



## **New Zealand 2006 Consumers Price Index Review: Price Updating**

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## 1. Introduction

The New Zealand Consumers Price Index (CPI) was reweighted in 2006. The weights were based on expenditure information from the 2003/04 Household Economic Survey (HES) and other sources, price updated to the June 2006 quarter.

The effect of price updating was to express the underlying 2003/04 quantities of the weight reference period in the prices of the June 2006 quarter price reference period. However, volume adjustments were also made for some goods and services (such as audio-visual equipment), to reflect trend change in quantities subsequent to the 2003/04 weight reference period but before implementation of the weights.

This paper describes the price-updating and volume-adjustment processes, and discusses related issues that were considered, such as an increase of 53 percent in petrol prices from 2003/04 to the June 2006 quarter.

The paper also presents eight analytical time series that have been constructed using 2003/04 weights without price updating, with price updating but at different levels of the hierarchical CPI classification, and based solely on the HES. These analytical series have been compiled using Lowe, Young and geometric Young index formulas.

## 2. Background

Typically, CPI expenditure weights are derived from household budget surveys, national accounts data or other sources. The weight reference period that these household consumption expenditures relate to is usually a year or longer and is earlier than the CPI price reference period.

CPI compilers have the options of preserving the underlying quantities of the weight reference period by price updating the weight reference period expenditures to the price reference period, or of preserving the weight reference period expenditure shares.

The price updating (or Lowe index) approach is conceptually clear, as it measures the changing cost of the weight reference period basket. However, it holds weight reference period quantities fixed and assumes households do not substitute in response to changes in relative prices.

An approach that involved preserving the weight reference period expenditure shares and calculating a Young index would imply households substitute in response to changes in relative prices from the weight reference period to the price reference period, but that there is no substitution after the price reference period. Carsten Hansen (2006) suggested that this apparent inconsistency could be addressed by using a geometric mean upper-level index aggregation formula.

Whether preserving weight reference period quantities by price updating (and calculating a Lowe index) or preserving weight reference period expenditure shares (and compiling a Young index) is likely to be more representative overall of the consumption pattern at the price reference period is an open question. Use of a Lowe index could be justified strongly for some parts of the basket but much less so for others, and vice versa for a Young index.

The *Resolution Concerning Consumer Price Indices* (ILO, 2003) states that:

Where the weight reference period differs significantly from the price reference period, the weights should be price updated to take account of price changes between the weight reference period and the price reference period. Where it is likely that price updated weights are less representative of the consumption pattern in the price reference period this procedure may be omitted.

For the New Zealand CPI, weight reference period expenditures have historically been price updated to the price reference period. Price updating generally occurs at the lowest level of the expenditure classification,

comprising about 700 goods and services in the basket. At the most recent reweighting of the CPI in 2006, there was a longer gap between the weight reference period and the price reference period than usual. This resulted in careful consideration about whether to price update and, if so, at what level of the expenditure classification.

The longer than usual gap also meant that Statistics NZ had access to a range of information, such as retail transaction data, for periods after the weight reference period, prior to finalising and implementing the expenditure weights in the CPI. This presented an opportunity to consider whether there was a case for making volume adjustments to reflect significant trend change in quantities that had occurred after the weight reference period but before implementation of the weights.

The following section of the paper explains how the expenditure weights were calculated as part of the 2006 CPI review.

### **3. Reweighting the basket**

#### **3.1 Background**

The New Zealand CPI is reweighted approximately once every three years to ensure that the expenditure weights allocated to the basket of representative goods and services continue to reflect the relative importance of goods and services acquired by households for consumption purposes. The time between reweights is well within the ILO recommendation of at least once every five years. The most recent reweight, in 2006, was based on information from the 2003/04 HES and a number of other sources. The previous reweight, in 2002, was based on the 2000/01 HES.

The 2006 reweight was implemented one year later than usual. This is because decisions were made to delay both the 2003/04 HES and the 2003 CPI Revision Advisory Committee review by one year. The HES decision was subsequently reversed, but this decision was made too late to convene the CPI Revision Advisory Committee in 2003.

The latest HES ran from July 2006 to June 2007. The 2006/07 HES will be used to reweight the CPI in 2008 (with the publication of the September 2008 quarter CPI in October 2008). The current CPI weights will therefore be used for only two years, rather than the usual three.

As noted above, the 2006 reweight made use of information from the 2003/04 HES and other sources. For some goods and services, the HES does not provide accurate estimates of expenditure. Respondents tend to under-report expenditure on some goods and services (such as tobacco and alcohol), and large, infrequent purchases (such as new dwellings and new cars) may not be reported frequently enough by the nearly 3,000 households in the survey to provide accurate estimates of total household expenditure.

HES data is complemented by information obtained from a range of other sources, including Statistics NZ surveys, government administration data, retail transaction data and information provided by businesses.

The goods and services in the CPI basket comprise a representative sample of the wider range of goods and services acquired by households. The expenditure weights assigned to the 685 individual goods and services in the basket represent expenditure on those goods and services, and also expenditure on similar goods and services not directly included in the basket but expected to exhibit similar price changes. For example, oranges and mandarins are included in the basket but lemons are not. Expenditure on lemons (and other citrus fruits not directly included in the basket) is allocated to oranges and to mandarins in proportion to spending directly on each of these two citrus fruits.

Table 1 shows the proportion of the 2006 expenditure weights contributed directly from the HES for the sample of goods and services included in the CPI basket (for example, oranges), the proportion that was contributed by the HES for goods and services not directly included in the basket (for example, lemons), and the proportion of the weight estimated using sources other than the HES.

Table 1

**Consumers Price Index**  
*Source of expenditure weights*  
By group

Group	Household Economic Survey (HES)		Total HES	Other Sources	Total
	Directly allocated <sup>(1)</sup>	Indirectly allocated <sup>(2)</sup>			
	Percent				
Food	48.6	32.1	80.7	19.3	100.0
Alcoholic beverages and tobacco	0.0	0.4	0.4	99.6	100.0
Clothing and footwear <sup>(3)</sup>	59.7	40.3	100.0	0.0	100.0
Housing and household utilities	35.3	9.7	45.0	55.0	100.0
Household contents and services	60.8	38.6	99.4	0.6	100.0
Health	11.6	5.6	17.1	82.9	100.0
Transport	66.5	4.8	71.4	28.6	100.0
Communication	86.1	13.9	100.0	0.0	100.0
Recreation and culture	65.6	28.0	93.7	6.3	100.0
Education	52.2	15.1	67.3	32.7	100.0
Miscellaneous goods and services	36.3	18.1	54.4	45.6	100.0
All groups	47.3	18.3	65.5	34.5	100.0

(1) HES expenditure on goods and services directly included in the CPI basket.

(2) HES expenditure on goods and services not directly included in the CPI basket.

(3) Although the HES is listed as being the source of clothing and footwear weights, HES expenditure is benchmarked to adjusted Retail Trade Survey figures. This benchmarking contributed about one-quarter of the weight for clothing and footwear.

The table shows that 65.5 percent of the total expenditure weight was sourced from the HES, and the remainder was based on information from other sources. Of the HES-sourced weights, more than two-thirds comprised spending directly on goods and services in the basket, with the remainder being spending on goods and services not directly included in the basket.

HES was the main weighting source for communication (100 percent), household contents and services (99.4 percent), and recreation and culture (93.7 percent). While the table shows that HES was the only source of clothing and footwear weights, HES provided the relative shares of apparel goods and services in the basket, but use was made of adjusted Retail Trade Survey figures to benchmark clothing and footwear expenditure. Groups where other information sources were heavily relied on include alcoholic beverages and tobacco (the HES contributed just 0.4 percent), health (HES contributed 17.1 percent), and housing and household utilities (HES contributed 45.0 percent).

### 3.2 Excluding out-of-scope expenditure

The target population for the HES (and the CPI) is New Zealand-resident, private households living in permanent private dwellings. This means that the population does not include overseas visitors who expect to be resident in New Zealand for less than 12 months; people living in non-private dwellings such as hotels, motels, boarding houses, hostels, motor camps and homes for the elderly; patients in hospitals; residents of psychiatric and penal institutions; members of the permanent armed forces; members of non-New Zealand armed forces; and overseas diplomats. Children at boarding schools are not surveyed, but expenditure on behalf of those children is included in the record-keeping of the parent or guardian.

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.

A key step when alternative data sources are used to estimate CPI expenditure weights is to ensure that the estimates include expenditure made by only the HES and CPI reference population. Expenditure by others is out of the scope of the CPI and needs to be excluded from the expenditure weights so that they will not be overstated relative to weights sourced from the HES. In addition to the people listed above not covered by the HES and CPI, expenditure by businesses and government also needs to be excluded.

Alternative expenditure information is sourced from a wide range of providers. Where possible, data providers are asked to report expenditure information that closely matches the scope of the CPI. In practice, however, many providers are not able to disaggregate their data to the level required. Statistics NZ has to estimate what proportion of a particular expenditure is in scope of the CPI when making use of this information to derive expenditure weights.

As part of the 2006 review, a more targeted approach than has been used in the past was developed to exclude out-of-scope expenditure. This involved deriving a set of specific adjustment ratios for various areas of the basket. Appropriate ratios were then applied to the corresponding independently sourced expenditures. For example, these ratios took into account the relative shares of expenditure made by visitors from overseas, which varied significantly across different areas of the basket.

Sources of information used in deriving the out-of-scope adjustment factors included:

Information source	Breakdown	Type of out-of-scope expenditure
National Accounts Household Consumption Expenditure	Estimates of proportion of total retail spending by the business sector, by retail store type	Business
National Population Estimates	Estimated resident population	Non-private and non-permanent households
Tourism Satellite Account	International visitor expenditure as a proportion of total supply, by product	Non-residents (overseas tourists)

### 3.3 Price updating expenditures

For the 2006 review, the weight reference period was the year to June 2004, which coincides with the 2003/04 HES (although expenditure on some goods and services is collected in the HES on a recall basis, meaning that purchases can span a two-year period). When alternative sources were used to derive expenditure weights, information for the year to June 2004 was used, where possible.

Expenditure information from the 2003/04 HES and other sources was price updated to the price reference period of the June 2006 quarter. The effect of price updating, which is common international practice and in line with recommendations for CPIs by the ILO, was to express the underlying 2003/04 quantities in the prices of the June 2006 quarter price reference period. In general, the indicators used to price update the weights were the lower-level CPI indexes corresponding to the goods and services in the new basket.

Prior to price updating, the expenditure totalled \$64.691 billion for 2003/04. After price updating to the June 2006 quarter, the new CPI expenditure weights totalled \$69.586 billion, which is \$4.895 billion or 7.6 percent higher than the figure prior to price updating.

Petrol prices increased by about 53 percent from 2003/04 to the June 2006 quarter, resulting in the price updating of petrol adding \$1.294 billion (or 26 percent) of the overall \$4.895 million added by price updating.

Other goods and services with high price updating ratios included other vehicle fuels and lubricants, including diesel (prices in the June 2006 quarter were 83 percent higher than in 2003/04), purchase of housing (up 31 percent), domestic air transport (up 29 percent), gas (up 22 percent), real estate services (up 21 percent), dental services (up 21 percent), electricity (up 19 percent), property maintenance services (up 16 percent), and local authority rates and payments (up 13 percent). The price updating indicator that was used for

purchase of housing was not the CPI index for purchase and construction of new dwellings. The reasons for this are given in table 2.

Goods and services for which price updating resulted in reduced expenditure included audio-visual equipment (down 39 percent), small electrical household appliances (down 12 percent), purchase of second-hand motor cars (down 5 percent), international air transport (down 3 percent) and purchase of new motor cars (down 3 percent).

For goods and services showing price increases from 2003/04 to the June 2006 quarter, price updating added \$6.215 billion to the expenditure weight. This was partly offset by a reduction of \$1.320 billion for goods and services showing price decreases from 2003/04 to the June 2006 quarter.

### **3.4 Volume adjustments**

CPIs are generally calculated using a Lowe formula that measures the changing cost of acquiring, using or paying for a basket of goods and services. The underlying quantities of goods and services in the basket relate to some earlier period (prior to the price reference period) and are held fixed.

The underlying 2003/04 quantities will be held fixed in the price index formula during the life of the index (from 2006 to 2008). These quantities will be assumed to be broadly representative of household purchases during the two-year life of the index (although it is known that consumers will to some extent substitute towards goods and services showing lower relative price change during the period).

It is also known that there have been significant shifts in quantities for some goods and services since the weight reference period of 2003/04. As the 2006 reweight happened a year later than usual, the price reference period was a year further away from the weight reference period than usual, therefore increasing the possibility and magnitude of volume shifts.

Adjustments were made to the underlying quantities in selected cases where there was strong evidence of a significant trend (rather than short-term) change in volumes since 2003/04. A wide range of possible adjustments was considered, but the number actually made was limited to those cases that were considered significant and where reliable information was available. Although the use of selected adjustments introduced a level of subjectivity into the process, this was considered preferable to steadfastly retaining the underlying 2003/04 quantities across the whole basket. The aim of making these adjustments was to improve the relevance of the expenditure weights during the period they will be used (from 2006 to 2008).

These 'volume adjustments' were made in two ways: either directly to the 2003/04 expenditures prior to price updating, or incorporated into the indicator used to price update 2003/04 expenditures.

Table 2 lists the volume adjustments that were made, the reasons for making these adjustments, and the data sources used to determine whether to adjust and by how much.

Table 2

**Consumers Price Index**  
*Expenditure-weight volume adjustments*

<b>Good or service</b>	<b>Reason for adjustment</b>	<b>Information source</b>
Wine	To reflect growth in volumes	Alcohol available for consumption figures for 2003/04 and 2005/06
Spirits and liqueurs	To reflect growth in volumes, particularly for ready-to-drink spirits	Alcohol available for consumption figures for 2003/04 and 2005/06
Purchase of housing	To reflect increases in the size of new houses and increased costs as a result of the introduction of a more stringent building consents and inspection process	Building consents and value of work put in place information
Purchase of new motor cars	To reflect a shift from large to medium and small cars since 2003/04	Vehicle registration information for the year to March 2006
Purchase of motorcycles	To reflect big increases in registrations, influenced by petrol price increases	Vehicle registration information for the year to March 2006
Urban train fares	To reflect increased usage, particularly in Auckland	Passenger numbers
Internet charges	To reflect a strong shift from dial-up to broadband connections	Internet connection numbers
Cellphone handset purchases	To reflect growth in connections and improvements in the quality of handsets	Information on the number of connections and the prices of handsets
Cellphone call charges	To reflect growth in connections and changes in average revenue per user	Information on the number of connections and average revenue per user
DVD players and player/recorders	To reflect strong volume growth, particularly in player/recorders	Retail transaction data for 2003/04, 2004/05 and 2005/06 obtained from GfK
VCR/DVD combination players	To reflect volume growth in combination players and player/recorders	Retail transaction data for 2003/04, 2004/05 and 2005/06 obtained from GfK
Television sets	To reflect strong volume growth, particularly in flat-panel plasma and LCD display television sets	Retail transaction data for 2003/04, 2004/05 and 2005/06 obtained from GfK
Digital cameras	To reflect strong growth for digital cameras, partly offset by decreased volumes for analogue cameras	Retail transaction data for 2003/04, 2004/05 and 2005/06 obtained from GfK
Subscriber television	To reflect strong growth in subscribers	Subscriber numbers
Sunday newspapers	To reflect the emergence in 2005 of a new Sunday newspaper	Circulation figures

As noted above, price updating expenditure on petrol by households during 2003/04 to June 2006 quarter prices added \$1.294 billion to the expenditure weight for petrol. According to New Zealand Energy Statistics, deliveries of petrol declined in volume terms by 0.8 percent between 2003/04 and 2005/06. However, these deliveries were for both household and non-household use. Because reliable information was not available on changes in volumes purchased by households, an adjustment was not made for any decline in petrol volumes purchased by households.

Adjustments elsewhere in the basket for any changes since 2003/04 in spending on other goods and services in the basket as a result of higher petrol prices have been limited to those transport-related goods and services in the table above. These adjustments resulted in a lower overall weight for purchase of new cars, and higher weights for purchase of motorcycles and for urban train fares. It is worth noting that the Quarterly Employment Survey measure of average weekly earnings (including overtime) increased by 8.8 percent from

2003/04 to the June 2006 quarter, broadly in line with the 7.6 percent increase (including the impact of petrol price rises) caused by expressing 2003/04 expenditures in June 2006 quarter prices.

Expenditure for some goods and services is highly cyclical or highly volatile. Two important areas of expenditure where this can be the case are the purchase of newly constructed dwellings and insurance services. For purchase of housing (and related services such as conveyancing and real estate fees), rentals for housing, and insurance services, a decision was made to extend the weight reference period to the three years ending with the HES period to derive annual average CPI expenditure weights, in order to smooth the impact of cyclical highs or lows (housing) or years with unusual claims (insurance). For the 2006 review, information for the three years to June 2004 was used.

#### 4. Analytical series

At the 2006 review, Statistics NZ had a number of options relating to price updating and expenditure weight information sources. To help shed light on the impact of the choices that were made, Statistics NZ has compiled a range of eight analytical time series. These analytical time series are based on 2003/04 weight reference period expenditures:

- without price updating or volume adjustments
- with price updating but at different levels of the hierarchical CPI classification
- based solely on the HES.

The analytical series have been compiled using Lowe, Young and geometric Young index formulas. All indexes except the geometric Young index have been set up in the price index computer system and will be calculated on an ongoing basis, in real time. To date, the time series run from the June 2006 quarter to the June 2007 quarter.

As they grow in length, the time series will be used to inform decisions regarding price updating practice for the upcoming 2008 CPI review. The time series will also be used to help assess how much value is added through devoting a significant amount of resources to the estimation of expenditure weights using information sources other than the HES for about one-third of the basket.

Table 3 describes the eight analytical series and the official CPI.

Table 3

**Consumers Price Index**  
*Analytical price updating and alternative weighting options*  
Weight reference period: 2003/04 and price reference period: June 2006 quarter

Weight/Price Updating Attribute	Official Series	Analytical Series								
		Series 1	Series 2	Series 3	Series 4	Series 5	Series 6	Series 7	Series 8	
Source of weights	HES	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Other	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Volume adjustments	Yes	No	No	No	No	No	No	No	No	No
Price updated	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No
	(subitem)	(subitem)	(class)	(subgroup)	(group)				(subitem)	
Index formula	Lowe	Lowe	Lowe	Lowe	Lowe	Lowe	Young (arithmetic)	Young (geometric)	Lowe	Young (arithmetic)

The expenditure weights of the official series are based on the 2003/04 HES and a range of other sources, volume adjustments (outlined in section 3.4) were made to reflect trend change in quantities after the weight reference period but before implementation, and weight reference period (that is, 2003/04) expenditures were price updated to the price reference period of the June 2006 quarter.

By comparison, the expenditure weights for analytical series 1 were compiled in the same way as the official series, except that no volume adjustments were made (either directly or via price updating).

The New Zealand Household Expenditure Classification (NZHEC) is loosely based on the United Nations Classification of Individual Consumption According to Purpose (COICOP). The NZHEC classification has seven levels.

Level	Level Name	Number of Categories
1	Group	11
2	Subgroup	44
3	Class	105
4	Section	176
5	Subsection	215
6	Item	487
7	Subitem	685

Expenditure weights – and index numbers – are published down to the class level of 105 categories. The current expenditure weights were calculated – and assigned in the calculation system – at the subitem level of the classification. Price updating of expenditure weights for the official series and for analytical series 1 was generally at the subitem level of NZHEC.

At the 2006 review, consideration was given to price updating 2003/04 expenditures at an intermediate level of the classification. This would have resulted in 2003/04 expenditure shares being preserved below the intermediate level. For example, if indexes at the class level were used to price update 2003/04 expenditures, there would be an assumption that households respond to change in relative prices by substituting within classes to keep expenditure shares constant, but do not substitute between classes.

Analytical series 2, 3 and 4 were compiled in the same way as series 1, except that the indexes used to price update 2003/04 expenditures were at the class, subgroup and group levels of NZHEC, respectively.

Series 1, 2, 3 and 4 were all calculated using a Lowe formula. Series 5 was compiled using the same weighting sources as series 1 to 4 (that is, the HES and other sources) and no direct volume adjustments were made. However, series 5 was not price updated, resulting in 2003/04 expenditure shares being preserved and an arithmetic Young formula being used.

The expenditure weights for series 6 are the same as those for series 5 (as at the price reference period of the June 2006 quarter). However, a geometric Young formula is being used to calculate series 6.

The 2003/04 expenditures for series 7 were compiled only from the HES (after editing and cleaning, but with no use of weighting information from other sources nor any adjustments for under-reporting). No volume adjustments were made and 2003/04 expenditures were price updated (using subitem indexes), resulting in a Lowe formula being used.

The expenditure weights for series 8 were compiled in the same way as those for series 7, except that the price-updating step was omitted. An arithmetic Young formula is being used to calculate series 8.

Table 4 shows the expenditure weights for the official CPI and for the eight analytical series, at the group level of NZHEC.

Comparing the official series with analytical series 1 (HES and other weighting sources, after price updating but without volume adjustments), shows that volume adjustments resulted in higher relative weights for recreation and culture; communication; and housing and household utilities in particular. The reasons for this are explained in relation to figures presented in table 5.

Table 4

**Consumers Price Index**  
*Group expenditure weights – percent of total*  
June 2006 quarter

Group	Official Series	Analytical Series							
		Series 1	Series 2	Series 3	Series 4	Series 5	Series 6	Series 7	Series 8
Food	17.38	17.64	17.59	17.55	17.51	18.20	18.20	18.03	18.62
Alcoholic beverages and tobacco	7.20	7.10	7.08	7.08	7.06	7.12	7.12	4.13	4.16
Clothing and footwear	4.75	4.82	4.81	4.80	4.79	5.17	5.17	3.84	4.13
Housing and household utilities	20.02	19.81	19.72	19.66	19.88	18.85	18.85	23.84	22.54
Household contents and services	5.49	5.57	5.58	5.58	5.56	5.97	5.97	5.85	6.29
Health	5.23	5.31	5.34	5.32	5.33	5.08	5.08	3.08	3.04
Transport	17.24	17.48	17.44	17.42	17.35	16.37	16.37	16.62	15.48
Communication	3.26	3.01	3.00	2.99	2.99	3.23	3.23	3.20	3.44
Recreation and culture	10.21	9.90	9.94	10.05	10.15	10.77	10.77	10.22	11.17
Education	2.08	2.11	2.10	2.09	2.07	1.98	1.98	2.63	2.47
Miscellaneous goods and services	7.13	7.23	7.42	7.46	7.32	7.26	7.26	8.57	8.67
All groups	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
All groups – NZ\$(billion)	69.586	68.559	68.778	68.931	69.097	64.075	64.075	64.468	60.073

Table 4 also shows that price updating at the class, subgroup and group levels (series 1, 2 and 3, respectively) had relatively little effect on the relative weights at the group level. However, there is a more pronounced effect at lower levels within classes, subgroups and groups that have shown strong variations in price change. For example, the television sets index within the audio-visual equipment class has shown lower relative price change than other goods and services within its class, subgroup and group. This resulted in the relative weight of television sets in series 1, 2, 3 and 4 being 0.23, 0.28, 0.34 and 0.43 percent, respectively. Interestingly, the figure for series 4 (with price updating at the group level) is very similar to the official series figure of 0.42 percent, which includes a volume adjustment to reflect strong volume growth after the weight reference period.

Comparing series 5 and 6 (HES and other weighting sources, before price updating and without volume adjustments) with series 1, 2, 3 and 4 (HES and other weighting sources, after price updating at various levels but without volume adjustments), shows that price updating the expenditure weights from the 2003/04 weight reference period to the June 2006 quarter price reference period had a strong impact on the relative weights of some groups. Series 1 has significantly higher relative weights than series 5 and 6 for housing and household utilities (mainly the result of relatively strong growth in new house prices, local authority rates and electricity prices) and transport (mainly due to petrol prices increasing by about 53 percent from 2003/04 to the June 2006 quarter). The series 1 weight for recreation and culture (9.90 percent) was lower than those for series 5 and 6 (10.77 percent), reflecting a fall of 39 percent in audio-visual equipment prices from 2003/04 to the June 2006 quarter.

The series 5 and 6 weights for recreation and culture are higher than that of the official series (10.21 percent), with the volume adjustments for the latter series being offset by price updating.

Series 7 (HES only, with price updating) has a significantly lower weight than the official series for alcoholic beverages and tobacco (4.13 percent compared with 7.20 percent), reflecting under-reporting in the HES. Series 7 also has lower relative weights for health, transport, and clothing and footwear. The reasons for these differences are explained in relation to figures presented in table 5.

Table 5 presents the expenditure weights in New Zealand dollars for selected analytical series and for the official series. Comparing series 8 (HES only, without price updating) with series 5 (HES and other weighting sources, without price updating) shows that the use of other weighting sources added a net NZ\$4.002 billion of expenditure (prior to price updating).

At the group level, alternative weighting sources resulted in higher expenditure values for series 5 (compared with series 8) for alcoholic beverages and tobacco (NZ\$2.067 billion higher), health (NZ\$1.428 billion higher, mainly as a result of the inclusion of spending on claims made, on behalf of households, by health insurance companies to health service providers), transport (NZ\$1.190 billion higher, mainly due to alternative sources being used to estimate expenditure on new cars, domestic and international air transport; and the inclusion of spending on claims made, on behalf of households, by motor vehicle insurance companies to vehicle repairers), clothing and footwear (NZ\$0.831 billion higher), and food (NZ\$0.474 billion higher, mainly due to the inclusion of independent estimates of expenditure on soft drinks and confectionery).

Alternative weighting sources resulted in lower weights for housing and household utilities (NZ\$1.458 billion lower, mainly the result of alternative sources being used to estimate the value of the net increase in the stock of owner-occupied housing), miscellaneous goods and services (NZ\$0.557 billion lower, mainly due to alternative sources being used to estimate the value of insurance service charges), and education (NZ\$0.216 billion lower, as independent sources indicated expenditure on tertiary education had been significantly over-estimated in the 2003/04 HES).

Table 5

**Consumers Price Index**  
*Expenditure weights – dollar values*  
June 2006 quarter

Group	Official Series	Analytical Series			
		Series 1	Series 5	Series 7	Series 8
NZ\$(billion)					
Food	12.094	12.094	11.660	11.622	11.187
Alcoholic beverages and tobacco	5.013	4.871	4.563	2.661	2.497
Clothing and footwear	3.305	3.305	3.311	2.476	2.480
Housing and household utilities	13.933	13.580	12.080	15.370	13.538
Household contents and services	3.822	3.822	3.828	3.771	3.778
Health	3.642	3.642	3.253	1.988	1.826
Transport	11.996	11.987	10.490	10.712	9.300
Communication	2.269	2.064	2.071	2.063	2.069
Recreation and culture	7.104	6.786	6.902	6.589	6.710
Education	1.448	1.448	1.266	1.695	1.482
Miscellaneous goods and services	4.959	4.959	4.650	5.523	5.207
All groups	69.586	68.559	64.075	64.468	60.073

Comparing series 1 (HES and other weighting sources, after price updating but without volume adjustments) with series 5 (HES and other weighting sources, before price updating and without volume adjustments) shows that price updating the expenditure weights from the 2003/04 weight reference period to the June 2006 quarter price reference period added NZ\$4.484 billion of expenditure. About two-thirds of the added expenditure came from housing and household utilities (NZ\$1.499 billion higher, mainly the result of relatively strong growth from 2003/04 to the June 2006 quarter in new house prices, local authority rates and electricity prices) and transport (NZ\$1.497 billion higher, mainly due to petrol prices increasing by about 53 percent from 2003/04 to the June 2006 quarter).

Comparing series 1 (HES and other weighting sources, after price updating but without volume adjustments) with the official series shows that volume adjustments added about NZ\$1.027 billion (after price updating).<sup>1</sup> This came largely from housing and household utilities (NZ\$0.353 billion, to reflect increases in the size and quality of new houses), recreation and culture (NZ\$0.318 billion, to reflect strong volume growth of audio-visual equipment and a strong shift from dial-up to broadband Internet connections), and communication (NZ\$0.205 billion, to reflect growth in cellphone connections, handset quality and average revenue per user).

Table 6 shows the all groups index numbers for the June 2007 quarter, on an index reference period of the June 2006 quarter (=1000), for the official series and for the eight analytical series.

Table 6

**Consumers Price Index**  
*All groups – June 2007 quarter index numbers and differences*  
Base: June 2006 quarter (=1000)

Level	Official Series	Analytical Series							
		Series 1	Series 2	Series 3	Series 4	Series 5	Series 6	Series 7	Series 8
All groups	1019.60	1020.28	1020.69	1021.24	1020.43	1020.39	1017.99	1020.49	1020.75
Index points difference <sup>(1)</sup>	...	0.68	1.09	1.64	0.83	0.79	-1.61	0.89	1.15

(1) Analytical series minus official series.

Symbol:

... not applicable

The June 2007 quarter index numbers for the seven analytical series calculated using Lowe or arithmetic Young formulas are higher than that for the official series, by between 0.68 and 1.64 index points. The smallest differences are for series 1 (which, compared with the official series, omits volumes adjustments) and series 5 (which omits both volumes adjustments and price updating).

Series 6 (which is calculated using the geometric Young formula and omits both volumes adjustments and price updating), is 1.61 index points lower than the official series (and 3.25 index points lower than series 3, which had weights price updated at the subgroup level).

Following implementation of the 2006 CPI review, Statistics NZ published an information paper (Statistics New Zealand, 2007) that presented results of a retrospective superlative index calculated between the June 2002 quarter and the June 2006 quarter. After accounting for changes between 2002 and 2006 in the way that the housing-related expenditure weights were calculated, the analytical Fisher index rose by an average of 1.83 index points per year less than the Lowe index during the period from the June 2002 quarter to the June 2006 quarter.

<sup>1</sup> When the 2006 expenditure weights were compiled, volume adjustments were actually made prior to price updating from 2003/04 to the June 2006 quarter.

Table 7 gives index numbers for the June 2007 quarter at the group level, for the official series and for the eight analytical series.

Table 7

**Consumers Price Index**  
*Groups – June 2007 quarter index numbers and differences*  
Base: June 2006 quarter (=1000)

Group	Official Series	Analytical Series							
		Series 1	Series 2	Series 3	Series 4	Series 5	Series 6	Series 7	Series 8
		Index number							
Food	1041	1041	1044	1044	1044	1044	1039	1041	1045
Alcoholic beverages and tobacco	1034	1034	1034	1034	1034	1034	1034	1033	1033
Clothing and footwear	1001	1001	1001	1001	1000	1000	1000	1002	1001
Housing and household utilities	1052	1052	1051	1051	1051	1050	1050	1052	1051
Household contents and services	1011	1011	1011	1011	1010	1010	1010	1011	1010
Health	1024	1024	1022	1021	1021	1021	1018	1005	1002
Transport	970	969	970	975	977	977	975	965	973
Communication	1002	1008	1008	1008	1003	1003	1002	1008	1003
Recreation and culture	999	1005	1004	1002	996	996	992	1005	997
Education	1032	1032	1031	1031	1031	1031	1030	1032	1031
Miscellaneous goods and services	1033	1033	1034	1033	1031	1031	1030	1029	1027
		Index points difference <sup>(1)</sup>							
Food	...	0	3	3	3	3	-2	0	4
Alcoholic beverages and tobacco	...	0	0	0	0	0	0	-1	-1
Clothing and footwear	...	0	0	0	-1	-1	-1	1	0
Housing and household utilities	...	0	-1	-1	-1	-2	-2	0	-1
Household contents and services	...	0	0	0	-1	-1	-1	0	-1
Health	...	0	-2	-3	-3	-3	-6	-19	-22
Transport	...	-1	0	5	7	7	5	-5	3
Communication	...	6	6	6	1	1	0	6	1
Recreation and culture	...	6	5	3	-3	-3	-7	6	-2
Education	...	0	-1	-1	-1	-1	-2	0	-1
Miscellaneous goods and services	...	0	1	0	-2	-2	-3	-4	-6

(1) Analytical series minus official series. Calculated from index numbers rounded to the nearest index point.

Symbol:

... not applicable

There were moderate differences for food. Unusually high June 2006 quarter prices for some fresh vegetable items in the basket resulted in high price updating ratios from the weight reference period to the price reference period, giving higher relative weights to subsequent falls for the official series, series 1 and series 7.

Looking at the health group, series 7 and 8 were 19 and 22 index points, respectively, lower than the official series. This is due to a combination of:

- significantly higher relative official series weights for out-patient services and for hospital services, which were independently estimated for the official series and included spending on claims made, on behalf of households, by health insurance companies directly to health service providers
- high price change for out-patient services and for hospital services, relative to the other subgroup within health (that is, medical appliances, products and equipment).

Fuel prices fell about 9 percent from the June 2006 quarter to the June 2007 quarter, resulting in transport series that omitted price updating (that is, series 5, 6 and 8) or where price updating was at much higher levels in the structure (series 3 and 4), tracking several index points higher than the official series. Series 7 is 5 index points lower than the official series. This is because passenger transport prices rose during the year and the official series has a higher relative weight (as the weights estimated from alternative sources for domestic and international air transport were higher than those derived from the HES).

Strong price falls for telecommunication equipment during the price updating period and from the June 2006 quarter to the June 2007 quarter resulted in the analytical series that omitted price updating (series 5, 6 and 8), that were price updated at the group level (series 4) or that had volume adjustments (official series) being several index points lower at the June 2007 quarter than those series that were price updated at low levels (without volume adjustments).

As might be expected of the group that includes audio-visual and computing equipment, there were differences for recreation and culture. Series that omitted price updating (series 5, 6 and 8) or were price updated at the group level (series 4) tracked lower than the official series (despite volume adjustments). By comparison, series 1, 2, 3 and 7 (which were price updated at lower levels of NZHEC, without volume adjustment) were several index points higher than the official series at the June 2007 quarter.

Expenditure weights and index numbers for the official CPI and for the eight analytical series at the subgroup level of NZHEC are included in tables 8 and 9 of the appendix. Two points of interest follow.

It was noted above that unusually high June 2006 quarter prices for some fresh vegetable items in the basket resulted in high price updating ratios from the weight reference period to the price reference period, giving higher relative weights to subsequent falls for series that were price updated at the subitem level (that is, the official series, series 1 and series 7). For each of these three series, a June 2007 quarter index number of 1093 was recorded for the fruit and vegetables subgroup. This was between 20 and 22 index points lower than for the remaining series calculated using Lowe or arithmetic Young formulas. However, the figure for series 6 of 1092 (calculated using the geometric Young formula) was within an index point of the figure for the official series.

For the audio-visual and computing equipment subgroup, the June 2007 quarter index number for the official series (which included volume adjustments and price updating) of 875 was between 5 and 19 index points lower than the analytical series calculated using Lowe or arithmetic Young formulas. However, the figure for series 6 (calculated using a geometric Young formula) matched that of the official series.

## 5. Conclusion

Statistics NZ has compiled a range of analytical time series to help shed light on the impact of the choices made concerning price updating and expenditure weight information sources.

These analytical series have been compiled using Lowe, Young and geometric Young index formulas. All indexes except the geometric Young index have been set up in the price index computer system and will be calculated on an ongoing basis, in real time.

To date, the time series run for only a year, limiting the extent to which conclusions could be drawn.

As the time series grow in length, they will be used to inform decisions regarding price updating practice for the upcoming 2008 CPI review and future reviews. The time series will also be used to help assess how much value is added through devoting a significant amount of resources to the estimation of expenditure weights using information sources other than the HES for about one-third of the basket.

The June 2007 quarter index numbers for the seven all groups analytical series calculated using Lowe or arithmetic Young formulas are higher than that for the official series, by between 0.68 and 1.64 index points. The smallest differences are for series 1 (which, compared with the official series, omits volume adjustments) and series 5 (which omits both volumes adjustments and price updating).

Series 6 (which is calculated using the geometric Young formula and omits both volume adjustments and price updating), is 1.61 index points lower than the official series. By comparison, a retrospective analytical Fisher series calculated between the June 2002 quarter and the June 2006 quarter rose by an average of 1.83 index points per year less than the official series (after accounting for changes between 2002 and 2006 in the way that the housing-related expenditure weights were calculated).

## References

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## Appendix

Table 8

**Consumers Price Index**  
*Subgroup expenditure weights – percent of total*  
 June 2006 quarter

Subgroup	Official Series	Analytical Series							
		Series 1	Series 2	Series 3	Series 4	Series 5	Series 6	Series 7	Series 8
Fruit and vegetables	2.20	2.24	2.27	2.26	2.28	2.37	2.37	2.31	2.45
Meat, poultry and fish	2.82	2.86	2.87	2.87	2.86	2.97	2.97	2.99	3.11
Grocery food	6.70	6.80	6.77	6.76	6.83	7.10	7.10	6.52	6.82
Non-alcoholic beverages	1.62	1.65	1.65	1.65	1.62	1.69	1.69	1.23	1.28
Restaurant meals and ready-to-eat food	4.03	4.09	4.02	4.01	3.92	4.07	4.07	4.97	4.95
Alcoholic beverages	4.97	4.84	4.82	4.83	4.84	4.89	4.89	2.78	2.82
Cigarettes and tobacco	2.23	2.27	2.26	2.25	2.21	2.24	2.24	1.35	1.34
Clothing	3.95	4.01	4.00	4.00	3.95	4.26	4.26	3.16	3.36
Footwear	0.80	0.81	0.80	0.80	0.84	0.91	0.91	0.68	0.77
Actual rentals for housing	6.87	6.97	6.95	6.93	7.38	7.02	7.02	7.67	7.75
Home ownership	4.66	4.21	4.20	4.19	4.06	3.86	3.86	7.07	6.35
Property maintenance	2.24	2.27	2.24	2.21	2.30	2.14	2.14	2.35	2.22
Property rates and related services	2.44	2.48	2.47	2.47	2.47	2.35	2.35	2.63	2.51
Household energy	3.82	3.88	3.86	3.85	3.66	3.48	3.48	4.12	3.71
Furniture, furnishings and floor coverings	2.07	2.10	2.11	2.10	2.08	2.24	2.24	2.19	2.33
Household textiles	0.53	0.54	0.53	0.53	0.55	0.59	0.59	0.57	0.63
Household appliances	1.16	1.18	1.17	1.19	1.19	1.28	1.28	1.22	1.34
Glassware, tableware and household utensils	0.35	0.36	0.36	0.35	0.36	0.39	0.39	0.38	0.42
Tools and equipment for house and garden	0.45	0.46	0.47	0.47	0.47	0.50	0.50	0.48	0.52
Other household supplies and services	0.93	0.94	0.94	0.93	0.92	0.98	0.98	1.01	1.06
Medical products, appliances and equipment	1.13	1.15	1.17	1.18	1.20	1.17	1.17	1.08	1.10
Out-patient services	3.42	3.47	3.48	3.46	3.45	3.27	3.27	1.73	1.68
Hospital services	0.68	0.69	0.69	0.68	0.68	0.64	0.64	0.27	0.26
Purchase of vehicles	5.24	5.32	5.30	5.31	6.29	5.96	5.96	5.06	5.69
Private transport supplies and services	9.27	9.41	9.35	9.36	8.11	7.64	7.64	9.44	7.59
Passenger transport services	2.73	2.76	2.79	2.74	2.95	2.78	2.78	2.12	2.20
Postal services	0.16	0.16	0.16	0.16	0.15	0.16	0.16	0.17	0.17
Telecommunication equipment	0.15	0.07	0.07	0.07	0.13	0.15	0.15	0.08	0.15
Telecommunication services	2.96	2.78	2.77	2.76	2.70	2.93	2.93	2.95	3.12
Audio-visual and computing equipment	1.83	1.52	1.52	1.60	2.00	2.12	2.12	1.57	2.20
Major recreational and cultural equipment	0.42	0.43	0.43	0.43	0.42	0.45	0.45	0.44	0.46
Other recreational equipment and supplies	2.01	2.04	2.05	2.06	2.14	2.27	2.27	2.14	2.39
Recreational and cultural services	2.88	2.81	2.79	2.79	2.62	2.79	2.79	2.98	2.96
Newspapers, books and stationery	1.58	1.59	1.59	1.63	1.52	1.61	1.61	1.48	1.51
Accommodation services	0.66	0.67	0.66	0.66	0.62	0.65	0.65	0.71	0.70
Package holidays	0.84	0.85	0.89	0.89	0.83	0.88	0.88	0.90	0.94
Early childhood education	0.35	0.35	0.35	0.35	0.35	0.33	0.33	0.37	0.35
Primary and secondary education	0.70	0.71	0.71	0.71	0.67	0.64	0.64	0.75	0.68
Tertiary and other post school education	1.03	1.05	1.04	1.04	1.05	1.00	1.00	1.51	1.44
Personal care	2.14	2.17	2.18	2.17	2.27	2.25	2.25	2.28	2.37
Personal effects	0.58	0.59	0.60	0.60	0.63	0.62	0.62	0.62	0.65
Insurance	1.70	1.72	1.73	1.77	1.82	1.81	1.81	3.22	3.28
Credit services	0.76	0.77	0.76	0.76	0.78	0.77	0.77	0.78	0.79
Other miscellaneous services	1.95	1.98	2.15	2.16	1.83	1.81	1.81	1.66	1.58
All groups	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 9

**Consumers Price Index**  
*Subgroups – June 2007 quarter index numbers*  
 Base: June 2006 quarter (=1000)

Subgroup	Official Series	Analytical Series							
		Series 1	Series 2	Series 3	Series 4	Series 5	Series 6	Series 7	Series 8
Fruit and vegetables	1093	1093	1113	1115	1115	1115	1092	1093	1115
Meat, poultry and fish	1090	1090	1094	1094	1094	1094	1089	1090	1094
Grocery food	1006	1006	1005	1006	1006	1006	1004	1004	1004
Non-alcoholic beverages	1034	1034	1034	1034	1034	1034	1034	1036	1036
Restaurant meals and ready-to-eat food	1038	1038	1038	1038	1038	1038	1038	1038	1038
Alcoholic beverages	1031	1031	1030	1030	1030	1030	1030	1030	1029
Cigarettes and tobacco	1041	1041	1041	1041	1041	1041	1041	1041	1041
Clothing	1004	1004	1004	1004	1004	1004	1004	1005	1005
Footwear	982	982	981	981	981	981	981	983	982
Actual rentals for housing	1026	1026	1026	1026	1026	1026	1026	1026	1026
Home ownership	1061	1061	1061	1061	1061	1061	1061	1061	1061
Property maintenance	1051	1051	1050	1049	1049	1049	1049	1051	1049
Property rates and related services	1079	1079	1079	1079	1079	1079	1079	1079	1079
Household energy	1070	1070	1070	1070	1070	1070	1070	1070	1070
Furniture, furnishings and floor coverings	1022	1022	1022	1022	1022	1022	1021	1022	1022
Household textiles	978	978	978	978	978	978	977	978	978
Household appliances	1003	1003	1003	1001	1001	1001	1000	1003	1001
Glassware, tableware and household utensils	991	991	991	991	991	991	991	991	991
Tools and equipment for house and garden	1018	1018	1017	1017	1017	1017	1016	1017	1017
Other household supplies and services	1021	1021	1022	1021	1021	1021	1020	1021	1020
Medical products, appliances and equipment	988	988	987	987	987	987	985	984	983
Out-patient services	1027	1027	1025	1024	1024	1024	1021	1008	1005
Hospital services	1067	1067	1067	1067	1067	1067	1067	1064	1064
Purchase of vehicles	982	981	981	981	981	981	981	982	982
Private transport supplies and services	950	950	950	960	960	960	957	944	954
Passenger transport services	1015	1014	1013	1013	1013	1013	1010	1019	1016
Postal services	1028	1028	1028	1028	1028	1028	1027	1028	1028
Telecommunication equipment	803	829	814	814	813	813	812	829	813
Telecommunication services	1011	1012	1011	1011	1011	1011	1011	1012	1011
Audio-visual and computing equipment	875	891	888	881	880	880	875	894	885
Major recreational and cultural equipment	1025	1025	1023	1023	1024	1024	1023	1025	1023
Other recreational equipment and supplies	1009	1009	1008	1007	1007	1007	1006	1009	1007
Recreational and cultural services	1019	1020	1019	1019	1019	1019	1018	1020	1019
Newspapers, books and stationery	1057	1057	1057	1058	1058	1058	1056	1058	1059
Accommodation services	1039	1039	1038	1038	1038	1038	1038	1039	1038
Package holidays	1018	1018	1018	1018	1018	1018	1018	1018	1018
Early childhood education	995	995	995	995	995	995	995	995	995
Primary and secondary education	1072	1072	1072	1072	1072	1072	1072	1072	1072
Tertiary and other post school education	1017	1017	1016	1016	1016	1016	1016	1021	1021
Personal care	1014	1014	1014	1013	1013	1013	1012	1014	1013
Personal effects	1071	1071	1067	1065	1065	1065	1062	1071	1065
Insurance	1012	1012	1012	1012	1012	1012	1011	1016	1016
Credit services	982	982	982	982	982	982	982	981	981
Other miscellaneous services	1082	1082	1083	1081	1081	1081	1081	1080	1080