Assessing socio-economic status through occupation

AN UPDATE OF THE NEW ZEALAND SOCIOECONOMIC INDEX (NZSEI)

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BRIAN BYUN, ALAN LEE, PETER DAVIS

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Outline

- Socio-economic status (SES)
  - What is it? Why measure it? How to measure it?

- Theory and construction of NZSEI

- Validation
  - Smoking and other socio-economic correlates

- Conclusions
Socio-economic status (SES)

- Also called socio-economic position (SEP)
- Not claiming it is the same as ‘class’
  - CLASS
    - “A group of people who share a common economic situation, based upon their relationship to the means of production, and whose interests inevitably clash with those of others”
  - SOCIO-ECONOMIC STATUS
    - “The patterned unequal distribution of opportunities, advantages, resources and power among the population. Distinct ‘socio-economic groups’ may thus be said to exhibit different life chances, living standards and associated cultural practices”
- Interested in measuring stratification in SES, without making assumptions about class
Why measure SES?

- **Research**
  - Can test hypotheses about the impact of unequal distribution of opportunities, advantages, resources and power on
    - Health, wellbeing, life choices, use of services, crime
    - Moderating the impact of other risk factors
  - Can investigate SES stability and mobility, both within one’s life and inter-generationally

- **Describing populations**

- **Funding allocation**
  - Social and health services are sometimes funded (in-part) based on the socio-economic characteristics of the areas that they serve.
How to measure SES

Fig. 1. Some approaches to measuring socioeconomic position.

SES Measures

• All measures have their advantages and drawbacks
  ○ Income – face validity, often recorded administratively; often reluctantly reported, known under-reporting (self-employed)
  ○ Education – stable past a certain age; but inversely associated with age
  ○ Deprivation measures
    ▪ Area-based – proven validity, easily coded, summarises multiple adversities; individuals within area may differ, address may mislead
    ▪ Individual-based – proven validity, summarises multiple adversities; need specific questionnaire, focus on deprived end
  ○ Occupation – readily recalled, often recorded, proven validity; coding not straightforward, how to code those not in workforce?
SES Measures

- Not the case that one ‘best’ captures SES; each might be seen as complementary to others
  - No reason to just focus on one
  - Some do draw from different sources

- Will describe theory, construction and properties of the NZSEI, an occupation-based measure of SES
  - Long history – Elley-Irving scales, previous NZSEIs
  - Update overdue – last version based on 1996 census
    - Job structure changed (and new classification system)
    - Anomalous aspects to previous versions
NZSEI – Theory

• ‘Returns to human capital’ model
  ○ The relationship between cultural capital or resources (education) and access to material rewards (income) is mediated through occupational structure.
  ○ In capitalist societies, division of labour is “the kernel of social inequality” and occupation, by implication, is a pivotal factor underpinning socio-economic stratification.
  ○ Thus, variations in occupational order translate into variations in social stratification and differentiation in lifestyles and life chances.
NZSEI – Theory

Representation of the NZSEI path model

- Age
  - $\beta_{31}$
  - $\beta_{32}$
- Education
  - $\beta_{21}$
- Occupational SES
  - $\beta_{41}$
  - $\beta_{42}$
- Income
  - $\beta_{43}$
NZSEI – Construction

- Use statistical (path analytic) techniques to derive SES scores which equate to an optimal weighting of education and income, corrected for age
- Scale scores to be from 10 (low SES) – 90 (high SES)
NZSEI – Construction

- E.g., the NZSEI-96:

<table>
<thead>
<tr>
<th>High SEI Scores</th>
<th>1996</th>
<th>Low SEI Scores</th>
<th>1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior business administrators</td>
<td>90</td>
<td>Textile machinery operators</td>
<td>10</td>
</tr>
<tr>
<td>Health professionals</td>
<td>89</td>
<td>Labourers</td>
<td>18</td>
</tr>
<tr>
<td>Legal professionals</td>
<td>83</td>
<td>Housekeeping and restaurant workers</td>
<td>18</td>
</tr>
<tr>
<td>Mathematicians/statisticians</td>
<td>71</td>
<td>Packers and freight handlers</td>
<td>19</td>
</tr>
<tr>
<td>Senior government administrators</td>
<td>69</td>
<td>Glass and ceramic plant operators</td>
<td>19</td>
</tr>
<tr>
<td>Tertiary teaching professionals</td>
<td>69</td>
<td>Professional service workers</td>
<td>19</td>
</tr>
</tbody>
</table>

Davis et al., 2003
NZSEI – Construction

- In previous NZSEIs (1991 & 1996), education weakly associated with occupational SES, but occupational SES strongly associated with income.
- Opposite pattern in Australia (AUSEI96 & AUSEI06) and internationally (ISEI88).

<table>
<thead>
<tr>
<th></th>
<th>NZSEI91</th>
<th>NZSEI96</th>
<th>AUSEI96</th>
<th>AUSEI06</th>
<th>ISEI88</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_{32}$ Education-Occupation</td>
<td>0.23</td>
<td>0.25</td>
<td>0.63</td>
<td>0.65</td>
<td>0.58</td>
</tr>
<tr>
<td>$\beta_{43}$ Occupation-Income</td>
<td>0.79</td>
<td>0.79</td>
<td>0.30</td>
<td>0.35</td>
<td>0.47</td>
</tr>
</tbody>
</table>

- For NZSEI-06, adopt methods more closely in line with AUSEI to see if pattern changes.

Davis et al., 2003
NZSEI-06 - Data

- Data from 2006 Census
  - Restricted to full- and part-time workers aged 21-69 (n≈1,700,000)

- Education
  - Highest qualification converted into years of education

- Occupation
  - Grouped into 97 occupations (ANZSCO classification – same used in Australia)

- Income
  - Four measures: annual or hourly income (to assess impact of part-time workers) x inflated or not-inflated income for self-employed workers (to account for known under-reporting)
NZSEI-06 – Results

• Scores affected - esp at lower end - by adjustments for part-time work (by using hourly income)

• Scores hardly affected by adjustments for self-employment (by inflating income for the self-employed)

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## NZSEI-06 – Results

<table>
<thead>
<tr>
<th>High SEI Scores</th>
<th>2006</th>
<th>Low SEI Scores</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Practitioners</td>
<td>90</td>
<td>Truck Drivers</td>
<td>10</td>
</tr>
<tr>
<td>Tertiary Education Teachers</td>
<td>87</td>
<td>Mobile Plant Operators</td>
<td>14</td>
</tr>
<tr>
<td>Legal Professionals</td>
<td>83</td>
<td>Miscellaneous Factory Workers</td>
<td>15</td>
</tr>
<tr>
<td>Natural and Physical Science Professionals</td>
<td>80</td>
<td>Cleaners and Laundry Workers</td>
<td>16</td>
</tr>
<tr>
<td>Health Therapy Professionals</td>
<td>79</td>
<td>Packers and Product Assemblers</td>
<td>16</td>
</tr>
<tr>
<td>Education, Health and Welfare Services Managers</td>
<td>77</td>
<td>Food Preparation Assistants</td>
<td>16</td>
</tr>
<tr>
<td>Accountants, Auditors and Company Secretaries</td>
<td>77</td>
<td>Food Process Workers</td>
<td>17</td>
</tr>
<tr>
<td>School Teachers</td>
<td>77</td>
<td>Miscellaneous Labourers</td>
<td>19</td>
</tr>
<tr>
<td>Miscellaneous Education Professionals</td>
<td>75</td>
<td>Machine Operators</td>
<td>21</td>
</tr>
<tr>
<td>Information Professionals</td>
<td>75</td>
<td>Storepersons</td>
<td>22</td>
</tr>
</tbody>
</table>

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## NZSEI-o6 – Results

<table>
<thead>
<tr>
<th>ANZSCO major group</th>
<th>NZSEI06 Score (Mean)</th>
<th>NZSEI06 score (range among occupations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manager</td>
<td>55.0</td>
<td>40-77</td>
</tr>
<tr>
<td>2. Professional</td>
<td>74.7</td>
<td>59-90</td>
</tr>
<tr>
<td>3. Technician and Trades Workers</td>
<td>42.1</td>
<td>28-63</td>
</tr>
<tr>
<td>4. Community and Personal Service Workers</td>
<td>41.2</td>
<td>28-56</td>
</tr>
<tr>
<td>5. Clerical and Administrative Workers</td>
<td>48.1</td>
<td>39-56</td>
</tr>
<tr>
<td>6. Sales Workers</td>
<td>43.0</td>
<td>34-60</td>
</tr>
<tr>
<td>7. Machinery Operators and Drivers</td>
<td>20.0</td>
<td>10-37</td>
</tr>
<tr>
<td>8. Labourers</td>
<td>19.9</td>
<td>15-29</td>
</tr>
</tbody>
</table>

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NZSEI-o6 – Results

- Path weights in line with Australian (AUSEI96 & AUSEI06) and international (ISEI88) scales

<table>
<thead>
<tr>
<th></th>
<th>NZSEI91</th>
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<td>0.35</td>
<td>0.47</td>
</tr>
</tbody>
</table>

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### NZSEI-06 – Results

- **SEI scores split into six groups (1=high, 6=low)**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean income ($)</th>
<th>Difference</th>
<th>Years of education</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>non-Maori</td>
<td>Maori</td>
<td>%</td>
<td>$ (1000s)</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>82,600</td>
<td>64,000</td>
<td>29.0</td>
<td>18.6</td>
</tr>
<tr>
<td>2</td>
<td>72,200</td>
<td>59,500</td>
<td>21.2</td>
<td>12.6</td>
</tr>
<tr>
<td>3</td>
<td>53,900</td>
<td>46,600</td>
<td>15.6</td>
<td>7.3</td>
</tr>
<tr>
<td>4</td>
<td>43,100</td>
<td>39,500</td>
<td>9.3</td>
<td>3.7</td>
</tr>
<tr>
<td>5</td>
<td>35,700</td>
<td>33,500</td>
<td>6.5</td>
<td>2.2</td>
</tr>
<tr>
<td>6</td>
<td>33,000</td>
<td>31,900</td>
<td>3.6</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>56,700</td>
<td>50,000</td>
<td>13.2</td>
<td>6.6</td>
</tr>
<tr>
<td>2</td>
<td>47,200</td>
<td>42,200</td>
<td>11.9</td>
<td>5.0</td>
</tr>
<tr>
<td>3</td>
<td>40,700</td>
<td>38,500</td>
<td>5.7</td>
<td>2.2</td>
</tr>
<tr>
<td>4</td>
<td>32,700</td>
<td>31,200</td>
<td>4.7</td>
<td>1.5</td>
</tr>
<tr>
<td>5</td>
<td>22,900</td>
<td>22,600</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>6</td>
<td>19,200</td>
<td>20,500</td>
<td>-6.2</td>
<td>-1.3</td>
</tr>
</tbody>
</table>

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NZSEI – Validation

- Does the NZSEI-06 replicate known socio-economic patterns for health and other socio-economic indicators?
  - Smoking prevalence (%)
  - Home ownership (%)
  - Motor vehicle access (% access to 2 or more cars)
  - Neighbourhood deprivation (NZDep scores: 1=least deprived; 10=most deprived)

- Based on 2006 data for 21-69 year olds in the workforce (n≈1,700,000)
NZSEI-06 – Validation - Smoking

This is the work of the authors and not of Statistics New Zealand
NZSEI-06 – Validation – Home ownership

This is the work of the authors and not of Statistics New Zealand
This is the work of the authors and not of Statistics New Zealand
NZSEI-06 – Validation – Deprivation

Maori males

non-Maori males

Maori females

non-Maori females

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NZSEI-06 – Coding those not in workforce

A problem with occupation-based SEI measures is how to classify those outside the workforce

A number of solutions have been suggested

- Treat household as unit of analysis and assign SEI scores to all household members on the basis of occupation of one (or more) household members
  - Necessarily done with children
  - Anachronistic? (coding wife based on husband’s occupation)
  - What if no-one in workforce?
- Previous occupation
  - Considered suitable proxy measure, especially for retirees or those taking break from employment
NZSEI-06 – Coding those not in workforce

- A number of solutions have been suggested
  - Separate category(ies) for those not in the workforce
    - E.g., unemployed category, homemakers category
    - Long-term unemployed might be considered separate ‘underclass’
    - But ... heterogeneity in short-term unemployed, homemakers
  - ‘Occupational potential’: use model developed to assign SES on the basis of known association between SEI, age and education (income affected by being out of workforce so cannot be used)
    - Consistent - assigns scores using essentially the same algorithm
    - Still just ‘potential’, which might be fulfilled, unmet or exceeded
    - Results of this approach shown here...
NZSEI-06 – Coding those not in workforce

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21-30</td>
</tr>
<tr>
<td>Doctorate Degree</td>
<td>69.8</td>
</tr>
<tr>
<td>Masters Degree</td>
<td>65.3</td>
</tr>
<tr>
<td>Post-Graduate and Honours Degree</td>
<td>60.8</td>
</tr>
<tr>
<td>Bachelor Degree and Level 7 Qualification</td>
<td>56.3</td>
</tr>
<tr>
<td>Level 6 Diploma</td>
<td>49.8</td>
</tr>
<tr>
<td>Level 5 Diploma</td>
<td>49.7</td>
</tr>
<tr>
<td>Level 4 Certificate Gained Post-school</td>
<td>45.4</td>
</tr>
<tr>
<td>Level 3 Certificate Gained Post-school</td>
<td>45.3</td>
</tr>
<tr>
<td>Level 2 Certificate Gained Post-school</td>
<td>41.0</td>
</tr>
<tr>
<td>Level 1 Certificate Gained Post-school</td>
<td>36.6</td>
</tr>
<tr>
<td>Overseas Secondary School Qualification</td>
<td>38.8</td>
</tr>
<tr>
<td>Level 3 or 4 Certificate Gained at School</td>
<td>43.0</td>
</tr>
<tr>
<td>Level 2 Certificate Gained at School</td>
<td>38.8</td>
</tr>
<tr>
<td>Level 1 Certificate Gained at School</td>
<td>34.4</td>
</tr>
<tr>
<td>No school qualification</td>
<td>30.0</td>
</tr>
</tbody>
</table>

This is the work of the authors and not of Statistics New Zealand.
NZSEI – Validation (those not in workforce)

- Does the **IMPUTED** NZSEI-06 replicate known socio-economic patterns for health and other socio-economic indicators for those not in the workforce?
  - Smoking prevalence (%)
  - Home ownership (%)
  - Motor vehicle access (% access to 2 or more cars)
  - Neighbourhood deprivation (NZDep scores: 1=least deprived; 10=most deprived)

- Based on 2006 data for 21-69 year olds **NOT** in the workforce (n≈500,000)
Validation - Smoking - Non-workers

This is the work of the authors and not of Statistics New Zealand
Validation - Housing tenure - Non-workers

This is the work of the authors and not of Statistics New Zealand
Validation - Vehicle access - Non-workers

This is the work of the authors and not of Statistics New Zealand
Validation - Deprivation - Non-workers

This is the work of the authors and not of Statistics New Zealand
Conclusions

- Updated the NZSEI scale for the 2006 Census
- Classifies occupations as expected
- Path weights (education-occupation; occupation-income) differ from earlier versions, now more in line with international scales
- Correlates with smoking and socio-economic correlates as expected
- Classification of those not in workforce also has reasonable construct validity
Issues

- Occupation being coded less frequently on national surveys.
  - Utility requires occupation data to be readily available
- Only 97 occupations coded (level of detail to which Statistics NZ releases occupation data)
  - Likely heterogeneity among some of these groups
  - Would a more fine-grained classification produce a better scale or just more noise?
    - 358 groups if next level was made available, 998 if finest level of detail was made available
    - Harder for user: coding more difficult for finer-grained classification
Future work

• More validation
  o Is the construct the same across different ethnic and gender groups (calculate separately and compare)?
  o Additional health measures. Another sample required - only data on smoking in Census
  o Children. Lots of work on socioeconomic disparities in children. If NZSEI-06 is a good measure of SES, it should also differentiate children in terms of health and other outcomes
  o Household SES

• Compare performance against other SES measures
  o NZDep, NZiDep, Education, Income, Living Standards

• Wait for 2013 Census ...
Thanks!

- Any questions?
Statistics

The path model can be represented by three linear regression equations.

1. \( i = \beta_{41} a + \beta_{42} e + \beta_{43} o + \epsilon \)
2. \( o = \beta_{31} a + \beta_{32} e + \epsilon \)
3. \( e = \beta_{21} a + \epsilon \)

\( i, e \) and \( a \) are normalised income, education and age variables, and \( o \) is our unknown occupational SES variable, also normalised. The beta coefficients represent the arrows on the path diagram.

- Set \( \beta_{42} \) to zero
- Vary values of ‘\( o \)’ until the summed residual sum of squares of equations 1 & 2 are minimised.