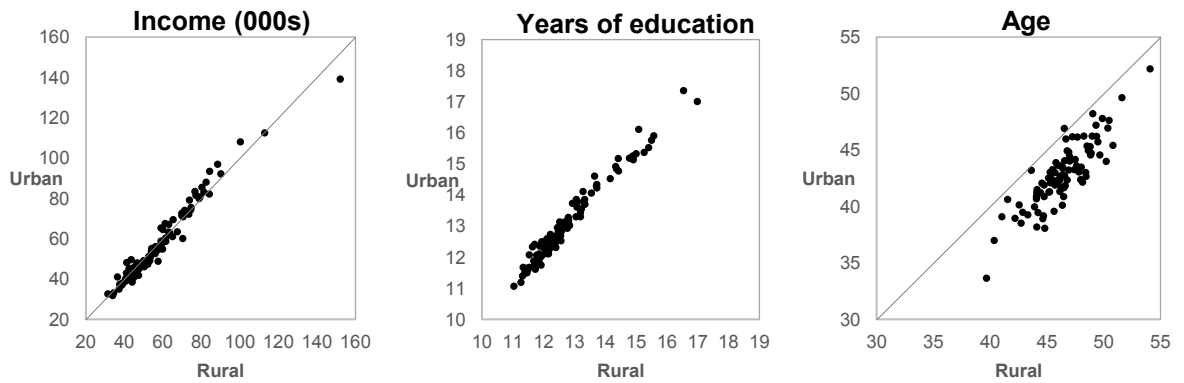
- Fabrication Engineering Trades Workers (322)
- Bricklayers, Carpenters and Joiners (331)
- Glaziers, Plasterers and Tilers (333)
- Electricians (341)
- Horticultural Trades Workers (362)
- Mobile Plant Operators (721)
- Farm, Forestry and Garden Workers (841).

This difference in education levels across nearly all occupations, combined with the strong contribution education makes to NZSEI-13 scores, is the primary reason that urban workers are assigned higher NZSEI-13 scores.

**Figure 11**

**Mean values for income, years of education, and age**

Urban compared with rural for each occupation (ANZSCO minor group)



**Source:** Statistics New Zealand, 2013 Census

The absolute and percentage differences between urban and rural workers in education and income by socio-economic group are shown in table 26. Differences between rural and urban income was patterned by socio-economic group. Rural workers in lower SES groups reported higher incomes (by between 5 and 10 percent for groups 4–6), whereas in higher SES groups urban workers reported higher incomes (by between 5 and 6 percent for groups 1–3). Urban workers have slightly (1–4 percent) higher average years of education across SES group.

**Table 26**  
**Differences in mean income and education**  
 Urban compared with rural

SES group	Mean income (\$)		Difference in income between regions (U-R)		Mean education (years)		Difference in education between regions (U-R)	
	Urban	Rural	Percent (U-R)/R	\$ (U-R)	Urban	Rural	Percent (U-R)/R	Years (U-R)
1	82,700	77,700	6	5,000	15.8	15.3	3	0.5
2	70,500	67,100	5	3,400	15.1	14.8	2	0.3
3	72,900	69,400	5	3,500	13.5	13.0	4	0.5
4	49,900	55,100	-9	-5,200	12.5	12.2	3	0.3
5	40,500	42,700	-5	-2,200	12.1	11.9	2	0.3
6	41,800	46,500	-10	-4,700	11.5	11.3	1	0.1

## 4.5 Analyses by region

To assess the possibility that the associations between education, income, and occupation may differ for workers in Auckland, when compared with the rest of New Zealand, the model coefficients from table 20 were used to calculate separate scales for workers in both. The minor group (three-digit) area-specific NZSEI-13 scores are shown in figure 12.

**Figure 12**

**Comparison of Auckland and rest of New Zealand NZSEI-13 scores**  
ANZSCO minor group

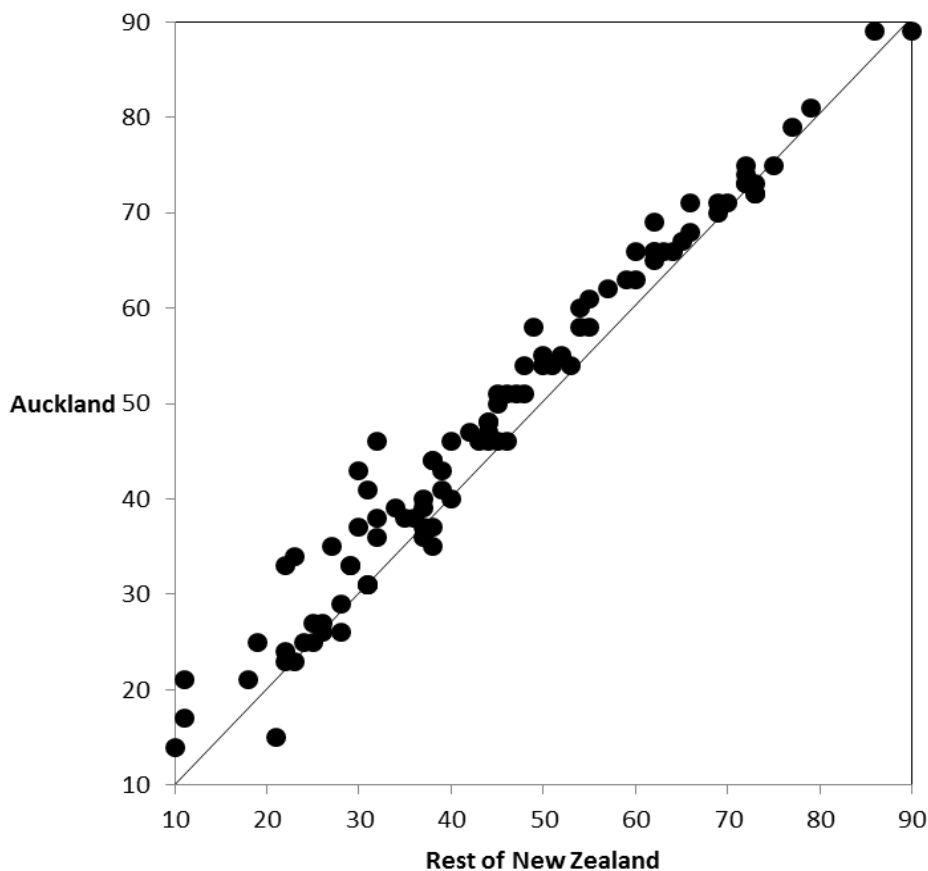


Figure 12 shows that for most occupations (78 out of 97), workers in Auckland were assigned higher NZSEI-13 scores than those elsewhere in New Zealand, and for six occupations the difference was 10 points or greater. Workers outside of Auckland were assigned scores at least 5 points greater than workers in Auckland for only one occupation: Mobile Plant Operators (ANZSCO minor group code 721) were assigned a score of 15 for Auckland workers, and 21 for workers elsewhere. There was a 3.3 point difference in mean scores across occupations (Auckland mean = 48.6, rest of New Zealand mean = 45.3). Despite this difference, both regions' scores correlated at  $r=0.98$ , suggesting that the socio-economic structuring of occupations was similar for Auckland and the rest of New Zealand.

To investigate reasons for the higher scores assigned to Auckland workers, figure 13 compares the mean income, years of education, and age for workers in Auckland and the rest of New Zealand by minor group (three-digit) occupation. For the most occupations, Auckland workers are younger, on average. Despite this, workers in Auckland report slightly higher incomes, especially for high-paying occupations. Similar to the urban workers, workers in Auckland have a higher level of education for nearly all (93 of 97) occupations.

The four occupations for which workers in the rest of New Zealand had higher average years of education than Auckland workers were:

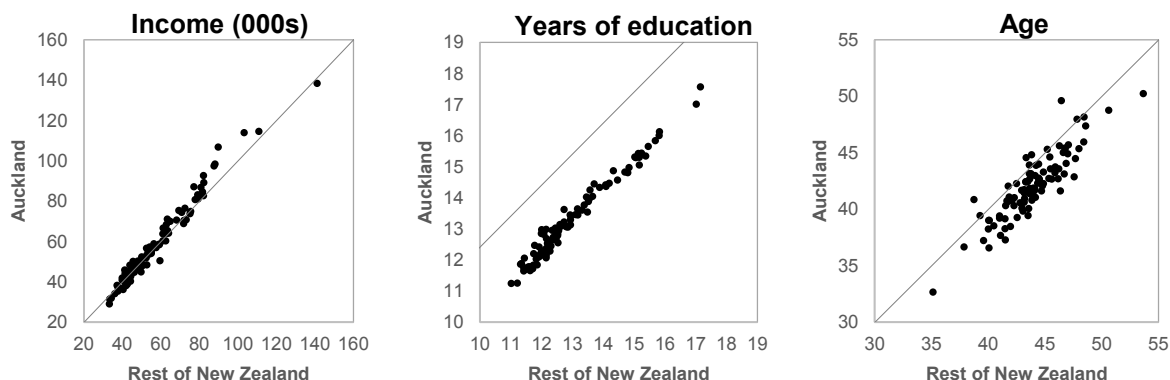
- Information and Organisation Professionals (224)
- Midwifery and Nursing Professionals (254)
- Bricklayers, Carpenters and Joiners (331)
- Hairdressers (391).

These differences in both income and education likely contribute to the higher NZSEI-13 scores assigned to Auckland workers.

**Figure 13**

**Mean values for income, years of education, and age**

Auckland compared with the rest of New Zealand for each occupation (ANZSCO minor group)



Source: Statistics New Zealand, 2013 Census

The absolute and percentage differences between Auckland and the rest of New Zealand’s workers in education and income by socio-economic group is shown in table 27. As for figure 13, workers outside of Auckland in lower SES groups reported higher incomes (by between 1 and 8 percent for groups 4–6), whereas in higher SES groups workers in Auckland reported higher incomes (by between 2 and 8 percent for groups 1–3). For all socio-economic groups, workers in Auckland have higher education levels. There are small differences in average education levels across all socio-economic groups (between 1 and 4 percent).

**Table 27**

**Differences in mean income and education**

Auckland compared with the rest of New Zealand

SES group	Mean income (\$)		Difference in income between regions (A-R)		Mean education (years)		Difference in education between regions (A-R)	
	Auckland	Rest of NZ	Percent (A-R)/R	\$ (A-R)	Auckland	Rest of NZ	Percent (A-R)/R	Years (A-R)
1	82,500	80,500	2	2,000	15.8	15.7	1	0.1
2	70,500	68,800	2	1,700	15.2	15.0	1	0.2
3	74,800	69,500	8	5,300	13.6	13.2	3	0.4
4	50,400	51,200	-2	-800	12.7	12.3	3	0.4
5	40,500	41,000	-1	-500	12.4	11.9	4	0.5
6	40,100	43,600	-8	-3,500	11.7	11.3	4	0.4

### 4.6 Analyses by country of birth

To assess the possibility that the associations between education, income, and occupation may differ for workers born overseas compared with those born in New Zealand, the model coefficients from table 20 were used to calculate separate scales for

workers born overseas and workers born in New Zealand. The minor group (three-digit) NZSEI-13 scores for New Zealand-born and overseas-born workers are shown in figure 14.

**Figure 14**

**NZSEI-13 scores for workers born overseas and workers born in New Zealand**  
ANZSCO minor group

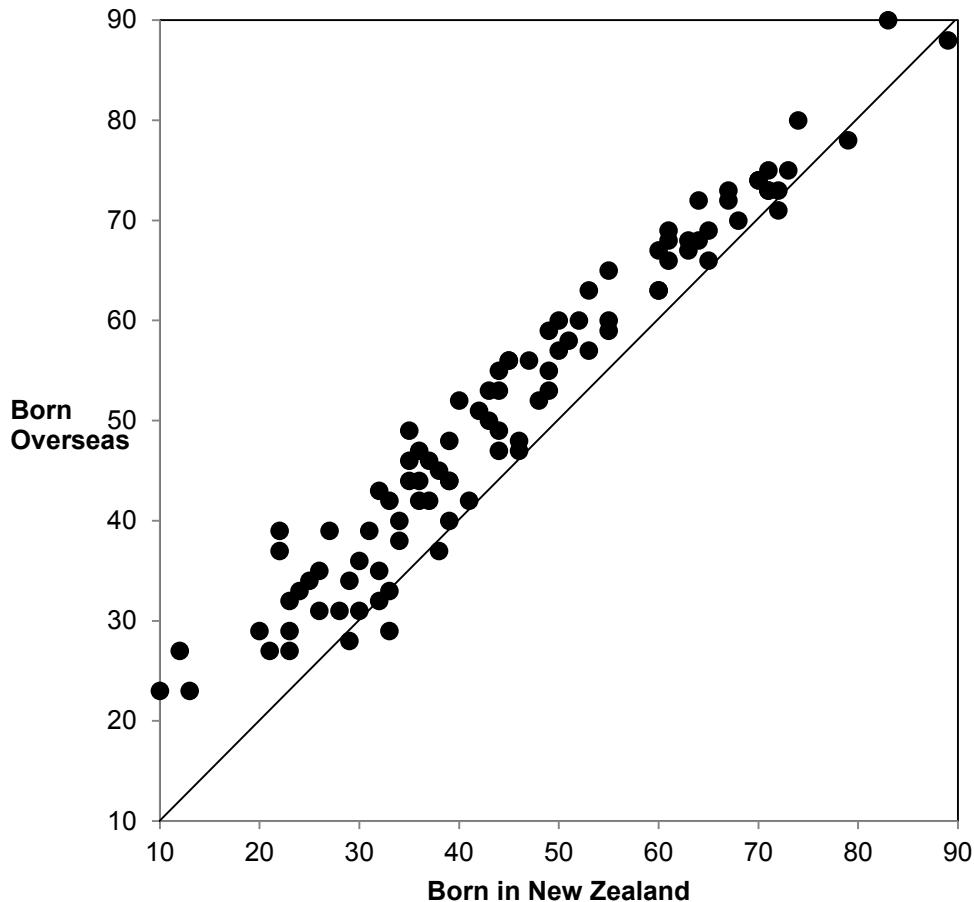


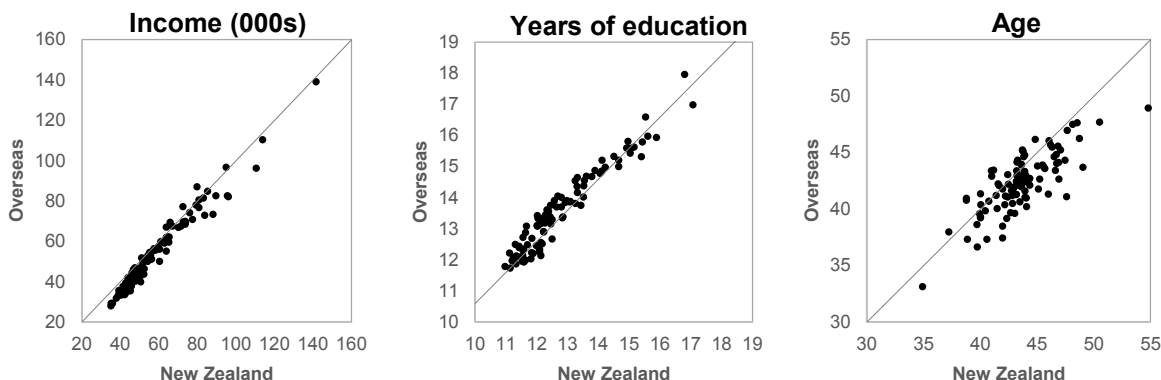
Figure 14 shows that for most occupations (89 out of 97), workers born overseas are assigned higher NZSEI-13 scores than workers born in New Zealand, and for 19 occupations this difference was 10 points or greater. There was a 6.1 point difference in mean scores across occupations (New Zealand mean = 45.4, overseas mean = 51.5). However, as with urban vs rural workers, and Auckland workers vs workers from the rest of New Zealand, scores for workers born in New Zealand and workers born overseas correlated strongly ( $r=0.97$ ). This suggests that the socio-economic structuring of occupations was largely the same, regardless of country of birth.

To investigate potential reasons for the higher scores assigned to workers born overseas, figure 15 compares the mean income, years of education, and age, for workers born overseas and born in New Zealand by minor group (three-digit) occupation. For most occupations, the average age of workers is older for those born in New Zealand. For almost all occupations, workers born in New Zealand report higher incomes. However, workers born overseas have a higher level of education, on average, for all but two occupations: Medical Practitioners (253); and Midwifery and Nursing Professionals (254). This difference in education levels is likely the reason why workers born overseas are assigned higher NZSEI-13 scores, despite reporting lower incomes (remembering that education contributes more to NZSEI-13 scores than income).

**Figure 15**

**Mean values for income, years of education, and age**

Workers born overseas vs workers born in New Zealand (ANZSCO minor group)



Source: Statistics New Zealand, 2013 Census

The absolute and percentage differences between workers born in New Zealand and workers born overseas in education and income by socio-economic group is shown in table 28. As shown in figure 15, workers born overseas report lower incomes than workers born in New Zealand for socio-economic groups 3–6, but similar incomes for socio-economic groups 1 and 2. Differences are greater in lower SES groups (7 percent, 11 percent, 17 percent, and 19 percent for groups 3, 4, 5, and 6, respectively). For all socio-economic groups, workers born overseas have higher levels of education, especially in lower SES groups (8 percent for groups 3–6).

**Table 28**

**Differences in mean income and education**

Workers born in New Zealand (NZ) compared with workers born overseas

SES group	Mean income (\$)		Difference in income between country of birth (O-N)		Mean education (years)		Difference in education between country of birth (O-N)	
	Overseas	NZ	Percent (O-N)/N	\$ (O-N)	Overseas	NZ	Percent (O-N)/N	Years (O-N)
1	77,900	79,600	-2	-1,700	15.4	15.0	3	0.4
2	70,400	70,000	1	400	15.4	14.9	3	0.5
3	68,800	73,800	-7	-5,000	14.1	13.1	8	1.0
4	46,500	52,500	-11	-6,000	13.2	12.2	8	1.0
5	35,700	43,000	-17	-7,300	12.7	11.8	8	0.9
6	36,200	44,600	-19	-8,400	12.1	11.2	8	0.9

## 4.7 Summary and discussion

### Comparison with NZSEI-06

It was possible to compare the scores assigned to individuals by NZSEI-13 with the scores assigned to individuals by NZSEI-06. This revealed that NZSEI-13 assigned socio-economic scores to occupations almost identically to NZSEI-06 (the scores correlate at  $r > 0.99$ ). The near-perfect correlation was not surprising, given that the two

scales were calculated using very similar path coefficients. The implication of this is that NZSEI-13 can reasonably be applied to occupation data collected prior to 2013 (at least as far back as 2006), so long as the ANZSCO classification has been used.

### Comparisons between population subgroups

Using the path coefficients determined for the sample as a whole, NZSEI-13 scores were constructed separately for males and females. Comparisons showed that males were assigned higher scores for the vast majority of occupations (mean difference across occupations was 4.0 points). Comparing males and females on mean income, years of education, and age for each minor group occupation revealed that it was the lower mean income reported by females that likely resulted in lower sex-specific NZSEI-13 scores. However, male and female scores correlated strongly ( $r = 0.95$ ), suggesting that the socio-economic structure of occupations is similar for the two sexes. This also suggests that NZSEI-13 scale is applicable to both males and females.

NZSEI-13 scores were also constructed separately and compared for five ethnic groups – European, Māori, Pacific, Asian, and MELAA. Asian and MELAA workers had ethnic-specific NZSEI-13 scores that were higher than European, Māori, and Pacific workers. Comparing ethnicities on mean income, years of education, and age for each minor group occupation revealed that the higher mean years of education for Asian and MELAA workers relative to other ethnic groups was the likely reason for their higher ethnic-specific NZSEI-13 scores. These differences notwithstanding, the ethnic-specific NZSEI-13 scores of each ethnic group correlated strongly with every other group (all pairwise  $r > 0.90$ ). This suggests that the socio-economic structure of occupations is similar across ethnic groups, and that NZSEI-13 can be applied to these ethnic groups.

NZSEI-13 scores were also constructed separately for urban and rural workers; Auckland workers and workers from the rest of New Zealand; and workers born in New Zealand and workers born overseas. Some between-group differences were found. Urban workers were assigned higher scale scores for most occupations (mean difference across occupations was 3.3 points), and this was likely because of the higher levels of education for urban vs rural workers for nearly all occupations. Similarly, Auckland workers were assigned higher scale scores than workers from the rest of New Zealand (mean difference 3.3 points). This was likely a function both of the higher incomes and the higher education levels of Auckland workers for most occupations. Workers born overseas were assigned substantially higher scores than workers born in New Zealand for most occupations (mean difference 6.1 points). This appeared to be a function of the higher education levels for most occupations for workers born overseas, and was *despite* the lower incomes reported for most occupations for workers born overseas.

Notwithstanding these differences, the scales constructed for each of the groups were very similar to each other. Urban and rural scores correlated at  $r = 0.98$ ; scores for Auckland workers and for workers from the rest of New Zealand also correlated at  $r = 0.98$ ; while scores for workers born in New Zealand and workers born overseas correlated at  $r = 0.97$ . Taken together, this suggests that the socio-economic structure of occupations is similar for workers – and NZSEI-13 is applicable – regardless of rurality, region, and country of birth.





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## 5 Construct validation of NZSEI-13

In this section, NZSEI-13 is applied to data from the 2013 Census to assess whether the socio-economic index replicated known patterns for smoking, housing tenure, and residential deprivation.

Multivariable regression analyses will be presented to further assess the validity of NZSEI-13 and to determine the relative contribution of age, sex, ethnicity, and NZSEI-13 to the three outcomes. To assess the independent effects of sex, ethnicity, and socio-economic status on the three outcomes – smoking, housing tenure, and household deprivation – regression models were undertaken. Logistic regression analyses were undertaken for binary outcomes (smoking, housing tenure), while least-squares regression analyses were undertaken for the continuous NZDep2013 measure. For each correlate, two models were fitted, one using the continuous measure of NZSEI-13, and the other using the categorical six socio-economic group measure of NZSEI-13.

All models included age, sex (male versus female), and ethnicity (European, Māori, Pacific, Asian, and MELAA; for each ethnicity, the comparison group is those not identifying with that ethnic group). The odds ratios for age and NZSEI-13 scores are reported on a scale converted into units of 10 (that is, per 10 years and per 10 NZSEI-13 score units, respectively).

### 5.1 Smoking prevalence

The overall prevalence of smoking for workers aged 21–69 years for the 2013 Census was 15.2 percent.

#### **Bivariate analysis**

Figure 16 shows the prevalence of smoking across the six NZSEI-13 socio-economic groups. There was a graded association between smoking prevalence and socio-economic group, with the prevalence of smoking increasing with declining socio-economic groups. The prevalence of smoking in the lowest socio-economic group was more than four times as high (27.9 percent) as that reported by the highest occupational group (6.0 percent).

**Figure 16**

**Smoking prevalence**

By NZSEI-13 SES group

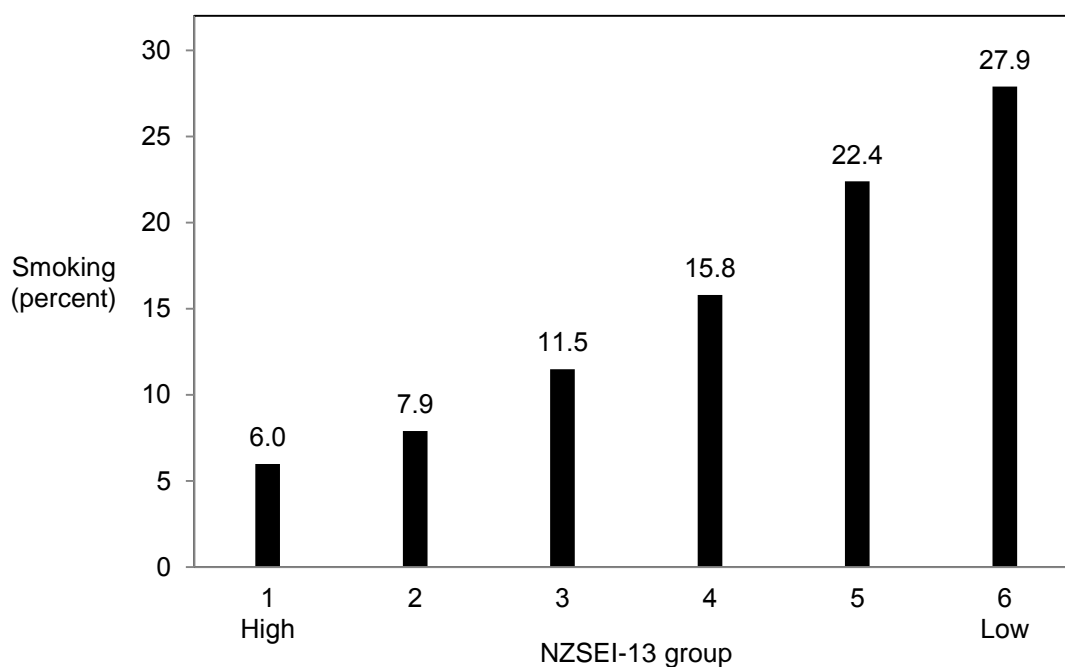


Figure 17 shows that the socio-economic gradient in smoking was apparent for both males and females of each ethnic group. This is most obvious among European and Māori males and females, and Pacific males.

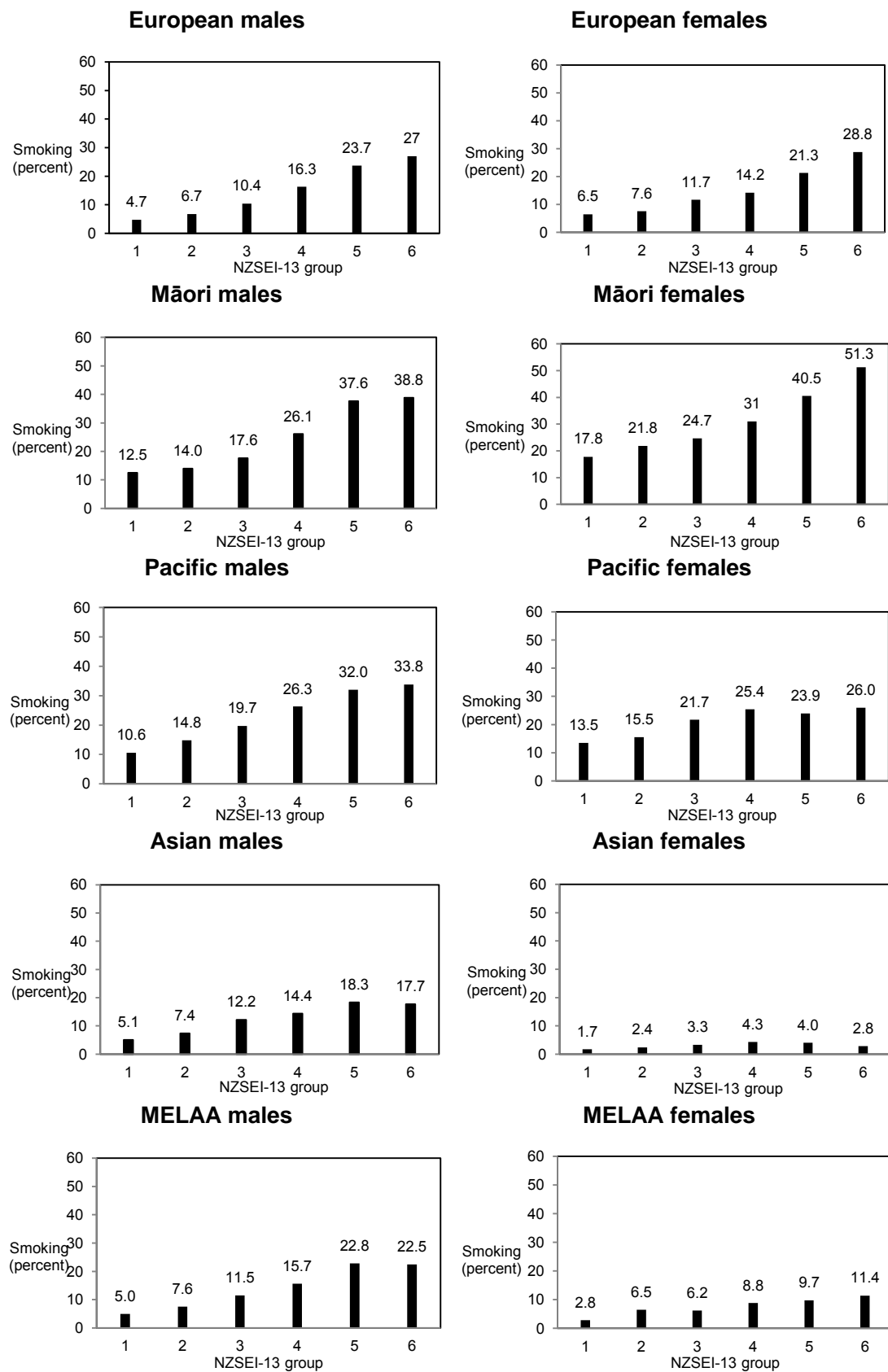
For Asian and MELAA males, there was a clear gradient for socio-economic groups 1–5, but smoking prevalence was slightly lower among those in group 6 compared with group 5. For Pacific females, there was a gradient for socio-economic groups 1–3 but little to distinguish those in groups 4–6.

A male excess in smoking was apparent for those of Pacific, Asian, and MELAA ethnicity, while a female excess was apparent among Māori. Smoking prevalence was particularly low among Asian females.

**Figure 17**

**Smoking prevalence**

By NZSEI-13 SES group, sex, and ethnicity



## Multi-variable analysis

Table 29 shows the results for the logistic regression model on smoking, using the continuous measure of NZSEI-13. Controlling for age, sex, and ethnicity, the odds of smoking decreased by a factor of 0.762 for each 10-unit increase in NZSEI-13. Older age and being male were both associated with *decreased* odds of smoking. Māori and Pacific ethnicity were each associated with *increased* odds of smoking. European, Asian, and MELAA ethnicity were each associated with substantially *decreased* odds of smoking.

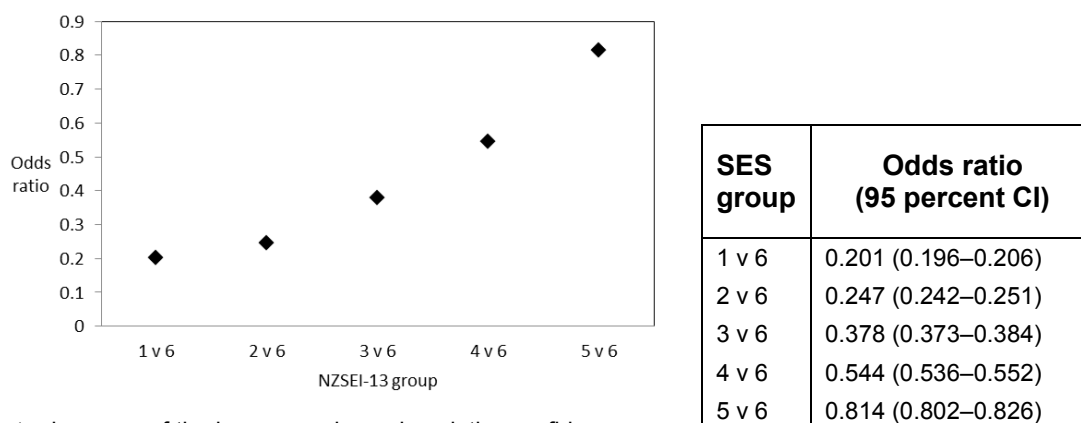
**Table 29**  
**Odds ratios for smoking**  
NZSEI-13 continuous measure

Factor	Odds ratio (95 percent CI)	P value
NZSEI-13 (per 10 units)	0.762 (0.760–0.764)	<.0001
Age (per 10 years)	0.846 (0.843–0.849)	<.0001
Sex (male vs female)	0.921 (0.913–0.929)	<.0001
European (vs non-European)	0.771 (0.759–0.783)	<.0001
Māori (vs non-Māori)	1.988 (1.961–2.016)	<.0001
Pacific (vs non-Pacific)	1.207 (1.182–1.233)	<.0001
Asian (vs non-Asian)	0.383 (0.375–0.392)	<.0001
MELAA (vs non-MELAA)	0.554 (0.526–0.583)	<.0001

The results of the logistic regression model using the categorical group measure of NZSEI-13 are shown in figure 18, with odds ratios shown for each socio-economic group, controlling for age, sex, and ethnicity (reference group = socio-economic group 6).

There was a linear association between socio-economic group and smoking. Those from socio-economic groups 1–5 all had reduced odds of smoking compared with socio-economic group 6. Those from socio-economic group 1 had greatly reduced odds of smoking (0.201), and the odds of smoking were also reduced for each of the remaining socio-economic groups, with the strength of the difference diminishing in a linear fashion.

**Figure 18**  
**Odds ratios for smoking**  
NZSEI-13 categorical measure



**Note:** because of the large sample analysed, the confidence intervals for the odds ratios are so narrow that they do not appear on the graph above.

## 5.2 Housing tenure

In the 2013 Census, a dwelling was defined as rented if its occupants do not own the home, with or without a mortgage. For analyses here, individuals were assigned the rent status of the dwelling occupied on census night.

### Bivariate analysis

The prevalence of renting homes in New Zealand among workers aged 21–69 years was 42 percent, similar to the prevalence of renting in 2006 of 39 percent (Milne et al, 2013). Figure 19 shows that NZSEI-13 did not distinguish well between the highest four groups, but did distinguish between groups 1–4 and groups 5–6: the prevalence of renting among those in groups 1–4 was 13–23 percent lower than the prevalence of renting among those in groups 5 and 6.

**Figure 19**

#### Home renting

By NZSEI-13 SES group

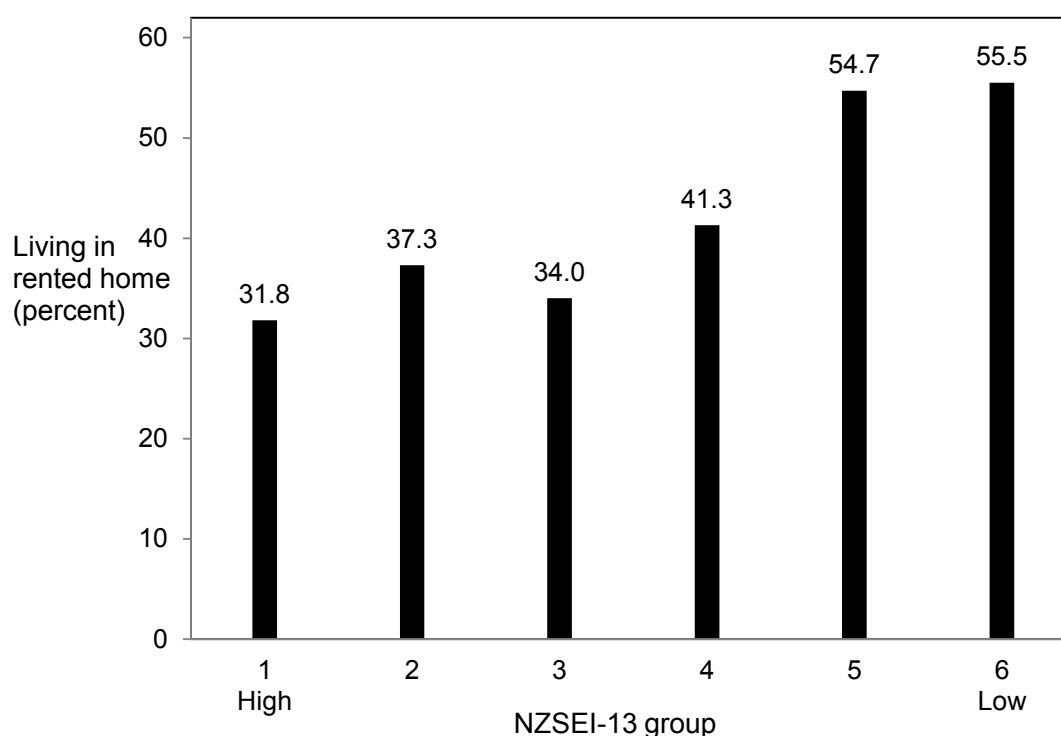
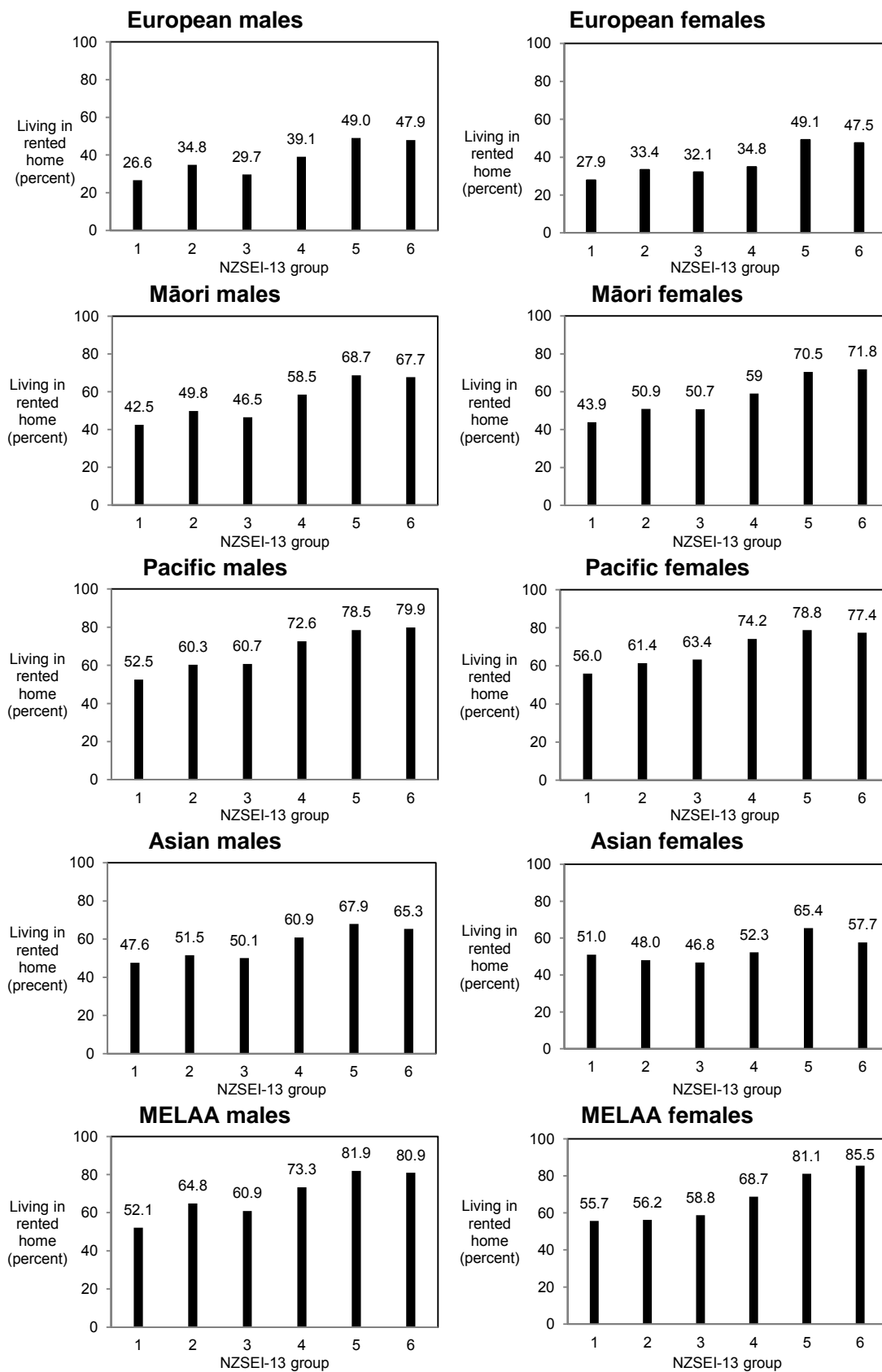


Figure 20 shows the prevalence of home renting within each NZSEI-13 socio-economic group, by sex and ethnicity. Mild socio-economic gradients were apparent for males and females of each ethnicity. As with the overall trend, groups 1–3 differed very little for each ethnicity, but prevalence of home renting was 10–30 percent larger among those in groups 5 and 6 compared with those in groups 1–3. Socio-economic gradients were strongest for Māori, Pacific, and MELAA workers. Prevalence of home renting among European workers was significantly lower than all other ethnic groups.

**Figure 20**

**Home renting**

By NZSEI-13 SES group, sex, and ethnicity



## Multi-variable analysis

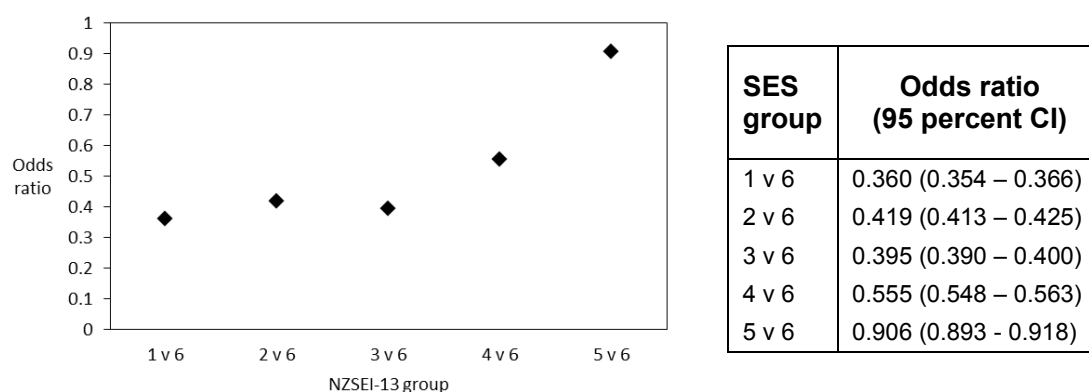
The odds of living in a rented versus an owned home, for a 10-unit change in NZSEI-13, are given in table 30. The table shows that the odds of living in a rented home decreased by a factor of 0.828 for each 10-unit increase in NZSEI-06 score. Younger age, and identifying as being of Māori, Pacific, or MELAA ethnicity were associated with increased odds of living in a rented home. Conversely, being male, and identifying as being of European ethnicity were associated with decreased odds of living in a rented home. It should be noted that being of Asian ethnicity does not have a significant effect on the odds of living in a rented home.

**Table 30**  
**Odds ratios for living in a rented dwelling**  
NZSEI-13 continuous measure

Factor	Odds ratio (95 percent CI)	P value
NZSEI-13 (per 10 units)	0.828 (0.826–0.829)	<.0001
Age (per 10 years)	0.430 (0.428–0.431)	<.0001
Sex (male vs female)	0.986 (0.979–0.993)	0.0001
European (vs non-European)	0.627 (0.618–0.636)	<.0001
Māori (vs non-Māori)	1.685 (1.664–1.707)	<.0001
Pacific (vs non-Pacific)	2.317 (2.271–2.365)	<.0001
Asian (vs non-Asian)	0.985 (0.969–1.002)	0.0937
MELAA (vs non-MELAA)	1.950 (1.876–2.028)	<.0001

Figure 21 presents the analysis using the categorical measure of NZSEI-13. With the effects of age, sex, and ethnicity controlled, the odds of living in a rented home for those in socio-economic groups 1–3 were two-fifths those in socio-economic group 6. The odds of living in a rented home for those in socio-economic group 4 were approximately half those in socio-economic group 6. The odds of living in a rented home were slightly lower for those in socio-economic group 5 vs those in socio-economic group 6.

**Figure 21**  
**Odds ratios for housing tenure**  
NZSEI-13 categorical measure



**Note:** because of the large sample analysed, the confidence intervals for the odds ratios are so narrow that they do not appear on the graph above.

## 5.3 Deprivation

As described in section 1.3, an area-based measure of deprivation – NZDep2013 – has been derived using data from the 2013 Census. The NZDep2013 scale assigns each meshblock in New Zealand a score from 1 (least deprived) to 10 (most deprived) with roughly the same number of meshblocks in each of the 10 categories. For the analyses presented here, each individual was assigned the NZDep2013 scale score of the dwelling in which they lived.

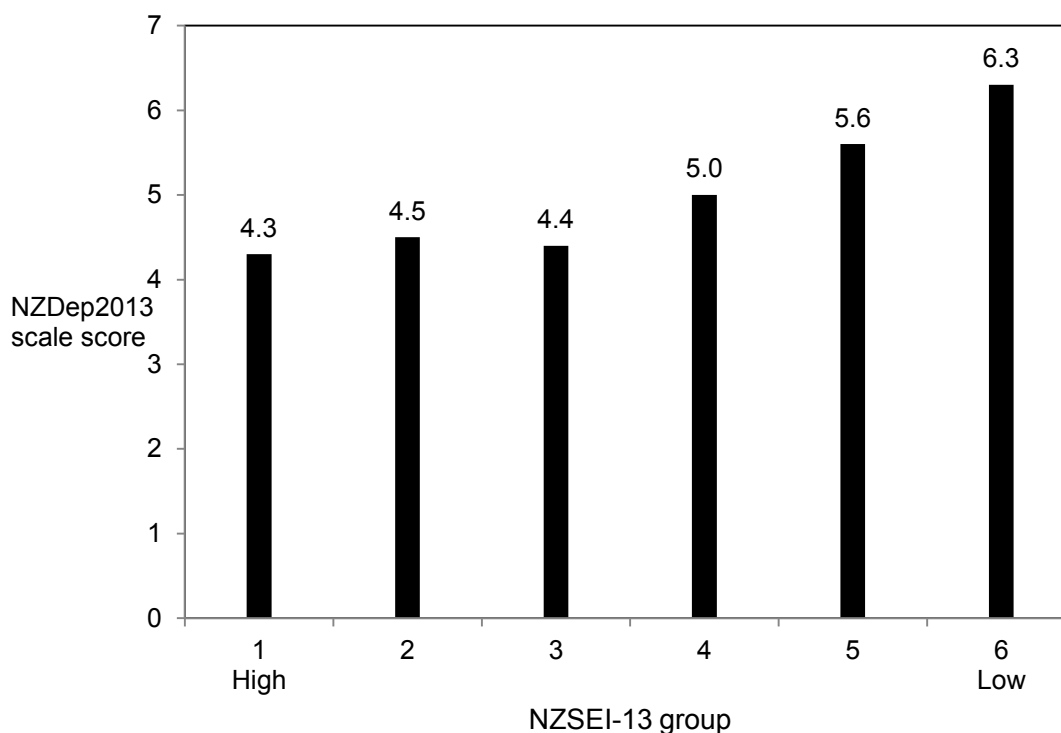
### Bivariate analysis

Figure 22 shows the mean NZDep2013 scale scores for each NZSEI-13 socio-economic group (note that the mean NZDep2013 scale score across all workers aged 21–69 years was 5.0). As with housing tenure, there was little evidence that the top half of the NZSEI-13 distribution (groups 1–3) differed on NZDep2013 scale scores. However, there was a gradient across NZSEI-13 groups 1–3, 4, 5, and 6.

**Figure 22**

#### Mean scores on NZDep2013 scale

By NZSEI-13 SES group



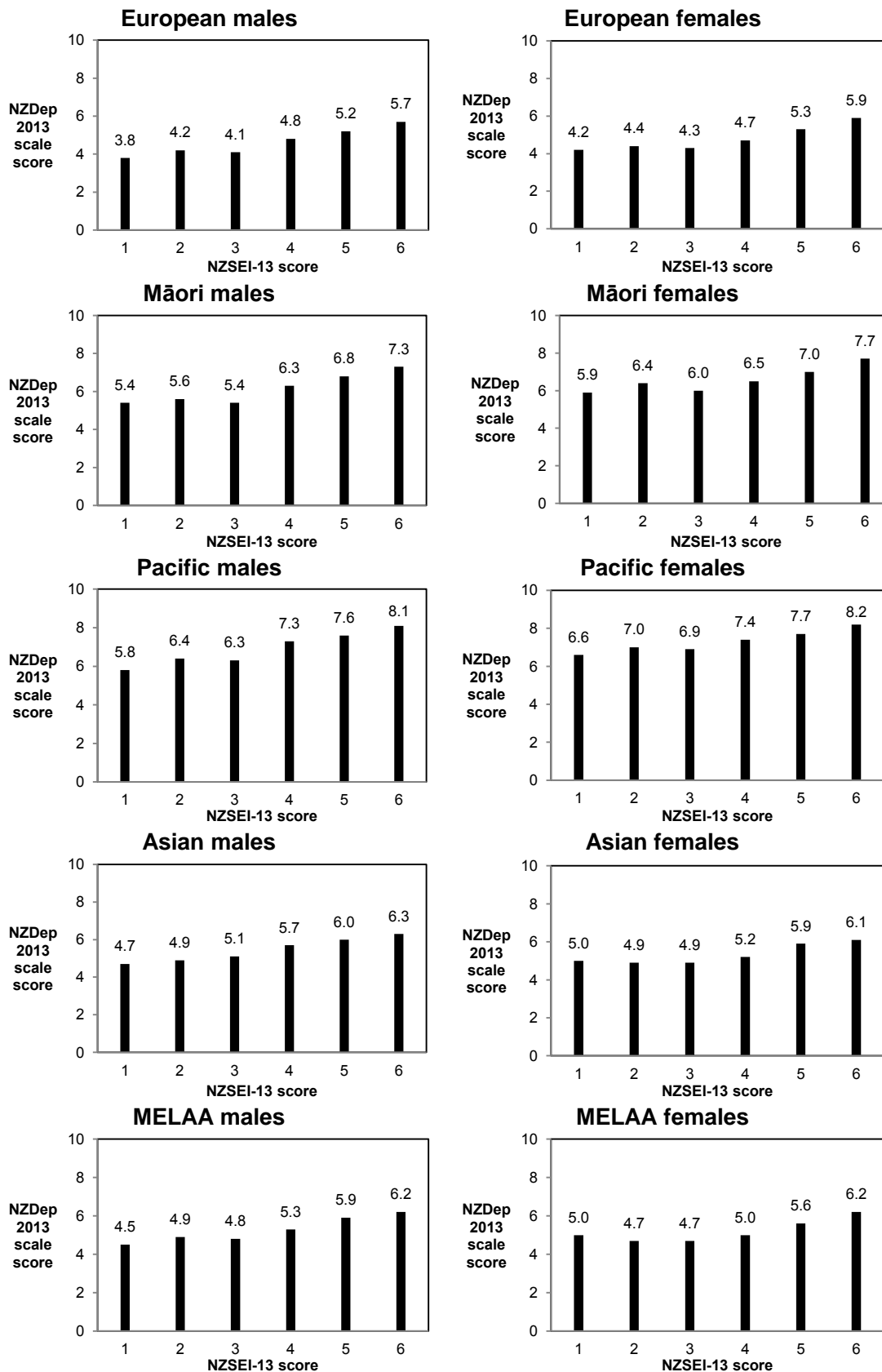
There were slight socio-economic gradients in deprivation by sex and ethnicity, as shown in figure 23. Again, however, there was little to distinguish those in socio-economic groups 1–3, with gradients more apparent across groups 4–6 for both sexes and each ethnic group. Few sex differences were evident, but there were clear ethnic differences in deprivation. European workers (mean NZDep2013 scale score across socio-economic groups = 4.7) lived in the least-deprived areas, followed by MELAA workers (mean = 5.2), Asian workers (mean = 5.4), Māori workers (mean = 6.4), and Pacific workers (mean = 7.1).



**Figure 23**

**Mean scores on NZDep2013 scale**

By NZSEI-13 SES group, sex, and ethnicity



## Multi-variable analysis

Table 31 shows the effect of the continuous NZSEI-13 measure on scores on the NZDep2013 scale, controlling for age, sex, and ethnicity. The table shows that NZDep2013 scale scores decreased by 0.27 points for every 10-point increase in the continuous NZSEI-13 measure. Note that while increasing scores on the continuous NZSEI-13 scale represent higher SES, increasing scores on the NZDep2013 scale represent higher deprivation, so a negative association is expected. NZDep2013 scores also decreased with age, and were lower for males and those of European ethnicity. NZDep2013 scores were higher for those of Māori and Pacific ethnicity.

**Table 31**  
**Regression coefficients for scores on the NZDep2013 scale**  
 NZSEI-13 continuous measure

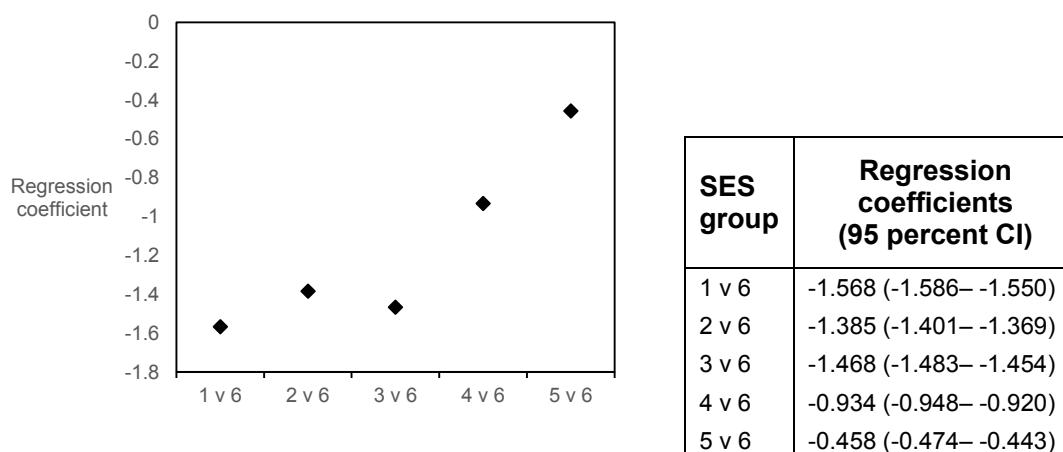
Factor	Regression coefficients (95 percent CI)	P value
NZSEI-13 (per 10 units)	-0.265 (-0.267– -0.263)	<.0001
Age (per 10 years)	-0.155 (-0.158– -0.152)	<.0001
Sex (male vs female)	0.128 (0.120–0.136)	<.0001
European (vs non-European)	-1.016 (-1.032– -1.000)	<.0001
Māori (vs non-Māori)	1.158 (1.143–1.172)	<.0001
Pacific (vs non-Pacific)	1.572 (1.550–1.594)	<.0001
Asian (vs non-Asian)	-0.281 (-0.301– -0.262)	<.0001
MELAA (vs non-MELAA)	-0.389 (-0.431– -0.348)	<.0001

**Note:** NZDep2013 scale = ordinal index of deprivation 2013

Analysing NZSEI-13 as a six-group categorical variable (see figure 24) revealed that those in socio-economic groups 1-3 had NZDep2013 scores that were approximately 1.5 points less than those in socio-economic group 6. The effect on NZDep2013 scores for each of the remaining socio-economic groups was less, with the strength of the difference diminishing in a linear fashion.

**Figure 24**

**Regression coefficients for scores on the NZDep2013 scale**  
 NZSEI-13 categorical measure



**Note:** because of the large sample analysed, the confidence intervals for the regression coefficients are so narrow that they do not appear on the graph above.

## 5.4 Summary and discussion

The purpose of this section was to assess NZSEI-13 in relation to a number of health and other socio-economic indicators.

Assessing NZSEI-13 against 2013 Census data on smoking, housing tenure, and residential deprivation revealed socio-economic patterning for each of these outcomes. Moreover, these patterns were apparent for both males and females of each major ethnic group. Results were clearest for smoking: the higher the NZSEI-13 score (or socio-economic group), the lower the likelihood of smoking. However, there was no gradient for either housing tenure or residential deprivation among those in the top half of the NZSEI-13 distribution (socio-economic groups 1–3). There was a clear gradient across socio-economic groups 4–6 for both of these outcomes.

## 6 Imputing NZSEI-13 scores in the absence of occupational data

This section describes and evaluates a method for imputing NZSEI-13 scores for those with no occupational data. The method is based on the notion of 'occupational potential' (Jones & McMillan, 2001), whereby, in the absence of information on occupation, scores can be assigned using available data on age and education.

Two versions of the method were trialled for NZSEI-06. The methods gave very similar scores to each other (they correlated at  $r = 0.97$ ), and both were found to correspond well with actual NZSEI-06 scores and to have reasonable construct validity (Milne et al, 2013). The first of these methods was favoured for its simplicity, and the suitability of this method will be tested for the classification of those without occupational data. This is done by assessing their correspondence with actual NZSEI-13 scores, and their ability to predict socio-economic patterns in smoking prevalence, housing tenure, and deprivation (NZDep2013 scale).

### 6.1 Imputing NZSEI-13 scores: results

For the imputation for NZSEI-13, educational qualifications were classified at the greatest (15-group) level of detail, as was done with NZSEI-06 (Milne et al, 2013). The reasons for this are that, first, simplifying educational qualification levels risks grouping together individuals with a quite different socio-economic standing. Second, with the standardisation of New Zealand qualifications to a 'levels' system through the New Zealand Qualifications Authority ([NZQA](#)), classification of qualifications has become easier. Third, by showing the results of imputations with educational qualifications classified to the greatest level of detail, it is possible to determine where misclassifications might make large differences to an imputed score and where they have little impact. This will help those charged with the classification of qualification data to determine the distinctions that are important for the accurate classification of socio-economic status.

For the purposes of imputing NZSEI-13 scores, 10-year age bands were used from the 2013 Census. All ages 15 years and older were used so that all those out of the workforce with valid education data (available only for those 15 years and older) could have scores imputed.

Table 32 shows a classification of highest qualification by 10-year age band for those reporting an occupation as part of the 2013 Census. As the years of education corresponding to each qualification level are used in one of the imputation methods, these are also shown in the table (note, these are repeated from table 3).

**Table 32**  
**Distribution of people with an occupation**  
 By age-band and qualification  
 2013 Census

Highest qualification	Years of education	People with an occupation						
		Age (years)						
		15–24	25–34	35–44	45–54	55–64	65–74	75+
Doctorate degree	20	18	1,686	4,449	4,869	3,876	1,650	156
Master's degree	18	957	13,368	17,151	16,758	11,514	3,024	279
Post-graduate and honours degree	17	4,482	18,072	19,590	16,215	9,336	1,881	147
Bachelor's degree and level 7 qualification	16	30,561	89,928	83,109	65,115	37,488	9,213	1,098
Level 6 diploma	14.5	4,866	12,978	19,920	26,460	24,561	7,980	870
Level 5 diploma	13.5	10,356	19,914	21,957	23,523	15,861	4,401	525
Level 4 certificate gained post-school	12.5	17,736	37,506	48,429	56,496	40,116	11,247	1,356
Level 3 certificate gained post-school	11.5	8,481	10,566	8,706	7,455	4,446	987	105
Level 2 certificate gained post-school	11.5	3,453	3,642	3,654	4,074	2,730	837	81
Level 1 certificate gained post-school	11.5	1,596	1,728	1,500	1,224	672	177	18
Overseas secondary school qualification	12	6,912	19,983	27,078	27,627	15,645	4,860	678
Level 3 or 4 certificate gained at school	13	58,254	25,665	23,652	14,349	9,324	2,616	426
Level 2 certificate gained at school	12	50,397	24,615	39,381	46,839	24,723	5,136	750
Level 1 certificate gained at school	11	30,792	26,877	42,249	58,674	47,889	13,635	1,410
No school qualifications	10	22,521	30,495	41,745	64,818	65,616	27,291	3,435

**Source:** Statistics New Zealand, 2013 Census

## Imputation method – simple averages

The method of imputation involves calculating the average NZSEI-13 scores by highest educational qualification and age band. These are shown in table 33. The mean NZSEI-13 scores obtained ranged from 29, for those aged 15–24 years with no qualifications, to 76, for those aged 45–64 years with doctoral degrees. This range of scores is substantially narrower than the potential range of 10–90 for the 97 minor group occupations. Scores increased with age, irrespective of education, and also increased with education, irrespective of age. Both these effects were reported with previous imputations of NZSEI (eg Davis et al, 2003; Milne et al, 2013).

**Table 33**  
**Imputed mean NZSEI-13 scores**  
For each age/qualification category

Highest qualification	Age (years)						
	15–24	25–34	35–44	45–54	55–64	65–74	75+
	<b>Imputed mean NZSEI-13 score</b>						
Doctorate degree	48	72	75	76	76	74	68
Master's degree	57	62	64	65	66	64	60
Post-graduate and honours degree	58	63	65	66	66	64	62
Bachelor's degree and level 7 qualification	54	60	61	61	62	60	59
Level 6 diploma	45	52	58	59	59	56	52
Level 5 diploma	39	46	51	51	51	50	46
Level 4 certificate gained post-school	37	41	43	44	44	43	42
Level 3 certificate gained post-school	35	40	43	43	42	42	43
Level 2 certificate gained post-school	33	38	41	42	42	43	43
Level 1 certificate gained post-school	35	40	43	45	44	46	45
Overseas secondary school qualification	34	40	42	42	42	44	43
Level 3 or 4 certificate gained at school	37	46	49	50	48	48	47
Level 2 certificate gained at school	34	42	45	47	46	46	45
Level 1 certificate gained at school	31	38	41	41	42	42	41
No school qualifications	29	32	33	33	34	36	36

Differences between adjacent educational qualification levels were in some cases large and in others virtually non-existent. For example, while those with a doctorate degree had NZSEI-13 scores that were, on average, around 10 points higher than those with a master's degree, only around one point separated those with a master's degree from

those with a post-graduate or honours degree. Consistent 4–5 point gaps separated the next four educational qualifications on the hierarchy, but there was little to separate those with a Level 4, Level 3, Level 2, or Level 1 Certificate gained post-school. For those with school qualifications, the difference in average NZSEI-13 scores between obtaining a Level 3 or 4 certificate and a Level 2 certificate was slight (2–4 points); a greater difference (3–8 points) was apparent between obtaining these and obtaining a Level 1 or overseas school qualification, and between gaining a Level 1 and obtaining none (2–8 points).

These similarities and differences have implications for coding educational qualifications for the classification of socio-economic status. In particular, it may *not* be important to distinguish:

- (i) between those with a master's degree and those with a post-graduate or honours degree
- (ii) between those with a Level 1, 2, 3, or 4 qualification obtained post-school
- (iii) between those with a Level 3 or 4 and a Level 2 school qualification.

All other distinctions appear important.

## 6.2 Comparison of actual and imputed scores

The Pearson correlation coefficient between actual NZSEI-13 scores and imputed scores for all workers aged at least 15 years was 0.577. This shows that imputed scores correlated substantially but by no means perfectly with actual NZSEI-13 scores. Imperfect correlation is expected as there are variety of occupations – and a range of occupation status scores – held by those with the same education level and within the same age band.

To gain a greater insight into the performance of the method, the mean error between imputed scores and actual scores by age and qualification level is shown in table 34. This shows that the mean difference between imputed scores and actual scores ranged from 10 points, for a variety of age bands and qualification levels, to 21 points, for those aged 15–24 years holding a doctoral degree. Overall, the mean difference averaged across age and qualification level was 12.35. These descriptive statistics are somewhat similar to those found for NZSEI-06, which had mean differences by age bands and qualification levels which ranged from 8 to 23, and an overall mean difference averaged across age and qualification level of 12.18 (Milne et al, 2006).

**Table 34**  
**Mean error (absolute difference) between imputed and actual NZSEI-13 scores**

Highest qualification	Age (years)						
	15–24	25–34	35–44	45–54	55–64	65–74	75+
	Mean error						
Doctorate degree	21	11	12	12	12	14	16
Master's degree	16	12	10	10	11	13	16
Post-graduate and honours degree	16	12	10	11	11	13	17
Bachelor's degree and level 7 qualification	16	14	12	12	13	14	15
Level 6 diploma	15	15	14	14	14	16	17
Level 5 diploma	12	13	13	13	14	14	15
Level 4 certificate gained post-school	10	11	12	12	12	13	13
Level 3 certificate gained post-school	10	12	13	13	13	13	14
Level 2 certificate gained post-school	10	12	13	13	12	13	13
Level 1 certificate gained post-school	10	13	13	14	14	13	10
Overseas secondary school qualification	11	14	15	14	14	14	14
Level 3 or 4 certificate gained at school	11	13	13	14	14	15	15
Level 2 certificate gained at school	10	13	12	12	13	13	14
Level 1 certificate gained at school	10	12	13	12	12	12	12
No school qualifications	10	11	12	12	12	11	10

### 6.3 Validation against health and socio-economic correlates

As a final assessment of the imputation method, the performance of the method at predicting health and socio-economic correlates was assessed for those aged 21–69 years and not in the workforce, using data from the 2013 Census. The assessment involved regressing each of three health and socio-economic correlates – smoking



prevalence, housing tenure, and deprivation – against the imputed scores, controlling for age, sex, and ethnicity.

A regression approach was favoured over comparing rates of each correlate across the six socio-economic groups, in part because the restricted range of imputed scores resulted in no imputed cases in socio-economic group 6 and very few in socio-economic groups 1 and 5. These validation analyses are equivalent to those conducted in figures 18, 21, and 24 in sections 5.1 to 5.3, describing the validation of actual NZSEI-13 scores among those in the workforce. Thus, the performance of the imputed NZSEI-13 scores was able to be directly compared with the performance of the actual NZSEI-13 at predicting each of the four health and socio-economic correlates. The result of these comparisons is described below.

### Smoking prevalence and housing tenure

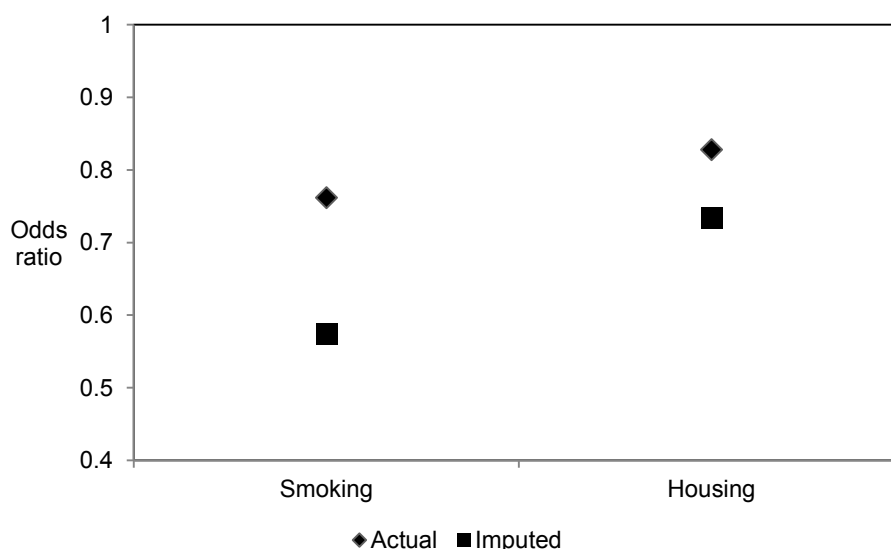
Figure 25 shows the odds ratios for smoking and housing tenure per 10-unit increase in NZSEI-13 scores, comparing actual scores for those in the workforce versus imputed scores for those not in the workforce, using the method described above. The effects of age, sex, and ethnicity were controlled.

The figure indicates that the odds of smoking were lower for the imputed scores (odds ratio = 0.575) than for actual scores (odds ratio = 0.762), and that the odds of living in a rented home were also lower for the imputed scores (odds ratio = 0.734) than for the actual scores (odds ratio = 0.828). Thus, imputed socio-economic scores were found to be strong predictors of both smoking and housing tenure among those not in the workforce. Similar to NZSEI-06, the imputed scores were *more strongly* associated with smoking and housing tenure among those not in the workforce than the actual scores were among those in the workforce. This perhaps highlights the importance of age and education as a predictor of smoking and housing tenure.

**Figure 25**

#### Odds ratios for smoking and housing tenure

Comparison between actual and imputed NZSEI-13 scores (per 10 units)



**Note:** because of the large sample analysed, the confidence intervals for the beta coefficients are so narrow that they do not appear on the graph above.

## Deprivation

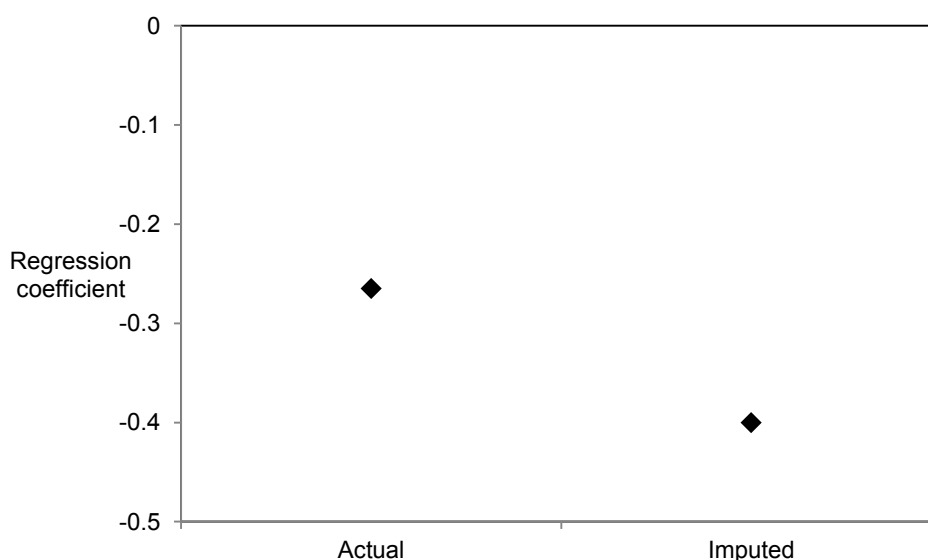
Figure 26 shows the effect on the NZDep2013 scale per 10-unit increase in actual and imputed NZSEI-13 scores, controlling for age, sex, and ethnicity.

The figure indicates that NZDep2013 scale scores were approximately 0.4 points lower for every 10-unit increase in imputed NZSEI-13 scores ( $B = -0.400$ ). This was a stronger effect than the effect of actual NZSEI-13 scores among those in the workforce ( $B = -0.265$ ).

**Figure 26**

### Regression coefficients for scores on the NZDep2013 scale

Comparison between actual and imputed NZSEI-13 scores (per 10 units)



**Note:** because of the large sample analysed, the confidence intervals for the regression coefficients are so narrow that they do not appear on the graph above.

## 6.4 Summary and discussion

This section described a method for imputing NZSEI-13 scores when data on occupation are unavailable. This involved analysing data from the 2013 Census for those in an occupation and with an NZSEI-13 score assigned. The method involved calculating the average NZSEI-13 scores by highest educational qualification and age band.

Three evaluations of this method were undertaken:

- (i) assessing the extent to which imputed scores correlated with actual NZSEI-13 scores
- (ii) assessing the mean error between imputed and actual NZSEI-13 scores
- (iii) validating the imputed scores against health and socio-economic correlates.

These evaluations revealed that the imputations correlated with actual NZSEI-13 scores, and validated well against health and socio-economic correlates – at least as well (if not better) than actual NZSEI-13 scores. However, this method produced a restricted range of scores compared with the actual NZSEI-13, suggesting that it was unsuitable for the assignment of socio-economic groups.

## 7 Conclusion

This report detailed the construction of NZSEI-13, an occupation-based measure of socio-economic status, derived using data from the 2013 Census. NZSEI-13 assigned scores from 10 (lowest) to 90 (highest) for each minor group (three-digit) occupation in New Zealand according to ANZSCO.

The algorithm used to derive NZSEI-13 scores was based on a path-analytic representation of the 'returns to human capital' model of stratification, in which occupation is viewed as the means by which human capital (education) is converted into material rewards (income).

NZSEI-13 produced similar scores to the previous NZSEI-06. NZSEI-13 validated well against some health and socio-economic correlates for both sexes and also for five major ethnic groups: European, Māori, Pacific, Asian, and MELAA. The NZSEI-13 was developed for the entire workforce, with part-time workers' incomes inflated to a full-time equivalent. The full scale (including part-time workers) was very similar to the scale including the full-time workforce only, with no large rank-order changes among occupations.

Also like previous versions, a method was suggested for imputing NZSEI-13 scores for those not in the workforce. The method involved assigning scores based on the mean NZSEI-13 scores for each age and educational qualification group. It was suggested that categorisation should not be used for imputed scores (eg for those not in the workforce) because the restricted range of the imputed scores results in some categories having few or no cases.

A couple of differences between NZSEI-13 and its predecessors should be noted. First, NZSEI-13 was validated for a wider range of ethnic groups than previous NZSEI versions had undertaken. In general, NZSEI-13 validated well for each of the five ethnic groups studied: European, Māori, Pacific, Asian, and MELAA.

Interestingly, both the Asian and MELAA workers showed the same anomalous association between education and income found for Asian workers when developing NZSEI-06 (Milne et al, 2013). That is, while Asian and MELAA workers had the highest education levels across occupation groups, they tended to report lower (or at least equal) incomes than workers from every other ethnic group. An investigation found that being born overseas best explained low income in the presence of high education for Asian workers in the 2006 Census (Bolton, 2014), and for both Asian and MELAA workers in the 2013 Census (Bolton, personal communication).

Second, NZSEI-13 was validated for urban and rural workers, workers in Auckland and elsewhere in New Zealand, and overseas-born and New Zealand-born workers. The scale validated well for each category.

### 7.1 Advantages of NZSEI-13 as a measure of socio-economic status

There are several advantages of NZSEI-13. First, occupation is readily and accurately recalled. It is not subject to stigma with reporting, or a tendency to misreport (as, for example, income may be in some instances (Davis & Smith, 1994)).

Second, occupation can be retrospectively recalled with some accuracy (Hauser & Warren, 1997). Thus, it may be possible (and preferable) to assess the socio-economic status of individuals in late-aged or retired samples by asking about their main occupation during their working years.

Third, occupation is often recorded in survey datasets, especially in the socio-economic and sociological fields, and also on administrative datasets (eg birth and death records). Against this, recent health surveys and Statistics NZ surveys in New Zealand have tended to neglect the collection of occupation data.

Fourth, as the validation exercise showed, NZSEI-13 is a robust measure of socio-economic status in that it produces expected stratification patterns across smoking prevalence and across two socio-economic correlates.

Fifth, NZSEI-13 has a sound theoretical basis – the ‘returns to human capital model’ – that has been used and validated previously in New Zealand and elsewhere (Davis et al, 1997; 2003; Ganzeboom et al, 1992; McMillan et al, 2009).

Sixth, because NZSEI-13 uses a similar methodology to other scales developed internationally, this provides opportunities for international comparisons.

Seventh, New Zealand has a long history of occupation-based socio-economic measures that have been frequently updated, and an even longer history of collecting information on occupation. This enables socio-economic comparisons over time to be undertaken, and for cohort samples to have socio-economic status to be assessed at different life-stages using the ‘current’ occupation-based socio-economic measure.

## 7.2 Limitations of NZSEI-13

NZSEI-13 has its limitations. First, it requires occupational information. A significant proportion of the population is not currently employed, and unless further steps are taken to collect such information – for example, previous occupation – NZSEI-13 cannot be directly estimated. An ‘imputed’ score, based on the age and education of respondents, has been suggested as a way to assign scores to those without any information on occupation, but previous occupation or ‘main’ occupation during working life may be preferable for some individuals (eg retirees). Note that in some cases it may be justified to use the occupation of a proxy person to assess socio-economic status (eg for children).

Second, even if occupational information is available, it is often difficult to classify with accuracy to the minor group (three-digit) level of ANZSCO, which is required for NZSEI-13. Steps can be taken to help with the collection and classification of occupations (see appendix V), but if insufficient detail is provided to the coder, there is little that can be done. Where there is insufficient detail to code to the minor group level, it may sometimes be possible to classify to the major (one-digit) or sub-major (two-digit) group level, and NZSEI-13 scores can be assigned for these classifications (see appendix III).

Third, NZSEI-13 only classifies occupations to the minor group level of ANZSCO, and it is likely that there is a great deal of socio-economic heterogeneity among occupations grouped at this level. Thus, while it would make the task of occupational coding more difficult, it is possible that more accurate socio-economic scores could be obtained if NZSEI-13 was developed for occupations coded at the unit group (four-digit) or group (six-digit) level.

Fourth, there is likely to be socio-economic heterogeneity among individuals who have the same occupation, regardless of the level of categorisation. Unfortunately, this cannot be captured by NZSEI-13, which groups individuals according to their occupation.

## 7.3 Future work

Further work remains to be done with NZSEI-13. First, the validation work, while promising, only encompasses one health indicator and two socio-economic indicators. An assessment of NZSEI-13 against a wider range of indicators is required. Fortunately, the addition of 2013 Census data containing occupation to the Integrated Data Infrastructure

(IDI, Statistics New Zealand, 2013), encompassing a range of health, social, and justice administrative data sources, opens up a range of such validation possibilities.

Second, given the interest in the socio-economic patterning of children's outcomes – particularly in the area of health (eg Mortensen, Helweg-Larsen, & Andersen, 2011) – the validity of NZSEI-13 as it applies to children also needs to be explored. As suggested above, the scores assigned to children will necessarily have to be derived from a proxy (eg a parent, or perhaps the combined scores of two parents or the household). Again, the IDI datasets may be ideal for this purpose.

Third, since the basic unit of socio-economic structure is often the household (or family) rather than the individual, a framework for placing the household at the centre of socio-economic index construction needs to be developed.

Finally, given that researchers have several different options for assessing socio-economic status in New Zealand – for example, New Zealand deprivation index (NZDep), New Zealand index of socio-economic deprivation for individuals (NZiDep), education, income, living standards, as well as NZSEI-13 – it would be worthwhile to assess the extent to which these different measures have independent, as opposed to shared, influences on outcomes of interest.

## 8 References

- Atkinson, J., Salmond, C., & Crampton, P. (2014). *NZDep2013 Index of Deprivation*. Wellington: School of Public Health, University of Otago
- Australian Bureau of Statistics & Statistics NZ (2006). *ANZSCO – Australian and New Zealand Standard Classification of Occupations, first edition*. Canberra: Australian Bureau of Statistics. Available from [www.abs.gov.au](http://www.abs.gov.au).
- Baker, PS (1993). *Taxpayer compliance of the self-employed: estimates from household spending data. Working Paper 93/14* London: Institute for Fiscal Studies.
- Bolton, E (2014). *Factors explaining the low income return for education among Asian New Zealanders*. Auckland: University of Auckland. (dissertation).
- Bradbury, B (1997). The living standards of the low income self-employed. *Australian Economic Review* 30(4), 374–389.
- Crampton, P, Salmond, C, & Sutton, F (1997). *Research report no 5: NZDep91 index of deprivation*. Wellington: Health Services Research Centre.
- Davis, JA, & Smith, TW (1994). *General Social Surveys 1972–1994; cumulative codebook*. Chicago: National Opinion Research Centre.
- Davis, P, McLeod, K, Ransom, M, & Ongley, P (1997). *The New Zealand socio-economic index of occupational status (NZSEI)*. (Research report no. 2). Wellington: Statistics NZ.
- Davis, P, Jenkin, G, & Coope, P (2003). *The New Zealand socio-economic index 1996. An update and revision of the New Zealand socio-economic index of occupational status*. Wellington: Statistics NZ.
- De-Leeuw, J (1989). Multivariate analysis with linearizable regressions. *Psychometrika* 53(4), 437–454.
- Department of Statistics (1992). *New Zealand Standard Classification of Occupations 1990*. Wellington: Department of Statistics.
- Didham, R (forthcoming). Ethnic mobility in the NZ Census, 1981-2013, a preliminary look. *New Zealand Population Review*, 42
- Elley, WB, & Irving, JC (1972). A socio-economic index for New Zealand based on levels of education and income from the 1966 Census. *New Zealand Journal of Educational Studies* 2(2), 153–157.
- Elley, WB, & Irving, JC (1976). Revised socio-economic index for New Zealand. *New Zealand Journal of Educational Studies* 11(1), 25–36.
- Elley, WB, & Irving, JC (1985). The Elley-Irving socio-economic index 1981 Census revision. *New Zealand Journal of Educational Studies* 20(2), 115–128.
- Elley, WB, & Irving, JC (2003). The Elley-Irving socio-economic index: 2001 Census revision. *New Zealand Journal of Educational Studies* 38(1), 3–17.
- Galbraith, C, Jenkin, G, Davis, P, & Coope, P (2003). *New Zealand socio-economic index 1996 users' guide*. Wellington: Statistics NZ.
- Ganzeboom, H, De-Graaf, P, Treiman, D, & De-Leeuw, J (1992). A standard international socioeconomic index of occupational status. *Social Science Research* 21(1), 1–56.

- Ganzeboom, H, & Treiman, D (1996). Internationally comparable measures of occupational status for the 1988 International Standard Classification of Occupations. *Social Science Research* 25(3), 201–239.
- Hauser, RM, & Warren, JR (1997). Socioeconomic indices for occupation: A review, update, and critique. *Sociological Methodology* 27, 177–298.
- Irving, JC, & Elley, WB (1977). A socioeconomic index for the female labour force in New Zealand. *New Zealand Journal of Educational Studies* 34, 86–98.
- Jones, F & McMillan, J (2001). Scoring occupational categories for social research: A review of current practice, with Australian examples. *Work, Employment and Society* 15(3): 539–564.
- McMillan, J, Beavis, A, & Jones, FL (2009). The AUSEI06. A new socioeconomic index for Australia. *Journal of Sociology* 45, 123–49.
- Metcalfe, PA, Scragg, R, Schaaf, D, Dyal, L, Black, PN, & Jackson, RT (2008). Comparison of different markers of socioeconomic status with cardiovascular disease and diabetes risk factors in the Diabetes, Heart and Health Survey. *New Zealand Medical Journal*, 121(1269), 45–56.
- Milne, BJ, Byun, U, & Lee, A (2013). *New Zealand socio-economic index 2006*. Wellington: Statistics New Zealand.
- Ministry of Health (2015). *Content Guide 2014/15: New Zealand Health Survey*. Wellington: Ministry of Health.
- Mortensen, LH, Helweg-Larsen, K, & Andersen, AM (2011). Socioeconomic differences in perinatal health and disease. *Scandinavian Journal of Public Health* 39(7 Suppl), 110–4.
- Parker, SC (1997). The distribution of self-employment income in the United Kingdom, 1976–1991. *The Economic Journal* 107(441), 455–466.
- Pissarides, CA, & Weber, G (1989). An expenditure-based estimate of Britain's black economy. *Journal of Public Economics* 39(1), 17–32.
- Salmond, C, Crampton, P, & Sutton, F (1998). *Research report No 8, NZDep96 index of deprivation*. Wellington: Health Services Research Centre.
- Salmond, C, & Crampton, P (2002). *NZDep2001 index of deprivation*. Wellington: Department of Public Health: School of Medicine and Health Sciences.
- Salmond, C, Crampton, P, & Atkinson, J (2007). *NZDep2006 index of deprivation*. Wellington: Ministry of Health.
- Statistics New Zealand (1995). *New Zealand Standard Classification of Occupations 1995*. Wellington: Statistics NZ.
- Statistics New Zealand (2007). *Guidelines for using ethnicity data: 2006 Census*. Wellington: Statistics NZ.
- Statistics New Zealand (2013). Introduction to the Integrated Data Infrastructure 2013. Wellington: Statistics New Zealand.
- Statistics New Zealand (2015). *Inside Auckland 2013–15: A profile of people and households in the Auckland region*. Retrieved from [www.stats.govt.nz](http://www.stats.govt.nz).

## Appendix I: Occupation by sex

**Table A1**  
**Occupation by sex**  
 Workers aged 21–69 years  
 2013 Census

Occupation (minor group)		Sex		Total
		Male	Female	
<b>Manager</b>				
111	Chief Executives, General Managers and Legislators	46,950	21,042	67,992
121	Farmers and Farm Managers	36,315	14,427	50,742
131	Advertising, Public Relations and Sales Managers	18,552	11,982	30,534
132	Business Administration Managers	25,794	26,799	52,593
133	Construction, Distribution and Production Managers	38,631	3,561	42,192
134	Education, Health and Welfare Services Managers	3,030	8,163	11,193
135	ICT Managers	4,749	1,374	6,123
139	Miscellaneous Specialist Managers	4,332	3,348	7,680
141	Accommodation and Hospitality Managers	8,505	11,385	19,890
142	Retail Managers	14,484	16,014	30,498
149	Miscellaneous Hospitality, Retail and Service Managers	8,082	7,452	15,534
	<b>Total</b>	<b>209,424</b>	<b>125,547</b>	<b>334,971</b>
<b>Professional</b>				
211	Arts Professionals	4,155	2,850	7,005
212	Media Professionals	4,839	4,476	9,315
221	Accountants, Auditors and Company Secretaries	12,249	14,844	27,093
222	Financial Brokers and Dealers, and Investment Advisers	5,940	4,188	10,128
223	Human Resource and Training Professionals	3,018	6,822	9,840
224	Information and Organisation Professionals	12,894	14,898	27,792
225	Sales, Marketing and Public Relations Professionals	7,875	8,868	16,743
231	Air and Marine Transport Professionals	5,211	417	5,628
232	Architects, Designers, Planners and Surveyors	10,557	7,995	18,552
233	Engineering Professionals	18,900	1,623	20,523
234	Natural and Physical Science Professionals	6,933	5,181	12,114
241	School Teachers	13,878	61,476	75,354

Table A1 continued on next page



Table A1 continued

Occupation (minor group)		Sex		Total
		Male	Female	
242	Tertiary Education Teachers	6,684	6,813	13,497
249	Miscellaneous Education Professionals	2,058	5,265	7,323
251	Health Diagnostic and Promotion Professionals	2,703	6,480	9,183
252	Health Therapy Professionals	2,910	7,473	10,383
253	Medical Practitioners	6,948	5,562	12,510
254	Midwifery and Nursing Professionals	3,081	37,479	40,560
261	Business and Systems Analysts, and Programmers	23,139	5,541	28,680
262	Database and Systems Administrators, and ICT Security Specialists	2,649	2,742	5,391
263	ICT Network and Support Professionals	3,936	1,188	5,124
271	Legal Professionals	6,516	6,600	13,116
272	Social and Welfare Professionals	8,490	17,268	25,758
	<b>Total</b>	<b>175,563</b>	<b>236,049</b>	<b>411,612</b>
<b>Technician and Trades Workers</b>				
311	Agricultural, Medical and Science Technicians	4,647	7,020	11,667
312	Building and Engineering Technicians	12,666	1,776	14,442
313	ICT and Telecommunications Technicians	5,475	1,854	7,329
321	Automotive Electricians and Mechanics	15,516	135	15,651
322	Fabrication Engineering Trades Workers	9,081	192	9,273
323	Mechanical Engineering Trades Workers	14,121	600	14,721
324	Panelbeaters, and Vehicle Body Builders, Trimmers and Painters	4,077	63	4,140
331	Bricklayers, Carpenters and Joiners	13,080	120	13,200
332	Floor Finishers and Painting Trades Workers	9,003	615	9,618
333	Glaziers, Plasterers and Tilers	7,575	159	7,734
334	Plumbers	7,467	39	7,506
341	Electricians	12,345	180	12,525
342	Electronics and Telecommunications Trades Workers	7,302	435	7,737
351	Food Trades Workers	16,917	10,332	27,249
361	Animal Attendants and Trainers, and Shearers	2,196	2,802	4,998
362	Horticultural Trades Workers	8,847	4,152	12,999
391	Hairdressers	1,038	6,798	7,836
392	Printing Trades Workers	3,498	939	4,437
393	Textile, Clothing and Footwear Trades Workers	1,317	888	2,205

Table A1 continued on next page

Table A1 continued

Occupation (minor group)		Sex		Total
		Male	Female	
394	Wood Trades Workers	2,613	267	2,880
399	Miscellaneous Technicians and Trades Workers	7,212	2,211	9,423
	<b>Total</b>	<b>165,993</b>	<b>41,577</b>	<b>207,570</b>
<b>Community and Personal Service Workers</b>				
411	Health and Welfare Support Workers	4,806	12,654	17,460
421	Child Carers	342	6,432	6,774
422	Education Aides	831	10,587	11,418
423	Personal Carers and Assistants	4,212	33,384	37,596
431	Hospitality Workers	7,377	16,659	24,036
441	Defence Force Members, Fire Fighters and Police	12,246	2,736	14,982
442	Prison and Security Officers	7,410	1,902	9,312
451	Personal Service and Travel Workers	3,816	10,074	13,890
452	Sports and Fitness Workers	5,499	5,202	10,701
	<b>Total</b>	<b>46,539</b>	<b>99,630</b>	<b>146,169</b>
<b>Clerical and Administrative Workers</b>				
511	Contract, Program and Project Administrators	4,395	13,116	17,511
512	Office and Practice Managers	3,225	29,643	32,868
521	Personal Assistants and Secretaries	552	16,305	16,857
531	General Clerks	6,165	29,055	35,220
532	Keyboard Operators	636	3,897	4,533
541	Call or Contact Centre Information Clerks	1,236	2,796	4,032
542	Receptionists	1,140	20,331	21,471
551	Accounting Clerks and Bookkeepers	2,814	19,812	22,626
552	Financial and Insurance Clerks	3,942	9,393	13,335
561	Clerical and Office Support Workers	6,522	7,446	13,968
591	Logistics Clerks	9,771	6,141	15,912
599	Miscellaneous Clerical and Administrative Workers	5,886	8,709	14,595
	<b>Total</b>	<b>46,284</b>	<b>166,644</b>	<b>212,928</b>
<b>Sales Workers</b>				
611	Insurance Agents and Sales Representatives	16,329	22,872	39,201
612	Real Estate Sales Agents	7,257	6,195	13,452
621	Sales Assistants and Salespersons	30,333	42,588	72,921
631	Checkout Operators and Office Cashiers	981	6,216	7,197

Table A1 continued on next page

Table A1 continued

Occupation (minor group)		Sex		Total
		Male	Female	
639	Miscellaneous Sales Support Workers	1,959	5,136	7,095
	<b>Total</b>	<b>56,859</b>	<b>83,007</b>	<b>139,866</b>
<b>Machinery Operators and Drivers</b>				
711	Machine Operators	11,397	5,754	17,151
712	Stationary Plant Operators	7,680	525	8,205
721	Mobile Plant Operators	14,532	840	15,372
731	Automobile, Bus and Rail Drivers	9,066	1,689	10,755
732	Delivery Drivers	2,901	570	3,471
733	Truck Drivers	22,104	756	22,860
741	Storepersons	13,098	2,409	15,507
	<b>Total</b>	<b>80,778</b>	<b>12,543</b>	<b>93,321</b>
<b>Labourers</b>				
811	Cleaners and Laundry Workers	10,485	23,421	33,906
821	Construction and Mining Labourers	14,862	705	15,567
831	Food Process Workers	11,967	5,412	17,379
832	Packers and Product Assemblers	4,578	5,751	10,329
839	Miscellaneous Factory Process Workers	4,899	1,452	6,351
841	Farm, Forestry and Garden Workers	24,594	11,895	36,489
851	Food Preparation Assistants	2,634	5,805	8,439
891	Freight Handlers and Shelf Fillers	3,435	1,242	4,677
899	Miscellaneous Labourers	29,709	7,131	36,840
	<b>Total</b>	<b>107,163</b>	<b>62,814</b>	<b>169,977</b>
<b>All occupations</b>				
<b>Total</b>		<b>888,603</b>	<b>827,811</b>	<b>1,716,414</b>
<b>Note:</b> Data randomly rounded to base three.				
<b>Source:</b> Statistics New Zealand, 2013 Census				

## Appendix II: Occupations of waged and self-employed workers

**Table A2**  
**Occupations of waged and self-employed workers**  
 Workers aged 21–69 years  
 2013 Census

Occupation (minor group)		Employment status		Percent self-employed
		Waged	Self-employed	
<b>Manager</b>				
111	Chief Executives, General Managers and Legislators	30,852	37,140	54.6
121	Farmers and Farm Managers	17,271	33,474	66.0
131	Advertising, Public Relations and Sales Managers	25,068	5,466	17.9
132	Business Administration Managers	44,142	8,454	16.1
133	Construction, Distribution and Production Managers	24,432	17,760	42.1
134	Education, Health and Welfare Services Managers	10,035	1,158	10.3
135	ICT Managers	5,013	1,113	18.2
139	Miscellaneous Specialist Managers	6,828	852	11.1
141	Accommodation and Hospitality Managers	10,380	9,504	47.8
142	Retail Managers	19,506	10,995	36.0
149	Miscellaneous Hospitality, Retail and Service Managers	12,930	2,607	16.8
	<b>Total</b>	<b>206,457</b>	<b>128,523</b>	<b>38.4</b>
<b>Professional</b>				
211	Arts Professionals	1,920	5,082	72.6
212	Media Professionals	4,983	4,332	46.5
221	Accountants, Auditors and Company Secretaries	19,815	7,275	26.9
222	Financial Brokers and Dealers, and Investment Advisers	7,191	2,940	29.0
223	Human Resource and Training Professionals	8,025	1,815	18.4
224	Information and Organisation Professionals	21,738	6,051	21.8
225	Sales, Marketing and Public Relations Professionals	13,614	3,129	18.7
231	Air and Marine Transport Professionals	4,464	1,158	20.6

Table A2 continued next page

Table A2 continued

Occupation (minor group)		Employment status		Percent self-employed
		Waged	Self-employed	
232	Architects, Designers, Planners and Surveyors	9,933	8,619	46.5
233	Engineering Professionals	16,659	3,861	18.8
234	Natural and Physical Science Professionals	9,465	2,649	21.9
241	School Teachers	69,621	5,733	7.6
242	Tertiary Education Teachers	11,178	2,316	17.2
249	Miscellaneous Education Professionals	3,801	3,522	48.1
251	Health Diagnostic and Promotion Professionals	7,206	1,980	21.6
252	Health Therapy Professionals	5,250	5,133	49.4
253	Medical Practitioners	7,347	5,166	41.3
254	Midwifery and Nursing Professionals	37,389	3,171	7.8
261	Business and Systems Analysts, and Programmers	21,450	7,230	25.2
262	Database and Systems Administrators, and ICT Security Specialists	4,827	564	10.5
263	ICT Network and Support Professionals	4,371	750	14.6
271	Legal Professionals	8,172	4,944	37.7
272	Social and Welfare Professionals	20,550	5,208	20.2
	<b>Total</b>	<b>318,969</b>	<b>92,628</b>	<b>22.5</b>
<b>Technician and Trades Workers</b>				
311	Agricultural, Medical and Science Technicians	10,719	948	8.1
312	Building and Engineering Technicians	11,685	2,757	19.1
313	ICT and Telecommunications Technicians	6,120	1,206	16.5
321	Automotive Electricians and Mechanics	11,922	3,729	23.8
322	Fabrication Engineering Trades Workers	7,788	1,485	16.0
323	Mechanical Engineering Trades Workers	12,585	2,133	14.5
324	Panelbeaters, and Vehicle Body Builders, Trimmers and Painters	2,982	1,161	28.0
331	Bricklayers, Carpenters and Joiners	7,968	5,229	39.6
332	Floor Finishers and Painting Trades Workers	4,641	4,977	51.7
333	Glaziers, Plasterers and Tilers	3,942	3,792	49.0
334	Plumbers	4,632	2,874	38.3
341	Electricians	8,529	3,999	31.9
342	Electronics and Telecommunications Trades Workers	6,285	1,455	18.8
351	Food Trades Workers	22,641	4,608	16.9

Table A2 continued next page

Table A2 continued

Occupation (minor group)		Employment status		Percent self-employed
		Waged	Self-employed	
361	Animal Attendants and Trainers, and Shearers	3,405	1,596	31.9
362	Horticultural Trades Workers	7,350	5,652	43.5
391	Hairdressers	4,182	3,657	46.7
392	Printing Trades Workers	3,837	603	13.6
393	Textile, Clothing and Footwear Trades Workers	1,236	969	43.9
394	Wood Trades Workers	1,926	951	33.1
399	Miscellaneous Technicians and Trades Workers	5,955	3,465	36.8
	<b>Total</b>	<b>150,330</b>	<b>57,246</b>	<b>27.6</b>
<b>Community and Personal Service Workers</b>				
411	Health and Welfare Support Workers	15,129	2,328	13.3
421	Child Carers	5,070	1,704	25.2
422	Education Aides	10,494	927	8.1
423	Personal Carers and Assistants	35,457	2,142	5.7
431	Hospitality Workers	21,885	2,151	8.9
441	Defence Force Members, Fire Fighters and Police	14,010	975	6.5
442	Prison and Security Officers	8,691	621	6.7
451	Personal Service and Travel Workers	9,618	4,275	30.8
452	Sports and Fitness Workers	6,606	4,098	38.3
	<b>Total</b>	<b>126,960</b>	<b>19,221</b>	<b>13.1</b>
<b>Clerical and Administrative Workers</b>				
511	Contract, Program and Project Administrators	14,523	2,988	17.1
512	Office and Practice Managers	26,001	6,870	20.9
521	Personal Assistants and Secretaries	14,508	2,346	13.9
531	General Clerks	29,229	5,994	17.0
532	Keyboard Operators	3,951	585	12.9
541	Call or Contact Centre Information Clerks	3,843	189	4.7
542	Receptionists	19,110	2,364	11.0
551	Accounting Clerks and Bookkeepers	17,763	4,863	21.5
552	Financial and Insurance Clerks	12,537	792	5.9
561	Clerical and Office Support Workers	10,320	3,645	26.1
591	Logistics Clerks	14,541	1,371	8.6
599	Miscellaneous Clerical and Administrative Workers	13,077	1,512	10.4
	<b>Total</b>	<b>179,403</b>	<b>33,519</b>	<b>15.7</b>

Table A2 continued next page

Table A2 continued

Occupation (minor group)		Employment status		Percent self-employed
		Waged	Self-employed	
<b>Sales Workers</b>				
611	Insurance Agents and Sales Representatives	35,502	3,699	9.4
612	Real Estate Sales Agents	7,206	6,246	46.4
621	Sales Assistants and Salespersons	63,174	9,750	13.4
631	Checkout Operators and Office Cashiers	6,909	291	4.0
639	Miscellaneous Sales Support Workers	6,255	840	11.8
	<b>Total</b>	<b>119,046</b>	<b>20,826</b>	<b>14.9</b>
<b>Machinery Operators and Drivers</b>				
711	Machine Operators	14,799	2,349	13.7
712	Stationary Plant Operators	7,434	771	9.4
721	Mobile Plant Operators	12,150	3,219	20.9
731	Automobile, Bus and Rail Drivers	6,792	3,969	36.9
732	Delivery Drivers	2,805	663	19.1
733	Truck Drivers	19,860	3,000	13.1
741	Storepersons	15,087	420	2.7
	<b>Total</b>	<b>78,927</b>	<b>14,391</b>	<b>15.4</b>
<b>Labourers</b>				
811	Cleaners and Laundry Workers	27,720	6,186	18.2
821	Construction and Mining Labourers	10,734	4,836	31.1
831	Food Process Workers	16,353	1,026	5.9
832	Packers and Product Assemblers	9,753	579	5.6
839	Miscellaneous Factory Process Workers	5,721	633	10.0
841	Farm, Forestry and Garden Workers	25,935	10,554	28.9
851	Food Preparation Assistants	7,779	663	7.9
891	Freight Handlers and Shelf Fillers	4,464	213	4.6
899	Miscellaneous Labourers	31,746	5,097	13.8
	<b>Total</b>	<b>140,205</b>	<b>29,787</b>	<b>17.5</b>
<b>All occupations</b>				
<b>Total</b>		<b>1,320,297</b>	<b>396,141</b>	<b>23.1</b>
<b>Note:</b> Data randomly rounded to base three.				
<b>Source:</b> Statistics New Zealand, 2013 Census				

## Appendix III: Final NZSEI-13 scores

**Table A3**  
**Final NZSEI-13 scores**  
 ANZSCO major, sub-major, and minor group level

Occupation (ANZSCO major, sub-major, and minor groups)		NZSEI-13 score			Count
		Major group	Sub-major group	Minor group	
<b>1</b>	<b>Managers</b>	<b>52</b>			<b>334,998</b>
11	<i>Chief Executives, General Managers and Legislators</i>		61		67,998
	111 Chief Executives, General Managers and Legislators			61	67,998
12	<i>Farmers and Farm Managers</i>		37		50,745
	121 Farmers and Farm Managers			37	50,745
13	<i>Specialist Managers</i>		60		150,327
	131 Advertising, Public Relations and Sales Managers			63	30,534
	132 Business Administration Managers			63	52,599
	133 Construction, Distribution and Production Managers			48	42,195
	134 Education, Health and Welfare Services Managers			73	11,193
	135 ICT Managers			72	6,123
	139 Miscellaneous Specialist Managers			64	7,683
14	<i>Hospital, Retail and Service Managers</i>		43		65,928
	141 Accommodation and Hospitality Managers			40	19,887
	142 Retail Managers			39	30,504
	149 Miscellaneous Hospitality, Retail and Service Managers			56	15,537
<b>2</b>	<b>Professionals</b>	<b>70</b>			<b>411,609</b>
21	<i>Arts and Media Professionals</i>		60		16,320
	211 Arts Professionals			50	7,002
	212 Media Professionals			67	9,318
22	<i>Business, Human Resource and Marketing Professionals</i>		69		91,596
	221 Accountants, Auditors and Company Secretaries			73	27,090
	222 Financial Brokers and Dealers, and Investment Advisers			65	10,131
	223 Human Resource and Training Professionals			65	9,840

Table A3 continued next page



Table A3 continued

Occupation (ANZSCO major, sub-major, and minor groups)		NZSEI-13 score			Count
		Major group	Sub-major group	Minor group	
23	224 Information and Organisation Professionals			72	27,792
	225 Sales, Marketing and Public Relations Professionals			64	16,743
	<i>Design, Engineering, Science and Transport Professionals</i>		69		56,814
	231 Air and Marine Transport Professionals			61	5,622
	232 Architects, Designers, Planners and Surveyors			66	18,552
	233 Engineering Professionals			68	20,523
	234 Natural and Physical Science Professionals			77	12,117
24	<i>Education Professionals</i>		74		96,168
	241 School Teachers			72	75,351
	242 Tertiary Education Teachers			88	13,494
	249 Miscellaneous Education Professionals			69	7,323
25	<i>Health Professionals</i>		76		72,636
	251 Health Diagnostic and Promotion Professionals			73	9,183
	252 Health Therapy Professionals			75	10,383
	253 Medical Practitioners			90	12,510
	254 Midwifery and Nursing Professionals			73	40,560
26	<i>ICT Professionals</i>		68		39,198
	261 Business and Systems Analysts, and Programmers			71	28,680
	262 Database and Systems Administrators, and ICT Security Specialists			59	5,394
	263 ICT Network and Support Professionals			64	5,124
27	<i>Legal, Social and Welfare Professionals</i>		73		38,877
	271 Legal Professionals			80	13,119
	272 Social and Welfare Professionals			70	25,758

Table A3 continued next page

Table A3 continued

Occupation (ANZSCO major, sub-major, and minor groups)		NZSEI-13 score			Count
		Major group	Sub-major group	Minor group	
<b>3</b>	<b>Technicians and Trades Workers</b>	<b>40</b>			<b>207,573</b>
31	<i>Engineering, ICT and Science Technicians</i>		55		33,438
	311 Agricultural, Medical and Science Technicians			57	11,670
	312 Building and Engineering Technicians			53	14,442
	313 ICT and Telecommunications Technicians			56	7,326
32	<i>Automotive and Engineering Trades Workers</i>		37		43,788
	321 Automotive Electricians and Mechanics			37	15,654
	322 Fabrication Engineering Trades Workers			30	9,273
	323 Mechanical Engineering Trades Workers			44	14,721
	324 Panelbeaters, and Vehicle Body Builders, Trimmers and Painters			31	4,140
33	<i>Construction Trades Workers</i>		32		38,058
	331 Bricklayers, Carpenters and Joiners			36	13,194
	332 Floor Finishers and Painting Trades Workers			27	9,621
	333 Glaziers, Plasterers and Tilers			26	7,734
	334 Plumbers			40	7,509
34	<i>Electrotechnology and Telecommunication Trades Workers</i>		46		20,262
	341 Electricians			46	12,525
	342 Electronics and Telecommunications Trades Workers			45	7,737
35	<i>Food Trades Workers</i>		25		27,249
	351 Food Trades Workers			25	27,249
36	<i>Skilled Animal and Horticultural Workers</i>		34		17,997
	361 Animal Attendants and Trainers, and Shearers			32	4,998
	362 Horticultural Trades Workers			35	12,999

Table A3 continued next page

Table A3 continued

Occupation (ANZSCO major, sub-major, and minor groups)		NZSEI-13 score			Count
		Major group	Sub-major group	Minor group	
39	<i>Other Technicians and Trades Workers</i>		37		26,781
	391 Hairdressers			30	7,839
	392 Printing Trades Workers			40	4,440
	393 Textile, Clothing and Footwear Trades Workers			30	2,205
	394 Wood Trades Workers			33	2,877
	399 Miscellaneous Technicians and Trades Workers			44	9,420
<b>4</b>	<b>Community and Personal Service Workers</b>		<b>38</b>		<b>146,172</b>
41	<i>Health and Welfare Support Workers</i>		51		17,460
	411 Health and Welfare Support Workers			51	17,460
42	<i>Carers and Aides</i>		31		55,788
	421 Child Carers			34	6,774
	422 Education Aides			36	11,418
	423 Personal Carers and Assistants			29	37,596
43	<i>Hospitality Workers</i>		30		24,036
	431 Hospitality Workers			30	24,036
44	<i>Protective Service Workers</i>		47		24,297
	441 Defence Force Members, Fire Fighters and Police			54	14,985
	442 Prison and Security Officers			37	9,312
45	<i>Sports and Personal Service Workers</i>		47		24,591
	451 Personal Service and Travel Workers			45	13,890
	452 Sports and Fitness Workers			49	10,701
<b>5</b>	<b>Clerical and Administrative Workers</b>		<b>44</b>		<b>212,922</b>
51	<i>Office Managers and Program Administrators</i>		48		50,379
	511 Contract, Program and Project Administrators			51	17,511
	512 Office and Practice Managers			46	32,868
52	<i>Personal Assistants and Secretaries</i>		45		16,854
	521 Personal Assistants and Secretaries			45	16,854

Table A3 continued next page

Table A3 continued

Occupation (ANZSCO major, sub-major, and minor groups)		NZSEI-13 score			Count
		Major group	Sub-major group	Minor group	
53	<i>General Clerical Workers</i>		46		39,753
	531 General Clerks			47	35,220
	532 Keyboard Operators			40	4,533
54	<i>Inquiry Clerks and Receptionists</i>		37		25,506
	541 Call or Contact Centre Information Clerks			45	4,032
	542 Receptionists			36	21,474
55	<i>Numerical Clerks</i>		50		35,958
	551 Accounting Clerks and Bookkeepers			48	22,626
	552 Financial and Insurance Clerks			53	13,332
56	<i>Clerical and Office Support Workers</i>		38		13,965
	561 Clerical and Office Support Workers			38	13,965
59	<i>Other Clerical and Administrative Workers</i>		47		30,507
	591 Logistics Clerks			43	15,915
	599 Miscellaneous Clerical and Administrative Workers			52	14,592
<b>6</b>	<b>Sales Workers</b>		<b>39</b>		<b>139,869</b>
61	<i>Sales Representatives and Agents</i>		47		52,650
	611 Insurance Agents and Sales Representatives			44	39,198
	612 Real Estate Sales Agents			56	13,452
62	<i>Sales Assistants and Salespersons</i>		34		72,924
	621 Sales Assistants and Salespersons			34	72,924
63	<i>Sales Support Workers</i>		32		14,295
	631 Checkout Operators and Office Cashiers			27	7,200
	639 Miscellaneous Sales Support Workers			38	7,095
<b>7</b>	<b>Machinery Operators and Drivers</b>		<b>26</b>		<b>93,318</b>
71	<i>Machinery and Stationary Plant Operators</i>		27		25,350
	711 Machine Operators			22	17,148
	712 Stationary Plant Operators			36	8,202
72	<i>Mobile Plant Operators</i>		19		15,372
	721 Mobile Plant Operators			19	15,372

Table A3 continued next page

Table A3 continued

Occupation (ANZSCO major, sub-major, and minor groups)		NZSEI-13 score			Count
		Major group	Sub-major group	Minor group	
73	<i>Road and Rail Drivers</i>		25		37,086
	731 Automobile, Bus and Rail Drivers			33	10,758
	732 Delivery Drivers			25	3,468
	733 Truck Drivers			21	22,860
74	<i>Storepersons</i>		22		15,510
	741 Storepersons			22	15,510
<b>8</b>	<b>Labourers</b>		<b>21</b>		<b>169,983</b>
81	<i>Cleaners and Laundry Workers</i>		12		33,906
	811 Cleaners and Laundry Workers			12	33,906
82	<i>Construction and Mining Labourers</i>		28		15,570
	821 Construction and Mining Labourers			28	15,570
83	<i>Factory Process Workers</i>		17		34,062
	831 Food Process Workers			19	17,379
	832 Packers and Product Assemblers			10	10,329
	839 Miscellaneous Factory Process Workers			24	6,354
84	<i>Farm, Forestry and Garden Workers</i>		24		36,486
	841 Farm, Forestry and Garden Workers			24	36,486
85	<i>Food Preparation Assistants</i>		11		8,442
	851 Food Preparation Assistants			11	8,442
89	<i>Other Labourers</i>		19		41,517
	891 Freight Handlers and Shelf Fillers			24	4,677
	899 Miscellaneous Labourers			18	36,840
<b>All occupations</b>					
<b>Total</b>					<b>1,716,426</b>
<b>Note:</b> Data randomly rounded to base three.					
<b>Source:</b> Statistics New Zealand, 2013 Census					

## Appendix IV: NZSEI-13 groups and final scores

**Table A4**  
**NZSEI-13 groups and final scores**

Occupation (ANZSCO minor groups)		NZSEI-13 groups			NZSEI-13 score
		6-group	4-group	10-group	
<b>Managers</b>					
111	Chief Executives, General Managers and Legislators	3	2	4	61
121	Farmers and Farm Managers	4	3	7	37
131	Advertising, Public Relations and Sales Managers	3	2	3	63
132	Business Administration Managers	3	2	3	63
133	Construction, Distribution and Production Managers	3	2	5	48
134	Education, Health and Welfare Services Managers	1	1	1	73
135	ICT Managers	2	1	2	72
139	Miscellaneous Specialist Managers	3	2	3	64
141	Accommodation and Hospitality Managers	4	3	6	40
142	Retail Managers	4	3	7	39
149	Miscellaneous Hospitality, Retail and Service Managers	3	2	4	56
<b>Professionals</b>					
211	Arts Professionals	3	2	5	50
212	Media Professionals	2	1	3	67
221	Accountants, Auditors and Company Secretaries	1	1	1	73
222	Financial Brokers and Dealers, and Investment Advisers	2	1	3	65
223	Human Resource and Training Professionals	2	1	3	65
224	Information and Organisation Professionals	2	1	2	72
225	Sales, Marketing and Public Relations Professionals	3	2	3	64
231	Air and Marine Transport Professionals	3	2	4	61
232	Architects, Designers, Planners and Surveyors	2	1	3	66
233	Engineering Professionals	2	1	2	68
234	Natural and Physical Science Professionals	1	1	1	77
241	School Teachers	2	1	2	72
242	Tertiary Education Teachers	1	1	1	88
249	Miscellaneous Education Professionals	2	1	2	69

Table A4 continued next page

Table A4 continued

Occupation (ANZSCO minor groups)		NZSEI-13 groups			NZSEI-13 score
		6- group	4- group	10- group	
251	Health Diagnostic and Promotion Professionals	1	1	1	73
252	Health Therapy Professionals	1	1	1	75
253	Medical Practitioners	1	1	1	90
254	Midwifery and Nursing Professionals	1	1	1	73
261	Business and Systems Analysts, and Programmers	2	1	2	71
262	Database and Systems Administrators, and ICT Security Specialists	3	2	4	59
263	ICT Network and Support Professionals	3	2	3	64
271	Legal Professionals	1	1	1	80
272	Social and Welfare Professionals	2	1	2	70
<b>Technicians and Trades Workers</b>					
311	Agricultural, Medical and Science Technicians	3	2	4	57
312	Building and Engineering Technicians	3	2	4	53
313	ICT and Telecommunications Technicians	3	2	4	56
321	Automotive Electricians and Mechanics	4	3	7	37
322	Fabrication Engineering Trades Workers	5	4	8	30
323	Mechanical Engineering Trades Workers	4	3	6	44
324	Panelbeaters, and Vehicle Body Builders, Trimmers and Painters	5	4	8	31
331	Bricklayers, Carpenters and Joiners	4	3	7	36
332	Floor Finishers and Painting Trades Workers	5	4	9	27
333	Glaziers, Plasterers and Tilers	5	4	9	26
334	Plumbers	4	3	6	40
341	Electricians	4	3	6	46
342	Electronics and Telecommunications Trades Workers	4	3	6	45
351	Food Trades Workers	5	4	9	25
361	Animal Attendants and Trainers, and Shearers	5	4	8	32
362	Horticultural Trades Workers	4	3	8	35
391	Hairdressers	5	4	8	30
392	Printing Trades Workers	4	3	6	40
393	Textile, Clothing and Footwear Trades Workers	5	4	8	30
394	Wood Trades Workers	5	4	8	33
399	Miscellaneous Technicians and Trades Workers	4	3	6	44

Table A4 continued next page

Table A4 continued

Occupation (ANZSCO minor groups)		NZSEI-13 groups			NZSEI-13 score
		6- group	4- group	10- group	
<b>Community and Personal Service Workers</b>					
411	Health and Welfare Support Workers	3	2	5	51
421	Child Carers	5	4	8	34
422	Education Aides	4	3	7	36
423	Personal Carers and Assistants	5	4	9	29
431	Hospitality Workers	5	4	8	30
441	Defence Force Members, Fire Fighters and Police	3	2	4	54
442	Prison and Security Officers	4	3	7	37
451	Personal Service and Travel Workers	4	3	6	45
452	Sports and Fitness Workers	3	2	5	49
<b>Clerical and Administrative Workers</b>					
511	Contract, Program and Project Administrators	3	2	5	51
512	Office and Practice Managers	4	3	6	46
521	Personal Assistants and Secretaries	4	3	6	45
531	General Clerks	4	3	5	47
532	Keyboard Operators	4	3	6	40
541	Call or Contact Centre Information Clerks	4	3	6	45
542	Receptionists	4	3	7	36
551	Accounting Clerks and Bookkeepers	3	2	5	48
552	Financial and Insurance Clerks	3	2	4	53
561	Clerical and Office Support Workers	4	3	7	38
591	Logistics Clerks	4	3	6	43
599	Miscellaneous Clerical and Administrative Workers	3	2	4	52
<b>Sales Workers</b>					
611	Insurance Agents and Sales Representatives	4	3	6	44
612	Real Estate Sales Agents	3	2	4	56
621	Sales Assistants and Salespersons	5	4	8	34
631	Checkout Operators and Office Cashiers	5	4	9	27
639	Miscellaneous Sales Support Workers	4	3	7	38
<b>Machinery Operators and Drivers</b>					
711	Machine Operators	6	4	10	22
712	Stationary Plant Operators	4	3	7	36
721	Mobile Plant Operators	6	4	10	19

Table A4 continued next page



Table A4 continued

Occupation (ANZSCO minor groups)		NZSEI-13 groups			NZSEI-13 score
		6- group	4- group	10- group	
731	Automobile, Bus and Rail Drivers	5	4	8	33
732	Delivery Drivers	5	4	9	25
733	Truck Drivers	6	4	10	21
741	Storepersons	6	4	10	22
<b>Labourers</b>					
811	Cleaners and Laundry Workers	6	4	10	12
821	Construction and Mining Labourers	5	4	9	28
831	Food Process Workers	6	4	10	19
832	Packers and Product Assemblers	6	4	10	10
839	Miscellaneous Factory Process Workers	5	4	9	24
841	Farm, Forestry and Garden Workers	5	4	9	24
851	Food Preparation Assistants	6	4	10	11
891	Freight Handlers and Shelf Fillers	5	4	9	24
899	Miscellaneous Labourers	6	4	10	18



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## Appendix V: Using NZSEI-13

This appendix is intended to provide brief notes on using NZSEI-13, and is a copy of the appendix V provided for NZSEI-06. The websites mentioned in this section may also be a useful resource for those requiring more information of occupation coding.

### Coding occupation

In order to assign NZSEI-13 scores or groups, occupation must first be coded using the Australian and New Zealand Standard Classification of Occupations (ANZSCO). At the time of writing, ANZSCO (version 1.2) is the classification system suggested for occupational classification in New Zealand, and since 2006 ANZSCO has been used in Statistics NZ censuses and surveys where occupation data are collected.

For the coding of NZSEI-13, coding to the minor group (three-digit) level of ANZSCO is required. This has 97 categories. However, if coding to the minor group level is not possible (eg, it is unavailable or if data on occupation lack the detail required), NZSEI-13 scores can be assigned to the sub-major group (two-digit, 43 categories) or major group (one-digit, eight categories) level of ANZSCO. Coding to any greater detail than the minor group level is unnecessary.

Researchers with occupational data already pre-coded to the minor group level of ANZSCO can move to coding NZSEI-13 scores (see below).

For researchers with un-coded data on occupation in text form, a list of ANZSCO codes as well as guides for coding occupational data to ANZSCO can be found at [Occupation](#). A [classification code finder](#) has also been developed.

Coders may find it useful to alphabetise their occupational data so that individuals with the same occupation can be coded at the same time (and with the same code). This is particularly useful if a large number of individuals need to be coded. If necessary, the reliability of coding can be checked by two or more coders coding a subset (or all) of the occupational data and comparing results, for example, by assessing the correlation or computing a kappa statistic.

Researchers who wish to collect occupational data to code to ANZSCO should take the following steps.

First, to enable accurate coding, it is helpful to obtain:

- the occupation title
- the main tasks or duties of that occupation
- the industry to which the occupation belongs.

Second, data collected face-to-face or via telephone are likely to be more accurate, as this allows for the researcher to probe for more information where insufficient detail has been supplied. In this regard, it is helpful for interviewers to be trained with the ANZSCO system or with occupational coding, to gain an understanding of the level of detail required to code occupations accurately.

### Coding NZSEI-13

If ANZSCO-classified occupational data are available to the minor group (three-digit) level, researchers can assign NZSEI-13 scores and groups by referring to the 'Minor group' column in appendix III. If ANZSCO-classified occupational data are only available to the sub-major (two-digit) or major (one-digit) group level, then NZSEI-13 scores can still be assigned by referring to the appropriate columns in appendix III. Note that NZSEI-

13 scores are presented for sub-major group occupations in *italics* and for major group occupations in **bold**. Note also that if ANZSCO-classified occupational data are only available to the major or sub-major level, NZSEI-13 SES groups cannot be assigned.

Whether to assign individuals NZSEI-13 scores or assign them to NZSEI-13 SES groups is entirely up to the researcher. Greater sensitivity should be obtained by assigning scores, and scores may also be preferred for analytic reasons – for example, continuous data allow analyses such as linear regression to be undertaken.

However, there are circumstances under which one or other of the SES group classifications would be preferred. For example, for researchers wanting equal-sized groups representing different levels of socio-economic status, NZSEI-13 four-group or 10-group classification would be appropriate. NZSEI-06 10-group classification also allows for direct comparisons with NZDep scales (eg NZDep2006, Salmond et al, 2007). Similarly, for comparisons with, or assessing continuity with, the previous Elley-Irving scales (eg Elley and Irving, 1972; 1976; 1985; 2003; Irving and Elley, 1977), NZSEI-13 six-group classification may be preferred.

## Coding those not in the workforce

One of the major disadvantages of an occupational-based measure of SES such as NZSEI-13 is that those without an occupation – or for whom occupational data are unavailable – cannot be coded. There are at least three alternatives to assigning NZSEI-06 scores in this situation.

First, NZSEI-13 scores can be assigned based on previous occupation, if such data are available. Moreover, those wishing to estimate the SES of those who have left the workforce (eg retirees) might wish to consider collecting information on the main occupation held by respondents in their lifetime.

Second, in some cases it may be justifiable to use the occupation of a proxy person to assess socio-economic status (eg for children or homemakers). Researchers using this method should carefully consider whether an individual's SES is best captured by the SES of their proxy.

Third, individuals can be assigned SES scores based on their 'occupational potential' (Jones and McMillan, 2001), whereby in the absence of information on occupation, scores are imputed using available data on age and education. Methods for imputing NZSEI-13 scores based on age and education were described in chapter 6, and were shown to provide reasonably robust measures of SES that validated well against health and socio-economic correlates.

The suggested imputed NZSEI-13 scores are shown in table A5, and are based on the mean NZSEI-13 scores by age and education for those with a current occupation. Scores are given for seven age bands (10-year blocks from 15–24 years to 75+ years) and 15 different highest qualification levels (from no qualification to doctoral degree). While no problem should be encountered classifying the age of individuals, in some cases there may be difficulties classifying the highest education of individuals to the level displayed in the table. Researchers are advised to classify individuals as accurately as possible, but should note that similar scores are often assigned to adjacent groups. Thus, some distinctions are more important than others. For example, similar scores are assigned to:

- (i) those with a master's degree and those with a post-graduate or honours degree
- (ii) those with either a Level 4, Level 3, Level 2, or Level 1 Certificate gained post-school
- (iii) those with a Level 3 or 4 certificate gained at school and those with a Level 2 certificate gained at school.

Thus, failure to distinguish between these adjacent qualification levels is unlikely to cause large misclassification in imputed NZSEI-13 scores.

The major disadvantage of these imputed NZSEI-13 scores is their restricted range from 30 to 75 (NZSEI-13 scores for those with occupational data range from 10 to 90). A consequence of the restricted range is that NZSEI-13 SES groups cut points do not sensibly assign those with imputed NZSEI-13 scores to SES groups (eg individuals are concentrated in the middle groups, and groups at the upper and lower end often have no or few cases). Thus, it is suggested that SES groups are not used for those with imputed NZSEI-13 scores.

**Table A5**  
**Suggested imputed NZSEI-13 scores for those not in the workforce**  
 Based on age and highest qualification

Highest qualification	Age (years)						
	15–24	25–34	35–44	45–54	55–64	65–74	75+
	Suggested imputed NZSEI-13 score						
Doctorate degree	48	72	75	76	76	74	68
Master's degree	57	62	64	65	66	64	60
Post-graduate and honours degree	58	63	65	66	66	64	62
Bachelor's degree and level 7 qualification	54	60	61	61	62	60	59
Level 6 diploma	45	52	58	59	59	56	52
Level 5 diploma	39	46	51	51	51	50	46
Level 4 certificate gained post-school	37	41	43	44	44	43	42
Level 3 certificate gained post-school	35	40	43	43	42	42	43
Level 2 certificate gained post-school	33	38	41	42	42	43	43
Level 1 certificate gained post-school	35	40	43	45	44	46	45
Overseas secondary school qualification	34	40	42	42	42	44	43
Level 3 or 4 certificate gained at school	37	46	49	50	48	48	47
Level 2 certificate gained at school	34	42	45	47	46	46	45
Level 1 certificate gained at school	31	38	41	41	42	42	41
No school qualifications	29	32	33	33	34	36	36