

Returns to Human Capital by Gender and Ethnicity: Analyses with a Population-Based Occupational Socioeconomic Measure

Ngā Hua ā-Rawa Tangata mā te Ira me te Mātāwaka: He Tātaritanga me te Inenga Ohapori Umanga ā-Taupori

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Abstract

Occupational socioeconomic position (SEP) measures commonly model occupations as converting education into income. Such measures rarely consider group differences in occupational access or pay differences within occupations. We investigated ethnic and gender group differences in these relationships using the 2018 New Zealand Socioeconomic Index (NZSEI-18). The education to occupational SEP pathway was weaker for non-European ethnicity-by-gender groups except for Māori women, and the pathway from occupational SEP to income was weaker for Māori and Pacific Peoples. Patterns with two SEP-sensitive measures were similar for the whole population and subgroup-specific NZSEI scales, suggesting it is unnecessary to construct group-specific scales.

Keywords: socioeconomic, ethnicity, gender, occupation, education, income

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Whakarāpopotonga

Whakatauirā noa ai ngā inenga tūnga ohapori umanga i ngā umanga hei takahuringa o te mātauranga ki te moniwhiwhi. Kua kore e tino whai whakaaro ana ngā inenga pērā ki ngā rerekētanga i te āhei ki te umanga, i ngā rerekē ā-utu mahi rānei i waenga umanga. Nā mātou i mātai ngā rerekētanga mātāwaka, ā-ira hoki i aua hononga nā te whakamahi i te Taupū Ohapori Aotearoa (SEP) (NZSEI-18). I ngoikore atu te ara SEP mātauranga ki te umanga mō te rōpū mātāwaka ā-ira ehara i te Uropi, hāunga ngā wāhine Māori, ā, i ngoikore atu te ara mai i te SEP ā-umanga ki te moniwhiwhi mō ngāi Māori me ngā iwi o Te Moananui-a-Kiwa. He āhua rite ngā tauira me ngā inenga e rua e aro ana ki te SEP mō te taupori katoa me ngā tauine hāngai ki te rōpū iti NZSEI, me te matapae kāore e hiahiaatia te hanga tauine hāngai ki ngā rōpū tauwhāiti.

Ngā kupu matua: ohapori, mātāwaka, ira, umanga, mātauranga, moniwhiwhi

Socioeconomic position (SEP) measures try to capture the distribution of opportunities, advantages, resources and power among the population. SEP is commonly measured using education, income, occupation, deprivation or composite measures combining different aspects of SEP (Galobardes et al., 2006a, 2006b). SEP has an important influence on people’s lives (Adler & Stewart, 2010; Braveman & Gottlieb, 2014), and can be transmitted through generations (Coley et al., 2019; Gibbons, 2010; Schulz et al., 2017).

Occupational measures of SEP classify the SEP of workers using their occupation. The ‘returns to human capital’ model posits that occupations are the way in which education is converted into material rewards, in the form of income (Ganzeboom et al., 1992). This model underlies several occupational SEP measures, including the International Socioeconomic Index (ISEI; Ganzeboom et al., 1992), Australian Socioeconomic Index (McMillan et al., 2009), and New Zealand Socioeconomic Index (NZSEI) – the focus of this paper. Occupational measures have certain advantages such as being reliably reported, relatively stable over time, and reflecting social networks and social standing as well as occupational exposures (Galobardes et al., 2006a; Hauser & Warren, 1997). Occupational measures can also be combined with other measures of SEP, which is particularly important when trying to adjust for the potential confounding role of SEP on the relationship between exposures and outcomes (Galobardes et al., 2006a).

Occupational SEP measures typically do not take account of differences in access to occupations between groups in society, or differences in pay within the same occupations for groups with similar levels of education, despite a large body of literature demonstrating such inequities exist. For example, the gender pay gap across OECD countries was estimated at 11.3 per cent for full-time employees in 2023 (OECD, 2025), 10 per cent across Latin American countries (Atal et al., 2009), and 8.2 per cent for the June 2024 quarter in Aotearoa New Zealand (Stats NZ, 2024c). The magnitude of gender pay gaps in the OECD and Aotearoa New Zealand increase with increasing wages (OECD, 2022; Pacheco et al., 2019). Much of the gender pay gap remains unexplained after controlling for personal characteristics, family characteristics, education, work characteristics (Pacheco et al., 2019) and work performance (Brower & James, 2020).

Similarly, pay gaps also exist across ethnic groups. This has been documented in Latin American countries (Atal et al., 2009), Germany (Ayaita, 2023) and the United Kingdom (Longhi & Brynin, 2017), as well as in Aotearoa New Zealand. In Aotearoa New Zealand, the mean hourly rate for Māori and Pacific workers has been estimated to be only 82.2 per cent and 76.3 per cent of European workers', respectively (The Treasury, 2018). Personal and job characteristics accounted for 68–73 per cent of the pay gap between Māori and European men, 75 per cent of the gap between Māori and Pākehā women, 39–55 per cent of the gap between Pacific and European men, and 41–55 per cent of the gap for Pacific and European women, with education and occupation particularly important factors (The Treasury, 2018).

Higher levels of education increase occupational position and income through both increasing skills, and thereby productivity, and by signalling the presence of skills to employers via credentials (Araki, 2020). However, previous research has demonstrated that income returns to education may differ across sociodemographic groups. For example, in the United States, male workers have greater median lifetime earnings than female workers at the same educational level, and White and Asian workers have greater lifetime earnings than other ethnic groups (Carnevale et al., 2021). Other research from the United States showed that the influence of education on career earnings is smaller for those from low-income family backgrounds than those from high-income family backgrounds (Bartik & Hershbein, 2018). This finding appeared to be driven by large differences in income by

family background among men, with returns to college education not differing by family background for women or African Americans (Bartik & Hershbein, 2018). Similarly, Australian research demonstrated greater income differentials by educational qualifications for men than for women (Sinning, 2017). In contrast, research examining returns to education across 139 countries found that although men are better paid than women, returns to education are typically higher for women than for men (Psacharopoulos & Patrinos, 2018).

Income returns by occupational position may vary across sociodemographic groups. For example, Swedish research demonstrated that men typically received higher incomes than women for the same level of occupational prestige, with these gaps increasing for occupations with greater prestige (Magnusson, 2010). The income gaps were particularly large for mothers compared with fathers (Magnusson, 2010). Other research from Britain has demonstrated that there are substantial income gaps between those with high- and low-class backgrounds working in high-status occupations (Laurison & Friedman, 2016).

Similarly, the returns of education to occupational position may differ across groups. Research on discrimination in hiring practices has shown that different groups in society do not have the same access to jobs despite equivalent education levels (Carlsson & Eriksson, 2019; Hipp, 2020; Quillian & Midtbøen, 2021). For example, a number of studies have found that immigrants, especially newly arrived immigrants, are typically overqualified for their occupational roles compared with the native-born population (De Alwis et al., 2020; Johnston et al., 2015; Maani et al., 2015; Poot & Roskrug, 2013; Poot & Stillman, 2010; Stillman & Maré, 2009). Furthermore, the extent of immigrant over-education may differ depending on country of origin (De Alwis et al., 2020; Johnston et al., 2015; Maani et al., 2015; Stillman & Maré, 2009).

As noted by Hauser and Warren (1997), it is not common for occupational socioeconomic scales to consider the impacts of differing access to occupations and income across groups. To our knowledge, this issue has not been substantively addressed since. While some occupational scales have been constructed separately for men and women, researchers have historically made little attempt to evaluate or explain differences (or similarities) between the scales (Hauser & Warren, 1997). There is evidence

that country-specific and gender-specific occupational scales may modestly improve the measurement of occupational position over universal measures (Lambert et al., 2008). We are not aware of any research comparing ethnic-group-specific occupational SEP scales.

The current research aims to assess whether there are differences in the returns of education to occupational SEP and/or of occupational SEP to income across ethnic and gender groups in Aotearoa New Zealand, and if so, whether these differences meaningfully affect the measurement of occupational SEP across groups. Aotearoa New Zealand provides an interesting case study as it has an ethnically diverse population, a large Indigenous population with Māori making up 17.8 per cent of the population, and approximately 28.6 per cent of the total population born overseas (Stats NZ, 2024a). Furthermore, female labour force participation is high, with 67.3 per cent of women in the labour force compared with 75.8 per cent of men (Stats NZ, 2024b). Previous research has demonstrated pay gaps and barriers to accessing promotions by gender and ethnicity in Aotearoa New Zealand (Brower & James, 2020; McAllister et al., 2020; Pacheco et al., 2019; Stats NZ, 2024c; The Treasury, 2018).

The NZSEI, an occupation-based measure of SEP developed specifically for the New Zealand population using census data, provides an opportunity to test for any differences in these relationships across ethnic and gender groups. Separate NZSEI scales have been constructed using census data from 1991, 1996, 2006, 2013 and 2018 (Boven et al., 2022; Davis et al., 1997, 2003; Fahy et al., 2017; Milne et al., 2013). The NZSEI-18 demonstrated expected SEP gradients with various health and social outcomes, including smoking, area deprivation, housing tenure, self-rated health, life satisfaction and hospitalisations for any cause (Boven et al., 2022). All the NZSEI scales have assessed the adequacy of the NZSEI across groups by using the estimated path coefficients for the overall population of workers for the returns to human capital model and applying them to the means and standard deviations of education, income and age for each occupation to estimate subgroup-specific scores (Boven et al., 2022; Davis et al., 1997, 2003; Fahy et al., 2017; Milne et al., 2013). In line with findings for previous versions of the scale, analyses for NZSEI-18 found that, on average, higher scores were assigned to workers who are male, identify with an Asian, Middle Eastern / Latin American / African (MELAA) or European

ethnic group, live in urban areas, live in Auckland, were born overseas and are not disabled.

However, this approach does not consider the possibility for different strength associations in the returns to education and occupation across groups. If there are differences, this may provide a rationale for taking gender and/or ethnicity into account when calculating NZSEI scores. Note, even if differences exist, it is possible that these do not substantially affect the resulting occupational scales and the associations with socioeconomically patterned outcomes. This paper will test whether there are differences in the patterns underlying the returns to human capital model across ethnic and gender groups, and if so, whether these differences meaningfully affect the measurement of occupational SEP across these groups.

Methods

This research was granted ethical approval by the University of Auckland Human Participants Ethics Committee (UAHPEC) on 4 May 2020 (reference UAHPEC24489). The approval was extended on 4 May 2023. Stats NZ approved the use of the Integrated Data Infrastructure for this project (reference MAA2020-23).

Participants

The NZSEI-18 was constructed with data from the 2018 Census using responses from 2,215,644 workers (individuals with occupation information) who were usually resident in New Zealand and aged 21–69 on the night of the census (Boven et al., 2022). Those under the age of 21 years were not included because young workers first entering the workforce often take on occupations that do not reflect their education and skill level (Ganzeboom et al., 1992), and those over the age of 69 years were excluded because very few of this group (13.7 per cent) were in the workforce. Those aged 65–69 years were included because 42.2 per cent of those aged 65–69 were in the workforce, despite the age of eligibility for New Zealand Superannuation being 65 years.

The 2018 Census data set includes those who responded to the 2018 Census (around 83.3 per cent of New Zealanders), as well as records derived

from alternative data sources when census responses were missing. Alternative data sources included administrative data (e.g., tax records, educational qualifications data), earlier (2013) Census data, or imputation (2018 Census External Data Quality Panel, 2019a; Stats NZ, 2019). Note that alternative data sources were used to supplement missing census responses typically (but not exclusively) for individuals who did not complete a 2018 Census form. As such, if alternative data sources were used for one variable, they tended to be used across a range of variables. Use of alternative data sources that had impacts on data quality for variables used in the current analyses are described below.

Measures

The NZSEI scale was constructed using information about occupation, income and education. The validity of the NZSEI scale was compared for ethnic and gender groups. Smoking and neighbourhood deprivation, variables that are known to be socioeconomically patterned, were used as validation measures to compare the relative performance of the overall NZSEI scale against subgroup-specific scales. Each of these measures is described below.

Occupation

Eighty point four per cent of occupation information was derived from participants' responses to the 2018 Census. Those working more than one job provided details about their primary occupation only (i.e., the occupation in which they worked the most hours). NZSEI-18 scores were derived at the minor group (three-digit) level of the Australian and New Zealand Standard Classification of Occupations (ANZSCO) V1.2 for the full-time and part-time workforce – 97 occupation groups in total.

All missing values for occupation were imputed by Stats NZ using the Canadian Census Editing and Imputation (CANCEIS) method, whereby information – in this case, occupation information – from a participant with similar characteristics on specified variables ('the closest match') is copied to the person with missing data (Stats NZ, 2019). Occupation was imputed in the same block as income, other employment-related variables and smoking (Stats NZ, 2019). Values for occupation were sourced by matching

on these variables (where available), along with demographic and usual-residence information (Stats NZ, 2019)

The extent of imputation for occupation – 19.6 per cent overall – differed by ethnic group. For our cohort, imputation was used extensively for Māori (32.5 per cent) and Pacific (40.0 per cent) populations. Notably, while imputation maintains population distributions of occupations, imputed occupations are likely to be incorrect for many (approximately 60 per cent) individuals (2018 Census External Data Quality Panel, 2019a).

Income

Eighty-one point nine per cent of total personal income data were derived from responses to the 2018 Census. Personal income is recorded in 15 bands covering loss, nil income, \$1–\$40,000 in bands of \$5,000, \$40,001–\$70,000 in \$10,000 increments, \$70,000–\$100,000, \$100,001–\$150,000, and \$150,001 or more.

These bands were converted into a continuous measure using income midpoints provided by Stats NZ based on responses to the Household Labour Force Survey. The incomes for part-time earners, defined as those working less than 30 hours per week, were then inflated to the 40-hour equivalent. Part-time incomes that were above the top 1 per cent and below the bottom 1 per cent of hourly incomes for full-time earners were excluded to avoid over-inflation of part-time incomes. Women were more likely to work part-time than men (29.2 per cent compared with 9.7 per cent). Income values were then logged to reduce skewness when constructing the NZSEI-18 scores.

Sixteen point six per cent of responses to personal income were supplemented with Inland Revenue tax data and 1.5 per cent were imputed using the CANCEIS method for the analytical population described above. Income data in the census usually has higher item non-response than other variables, so the use of administrative data may have improved the quality (especially completeness) of income data compared with previous censuses (2018 Census External Data Quality Panel, 2019a). However, it is important to note that personal income in the census relates to total income from all sources, rather than just taxable income. Despite this, the distribution of income in the 2018 Census is similar to the distribution in the population-representative Household Economic Survey (2018 Census External Data Quality Panel, 2019a).

Education

Eighty-two point four per cent of secondary school education and 81.1 per cent of post-school education information was derived from 2018 Census responses for the analytical population. Data from Ministry of Education sources were used to supplement the Census responses (making up 4.1 per cent of responses for secondary school education and 7.3 per cent for post-school education for this cohort), as were responses to the 2013 Census (making up 8.0 per cent of responses for secondary school education and 6.1 per cent for post-school education). There was still approximately 5.5 per cent missing data for education for workers aged 21–69, which is lower than in previous censuses. The 2018 Census distribution of qualifications was broadly consistent with the population-representative Household Labour Force Survey and expected trends from the 2013 Census (2018 Census External Data Quality Panel, 2019a).

As the NZSEI algorithm requires mean values, the 15-category highest educational qualification variable was converted into years of education ranging from 10 (no school qualifications) to 20 (doctorate degree). (For further details, see Boven et al., 2022; Fahy et al., 2017.)

Age

For the analytical population, 88.2 per cent of age responses were derived from census responses and 11.5 per cent from administrative data, while 0.2 per cent were imputed. Age, in years, is included as a control variable when constructing the NZSEI as it is negatively associated with education (younger workers have higher qualifications) but positively correlated with income (older workers earn more).

Ethnicity

The standard classification of ethnicity in New Zealand defines ethnicity as a self-perceived measure of identity or belonging, where a person can belong to more than one ethnic group (Stats NZ, 2021). It is a hierarchical classification, which at the highest level of the hierarchy contains six categories: European, Māori, Pacific Peoples, Asian, MELAA and Other. We report on European, Māori, Pacific and Asian ethnic groups only, as the MELAA and Other ethnic groups had small counts for some occupations (1.5 per cent and 1.4 per cent of the cohort identified with MELAA and Other ethnic groups, respectively).

Eighty-three point nine per cent of ethnicity information was derived from 2018 Census responses and 8.7 per cent from 2013 Census responses; 6.1 per cent was sourced from administrative data sources including the Department of Internal Affairs births register, Ministry of Education qualifications enrolments and courses, Ministry of Health cohort demographics, and Department of Corrections and Ministry of Defence data; and 1.4 per cent of responses were imputed using the CANCEIS methodology.¹ Ethnicity was imputed in the same block as other cultural variables, and by matching on demographic information, usual residence, birthplace and education (Stats NZ, 2019a).

Gender

Eighty-eight point three per cent of gender information was derived from 2018 Census responses and 11.5 per cent from administrative data, while 0.1 per cent was imputed.

Smoking

2018 Census participants self-reported regular smoking. Participants were asked: “Do you smoke cigarettes regularly (that is, one or more a day)?”

Eighty-three point five per cent of workers aged 21–69 had regular smoking data from 2018 Census forms. The remainder had regular smoking data from the 2013 Census (8.6 per cent) or imputed using the CANCEIS methodology (7.9 per cent). As levels of smoking have been decreasing through time, using historical data for smoking may overstate the level of smoking to some extent (2018 Census External Data Quality Panel, 2019a). Comparisons with the New Zealand Health Survey conducted by Stats NZ suggest that smoking is likely to be overestimated by up to 1 per cent for Māori, and about 0.2 per cent for the population overall (2018 Census External Data Quality Panel, 2019a). Notably, while the use of imputation may weaken associations (2018 Census External Data Quality Panel, 2019a), smoking was imputed in the same block of variables as income and occupation, and by matching on various socioeconomic and demographic variables (Stats NZ, 2019a). It is, therefore, unlikely that imputation had a substantial impact on associations with SEP measures.² The overall prevalence of smoking for workers aged 21–69 years for the 2018 Census was estimated as 13.9 per cent.

Deprivation

The New Zealand Index of Deprivation (NZDep) is a measure of area deprivation that assigns deprivation scores to small area units in Aotearoa New Zealand. The latest NZDep, NZDep2018 (Atkinson et al., 2020), was constructed on 2018 Census data and used Statistical Area 1 units, typically comprising 100–200 usual residents, with a maximum of 500 usual residents. The NZDep classifies areas based on the proportion of the population experiencing deprivation across eight domains: communication, income, employment, qualifications, home ownership, support, living space and living condition (Atkinson et al., 2020).

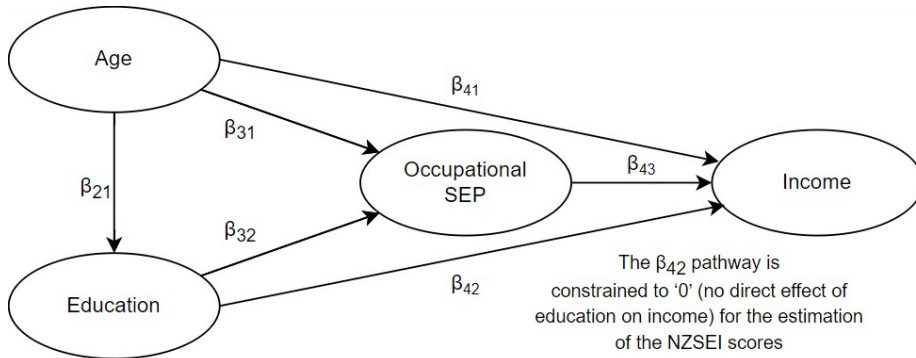
NZDep scores were assigned based on usual residence address. Usual residence address was sourced from 2018 Census forms for 88.2 per cent of workers, from administrative data for 11.5 per cent of workers, and was imputed for 0.3 per cent of workers.

Construction of the NZSEI

To create the NZSEI, occupations were assigned SEP scores based on a weighted average of income and education level of individuals in those occupations, adjusted for age. The weights for income and education were determined by an iterative least squares procedure, which starts from an initial estimated set of coefficients and proceeds in a stepwise fashion to find the set of estimated coefficients that minimises the residual sum of squares. This algorithm finds the optimal weighting using a path model that maximises the indirect pathway from education to income through the mediating pathway of occupation to estimate the NZSEI scores (see Figure 1). Note that education is also expected to impact income directly, but this pathway does not affect the estimation of occupational scores.

The inputs to this model were the means, standard deviations and counts of age, education and income for each occupation ($n = 97$), in addition to the correlations between age, education and income across all workers. This procedure, initially developed for the ISEI (Ganzeboom et al., 1992), does not require external information on occupational prestige scores and allows education and income to have different weightings, unlike some earlier occupational scales (Davis et al., 1997; Ganzeboom et al., 1992; Hauser & Warren, 1997). Final NZSEI SEP scores for occupations are scaled to range from 10 (lowest) to 90 (highest) with a mean value of 50.

Figure 1: Key pathways underpinning the NZSEI based on the returns to human capital model



Analysis

The NZSEI-18 scale was constructed using the means, standard deviations and counts for age, education and income for each occupation ($n = 97$) across all workers, as well as the correlations between age, education and income. To calculate the subgroup-specific betas for the pathways shown in Figure 1, and subgroup-specific NZSEI scores, these values were substituted with those for each ethnic group (European, Māori, Pacific and Asian) and gender group (men and women), and ethnicity-by-gender subgroups. This approach incorporates both compositional differences for subgroups, where age, income and education are differentially distributed within these subgroups and across occupations, and differences in the associations between education, occupation and income, both of which may have an impact on NZSEI scores. As with the standard NZSEI, subgroup-specific NZSEI scores were scaled to fall between 10 (lowest) and 90 (highest) with a mean of 50.

We present four sets of results. First, we describe compositional differences between ethnicity, gender and ethnicity-by-gender subgroups in terms of average age, education and income overall, and for each minor group occupation for gender and ethnic groups. Second, we present correlations between age, education and income for these subgroups. Third, we compare the magnitude of the estimated coefficients for the key pathways underlying the returns to human capital model (education to occupational SEP and occupational SEP to income, shown in Figure 1).³

Fourth, we investigate differences in performance of the NZSEI scores for ethnicity-by-gender subgroups. We compare the ranking of occupations according to NZSEI score for the overall NZSEI score stratified by gender and ethnicity (where path coefficients are fixed as equal for all subgroups), and the ethnicity-by-gender specific estimated NZSEI scores (where the path coefficients are estimated separately for each subgroup) by assessing the correlations between the two NZSEI scores for each ethnicity-by-gender subgroup. We also compare the size of the estimated coefficients when predicting outcomes known to be strongly patterned by individual SEP – smoking behaviour and area-level deprivation. These models are adjusted for age group. For each ethnic, gender and ethnicity-by-gender group, the stratified scores and ethnicity-by-gender scores were constructed on the same analytic population and hence it is valid to directly compare the estimated odds ratios within groups.

Results

Compositional differences between ethnicity-by-gender subgroups

On average, the participants were 42.8 years old, had 13.5 years of education, and part-time inflated incomes of \$64,500, as shown in Table 1. Five per cent of the participants were missing information on education in years and 2.1 per cent were missing information on income. Across the 97 occupation groups, average ages ranged from 33.1 years (hospitality workers) to 51.7 years (automobile, bus and rail drivers); years of education ranged from an average of 11.4 years (truck drivers) to 17.4 years (tertiary education teachers); and part-time inflated income ranged from \$32,900 (food preparation assistants) to \$146,700 (medical practitioners) on average. Table A1, in the supplementary notes, presents the mean age, years of education and log income, as well as the NZSEI-18 scores, for each occupation.⁴

Table 1: Characteristics of the analytic sample

	Age (years)	Education (years)	Part-time inflated income (\$)
Overall (mean (SD))	42.8 (13.1)	13.5 (2.5)	64,500 (44,300)
<i>n</i>	2,215,644	2,104,350	2,169,567
Men (mean (SD))	42.7 (13.2)	13.3 (2.4)	70,600 (48,200)
<i>n</i>	1,160,799	1,091,109	1,142,001
Women (mean (SD))	43.0 (13.0)	13.7 (2.5)	57,800 (38,400)
<i>n</i>	1,054,845	1,013,244	1,027,563
European (mean (SD))	44.2 (13.2)	13.4 (2.5)	69,500 (46,300)
<i>n</i>	1,571,874	1,521,663	1,539,012
Māori (mean (SD))	40.7 (13.0)	12.6 (2.2)	55,100 (36,300)
<i>n</i>	286,713	271,101	281,538
Pacific Peoples (mean (SD))	38.8 (12.5)	12.5 (2.0)	49,800 (32,300)
<i>n</i>	139,074	124,608	136,368
Asian (mean (SD))	37.8 (11.4)	14.5 (2.4)	53,200 (37,300)
<i>n</i>	347,976	316,140	340,569
European men (mean (SD))	44.2 (13.4)	13.2 (2.4)	77,100 (50,600)
<i>n</i>	811,416	780,492	799,035
European women (mean (SD))	44.2 (13.1)	13.7 (2.5)	61,300 (39,600)
<i>n</i>	760,458	741,174	739,977
Māori men (mean (SD))	40.3 (13.1)	12.2 (2.0)	58,100 (38,200)
<i>n</i>	146,991	136,653	144,945
Māori women (mean (SD))	41.2 (12.8)	12.9 (2.3)	51,800 (33,900)
<i>n</i>	139,719	134,448	136,593
Pacific men (mean (SD))	38.5 (12.4)	12.1 (1.9)	51,900 (33,300)
<i>n</i>	75,060	65,430	73,767
Pacific women (mean (SD))	39.1 (12.5)	12.8 (2.1)	47,400 (31,000)
<i>n</i>	64,014	59,178	62,601

	Age (years)	Education (years)	Part-time inflated income (\$)
Asian men			
(mean (SD))	37.4 (11.4)	14.4 (2.4)	56,500 (39,500)
<i>n</i>	185,223	165,927	181,587
Asian women			
(mean (SD))	38.2 (11.3)	14.6 (2.4)	49,400 (34,300)
<i>n</i>	162,753	150,216	158,979

Note: Counts are random rounded to base 3, so may not sum to totals.

Men were on average slightly younger than women (men, 42.7 years; women, 43.0), had slightly fewer years of education (men, 13.3 years; women, 13.7), and had higher incomes (men, \$70,600; women, \$57,800). Workers identifying as European were the oldest on average (44.2 years), followed by workers identifying as Māori (40.7), Pacific Peoples (38.8) and Asian (37.8). Workers identifying as Asian had the highest average years of education (14.5 years), followed by workers identifying as European (13.4), Māori (12.6) and then Pacific Peoples (12.5), but 9.1 per cent of Asian workers and 10.4 per cent of Pacific workers were missing information on education. Workers identifying as European had the highest incomes on average (\$69,500), followed by Māori (\$55,100), Asian (\$53,200) and then Pacific Peoples (\$49,800).

Within each ethnic group, women had more years of education on average. The smallest observed difference in average years of education between men and women was for the Asian ethnic group (difference in means = 0.2 years) while the largest difference was for the Māori ethnic group (difference in means = 0.7 years). Men had higher average incomes than women for all ethnic groups. The largest difference was for the European ethnic group (men, \$77,100; women, \$61,300) while the smallest difference was for the Pacific Peoples ethnic group (men, \$51,900; women, \$47,400).

The estimated mean years of education and part-time inflated incomes for each minor group occupation (ordered by NZSEI-18 overall score) for men, women and workers identifying with European, Māori, Pacific Peoples and Asian ethnic groups are shown in Figure 2 and Figure 3, respectively. For all groups, workers in occupations with higher NZSEI-18 scores had more years of education and greater incomes on average

(Figure 2). Differences in average years of education between men and women were small at the occupation level. Workers identifying with Asian ethnic groups were typically more educated than other workers in the same occupational group and Māori and Pacific workers in high SEP occupations appeared to have lower mean years of education than other workers. There were substantial differences in the mean part-time inflated incomes at the minor group occupation level (Figure 3). Men and those identifying with European ethnic groups reported higher incomes within occupations than women and workers identifying with Māori, Pacific Peoples and Asian ethnic groups.

Figure 2: Mean years of education for each minor group occupation for (a) men and women, and (b) European, Māori, Pacific and Asian workers, sorted by NZSEI-18 score for the overall population, with a loess smoother applied

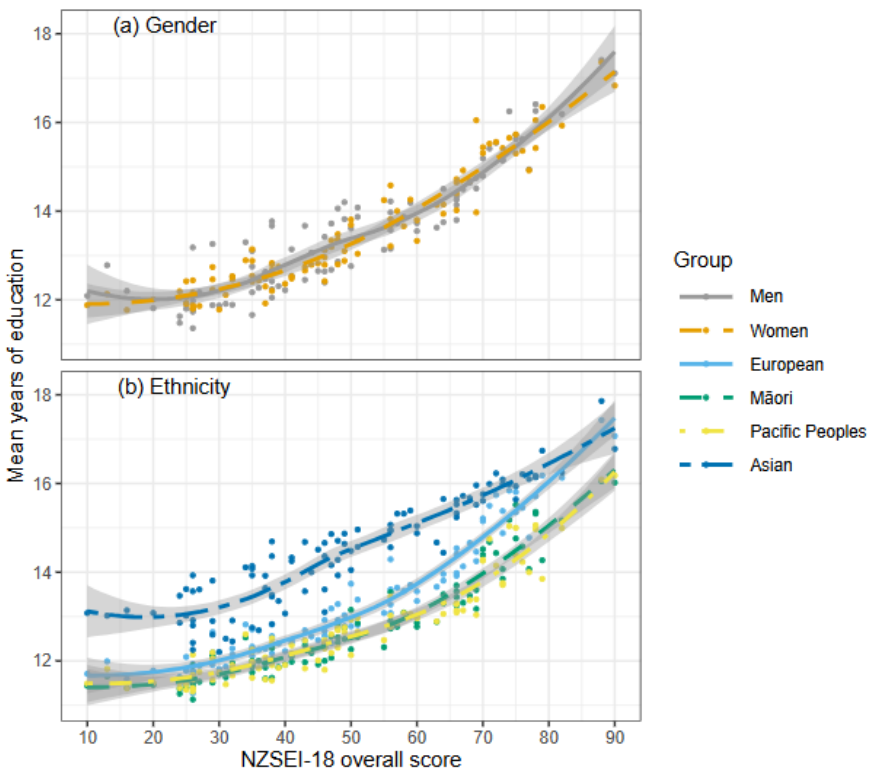
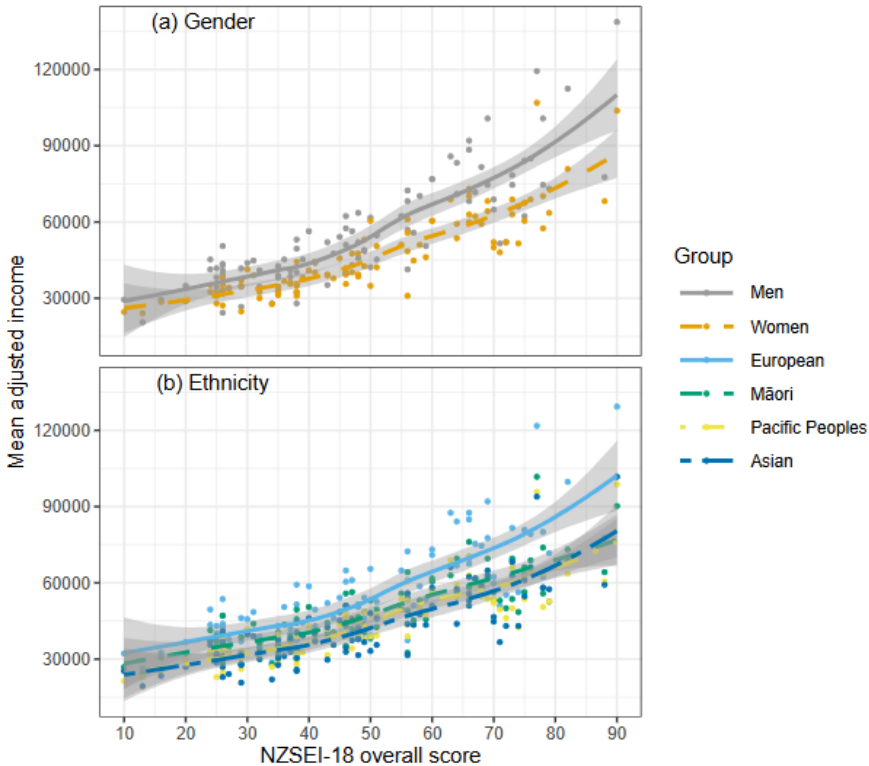


Figure 3: Mean part-time inflated income for each minor group occupation for (a) men and women, and (b) European, Māori, Pacific and Asian workers, sorted by NZSEI-18 score for the overall population, with a loess smoother applied



Correlations between age, education, and income for gender-by-ethnicity subgroups

Correlations between age, education, and income for gender-by-ethnicity subgroups are shown in Table 2. The correlations between age and education were more strongly negative for women ($r = -0.163$) than for men ($r = -0.085$), with a somewhat weaker relationship for age and income for women (women, $r = 0.168$; men, $r = 0.190$) and a slightly weaker relationship for education and logged income (women, $r = 0.193$; men, $r = 0.201$).

Table 2: Correlations between age, years of education and log of income at the individual level for gender, ethnic and ethnicity-by-gender groups, workers aged 21–69

Group	Age, education	Age, income	Education, income
Overall	-0.121	0.178	0.184
Men	-0.085	0.190	0.201
Women	-0.163	0.168	0.193
European	-0.108	0.157	0.207
Māori	-0.051	0.160	0.190
Pacific Peoples	-0.094	0.128	0.164
Asian	-0.139	0.146	0.168
European men	-0.061	0.167	0.236
European women	-0.159	0.150	0.214
Māori men	-0.053	0.176	0.190
Māori women	-0.061	0.149	0.218
Pacific men	-0.094	0.128	0.164
Pacific women	-0.113	0.133	0.185
Asian men	-0.104	0.153	0.177
Asian women	-0.181	0.144	0.166

The correlations between age, education and the log of income also varied across ethnic groups. The correlation between age and education was especially strong for workers identifying as Asian ($r = -0.139$) and particularly weak for workers identifying as Māori ($r = -0.051$) and Pacific Peoples ($r = -0.094$). For workers identifying as Pacific Peoples, the correlation between age and income was especially weak ($r = 0.128$). For workers identifying as European or as Māori, the correlation between education and income was stronger than for the population overall (European, $r = 0.207$; Māori, $r = 0.190$), whereas the converse was true for workers identifying with Asian or Pacific Peoples ethnic groups (Asian, $r = 0.168$; Pacific Peoples, $r = 0.164$).

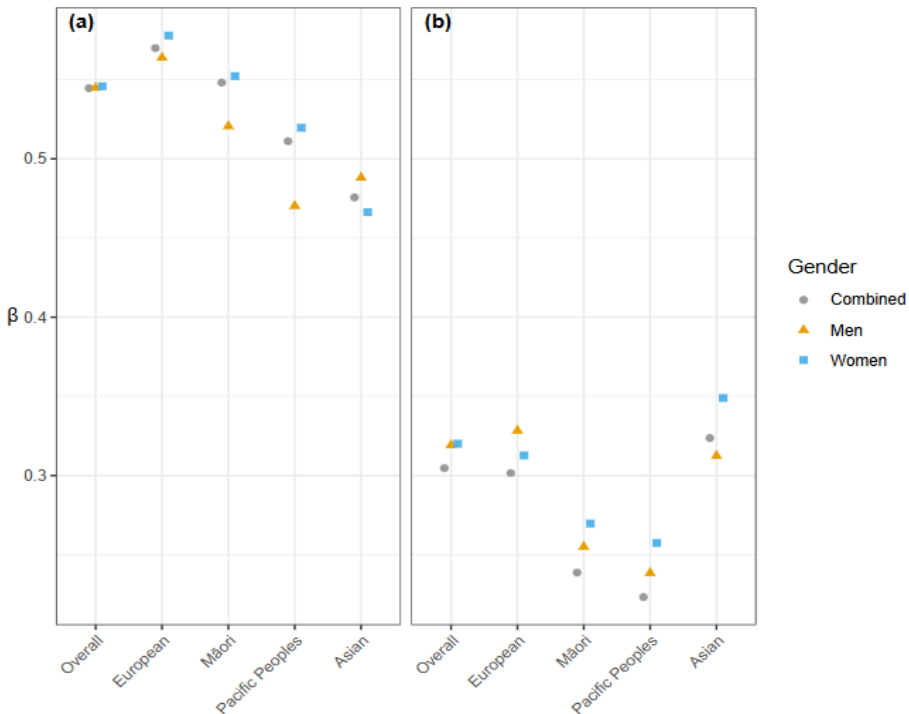
There was also variability in the magnitude of the correlations between age, education and log of income for the ethnicity-by-gender subgroups of workers. The correlations between age and education were stronger for women than men for workers identifying as European (men, $r = -0.061$; women, $r = -0.159$) and Asian (men, $r = -0.104$; women, $r = -0.181$).

The correlation between age and education was particularly strong for Asian women ($r = -0.181$), and especially weak for European men ($r = -0.061$), Māori men ($r = -0.053$) and Māori women ($r = -0.061$). The correlation between education and log income was weakest for Pacific men ($r = 0.164$) and Asian women ($r = 0.166$) and strongest for European men ($r = 0.236$), European women ($r = 0.214$) and Māori women ($r = 0.218$).

Ethnicity-by-gender specific path coefficients

Ethnicity-by-gender specific path coefficients for the NZSEI-18 are shown in Figure 4. For all ethnicity-by-gender groups, the weight given to the education to occupation pathway (range: $\beta_{32} = 0.466\text{--}0.578$) was much larger than that given to the occupation to income pathway ($\beta_{43} = 0.223\text{--}0.349$). This is in line with earlier versions of the scale (Fahy et al., 2017; Milne et al., 2013) and international estimates such as the ISEI-08 (Ganzeboom, 2010) and the Australian Socioeconomic Index 2006 (McMillan et al., 2009).

Figure 4: Estimated pathways (a) from education to occupation SEP (β_{32}) and (b) from occupational SEP to income (β_{43}) for ethnicity-by-gender groups



There were differences across groups in the estimated β_{32} coefficient, representing the pathway between education and occupational SEP. These differences were generally larger across ethnic groups than across genders. The estimated β_{32} coefficients were noticeably smaller for Pacific men ($\beta_{32} = 0.470$) and both Asian men and women (Asian men, $\beta_{32} = 0.488$; Asian women, $\beta_{32} = 0.466$) compared with the overall population (men, $\beta_{32} = 0.545$; women, $\beta_{32} = 0.546$). This pathway was also somewhat smaller for Pacific women ($\beta_{32} = 0.520$) and Māori men ($\beta_{32} = 0.521$). The estimated coefficients were larger than for the population overall for the European ethnic group (men, $\beta_{32} = 0.564$; women, $\beta_{32} = 0.578$).

The estimated β_{43} coefficient, representing the pathway from occupational SEP to income, was smaller for the Māori (Māori men, $\beta_{43} = 0.255$; Māori women, $\beta_{43} = 0.270$) and Pacific Peoples (Pacific men, $\beta_{43} = 0.238$; Pacific women, $\beta_{43} = 0.257$) ethnic groups compared with the overall population (men, $\beta_{43} = 0.319$; women, $\beta_{43} = 0.320$). The magnitude of the estimated coefficients for the European ethnic group (men, $\beta_{43} = 0.328$; women, $\beta_{43} = 0.313$) and Asian men ($\beta_{43} = 0.312$) were similar to that for the overall population estimate, with a slightly higher estimated income return to occupation for Asian women ($\beta_{43} = 0.349$). As for the pathway from education to occupation, differences for the pathway from occupation to income differed more by ethnic group than by gender.

There were also some differences across groups for pathways from age, as shown in Table 3. In particular, the relationships from age to education and from age to occupation SEP were weaker for Asian gender groups (especially Asian women), while the relationships from age to income were slightly weaker for Pacific men and women.

Ethnicity-by-gender specific NZSEI scores and their associations

Despite differences in the path coefficients for some population subgroups compared with the overall population, the correlation between the scores for the overall NZSEI-18 scores and the ethnicity-by-gender specifically estimated NZSEI scores were all high (all correlations ≥ 0.93). Correlations ranged from $r = 0.98$ for European men and European women to $r = 0.93$ for Asian men (see Table B1, in the supplementary notes).⁵ This indicates that the socioeconomic ordering of occupations is similar when using coefficients

derived from the overall population and coefficients derived from the ethnicity-by-gender subgroups.

Table 3: Estimated pathways from age to education, occupation SEP and income for ethnicity-by-gender subgroups, workers aged 21–69

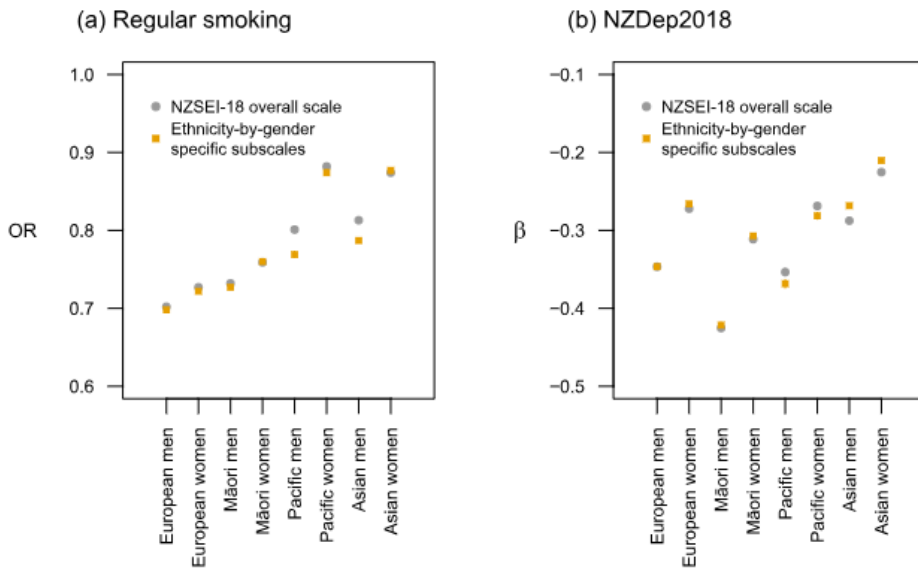
Group	β_{21} age to education	β_{31} age to occupation SEP	β_{41} age to income
Overall	0.061	0.111	0.164
Men	0.058	0.112	0.169
Women	0.051	0.104	0.163
European	0.047	0.091	0.148
Māori	0.07	0.104	0.142
Pacific Peoples	0.07	0.096	0.118
Asian	0.002	0.051	0.151
European men	0.047	0.095	0.147
European women	0.04	0.087	0.151
Māori men	0.061	0.101	0.157
Māori women	0.066	0.101	0.131
Pacific men	0.061	0.089	0.115
Pacific women	0.059	0.091	0.124
Asian men	0.009	0.057	0.151
Asian women	-0.034	0.024	0.165

Outcomes patterned by individual SEP

The estimated coefficients for modelling smoking and area deprivation using the NZSEI-18 scale and subgroup-specific scales are shown in Figure 5. For Pacific and Asian men, there were statistically significant differences in the estimated odds ratio (OR) for the relationship between a 10-unit increase in NZSEI score (indicating higher SEP) and regular smoking (panel (a)) when using ethnicity-by-gender specifically estimated NZSEI scores (Pacific men, OR = 0.77 (0.77–0.77); Asian men, OR = 0.79 (0.79–0.79)) compared with the overall NZSEI score stratified for these subgroups (Pacific men, OR = 0.80 (0.80–0.80); Asian men, OR = 0.81 (0.81–0.82)). However, the differences for these subgroups were very small and reflect the high level of statistical power due to the use of population-level data. There were no statistically significant differences in the OR estimates for all the other subgroups for

the ethnicity-by-gender individual subscales and the NZSEI scale stratified by gender and ethnic group.

Figure 5: Comparison of estimated coefficients for (a) regular smoking and (b) NZDep2018, respectively, between stratified models for ethnicity-by-gender subgroups using the overall NZSEI-18 scale compared with ethnicity-by-gender NZSEI subscales, workers aged 21–69



Note: Estimates presented are for a 10-unit difference in NZSEI scores and control for age group. 95 per cent confidence intervals are shown but are very narrow.

For Asian men and Asian women, there was evidence for a stronger negative association between NZSEI score and NZDep2018 score (Figure 5, panel (b); note that a higher score indicates higher deprivation) when using the overall NZSEI scores stratified by gender and ethnicity (Asian men, $\beta = -0.29$ (-0.29 to -0.28); Asian women, $\beta = -0.23$ (-0.23 to -0.22)) rather than gender-by-ethnic specific NZSEI scores (Asian men, $\beta = -0.27$ (-0.27 to -0.26); Asian women, $\beta = -0.21$ (-0.22 to -0.20)). For Pacific men and Pacific women this pattern was reversed, with a stronger negative association between NZSEI score and NZDep2018 score when using the gender-by-ethnic specific NZSEI scores (Pacific men, $\beta = -0.37$ (-0.37 to -0.36); Pacific women, $\beta = -0.28$ (-0.29 to -0.28)) compared with the overall NZSEI scores stratified by gender and ethnicity (Pacific men, $\beta = -0.35$ (-0.36 to -0.35); Pacific women, $\beta = -0.27$ (-0.27 to -0.26)). As for the findings with smoking,

the statistically significant differences in associations between stratified and overall scores were very small and unlikely to be meaningful. For Māori men, Māori women, European men and European women, whether the overall or individual path coefficients were used in constructing NZSEI scores made no difference for modelling NZDep2018 scores.

Discussion

This paper investigated differences in socioeconomic relationships across ethnic and gender groups, and whether there is evidence that these affect scores for an occupational scale, the New Zealand Socioeconomic Index 2018 (NZSEI-18). The results showed that the strength of the pathways from education to occupational SEP and from occupational SEP to income were similar for men and women. By contrast, weaker associations for these pathways were observed for non-European ethnic groups than for the full population, reflecting known inequities in society. The strength of the pathway from education to occupational SEP was particularly reduced for Pacific and Asian ethnic groups, while the strength of the pathway from occupational SEP to income was reduced for Māori and Pacific Peoples ethnic groups.

Despite these differences, the NZSEI-18 scores separately estimated for each of the ethnicity-by-gender subgroups patterned two SEP-sensitive measures – regular smoking and neighbourhood deprivation – similarly to the overall scores. While associations with smoking among Pacific and Asian men differed slightly when estimated using ethnicity-by-gender specific scale scores compared with the overall scale scores, this did not change the interpretation: higher SEP is associated with lower prevalence of regular smoking. Similarly, for neighbourhood deprivation as measured by the New Zealand Deprivation Index, very slight differences were observed for both men and women in the Pacific and Asian ethnic groups, but in each case, higher SEP was strongly associated with lower neighbourhood deprivation.

These differences suggest that the overall scale may not provide as accurate an estimate of SEP for some of these subgroups as estimating scores separately for each subgroup, but also that this is unlikely to affect substantive findings when using the NZSEI (at least for the associations examined).

Gender differences

There are well-established gender differences in pay and promotion, both internationally (Atal et al., 2009; Carnevale et al., 2021; OECD, 2025), and in Aotearoa New Zealand (Brower & James, 2020; Pacheco et al., 2019), as well as quite substantial occupational gender segregation (Boven et al., 2022). Previous research has also demonstrated differences in the occupational returns to education and income returns to occupation for men and women (Magnusson, 2010; Psacharopoulos & Patrinos, 2018; Sinning, 2017).

In the present study, there was little evidence of gender differences in the returns of occupation to income, the returns of education to occupation, or the association between education and income. While men reported higher average incomes than women for almost all occupations, despite similar levels of average education at the occupational level, the rank orderings of occupations by both average income and average education were similar for men and women. This may have resulted in similar associations between education and occupation, and between occupation and income for men and women, despite substantial differences in average income. Taken together, this may indicate that the *relative (within-group) pay-off* for gaining additional qualifications, or of moving into a higher SEP occupation, is similar for men and women, despite the *absolute pay-off* being lower for women than for men.

Ethnic differences

There were substantial differences in both the associations between age, education and income, and the pathways from education to income through occupation, across the ethnic groups examined. Those identifying as Asian and Pacific Peoples, and to a lesser extent Māori men, were disadvantaged in educational returns to occupation, while those identifying as Māori and Pacific Peoples were disadvantaged in occupational returns to income. There were small gender differences within each ethnic group.

The lower returns in occupational position relative to educational attainment for Pacific and Asian populations appears consistent with prior research on the employment outcomes of immigrants internationally (De Alwis et al., 2020; Johnston et al., 2015), and in Aotearoa New Zealand

(Maani et al., 2015; Poot & Roskrug, 2013; Poot & Stillman, 2010; Stillman & Maré, 2009). A large share of the population for these two ethnic groups was born overseas (77.0 per cent for those identifying with an Asian ethnic group and 33.6 per cent for those identifying with a Pacific Peoples ethnic group, compared with 17.2 per cent for Europeans and 2.0 per cent for Māori (Stats NZ, 2024a)). Research by Maani et al. (2015) demonstrated that there are disparities across ethnic groups in occupational attainment for male immigrants in New Zealand, after controlling for factors including education. Higher occupational attainment was observed for Europeans and lower attainment observed for Pacific workers, and to a lesser extent, migrants belonging to Asian and other ethnic groups (Maani et al., 2015). Previous research has also demonstrated evidence of occupational mismatch with recent immigrants tending to experience greater discrepancies in occupational levels and hourly wages for their level of education than non-migrants, with these differences reducing over time (Johnston et al., 2015; Poot & Stillman, 2010; Stillman & Maré, 2009). However, in the Aotearoa New Zealand context, employment outcomes for workers from the Pacific do not seem to converge to those of New Zealand-born workers (Stillman & Maré, 2009).

Interestingly, in the present study, the Asian ethnic group appeared to have income returns from occupation comparable to those of the overall population but lower occupational returns from education, suggesting that this pattern may be driven by a mismatch between qualifications and occupational position. This was not true of the Pacific Peoples ethnic group, who appeared to experience both lower occupational returns to education and lower income returns to occupation. Further research should explore the contribution of migrant status to the patterns observed for the Pacific Peoples and Asian ethnic groups. Such analyses should also consider the length of time resident in Aotearoa New Zealand. Notably, there were also lower income returns to occupational position for the Māori ethnic group.

Strengths and limitations

This study used all-of-population data to examine potential differences in socioeconomic relationships for ethnic and gender groups using a well-established theoretical model: the returns to human capital model. Despite considerable issues with the operation of the 2018 New Zealand

Census (2018 Census External Data Quality Panel, 2019b; Stats NZ, 2019), the 2018 scale was very similar to previous versions of the NZSEI.

There are some limitations that warrant mention. The first is that this study solely examined data from Aotearoa New Zealand, which has a unique history, demography and sociocultural context. It is important to understand the results in this context. Even so, the study adds to the international literature demonstrating lower educational and occupational returns for marginalised ethnic groups. While NZSEI scores appear to be robust to moderate group differences in returns to education and occupation, occupational scales for contexts with large differences in these relationships across groups may not be valid for the whole population.

Secondly, a disproportionate share of records for people belonging to Māori and Pacific Peoples ethnic groups had data supplemented from other sources (2018 Census External Data Quality Panel, 2019a; Stats NZ, 2019), which may have affected estimates for these groups. For example, occupation was imputed for 32.5 per cent and 40.0 per cent of Māori and Pacific workers, respectively. It is possible that the patterns shown here of lower returns for these groups may reflect greater supplementation with alternative data sources for these groups, as this was shown to weaken the estimated pathways between education to occupational SEP, and to a lesser extent, occupational SEP to income (Boven et al., 2022).⁶

Furthermore, the classification of ethnicity itself was dependent on administrative data for 6.1 per cent of the workers in this study. Consistency between ethnic identification in census and administrative data tends to be lower for the Māori and Pacific Peoples ethnic groups, and for those who identify with multiple ethnic groups (Reid et al., 2016). Given differences in data characteristics, it would not be valid to use different NZSEI versions to understand longitudinal patterns of relative SEP across ethnic groups. Notably, the ethnicity categorisation method used affects estimates for health outcomes (Hobbs et al., 2019, Yao et al., 2022), and it is possible we may have observed different patterns had we used single/combination categorisation rather than total response categorisation. Similarly, the use of broad Level 1 ethnic grouping may have obscured important differences across ethnicities.

Third, as the 2018 Census only included a binary classification of gender, all workers were classified as either men or women in this study.

Consequently, non-binary people will have been misgendered, and some transgender people may have been misgendered. Notably, the 2023 Census included separate questions to capture information about gender and sex (Stats NZ, 2024d), meaning that it may be possible to examine the socioeconomic characteristic of non-binary and transgender workers as part of constructing and validating the NZSEI-23.

Fourth, income was measured primarily as total personal income from all sources, with a further 16.6 per cent of income values sourced from tax data.⁷ Total personal income is the only personal income measure available from New Zealand census data, and this is what has been used for prior NZSEI scales. The ISEI, on which the NZSEI was based, also used total income sources due to earnings data being unavailable, but the authors noted that earnings may have been more appropriate (Ganzeboom et al., 1992). While many occupational SEP scales have used income (Hauser & Warren, 1997), we are not aware of any research comparing the results generated using earnings versus income, and this would be a useful direction for further research.

Furthermore, for part-time workers, income was converted to hourly earnings based on the reported hours usually worked, and this was scaled up to the 40-hour equivalent, with extreme values removed. This may have overestimated the income returns for part-time workers who may be more likely to receive a greater share of their income from sources other than wages and salaries. Given that women in New Zealand are more likely to work part-time and to receive income from sources such as government benefits (Boven et al., 2022), this may have particularly impacted estimates of associations with income for this group. Additional analyses conducted using the 2018 Census data showed that adjusting all estimated incomes to 40 hours per week somewhat strengthened the associations between age and income and education and income, as well as the estimated pathway from occupation to income, but did not markedly change the estimated NZSEI-18 scores.⁸

Lastly, occupations at the minor group level of ANZSCO – 97 occupations – may encompass some heterogeneity (Fahy et al., 2017). Consequently, it is possible that some of the patterns of differences in mean levels of education and/or income across groups could reflect differences in the distribution of occupational characteristics (e.g., skills requirements)

which are not captured at the minor group level. It was not possible to conduct subgroup analyses with a more detailed classification of occupations given the size of some population groups.

Implications

This study demonstrated large differences in socioeconomic position, and especially income, across groups at the occupational level, consistent with previous research in this area. Across ethnic groups, differences in the relationships between education, occupational position and income contributed to these inequities in unique ways. Conversely, observed income disparities between men and women were not reflected in these relationships. This suggests that different occupational processes may influence inequities for different groups. Furthermore, it may be possible to use the returns to human capital model to better understand the nature of socioeconomic inequities for particular groups. This may facilitate more effective policy action to tackle inequities.

This study also demonstrated that occupational scales may be robust to moderate differences in the underlying relationships between education, occupation and income across groups. This is reassuring as it is not standard practice to create separate subscales for population subgroups (although some gender-specific scales exist).

Conclusion

Despite some substantial differences in the pathways underlying the returns to human capital model, the overall NZSEI scale appears to adequately capture SEP for key population groups. Observed differences in the associations with socioeconomically patterned outcomes between the ethnicity-by-gender specific NZSEI subscales and the overall scale stratified by ethnicity-by-gender subgroups were minor and unlikely to substantively affect conclusions. Analyses revealed substantially lower average income levels across occupations for women and marginalised ethnic groups. Comparisons by gender revealed little evidence of substantial differences in the pathways from education to occupation, and from occupation to income, but men reported higher incomes for most occupations. This indicates that women typically need a higher level of education and occupational position to achieve the same level of income as men. There was evidence of weaker

returns for education to occupation for the Pacific Peoples and Asian ethnic groups, and evidence of weaker occupation returns to income for the Māori and Pacific Peoples ethnic groups. Occupational mismatch may have influenced the pattern of returns observed for the Asian ethnic group.

Notes

- 1 All counts are random rounded to base 3 (due to Stats NZ confidentiality requirements), so it is normal for the sum of percentages to not add to exactly 100 per cent.
- 2 The estimated odds ratios between NZSEI scores and regular smoking (adjusted for covariates) were very similar for the NZSEI-18 (0.752, 0.750–0.753; Boven et al., 2022) and the NZSEI-13 (0.762, 0.760–0.764; Fahy et al., 2017).
- 3 The Booth et al. (1994) bootstrapping approach was used to estimate finite-population-corrected 95 per cent confidence intervals for the path coefficients for each group. However, these were extremely narrow so are not shown. Finite-population-corrected 95 per cent confidence intervals were also estimated for the associations between NZSEI scales and both smoking and area deprivation.
- 4 The supplementary notes, which include ‘Table A1: Mean (standard deviation) age, years of education and logged income by occupation, and NZSEI-18 scores for each occupation, for workers aged 21–69’, are available from the corresponding author on request.
- 5 The supplementary notes, which include ‘Table B1: Correlations between ethnicity-by-gender NZSEI subscales’, are available from the corresponding author on request.
- 6 The estimated pathway from education to occupational SEP was $\beta_{32} = 0.368$ for records with occupation and/or income supplemented, while that from occupational SEP to income was $\beta_{43} = 0.252$ (Boven et al., 2022). See Section 7 of Boven et al. (2022) for detailed analyses exploring the potential impacts of data supplementation on the NZSEI-18 scale, including estimates of the level of data supplementation across groups for key variables.
- 7 Additional analyses demonstrated that estimated mean income at the occupational level was slightly greater for those with income and occupation data from the census than for those who had either variable (or both) supplemented. While this may relate to the broader income definition in the census, people with data from the census tended to be

socioeconomically advantaged over those with supplemented data (Boven et al., 2022).

- 8 The estimated pathway from occupational SEP to income increased from 0.306 to 0.349 when all incomes were adjusted to the 40-hour equivalent, while the estimated pathway from education to occupational SEP decreased slightly from 0.545 to 0.542. The association between education and income increased from 0.184 to 0.211. The NZSEI scores with and without this adjustment correlated at $r > 0.99$.

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Appendix A: Characteristics of the analytic sample at the occupational level

Table A1: Mean (standard deviation) age, years of education and logged income by occupation, and NZSEI-18 scores for each occupation, for workers aged 21–69

Occupation	age	education	log income	NZSEI-18 score
111 Chief Executives, General Managers and Legislators	48.3 (10.9)	13.9 (2.5)	11.2 (1.1)	65
121 Farmers and Farm Managers	46.1 (13.3)	12.4 (2.1)	10.7 (1.3)	41
131 Advertising, Public Relations and Sales Managers	42.3 (10.9)	14.1 (2.4)	11.3 (0.7)	66
132 Business Administration Managers	45 (11.2)	14.1 (2.5)	11.3 (0.7)	66
133 Construction, Distribution and Production Managers	41.9 (12.7)	12.8 (2)	11 (0.8)	51
134 Education, Health and Welfare Services Managers	48.7 (10.7)	15.7 (2.2)	11.3 (0.6)	78
135 ICT Managers	44.7 (9.5)	14.9 (2.3)	11.7 (0.6)	77
139 Miscellaneous Specialist Managers	42.7 (12.2)	14.7 (2.5)	11.2 (0.7)	69
141 Accommodation and Hospitality Managers	43.8 (13.8)	13.3 (2.3)	10.5 (1.1)	48
142 Retail Managers	41.8 (13)	12.9 (2.2)	10.7 (0.9)	46
149 Miscellaneous Hospitality, Retail and Service Managers	42.8 (12)	13.7 (2.3)	11.1 (0.7)	61
211 Arts Professionals	43.7 (12.9)	14.3 (2.4)	10.5 (1.2)	57
212 Media Professionals	42.5 (12.7)	15.1 (2.3)	11 (0.9)	70
221 Accountants, Auditors and Company Secretaries	42.1 (12.7)	15.5 (1.8)	11.2 (0.7)	75
222 Financial Brokers and Dealers, and Investment Advisers	43.7 (12.2)	14.4 (2.3)	11.4 (0.8)	69
223 Human Resource and Training Professionals	41 (12.3)	14.6 (2.3)	11.1 (0.7)	67
224 Information and Organisation Professionals	43.8 (12.3)	15.5 (2.4)	11.2 (0.7)	76

Occupation	age	education	log income	NZSEI-18 score
225 Sales, Marketing and Public Relations Professionals	39.1 (11.7)	14.5 (2.3)	11.1 (0.7)	66
231 Air and Marine Transport Professionals	43.4 (12.8)	13.7 (1.9)	11.4 (0.8)	64
232 Architects, Designers, Planners and Surveyors	39.7 (12)	15.2 (2.1)	11 (0.8)	71
233 Engineering Professionals	41.1 (13.2)	14.7 (2.5)	11.2 (0.8)	69
234 Natural and Physical Science Professionals	42.4 (12.5)	16.1 (2.5)	11.1 (0.7)	79
241 School Teachers	43.4 (12.5)	15.8 (1.7)	10.9 (0.7)	74
242 Tertiary Education Teachers	46.9 (12.6)	17.4 (2.6)	11.2 (0.7)	88
249 Miscellaneous Education Professionals	46.2 (13.4)	15.5 (2.3)	10.8 (0.8)	71
251 Health Diagnostic and Promotion Professionals	42.6 (12.8)	15.3 (2.2)	11.1 (0.6)	73
252 Health Therapy Professionals	42.1 (12.5)	16.1 (1.7)	11 (0.8)	78
253 Medical Practitioners	42.6 (13)	17 (1.8)	11.7 (0.8)	90
254 Midwifery and Nursing Professionals	44.1 (12.8)	15.7 (1.6)	11 (0.6)	75
261 Business and Systems Analysts, and Programmers	39.4 (10.8)	15.2 (2.2)	11.3 (0.7)	73
262 Database and Systems Administrators, and ICT Security Specialists	41.3 (11.6)	14.3 (2.3)	11.1 (0.7)	65
263 ICT Network and Support Professionals	40.2 (11.4)	14.6 (2.2)	11.2 (0.6)	68
271 Legal Professionals	43.2 (13)	16.1 (1.7)	11.5 (0.8)	82
272 Social and Welfare Professionals	45.5 (12.8)	15.6 (2.6)	10.9 (0.7)	72
311 Agricultural, Medical and Science Technicians	42 (13.1)	13.9 (2.3)	10.8 (0.6)	58
312 Building and Engineering Technicians	43 (12.8)	13.3 (2.1)	11 (0.7)	56
313 ICT and Telecommunications Technicians	38 (12.2)	14.2 (2.2)	10.8 (0.7)	60
321 Automotive Electricians and Mechanics	41 (13.4)	12.2 (1.3)	10.8 (0.7)	40

Occupation	age	education	log income	NZSEI-18 score
322 Fabrication Engineering Trades Workers	41.1 (12.6)	11.9 (1.5)	10.7 (0.8)	33
323 Mechanical Engineering Trades Workers	45.5 (13)	12.4 (1.5)	11 (0.7)	47
324 Panelbeaters, and Vehicle Body Builders, Trimmers and Painters	41.9 (12.8)	11.9 (1.3)	10.7 (0.8)	32
331 Bricklayers, Carpenters and Joiners	40.7 (12.6)	12.3 (1.5)	10.7 (0.9)	38
332 Floor Finishers and Painting Trades Workers	43.1 (12.8)	11.8 (1.6)	10.6 (0.9)	29
333 Glaziers, Plasterers and Tilers	38.8 (12)	11.8 (1.5)	10.7 (0.8)	29
334 Plumbers	39.4 (13.1)	12.2 (1.3)	10.9 (0.6)	42
341 Electricians	39.7 (13.4)	12.6 (1.3)	11 (0.6)	47
342 Electronics and Telecommunications Trades Workers	41.9 (13)	12.7 (1.8)	10.9 (0.7)	48
351 Food Trades Workers	38.7 (12.1)	12.5 (1.8)	10.4 (0.9)	34
361 Animal Attendants and Trainers, and Shearers	38.6 (13.1)	12.6 (2)	10.5 (0.9)	37
362 Horticultural Trades Workers	45.1 (13.5)	12.5 (2)	10.5 (0.9)	40
391 Hairdressers	39.3 (12.3)	12.2 (1.3)	10.5 (0.8)	31
392 Printing Trades Workers	45.4 (12.1)	12.5 (1.9)	10.8 (0.7)	44
393 Textile, Clothing and Footwear Trades Workers	47.6 (12.6)	12.2 (1.9)	10.5 (0.8)	35
394 Wood Trades Workers	44.6 (12.9)	12.2 (1.7)	10.6 (0.8)	37
399 Miscellaneous Technicians and Trades Workers	41.4 (13)	13 (2.1)	10.8 (0.8)	49
411 Health and Welfare Support Workers	45.4 (13.1)	13.5 (2.3)	10.7 (0.7)	53
421 Child Carers	39.5 (14.1)	12.9 (2.1)	10.2 (1)	36
422 Education Aides	45.3 (11.7)	12.9 (2.2)	10.3 (0.8)	40
423 Personal Carers and Assistants	46.3 (13.4)	12.5 (2.1)	10.5 (0.8)	37

Occupation	age	education	log income	NZSEI-18 score
431 Hospitality Workers	33.1 (12.2)	12.9 (2.1)	10.1 (1)	32
441 Defence Force Members, Fire Fighters and Police	40.1 (11.9)	13.3 (1.9)	11.2 (0.5)	57
442 Prison and Security Officers	44.3 (13.4)	12.5 (2)	10.7 (0.8)	42
451 Personal Service and Travel Workers	40.1 (13.2)	13.4 (2.1)	10.6 (0.9)	49
452 Sports and Fitness Workers	37.4 (13)	13.7 (2.2)	10.6 (1)	52
511 Contract, Program and Project Administrators	43.8 (12.3)	13.7 (2.4)	10.9 (0.6)	59
512 Office and Practice Managers	45.7 (12)	12.9 (2.2)	10.8 (0.7)	49
521 Personal Assistants and Secretaries	46.4 (12.5)	12.9 (2.1)	10.9 (0.6)	50
531 General Clerks	44.2 (13.6)	13.2 (2.4)	10.7 (0.8)	50
532 Keyboard Operators	44.8 (14.4)	12.9 (2.2)	10.6 (0.9)	44
541 Call or Contact Centre Information Clerks	36 (12.4)	13.4 (2.2)	10.6 (0.8)	49
542 Receptionists	41.8 (15)	12.8 (2.1)	10.5 (0.8)	40
551 Accounting Clerks and Bookkeepers	45.5 (12.3)	13.2 (2.2)	10.8 (0.6)	52
552 Financial and Insurance Clerks	41.2 (12.5)	13.5 (2.2)	11 (0.6)	57
561 Clerical and Office Support Workers	45.1 (13.7)	12.5 (2.1)	10.6 (0.8)	39
591 Logistics Clerks	42 (12.5)	12.7 (2.2)	10.8 (0.6)	47
599 Miscellaneous Clerical and Administrative Workers	42.5 (13.4)	13.7 (2.3)	10.9 (0.7)	57
611 Insurance Agents and Sales Representatives	39.3 (13)	13 (2.2)	10.7 (0.7)	47
612 Real Estate Sales Agents	48.9 (12.3)	13.5 (2.3)	11.1 (1)	61
621 Sales Assistants and Salespersons	39.9 (14.5)	12.6 (2.1)	10.5 (0.8)	38
631 Checkout Operators and Office Cashiers	39 (14.8)	12.5 (2.1)	10.2 (0.9)	29
639 Miscellaneous Sales Support Workers	41.7 (13.4)	12.7 (2.2)	10.6 (0.7)	43

Occupation	age	education	log income	NZSEI-18 score
711 Machine Operators	44 (12.9)	11.8 (1.8)	10.6 (0.8)	28
712 Stationary Plant Operators	42.1 (12.7)	12.1 (1.8)	10.9 (0.8)	40
721 Mobile Plant Operators	42.6 (13.5)	11.5 (1.6)	10.7 (0.8)	27
731 Automobile, Bus and Rail Drivers	51.7 (12.2)	12.4 (2.2)	10.6 (0.8)	39
732 Delivery Drivers	43 (14.6)	12.1 (1.9)	10.4 (0.9)	30
733 Truck Drivers	47.1 (12.5)	11.4 (1.5)	10.8 (0.7)	29
741 Storepersons	40.6 (13.5)	12 (1.8)	10.5 (0.8)	28
811 Cleaners and Laundry Workers	45.2 (13.4)	11.9 (2)	10.3 (1)	19
821 Construction and Mining Labourers	41.6 (13.7)	11.9 (1.7)	10.6 (0.9)	31
831 Food Process Workers	41.3 (13.2)	11.8 (1.8)	10.6 (0.9)	28
832 Packers and Product Assemblers	40.1 (13.4)	12 (1.9)	10.2 (1.1)	10
839 Miscellaneous Factory Process Workers	42.4 (13.3)	11.8 (1.8)	10.6 (0.9)	27
841 Farm, Forestry and Garden Workers	42 (14)	12.1 (1.9)	10.4 (1)	27
851 Food Preparation Assistants	37.5 (13.9)	12.4 (2.1)	10 (1.1)	16
891 Freight Handlers and Shelf Fillers	40.7 (14.1)	12 (1.9)	10.5 (0.8)	29
899 Miscellaneous Labourers	41.7 (14.1)	11.9 (1.8)	10.4 (0.9)	23

Appendix B: Associations between subgroup scales

Table B1: Correlations between ethnicity-by-gender NZSEI subscales

Group	European		Māori		Pacific		Asian		
	Overall	Men	Women	Men	Women	Men	Women	Men	Women
Overall	1.00	0.98	0.98	0.97	0.97	0.96	0.94	0.93	0.94
European men		1.00	0.95	0.98	0.96	0.96	0.93	0.93	0.92
European women			1.00	0.93	0.97	0.92	0.93	0.90	0.93
Māori men				1.00	0.95	0.97	0.93	0.90	0.90
Māori women					1.00	0.94	0.93	0.90	0.91
Pacific men						1.00	0.93	0.91	0.90
Pacific women							1.00	0.85	0.89
Asian men								1.00	0.95
Asian women									1.00

Figure B1: Scatter plots comparing the overall NZSEI-18 scale and ethnicity-by-gender NZSEI subscales for (a) European men, (b) European women, (c) Māori men, (d) Māori women, (e) Pacific men, (f) Pacific women, (g) Asian men and (h) Asian women

