Differences in health and health inequalities between Australia and New Zealand: a working paper

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Abstract

There are vast differences in health and inequalities in health between different population groups and nations. We compared scores on the Short Form 36 Questionnaire (SF-36), a widely used measure of health-related quality of life, using data from wave 8 (2008) of the Household Income and Labour Dynamics in Australia (HILDA) Survey and wave 7 (2008/2009) of the Survey of Family Income and Employment (SoFIE), the equivalent New Zealand longitudinal survey. Overall, SoFIE respondents score significantly higher (i.e. better) on the mental and general health SF-36 domains than do HILDA respondents. This may be due to population differences or differences in the sample designs or administration of the questionnaires. Males in both surveys generally report better SF-36 scores than females but in SoFIE, both males and females have flat and/or improving SF-36 scores in all the mental health domains with increasing age, but declining with age for physical health scores. In HILDA, only the vitality and mental health domains showed increases with age (for men and women). To investigate differences in health inequalities we compared concentration indices examining the distribution of reported health across income in working age (20-65 year old) men and women. Income-related health inequalities were present in both samples, with better health in high income groups. Decomposition analyses, to identify the relative contribution of various health determinants to the inequality, found that age, income, area deprivation and being inactive in the labour force were major contributors to income-related health inequality, in both HILDA and SoFIE, and for both mental health and physical health measures.

Acknowledgments

Access to the SoFIE data used in this study was provided by Statistics New Zealand in a secure environment designed to give effect to the confidentiality provisions of the Statistics Act, 1975. The results from SoFIE in this study and any errors contained therein are those of the authors, not Statistics New Zealand. The paper also uses unit record from the HILDA Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either FaHCSIA or the Melbourne Institute, which is managed by the Melbourne Institute of Applied Economic and Social Research. This work, and the SoFIE-Health sub-study, was supported by the Health Research Council of New Zealand. The authors wish to thank all participants in SoFIE and HILDA for their contributions.

Note that the version of SoFIE data used in this paper is version 6. The income variable in data release was found by Statistics New Zealand to contain errors, but the researchers were not made aware of this until July 11 2011. Possible implications of this are included in the discussion.

Background

Differences in health status and inequalities in health by demographics and socioeconomic position have been shown between many countries. For example, in New Zealand and Australia, mortality rates of indigenous populations are much worse than that of non-indigenous populations (Bramley, Hebert et al. 2004; Hill, Barker et al. 2007). Health outcomes are often affected by income levels, where the poor suffer worse health than the rich (Benzeval and Judge 2001; Kawachi, Adler et al. 2010), although how much income inequality (the spread of income from poor to rich) per se also affects health is still widely debated (Wagstaff and van Doorslaer 2000; Lynch, Smith et al. 2004; Kondo, Sembajwe et al. 2009; Wilkinson and Pickett 2009).

Cross-country comparisons of socioeconomic inequalities in health are common, using cross-sectional (at one point in time) (Martikainen, Lahelma et al. 2004; Van Doorslaer and Koolman 2004) and more recently longitudinal data (Jones and Lopez Nicolas 2004; Allanson, Gerdtham et al. 2010). One of the most frequently used measures of inequalities in these studies are concentration indices (and/or curves), which include both a health and socioeconomic ranking, so the measure estimates how unequally health is distributed by socioeconomic position (e.g. income, educational attainment or occupational class). Many different health outcomes have been used in such analyses, including mortality (van Doorslaer and Gerdtham 2003), self-rated health (SRH) (Mackenbach, Kunst et al. 1997; van Doorslaer, Wagstaff et al. 1997), the Short-Form (SF-36) Questionnaire (Gundgaard and Lauridsen 2006; Lee and Jones 2007), the General Health Questionnaire (GHQ) (Wildman 2003) and other measures of morbidity (Diaz 2002; Lahelma, Martikainen et al. 2005). These studies have mainly found income-related health inequalities that favour the rich.

However, very little of this literature includes Australia and New Zealand. Health inequalities have been compared between Australia and England using concentration indices with the SF-36 and occupation for working age men (Clarke, Smith et al. 2002), which revealed similar patterns of inequalities, and between Australia and the US and eight European countries using self-rated health (SRH) and income (Clarke and Smith 2000). This showed that Australia, the US and the UK had similar concentration indices but these were higher than those in other European countries, such as Sweden, Germany, Finland and Spain. Another comparison between Australia and Sweden, using the SF-36, found more similar CIs, with some differences in some components of the SF-36 (Clarke, Gerdtham et al. 2002).

However, comparisons between New Zealand and Australia are lacking, despite interest in health and income inequalities in both countries and evidence of existing inequalities. In 2010, Australia had a Gini coefficient (measuring income inequality by plotting the cumulative distribution of income, cumulated over the population ranked from poor to rich) of 0.30, ranking 16 of 30 OECD countries, compared to New Zealand, with a Gini of 0.34, and ranking 23 (i.e. worse) (OECD 2010). New Zealand has experienced the largest increase in income inequality of all the OECD countries since the mid 1980s, whereas Australia's income inequality appears to have reduced slightly over the last decade (OECD 2010). The lack of trans-Tasman health inequality comparisons may have been partly due lack of access to household survey data in New Zealand comparable to other international datasets. However, the New Zealand Survey of Family, Income and Employment (SoFIE), which is a household panel survey run annually from 2002 to 2010, contains data on both health and socioeconomic position and is comparable to the Household, Income and Labour Dynamics in Australia (HILDA) panel survey, which also runs annually over the same time period.

We take advantage of these two surveys to compare income-related health inequalities between New Zealand and Australia using concentration indices. We use responses from the SF-36 as the measures of health, which will give a broader and more detailed picture of health differences, including dimensions of both physical and mental health, rather than the simple measure of SRH, an alternative health measure collected in both surveys. Also, SRH is a single measure of health status measured on a likert scale and there are methodological problems with using an ordinal health outcome in concentration indices. These may be addressed by cardinalising or adjusting the ordinal measure in some way (Wagstaff and Van Doorslaer 1994; van Doorslaer and Jones 2003). A linear outcome such as the SF-36 is preferable as it does not require this adjustment and the assumptions that are inherent in it. We also attempt to understand any differences between the two countries by investigating the determinants of health inequalities using decomposition analyses, whereby the contribution of characteristics such as age, sex, labour force status and area deprivation to inequalities in health are investigated.

Methods

SoFIE data

We used wave 7 (2008/2009) of SoFIE, a nationally representative household panel survey that began in 2002 with 22,165 adult participants (15 years and older) from 11,500 households (Carter, Cronin et al. 2010). Wave 7 data collection occurred from October 1st 2008 to September 30th 2009 through computer-assisted face to face interviews. SoFIE is managed by Statistics New Zealand under the Statistics Act (1975) and all data analysis must be done in the Wellington data laboratory to comply with confidentiality and privacy conditions.

SoFIE was a longitudinal survey that collected annual information on income, employment, family and household structure, self-rated health and demographics. In waves three, five and seven, a module of health questions (the SoFIE-Health sub-study) was asked of all original sample member adults, which included the SF-36 as well as questions on chronic disease, smoking, alcohol, stress and individual deprivation. The population covered by SoFIE was the usually resident population of New Zealand living in private dwellings (excluding people living in institutions or establishments such as boarding houses, rest homes, etc). In wave 7 there were 16 385 (74% of wave one) adult original sample members still participating. It is known that higher rates of attrition occur in youth, ethnic minority groups, and those people on lower incomes and reporting poorer health (Carter, Shaw et al. 2010).

For the analyses in this paper, individuals with missing information on the health outcome (SF-36) were removed (N=185), as were those with missing, zero or negative income data (an additional 2550 individuals). The sample was then restricted to adults of working age, defined as those between 20 and 65 years, giving a final sample size of 10200.

Analyses of SoFIE data were done on data release version 6 using SAS version 8.2 in the Statistics NZ datalab in Wellington. All numbers were rounded to base 5, in order to meet confidentiality requirements for the data.

HILDA data

We used wave 8 (2008) of the HILDA Survey, a household panel that began in 2001 with 13,969 adult participants from 7682 households (Wilkins, Warren et al. 2009). Wave 8 data was collected from 20 August 2008 to 27 February 2009, although most of the data collection was during 2008 (Melbourne Institute of Applied Economic and Social Research 2009).

HILDA is a longitudinal survey that also collects annual data on socioeconomic, household and demographic factors via face-to-face interviews. Additional questions are asked in a self-complete questionnaire, which is left with respondents to answer on their own, and includes health questions and the SF-36. There were 9354 adults (aged 15 years and older) who were eligible at wave one who also completed an interview at wave 8 (72% of wave one). Of these, 7475 were of working age (20-65 years old) and 6439 returned the self-complete questionnaire, with completed SF-36. The final sample, with zero and negative income removed, was 6327 individuals.

Analyses of HILDA data were done on general release version 9 using SAS version 9.1.

Measures

The health outcome measure used was the SF-36, which is derived from 36 questions and gives scores on eight domains of health: general health (GH), physical functioning (PF), bodily pain (BP), role limitations due to physical problems (RP), mental health (MH), vitality (VT), social functioning (SF) and role limitations due to emotional problems (RE) (Ware, Kosinki et al. 2005). The scores are transformed into a scale from 0-100 where 0 is poor health and 100 is excellent health. The SF-36 has been shown to be a valid measure of health and applicable to health inequality research in a variety of settings (Jenkinson, Layte et al. 1996; Beaton, Hogg-Johnson et al. 1997; Butterworth 2004; Ware, Kosinki et al. 2005).

The income measure used was gross personal income, including only positive values and derived from employment and self-employment earnings, benefits, income from investments and other sources.

Other variables included in the descriptive and decomposition analyses were sex, age at the time of interview, legal marital status, highest education qualification achieved, labour force status and area level deprivation. In New Zealand area level deprivation was measured using the New Zealand Deprivation Index 2001, which is a deprivation scale from 1 to 10, where 1 represents the areas with the least deprived scores and 10 the areas with the most deprived scores (Salmond and Crampton 2002). The index is based on measures of deprivation including proportions of people receiving a means-tested benefit, unemployment, income levels, access to resources, education and household crowding. In Australia, the SEIFA 2001 (Socio-Economic Indexes for Areas) was used, an area-based index of relative socio-economic disadvantage, based on factors including education, income, occupation, rent or mortgage repayments where 1 represented the most deprived and 10 the least deprived area (Statistics 2006). In this paper, this was reverse coded so it matched the NZ Deprivation coding.

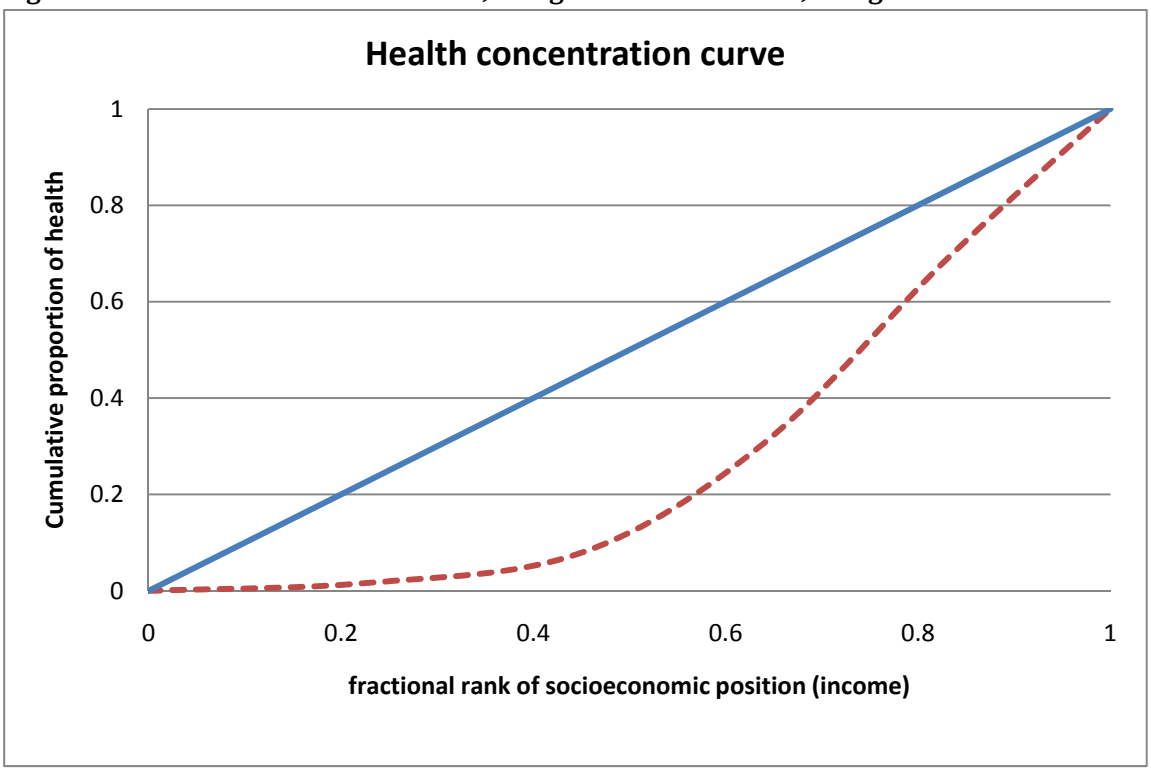
Education was the highest level of education attained at the time of interview and categorized into no qualification, school qualification, post-school qualification and degree or higher. Labour force status was categorised into working, not employed but seeking work and inactive (not employed and not seeking work). Marital status was grouped into married, never married and divorced, separated or widowed.

Analytical methods

Initially we compare the mean SF-36 scores for the eight health domains for the HILDA and SoFIE populations. A difference of 5 points on an SF-36 domain is understood to be a clinically significant difference (all else being held constant) (Ware, Kosinki et al. 2005). Crude mean SF-36 scores for HILDA and SoFIE were age- and sex-adjusted to allow comparisons to the standardized New Zealand normal values (Gerritsen, Stefanogiannis et al. 2008). (Data not presented in this paper).

To investigate differences in income-related health inequalities concentration indices were used , as they include the socioeconomic dimension and contrast inequalities across the entire population, not only the outlying groups (e.g. rich and poor) (Wagstaff, Paci et al. 1991). The relative concentration index provides a measure of health inequality that is calculated by determining how the distribution of health across individuals varies according to socioeconomic position. This is done via the concentration curve, which graphs the amount (cumulative percentage) of health (on the y axis) occurring in the population ranked by socioeconomic position (on the x axis) such as income, beginning with the poorest individuals and ending with the richest (see Figure 1). If there is no income-related inequality, the concentration curve would lie directly on the line of equality, meaning that the poor and rich have the same levels of health (or ill-health). The value of the concentration index is twice the area between the line of equality and the concentration curve. If the concentration curve lies above the line of equality, the health outcome is disproportionately concentrated among the poor and the concentration index is negative (a pro-poor distribution). Alternatively, if the concentration curve lies below the line of equality, the health outcome is more highly distributed among the rich and the concentration index is positive (a pro-rich distribution) (Erreygers 2009; Konings, Harper et al. 2009).

Figure 1: Relative concentration curve, using health and income, using the SoFIE data.



The concentration index (CI) can be computed from the covariance of the (continuous) health and income variables:

$$CI = \frac{2}{\mu} \mathrm{cov}(y_i, R_i) \qquad (1)$$

where μ is the mean health, y_i is the health of each individual ($i = 1, 2, \ldots N$) and R_i is the fractional rank of each individual according to distribution of income (from $R_i = 1/N$ for the person with the lowest income to $R_i = N_i/N$ for the person with the most income).

An alternative method to equation 1, which gives the same estimate for CI but also standard errors is to run a regression on equation 2 (Kakwani, Wagstaff et al. 1997):

$$2\sigma_R^2[y_i/\mu] = \alpha + \beta R_i + \varepsilon_i \quad (2)$$

Where ε_i is the error term, α the intercept and σ^2 the variance of R_i. From (Kakwani, Wagstaff et al. 1997), β from equation 2 equals the CI. However, the standard errors are not entirely accurate due to serial correlation in the data and these can be corrected by running a Newey West regression of the health score on income rank (Kakwani, Wagstaff et al. 1997; Lee and Jones 2007).

When comparing the CI across countries it is also important to account for differences in the age/sex structure that may confound measures of inequality (Wagstaff and Van Doorslaer 1994). The scores for eight SF-36 domains(for HILDA and SoFIE) were directly standardised to the WHO World Standard Population (Ahmad, Boschi-Pinto et al. 2001).

One problem with the relative CI is that the value is bounded (from -1 to +1) but the range of values may depend on the mean of the health outcome. One proposed alternative inequality measure, that may correct for this issue, is the generalized CI, which is calculated by multiplying the CI by the mean health (Erreygers 2009).

The concentration index can also be decomposed to the proportional contributions of various determinants of health inequality, including fixed or unalterable determinants such as age and sex, and potentially avoidable determinants such as labour force status and deprivation (Van Doorslaer and Koolman 2004; Speybroek, Konings et al. 2010). The decomposition of inequality into contributions by a variety of health determinants can be done by first regressing the determinants (as explanatory variables, x_k) on the health outcome (y_i):

$$y_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i \quad (3)$$

The CI for *y* then becomes:

$$C = \sum_k (\beta_k \bar{x}_k / \mu) / C_k + GC\varepsilon / \mu \quad (4)$$

Where $\bar{x}_k$ is the mean of the health determinant/explanatory variable x_k , C_k is the concentration index for the explanatory variable x_k and $GC\varepsilon$ is the generalized concentration index for the error term. The overall CI is thus the sum of the concentration indices of all the explanatory variables included in the regression and the $GC\varepsilon$ is the residual inequality not explained by the other terms. The health elasticity of each health determinant is the amount of health explained by x_k (equation 5):

$$\text{Elasticity } (\eta_k) = \beta_k \bar{x}_k / \mu_k \quad (5)$$

The estimated health inequality can then be estimated as the sum of the concentration indices of all the explanatory variables, weighted by the elasticities of these variables:

$$\text{Estimated } C = \sum_k \eta_k C_k \quad (6)$$

The relative contribution of each variable to the total concentration index can be calculated by dividing the total CI by the weighted concentration index of each determinant. We undertake decomposition analyses for the general health and mental health domains of the SF-36. The data used in the analyses in not weighted to the original population.

Results

Characteristics of the HILDA and SoFIE samples are given in Table 1, Table 2 and Table 3. Both samples have slightly more females than males and have a similar age distribution. The distribution by other characteristics are also similar except for a slightly higher proportion of people who are never married in SoFIE, and fewer divorced, separated and widowed (especially males) and a higher proportion of post school qualifications.

The mean SF-36 scores by age and sex for HILDA and SoFIE are given in Table 4, Table 5, Table 6 and Table 7. Even after age-standardising to the WHO World Standard Population, the mean scores from SoFIE are much higher than those in HILDA, in most instances a difference in mean scores greater than 5 and in some instances a difference greater than 10 (e.g. GH). In both HILDA and SoFIE, in almost all cases, the mean scores for males were higher than for females. For males in HILDA, scores decline fairly linearly with age, except for the mental health component, which increases and is much higher in the oldest age group than any other age, and vitality which also peaks at the older age. In SoFIE, deterioration with age occurs only with the physical SF-36 scores. The oldest male age group have higher mean scores in all the 'mental health' domains (vitality, social functioning, role emotional and mental health) than the overall average. The same pattern is seen for females in both HILDA and SoFIE – in HILDA females, a general decline with age except for mental health and vitality, which increased at age 55-65; in SoFIE females, a decline in the physical domains and a flat or increasing trajectory with age for the mental health domains. The difference between mean scores for the HILDA and SoFIE populations is greatest at the older age groups.

Concentration indices from HILDA and SoFIE are presented in Table 8 and Table 9. The results are all positive, meaning that the health scores are increasing with increasing income i.e. the inequalities in health favour the high income groups and are detrimental to the poor. The 95% confidence intervals exclude zero, indicating significant income-related health inequality in these health variables. The concentration indices were higher in HILDA than SoFIE indicating greater inequality in the Australian sample. The highest degree of inequality in HILDA was 0.0470 (for RP) and in SoFIE 0.0228 (for GH). The ranking also differed across the surveys, with different SF-36 domains rating as having more income-related inequality than others, except for mental health, which scored lowest in both surveys. The rankings changed in only a minor fashion using the generalized CIs, which adjusted for mean health and were still higher in HILDA than SoFIE.

Differences by sex in the concentration indices are given in Table 10 and Table 11. The CIs in males in HILDA were higher than for females but in SoFIE, there was little difference in CIs by sex. Income-related inequality in BP ranked higher for females than males in both samples.

Decomposition analyses for the general health domain are presented in Table 12 and Table 13. For both HILDA and SoFIE, age, income, area deprivation and being inactive in the labour force (and also unemployment in HILDA) have positive effects, meaning that the effect of these determinants on health is to increase general health inequality, to the advantage of the rich and the disadvantage of the poor.

Decomposition analyses for the mental health domain are in Table 14 and Table 15. The results are similar to those for general health in that the largest determinants of inequality are found to be labour force status, income, area deprivation and age, with marital status (being married) also having an effect.

Discussion

We found that although the survey samples had similar cross-sectional characteristics, the SF-36 scores from the HILDA sample were much lower than in the SoFIE sample. The New Zealand survey sample reported significantly higher (better) scores in all eight domains of health. The reasons for this are likely to be multifactorial. There are differences in the survey data collection procedures in HILDA and SoFIE and the sample populations. The SF-36 in HILDA is collected in the self-completed questionnaire and has 12.4% missing data (Melbourne Institute of Applied Economic and Social Research 2010). In SoFIE, the SF-36 is collected as part of the face to face interview. Another difference is that in SoFIE, the SF-36 is only asked of original sample members – those people who were deemed to be eligible for the survey at the onset – whereas in HILDA, the health questions are asked of all participating adults. Although the SoFIE sample was initially intended to be representative of the New Zealand population, even the initial sample appeared to be richer and healthier than seen in other health surveys, perhaps due to non-response of poorer and less healthy individuals at the sampling stage. The initial household response rate was better in SoFIE (77%) compared to HILDA (66%) which is probably due to differences in the survey approach, (for example, SoFIE comes under the *Statistics Act 1975* and New Zealanders are obliged to respond to the survey , although this was not strictly enforced). Attrition may have led to a healthier sample over time, as less healthy individuals are lost from longitudinal surveys. This is a problem in both surveys – the follow up response rate of originally responding adults in HILDA at wave 8 was 67% and in SoFIE (in wave 7) was 74%.

Income-related health inequalities existed in both samples. The concentration indices found using wave 8 of the HILDA data were higher than those found using the National Health Survey from 1995(Clarke, Gerdtham et al. 2002) – see Table 16. This may be due to changes in inequalities over time or differences in the samples or different amounts of measurement error, especially in the income variable. The concentration indices were also higher in HILDA compared to SoFIE which again may be due to sample differences, measurement error or may reflect some real differences in income-related health inequalities between the countries. However, the decomposition analyses showed that similar factors influenced the inequalities in both samples. Age and sex might be considered unremediable by policy intervention but being inactive in the labour force, area deprivation and income were important determinants of health inequality that had significant contributions to health inequalities favouring the rich. We did not examine the role of ethnicity in influencing health inequalities, as this is measured differently across the two surveys.

Work done by the New Zealand Ministry of Social Development has found that New Zealand does better than Australia on some indicators of social wellbeing, such as population with low incomes, representation of women in Parliament and trust in others, but does worse than Australia on other indicators such as GDP per person, income inequality, suicide, mortality from assault and road traffic accidents. All of these are likely to influence health inequalities (Ministry of Social Development 2010). In light of this, it is perhaps surprising that reported health is higher in the NZ survey compared to the Australian survey. On many indicators, there is little difference between the two countries (e.g. life expectancy, employment, numeracy and literacy, life satisfaction). However, there may be other factors that this comparison does not capture, such as differences in health systems including the balance of private/public health provision, cultural factors and how different populations interpret health questions.

The researchers were made aware of a potentially serious issue with the SoFIE income data the very week of the HILDA conference, whereby half of SoFIE respondents appear to have underestimates of their employment earnings (used in the derivation of personal income), of probably an average of one month (8%) but up to 3 months (25%). The impact of this error on these analyses is difficult to predict. It may be that the error introduced is more random than systematic and would have less impact for a cross sectional analysis than a longitudinal one, although an attenuation bias for income estimates is likely. The correction to this error will not be made before the end of 2011.

Given the issues with the data, this paper is a work in progress and must be repeated when the SoFIE income data is fixed to see what impact this has on the results. In addition, a more detailed cross-sectional comparison using survey weights and different socioeconomic indicators, including household equivalised income and occupation, would further illuminate the health inequalities between Australia and New Zealand. A comparison of income-related health inequalities over time, using several waves of data and a longitudinal analysis of the concentration indices, would also be interesting, as such analyses generally find higher values of inequality than from cross-sectional analyses (Jones and Lopez Nicolas 2004). The strengths of this preliminary analysis include the use of a general working age population, not limited to only those in employment, which has identified those inactive in the labour force as a major determinant of income-related health inequalities, inclusion of both men and women and looking and both mental and physical dimensions of health.

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Table 1: Characteristics of HILDA sample by sex

Characteristics	Male	Female	Total N
	N (% of total N)	N (% of total N)	
Age			
20-35	655 (10.4)	784 (12.4)	1439
35-45	727 (11.5)	903 (14.3)	1630
45-55	820 (13.0)	966 (15.3)	1786
55-65	693 (11.0)	779 (12.3)	1472
Education			
No qualification	774 (12.2)	1003 (15.9)	1777
School qualification	1152 (18.2)	955 (15.1)	2107
Post school qualification	376 (5.9)	507 (8.0)	883
Higher degree	593 (9.4)	967 (15.3)	1560
Labour force status			
Employed	2479 (39.2)	2502 (39.5)	4981
Not employed, looking for work	61 (1.0)	76 (1.2)	137
Inactive	355 (5.6)	854 (13.5)	1209
SEIFA 2001			
10 (lowest decile/most deprived)	193 (3.1)	262 (4.1)	455
9	255 (4.0)	300 (4.7)	555
8	291 (4.6)	378 (6.0)	669
7	236 (3.7)	264 (4.2)	500
6	289 (4.6)	354 (5.6)	643
5	295 (4.7)	350 (5.5)	645
4	342 (5.4)	383 (6.1)	725
3	337 (5.3)	382 (6.0)	719
2	341 (5.4)	399 (6.3)	740
1 (highest decile/least deprived)	316 (5.0)	359 (5.7)	675
Marital status			
Married	1761 (27.8)	1981 (31.3)	3742
Divorced, separated or widowed	609 (9.6)	859 (13.6)	1468
Never married	525 (8.3)	592 (9.4)	1117
Family type			
Couple only	786 (12.4)	919 (14.5)	1705
Couple with children	1445 (22.8)	1544 (24.4)	2989
Sole parent	110 (1.7)	432 (6.8)	542
Not in family	534 (8.4)	519 (8.2)	1053
Total	**2895 (45.8)**	**3432 (54.2)**	**6327**

Table 2: Characteristics of SoFIE sample by sex

Characteristics	Male	Female	Total N
	N (% of total N)	N (% of total N)	
Age			
20-35	1110 (10.9)	1295 (12.7)	2405
35-45	1110 (10.9)	1360 (13.3)	2470
45-55	1305 (12.8)	1570 (15.4)	2875
55-65	1155 (11.3)	1310 (12.8)	2465
Education			
No qualification	780 (7.6)	885 (8.7)	1665
School qualification	1045 (10.2)	1435 (14.1)	2480
Post school qualification	1950 (19.1)	2020 (19.8)	3970
Higher degree	900 (8.8)	1185 (11.6)	2085
Labour force status			
Employed	4125 (40.4)	4310 (42.3)	8435
Not employed, looking for work	95 (0.9)	85 (0.8)	180
Inactive	450 (4.4)	1130 (11.1)	1580
NZ Deprivation Index 2001			
10 (most deprived)	315 (3.1)	475 (4.7)	790
9	380 (3.7)	510 (5.0)	890
8	455 (4.5)	525 (5.1)	980
7	455 (4.5)	565 (5.5)	1020
6	440 (4.3)	510 (5.0)	950
5	450 (4.4)	510 (5.0)	960
4	530 (5.2)	620 (6.10	1150
3	530 (5.2)	600 (5.9)	1130
2	555 (5.4)	605 (5.9)	1160
1 (least deprived)	560 (5.5)	610 (6.0)	1170
Marital status			
Married	2745 (26.9)	2955 (29.0)	5700
Divorced, separated or widowed	550 (5.4)	1035 (10.1)	1585
Never married	1365 (13.4)	1520 (14.9)	2885
Family type			
Couple only	1255 (12.3)	1440 (14.1)	2695
Couple with children	2270 (22.3)	2290 (22.5)	4560
Sole parent	220 (2.2)	735 (7.2)	955
Not in family	930 (9.1)	1065 (10.4)	1995
Total	**4670 (45.8)**	**5530 (54.2)**	**10200**

All counts in tables from SoFIE data were rounded to the nearest multiple of five, as per Statistics New Zealand protocol.

Table 3: Mean values of characteristics in HILDA and SoFIE

Characteristic	HILDA	SoFIE
Age	44	44
Personal income	51963 (AUS$)	65617 (NZ$)
SEIFA/NZ Dep	5.17	5.18

Table 4: Mean SF-36 scores for males in HILDA by age (wave 8)

SF-36 component	Age (years)								Overall mean*
	20-34		35-44		45-54		55-65		
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
BP	82.33	0.707	77.46	0.808	73.54	0.794	68.68	0.930	75.35
GH	73.49	0.718	70.49	0.680	66.70	0.698	64.60	0.864	68.68
MH	74.32	0.680	74.90	0.630	74.47	0.570	77.79	0.619	75.34
PF	94.84	0.530	91.35	0.591	86.49	0.678	80.16	0.865	88.09
RE	87.33	1.130	87.80	1.055	85.85	1.078	83.26	1.269	86.06
RP	90.34	0.964	87.51	1.036	83.33	1.137	73.80	1.496	83.68
SF	87.60	0.776	86.14	0.792	84.45	0.790	82.97	0.903	85.23
VT	62.49	0.721	61.47	0.701	61.42	0.661	63.06	0.784	62.07

*Age standardardised.

Table 5: Mean SF-36 scores for females in HILDA by age (wave 8)

SF-36 component	Age (years)								Overall mean*
	20-34		35-44		45-54		55-65		
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
BP	79.75	0.723	76.61	0.733	70.27	0.790	66.19	0.923	73.18
GH	72.23	0.666	72.28	0.646	68.30	0.698	66.16	0.793	69.76
MH	72.58	0.571	73.08	0.581	73.25	0.570	75.40	0.592	73.54
PF	93.06	0.492	90.48	0.506	83.81	0.660	75.76	0.828	85.85
RE	83.67	1.142	83.54	1.082	83.23	1.065	82.93	1.214	83.34
RP	85.49	1.085	84.00	1.058	80.09	1.157	71.06	1.469	80.30
SF	85.03	0.724	83.93	0.740	82.70	0.761	80.62	0.884	83.08
VT	58.05	0.684	57.78	0.669	58.31	0.653	60.07	0.739	58.51

*Age standardardised

Table 6: Mean SF-36 score for males in SoFIE by age (wave 7)

SF-36 component	Age (years)								Overall mean*
	20-34		35-44		45-54		55-65		
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
BP	86.23	0.591	84.21	0.623	82.26	0.589	82.41	0.645	83.69
GH	82.91	0.482	81.85	0.503	79.47	0.527	77.36	0.575	80.32
MH	83.92	0.390	83.50	0.403	84.53	0.356	86.81	0.351	84.71
PF	95.91	0.344	93.72	0.436	90.85	0.445	87.24	0.572	91.82
RE	94.70	0.396	94.95	0.396	94.20	0.408	95.13	0.386	94.72
RP	90.72	0.535	89.16	0.593	87.25	0.601	86.81	0.658	88.41
SF	93.62	0.481	93.29	0.495	92.87	0.485	93.43	0.506	93.28
VT	67.16	0.512	66.94	0.538	67.34	0.501	67.93	0.530	67.35

*Age standardardised

Table 7: Mean SF-36 scores for females in SoFIE by age (wave 7)

SF-36 component	Age (years)								Overall mean*
	20-34		35-44		45-54		55-65		
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
BP	83.96	0.587	82.56	0.598	81.61	0.559	79.73	0.641	81.95
GH	78.81	0.488	80.61	0.502	80.40	0.478	77.38	0.578	79.36
MH	80.89	0.394	82.21	0.387	83.68	0.346	83.53	0.408	82.63
PF	93.45	0.401	91.78	0.420	88.84	0.436	82.89	0.607	89.25
RE	92.03	0.465	92.73	0.432	93.04	0.416	92.79	0.469	92.67
RP	86.89	0.572	86.92	0.570	86.21	0.559	84.15	0.669	86.06
SF	89.81	0.562	90.83	0.520	91.23	0.499	91.14	0.565	90.78
VT	61.14	0.516	62.37	0.517	64.64	0.482	64.66	0.537	63.26

*Age standardardised

Table 8: Relative and generalised concentration indices by SF-36 scores, HILDA

SF-36 component score	Concentration indices (95% confidence interval)*	Generalised concentration indices
Role physical (RP)	0.0470 (0.0411 - 0.0529)	4.4409
Role emotional (RE)	0.0377 (0.0318 - 0.0436)	3.4149
Bodily pain (BP)	0.0353 (0.0309 - 0.0398)	3.0196
Social functioning (SF)	0.0310 (0.0271 - 0.0349)	2.9575
Physical functioning (PF)	0.0300 (0.0267 - 0.0332)	2.9603
Vitality (VT)	0.0293 (0.0245 - 0.0340)	2.0500
General health (GH)	0.0292 (0.0249 - 0.0335)	2.3496
Mental health (MH)	0.0200 (0.0167 - 0.0233)	1.7270

* Based on Newey West corrected standard errors

Table 9: Relative and generalised concentration indices by SF-36 scores, SoFIE

SF-36 component score	Concentration indices (95% confidence interval)*	Generalised concentration indices
General health (GH)	0.0228 (0.0202 - 0.0254)	1.8263
Social functioning (SF)	0.0207 (0.0175 - 0.0239)	1.3318
Role physical (RP)	0.0183 (0.0155 - 0.0212)	1.5978
Physical functioning (PF)	0.0161 (0.0140 - 0.0182)	1.4591
Vitality (VT)	0.0155 (0.0132 - 0.0177)	1.4165
Role emotional (RE)	0.0144 (0.0126 - 0.0161)	1.3395
Bodily pain (BP)	0.0137 (0.0107 - 0.0167)	1.1343
Mental health (MH)	0.0127 (0.0109 - 0.0146)	1.0594

* Based on Newey West corrected standard errors

Table 10: Relative concentration indices by SF-36 scores and by sex, HILDA

SF-36 component score	Concentration indices (95% confidence interval)	
	Male	Female
Role physical (RP)	0.0557 (0.0475 - 0.0638)	0.0419 (0.0333 - 0.0506)
Role emotional (RE)	0.0504 (0.0421 - 0.0588)	0.0279 (0.0192 - 0.0366)
Bodily pain (BP)	0.0415 (0.0352 - 0.0478)	0.0321 (0.0257 - 0.0385)
General health (GH)	0.0397 (0.0335 - 0.0458)	0.0295 (0.0234 - 0.0355)
Social functioning (SF)	0.0391 (0.0336 - 0.0446)	0.0257 (0.0201 - 0.0312)
Physical functioning (PF)	0.0340 (0.0294 - 0.0385)	0.0282 (0.0238 - 0.0327)
Vitality (VT)	0.0340 (0.0271 - 0.0408)	0.0199 (0.0130 - 0.0267)
Mental health (MH)	0.0229 (0.0180 - 0.0278)	0.0172 (0.0124 - 0.0219)

Table 11: Relative concentration indices by SF-36 scores and by sex, SoFIE

SF-36 component score	Concentration indices (95% confidence interval)	
	Male	Female
General health (GH)	0.0240 (0.0201 - 0.0278)	0.0239 (0.0202 - 0.0277)
Role physical (RP)	0.0174 (0.0133 - 0.0215)	0.0177 (0.0136 - 0.0217)
Vitality (VT)	0.0161 (0.0114 - 0.0209)	0.0171 (0.0123 - 0.0218)
Physical functioning (PF)	0.0160 (0.0130 - 0.0191)	0.0140 (0.0108 - 0.0171)
Social functioning (SF)	0.0155 (0.0123 - 0.0186)	0.0135 (0.0100 - 0.0169)
Role emotional (RE)	0.0155 (0.0131 - 0.0180)	0.0121 (0.0093 - 0.0149)
Mental health (MH)	0.0120 (0.0094 - 0.0147)	0.0113 (0.0086 - 0.0140)
Bodily pain (BP)	0.0118 (0.0075 - 0.0162)	0.0141 (0.0098 - 0.0183)

Table 12: Decomposition analysis for GH, HILDA

Parameter	Beta	Standard Error	Elasticity	% Contribution
Sex (male)	-3.0842	0.5227	-0.0202	-1.59
Age	-0.1948	0.0233	-0.1234	46.33
Personal income	0.2702	0.0575	0.0200	8.95
SEIFA 2001	-0.6033	0.0931	-0.0445	15.56
No Qual	0.9895	0.6588	0.0040	1.20
Post school qual	1.8315	0.7986	0.0036	0.58
Degree	-0.4098	0.6723	-0.0014	0.51
Married	3.6203	0.7091	0.0305	5.45
DWS	1.2079	0.7983	0.0040	-0.59
Inactive	-9.5991	0.6862	-0.0261	22.76
Not employed	-6.3333	1.7077	-0.0020	0.83

Table 13: Decomposition analysis for GH, SoFIE

Parameter	Beta	Standard Error	Elasticity	% Contribution
Sex (male)	0.5281	0.3883	0.0031	-0.39
Age	-0.1208	0.0183	-0.0674	23.39
Personal income	0.1584	0.0286	0.0136	11.40
NZ Dep 2001	-0.5571	0.0703	-0.0356	23.10
No Qual	-1.5532	0.6171	-0.0032	2.05
Post school qual	-0.5774	0.4871	-0.0028	-0.11
Degree	-0.6071	0.5720	-0.0015	-0.49
Married	2.2662	0.5095	0.0163	6.97
DWS	0.0012	0.6696	0.0000	0.00
Inactive	-10.0413	0.5419	-0.0191	33.44
Not employed	-2.8776	1.4542	-0.0006	0.25

Table 14: Decomposition analysis for MH, HILDA

Parameter	Beta	Standard Error	Elasticity	% Contribution
Sex (male)	0.3930	0.4395	0.0024	-0.85
Age	0.1004	0.0196	0.0602	18.96
Personal income	0.1860	0.0484	0.0130	11.27
SEIFA 2001	-0.2898	0.0782	-0.0202	11.25
No Qual	0.4345	0.5540	0.0016	0.62
Post school qual	1.9773	0.6715	0.0037	0.52
Degree	-0.3909	0.5653	-0.0013	0.62
Married	3.8436	0.5963	0.0307	25.75
DWS	1.0949	0.6713	0.0034	-1.60

Inactive	-9.3026	1.4361	-0.0240	29.89
Not employed	-6.2347	0.5770	-0.0018	3.57

Table 15: Decomposition analysis for MH, SoFIE

Parameter	Beta	Standard Error	Elasticity	% Contribution
Sex (male)	-1.1293	0.2836	-0.0063	5.95
Age	0.0786	0.0135	0.0422	36.97
Personal income	0.0836	0.0212	0.0069	10.21
NZ Dep 2001	-0.1075	0.0520	-0.0066	5.24
No Qual	-0.6985	0.4566	-0.0014	0.54
Post school qual	-0.6680	0.3604	-0.0031	-0.19
Degree	-1.0953	0.4232	-0.0026	-0.16
Married	1.3389	0.3770	0.0093	14.24
DWS	-1.6788	0.4945	-0.0031	3.82
Inactive	-5.2477	0.4010	-0.0096	26.63
Not employed	-5.1837	1.0760	-0.0011	2.70

Table 16: Comparison of concentration indices from different Australian samples

SF-3 score	1995 National health survey (Clarke, Gerdtham et al. 2002)	2008 HILDA
	Concentration index (SE)	Concentration index (95% confidence interval)
RP	0.033 (0.002)	0.0470 (0.0411 - 0.0529)
RE	0.029 (0.002)	0.0377 (0.0318 - 0.0436)
BP	0.023 (0.003)	0.0353 (0.0309 - 0.0398)
SF	0.020 (0.002)	0.0310 (0.0271 - 0.0349)
PF	0.023 (0.002)	0.0300 (0.0267 - 0.0332)
VT	0.020 (0.002)	0.0293 (0.0245 - 0.0340)
GH	0.026 (0.003)	0.0292 (0.0249 - 0.0335)
MH	0.016 (0.001)	0.0200 (0.0167 - 0.0233)