# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE OF CONTENTS</td>
<td>1</td>
</tr>
<tr>
<td>1.1 BACKGROUND</td>
<td>1</td>
</tr>
<tr>
<td>1.2 PURPOSE</td>
<td>1</td>
</tr>
<tr>
<td>1.3 METHOD</td>
<td>2</td>
</tr>
<tr>
<td>1.3.1 P80/P20 RATIO</td>
<td>2</td>
</tr>
<tr>
<td>1.3.2 GINI COEFFICIENT</td>
<td>2</td>
</tr>
<tr>
<td>1.3.3 DATA</td>
<td>4</td>
</tr>
<tr>
<td>1.3.4 DATA LIMITATIONS</td>
<td>5</td>
</tr>
<tr>
<td>2 RESULTS</td>
<td>6</td>
</tr>
<tr>
<td>2.1 P80/P20 RATIO NEW ZEALAND AND SELECTED REGIONS</td>
<td>6</td>
</tr>
<tr>
<td>2.2 GINI COEFFICIENTS IN NEW ZEALAND AND REGIONS</td>
<td>7</td>
</tr>
<tr>
<td>2.1 AUCKLAND INCOME INEQUALITY INDICATORS</td>
<td>8</td>
</tr>
<tr>
<td>2.2 WELLINGTON REGION INCOME INEQUALITY INDICATORS</td>
<td>10</td>
</tr>
<tr>
<td>2.3 WAIKATO REGION INCOME INEQUALITY INDICATORS</td>
<td>10</td>
</tr>
<tr>
<td>3 CONCLUSION</td>
<td>12</td>
</tr>
<tr>
<td>4 REFERENCES</td>
<td>12</td>
</tr>
<tr>
<td>APPENDIX: SELECTED IMPORTANT INFORMATION FROM STATISTICS NEW ZEALAND’S HOUSEHOLD ECONOMIC SURVEY – TECHNICAL NOTES</td>
<td>13</td>
</tr>
</tbody>
</table>
1.1 BACKGROUND

As part of Greater Wellington Regional Council’s development of a Genuine Progress Index, along with Waikato Regional Council and Auckland Council’s updating of their Genuine Progress Indicator, the issue of improving welfare and well-being within the regions is an important focus.

For Greater Wellington, approximately ninety indicators have been identified for measuring the region’s well-being progress. Income inequality is one of such indicator, selected to show how ‘fair’ society is.

The Auckland Council and Waikato Regional Council developed a Genuine Progress Indicator for the period 1990 to 2006. Fundamental to the concepts of wellbeing, economic prosperity and standard of living is the ability of individuals in a society to access those goods and services that improve their quality of life, and hence the distribution of income determines who has access to these goods and services. A Gini Coefficient was calculated for Auckland Council and Waikato Region for the period 1990-2004, as part of the GPI.

Each region is concerned with income inequality and its affect within the region. In general, there are three principal reasons for the desirability of economic equality (Roemer, 2009). The first is based on the work of John Rawls’ notion of justice and the arbitrariness of talent, birth-family and environment as determinants of economic outcomes. Therefore economic inequality cannot be deserved. The second reason is that equality is the fairest way to share scarcity in an economy. The third argument is that inequality has negative effects on welfare. An equitable distribution of incomes amongst a population is seen to maintain social cohesion and reduce conflict. Conversely, a certain level of income inequity is desirable, as it provides incentives at an individual level to be productive and work. It also leads to innovation and change as individuals respond to financial incentives.

While acknowledging that household size, composition and preferences differ markedly among the population, income distributions are considered to be an important measure of living standards. It is inevitable that the income of individuals will differ depending on the value placed on their work and the norms pertaining to the importance of work/earning income in a society.

The wellbeing of a society can in part be expressed by measuring the personal consumption expenditure of all the individuals in that society - especially enabling the consumption of basic needs, such as shelter, housing and food. However, the resulting measure does not take into account the diminishing marginal utility of that consumption; the benefit received from an extra dollar of consumption is likely to be more for a poor family than for an affluent family. It is therefore necessary to consider how income, and thus spending power, is distributed throughout the society. If most of the income and spending power of the society is in the hands of only a small percentage of the total population, the wellbeing of the majority is likely to be lower than had the distribution been more even. Due to diminishing marginal utility, additional units of income received by the very wealthy will not provide as much total benefit as had that income been received by the very poor. As income distributions widen, there is a tendency for the poor to become poorer as they are less able to maintain their living standards in the face of rising costs (Kerr et al., 2004). There is also an additional ‘dis-utility’ as the poorer people in society become not only relatively worse off financially, but they feel disadvantaged in terms of their social standing (Brekke and Howarth, 2002; Kerr et al., 2004).

1.2 PURPOSE

The purpose of this indicator report is to develop an income inequality indicator for the Auckland, Waikato and Wellington regions within New Zealand for the years 2001, 2004, 2007 and 2009. The Ministry of Social
Development (MSD) developed national level income inequality indicators based on data obtained from Statistics New Zealand’s Household Economic Survey (Perry, 2010). The measures used were the P80/P20 ratio and the Gini Coefficient. The Gini Coefficient takes the distribution of incomes of all households within a region into account, whereas P80/P20 ratio looks at income in the 80th percentile and 20th percentile households only. Both indicators show a different aspect of income distribution.

1.3 METHOD

To measure inequality, the use of household income rather than individual employment income is standard international practice (Jenkins and van Kerm, 2009). This is due to various sources of income – for example through employment earnings, investments and transfers that can contribute to household income. According to the conventional economic welfare approach, it is the ability to consume that is used to measure well-being (Folbre, 2009). This is not without criticism, as income is a measure of money that comes into a household rather than of consumption expenditure which is a measure of money that goes out. It is for this reason that consumption is seen as a better measure of living standards. Both measures focus on flows to, and from, the market economy; ignoring production and consumption within the household. Folbre (2009) argues that it is not a direct measure of household living standards or household utility, given that there are internal household production processes along with consumption of leisure within a household. Despite these criticisms, disposable income is used as a proxy for consumption, given the current availability of data.

A further adjustment is made to household income. Household members may not receive any income in their own name, yet share in the income of the household. The difference in household composition, size, and the number of dependents on the household income are important. The disposable income of households must therefore be adjusted by household size and composition to produce an ‘equivalised’ household income.\(^1\) The methods used for measuring both indicators are discussed below in Sections 1.3.1 and 1.3.2, with details of the data obtained for this study outlined in Section 1.3.3.

1.3.1 P80/P20 RATIO

The P80/P20 ratio is calculated as the ratio of the household income at the 80th percentile (i.e. 20 percent below the wealthiest household) to the household income at the 20th percentile (i.e. 20 percent above the lowest income household) (Perry, 2005). Overall, as household income inequality increases the P80/P20 ratio also increases. The P80/P20 ratio measures the relative distance between these two points (P80 and P20) in the income distribution, or the ratio between the ‘richer’ and the ‘poorer’ percentiles.

1.3.2 GINI COEFFICIENT

Gini Coefficients are typically determined by taking the difference between a straight line representing income equality and a Lorenz Curve (Figure 1), which describes the distribution of income among share of the population (Kerr et al., 2004).

\(^1\) This assumes a standard within-household distribution of income i.e. that there is uniformity in intra-household expenditure.
The Gini Coefficient represents the ratio between the yellow highlighted area in Figure 1 and the entire area under the 45 degree line, which would imply complete equality of distribution. Mathematically, this can be modelled according to Equation 1 (Jenkins and van Kerm, 2009):

$$G(Y) = 1 - 2 \int_0^1 L(P;Y) \, dp$$  \hspace{1cm} \text{(E1)}$$

Where $P$ represents the cumulative population share, $Y$ represents the cumulative income share, and $L(P;Y)$ describes the Lorenz curve. The indices 0 to 1 represent the cumulative population share. The Gini Coefficient produces results which range between 0 and 1, where a coefficient of 0 means all income is equally spread, and a coefficient of 1 means all income is held by a single quintile.\footnote{Alternative to E.1, with further mathematical derivation (Buchan, 2002), the Gini Coefficient, $G$, can be calculated using the formula shown below, where $n$ is the number of income groups (deciles), $i$ is the rank value in ascending order (1 to 10) and $X_i$ is the mean income in each income interval,}

$$G = \frac{\sum_{i=1}^{n} (2i - n - 1)X_i}{n \sum_{i=1}^{n} X_i^2}$$  \hspace{1cm} \text{(E.2)}$$

The higher the Gini Coefficient the greater the level of income inequality; this is also the case with the P80/P20 ratio. Both indicators provide snapshots of income distribution at a particular point in time, but they do not reveal the level of income mobility within a population or region. There is no indication of whether the poor remain poor, or the rich retain their wealth. The use of the Gini Coefficient in this study shows how incomes are distributed in New Zealand regions. It is worth noting that regions may have similar Gini Coefficients, but differ in wealth.
1.3.3 DATA

Both indicators, the P80/P20 ratio and Gini Coefficient, were calculated for Auckland, Waikato, and Wellington regions based on data extracted from Statistics New Zealand’s (SNZ) Household Economic Survey (HES) for 2001, 2004, 2007 and 2010. The HES is survey based and provides median annual disposable household income values. A customised data request from SNZ was obtained for this report, SNZ modelled equivalised disposable household income, the number of households by decile, by region as well as the country as a whole. Table 1 provides a glossary of the data used.

<table>
<thead>
<tr>
<th>Table 1: Glossary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equivalised Disposable Household Income</strong></td>
</tr>
<tr>
<td><strong>Disposable Income</strong></td>
</tr>
<tr>
<td><strong>Total Income</strong></td>
</tr>
</tbody>
</table>

New Zealand deciles were used in this study, against which the regional decile is assessed, enabling a comparison between the region and the national level. As the distribution of incomes in each region differs from the national distribution, the household distribution under each regional decile is not strictly 10 per cent of the regional population. In Wellington, for example, there are more people categorised under the higher income bands; e.g. the top five deciles together covered approximately 60 per cent of total households. This issue has no impact on the results of the Gini Coefficient. This is because the Gini Coefficient is the ratio of the yellow area to the area under perfect line in Figure 1, as captured in equation E.1. Equation E.1 will produce the same Gini Coefficient once the Lorenz curve (100 per cent of population with 100 per cent of income) is set in the calculation and in the curve. As a result it does not matter if the decile is defined at a national level or at the regional level itself, as the Gini Coefficient will be the same.  

---

3 Customised data request with Job Reference number: JOB-01236 (Statistics New Zealand, 2011).
4 Perry (2005) provided more details on the importance of using equivalised disposable household income for studying ‘the economic wellbeing of different types of household’.
5 A uniform population distribution will however result when using equation E.2 to calculate the Gini Coefficient.
For the P80/P20 ratio, regional income distributions should be defined at the regional level. To calculate this, the regional data obtained from the HES was modelled (using regression analysis) to estimate the income distribution for the regional decile (10 per cent of total regional population).

1.3.4 DATA LIMITATIONS

As the Household Economic Survey is survey based at a national level, there is a margin of error in the regionalisation of the data and a compromising of data quality. More detail about the HES and potential sampling errors are given in the Appendix.

National results in this report cannot be directly compared to the national results published by the Ministry of Social Development’s report. This is due to different income definitions used for two reports. While both reports use the same method, it appears that differences exist in how the household incomes were equivalised. As previously noted, this report relies on the Jenson method to equivalise household incomes, while we have not been able to ascertain exactly what method was employed by Ministry of Social Development to equivalise household incomes.

---

6 Refer to Perry (2010) for income definitions used in the Ministry of Social Development report.
2 RESULTS

2.1 P80/P20 RATIO NEW ZEALAND AND SELECTED REGIONS

Figure 2 and Table 2 summarise the P80/P20 ratios for New Zealand and the Auckland, Waikato, Wellington, and Canterbury regions for the years 2001, 2004, 2007 and 2009. As stated, the P80/P20 ratio measures the relative distance between the two percentile points (P80 and P20) in the income distribution, or the ratio between the ‘richer’ and the ‘poorer’ percentiles. For New Zealand, the P80/P20 rose from 3.18 to 3.37 between 2001 and 2009. The level of inequality or distance between the richer percentile (80th quintile) and poorer percentile (20th quintile) was greatest in 2007, with a ratio of 3.44. Levels of household income inequity, as measured through differences in equivalised household disposable incomes, were more pronounced for the Auckland and Wellington regions, with ratios higher than the New Zealand ratio. Inequality in Waikato and Canterbury regions were consistently lower than the national level, as measured by this indicator for the same period.

Figure 2: P80/P20 Ratio for Equivalised Household Disposable Incomes

Table 2: P80/P20 Ratio for New Zealand and Selected Regions

<table>
<thead>
<tr>
<th>P80/P20 ratio</th>
<th>2001</th>
<th>2004</th>
<th>2007</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>3.53</td>
<td>3.69</td>
<td>3.70</td>
<td>3.66</td>
</tr>
<tr>
<td>Waikato</td>
<td>3.08</td>
<td>3.19</td>
<td>2.93</td>
<td>3.32</td>
</tr>
<tr>
<td>Wellington</td>
<td>3.59</td>
<td>3.91</td>
<td>3.91</td>
<td>4.06</td>
</tr>
<tr>
<td>Canterbury</td>
<td>2.99</td>
<td>2.81</td>
<td>2.84</td>
<td>3.08</td>
</tr>
<tr>
<td>New Zealand</td>
<td>3.18</td>
<td>3.31</td>
<td>3.44</td>
<td>3.37</td>
</tr>
</tbody>
</table>
2.2 GINI COEFFICIENTS IN NEW ZEALAND AND REGIONS

The Gini Coefficients for New Zealand and Auckland, Waikato, Wellington and Canterbury regions were calculated using the Jenkins and Kerm (2009) methodology, and are presented in Figure 3 and Table 3. The Gini Coefficient for New Zealand (as calculated using equivalised household disposable income) was 0.3 in 2001, marginally rising to 0.31 in 2004 and 2007, and returning to 0.3 in 2009. This is represented by the black line in Figure 3. The Auckland and Wellington Region Gini Coefficients were consistently on par or above the New Zealand Gini for this period, showing more inequality than the national level. Waikato and Canterbury had slightly lower levels of inequality over the ten year period.

![Figure 3: Gini Coefficient, Based on Equivalised Household Disposable Income](image)

**Table 3: Gini Coefficients for New Zealand and Selected Regions**

<table>
<thead>
<tr>
<th>Region</th>
<th>2001</th>
<th>2004</th>
<th>2007</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>0.30</td>
<td>0.32</td>
<td>0.32</td>
<td>0.31</td>
</tr>
<tr>
<td>Waikato</td>
<td>0.29</td>
<td>0.30</td>
<td>0.28</td>
<td>0.27</td>
</tr>
<tr>
<td>Wellington</td>
<td>0.30</td>
<td>0.32</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>Canterbury</td>
<td>0.29</td>
<td>0.28</td>
<td>0.28</td>
<td>0.30</td>
</tr>
<tr>
<td>New Zealand</td>
<td>0.30</td>
<td>0.31</td>
<td>0.31</td>
<td>0.30</td>
</tr>
</tbody>
</table>

In terms of longer term trends, Market Economics Ltd calculated a Gini Coefficient for New Zealand as part of the Genuine Progress Indicator report in 2008. This data is presented in Figure 4 below, along with the Gini Coefficient for New Zealand in Figure 3 above. It is important to note that a different income concept of income was used in the earlier report (that of total income). Perry (2010) found that the levels of inequality differed according to the definition of income used, and Figure 4 below is consistent with his
findings; inequality is more pronounced if total or gross household income is used, rather than household disposable equivalised income (as used in this study, and in Figure 3 above). Notwithstanding this, an upward trend of inequality is evident in New Zealand from 1969 to 2000, with a plateau developing in the mid-2000s, and a slight downward trend between 2007 and 2009. There are several underpinning reasons for these findings, which would require significant further analysis to confirm, a task which is beyond the scope of this study. One possibility is change in the taxation rate and general political environment of redistribution. Another possibility relates to low rates of pay accompanied by rising standards of living, which may be pronounced for some sub-sectors within an economy, based on, for example, age, ethnicity and gender. An additional possibility is the extent of social mobility in a society, including the opportunities to move across income brackets. This latter reason is dependent on the prevailing institutions of the economy, both formal and informal. The Gini Coefficient, as with the P80/P20 ratio gives a snapshot of the income distribution at particular point in time. It does not tell us whether those individuals who were poor three years ago were also ‘poor’ in the next year, or whether became ‘rich’. This is the subject of income mobility, or the ability to move outside income brackets; a focus beyond the scope of this study.

Figure 4: New Zealand Gini Coefficients
(Total Income 1969-2006 and Equivalised Disposable Income 2001-2009)

The following sections look at inequality in each of the Auckland, Waikato and Wellington regions. The overall context for regional analysis is within a widening distribution of the incomes of the rich and the poor in New Zealand, over the last fifty years.

2.1 AUCKLAND INCOME INEQUALITY INDICATORS

As previously stated, Auckland (along with Wellington region) has levels of inequality that are more pronounced than the New Zealand total level. There are concentrations of wealth and poverty in Auckland (and Wellington region) that are more pronounced than in other regions of the country. Auckland’s
inequality is consistently much higher than the national level for both the P80/P20 and Gini Coefficient indicators.

The P80/P20 ratio for New Zealand tracked that of Auckland for the period between 2001 and 2009. Auckland’s P80/P20 ratio of equivalised disposable household income rose from 3.53 in 2001 to a peak of 3.70 in 2007. That is, a larger proportion of total household income increasingly went to the higher decile households between 2001 and 2007. This ratio reduced to 3.66 in 2009 (Table 2).

With regards to the Gini Coefficient for Auckland, the trend was also similar to the national level, with Auckland displaying the same level of inequality in 2001 (with a Gini Coefficient of 0.30), and rising marginally above the national New Zealand level in the subsequent decade (with a Gini Coefficient of 0.32 in 2004 and 2007, and 0.31 in 2009). Overall, the Gini Coefficient was relatively stable for this decade for the Auckland.

To put this within historical context, a Gini Coefficient was calculated for the Auckland for the years 1989 to 2006. As with the calculations mentioned for the historical data for the New Zealand Gini Coefficient above, a different measure of income (total household income) was used at the time of that calculation, and therefore the Gini Coefficient are not directly commensurate. It is useful to look at the overall longer-term trend for the region, and this is shown in Figure 5.

![Figure 5 Auckland Gini Coefficients (Total income 1989-2006 and Equivalised disposable Income 2001-2009)](chart)

The Gini Coefficient for total household income increased from 0.34 in 1989 to 0.39 in 2006. This was marginally below the New Zealand Gini Coefficient for this time, as in Figure 4 (0.36 in 1989 and 0.40 in

---

7 Auckland Regional Council’s Genuine Progress Indicator
2006). Interestingly, the Gini Coefficient measure using total household income showed Auckland levels below the New Zealand level, whereas the Gini Coefficient using equivalised disposable household incomes showed levels above the New Zealand level, for the last decade. This could possibly be explained by higher levels of net transfers for Auckland households than the rest of the country, or differences in the size and composition of Auckland’s households.

### 2.2 WELLINGTON REGION INCOME INEQUALITY INDICATORS

Inequality in the Wellington region is more accentuated than at the national level, as the regional P80/P20 ratio is consistently higher over the study period. Indeed Wellington region had the highest regional levels of inequity for this indicator; the distance between the richer percentile and the poorer percentile was more accentuated for the Wellington region than others. The degree of income inequality in the Wellington region has increased over the study period from 3.59 to 4.06, with a larger proportion of total household income going to the top household percentiles. Between 2001 and 2007 income inequality at a national level also experienced an upward trend (3.18 to 3.44), but decreased to 3.37 between 2007 and 2009. This decrease in inequity was not evident in Wellington region. Only Auckland and Wellington regions had inequity on this indicator that was higher than the national level. Interestingly, both Auckland and Wellington region have a wage premium over the rest of the country, with average annual weekly wage incomes that are higher. Although the P80/P20 indicator uses equivalised disposable household income, the wage premium that Wellington region has over other regions and the national average weekly income level is significant.\(^8\)

In 2009, Wellington region had a Gini Coefficient of 0.31, while the New Zealand Gini Coefficient was 0.30. As with the P80/P20 indicator, the Wellington region showed more inequality than the national level, and this is consistent for the past decade under study. The Gini Coefficient has remained relatively stable over this ten year period, moving from 0.30 in 2001 to 0.31 in 2009. The Gini Coefficient for Wellington region was very similar to Auckland for this 10 year period; again these two regions were the only two above the national level. The Gini Coefficient measures the distribution for all households, not just for two selected percentiles in the P80/P20 ratio. The Gini Coefficient for the Wellington region is consistent with the trend in the national Gini Coefficient, which if taken alongside a longer term trend (as in Figure 4), seems to be levelling off, after an increase in inequality in the period from 1970 to 2006. Historical data is not available at this current time for longer term analysis of inequality in the Wellington region.

### 2.3 WAIKATO REGION INCOME INEQUALITY INDICATORS

Income inequality in the Waikato region was not as pronounced as the Wellington and Auckland regions. Incomes in the Waikato region were more equitable than the national level for the last 10 years. The data for the Waikato fluctuated over this time, although this may be due to the nature of the Household Economic Survey data at a regional level.

\(^8\) The SNZ Income survey of average weekly earnings shows Wellington wage earners earning 10 per cent above the national average in 2006, and 22 per cent above the national average in 2009 in the June quarter.
The Waikato P80/P20 ratio rose from 3.08 to 3.19 between 2001 and 2004, showing greater inequality. It then decreased to 2.93 in 2007, but rising to 3.32 in 2009. Over this period, this was widening of the inequality levels between the richer percentile and the poorer percentile.

Inequality, as measured by the Gini Coefficient, but using the same data as for the P80/P20, showed a different picture. The Gini Coefficient fell from 0.29 in 2001 to 0.27 in 2009 in the Waikato region. This implied that the distribution of all household disposable incomes became more equitable over this period, despite a widening gap between rich and poor. The Gini Coefficient is more sensitive to changes in the more dense low-to-middle parts of the distribution.

In terms of historical trend the equity gap (as measured by total household income) within the Waikato region remained relatively stable, with the exception of an increase between 1995 and 2000. Directly prior to and after this rise, there was little divergence in the levels of inequity. The equivalised disposable household income Gini Coefficient for the Waikato region (as in Figure 3 and Figure 6) show that the gap may be lessening in the region.

---

9 As with the National and Auckland historical Gini Coefficient measures from 1989 to 2006, a different definition of income was used to that of equivalised disposable household income.
3 CONCLUSION

There are numerous methods to measure income inequality in a population. The focus of this study was household income as an indicator for the material wellbeing of individuals, relative to each other. This is in line with the methodology used by the Ministry of Social Development (as per Perry, 2010). This report provides a regional analysis of household income distribution, with a focus on the Auckland, Waikato and Wellington regions for the period 2001 to 2009.

The choice of indicator can yield different results in terms of measuring inequality. A measure of distance between the richer and poorer households (P80/P20 ratio) was calculated along with a measure of the distribution of all household incomes (Gini Coefficient).

Historically, the income gap in New Zealand has widened over the last 50 years. For Auckland, inequality levels of households remains above the national level, as measured by both indicators. This is also the case for the Wellington region, which is the region with the highest inequity between rich and poor. The Waikato Region had consistently a more equitable distribution than the other two regions or the national level. Interestingly although it appears that the distribution of household income for all Waikato region households is becoming more equitable, the gap between rich and poor households is rising.

4 REFERENCES

Folbre, N., 2009 Inequality and time use in the Household. In Salverda, W., Nolan, B. and Smeeding, T.M. (Eds.), pp. 342-363
APPENDIX: SELECTED IMPORTANT INFORMATION FROM STATISTICS NEW ZEALAND’S HOUSEHOLD ECONOMIC SURVEY TECHNICAL NOTES

The HES provides a comprehensive range of statistics relating to income and expenditure, as well as demographic information on households and individuals.

**Survey design**

**Scope of the survey**

The target population for the HES is the usually resident population of New Zealand aged 15 years and over living in private dwellings.

For survey purposes, a ‘household’ comprises a group of people who share a private dwelling and normally spend four or more nights a week in the household. They must share consumption of food or contribute some portion of income towards the provision of essentials for living as a group.

The income questionnaire collects detailed data on incomes received by each member of the household aged 15 years and over. Topics in this questionnaire include wages and salaries from current and previous jobs within the recall period, self-employment income, government benefits received in the last year, New Zealand Superannuation, private superannuation and annuities, investment income, and income from overseas sources. Also collected are information on income from casual jobs, hobbies, and other irregular income.

**Population weighting adjustments**

The population weighting used for the full HES and HES (Income) is integrated weighting. This statistical method adjusts the output to match externally sourced population benchmarks. In particular, it takes account of undercoverage in the survey for specific population groups such as young males and Māori.

The key benefits to using integrated weighting are:
- improving the robustness and accuracy of the survey estimates
- reducing the effect of bias in estimates resulting from undercoverage
- decreasing the level of sampling error for benchmark variables.
- The population used for the integrated weighting was benchmarked to estimates based on the 2006 Census.

**Changes since last release and data comparability**

**Imputation**

Imputation is a method that replaces missing values with actual values from similar respondents. Imputation was introduced into HES in 2009/10 and was also applied to the data for 2006/07 (HES) and 2007/08 and 2008/09 (HES (Income)). Imputation is applied to a household where the household did not supply all of the required income or diary information, but supplied sufficient information to be retained in the sample. For households where at least one significant household member has a fully completed income questionnaire, the other household members who do not have fully completed income questionnaire(s) have their income questionnaire(s) imputed. The same process is applied when diaries are not supplied by all eligible members of the household. In addition, respondents who have not provided an age have their age imputed.
A hierarchical hot-deck method is used to identify donors, with the donor's income questionnaire or diary replacing that of the non-respondent. CANCWISE (Canadian Census Edit and Imputation System) is used to select the best donor by matching on a range of demographic characteristics. The demographic characteristics used were: sex, age, whether in paid employment, highest qualification, region, whether in full-time employment, and household income.

Hot-deck imputation was chosen for three reasons:

- to maintain accurate distributions for the New Zealand population
- to allow calculation and analysis of household income and expenditure for a larger number of households
- to account for likely biases due to non-response.

Changes to the questionnaires

Minor changes were made to the questionnaires to account for real world changes since 2006/07, such as the introduction of interest-free student loans and KiwiSaver.

Edited data in previous HES and HES (Income)

The introduction of imputation and the addition of recovered records for the years 2006/07–2008/09 meant that the records for these years needed to be re-edited. As a result, all data for these years have been revised and are marked as such in the Hot Off the Press tables and in Table Builder.

Reliability of the survey estimates

The 2009/10 HES sample originally comprised approximately 4,700 private households, sampled on a statistically representative basis from rural and urban areas throughout New Zealand. As mentioned previously, the sample was boosted by 380 households in the last quarter in the field and the final sample comprised approximately 5,100 private households. Information was obtained for each member of a sampled household that fell within the scope of the survey and met survey coverage rules. For 2009/10, the overall achieved (pre-imputation) response rate for households was 62.0 percent and the post-imputed response rate was 68.8 percent. The target response rate was 70.0 percent.

Two types of error are possible in estimates based on a sample survey: sample error and non-sample error. Sample error can be measured, and quantifies the variability that occurs by chance because a sample rather than an entire population is surveyed.

Relative sample errors are calculated for expenditure, income and region. For example, in 2009/10 the estimated average annual household income from wages and salaries was $56,426. This is subject to a relative sample error at the 95 percent confidence interval of plus or minus 5 percent. This means there is a 95 percent likelihood that the true value lies between $53,605 and $59,247. Sample errors of movement indicate whether a change between years is significant or not. For example, in 2009/10 the average weekly household expenditure on food was $178, an increase of 9.1 percent on the $163 spent in 2006/07. The sample error of the movement is 4 percent which is less than the 9.1 percent change in estimate and therefore the change is significant.

Sample errors for average annual income by income source are shown below.
The table below summarises the level sample errors for household income by income source. The tables give an indication of the change in the variability of the estimates in the samples. Care should be taken when interpreting income or expenditure estimates with sample errors greater than 20 percent, as they will be less statistically reliable than those with sample errors less than or equal to 20 percent.

Level sample errors for household income by income source

<table>
<thead>
<tr>
<th>Years ended 30 June 2007–10</th>
<th>Sample errors (%)</th>
<th>2006/07(1)</th>
<th>2007/08(1)</th>
<th>2008/09(1)</th>
<th>2009/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income source</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages and salaries</td>
<td></td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Self-employment</td>
<td></td>
<td>49</td>
<td>31</td>
<td>29</td>
<td>41</td>
</tr>
<tr>
<td>Investments</td>
<td></td>
<td>21</td>
<td>17</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Private superannuation</td>
<td></td>
<td>29</td>
<td>36</td>
<td>27</td>
<td>41</td>
</tr>
<tr>
<td>New Zealand Superannuation and war pensions</td>
<td></td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Other government benefits</td>
<td></td>
<td>11</td>
<td>9</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Other sources</td>
<td></td>
<td>29</td>
<td>26</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>Total regular income</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

1. Data for this year has been revised.

The HES estimates are also subject to non-sample error. Non-sample errors include those arising from biases in the patterns of response and non-response, inaccuracies in reporting by respondents, and errors in the recording and coding of data. Statistics NZ endeavours to minimise the impact of these errors through the application of best practice survey methods and the monitoring of known indicators.