

# Sun Exposure Survey 2016

## Methodology Report

Research report commissioned by the Health Promotion Agency

28 July 2016

Project commissioned: 1 November 2015

Final report received: 1 April 2016

Provider: Key Research Limited

ISBN: 978-1-927303-80-1

Citation: Health Promotion Agency (2016). Sun Exposure Survey Methodology Report. Wellington: Report prepared by Key Research Limited.

Prepared for the Health Promotion Agency by:

David Mustard (Key Research Limited)

This document is available at: <http://www.hpa.org.nz/research-library/research-publications>

Any queries regarding this report should be directed to HPA at the following address:

Dr. Karen McBride-Henry

Health Promotion Agency

PO Box 2142

Wellington 6140

New Zealand

[www.hpa.org.nz](http://www.hpa.org.nz)

[research@hpa.org.nz](mailto:research@hpa.org.nz)

28 July 2016

## COMMISSIONING CONTACT'S COMMENTS

---

This Health Promotion Agency (HPA) commission was managed by Judy Li (senior researcher) and Sarah Dallas (researcher).

This research was undertaken as part of the national monitoring of sun exposure and related knowledge, attitudes, and behaviours. In addition to monitoring, this project helps to inform the activities of the skin cancer prevention sector, which includes HPA's Sun Safety programme. The Sun Exposure Survey (SES) is an ongoing, triennial survey that has been conducted since 1994. Data collection waves prior to 2016 also involved the Cancer Society of New Zealand and the University of Otago. The survey has undergone re-developments at different times, the most recent occurring in 2010. These re-developments were strategically conducted to ensure high quality research methodology and data collection procedures while maintaining to the extent possible comparability to previous years' data.

Key Research Limited was commissioned to carry out the 2016 data collection activities, which consisted of a national telephone survey conducted over the summer period from January to March 2016. The methodology is consistent with that of previous years and involved a design that takes into account regional weekend weather as a criterion for sampling. Along with quotas for region, gender, and age group, the use of random digit dialling helped to ensure a nationally representative sample was obtained. The data have been weighted (adjusted) so that the sample reflects the makeup of the 2016 New Zealand population.

### REVIEWED INTERNALLY BY

Thewaporn Thimasarn-Anwar, senior data analyst

Sarah Dallas, researcher

Holly Trowland, data analyst

## ACKNOWLEDGEMENTS

HPA would like to thank those respondents who took the time to participate in this research. Any findings learned would not be possible without their contribution to the project.

HPA would like to thank Tony Reeder (Cancer Society Social and Behavioural Research Unit, University of Otago) and Sally Gilbert (the Ministry of Health) for their assistance with questionnaire development. In addition, HPA would like to thank Dr Suzanne Dobbinson and the Centre for Behavioural Research in Cancer at the Cancer Council Victoria for allowing the adaption of some of the questionnaire content of the National Sun Survey.

Weather data was provided to HPA weekly by MetService, and HPA would like to thank Robert Hamilton (Client service coordinator) for facilitating this.

HPA acknowledges the work done by David Mustard (Key Research Ltd). The amount of advice and support received from the early stage of the project was phenomenal, in terms of questionnaire re-development and the matching of weather station and region of residence.

## COPYRIGHT

The copyright owner of this publication is HPA. HPA permits the reproduction of material from this publication without prior notification, provided that fair representation is made of the material and HPA is acknowledged as the source.

## DISCLAIMER

This research has been carried out by an independent party under contract to HPA. The views, observations and analysis expressed in this report are those of the authors and are not to be attributed to HPA.

## Table of Contents

	Page No.
Sponsors and Contractors .....	6
Background.....	7
Previous Surveys .....	8
Research Objectives.....	9
Survey Outcomes 2016 .....	9
The Questionnaire .....	11
Sample Design.....	14
Respondent Selection.....	16
Data Collection.....	20
Respondents Profiles.....	21
Data Weighting .....	23
Response Rates .....	31
Reference .....	33
Appendix .....	34

**Sponsors and  
Contractors**

*The survey was commissioned by the Health Promotion Agency and undertaken by Key Research Limited*

**Survey Sponsors:** Health Promotion Agency, Level 16, 101  
The Terrace, Wellington 6011  
PO Box 2142, Wellington 6140

**Survey Contractor** Key Research Limited  
Level 1, 247 Cameron Road  
  
PO Box 13297  
Tauranga 3141

**Survey Contractor** DigiPoll Limited  
(Data Collection) PO Box 4059  
Hamilton East  
Hamilton

**Contracts** Michael Hooker, Managing Director  
David Mustard, Senior Consultant  
Phone: 07 929 7044  
Fax: 07 575 0609

## Background

*The scope of the Sun Exposure Survey is to improve evidence of the prevalence and trends in sun safety behaviour, inclusive of risk factors and protective strategies to aid decision making*

The Health Promotion Agency (HPA) is a New Zealand government agency that has the aim of inspiring New Zealanders to lead healthy lives. The Health Promotion Agency has noted that skin cancer is by far the most common cancer affecting New Zealanders and is responsible for about 300 deaths each year. Melanoma, the most serious form of skin cancer, is directly attributed to sunlight exposure in around 90% of occasions. Recognising that the most efficient long term strategy to reduce the burden of melanoma is prevention that targets excessive sun exposure, the HPA requires regular and consistent information about sun exposure, and sun safe attitudes and behaviours to inform the skin cancer control programme. The primary objective of the Sun Exposure Survey is to provide quality, fact based information to inform decision making for such programmes. A secondary aim is to provide a mechanism to enable New Zealand data to be compared internationally.

The survey was designed to be nationally representative of the New Zealand population aged 13 years and over. This was a change to the prior survey editions in that these did not include people older than 54 years. Additionally, the total sample was increased for the 2016 survey from 1,750 to 2,250 with the inclusion of a quota of  $n = 500$  for adults aged 55 years or over. The 2016 survey was designed to be highly consistent with prior surveys undertaken in 2013 and 2010. In particular, most of the questions were identical to the 2013 survey and the same methodology was applied for data collection with sample selection being based on random digit dialling (RDD). Interviews obtained measures of attitudes and behaviours in relation to sun exposure over the summer period at times when the risk of skin damage from excessive exposure was at its highest. This was achieved by interviewing people about their sun exposure and measures taken to prevent excessive exposure over the preceding weekend in regions where weather conditions presented a high risk of sunburn and excessive ultraviolet light (UV) exposure. Data collection was undertaken during the months of January, February and March 2016.

The questionnaire incorporated a set of core questions that ask about skin type, sun exposure, outdoor activities, sunburn, sunburn prevention behaviours, risk behaviours, motivation such as role modelling sun safe behaviours and barriers, and unanticipated sun exposure. The questionnaire also included a set of non-core questions to examine prevention behaviour, campaign awareness and risk perception, plus a set of demographic questions. A total of 2,272 people were interviewed with the sample divided between teens ( $n = 486$ ), adults ( $n = 1,270$ ) and older adults ( $n = 516$ ), and distributed by region according to quota targets based on known population distributions.

The Triennial Sun Protection Survey (TSPS) was initiated in 1994 by the Cancer Society of New Zealand, along with the Department of Preventive and Social Medicine at the University of Otago. The survey was based on a seminal study from Victoria, Australia. The aims of the survey were to describe patterns and associations between outdoor behaviour: activities, sun protection, attitudes, knowledge, tanning preferences and sunburn. The purpose of the TSPS was to provide regular and consistent information about sun exposure and sun safe attitudes, and behaviours to inform skin cancer control programmes in New Zealand focused on prevention. Five waves of the survey, every three years (1994, 1997, 2000, 2002/2003, 2005/2006) were administered. The evidence suggests New Zealand's sun safety data collection to date at a national level provides the longest-running trend information internationally<sup>1</sup>. The TSPS survey population (largely driven by a need for cost-effectiveness) was adults (15 to 69 years) with approximately a sample size of 1,250 participants per wave and some children (12 to 14 years), from within the same households. The inclusion of children varied across years; for example children aged 12-14 years were included in the 2000, 2003 and 2006 surveys. Only people living in New Zealand's five largest metropolitan centres (Auckland, Hamilton, Wellington, Christchurch, and Dunedin) were included in the survey. Interviewing was conducted by computer assisted telephone interviewing (CATI).

RDD was used as the original sampling method. However in 2000, the sample frame was changed to the electoral roll by using the tele-matching method to generate phone numbers. This change was made so that a pre-contact letter could be sent to households in the hope that this might improve response rates. Additionally, in order to improve participation rates for younger adults, interviewers asked to speak to the youngest person in the household over 15 years of age, rather than selecting an adult at random. Additionally, for each wave of the survey, quotas were set for males and females (50:50) and within each geographical area ( $n = 250$ ). From 2000 onwards, the surveys were carried out each week from December to early March (previously January to late March). The locations where the survey was conducted each week were selected using meteorological data to identify whether or not the 'fine' weekends influence the probability of people having been outdoors, exposed to the sun and engaging in sun safe behaviours. The area with the highest calculated 'chance of sunburn' (based on climate, sky conditions and UV data), was selected for the survey, although priority was given to the southernmost centres as these were less likely to experience consistently sunny conditions relative to northern centres. Each centre was surveyed twice during each survey. Interviews were carried out on the Monday and Tuesday following the weekend of interest to maximise recall about activities undertaken and sun safe behaviours. This approach limited the number of call-backs to people unavailable on the first call (5 in 2006). For these reasons, the TSPS measured 'weekend prevalence' of sunburn not 'all of summer' prevalence.

The 2010 survey followed a somewhat different approach with respondents being selected from the white pages by systematically selecting each 15<sup>th</sup> residential number from the first and third columns.

<sup>1</sup> Watts, C., et al. (2009) Review of Practice and Options for the New Zealand Sun Exposure Survey

The sample was then drawn in two strata: in stratum one a residential number was sampled for each of the adult and teen sample and in stratum two a residential number was selected for the teen sample only. A total of 10,000 households were drawn with 7,500 assigned to stratum one and 2,500 assigned to stratum two. In 2013 the survey reverted to the use of RDD with interviews being conducted between Monday and Wednesday of each week in relation to outdoor activities undertaken the prior weekend in regions meeting fine weather criteria. The 2016 survey has followed the same approach.

**Research Objectives**

*The research has the aim of quantifying the prevalence and trends in sun safety behaviour*

A review of the Triennial Sun Protection Survey was undertaken in 2009 which included advice from a group of experts in the field of skin cancer prevention and sun safety. This review was aimed at improving the survey and formed the basis of the 2010 research that was renamed as the Sun Exposure Survey. The aim of the research is to provide nationally representative information about attitudes and behaviours towards sun exposure and to facilitate comparison with both historical survey data, and that being collected by other organisations internationally. The goal of the survey was restated as: *to improve evidence available on prevalence and trends in sun safety behaviour; inclusive of both risk factors and protective strategies in multivariable analyses that will aid future sector decision making.*

**Survey Outcomes 2016**

*Comments on the outcome and improvement opportunities for the future*

The 2016 survey used RDD as this enables the highest proportion of the target population to be included. The 2013 Census shows that of 1,549,890 households in New Zealand, 1,257,195 have access to a landline representing 81%. This compares with 88% at the 2006 Census. The survey was conducted over the period 11<sup>th</sup> January to 21<sup>st</sup> March with interviews conducted Monday to Wednesday to ask respondents about their outdoor activities the previous weekend. The rationale is that people will likely have better recall of their weekend activities in the days immediate after the weekend. However, the larger sample size for the 2016 survey combined with lower parts of the South Island having fewer qualifying days, plus a number of long weekends through the period, meant that it was necessary to conduct some interviews on a Thursday. A total of 64 interviews were conducted on a Thursday in relation to the prior weekend with this being necessary to achieve quota targets for some groups. The number of Thursday interviews was limited to minimise bias.

Our assessment is that the survey was well designed and administered and has resulted in a data set that is of high quality, and once weighted is representative of the national population. Overall, 2,272 responses were collected, comprising 486 teens aged 13-17 years, 1,270 adults aged 18-54 years and 516 older adults aged 55 years and over. Notably, after data was collected it was observed that the age groups that some respondents (39) were coded to did not align with their year of birth that was provided later in the interview. In all of these cases the initial age group was one less than possible based on the year of birth. We have taken the approach of re-coding the age group to align with the

year of birth which has resulted in some small differences in the totals relative to quota targets. Results relative to quota targets are summarized in Table 1:

**Table 1: Interviews Achieved Relative to Quota Targets**

Age	Quota	Achieved	Difference
13-17 Years	500	486	-14
18-54 Years	1200	1270	70
55+ Years	500	516	16
	2200	2272	72

Grouped Region	Teens			Adults			Older Adults		
	Quota	Achieved	Difference	Quota	Achieved	Difference	Quota	Achieved	Difference
Upper NI	270	260	-10	669	663	-6	248	245	-3
Lower NI	117	124	7	290	309	19	121	131	10
Upper SI	78	68	-10	205	210	5	93	99	6
Lower SI	36	34	-2	87	88	1	38	41	3
	501	486	-15	1,251	1270	19	500	516	16

Grouped Region	Teens			Adults			Older Adults		
	Quota	Achieved	Difference	Quota	Achieved	Difference	Quota	Achieved	Difference
Male	250	260	10	610	541	-69	250	254	4
Female	250	226	-24	640	729	89	250	262	12
	500	486	-14	1250	1270	20	500	516	16

Overall, results achieved are in line with quota targets set for the project.

A total of 29,683 numbers were dialled using RDD of which 18,279 were not valid; i.e. disconnected (6,237), businesses (7,973) or were un-contactable (4,069). Overall, 11,404 people were contacted and invited to participate in the survey from which 2,848 were not eligible due to quota targets having been achieved. Of the remaining 8,556 people who were eligible to participate in the survey:

- 3,402 people declined to be interviewed and 342 people (10%) from this group completed the 'refusal survey'
- 2,272 participants completed the survey representing a response rate of 27%
- 369 were unable to answer the survey due to illness or language barriers, and
- 2,512 were unavailable during the survey period. Note that the need to conduct interviews Monday to Wednesday effectively limited the ability to re-schedule interviews
- Among those who were contactable, available and eligible, (5,675), the cooperation rate was 40%.

Observation of elements that assisted with the quality of the outcome:

- The use of RDD meant that more than 80% of the population was potentially able to be included in the survey.
- The use of cognitive testing identified a small number of wording changes that would otherwise have presented a risk of bias through respondents incorrectly interpreting the questions.

- Based on findings from the 2013 questionnaire, we included reference to the Ministry of Health within the introduction to help maximize the response rate.
- As with the prior survey, respondents were targeted by geographical area with each area being assigned to a Meteorological Service weather station. Following the 2013 survey it was noted that the weather station at Milford Sound was not likely to be representative of Southland and accordingly for the 2016 survey the Milford weather station was substituted for one at Manapouri.

We have also identified opportunities for improvement:

- Eligibility is based on regional location with respondents being sought from regions that have met the fine weather criteria the previous weekend. Although the questionnaire does ask where the respondent was the previous weekend, if this location is outside of their home location, there is no check made to verify that their actual location over the weekend also meets the fine weather criteria. For the 2016 survey a total of 735 respondents indicated that their location on the prioritization day used was not their home location and of these 259 were at a location that was associated with a different weather station. While more complex to administer, it would be desirable for the location outdoors at Q6 to be matched with the eligibility data to ensure that all interviews were being undertaken in an area that had experienced fine weather over the weekend.
- A total of 39 respondents were grouped into age categories that did not align with their stated year of birth and in almost all cases the age group was one less than possible based on their stated year of birth. Incorporating logic into the questionnaire script would enable these situations to be clarified during the interview.

## The Questionnaire

*The questionnaire was substantially the same as that administered in 2013, but with some minor changes*

The questionnaire was provided by the HPA and was substantially the same as that used in 2013. A number of minor changes were made as a result of cognitive testing. The following question areas from 2013 were **maintained** in the 2016 survey:

- Q3: Days spent outdoors on previous weekend
- Q4: Whether the respondent got sunburn
- Q5: Days sunburnt on previous weekend
- Q6: Location of respondent on the prioritisation day
- Q7: Suburb respondent in on prioritisation day
- Q8: Whether conditions were such that you would expect to get sunburnt
- Q9: Parts of body sunburnt on previous weekend, and days sunburnt
- Q10: Main reason for getting sunburnt; note that the 'main reason sunburnt' and self-efficacy questions were adapted from Australia's National Sun Protection Survey: see Volkov, Dobbinson, Wakefield, Slevin, 2013; Dobbinson et al., 2008 for more details.
- Q11: Main activity outdoors on prioritisation say
- Q11b: If main activity was based in or near to the water

- Q12: Total time spent outdoors doing main activity
- Q13 and Q14: Start and finish times of main activity
- Q15: Time intended to spend outside
- Q16a and Q16b: Use of shade
- Q17a: Whether shade was available
- Q18 and Q19: Body coverage by hats
- Q20a: Body coverage by clothing
- Q21a: Use of sunscreen
- Q21b: Parts of body sunscreen applied
- Q22: Times sunscreen applied
- Q23: Use of sunglasses
- Q24: Whether respondent had things to protect their skin
- Q25: Whether conditions were such that you would expect to get sunburnt
- Q26: Try to get a suntan
- Q27b: Sunbathing
- Q27c: Avoidance of a suntan
- Q28a: Feeling more healthy with a suntan
- Q28b: Friends think a suntan is a good thing
- Q28c: Suntan makes me feel better about myself
- Q28d: Vitamin D
- Q28g: Tanning is part of the Kiwi summer
- Q28i: Protecting from skin cancer
- Q28k: Treatment of melanoma: melanoma can be easily treated by a GP
- Q28i: Treatment of melanoma: melanoma can lead to the loss of life
- Q29: Probability of skin cancer
- Q31a and Q31b: Viewing weather forecasts ahead of outdoor activity
- Q32a: Sun protection alert
- Q32b: UV index

- Q33 and Q34: Feature in the forecast about times of the day when sun protection is needed
- Q35: Skin colour
- Q36: Untanned skin reaction if it is exposed to the sun
- Q37: Sunburn history
- Q38: Family history of skin cancer
- Demographic questions are unchanged

The following question was **new** to the 2016 survey:

- Q27a: the likely use of a sunbed

The following questions were **amended** for the 2016 survey:

- Q1: the age groups were amended to reflect the different quota targets applied
- Q28g: About tanning previously asked only of teens, asked of all respondents

Questionnaire design and format is a critical component of any project since failures to adequately explain the required information potentially leads to a reduction in data quality. These typically relate to respondents being unable to comprehend questions and formulate valid responses. As a preliminary phase of the project, Key Research completed cognitive testing of the questionnaire to investigate how well questions performed when asked of survey respondents. This was to ensure that respondents understood the questions correctly and were able to formulate appropriate answers. In particular, the test aimed to ensure that the questions successfully captured the intended information and at the same time, made sense to respondents. Face-to-face testing was undertaken with a total of ten respondents who fitted a cross section of people within the primary target group of interest; i.e. fair skinned Europeans aged 13 years and over. Table 2 profiles the ten respondents:

**Table 2: Respondent Profile**

Age	Complexion	Gender	Total
13-17 years	3 x fair	2 x female, 1 x male	3
18-54 years	3 x fair, 1 x olive	2 x female, 2 x male	4
54 years and older	2 x olive, 1 x fair	3 x female	3
Total			10

Interviews were conducted in our Tauranga office and involved a senior researcher reading through each question within the draft script and assessing the level of comprehension being achieved, how respondents were recalling information, and summarising and assessing their responses. Results from the cognitive testing were summarised in a separate report to the HPA and used in finalising the questions, and to provide explanations to interviewers to help overcome potential response issues. A number of relatively minor wording changes were made to the questionnaire as a result of this process. Prior to the main phase of data collection, a pilot was conducted across sixty respondents with twenty in each age quota group; i.e. teens, adults and older adults over the weekend 29 and 30<sup>th</sup> November. The pilot confirmed that the questionnaire flowed well and that the expected interview duration was in the order of 15 minutes. Table 3 shows the distribution of the pilot interviews across age groups, gender and location:

**Table 3: Respondent Profile for Pilot Testing**

Attribute	Category	Number
Age	13-17 years	20
	18-54 years	20
	55 years and over	20
		<b>60</b>
Gender	Male	33
	Female	27
		<b>60</b>
Location	Upper NI	30
	Lower NI	11
	Upper SI	19
		<b>60</b>

The pilot phase did identify an issue with the flow logic within the questionnaire. This related to when only one day at the weekend qualified and the respondent was not outside on that day, but was outside on the non-qualifying day. In this case the questionnaire logic at the commencement of Section Three directed the interview to:

- Q9 if the person got sunburnt
- Q11a if the person was not sunburnt but was outdoors on either day for more than 15 minutes

The specific instruction at the commencement of Section Three stated ‘Start at Q8 if not outdoors for more than 15 minutes in either day (Q3=4)’ which meant that if the person was outdoors but on the non-qualifying day, then they are directed to Q11a which asked about outdoor activities on the qualifying day which is not when the respondent was outdoors. This did not make sense and was a source of confusion. There were four examples in the pilot interview of this situation. As a result of the pilot we recommended that the instruction at the commencement of Section Three be worded as ‘Start at Q8 if: not outdoors for more than 15 minutes on a qualifying day’. These respondents would accordingly skip to Q27a. This change was implemented and as it represented a significant logic change, a dummy data set was created from manually testing the different scenarios. Additionally, a dataset was extracted after the first weekend of interviewing to further verify that the logic was working correctly. This dataset contained 378 records comprised of 346 interviews for the main questionnaire plus 32 refusal interviews.

**Sample Design**

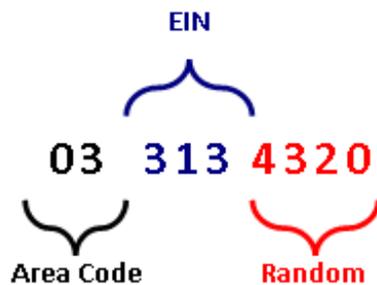
*The sample design is a critical component of the survey since decisions affect how representative the resulting data are of the population*

Since an objective of the study was to achieve a nationally representative sample of those aged 13 years and over, each person within this population would ideally have the same non-zero probability of selection and therefore the aim of the approach has been to achieve an outcome that is as close to this desired position as possible. Because of the need to interview people within the days immediately preceding the weekend in regions where the weather conditions met a qualifying threshold, the survey methodology is confined to telephone. There are two elements that represent potential sources of bias in sample selection when basing data collection on a telephone methodology:

- The diminishing use of landlines; declined from 92% in the 2001 Census to 88% in 2006 and is currently at 81% based on the 2013 Census
- White Pages listings being out of date. Mobility within the population and unlisted numbers potentially mean that 20-25% of those with landlines will be excluded where sample generation is based on listed numbers

To minimise the potential selection bias, the 2016 Sun Exposure Survey was based on the use of RDD, as was the 2013 survey. The core principle of the RDD method for sampling is targeting Exchange Information Numbers (EIN). Each EIN is attached to a geographic area, per the example below in Figure 1. The last four numbers are randomised:

**Figure 1: Example of Exchange Information Numbers**



This allows accurate representation of the geographic area surveyed since calls are scattered across the entire area and thus responses reflect the underlying population characteristic.

Quota targets were also used to ensure an appropriate distribution of responses. Quota targets were established as 'hard' targets that had to be achieved and 'soft' targets that permitted a variation of +/- 10%. Targets were set for broad geographic region, regional council boundary, age group and gender. Quota targets applied are detailed in Tables 4- 6.

**Table 4: Hard Quota Targets: Region**

Grouped Region	Teens	Adults	Older Adults
Upper North Island	270	669	248
Lower North Island	117	290	121
Upper South Island	78	205	93
Lower South Island	36	87	38
	501	1,251	500

**Table 5: Soft Quota Targets: Region**

Region	Teens	Adults	Older Adults
Northland Region	17	38	22
Auckland Region	172	445	141
Waikato Region	49	115	49
Bay of Plenty Region	31	71	36
Gisborne Region	6	12	5
Hawke's Bay Region	18	40	20
Taranaki Region	12	30	14
Manawatu-Wanganui Region	27	61	29
Wellington Region	54	146	52
Marlborough Region	4	11	7
Nelson Region	5	13	6
Tasman Region	5	12	7
West Coast Region	3	9	4
Canterbury Region	60	159	68
Otago Region	25	60	26
Southland Region	10	26	12
	498	1,248	498

**Table 6: Soft Quota Targets: Age**

Age Group	Teens	Adults	Older Adults
13-17 Years	500	0	0
18-29 Years	0	380	0
30-44 Years	0	540	0
45-54 Years	0	330	0
55+ Years	0	0	500
	500	1,250	500

**Table 7: Soft Quota Targets: Gender**

Gender	Teens	Adults	Older Adults
Male	250	610	250
Female	250	640	250
	500	1,250	500

**Respondent Selection**

*Respondent selection was based on their location having fine weather during the preceding weekend such that fair skinned people would have been at risk of excessive sun exposure if unprotected*

Interviews were conducted between Monday and Wednesday of each week with calls being made to those regions that met the fine weather criteria for the preceding weekend. The reason for restricting interviewing to the first part of the week was to help ensure that events were still in recent memory and therefore able to be recalled with accuracy. There was a small deviation to this regime due to lower eligibility than expected in the South Island and the impact of the larger sample size. Consequently 64 interviews were undertaken on a Thursday.

All respondents were selected using RDD in regions that met the fine weather criteria. From each household called, a respondent was selected by asking to speak with the youngest person in the household aged 18 years and over. This selection method was used because of the need to achieve quota targets by age. Initially, teen interviews were also sought from the same household as an adult interview with only one interview from each group from a single household (note that teens under 15 years were only interviewed with parental consent). Once the adult sample for a region had been achieved, RDD focused on achieving interviews with teens only until the targets for each respective region had been achieved. The fine weather criteria used the same scoring system as applied for the 2010 and the 2013 survey, and is detailed in Table 8 below:

**Table 8 Fine Weather Criteria**

<b>Temperature</b>	<b>Score</b>
Greater than or equal to 20 degrees	1.0
Greater than or equal to 15 degrees, and less than 20 degrees	0.5
Less than 15 degrees	0.0

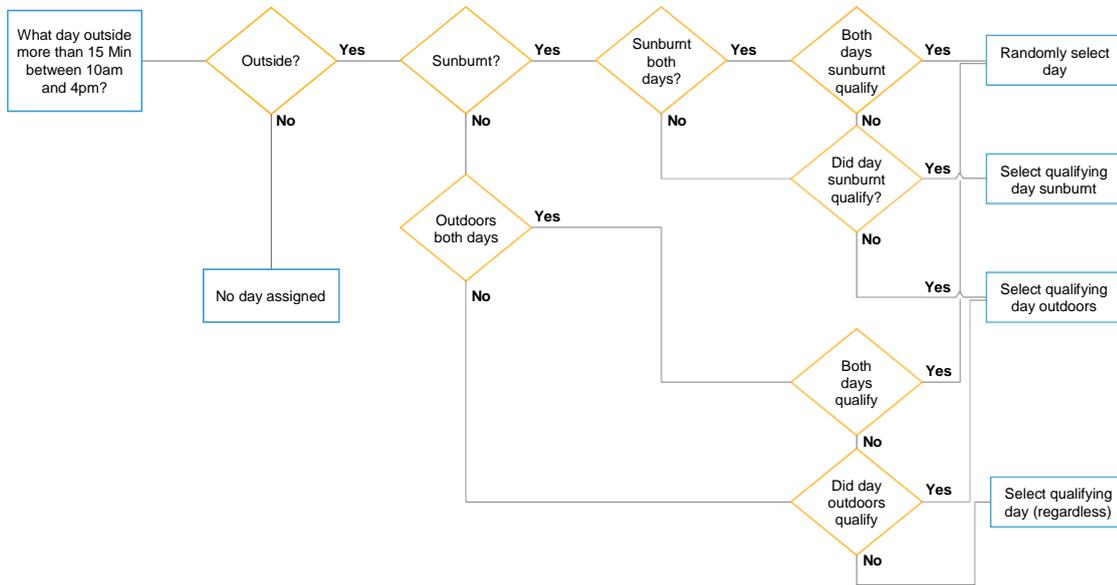
<b>Sky Conditions</b>	<b>Score</b>
Fine	1.0
Cloudy	0.5
Any form of precipitation	0.0

<b>UVI<sup>(1)</sup></b>	<b>Score</b>
Greater than, or equal to 10	1.0
Greater than or equal to 6, and less than 10	0.5
Less than 6	0.0

**Note:** (1) The UV Index was rounded to the nearest whole number for the calculations

The scores were applied for each hour from 11am to 4pm and were summed for the day. While the hours during which one needs to use sun protection often begin before 11am, this time was used to be consistent with previous survey years. Where an area had at least one weekend day with a score of greater than 10, this area was eligible to be interviewed the following week. If only one day met the fine weather criteria then interviews were confined to ask about activities for that day. If both Saturday and Sunday were eligible, then the interview was conducted in relation to the day that the respondent was outdoors for at least 15 minutes between 10am and 4pm. If the respondent was outdoors during that time on both days, then one day was randomly selected. If the respondent got sunburnt, then priority was given to the day on which they got burnt (assuming it met the fine weather criteria). The eligibility decision criteria for determining the day of the weekend that the interview would relate to is illustrated in the flowchart in Figure 2

**Figure 2: Eligibility Decision for Day of Weekend**



To enable the fine weather criteria to be determined, the Meteorological Service provided a report each Monday detailing the hourly daytime weather conditions for each of its weather stations. Table 9 summarises the qualifying weather stations for each week of the survey period.

**Table 9: Eligibility to Interview by Weather Station**

	Weather Station	Weekend											% Eligible
		9/10 Jan	16/17 Jan	23/24 Jan	30/31 Jan	6/7 Feb	13/14 Feb	20/21 Feb	27/28 Feb	5/6 Mar	12/13 Mar	19/20 Mar	
1	Northland Kerikeri	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
2	Northland Whangarei	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
3	Auckland Whenuapai	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	100%
4	Auckland Airport	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	100%
5	Waikato Hamilton	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	91%
6	Bay of Plenty Tauranga	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	91%
7	Bay of Plenty Whakatane	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	100%
8	Bay of Plenty-Rotorua	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	91%
9	BOP (Central)-Taupo	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	82%
10	Gisborne-Gisborne	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	82%
11	Hawke's Bay-Napier	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
12	Taranaki-New Plymouth	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	100%
13	Manawaru Wanganui	YES	YES	NO	NO	NO	YES	YES	YES	YES	NO	YES	64%
14	Manawatu P North	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
15	Manawatu Ohakea	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	100%
16	Wellington Airport	YES	NO	YES	YES	YES	YES	YES	YES	YES	NO	YES	82%
17	Wellington Paraparaumu	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
18	Wellington Masterton	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
19	Tasman Nelson	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
20	Marlborough Blenheim	YES	YES	YES	NO	YES	YES	YES	YES	YES	NO	NO	73%
21	West Coast Westport	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	91%
22	West Coast Hokitika	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	NO	64%
23	Canterbury Christchurch	NO	NO	YES	YES	YES	YES	YES	YES	YES	NO	NO	64%
24	Canterbury Timaru	NO	NO	YES	YES	NO	YES	YES	YES	YES	NO	YES	64%
25	Otago Oamaru	NO	NO	YES	NO	NO	YES	YES	YES	YES	NO	NO	45%
26	Otago Queenstown	YES	NO	YES	YES	YES	YES	NO	NO	YES	NO	NO	55%
27	Otago Dunedin	YES	NO	YES	NO	YES	YES	NO	YES	YES	NO	NO	55%
28	Southern Southland: Invercargill and Gore	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	9%
29	Northern Southland: Lumsden and Manapouri	YES	YES	NO	NO	YES	YES	NO	NO	YES	NO	NO	45%

For the purpose of determining the regions that qualify for the survey, each territorial authority region was assigned to one of the 29 weather stations. The territorial authority and weather station assignments are detailed in Appendix. Since there are 67 territorial authorities, this meant a relatively granular regional breakdown was achieved ensuring that the climatic conditions were accurately reflected. RDD was then able to be targeted to the qualifying regions using the exchange codes.

**Data collection**

The data collection method for the survey was computer assisted telephone interviewing (CATI) and this was undertaken by DigiPoll, a specialist data collection provider based in Hamilton. Interviewers received a briefing and were specifically trained with the questionnaire prior to commencing work. Data was collected in DigiPoll’s CATI software Flo-Stat and after collection the data was exported to SPSS.

**Interviewing**

All calls, including arranged call-backs, were made between Monday and Wednesday to areas that had met the ‘fine weather’ criteria for the previous weekend. Call-backs could be made in subsequent weeks, provided fine weather criteria had been met for the previous weekend. Most of the interviewing happened between 4.00pm until 8.30pm. As mentioned in the survey outcome section (page 4), 64 interviews were conducted on a Thursday to help achieve quota targets.

**Number of calls**

Each respondent received an initial call and up to six call-backs at different times / days if they could not be contacted. Appointments were made with respondents who were willing to participate but not at the time that the call was made. Options for daytime appointments or interviews following the next fine weekend were offered.

**Survey dates**

The interviews were carried out between Monday 11 January and 24 March 2016 as detailed in Table 10 (below).

**Table 10: Interview Dates**

Week	Weekend days	Interview Dates
1	09 – 10 January 2016	11 – 13 January 2016
2	16 – 17 January 2016	16 – 17 January 2016
3	23 – 24 January 2016	25 – 27 January 2016
4	30 – 31 January 2016	02 – 03 February 2016
5	06 – 07 February 2016	09 – 11 February 2016
6	13 – 14 February 2016	15 – 17 February 2016
7	20 – 21 February 2016	22 – 24 February 2016
8	27 – 28 February 2016	29 – 03 February 2016
9	05 – 06 March 2016	07 – 10 March 2016
10	12 – 13 March 2016	14 – 17 March 2016
11	19 – 20 March 2016	21 – 24 March 2016

All interviewers attended a face-to-face briefing with their supervisor prior to commencing the survey. The quality team monitored approximately 10% of all the calls made during the live interviews to ensure that interviewers were strictly adhering to the training and instructions that had been provided, and to further verify that no issues were occurring with the questionnaire.

## Ethics

All survey procedures were consistent with the Code of Practice of the Research Association New Zealand. When the selected respondent was a younger teenager, particularly those aged 13-15 years, the interviewer verbally sought permission from an adult in the household. Confidentiality of all the information given by respondents was assured as provided for by the Privacy Act 1993. The final, stored electronic records contain no identification of the participating respondents and responses can only be analysed as aggregated data.

## Interview duration

The average interview duration was 15 minutes.

## Respondents Profiles

*The profiles achieved within the data set reflect the fact that quota targets were applied to ensure a close representation of the population*

As outlined, quota targets were applied to ensure that the resulting data resembled the underlying population such that relatively minimal reliance would need to be placed on weighting to adjust the sample data. The following tables numbered 11-17 detail the unweighted demographic profiles for those interviewed within the 2016 Sun Exposure Survey:

**Table 11: Gender Distribution**

Gender	Frequency	Percent
Male	1,055	46%
Female	1,217	54%
Total	2,272	100%

**Table 12: Prioritised Ethnicity**

Ethnicity	Frequency	Percent
Māori	251	11%
Pacific	75	3%
Asian	151	7%
European	1,765	78%
Other	30	1%
Total	2,272	100%

**Table 13: Age**

Age Group	Frequency	Percent
13-17 years	486	21%
18-24 years	174	8%
25-34 years	261	11%
35-44 years	392	17%
45-54 years	443	20%
55 years and older	516	23%
Total	2,272	100%

**Table 14: Geographic Region**

Geographic Region	Frequency	Percent
Auckland	780	34%
Upper NI	388	17%
Lower NI	564	25%
Upper SI	377	17%
Lower SI	163	7%
Total	2,272	100%

**Table 15: Household Composition**

Age Group	None	One	Two	Three	Four	Five or more
Under 13 years	62%	18%	13%	5%	1%	0%
13-17 years	64%	25%	10%	1%	0%	0%
18-24 years	72%	18%	7%	2%	0%	0%
25-54 years	23%	20%	51%	3%	1%	0%
55 years and over	60%	20%	19%	1%	0%	0%

**Table 16 Education Level (Adults) Education**

	Frequency	Percent
No school qualification	146	8%
Secondary qualification	540	30%
Other tertiary qualification	325	18%
Degree	653	37%
Other	45	3%
Refused / Don't Know	77	4%
<b>Total</b>	<b>1,786</b>	<b>100%</b>

**Table 17: Income (Adults)**

Household Income	Frequency	Percent
\$40,000 or less	243	14%
\$40,001 - \$70,000	292	17%
\$70,001 - \$100,000	268	15%
\$100,001 or more	512	29%
Refused / Don't Know	471	26%
<b>Total</b>	<b>1,786</b>	<b>100%</b>

### Data Weighting

*The data was weighted to ensure that it is reflective of the underlying population*

Weight is commonly assigned to a survey observed data to ensure that the distribution of collected data is as close as possible to the population. The main objective of this technique is to reduce selection bias, non-response and non-coverage which may occur during sampling procedures (Kalton & Flores-Cervantes, 2003; Pike, 2008). Weighting was applied to the SES to ensure that no specific population was over- or under-represented in the survey sample and to ensure that it reflects the underlying New Zealand population. The weighting was performed in STATA version 13. As can be seen in Table 18, four factors were included in the weight calculation: region, selection weight, benchmark group and final weight.

**Table 18: Weight variables used in the 2016 SES**

Survey data setting in STATA	Variable	Description
Strata	Region	16 regions across New Zealand included Northland, Auckland and Wellington
Sampling weight	Selection weight	The inverse probability of a participant will be selected from a sampled household
Post-strata	Benchmark group	An identifier of age, gender and ethnicity grouping e.g. Maori male aged between 18-24 years old was coded as 111
Post-stratum weight	Final weight	The New Zealand population count from the 2013 census adjusted by the distribution of the age standard population obtained from the World Health Organisation (WHO)

### Region

The region variable was treated as strata in the survey data settings. This variable is composed of 16 regions across New Zealand which are ordered from the north to the south of New Zealand. The full list of regions is provided in Table 5.

### Selection Weights

Selection weights adjust for the probability of a person being selected from within a household with more than one occupant. Sample selection arises when the observed sample is not a random draw from the population of interest and failure to take this into account can potentially lead to inconsistent and biased estimates of the parameters of interest. For the SES, where households have equal selection probabilities but one person is interviewed from within each household, this gives people from large households a smaller chance of being interviewed and this is the basis for calculating a selection weight. Each household has an almost equal probability of selection, except for the omission of about 15% that don't have landlines. Collection, essentially, represented the adult and teen samples and neither group was omitted based on the selection of the other; i.e. adults were not omitted where there were teens and vice versa unless quota targets had been filled. Collection therefore is essentially the same as the 2013 SES and the calculation of selection weights for adults and teens has been done in the same way.

In the case of respondents in the adult sample (aged 18 to 54 years), a single respondent was randomly chosen and all eligible adults had an equal chance of selection. Therefore, if the number of eligible adults in the  $i^{th}$  dwelling was  $y_i$ , then the probability of selection was:

$$1/y_i$$

The selection weight was the inverse of this probability. In the case of respondents included in the teen sample (aged 13 to 17 years) a respondent was randomly chosen from any usual residents aged 13 to 17 years. The design provided that only one adult and one teen could be

interviewed from the same household; therefore, if the number of eligible teens in the  $i^{th}$  household was  $x_i$ , and the probability of selection was:

$$1/x_i$$

The selection weights were the inverse of these probabilities. Where the number of people in the household was not answered, the selection weight used was the average selection weight for those of the same gender, ethnicity and age group.

### Benchmarking

Benchmarking refers to adjustment of the data to ensure they are representative of the New Zealand population after selection weights have been applied. Participants were grouped based on their gender (male and female), age (18-24, 25-34, 35-44 and 45-54) and prioritised ethnicity (Māori, Pacific, Asian and European/Other). Population weights adjust the sample data so it is representative of the population from the 2013 Census. The 2013 Census was used as the reference population because it was the most recent census data available at the time when the survey was conducted (see Table 21). The details of age and prioritised ethnicity are as follows.

### Age

Prior to weighting a small number of adjustments were made to the age group assignment for some respondents. Using the screening question (Q1), participants were grouped into three main age groups namely teen (13-17 years,  $n = 486$ ), adult (18-54 years,  $n = 1,270$ ) and older adults (55+ years,  $n = 516$ ). By considering the age in years of participants, the age groups of the adult sample were re-categorised into four more groups: 18-24 years, 25-34 years, 35-44 years and 45-54 years. Note that, the age in year variable was calculated by using the survey year (2016) subtracted by the birth year of participants. The data of the age in year from 18 participants were missing. Hence, the age group for these 18 people were obtained from Q1, Q40a, Q40b, and the age at last birthday. The finalised age groups in this survey are presented in Table 19 below:

**Table 19: Age Groups**

Age	Frequency	Percent
13-17 years	486	21%
18-24 years	174	8%
25-34 years	261	11%
35-44 years	392	17%
45-54 years	443	20%
55+ years	516	23%
Total	2,272	100%

In total 39 respondents provided age information that was inconsistent with their stated year of birth and in all instances the age group was one group lower than it should be based on year of birth. Prior to calculating weights, these respondents were recorded to age groups based on their year of birth.

## **Prioritised Ethnicity**

The prioritised ethnicity system was used because in the SES survey, participants could identify with as many ethnicities as they felt accurately described their sense of cultural identity. Participants predominately identified with one ethnic group ( $n = 2,072$ , 91%), one in 12 of participant ( $n = 185$ , 8%) identified with two ethnic groups and a small number identified with three or more ethnic groups ( $n = 15$ , 0.7%).

The system of prioritising ethnicity commonly used in analysing health data in New Zealand (Ministry of Health, 2004). It involves classifying each respondent into one ethnic group, rather than every ethnicity they identified. The prioritised system was Maori, Pacific, Asian and European/Other. For example, a participant who selected both Maori and European ethnicities would have a prioritised ethnicity of Maori. A participant who selected Pacific, Asian and European would have prioritised ethnicity of Pacific.

## **Weighting calculation procedures**

The weight calculation procedures were the same as for the 2013 SES and incorporated a selection weight. For completeness, we note that the selection weights for the 2010 survey calculated a weight for the youth sample being those aged 13 years to 24 years, however the sampling and questionnaire design specifically sought to recruit teens aged 13 years to 17 years to fulfil the teen quota. People in the household aged 18 years to 24 years were, therefore, not available for selection specifically for the youth group (those aged 13-24 years); rather, they had the same probability of being selected as did the others in the adult group (i.e. those aged 25-54 years) and, therefore, have the same weight as the general adult sample.

Our approach has been to calculate selection weights on the actual probability of selection as applied in the recruitment of respondents. The sample data were weighted with the selection weights to prepare the observed counts. The benchmark adjustments were then calculated by dividing the expected by the observed population counts. These benchmark adjustments were then applied to the data records and multiplied by the selection weights to give the final benchmark adjusted selection weights; i.e. the final weight. The population counts used for arriving at the final weight are provided in Table 20 and the expected, observed and benchmark adjustments are provided in Tables 21-23.



**Table 21: Growth adjusted population counts**

Benchmark group	Ethnicity	Age	Gender	Adjusted count
111	Māori	13-17 years	Male	31,271
112	Māori	13-17 years	Female	29,688
121	Māori	18-24 years	Male	38,791
122	Māori	18-24 years	Female	38,247
131	Māori	25-34 years	Male	35,032
132	Māori	25-34 years	Female	40,502
141	Māori	35-44 years	Male	34,454
142	Māori	35-44 years	Female	41,113
151	Māori	45-54 years	Male	31,538
152	Māori	45-54 years	Female	36,287
161	Māori	55+ years	Male	35,124
162	Māori	55+ years	Female	41,340
211	Pacific	13-17 years	Male	11,642
212	Pacific	13-17 years	Female	11,163
221	Pacific	18-24 years	Male	15,173
222	Pacific	18-24 years	Female	14,703
231	Pacific	25-34 years	Male	17,360
232	Pacific	25-34 years	Female	18,073
241	Pacific	35-44 years	Male	14,068
242	Pacific	35-44 years	Female	15,635
251	Pacific	45-54 years	Male	11,529
252	Pacific	45-54 years	Female	12,352
261	Pacific	55+ years	Male	14,469
262	Pacific	55+ years	Female	16,488
311	Asian	13-17 years	Male	14,347
312	Asian	13-17 years	Female	13,475
321	Asian	18-24 years	Male	32,414
322	Asian	18-24 years	Female	30,421
331	Asian	25-34 years	Male	29,144
332	Asian	25-34 years	Female	32,661
341	Asian	35-44 years	Male	23,162
342	Asian	35-44 years	Female	30,900
351	Asian	45-54 years	Male	21,096
352	Asian	45-54 years	Female	25,347
361	Asian	55+ years	Male	29,838
362	Asian	55+ years	Female	34,965
411	European/Other	13-17 years	Male	93,323
412	European/Other	13-17 years	Female	87,792
421	European/Other	18-24 years	Male	139,764
422	European/Other	18-24 years	Female	127,092
431	European/Other	25-34 years	Male	185,368
432	European/Other	25-34 years	Female	186,042
441	European/Other	35-44 years	Male	199,221
442	European/Other	35-44 years	Female	214,788
451	European/Other	45-54 years	Male	228,627
452	European/Other	45-54 years	Female	241,102
461	European/Other	55+ years	Male	413,931
462	European/Other	55+ years	Female	461,664
Total				3,502,526

**Table 22: Expected, based on 2,272 people:  $2272 \times (\text{adjusted count} \div \text{total})$**

		Maori	Pacific	Asian	European/ Other
13-17 years	Male	20.3	7.6	9.3	60.5
	Female	19.3	7.2	8.7	56.9
18-24 years	Male	25.2	9.8	21.0	90.7
	Female	24.8	9.5	19.7	82.4
25-34 years	Male	22.7	11.3	18.9	120.2
	Female	26.3	11.7	21.2	120.7
35-44 years	Male	22.3	9.1	15.0	129.2
	Female	26.7	10.1	20.0	139.3
45-54 years	Male	20.5	7.5	13.7	148.3
	Female	23.5	8.0	16.4	156.4
55 + years	Male	22.8	9.4	19.4	268.5
	Female	26.8	10.7	22.7	299.5

**Table 21: Observed: number of sample  $\times$  mean of selection weight**

		Maori	Pacific	Asian	European/ Other
13-17 years	Male	55.5	19.0	28	259.7
	Female	52.3	13.0	34	204
18-24 years	Male	57	15.0	34	185
	Female	39	16	69	185
25-34 years	Male	45	13	31.8	211.5
	Female	58	22	42	237
35-44 years	Male	24	22	43.4	243.3
	Female	57	21	56	409.1
45-54 years	Male	39	4	33	401.6
	Female	54	8	21	511.1
55 + years	Male	18	12	7	503
	Female	41	13	2	434.5

**Table 23: Benchmark Adjustments:  $\text{expected} \div \text{observed}$**

		Maori	Pacific	Asian	European/ Other
13-17 years	Male	0.366	0.397	0.332	0.233
	Female	0.368	0.557	0.257	0.279
18-24 years	Male	0.441	0.656	0.618	0.490
	Female	0.636	0.596	0.286	0.446
25-34 years	Male	0.505	0.866	0.595	0.569
	Female	0.453	0.533	0.504	0.509
35-44 years	Male	0.931	0.411	0.346	0.531
	Female	0.468	0.483	0.358	0.341
45-54 years	Male	0.525	1.870	0.415	0.369
	Female	0.436	1.002	0.783	0.306
55 + years	Male	1.266	0.782	2.765	0.534
	Female	0.654	0.823	11.340	0.689

These population counts were ratioed down to obtain the 'expected' counts for the total sample size. The sample data were weighted with the selection weights to calculate the 'observed' counts. The benchmark adjustments were calculated by dividing the 'expected' by the 'observed'. These benchmark adjustments were applied to the data records and multiplied by the selection weights to give the final benchmark adjusted selection weights or 'final' weight.

### Age Standardisation

As with the 2013 survey, age standardisation has been applied using the World Health Organization (WHO) standard population (Ahmad et al., 2001). This adjustment recognises that the age structure of the population has changed over the years and unless taken into account can impact comparisons for health related data. The steps followed were:

1. Within each prioritised ethnic group, sum the benchmark weights by gender; e.g., all Māori males will have the same value; all Pacific females will have the same value, etc. as detailed in Table 24:

**Table 24: Sum of benchmark weights by gender**

Maori		Pacific		Asian		European/Other	
Male	Female	Male	Female	Male	Female	Male	Female
59.64	68.23	21.83	23.96	34.39	42.11	366.67	411.80

2. Within each prioritised ethnic group and within each gender, sum the benchmark weights by age group, as detailed in Table 24.

**Table 25: Sum of benchmark weights by age group**

	Maori		Pacific		Asian		European/Other	
	Male	Female	Male	Female	Male	Female	Male	Female
13-17 years	13.90	14.73	4.77	3.90	6.98	6.43	44.05	42.99
18-24 years	6.62	8.91	2.62	2.98	6.18	4.58	26.46	24.96
25-34 years	9.09	11.32	3.46	4.80	7.74	6.05	44.91	51.43
35-44 years	10.24	11.70	4.11	4.35	3.81	8.23	61.62	63.68
45-54 years	8.39	9.15	3.74	3.00	4.15	5.48	62.04	66.09
55 + years	11.39	12.43	3.00	3.13	5.53	11.34	127.58	162.65

3. The variable from step two divided by the variable from step one multiplied by 100, as detailed in Table 26

**Table 26: Ratio of Benchmark Weights: Age Group ÷ Gender x 100**

	Maori		Pacific		Asian		European/Other	
	Male	Female	Male	Female	Male	Female	Male	Female
13-17 years	23.30	21.58	21.84	16.27	20.30	15.26	12.01	10.44
18-24 years	11.10	13.05	17.86	12.44	17.98	10.87	7.22	6.06
25-34 years	15.24	16.60	12.02	20.01	22.50	14.37	12.25	12.49
35-44 years	17.18	17.14	18.81	18.14	11.08	19.55	16.81	15.46
45-54 years	14.07	13.42	17.13	12.54	12.06	13.02	16.92	16.05
55 + years	19.10	18.21	13.76	13.06	16.08	26.93	34.79	39.50

4. The WHO weights were then derived as detailed in Table 26

**Table 26: World Health Weights**

Age	Combined count	% of Total
13-17 years (2/5 of 10-14yrs plus 3/5 15-19yrs)	8.5	11.0%
18-24 years (2/5 of 15-19yrs plus 20-24yrs))	11.6	15.0%
25-34 years	15.5	20.1%
35-44 years	13.7	17.8%
45-54 years	11.4	14.8%
55 + years	16.5	21.4%
	77.3	100%

5. The WHO proportions were then merged into the dataset

6. The standard weight is then: variable from step four divided by the variable from step three as detailed in Table 27

**Table 27: Standard Weights**

	Maori		Pacific		Asian		European/Other	
	Male	Female	Male	Female	Male	Female	Male	Female
13-17 years	0.4724	0.5101	0.5039	0.6766	0.5424	0.7213	0.9163	1.0545
18-24 years	1.3515	1.1496	0.8403	1.2065	0.8344	1.3809	2.0791	2.4761
25-34 years	1.3189	1.2112	1.6723	1.0044	0.8934	1.3984	1.6412	1.6096
35-44 years	1.0348	1.0368	0.9449	0.9799	1.6043	0.9092	1.0576	1.1493
45-54 years	1.0488	1.1002	0.8618	1.1771	1.2240	1.1340	0.8723	0.9196
55 + years	1.1177	1.1723	1.5515	1.6353	1.3277	0.7928	0.6136	0.5406

7. The final benchmark adjusted weight is: variable from step six multiplied by the benchmark weight

#### Variables Added

The following variables have been added to the dataset:

- Selection weight for teens  $x_i$
- Selection weight for adults  $y_i$
- Combined selection weight ( $x_i$  and  $y_i$ ) (single variable containing  $x_i$  or  $y_i$  as applicable)
- Population benchmark weight
- Final weight
- WHO age-standardised weights for each stem described above:
  - Stage 1 variable
  - Stage 2 variable
  - Stage 3 variable
  - Stage 4 variable (WHO weights)

- Stage 5 variable
- Stage 6 variable
- Stage 7 variable, final WHO weight variable
- Adult sample indicator
- Youth sample indicator

### Response Rates

*The response rate has been calculated for those who were contactable and eligible for inclusion*

A total of 29,683 telephone calls were made using RDD, of which 18,279 were not to valid residential numbers; i.e. fax, disconnected, businesses numbers or we were unable to achieve a reply after multiple attempts. This resulted in a valid sample of 11,404. Table 28 provides details of the call outcomes for the survey period.

**Table 28: Call outcomes**

Calls			
Total Calls	29,683		
Un-contactable / Disconnected / Fax etc.	18,279		
<b>Total Available Sample</b>	<b>11,404</b>		
<b><u>Not Eligible</u></b>			
Not eligible	564		
Quota Target Full	2,284		
<b>Total Not Eligible</b>	<b>2,848</b>		
<b><u>Eligible</u></b>			
		% of Total Eligible	
		2016	2013
Refused (R)	3,402	40%	37%
Not Available During Survey	2,512	29%	34%
Language or Health Barriers	369	4%	3%
<b>Total Eligible non-response (E)</b>	<b>6,283</b>		
<b>Survey Complete (I)</b>	<b>2,272</b>	<b>27%</b>	<b>27%</b>
<b>Total Eligible (I + E)</b>	<b>8,556</b>		

A total of 8,556 respondents were classified as being eligible having removed those who were screened out for reasons such as being outside of the target age group or because the quota target for the age, gender or location had already been filled. Of these, 40% refused the survey and a further 29% were unavailable for interview on the days that the survey was conducted. Because interviews were undertaken only on a Monday to Wednesday. Some participants ( $n = 128$ , 5.6%) were interviewed on Thursday as they could not be interviewed on Monday to Wednesday. Related to the prior weekend, this had the impact of further limiting availability, particularly when the interview may have been deferred to the next week only to find that the particular region was non-qualifying for that week. Stated unavailability during the survey period is also frequently a soft refusal and therefore cannot necessarily be considered distinct from 'refusals'.

The refusal rate,  $R/I + E$  was 40% and the cooperation rate,  $I/I + R$  was also 40%.

The response rate is calculated by:

$$\frac{I}{I + E}$$

The completed interviews represent a response rate of 27% ( $2,272 \div 8,556$ ) of the available and eligible sample, this being very similar to that achieved for the 2013 survey having calculated the response rate using the same formula.

## Reference

- Ahmad, O. B., Boschi-Pinto, C., Lopez, A. D., Murray, C. J., Lozano, R., & Inoue, M. (2001). Age standardization of rates: a new WHO standard. *Geneva: World Health Organization*, 9.
- Dobbinson S, Wakefield M, Hill D, Girgis A, Aitken JF, Beckmann K, Reeder AI, Herd N, Fairthorne A, Bowles KA (2008). "Prevalence and determinants of Australian adolescents' and adults' weekend sun protection and sunburn, summer 2003-2004." *Journal of the American Academy of Dermatology* 59(4): 602-614.
- Kalton, G., & Flores-Cervantes, I. (2003). Weighting methods. *Journal of Official Statistics*, 19(2), 81.
- Ministry of Health 2004, Ethnicity Data Protocols for the Health and Disability Sector  
<http://www.health.govt.nz/publication/ethnicity-data-protocols-health-and-disability-sector>
- Pike, G. R. (2008). Using weighting adjustments to compensate for survey nonresponse. *Research in Higher Education*, 49(2), 153-171.
- Volkov A, Dobbinson S, Wakefield M, Slevin T. (2013). "Seven-year trends in sun protection and sunburn among Australian adolescents and adults." *Australian & New Zealand Journal of Public Health* 37(1): 63-69.

<b>Territorial Authorities</b>	<b>Weather Station Name</b>
Far North District Council	Northland Kerikeri
Kaipara District Council	Northland Whangarei
Whangarei District Council	Northland Whangarei
Auckland Council	Auckland Whenuapai
Thames-Coromandel District Council	Auckland Airport
Hamilton City Council	Waikato Hamilton
Hauraki District Council	Waikato Hamilton
Matamata-Piako District Council	Waikato Hamilton
Otorohanga District Council	Waikato Hamilton
Waikato District Council	Waikato Hamilton
Waipa District Council	Waikato Hamilton
Tauranga City Council	Bay of Plenty Tauranga
Western Bay of Plenty District Council	Bay of Plenty Tauranga
Kawerau District Council	Bay of Plenty Whakatane
Opotiki District Council	Bay of Plenty Whakatane
Whakatane District Council	Bay of Plenty Whakatane
Rotorua District Council	Bay of Plenty-Rotorua
South Waikato District Council	Bay of Plenty-Rotorua
Taupo District Council	BOP (Central)-Taupo
Waitomo District Council	BOP (Central)-Taupo
Gisborne District Council	Gisborne-Gisborne
Wairoa District Council	Gisborne-Gisborne
Central Hawke's Bay District Council	Hawke's Bay-Napier
Hastings District Council	Hawke's Bay-Napier
Napier City Council	Hawke's Bay-Napier New
Plymouth District Council	Taranaki-New Plymouth
Ruapehu District Council	Taranaki-New Plymouth
South Taranaki District Council	Taranaki-New Plymouth
Stratford District Council	Taranaki-New Plymouth
Wanganui District Council	Manawaru Wanganui
Horowhenua District Council	Manawatu P North
Manawatu District Council	Manawatu P North
Palmerston North City Council	Manawatu P North
Tararua District Council	Manawatu P North
Rangitikei District Council	Manawatu Ohakea
Hutt City Council	Wellington Airport
Wellington City Council	Wellington Airport
Kapiti Coast District Council	Wellington Paraparaumu

**Territorial Authorities**

**Weather Station Name**

Territorial Authorities	Weather Station Name
Porirua City Council	Wellington Paraparaumu
Upper Hutt City Council	Wellington Paraparaumu
Carterton District Council	Wellington Masterton
Masterton District Council	Wellington Masterton
South Wairarapa District Council	Wellington Masterton
Nelson City Council	Tasman Nelson
Tasman District Council	Tasman Nelson
Kaikoura District Council	Marlborough Blenheim
Marlborough District Council	Marlborough Blenheim
Buller District Council	West Coast Westport
Grey District Council	West Coast Westport
Westland District Council	West Coast Hokitika
Ashburton District Council	Canterbury Christchurch
Chatham Islands Council	Canterbury Christchurch
Christchurch City Council	Canterbury Christchurch
Hurunui District Council	Canterbury Christchurch
Selwyn District Council	Canterbury Christchurch
Waimakariri District Council	Canterbury Christchurch
Mackenzie District Council	Canterbury Timaru
Timaru District Council	Canterbury Timaru
Waimate District Council	Canterbury Timaru
Waitaki District Council	Canterbury Timaru
Central Otago District Council	Otago Queenstown
Queenstown Lakes District Council	Otago Queenstown
Clutha District Council	Otago Dunedin
Dunedin City Council	Otago Dunedin
Gore District Council	Southland Invercargill
Invercargill City Council	Southland Invercargill
Southland District Council	Manapouri (Northern Southland)
Southland District Council	Invercargill (Invercargill and Gore)