

# 2016 Health and Lifestyles Survey

## Methodology Report

May 2017

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**Prepared for the Health Promotion Agency by:**

Dr Holly Trowland, Thewaporn (Wa) Thimasarn-Anwar and Dr Hanna Squire (HPA),  
Neil Tee (CBG Health Research Ltd)

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Health Promotion Agency  
PO Box 2142  
Wellington 6140  
New Zealand  
[www.hpa.org.nz](http://www.hpa.org.nz)

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## LIST OF ACRONYMS

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CBG	CBG Health Research Ltd, the research provider for the HLS
DEFF	Design Effect
HLS	Health and Lifestyles Survey
HPA	Health Promotion Agency
HSC	Health Sponsorship Council
PAF	NZ Post Postal Address File
PCG	Parent/caregiver
PPS	Probability Proportional to Size
PSU	Primary Sampling Units

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# 1. INTRODUCTION

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The Health and Lifestyles Survey (HLS) is a biennial monitor of the health behaviours and attitudes of New Zealanders, first carried out in 2008. It has two components: a survey of adults aged 15 years and over and a survey of parents and caregivers of 5 to 16-year-olds. The HLS is managed by the Health Promotion Agency (HPA). HPA's mission is to inspire all New Zealanders to lead healthier lives by leading and delivering programmes to promote health and wellbeing. These programme areas include: alcohol, gambling harm, health education, mental health, immunisation, nutrition and physical activity, tobacco and skin cancer prevention.

The 2016 HLS involved face-to-face interviews with 3,854 adults (aged 15 years and over) and 1,160 parents and caregivers of 5 to 16-year-olds.

This methodology report details the procedures and protocols followed to ensure the HLS produces high quality, robust data. Specific analyses such as short fact sheets and reports can be accessed at: <http://www.hpa.org.nz/research-library/research-publications>.

## 1.1 BACKGROUND

Before the introduction of the HLS in 2008, the Health Sponsorship Council (HSC)<sup>1</sup> undertook a number of different monitor surveys to benchmark and monitor changes in New Zealanders' knowledge, attitudes and behaviour in response to its social marketing and health promotion programmes and community-level activities in the health sector. These included:

- Smokefree/Auahi Kore Monitor, which had been running since the early 1990s and had been run annually since 2003
- 2006/07 Gaming and Betting Activities Survey, which provided benchmark measures for the minimising gambling harm programme
- New Zealand Children's Food and Drinks Survey, undertaken in 2007 to provide benchmark measures for the nutrition and physical activity programme
- Sun Protection Triennial Survey, which monitored responses to the sun safety programme and had been undertaken since 1994.

These monitors focused on adults, although the Gaming and Betting Activities Survey, the Children's Food and Drink Survey and the Sun Protection Triennial Survey also interviewed young people in the target age group for that particular programme.

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<sup>1</sup> HSC and the Alcohol Advisory Council (ALAC) merged in 2012 to form HPA.

In 2007, HSC reviewed the adult surveys and combined the majority of these into a single survey - the HLS - and covered wider areas such as alcohol, tobacco control, sun safety, minimising gambling harm, nutrition and physical activity, mental health and immunisation.

## 1.2 OBJECTIVES OF THE HLS

The objectives of the HLS are to:

- measure progress against HPA's existing programme plans
- provide quality measures for Statement of Intent reporting requirements. Examples of measures of HPA's strategic objectives include: more New Zealanders drink at low-risk levels; more New Zealand young adults are smokefree; more at-risk gamblers monitor their gambling behaviour (Statement of Intent for 2014-2018, Health Promotion Agency 2014)
- monitor short, medium and long-term societal changes in attitudes, knowledge and behaviours, and track changes in views about the social desirability and acceptability of various measures of tobacco control, minimising gambling harm, nutrition and physical activity, alcohol, sun safety, immunisation and mental health.

The 2016 HLS included a comprehensive set of items relating to problem gambling, to enable comparisons with measures from the 2006/07 Gaming and Betting Activities Survey and previous waves of the HLS.

## 1.3 ETHICAL CONSIDERATION

The 2016 HLS survey proposal was submitted to the New Zealand Ethics Committee and approval was granted in May 2016.

The 2016 HLS was voluntary and this was clearly explained to potential participants in HPA's brochure, on HPA's website, as well as verbally by the interviewer. Confidentiality of all information provided by respondents in the interviews was assured by the Privacy Act 1993. The final, stored electronic records contain no identification of the participating respondents and responses can only be analysed as overall or grouped data.



## 2. POPULATION AND FRAME

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This section discusses the target population, the survey population and the sample frame.

The *target population* is the population the survey aims to represent. All statistics for the survey refer to the target population.

The *survey population* is the population that had a probability of being selected to participate in the survey. For reasons discussed below, a small proportion of people in the target population did not have a chance of being selected to participate in the survey. As a result, the survey population is slightly smaller than the target population.

The *sample frame* is the list of areas, and the lists of dwellings and people within these areas, that were used to select the HLS sample from the survey population.

The *sample weights* are designed to reflect the target population, so that the weighted statistics produced from the HLS can be taken to be representative of the target population. Weighting is discussed in Section 9 of this report.

### 2.1 TARGET POPULATION

The target population was the usually resident civilian population aged 15 years and over living in permanent private dwellings in New Zealand. The size of the target population for the adult survey was 3,772,995 individuals (the 2016 estimated resident population from Statistics New Zealand).

For reasons of practicality and cost-effectiveness, the target population is defined to include only permanent private dwellings, so temporary private dwellings are excluded, including caravans, cabins and tents in a motor camp, and boats. The target population also excludes non-private dwellings. Examples of non-private dwellings are hotels, motels, guest houses, boarding houses, homes for the elderly, hostels, motor camps, hospitals, barracks, and prisons.

People were eligible to be interviewed at their usual residence only. If they were temporarily visiting a household that was selected into the HLS they were not eligible for selection as part of that household. This process ensured that double counting was not possible.

People who were usually resident in a private dwelling in New Zealand, but who were temporarily overseas for some of the survey period, were included in the target population. In the majority of cases these individuals had a chance of being selected in the survey, as the survey provider made up to 10 calls to selected households in the sample over the survey period. The benchmarks used in weighting the survey also included usual residents temporarily overseas.

## 2.2 SURVEY POPULATION

Households were only included if they were in meshblocks with 10 or more occupied dwellings (according to the 2013 New Zealand Census of Population and Dwellings). This meant that a small number of households (about 2%) that were part of the defined target population were excluded from the survey population. However, these have been accounted for in the final estimates via the survey weights. Due to the small number of households omitted, any possible bias is likely to have little consequence.

## 2.3 SAMPLING FRAME

The 2013 New Zealand census meshblocks were used as the area-based sampling frame. Meshblocks are the smallest geographical measure used by Statistics New Zealand. They vary in size from a city block to a large rural area and are used to make up other geographical measures in New Zealand (Statistics New Zealand, 2014a). These were the primary sampling units (PSU) of the HLS.

The sampling frame comprised of 37,525 meshblocks that had 10 or more dwellings. A sample of 500 meshblocks were selected from this frame. Addresses for households in the selected meshblocks (from a NZ Post Postal Address File) were used as a frame from which a sample of dwellings was selected. One eligible adult and/or one parent/caregiver (if any) was then selected from each selected dwelling.

### 3. SAMPLE DESIGN

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The 2016 HLS was designed to be a nationally representative survey. It was conducted using a complex survey design, where different people have different probabilities of being selected to participate in the survey. The complex design was used for a variety of reasons, including: reducing interviewer travel costs by ensuring the sample is geographically clustered, and ensuring all sub-populations of interest have a sufficient sample size to provide reliable statistics. This section details the rationale for the sample design and sampling selection procedures.

#### 3.1 RATIONALE FOR THE SAMPLE DESIGN

A primary consideration in the sample design of the HLS was the need for sufficient sample sizes of Māori, Pacific peoples, people of European/Other ethnicities, as well as low socio-economic status groups and current smokers. The main groups of interest were adults aged 15 years and over, and parents and caregivers of 5 to 16-year-old children. The challenge for the sampling methodology was to arrive at a sample that could:

- provide national, projectable figures
- use a survey method with higher (face-to-face) rather than lower (phone, mail, web) public participation
- deliver 3,570 interviews with adults aged 15 years and over, including 640 interviews with Māori, 430 with Pacific peoples, and 360 with Asian people
- deliver 1140 interviews from parents/caregivers of 5 to 16-year-olds (including interviews with 290 Māori, 290 Pacific peoples and 140 Asian people)
- provide the minimum design effect for the overall sample and specific target groups within the budget for the survey.

The simplest possible sample design would be a random sample drawn from all people in New Zealand, so that everyone has an equal and independent chance of being selected in the sample. However, a design of this type would not be feasible for the following reasons:

- The sample would be geographically very dispersed, requiring interviewers to travel great distances between interviews.
- It would not result in large enough numbers of Māori or Pacific peoples to enable adequate statistics for these groups.

Therefore, the 2016 HLS used a complex sample design.

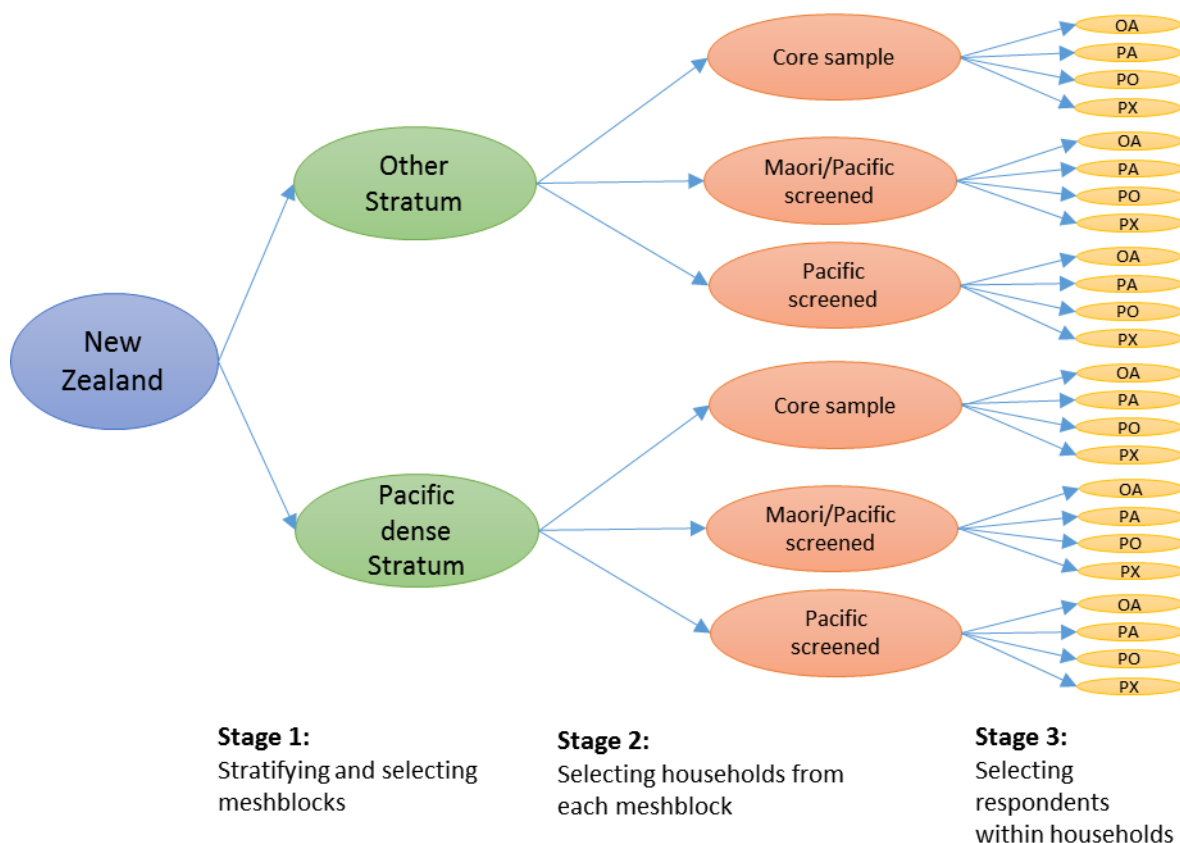
Complex designs have two main features that affect the precision of statistics coming from the survey:

1. *Different people have a different chance of selection.* This was captured in the 'weight', which is the number of people that each survey respondent represents in the target population. In the 2016 HLS, Māori and Pacific peoples had lower weights than other people to reflect the fact that these groups had an increased chance of selection in the sample relative to simple random sampling. Sampling of one adult per household also led to different weights, because adults in larger households received a larger weight. In the 2016 HLS, the selection weight for adult participants who were selected for the parent/caregiver sample was adjusted to account for their increased chance of selection in the adult sample.
2. *The sample was 'clustered'.* In the HLS a sample of meshblocks was selected, and then a sample of households was selected from each meshblock. If the households in the sample were shown on a map of New Zealand they would appear clumped. Clustering made the survey more cost effective as interviewers did not have to travel between as many areas as they would if simple random sampling was used.

## 3.2 SAMPLE SELECTION PROCEDURE

The HLS used a three-stage selection procedure. As summarised in Figure 3-1, this was: stratifying and selecting meshblocks; selecting households from each meshblock; and finally selecting an individual from within each household to complete the questionnaire.

**Figure 3-1 Multi-stage selection procedure**



Note: OA = Adults questionnaire only; PX = Parent/caregiver questionnaire only; PO = adult and parent/caregiver questionnaires were completed by the same person; PA = adult and parent/caregiver questionnaires were completed by different person from the same household.

### Stage 1: Stratifying and selecting meshblocks

Meshblocks from the 2013 New Zealand Census were used as part of an area-based sampling frame. Based on 2013 Census data, 37,525 eligible meshblocks met the 2016 HLS selection criteria (see Section 2.3 for selection criteria). The meshblocks were grouped into two strata; namely the Pacific-dense stratum and Other stratum. The Pacific-dense stratum comprised meshblocks which have a population of at least 20% Pacific Islanders by total response ethnicity, and the Other stratum comprised all other remaining meshblocks within the sampling frame.

Meshblocks vary considerably in size and were, therefore, selected by a probability proportional to size (PPS) design within each stratum. The size measure was the number of occupied dwellings in the meshblock according to the 2013 Census. This means that larger meshblocks had an increased chance of selection in the design. In total, 500 meshblocks were drawn, with 80 selected from within the Pacific stratum and 420 selected from the Other stratum.

### **Stage 2: Selecting households within meshblocks**

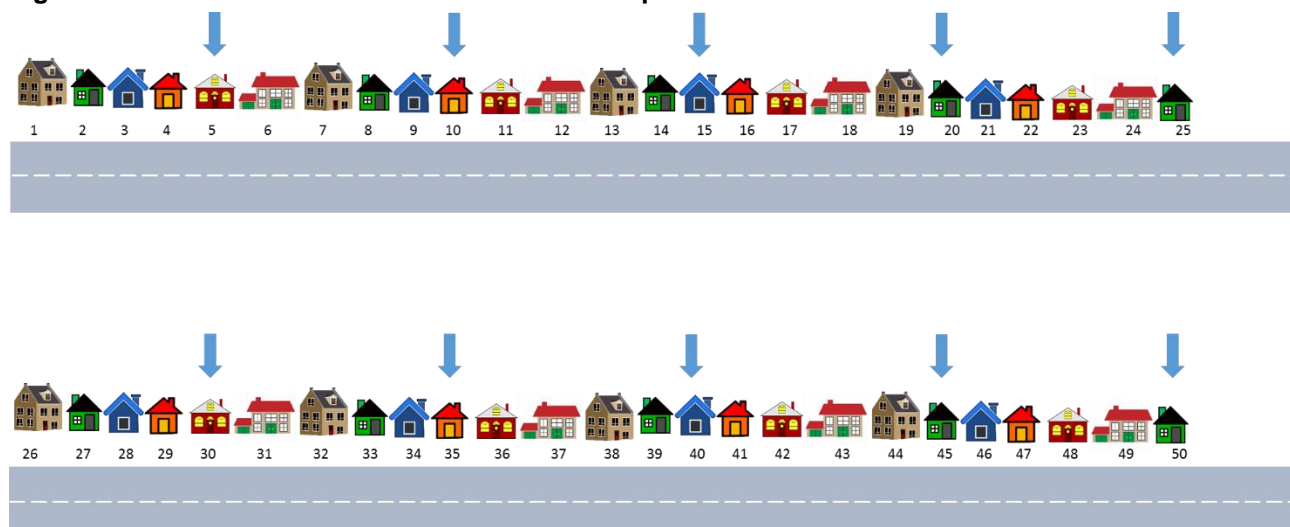
Within each selected meshblock, some households were screened for people within the sub-populations of interest (Māori and Pacific peoples) and some households were not screened. Households were classified into three categories on the basis of screening (as can be seen in Figure 3-1):

- The core sample: households that were not screened and where anyone 15-years and over was eligible to participate.
- The Māori/Pacific screened sample, where screening took place and both Māori and Pacific peoples were eligible to participate.
- The Pacific screened sample, where screening took place and only Pacific peoples were eligible to participate.

The number of households selected in each of these three samples was determined before interviewers went to field, using the sample targets. This system enables the targets to be filled by giving some people a higher chance of being selected into the study.

Given that the number of households selected in each of the sample types had been specified prior to the fieldwork, Pacific peoples would be eligible to participate from all three sample types (core, Māori/Pacific screened and Pacific screened). Māori people would be eligible to participate in the survey if they lived in a household selected into either the core sample or Māori/Pacific screened sample. All people of other ethnicities would be eligible to participate only in the core sample households.

**Figure 3-2: Household selection into the core sample**



As presented in Figure 3-2, households in the core sample were selected by a systematic procedure of beginning at a random dwelling pre-allocated within the meshblock and selecting every  $k^{th}$  house. The skip  $k$ , is determined by the number of dwellings in the meshblock and it was defined as the ratio of the pre-determined number of households in the core sample for a particular meshblock and the total number of households in that meshblock. In the example meshblock in Figure 3-2, there are 50 houses with 10 houses selected for the core sample, so the skip is 5. On average, 10 households per meshblock were selected into the core sample, with a maximum of 15.

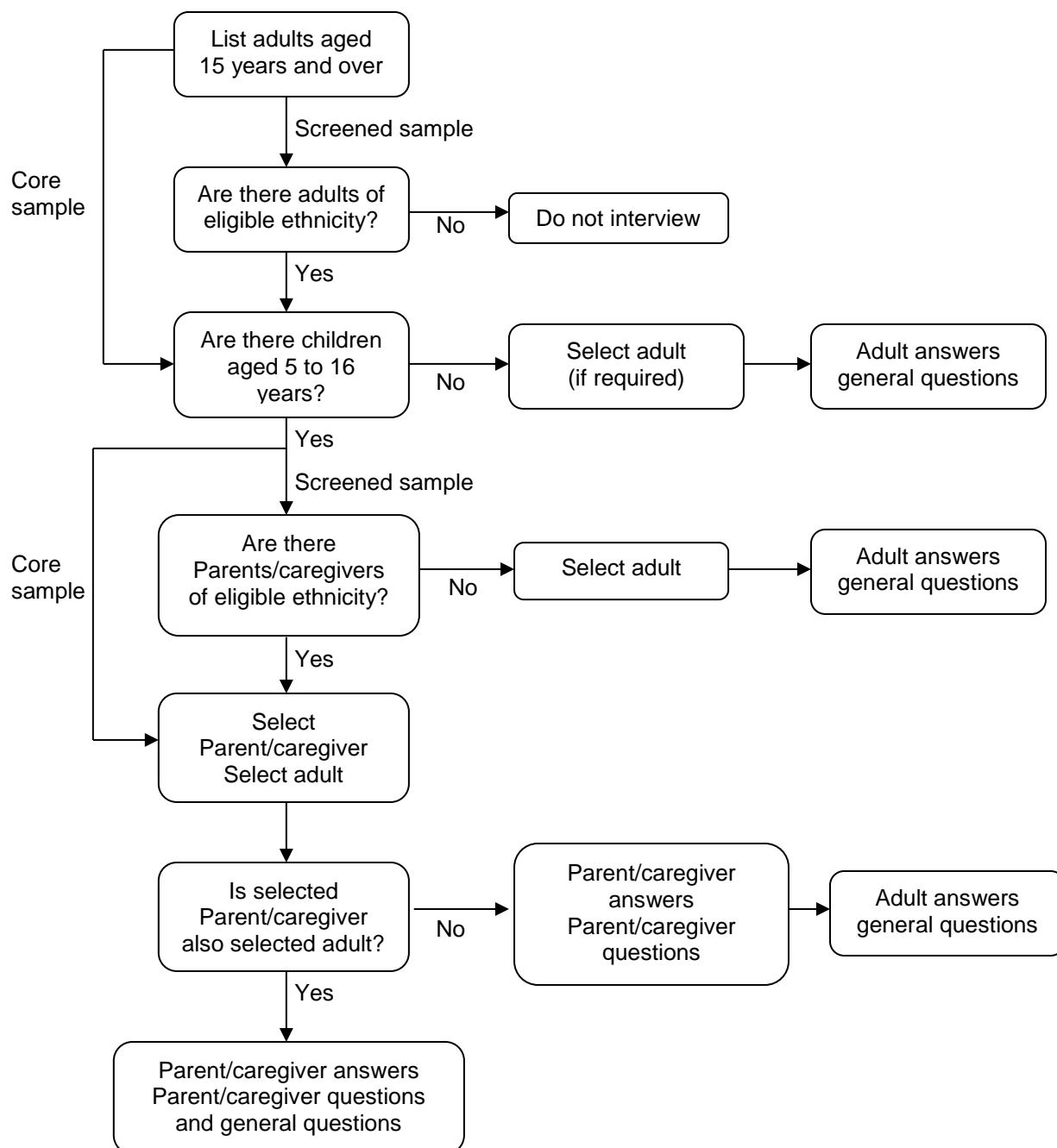
Up to 22 of the dwellings in between the core houses were then selected as the screened sample. In up to 14 of these 22 dwellings, both Māori and Pacific peoples were eligible to be sampled, in the remaining eight dwellings only Pacific peoples were eligible to be sampled. There was no substitution of households or respondents if the selected household or respondent was not contactable or was unavailable.

### **Stage 3: Select respondents within households**

From within each household, one Parent/caregiver was selected for the Parent/caregiver survey (the PCG sample), and one adult was selected for the Adult survey.

The procedure for selecting respondents in the 'core' and 'screened' households was essentially the same. Figure 3-3 shows that, within each household, all eligible adults and parents who were aged 15 years and over and usually resided at that dwelling were identified. One adult and one parent (if there were any) were then selected from the lists of those who were eligible.

**Figure 3-3: Diagram of the 2016 HLS respondent selection process within the household**



Within each household, all eligible adults who were aged 15 years and over and usually resided at that dwelling were identified. The initials and ages of eligible respondents were obtained from the person who answered the door.

The interviewer then asked the person to identify which ethnic groups each person belong to using the Statistics New Zealand question that was used in the 2013 Census; coding each person as either Māori, Pacific or Other (or any combination of the three groups). In Māori and Pacific screened households, ethnicity was prioritised in the order of Māori, Pacific, Other for the purposes



of respondent selection. In households screened for Pacific peoples only, ethnicity was prioritised as Pacific, Māori, Other.

Finally, the interviewer asked if there were any children aged between 5 and 16 years old who usually lived at the address four or more days per week. If there were any, the interviewer recorded whether any of the adults were parents or caregivers of these children. Once all of this information had been captured, CBG's 'Sample Manager' software selected the respondent(s) to take part according to the algorithm detailed in Figure 3-3.

## Selection outcomes

There were four combinations of PCG and Adult interviews conducted in each household: 'adults only' (OA), 'combined' (PO), 'parent and adult' (PA) and 'parent/caregiver only' (PX) (see Figure 3-1, Stage 3):

- If there were no 5 to 16-year-old children living in the household, and the household was included as part of the Adult sample (which occurred approximately 50% of the time), then one adult was selected from all of the adults in the household. This outcome was classified as **'adults only' (OA)**.

If there were 5 to 16-year-old children living in the household, then one parent/caregiver was selected from the list of parents/caregivers in the household to participate in the PCG survey. In these cases, a person in the household was also selected for the Adult survey. There are three different outcomes in these households:

- After the parent/caregiver was selected, that same person could be selected to complete the Adult interview as well. This meant that in some households a single person was interviewed as part of the PCG sample and as part of the Adult sample. In order to reduce the number of dwellings in which two interviews were required, the probability of selection of the person who was selected for the PCG interview to be selected for the adult interview as well was double that of the other adults in the household. The situation where the same person was selected to do both the PCG interview and the Adult interview was classified as **'combined' (PO)**.
- Sometimes, the person who was selected for the PCG interview was not selected for the Adult interview. In this case, another adult in the house was selected for the Adult interview and there were two people interviewed in the same house; the adult and the parent/caregiver. This outcome was classified as **'parent and adult' PA**.
- In 66 cases, only a PCG interview was completed in a house. This situation occurred when a person is selected for the PCG interview but the person who was selected for the adult interview refuses to participate, so only a PCG interview takes place. This outcome was classified as **'parent/caregiver only' (PX)**.

Overall, 3,854 people aged 15 years and over participated in the Adult sample and 1,160 people participated in the PCG sample. Table 3-1 summarises the selection outcome and resulting interview types.

**Table 3-1: Selection outcome and resulting interview type for the 2016 HLS**

Interview type	Selection outcome				Total
	OA	PA	PO	PX	
PCG	0	313	0	66	<b>379</b>
Adult	2,760	313	0	0	<b>3,073</b>
Combined adult/PCG	0	0	781	0	<b>781</b>
<b>Total</b>	<b>2,760</b>	<b>626</b>	<b>781</b>	<b>66</b>	<b>4,233</b>

### 3.3 DESIGN EFFECT

The net effect of a complex design can be measured by the design effect (or DEFF). The DEFF is commonly used across household surveys to evaluate the effect of the survey design on estimates calculated from survey data (see for example: Gibson, Beegle, De Weerd, & Friedman, 2015; Lotz et al., 2016; Groves & Heeringa, 2006). It is important to consider the DEFF because the underlying assumption of most statistical tests is that the data are equivalent to a simple random sample with a 100% response rate. However, for the reasons outlined in Section 3.1, the HLS used a complex survey design.

The DEFF is the ratio of the variance (a measure of precision) of an estimate achieved by a complex design relative to the variance of the same estimate that would be achieved by a simple random sample of the same size. The closer the DEFF is to 1, the closer the design is to simple random sampling. DEFFs of between 2 and 4 are typical in population health surveys, which means the variance is larger than would have been obtained using a simple random sample. A complex design like that used in the 2016 HLS is less precise than a simple random sample with the same sample size, but is much more precise than could be achieved by a simple random sample with the same budget.

Nevertheless, DEFFs should not be too large. On the one hand, it is appropriate for weights to vary across the sample, otherwise it would not be possible for Māori and Pacific peoples to have an increased chance of selection in the sample. On the other hand, if the variation in weights is too extreme, the DEFF will be very large, and this would be counter-productive for all statistics, even for Māori and other sub-population groups. The methods to sample sub-populations for the 2016 HLS were used to ensure the sample design was appropriate for achieving adequate precision for national and sub-population estimates within the survey budget.

The DEFFs are different for each statistic. Table 3-2 presents the design effects for a key indicator from each programme area. These are calculated by dividing the actual variance of the sample proportion by the variance assuming simple random sampling without replacement, with the same sample size ( $\frac{\text{proportion} \times (1 - \text{proportion})}{\text{sample size}}$ ).

**Table 3-2: Design effects for four key indicators from the 2016 HLS for each sample, by ethnic group**

Indicator	Ethnic group	Adult sample	PCG sample
Current smoker	Māori	2.09	1.98
	Pacific	3.27	2.36
	Asian	2.32	1.15
	European/Other	1.89	1.52
	Total	2.32	1.95
Sunburnt last summer	Māori	2.63	1.95
	Pacific	2.63	1.89
	Asian	2.41	1.37
	European/Other	2.29	1.43
	Total	2.78	2.01
Eats fruit at least twice a day	Māori	2.20	1.81
	Pacific	4.43	4.02
	Asian	2.07	2.04
	European/Other	2.07	1.29
	Total	2.80	2.12
Participated in any gambling activity in the past 12 months*	Māori	2.79	-
	Pacific	2.81	-
	Asian	1.72	-
	European/Other	1.99	-
	Total	2.52	-

\* The PCG sample was not asked any questions from the gambling section of the questionnaire.

## 4. DATA COLLECTION INSTRUMENTS

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### 4.1 QUESTIONNAIRE CONTENT

The 2016 HLS questionnaire is available from <http://www.hpa.org.nz/research-library/research-publications>. Table 4-1 outlines the topic areas covered by the questionnaire.

The gambling section was the largest section of the questionnaire (more than 60 questions). The majority of these gambling questions were sourced from the 2006/07 Gaming and Betting Activities Survey and the Gambling Participation and Attitudes Survey, to facilitate comparisons with these surveys and monitor any time trends in gambling behaviour, knowledge and attitudes since HPA's minimising gambling harm programme was established.

Other questions in the 2016 HLS were also sourced from previous surveys or pilot surveys. These included the 2008, 2010, 2012 and 2014 HLS, the Smokefree/Auahi Kore Monitor, the 2007 Children's Food and Drinks Survey, the 2010 Sun Exposure Survey, and the New Zealand Tobacco Use Survey.

The 2016 HLS questionnaire was informed by advice from HPA staff working in the specific programme areas, external researchers working in the specific topic areas, as well as other surveys.

**Table 4-1: Summarised content of the 2016 HLS questionnaire**

Programme area	Information domains	Output details
All	Demographics	<ul style="list-style-type: none"> <li>Age, gender, ethnicity (of adult, and child if applicable).</li> <li>Immigrant status.</li> <li>Employment status, leadership status, health sector status, workplace activity, highest qualification, household income.</li> <li>Household composition.</li> </ul>
	Re-contact	<ul style="list-style-type: none"> <li>Respondents were asked if they would consent to be re-contacted to participate in further HPA research. Details from the re-contact question responses have been kept separately from the main dataset to maintain confidentiality.</li> </ul>
Lifestyle	Sedentary behaviour	<ul style="list-style-type: none"> <li>Time spent watching television.</li> <li>Internet and social media use.</li> <li>Sites used to connect with people online.</li> </ul>
	Transport	<ul style="list-style-type: none"> <li>Mode of transport to main weekly activity (of adult, and child if applicable).</li> </ul>
	Neighbourhood	<ul style="list-style-type: none"> <li>Safety of local neighbourhood (for children).</li> </ul>

<b>Programme area</b>	<b>Information domains</b>	<b>Output details</b>
Sun safety	Sun protection-related demographics	<ul style="list-style-type: none"> <li>• Skin type (of adult, and child if applicable).</li> <li>• Workplace sun safety policy.</li> </ul>
	Sun protection behaviour	<ul style="list-style-type: none"> <li>• Use of sun protection behaviours (of adult, and child if applicable).</li> <li>• Tanning behaviour.</li> <li>• Skin checks.</li> </ul>
	Incidence of sunburn	<ul style="list-style-type: none"> <li>• Incidence of mild and extreme sunburn last summer (of adult, and child if applicable).</li> </ul>
	Campaign monitoring	<ul style="list-style-type: none"> <li>• Recognition and understanding of the Sun Protection Alert.</li> </ul>
Healthy eating	Healthy eating-related demographics	<ul style="list-style-type: none"> <li>• Consumption of different food types (by adult and child).</li> <li>• Main food provider status.</li> </ul>
	Healthy eating behaviour	<ul style="list-style-type: none"> <li>• Main meal preparation and child involvement.</li> <li>• Meal planning.</li> <li>• Agreement scale – changing household consumption of full sugar drinks, cost of full sugar drinks.</li> </ul>
	Shopping patterns	<ul style="list-style-type: none"> <li>• Weekly spend on food and drinks from supermarket-type locations, green grocer, fruit and vegetable shops or markets, farmers' markets, and from convenience-type locations.</li> </ul>
Tobacco control	Tobacco control-related demographics	<ul style="list-style-type: none"> <li>• Smoking status.</li> <li>• Stages of nicotine addiction.</li> <li>• Heavy smoking index.</li> <li>• Smoking around children in the home and cars (for children).</li> </ul>
	Quitting	<ul style="list-style-type: none"> <li>• Quit attempts.</li> <li>• Resources used.</li> <li>• Know where to seek help.</li> <li>• Nicotine replacement medications.</li> </ul>
	Exposure	<ul style="list-style-type: none"> <li>• Cigarette or tobacco packs displayed.</li> <li>• Brand recognition.</li> <li>• Warning labels.</li> </ul>
	Knowledge	<ul style="list-style-type: none"> <li>• Knowledge of how many adult smokers there are in New Zealand.</li> <li>• Knowledge of government smoking rates reduction by 2025.</li> </ul>

Programme area	Information domains	Output details
	Attitudes	<ul style="list-style-type: none"> <li>Attitudes towards smoking in a number of indoor and outdoor settings.</li> <li>Smoking in New Zealand.</li> <li>Attitudes towards regulation of smoking.</li> <li>Attitude towards regulation of cigarette or tobacco sales.</li> <li>Tobacco sales to minors.</li> </ul>
	E-cigarettes	<ul style="list-style-type: none"> <li>Usage and attitudes towards use.</li> <li>Helpfulness in assisting to quit smoking tobacco.</li> </ul>
	Marijuana	<ul style="list-style-type: none"> <li>Usage.</li> </ul>
Gambling harm	Gambling harm-related demographics	<ul style="list-style-type: none"> <li>Participation in gambling activity - nature and frequency of this participation.</li> <li>Stages of gambling addiction.</li> <li>Personal gambling harm (Problem Gambling Severity Index).</li> </ul>
	Exposure	<ul style="list-style-type: none"> <li>Gambling advertising and perceived behaviour relating to this.</li> <li>Gambling harm of a significant other.</li> <li>Household gambling harm.</li> <li>More time or money spent on gambling than wanted (self and other).</li> <li>Gambling harm service use.</li> <li>Strategies used to avoid gambling harm.</li> <li>Self-monitoring of gambling behaviour.</li> <li>Interaction with staff at gaming machine venues.</li> <li>Harmful gambling information at gaming machine venues.</li> </ul>
	Awareness	<ul style="list-style-type: none"> <li>Gambling harm advertising.</li> <li>Signs of harmful gambling.</li> <li>What to do to help someone with a gambling problem.</li> <li>Early signs of harmful gambling.</li> <li>Services available.</li> <li>Legal requirements of gaming machine venues.</li> </ul>
	Attitudes	<ul style="list-style-type: none"> <li>Social undesirability of gambling activities.</li> <li>Gaming machines in bars/clubs.</li> <li>Concern towards level of gambling in community.</li> </ul>
Alcohol	Alcohol-related demographics	<ul style="list-style-type: none"> <li>Drinking status.</li> </ul>

Programme area	Information domains	Output details
	Attitudes to regulation changes	<ul style="list-style-type: none"> <li>Hours.</li> <li>Purchasing age.</li> <li>Advertising, promotion and sponsorship.</li> <li>Number of outlets for alcohol purchase in local area.</li> <li>Nutrition labelling.</li> </ul>
	Quitting	<ul style="list-style-type: none"> <li>Attempts to cut back.</li> <li>Support services.</li> </ul>
	Alcohol-related injuries	<ul style="list-style-type: none"> <li>Accident in the past 12 months and alcohol consumption in previous 6 hours.</li> <li>Perception of consumption of alcohol contributing to injury.</li> </ul>
Physical activity	Physical activity behaviour	<ul style="list-style-type: none"> <li>Measure of physical activity level through type and frequency of physical activity.</li> <li>Sedentary activity frequency.</li> <li>Time spent playing/practising sport or other exercise activities outside of school hours (for children).</li> <li>Frequency of activities participated in (for children).</li> </ul>
Other HPA areas	Immunisation	<ul style="list-style-type: none"> <li>Child vaccination history.</li> <li>Concerns about recommended childhood vaccines.</li> <li>Sources of immunisation information.</li> </ul>
	Mental health	<ul style="list-style-type: none"> <li>Depression screening.</li> <li>Knowledge of depression.</li> <li>Mental health stigma and discrimination.</li> <li>Life stress and isolation.</li> </ul>
	General health	<ul style="list-style-type: none"> <li>Connectedness.</li> <li>Cultural identity.</li> <li>Weight and height.</li> <li>Perception of own weight.</li> <li>Primary healthcare.</li> <li>Internet use for health information.</li> </ul>



## 5. DATA COLLECTION

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### 5.1 COLLECTION MODE

Interviews were conducted in respondents' homes. Interviewers entered responses directly into laptop computers, with some questions being completed by the respondents independently. Showcards with predetermined response categories were used to assist respondents where appropriate.

### 5.2 INTERVIEWER TRAINING

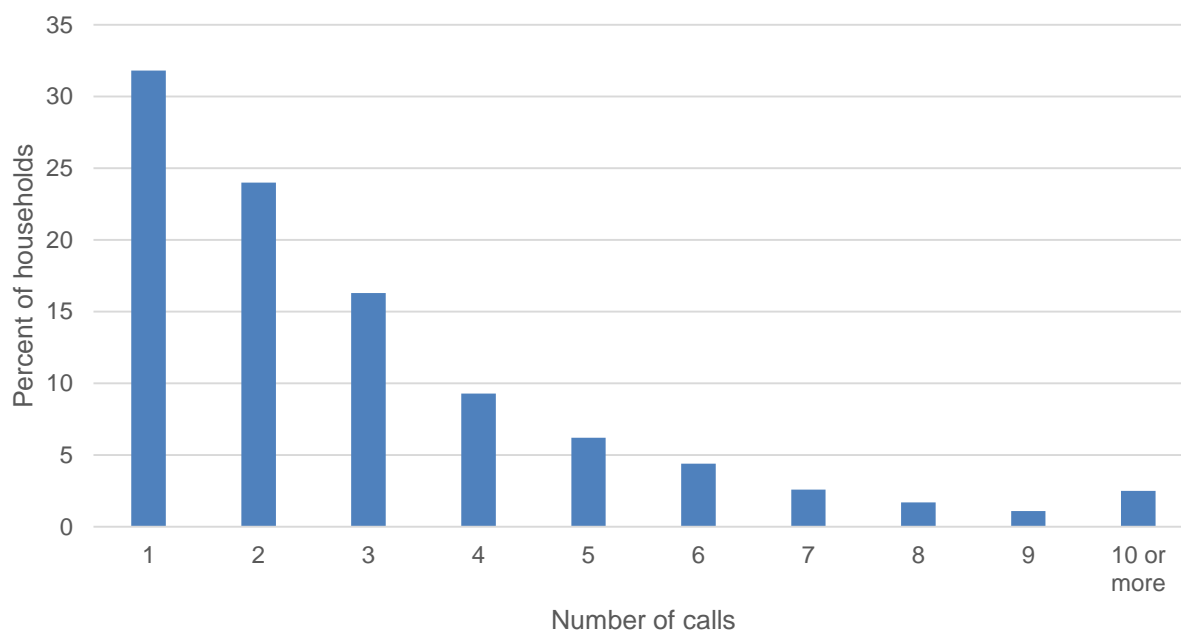
Forty-five interviewers were trained to deliver the survey in-field. Interviewers were trained over a two-week period which consisted of remote learning and face-to-face in-field assessment. Training covered both sampling procedures and questionnaire administration. Practice interviews were conducted by each interviewer as part of this training. A survey manual was developed as a reference guide that contained both generic CBG training material as well as material specific to the administration of the HLS.

### 5.3 ENUMERATION

Households were pre-selected from meshblocks for inclusion in the survey using the NZ Post Postal Address File (PAF). Each meshblock was re-enumerated when the interviewer first visited, in order to record new dwellings built and those removed since the last pre-Census enumeration and release of the New Zealand Post address list. The details of the new dwellings were entered into CBG's 'Sample Manager' software while the interviewer was in the field, allowing these households to be included in the random selection process for the meshblock.

### 5.4 CALL PATTERN

A 'call' refers to one visit on one day during a particular time period. Up to 10 calls to each sampled dwelling were made at different times of the day and on different days of the week, before accepting that a dwelling was a non-contact. Calls were recorded as unique events only if they were made at least two hours apart. Calls were spread out over the duration of the fieldwork. Six calls were made in the survey month in which the meshblock was issued. If no contact had been achieved by this point, there was a pause with no attempted contact with the dwelling for one to two weeks, before attempting four more calls. For 95% of households, the first (or only) interview took place within seven calls (Figure 5-1). 'Closed' meshblocks which contained non-responding households (households where no contact had been established or the selected respondent was unable to take part at that time but did not refuse to participate) were revisited during a mop-up phase in an effort to secure participation.



**Figure 5-1: Proportion of households agreeing to first interview, by number of calls, 2016 HLS**

## 5.5 PERFORMANCE AND QUALITY CONTROL

Interviewers were monitored by CBG management by:

- in-field assessment to ensure survey protocols were being followed correctly
- examination of individual performance metrics and exploration of strategies to improve these if necessary
- checking of a random selection of completed interviews by phoning respondents to confirm the interview was completed according to survey protocols and to collect satisfaction ratings.

Participants were also left with feedback postcards that they could use to send feedback directly to CBG, anonymously if they chose. In addition, CBG operated a Freephone survey helpline that participants could call if they had any questions about the survey or wanted to provide feedback. The results of these quality checks were communicated to the individual interviewers on a regular basis throughout the fieldwork period, with additional training and mentoring provided where required.

## 5.6 INFORMED CONSENT

The 2016 HLS was voluntary. Consent was obtained without coercion and no incentive was offered. Selected households were mailed an invitation letter and information brochure prior to the interviewer's first visit. Participants selected for the survey were presented with a copy of these documents as part of the informed consent process. Participants were asked to sign an electronic consent form and were given a copy of the consent form to keep. The consent form included a request for an interpreter if required (in a range of different languages, including New Zealand Sign Language), and the option was available to match respondents and interviewers by ethnicity and/or gender, although this was rarely requested. The information brochure, as well as the translations and further questions and answers were all available on the HPA website for respondents to view.

## 5.7 PILOT

A pilot survey involving 100 respondents and five interviewers was completed between the 14<sup>th</sup> and 30<sup>th</sup> of March 2016. The pilot was designed to mimic the main study in order to test:

- the duration of each survey type and the sections within
- that the questionnaire loaded into the CAPI software performed as expected and electronic sample management behaved as expected
- wording of new questions and how respondents understood them
- flow of the questionnaire
- that questions would provide useful information
- that interviewer training was appropriate and adequately prepared them for fieldwork
- that interviewer materials and resources were fit for purpose.

The survey design and sampling method had already been successfully used for the 2008, 2010, 2012, and 2014 HLS.

The pilot sample was not random, as people were selected to represent the different mix of ethnic groups, age groups, and geographic locations likely to be included in the main survey (a purposive sample). Once the pilot was reviewed, a number of questions were removed from the questionnaire, or further refined.

## 5.8 FIELD DATES

Interviews for the main survey were conducted between 5 May and 7 December 2016. This was a longer period than for the 2014 HLS (5 May to 10 August 2014).

## 5.9 RESPONDENT BURDEN

HPA sought to minimise the burden on respondents by:

- seeking interviews by appointment rather than requesting immediate participation
- reducing the number of dwellings where two interviews were required, by increasing the probability of the randomly selected parent/caregiver also being the randomly selected adult
- planning for a 50-minute average duration. In practice, a duration of 53 minutes<sup>2</sup> eventuated for the Adult interviews and 48 minutes for the PCG interview. Where the parent/caregiver was also the selected adult, therefore answering both sets of questions, the average duration was 65 minutes. Two interviews were conducted in 626 dwellings, one with a parent/caregiver and one with another adult. In these dwellings, the combined average interview duration was 136 minutes
- using showcards wherever possible to assist answering
- inviting open-ended answers to enable respondents to feel they could express themselves, rather than being simply an information source.

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<sup>2</sup> These times are the CAPI times and include all question modules. They do not include the time spent in a household before or after the interview was conducted.

## 6. SAMPLE SIZES

The target number of interviews for the Adult and PCG samples were met, and the targets for the Māori and Pacific subgroups were also met for both adult and PCG surveys. Table 6-1 shows the interviews achieved in the 2016 HLS, for the Adult sample and the PCG sample, broken down by ethnicity.

**Table 6-1: Interview target achievement for the 2016 HLS**

	Target	Achieved	Proportion of target
<b>Adult sample</b>	3,570	3,854	108%
Māori	640	930	145%
Pacific	430	615	143%
Asian	360	325	90%
Other	2140	1984	93%
<b>Parent/caregiver</b>	1,140	1,160	102%
Māori	290	347	120%
Pacific	290	329	113%
Asian	140	110	79%
Other	420	374	89%

Table 6-2 to Table 6-5 show the 2016 HLS actual sample sizes and the weighted counts by gender, age, ethnicity, and NZDep2013 quintile for the Adult and PCG samples. Note that the PCG sample was only selection weighted, while the Adult sample was selection weighted and benchmarked to the New Zealand population.

**Table 6-2: Sample size by gender**

Gender	Adult		Parent/caregiver	
	Actual	Weighted	Actual	Weighted
Males	1,575	1,877	315	373
Females	2,279	1,977	848	787
Total	3,854	3,854	1,160	1,160

**Table 6-3: Sample size by ethnic group and gender**

Prioritised group	ethnic	Gender	Adult		Parent/caregiver	
			Actual	Weighted	Actual	Weighted
Māori		Males	357	241	88	73
		Females	573	266	259	156
Pacific		Males	214	106	90	42
		Females	401	111	239	87
Asian		Males	136	260	33	54
		Females	189	274	77	110
European/Other		Males	868	1,270	104	204
		Females	1,116	1,325	270	433

**Table 6-4: Sample size by age group and gender**

Age group	Gender	Adult		Parent/caregiver	
		Actual	Weighted	Actual	Weighted
15-24 years	Males	192	355	9	8
	Females	227	328	22	13
25-34 years	Males	254	324	52	61
	Females	402	332	224	182
35-44 years	Males	231	284	123	145
	Females	451	309	342	335
45-54 years	Males	268	311	93	116
	Females	382	336	209	223
55-64 years	Males	273	253	32	32
	Females	344	309	32	24
65+ years	Males	357	351	6	12
	Females	473	361	16	10

**Table 6-5: Sample size by NZDep2013 group and gender**

NZDep2013 group	Gender	Adult		Parent/caregiver	
		Actual	Weighted	Actual	Weighted
Low (least deprived neighbourhoods)	Males	367	573	62	114
	Females	511	619	173	251
Mid	Males	569	801	93	152
	Females	778	874	243	312
High (most deprived neighbourhoods)	Males	639	503	160	107
	Females	990	484	429	224

## 7. RESPONSE RATES

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The response rate is a measure of how many people, from those selected to take part in the survey, actually participated. The response rate reflects the proportion of people interviewed from those who were selected for the sample, and describes the success of the study in terms of achieving cooperation from the population being measured. A high response rate suggests the survey results are more representative of the target population.

The response rate for a PPS survey is calculated according to internationally approved standards (RR3 in The American Association for Public Opinion Research (2016) and the “full response rate” in Lynn et.al, (2001)). The formula is:

$$RR_i = \frac{a_i}{a_i + d_i + e_i}$$

Where  $e_i$  is the estimated number of eligibles from the instances of eligibility not established.

$$e_i = c_i \times \frac{a_i + d_i}{a_i + d_i + b_i}$$

The letters in the formula correspond to the various categories of outcomes from the call attempts of the interviewers. The subscript 'i' refers to the *i*th PSU (meshblock).

The same response rate formula and estimation of the number of eligibles were also used in the NZ Health Survey, the NZ Crime and Safety Survey, and the NZ Alcohol and Drug Use Survey, among others.

**Table 7-1: Response rate calculation components**

Category	Outcomes
Interviews ( $a_i$ )	Interviews
Not eligible ( $b_i$ )	Not Eligible
Eligibility not established ( $c_i$ )	No Reply, Access Denied, Screened Household Refusal, Screened Household Language Issues, Not Visited, Other
Eligible non-response ( $d_i$ )	Respondent Refusal, Not Available, Core Household Refusal, Core Household Language Issues, Partial

The outcomes for all dwellings visited are detailed in the following table:

**Table 7-2: Outcomes for all dwellings visited**

Outcome	Code	Outcome Description	Adult number	PCG number	Adult category	PCG category
Interview	I	Survey fully completed	3,854	1,160	Interviews ( $a_i$ )	Interviews ( $a_i$ )
Not Eligible	NE	No eligible respondent in the dwelling	7,728	11,255	Not eligible ( $b_i$ )	Not eligible ( $b_i$ )
Not Occupied (Vacant)	V	Dwelling determined as vacant following all call-back attempts	1,294		Out of frame	Out of frame
Not a Dwelling/Empty Section	NDE	Selected address is not a residential dwelling or is an empty section	236			
No Reply	NR	Dwelling occupied, but no reply following all call-back attempts	461		Eligibility not established ( $c_i$ )	Eligibility not established ( $c_i$ )
Screened Household Language Issues	SL	Household members cannot understand the surveyor or any of the translated materials	3			
Not Visited	NV	Address not visited	0			
Other	OTH	Call back, danger, dogs etc.	61			
Screened Household Refusal	SHR	Decline received by someone on behalf of the whole household for a screened household before screening has taken place	162			
Core Household Refusal	CHR	Decline received by someone on behalf of the whole household for a core household	523		Eligibility not established ( $c_i$ )	Eligibility not established ( $c_i$ )
Core Household Language Issues	CL	Household members cannot understand the surveyor or any of the translated materials	20			
Respondent Refusal	RR	Decline by an individual respondent after they have been selected	29	6	Eligible non-response ( $d_i$ )	Eligible non-response ( $d_i$ )
Not Available	NA	Respondent selected but not available to complete an interview	355	121		
Partial	P	Interview only partially completed	43	22		
<b>Dwellings Visited</b>			<b>14,909</b>			



Unweighted response rates are calculated using the raw counts and reflect the success of the survey in terms of being able to get people selected to participate, whereas weighted response rates take probability of selection into account and reflect the success of the survey in terms of the population being measured. The unweighted and weighted response rates would be the same in the case where every person selected for the survey has the same probability of selection. In the HLS, the need to oversample some groups led to people having different chances of selection, and consequently there was a difference in the weighted and unweighted response rate calculations.

### **7.1.1 Unweighted Response Rate**

The unweighted response rate is calculated at the meshblock level first. The result is then averaged using a weighting of the estimated number of eligible respondents selected. Vacant dwellings and selected addresses which turn out not to contain a private dwelling (e.g. empty sections, businesses) are considered 'out of frame' and are not included in the calculations.

### **7.1.2 Weighted Response Rate**

The weighted response rate was calculated for each of the sample components (Core, Māori/Pacific screened and Pacific screened in both the Other stratum and the Pacific stratum). The weighting variables applied to each PSU of the relevant component were: the inverse of the probability of the PSU selection within the component sample frame; and the inverse of the probability of the dwelling selection within the PSU. The product of these two variables was applied to the estimate of the eligible dwellings within the PSU. The overall response rate within each component was calculated as the average of the PSU response rates, weighted by the estimated number of eligibles within each PSU. The overall weighted response rate is the average of the component response rate, weighted by the total of the weighted estimated eligibles within each component. The weight applied to the estimated eligibles within each PSU, in this case, is the inverse of the probability of the PSU selection within the component sample frame.

### 7.1.3 Response rates

As can be seen in Table 7-3 the overall unweighted response rates for the 2016 HLS are 75% for the adult sample and 80% for the parent/caregiver sample. The weighted response rates are 66% for the adult sample and 65% for the parent/caregiver sample.

The response rate for 2016 HLS for adult samples and for parents/caregivers compared with all previous HLS surveys' response rates are presented in Table 7-3. In previous years, call outcomes have been categorised differently. For example, in 2014, Not Occupied and Not a Dwelling/Empty Section were categorised as Not eligible and all household refusals were categorised as Eligible non-response. However, this change in categorisation has not resulted in a big difference in response rate; using the 2014 categorisation, the 2016 HLS adult sample unweighted response rate is 74%.

**Table 7-3: HLS response rates**

Year	Unweighted response rate	
	Adult	Parent/caregiver
2008	64%	63%
2010	56%	55%
2012	83%	84%
2014	68%	67%
2016	75%	80%

## 8. DATA PROCESSING

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This section outlines the processes used to collect, check and output the data for the 2016 HLS.

### 8.1 DATA CAPTURE

Questionnaire responses were entered directly onto interviewers' laptops. As interviewing progressed, completed interviews were uploaded to CBG's data server, from where they were compiled for inspection, coding and editing. Interviews were uploaded to the server by each interviewer on every day they were active in the field. Different types of questions were used in the 2016 HLS. Single-response closed-ended questions, which a respondent can only give one response to, were coded as is. Some questions allowed for multiple responses. For these questions all responses were retained, with each response shown as a separate variable on the data file. Open-ended questions were used extensively. For these, the interviewer keyed in the verbal answers, as near as possible to the respondent's spoken words. Coding of these was then done by HPA's data processing team.

### 8.2 IMPUTATION

A small number of respondents (less than 0.4%) did not answer their age. However, all of these provided an age group so age was imputed as the midpoint of this range where needed for specific age analysis. For those who selected the 65+ age group, age was imputed by randomly selecting another respondent with the same gender, ethnic group, employment and education status.

Income was missing for 15% of respondents in the Adult sample. However, 1% were able to be imputed using PCG responses from the same household. This was also done for a very small number of missing responses for the food and drink expenditure questions.

### 8.3 CODING

Coding of open-ended questions was undertaken by initially collating answers given by respondents to each open-ended question. These answers were examined jointly by the researcher and a data specialist to search for recurring points or themes. Each recurring point/theme was identified as a code. All answers falling sufficiently close to that point/theme i.e., differing only in the words the person used to describe it, were assigned to that code. Note that where an open-ended question was sourced from a prior HPA survey, the code frame used previously was also used for the 2016 HLS when appropriate, to enable comparisons between the surveys. Questions with an "Other, please specify" code were treated in the same way as open-ended questions. In this case, the number of original codes was extended to accommodate any further recurring answers. In some instances, interviewers tend to put into "Other, please specify" an answer that fits into one of the pre-coded categories. In this case, the answer was assigned that code. All open-ended responses have been retained, to inform any further review of the code frames used.

## 8.4 SECURITY OF INFORMATION

Any information collected in the survey that could be used to identify individuals has been treated as strictly confidential. Data were transferred from interviewers' laptops in an encrypted format to head office at CBG by a secure internet upload facility.

Names and addresses of people and households who participated in the survey were stored separately from the response data at all stages of data collection and transmission.

## 8.5 CREATION OF DERIVED VARIABLES

For comparison purposes (in data analysis), a number of derived variables have been created for the 2016 HLS dataset. These included: prioritised ethnicity groups, smoking status, gambling type, neighbourhood socio-economic deprivation, household equivalised income and household equivalised expenditure on food and drinks. The details of how these variables were derived are presented below.

### **Ethnicity**

In the HLS, respondents had the opportunity to select as many ethnic groups as they identified with. The ethnicity groups of interest in the analysis of the HLS were; Māori, Pacific, Asian and Other/European. Participants predominately identified with one of these four ethnic groups (n=3,635, 86%). 543 participants (13%) identified with two ethnic groups and a small number identified with three or more ethnic groups (n=48, 1%).

Both total-response and prioritised ethnicity has been used in the HLS. Total-response ethnicity refers to whether or not a respondent identified with an ethnic group. A single respondent may fit into more than one total-response ethnicity group.

Prioritised ethnicity is where each respondent is allocated to a single ethnic group, in the prioritised order of Māori, Pacific, Asian, Other/European. For example, if someone identified as being both Chinese and Māori, their prioritised ethnicity is Māori for the purpose of analysis. The way that the ethnicity data is prioritised means that the group of prioritised European/Other effectively refers to non-Māori, non-Pacific, and non-Asian people. Prioritisation is a method outlined in the Ethnicity Data Protocols for the Health and Disability Sector as a useful method for grouping people into independent ethnic groups for analysis (Ministry of Health, 2004).

Note that as ethnicity was collected as a multiple response variable it is possible to also analyse it using a sole/combination method.

## Smoking status

The definitions used for smoking status follows:

- *Never smoker*: has never smoked tobacco.
- *Past experimental*: has ever smoked tobacco, but never started smoking regularly.
- *Current smoker*: has ever smoked tobacco, and now smokes at least once a month or more often.
- *Recent/past quitter*: has ever smoked tobacco, but has now stopped smoking.

## Gambling type

Gambling types are often classified into two categories, those where winnings can be immediately 'reinvested' and those where they cannot. The former referred to as 'continuous' and the latter 'non-continuous' (Abbott & Volberg, 1996). For the HLS these two groupings were combined with frequency in the same way they were presented for the 2006/07 Gaming and Betting Activities Survey (National Research Bureau, 2007):

- *Non gamblers*: did not participate in any gambling activities in the previous 12 months.
- *Infrequent gamblers*: participated in any gambling activities less often than once a week in the previous 12 months.
- *Frequent, non-continuous gamblers*: participated weekly or more often in non-continuous forms of gambling in the previous 12 months. Non-continuous forms of gambling include lottery games, going to casino evenings/buying raffle tickets for fundraising, participating in sweepstakes, making bets with family/friends and other gambling activities.
- *Frequent, continuous gamblers*: participated weekly or more often in continuous forms of gambling in the previous 12 months. Continuous forms of gambling include playing electronic gaming (pokie) machines, betting on horse or dog races, or sports events, table games at casinos, housie and bingo, mobile phone games for money, online activities for money or prizes through an overseas website.

## Problem Gambling Severity Index (PGSI)

Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) is a 9-item scale which used to assess people's experiences of gambling-related harm in the last 12 months. An example of an item on the questionnaire are: "Thinking about the last 12 months, how often have you bet more than you could really afford to lose?". Participants rated themselves on a 4-point scale from 0 (never) to 3 (almost always).

Response values from each participants were added to calculate the total score and 'refused' or 'don't know' was coded as 'never' (0). Possible scores range from 0 to 27 with higher scores being indicative of greater problem gambling.

## Neighbourhood socioeconomic deprivation

The New Zealand Index of Socioeconomic Deprivation 2013 (NZDep2013) has been linked to the 2016 HLS as a measure of neighbourhood socioeconomic deprivation and a proxy for individual socioeconomic position. A series of factors from the 2013 Census was used to create the NZDep2013, with a decile value calculated for each meshblock (Atkinson, Salmond & Crampton, 2014). These factors were: receiving a means-tested benefit, low household income, not owning the home you live in, single-parent family, unemployment, no school qualifications, household overcrowding, no access to internet at home and no access to a car. For some analyses of the 2016 HLS, these deciles have been grouped, so that deciles 1–3 are referred to as low deprivation, 4-7 as moderate (or mid) deprivation, and 8-10 as high deprivation.

Where NZDep2013 was missing for a meshblock, the deprivation index was imputed from the Census Area Unit containing the meshblock.

## Household equivalised income

To measure household income, respondents were asked to choose an income range that represented their total household income from all sources before tax in the previous 12 months. However, household income by itself is not always an accurate measure of living standards as, for example, a two-person household with a total household income of \$100,000 is likely to be quite different in many characteristics from that of a six-person household with a total household income of \$100,000. Therefore, equivalised household income was derived using the revised Jensen Index (Jensen, 1988). The revised Jensen Index is a recognised equivalisation index used within New Zealand (Blakely, 2002; Ministry of Health, 2010), that takes into account the number of adults, the number of children (younger than 18-years-old) and the ages of the children living in the household.

Income was calculated as the mid-point of the band the respondent selected. If the respondent did not provide a band, but another person in the household was also interviewed and did provide a band (ie, different adults were interviewed for the PCG and the Adult sample), then the band selected by the other person in the household was used. If the respondent selected the band 'Over \$250,000', then \$275,000 was used as the household income. Some respondents did not give an answer using the narrower bands first provided to them, so were asked the question again using wider income bands. If these respondents selected the wider band of '\$100,000-\$250,000', their income was calculated as \$150,000 based on the mean of the mid-points of the three narrower bands between \$100,000 and \$250,000. Household income was divided by the formula developed by Jensen (1988, p. 13):

$$\frac{[(\text{number of adults aged 18+}) + (w_1 \times \text{number of children}) + (w_2 \times \text{the sum of the ages of all the children})]^u}{2^u}$$

Where  $w_1 = 0.460697$ ,  $w_2 = 0.0283848$  and  $u = 0.621488$ . The mid-points of the ranges provided for the children's ages were used in this equation. Equivalised household income was then divided into tertiles (ie, three equal groups, of low, medium and high) for use in some analyses.

### **Household equivalised expenditure on food and drinks**

Respondents were asked how much money their household usually spends each week on food and drinks from different vendors. These variables have the same limitation mentioned above for household income, and Jensen's formula can also be used for expenditure (Jensen, 1988). The same process was followed to calculate household equivalised expenditure on food and drinks as was used to calculate household equivalised income (please see the description of this outlined above), with \$425 used as the midpoint for the band '\$401 or more'.

### **Kessler psychological distress scale (K-10)**

The K-10 (Kessler et al., 2002) is designed as a screening tool for mental health disorders present during the previous four weeks. There are 10 questions in the K-10 and an example of a question in the K-10 is: 'In the past four weeks, about how often did you feel tired out for no good reason?'

Participants rated themselves on a 5-point scale from 1 (none of the time) to 5 (all of the time). Response values from each participant were added to calculate the total score and 'refused' or 'don't know' was coded as 'none of the time' (1). Scale scores are between 10 and 50, with higher scores being indicative of greater self-reporting of psychological distress.

## 9. WEIGHTING AND POST SURVEY ADJUSTMENTS

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Most national surveys have complex survey designs, where different groups have different probabilities of being selected in the survey (refer to Section 3 for details of the survey design). To ensure no group is under- or over-represented in estimates from a survey, a method of calculating estimates that reflects the sample design must be used.

Estimation weights are used to achieve this, and can be thought of as the number of people in the population represented by a given survey participant. A weight is calculated for every respondent and these weights are used to calculate estimates of population totals (counts), averages, and proportions. Typically, members of groups who have a lower chance of selection are assigned a higher weight, so that these groups are not under-represented in estimates. Conversely, groups with a higher chance of selection (eg, Māori and Pacific populations who are included in the booster samples) receive lower weights. Also, groups that have a lower response rate (eg, older men) are usually assigned a higher weight so that these groups are correctly represented in all estimates from the survey.

Weights are designed to:

- reflect the probabilities of selection of each respondent
- make use of external population benchmarks (typically obtained from a population census) to correct for any discrepancies between the sample and the population benchmarks. This improves the precision of estimates and reduces bias due to non-response.

The weights for 2016 HLS were constructed on the basis of sampling methods which were addressed in Section 3 and were computed in accordance with current guidance from experts in surveys (see for examples: Force, 2010; Kalton & Flores-Cervantes, 2003; Pike, 2008). The data weighting was performed in Stata, version 13, using five settings; Sampling units, Strata, Sampling weight, Post-strata and Post-stratum weight. These are summarised in Table 9-1.

The following section goes through how the variables used in the weighting are derived, how the weighting is applied, and how the weighting is used to calculate survey estimates.



**Table 9-1: Weight variables used in the 2016 HLS**

Survey data setting in Stata	Description
Sampling units	An identification of the meshblock where the respondent was interviewed; the smallest geographical unit based on the 2013 New Zealand Census.
Strata	A categorical variable which is composed of the Pacific and Others stratum.
Sampling weight	The inverse probability of a participant to be selected to participate in the survey. This was adjusted for the response rate and under-coverage of meshblocks.
Post-strata*	An identifier of age, gender and ethnicity grouping, also called benchmark groups.
Post-stratum weight*	The New Zealand estimated resident population for each post-strata group.

\* Post-stratification was applied to the Adult sample only.

## 9.1 SAMPLING UNITS

The identification number of meshblocks from 2013 census was treated as the sampling unit variable. Based on the 2013 census data there were 37,525 eligible meshblocks which met the HLS selection criterions (discussed in Section 2.3), and 500 were selected into the survey.

## 9.2 STRATA

The 500 selected meshblocks were grouped into two strata, namely the Pacific-dense stratum (containing meshblocks where at least 20% of the population is Pacific), and Other (all other meshblocks).

The survey stratification was set in Stata using a categorical variable that flagged meshblocks in the Pacific-dense stratum and meshblocks in the Others stratum.

## 9.3 SAMPLING WEIGHT

The sampling weights were calculated in a series of stages to compensate for unequal selection probabilities and adjusted for nonresponse. The 2016 HLS sampling weight was defined as the inverse probability of the meshblock being selected into the sample, multiplied by dwelling selection probability, and multiplied by the respondent selection probability:

$$\text{Selection weight} = \frac{1}{P(\text{meshblock}) \times P(\text{dwelling}) \times P(\text{respondent})}$$

This reflects the three-stage sampling procedure described in Section 3.2. The three components of the sampling weight are: the probability of meshblock selection; probability of dwelling selection and finally the probability the respondent being selected from within the household. The details of these probabilities are provided as follows:

### Stage 1: Meshblock selection

The 2016 HLS was comprised of two strata: Pacific-dense and Others. For each stratum, the probability of a meshblock being selected into the survey was defined as:

$$P(\text{meshblock}) = \left[ \frac{\text{Number of selected meshblocks in the stratum}}{\text{Total number of meshblocks in the stratum}} \right] \times \frac{\left[ \frac{\text{Number of dwellings in the meshblock}}{\text{Total number of dwellings in all NZ meshblocks in the stratum}} \right]}{\left[ \frac{\text{Total number of dwellings in all NZ meshblocks in the stratum}}{\text{Total number of dwellings in all NZ meshblocks in the stratum}} \right]}$$

The number of dwellings in each meshblock was obtained from the 2013 Census.

For the 2016 HLS, the number of selected meshblocks was 80 in the Pacific stratum and 420 in the Others stratum. The total number of dwellings in all New Zealand meshblocks (not only the selected meshblocks) was 111,429 for the Pacific stratum and 1,417,863 for the Others stratum.

### Stage 2: Household selection

Because of screening, different households in each meshblock have different probabilities of being selected into the sample. There are three screening components:

- Core (COR), where anyone aged 15 years and over are eligible to be selected.
- Screened Māori and Pacific (SMP), where people of either Māori or Pacific ethnicities are eligible to be selected.
- Screened Pacific (SPI), where only people of Pacific ethnicity are eligible to be selected.

This means that a European person could only be selected into the sample if they live in a core household, a Māori person could be selected into the sample if they live in either a Screened Māori and Pacific house or a core house, and a Pacific person could be selected no matter which component their house is in. The number of houses selected for each component is determined before the interviewer goes into field (more details of the household selection procedure can be found in Section 3.2).

The probability of a dwelling being selected into the study depends on the ethnicity of the respondent and is defined as:

$$P(\text{dwelling}) = \frac{[\text{Number of dwellings where respondent would be eligible for selection}]}{[\text{Total number of dwellings in the meshblock}]}$$

Explicitly, the probabilities of dwelling selection for respondents of Pacific, Māori and Other/Asian/European ethnicities are as follows.

For Pacific respondents:

$$P(\text{dwelling}) = \frac{[\text{Total number of selected dwellings (COR + SMP + SPI) in the meshblock}]}{[\text{Total number of dwellings in the meshblock}]}$$

For Māori respondents:

$$P(\text{dwelling}) = \frac{[\text{Number of COR and SMP dwellings in the meshblock}]}{[\text{Total number of dwellings in the meshblock}]}$$

For Other/Asian/European respondents:

$$P(\text{dwelling}) = \frac{[\text{Number of COR dwellings in the meshblock}]}{[\text{Total number of dwellings in the meshblock}]}$$

### **Stage 3: Respondent selection**

One adult and one parent (if there were any) were selected from the lists of those who were eligible in each household. First a parent/caregiver was selected if there were children living in the house, and then an adult was selected for the Adult survey. Sometimes the same respondent completed both the Adult and the PCG survey, and sometimes the two surveys were completed by two different people in the same household.

#### ***Parent/Caregiver selection***

If there were 5 to 16-year-old children living in the household, then one parent/caregiver was selected from the list of all the parents/caregivers in the household to do the PCG interview. The probability of being selected into the PCG sample was equal for all of the parents in the house.

$$P(\text{PCG respondent}) = \frac{1}{\text{Number of parents in the household}}$$

## **Adult selection**

### **1. Adult only (AO)**

If there were no 5 to 16-year-old children living in the household, then one adult was selected from all of the adults in the household. Each adult in the household had the same probability of being selected into the Adult sample:

$$P(\text{Adult respondent}_{OA}) = \frac{1}{\text{Total number of adults in the household}}$$

### **2. Combined (PO)**

If there were 5 to 16-year-old children living in the household, after the parent/caregiver was selected for the PCG sample, that same person could be selected to complete the Adult interview as well. This meant that in some households a single person was interviewed as part of the PCG sample and as part of the Adult sample.

In order to reduce the number of dwellings in which two interviews were required, the probability of selection of the person who was selected for the PCG interview to be selected for the Adult interview as well was double that of the other adults in the household. Replacement of that individual back into the list of adults in the house means that the total number of adults in the particular household was increased by one.

$$P(\text{Adult respondent}_{PO}) = \frac{2}{\text{Total number of adults in the household} + 1}$$

### **3. Parent and Adult (PA)**

Sometimes, the person who was selected for the PCG interview was not selected for the Adult interview. In this case, another adult in the house was selected for the adult interview and there were two people interviewed in the same house; the adult and the parent/caregiver.

Parents/caregivers were also eligible to complete Adult survey. As for the PO outcome above, the respondent who was selected for the PCG interview had their name entered into the list of adults twice, so the total number of adults in the household has been increased by one.

$$P(\text{Adult respondent}_{PA}) = \frac{1}{\text{Total number of adults in the household} + 1}$$

## 9.4 NON-RESPONSE ADJUSTMENT

Each selection weight was adjusted using the response rate of the meshblock the respondent was selected from. This adjustment was done to compensate for any non-response bias that may have arisen from people refusing to participate in the survey. The adjustment was made by dividing the selection weight by the response rate (see Section 7 for details on the response rate). Applying this adjustment at the meshblock level accounted for any bias that may have arisen due to differences at the area level (eg, differing levels of deprivation in different meshblocks). The adjustment was done using the following formula:

$$\text{Response rate modified selection weight} = \frac{\text{selection weight}}{\text{response rate for meshblock}}$$

## 9.5 BENCHMARKING

### Adult sample

Benchmarking is a post-stratification adjustment that ensures the proportion of particular groups in the sample match the proportions in the population. Benchmarking refers to an adjustment of the data to ensure they are representative of the New Zealand population after selection weights have been applied. The 2016 HLS Adult sample was benchmarked using the following:

- a) Gender (male and female).
- b) Prioritised ethnicity (Māori, Pacific, Asian and Other/European).
- c) Age group (15-24 years, 25-34 years, 35-44 years, 45-54 years and 55 and over).

Age, gender and ethnicity were included because these variables are related to health behaviour and to non-response and were a key output classification for the survey. In total, there are 40 gender/age/ethnicity groups.

The survey is designed to represent the resident population of New Zealand aged over 15 years. The most recent New Zealand Census was conducted in March 2013, but since then the demographics of the New Zealand population have changed (Statistics New Zealand, 2014b). Therefore, the 2016 estimated resident population was used as the reference population.

Projections produced by Statistics New Zealand according to assumptions specified by the Ministry of Health were used to benchmark to the population. These projections have the 2013 Census usually resident population counts as their starting point by updating the census usually resident population count at 5 March 2013 for:

- a) non-response to the census ethnicity question

- b) net census undercount
- c) residents temporarily overseas on census night (5 March 2013)
- d) births, deaths and net migration between census night and 30 June 2013.

The size of the target population was 3,772,995 individuals.

The magnitude of the post-stratification adjustment for each benchmark group was calculated as the ratio of the ‘expected’ population (the estimated resident population) to the ‘observed’ population (the sum of the response rate and under-coverage adjusted selection weights for each benchmark group). The adjustment ranged from 0.83 to 2.39. The full list of benchmark adjustments for the Adult sample is presented in Table 9-2.

**Table 9-2: Benchmark adjustments for the 2016 HLS Adult sample**

Age group	Māori		Pacific		Asian		Other/European	
	Female	Male	Female	Male	Female	Male	Female	Male
15-24	1.34	1.44	1.33	1.94	1.91	1.19	1.59	2.34
25-34	1.27	1.60	1.06	1.48	1.71	1.77	1.46	1.90
35-44	0.83	1.69	0.86	1.12	1.37	2.04	1.28	1.53
45-54	1.03	1.14	1.45	1.80	1.16	1.40	1.43	1.57
55+	0.98	1.09	1.26	1.80	1.58	2.39	1.24	1.33

### PCG sample

Because there are no published population figures of parents/caregivers that uses the HLS definition of a parent/caregiver (a regular parent or caregiver of a child aged 5 to 16 years, who usually lives in the household), post-stratification weighting was not applied to the PCG sample.

## 9.6 REPLICATE WEIGHTS

Standard errors are a measure of the precision of an estimate and replicate weights are a method for obtaining standard errors for any weighted estimate. Replicate weights were necessary for the HLS because its complex survey design meant that basic variance estimation methods, which assume simple random sampling, could not be used.

To remove bias in the estimate from any particular PSU 'delete-a-group' jackknife was used. This means that the estimate is first calculated from a sample of all respondents except those in a PSU, and then this calculation is repeated excluding a different PSU each time. The standard error of the population estimate is based on the variation of the replicate estimates.

An advantage of using jackknife was that it makes no assumptions about the shape of the underlying probability distribution. Another advantage was that the selection weight (adjusted for non-response) and post-stratification weight (benchmarking) can be incorporated into the replicate weights. Analysing data using jackknife does have some disadvantages as suggested by Abdi & Williams (2010). The jackknife method requires that the observations are independent of each other. When the independence assumption is violated, the jackknife underestimates the variance in the data-set which makes the data look more reliable than they actually are. The HLS satisfies this assumption because all observations are independent.

The jackknife replicate weights were implemented in the 2016 HLS as part of the survey estimation procedures in the Stata version 13 statistical software package. For technical information on replicate variance estimation in surveys, see Rao and Wu (1988) and Shao and Tu (1995).

## 9.7 SURVEY ESTIMATES

### **Proportions**

The proportion of the population who belong to a particular group (eg, the proportion of the population who smoke daily) is estimated by calculating the sum of the weights for the respondents in the group, divided by the sum of the weights of all respondents.

### **Proportions within population groups**

The proportion of people in a population group who belong to a subgroup (eg, the proportion of Māori who smoke daily) is estimated by calculating the sum of the weights for the respondents in the subgroup (Māori who smoke daily), divided by the sum of the weights for the respondents in the population group (Māori).

### **Totals (population estimated count)**

Multiply the weighted proportion by the population size. For example, for the number of daily smokers in the New Zealand population, multiply the weighted the proportion of daily smokers by the population size (3,772,995 in 2016).

### **Averages (means)**

The population averages (eg, the average number of gambling activities participated in by New Zealand adults) are estimated by calculating the sum, over all respondents, of the weight multiplied by the variable of interest divided by the sum of the weights.

### **Averages within population groups**

Sometimes the average within a group is of interest (eg, the average estimate of the number of smokers in New Zealand among males). The estimate is given by calculating the sum, over respondents, in the group of the weight multiplied by the variable of interest, divided by the sum of the weights of respondents in the group.



## 10. TECHNICAL NOTES FOR ANALYSIS

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The descriptive 2016 HLS analyses are presented in a series of fact sheets called *In Fact* as well as reports. These use a number of specific techniques that are discussed below.

### 10.1 SUPPRESSION DUE TO SMALL NUMBERS

To ensure the survey data presented are reliable and that the confidentiality of the participants is protected, data are only presented when there are at least 30 respondents in the denominator (the population group being analysed). This ensures that no participant can be identified from the results.

### 10.2 CONFIDENCE INTERVALS

Ninety-five percent confidence intervals have been used to represent the sample error for estimates. A 95% confidence interval means there is a 95% chance the true value of the estimate (if the whole population was sampled) lies between the lower and upper confidence interval values. Differences between estimates are said to be 'statistically significant' when the confidence intervals for each rate do not overlap. However, even when there are overlapping confidence intervals the difference between the groups can be statistically significant. Any differences between two variables where the confidence intervals overlapped were tested using the most appropriate statistical test for that data. The significance of many different statistical tests is represented by a probability value, or *p*-value. If a *p*-value is below 0.05, then it indicates that there is strong evidence for rejecting the null hypothesis, and that a significant difference exists.

## 11. DISSEMINATION OF DATA

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There are several ways to access the results and data from the 2016 HLS:

- publications
- confidential microdata.

### 11.1 PUBLICATIONS

*In Fact* are information sheets highlighting interesting points from specific research. *In Fact* is designed to meet the needs of researchers, academics and people working in the health sector.

*In Fact* reports using data from the 2008, 2010, 2012, 2014 and 2016 HLS are available on the HPA website at: <http://www.hpa.org.nz/research-library/research-publications>.

Further publications and reports using 2016 HLS data are planned and will be available from the same location.

### 11.2 ACCESS TO CONFIDENTIAL MICRODATA

The analyses presented in HPA publications are only a small proportion of those that could be undertaken. Confidentialised microdata from the 2016 HLS may be available in 2018 for approved researchers to use for specific research projects. The microdata will have all identifying information about individuals removed and be modified to protect individual information. Approval will be subject to certain criteria, terms and conditions and the researcher's organisation will have to sign an access agreement with HPA.

Contact HPA for more information:  
email: [research@hpa.org.nz](mailto:research@hpa.org.nz)

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