The New Zealand Longitudinal Study of Ageing

Technical Report

- Treatment of Income Data from the 2012 Survey Wave -

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A research collaboration between

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Introduction

Data Recording

The NZLSA first wave postal questionnaire recorded personal and household income data. Respondents recorded personal and household income separately, and could provide the amounts as either before tax or after tax, and either weekly, fortnightly, monthly, or annual. They also provided housing costs in the same variety of forms. At the data preparation stage, all recorded amounts were annualised and conversions carried out produced total before and after tax income amounts and annual housing costs. The procedures used to transform the recorded data are documented in a separate report.

Two issues were identified with the information recorded by respondents that led to further work needing to be carried out during the preparation of income data for analysis. There were 66 where the respondent was the only income recipient and had recorded personal income but not household income. In those cases, the household income was assumed to be equal to the personal income. The ID's of these 66 cases are listed in Table 1.

Table 1.

Cases in which personal income was used to stand for household income because household income had not been recorded in one person households (66).

Case Numbers					
NZL0036	NZL1001	NZL1693	NZL2213	NZL3263	NZL3642
NZL0178	NZL1064	NZL1696	NZL2515	NZL3268	NZL3648
NZL0203	NZL1155	NZL1714	NZL2535	NZL3338	NZL3677
NZL0214	NZL1289	NZL1920	NZL2609	NZL3354	NZL3724
NZL0382	NZL1308	NZL1994	NZL2710	NZL3367	NZL3813
NZL0569	NZL1340	NZL2054	NZL2854	NZL3447	NZL3826
NZL0615	NZL1560	NZL2057	NZL3087	NZL3459	NZL3923
NZL0766	NZL1583	NZL2074	NZL3139	NZL3465	NZL4014
NZL0769	NZL1617	NZL2136	NZL3142	NZL3524	NZL4066
NZL0779	NZL1665	NZL2154	NZL3225	NZL3589	NZL4139
NZL0894	NZL1686	NZL2193	NZL3242	NZL3616	NZL4145

In 126 cases recorded household income was lower than recorded personal income. There are two possible reasons why this might have happened: 1) the household income amount did not include the respondent's personal income or 2) the respondent transposed personal and household income when completing the questionnaire. During the first wave, such cases were assumed to result from the first reason and the personal income amount was added to the household amount to arrive at a total household income. However, in order to avoid that happening for the second wave the wording of the income questions was refined to minimise the chance of respondents not including their personal income in the household amount. Accordingly, for this second wave the reason for the discrepancy has been assumed to be the second one set out above, i.e., that those personal and household amounts were transposed. In those cases the recorded household income amount was replaced by the recorded personal income amount. The ID's of these 126 cases are listed in Table 2.

Table 2.

Cases in which personal income was used to stand for household income because household income was lower than personal income (126).

Case Numbers					
NZL0050	NZL0574	NZL1317	NZL2091	NZL2637	NZL3637
NZL0054	NZL0633	NZL1370	NZL2096	NZL2798	NZL3689
NZL0055	NZL0709	NZL1397	NZL2120	NZL2807	NZL3736
NZL0080	NZL0727	NZL1457	NZL2123	NZL2916	NZL3760
NZL0134	NZL0789	NZL1464	NZL2132	NZL2920	NZL3793
NZL0135	NZL0804	NZL1483	NZL2134	NZL2991	NZL3798
NZL0144	NZL0848	NZL1487	NZL2145	NZL3090	NZL3820
NZL0150	NZL0862	NZL1528	NZL2155	NZL3099	NZL3870
NZL0187	NZL0867	NZL1695	NZL2195	NZL3148	NZL3894
NZL0228	NZL0897	NZL1724	NZL2287	NZL3180	NZL3912
NZL0230	NZL0903	NZL1805	NZL2300	NZL3261	NZL3973
NZL0231	NZL0989	NZL1810	NZL2304	NZL3275	NZL4016
NZL0312	NZL1050	NZL1822	NZL2313	NZL3337	NZL4026
NZL0346	NZL1078	NZL1839	NZL2327	NZL3479	NZL4057

NZL0403	NZL1081	NZL1840	NZL2329	NZL3489	NZL4067
NZL0438	NZL1083	NZL1981	NZL2358	NZL3543	NZL4122
NZL0446	NZL1126	NZL2001	NZL2394	NZL3553	NZL4154
NZL0494	NZL1153	NZL2024	NZL2473	NZL3578	NZL4176
NZL0495	NZL1202	NZL2026	NZL2511	NZL3592	NZL4225
NZL0530	NZL1203	NZL2048	NZL2606	NZL3602	NZL4229
NZL0563	NZL1227	NZL2078	NZL2626	NZL3624	NZL4327

In addition to those changes, there were 36 cases in which income amount was not recorded but sole declared source of income was NZ Super. In these cases income was imputed according to current NZ Super rates. The ID's of these 36 cases are listed in Table 3.

Table 3.
Cases in which income amount was not recorded but sole declared source of income was NZ Super and this was imputed as income (36).

Case Numbers					
NZL0215	NZL3273	NZL0273	NZL1329	NZL3384	NZL1399
NZL0601	NZL3718	NZL0277	NZL1374	NZL3879	NZL1738
NZL0635	NZL4049	NZL0458	NZL1597	NZL4147	NZL1746
NZL1065	NZL4100	NZL0624	NZL2647	NZL4214	NZL3302
NZL1919	NZL0030	NZL1034	NZL2818	NZL4215	NZL4099
NZL2593	NZL0049	NZL1084	NZL3314	NZL0213	NZL0014

Finally, three cases had discrepancies which were clearly the result of either data entry or recording errors and they were altered accordingly (see Table 4). Users of the data might choose to exclude these cases from their analyses.

Table 4.
Cases with data entry or recording errors.

NZLID	Variable	Change
NZL3860	INBTPERmnth04	60,000 to 6,000
NZL1981	INBTPERweek04	7,000 to 700
NZL0036	Calculated Annual household disposable income changed $1 to match personal amount.	35,483 to 35,583

Numbers of People In Households

Q63 asked about the numbers of people in the household. This question records the household composition in terms of the numbers and types of people in the household in addition to the respondent, and whether they are under or over 18 years of age. Respondents only have an opportunity to count themselves if they live alone. Consequently, the respondent is only recorded when they live alone and in order to ensure they are counted in all households, one has been added to the numbers aged over 18 in all households containing other people in addition to the respondent.

Equivalisation

All household incomes were equivalised to a two adult household level using the Jensen Revised Equivalence Scales (Jensen, 1988). These distinguish between adults and children, with children being defined as those aged less than 18. In contrast with the first wave survey, the equivalisation process was straightforward because the household composition question was modified to ensure that numbers of household members aged below 18 were distinguished from those aged 18 or over.

Inland Revenue Department Income Tax Rates Information

Calculations of tax payable on gross income were based on the tax rates in effect during the current tax year 1 April 2012 to 31 March 2013 (the period within which the survey was conducted) shown in Table 5. Income tax calculations are based on the PAYE rates in the third column of Table 5 which shows the total deduction after the addition of the ACC Earners' levy to the PAYE. The ACC Earners' levy is currently set at 1.7 percent and applied equally to all income levels.

Table 5.
PAYE rates for the year 1 April 2012 to 31 March 2013.

Taxable income	Income tax rates for every $1 of taxable income (excluding ACC earners' levy)	PAYE rates for every $1 of taxable income (including ACC earners' levy[1])
up to $14,000	10.5 cents	12.20 cents
from $14,001 to $48,000	17.5 cents	19.20 cents
from $48,001 to $70,000	30 cents	31.70 cents
$70,001 and over	33 cents	34.70 cents

Source: Inland Revenue[1]

In order to simplify the process of calculating net and gross values with different income values and PAYE rates four sets of conversion formulas have been derived, and these are defined in the following section.

Tax Calculation Formulas

Four sets of formulas were derived, one for each of the four income brackets listed in Table 5. In the formulas, gross and net incomes are indicated, respectively, by the letters G and N. Formulas are shown for converting gross income to net and for converting net to gross. The formulas (shown in ***bold italic*** type) were derived as shown below.[2] In the first line of the working for deriving each formula, each sub-bracket contains the dollar amount covered by one tax bracket shown in Table 5, column 1 and the associated tax plus ACC rate shown in column 3 of Table 5. A further explanation of the content of the first line of each set of equations is provided at the end, using the first set as an example.

It must be emphasised that each formula is only valid for the income range to which it applies. In other words, the value of G in any particular case must be less than the value of the lowest income covered by the next highest tax bracket – except that there is no upper limit for income covered by the highest tax rate (i.e., for incomes over $70,001).

[1] http://www.ird.govt.nz/how-to/taxrates-codes/itaxsalaryandwage-incometaxrates.html

[2] Standard algebraic bracket expansion operations are used.

1. If Gross income is $70,001 and above

N = G – [(G-70000)*0.347 + (22000*0.317) + (34000*0.192) + (14000*0.122)]

= G – [(G - 70000)*0.347 + 15210]

= G – [(G – 70000)*0.347] – 15210

= G – 0.347G + 24290 – 15210

So

N = 0.653G + 9080

And (if Net income is in the range: $54,790.65[3] and above)

G = (N – 9080) / 0.653

2. If Gross income is in the range: $48,001-$70,000

N = G – [(G - 48000)*0.317 + (34000*0.192) + (14000*0.122)]

= G – [(G-48000)*0.317 + 8236]

= G – [(G – 48000)*0.317] – 8236

= G – 0.317G + 15216 – 8236

So

N = 0.683G + 6980

And (if Net income is in the range: $39,764.68 - $54,790.00)

G = (N – 6980) / 0.683

3. If Gross income is in the range: $14,001-$48,000

N = G – [(G - 14000)*0.192 + (14000*0.122)]

= G – [(G - 14000)*0.192 + 1708]

[3] I.e., the net value of $70,001 gross.

= G – [(G – 14000)*0.192] – 1708

= G – 0.192G + 2688 – 1708

So

N = 0.808G + 980

And (if Net income is in the range: $12,292.81 - $39,764.00)

G = (N – 980) / 0.808

4. If Gross income is in the range: $0 - $14,000

N = G - (G*0.122)

so

N = 0.878G

And (if Net income =<$12,292.00)

G = N / 0.878

A Further Explanation of Equation Content

Using the first line of set 1, above, as an example, the term (G – 70000) represents the result of subtracting the threshold value of $70,000 from the value of the total income received (when that income is greater than $70,000). The resulting income over the threshold of $70,000 is taxed at 34.7 percent, including the ACC earner's levy, which is expressed as 0.347 in the equation.

The second term, (22000*0.317) represents the tax on the $22,000 of income between $48,000 and $70,000 ($70,000 - $48,000 = $22,000) that is taxed at 31.7 percent (or 0.317), including the ACC earners' levy.

The third term, (34000*0.192) represents the tax on the $34,000 of income between $14,000 and $48,000 ($48,000 - $14,000 = $34,000) that is taxed at 19.2 percent (or 0.192), including the ACC earners' levy.

The fourth and final term, (14000*0.122) represents the tax on the first $14,000 of income that is taxed at 12.2 percent (or 0.122), including the ACC earners' levy.

The subsequent lines in each set of equations document the steps by which the final, simplified, conversion formulae were derived.

Excel Formula Statements

The formulas set out above can be combined in the following Excel statements, one of which converts gross income to net, and the other which converts net income to gross.

Gross to net income:

=IF(AND(N<=14000),N*0.878,IF(AND(N>14000,A2<=48000),N*0.808+980,IF(AND(N>48000,N<=70000),N*0.683+6980,IF(N>70000,N*0.653+9080,))))

Net to gross income:

=IF(AND((G<=12292),G/0.878,IF(AND((G>12292.81,G<=39764),(G-980)/0.808,IF(AND((G>39764.68,G<=54790),(G-6980)/0.683,IF(G>54790.65,(G-9080)/0.653,))))

Income Poverty

Households have been categorised as below or above the income poverty line according to three measures using the constant value (CV) medians calculated and published by MSD in 2012 (Perry, 2012) and equivalised disposable household income. The medians are annualised versions of weekly figures published in Tables E3 and E4 (p. 96) of the MSD report for two adults (i.e., the Couple only household type). The three poverty measures included in the dataset are, respectively, before housing cost poverty, after housing cost poverty using after housing cost (MSD calculated) median based on actual housing costs, and another after housing cost poverty measure based on a median that is equal to the before housing cost median minus 25 percent.

Income and Poverty Data

Table 6 lists and explains the variables created and added to the NZLSA Postal Survey SPSS master file.

Table 6.
The income and poverty data in SPSS.

Variables from the data file		
1	NZLSA_ID	NZLSA participant ID
2	Over_18	Household members aged 18 or over
3	Under_18	Household members aged under 18
4	Total_persons	Total number of people in household including respondent
5	bt_pers_total	Before tax personal income
6	at_pers_total	After tax personal income
7	bt_hh_total	Before tax household income
8	at_hh_total	After tax household income
9	Ann_house	Housing cost (annual)
10	net_hh_less_house	Household income minus housing cost
11	Incl_hh_inc_filter	Screener for excluding cases with no recorded household income
12	equiv_scale	Jensen equivalence value
13	equiv_bhc_2a	Equivalised before housing cost household income
14	equiv_ahc_2a	Equivalised after housing cost household income
15	pov_bhc	Before housing cost poverty using 60% CV 2007 ($2011) BHC median ($46,000)
16	pov_ahc	After housing cost poverty using 60% CV 2007 ($2011) AHC median ($34,667)
17	pov_ahc_25pc	After housing cost poverty using 60% CV 2007 ($2011) AHC median ($46,000 minus 25%)

Notes		
11	Screening variable to exclude cases for which income and/or housing data are unavailable or are negative. Code = 2 selects cases	
15	Code = 1 indicates below poverty 60% CV BHC line.	Median in parentheses is 100% median value not the 60% threshold
16	Code = 1 indicates below poverty 60% CV AHC line.	
17	Code = 1 indicates below poverty 60% CV AHC line where median is BHC median minus 25%.	
CV (constant value) medians are from Tables E3 and E4, Perry (2012:96)		

References

Jensen, J. (1988) *Income Equivalences and the Estimation of Family Expenditures on Children*, New Zealand Department of Social Welfare.

Perry, J. (2012) *Household Incomes in New Zealand: Trends in Indicators of Inequality and Hardship 1982 to 2011*, Wellington: Ministry of Social Development