2 Methodology

A brief overview of the methodology is presented in this chapter. This should be sufficient to enable a general understanding of the sample design, recruitment of participants, instruments used, analysis and presentation of results. A full account of the methodology is provided in the *Methodology Report for the 2008/09 New Zealand Adult Nutrition Survey*, which is available on the Ministry of Health website at http://www.moh.govt.nz.

2.1 Overview of survey design

Target population

The target population for the 2008/09 NZANS was the usually resident civilian population aged 15 years and over living in permanent private dwellings in New Zealand.

Sample design

The 2008/09 NZANS used a multi-stage, stratified, probability-proportional-to-size (PPS) sample design, with increased sampling of some ethnic groups and age groups, primarily through a 'screened' sample. A three-step process was used to achieve the sample:

- a sample of 607 meshblocks was selected
- a sample of dwellings was selected from each meshblock
- one eligible adult (aged 15 years and over, if any) was selected from each selected dwelling.

Participant recruitment

Recruiters from CBG Health Research Limited (CBG) visited each selected dwelling, assessed the eligibility of prospective participants, informed prospective participants about the survey, and gathered consents from those who agreed to be contacted by a University of Otago interviewer.

Recruiters collected information on the age and ethnicity of all occupants (adults aged 15 years and over) in the household. The eligible prospective participant was informed about the study verbally, and given a copy of the information pamphlet about the survey (see www.moh.govt.nz) and an opportunity to ask questions. Contact details were collected to facilitate the transition to the University of Otago interviewer team.

Participation was voluntary, with no inducement to participate. Consent was obtained in two parts: consent to be contacted by an interviewer to arrange a survey interview (collected with electronically recorded signature by the recruiter at first contact), and consent to participate in the survey (collected in hard copy by the interviewer at the survey interview).

Prospective participants were first given the survey information pamphlet by the recruiter. The pamphlet was available in English, Māori, Samoan, Tongan, Chinese, Korean, Hindi and Punjabi. The information pamphlet was provided again by the interviewer.

2.2 Data collection

The 2008/09 NZANS was carried out from October 2008 to October 2009, collecting information from a sample of New Zealanders aged 15 years and over.

Contact details collected by CBG recruiters were transferred to the University of Otago project office via a secure connection. A University of Otago interviewer arranged interview dates and times. The aim was to achieve a relatively even spread of interviews by day of week, with a minimum of 10% of interviews on both Saturday and Sunday.

The survey interviews and measurements were carried out in the participant's home by a University of Otago interviewer utilising customised data collection software. If required, an interviewer was accompanied by an interpreter.

Interviewer training

The interviewers attended a two-week training programme in October 2008 and were provided with a detailed interviewer training manual. Interviewer retraining days were conducted in January and June 2009. Two regional supervisors received additional training on contact procedures, support of interviewers and quality control.

Throughout the survey, interviewers were provided with feedback from project office staff on the accuracy and completeness of their data. Random telephone checks were carried out on approximately 10% of completed interviews to check participant satisfaction and interviewer adherence to the survey protocol.

Interview process

Data were collected during the approximately 90-minute interview in the following computer-controlled order:

- initial demographics
- 24-hour diet recall
- questionnaires–dietary habits, dietary supplement use, nutrition-related health, food security, sociodemographics
- blood pressure measurement
- height, weight and waist circumference measurement.

Consenting participants were given a specimen collection kit containing materials for blood and urine samples and information on their closest Canterbury Health Laboratory affiliated laboratory, and they were requested to attend within two weeks of the interview.

A random sample of 33% of participants was asked to complete a second 24-hour diet recall within a month of the first interview to allow calculation of intra-individual variability in intake of nutrients.

All participants received a bag with the survey logo at the time of the interview, whether or not they provided a blood or urine sample. Participants who provided blood and urine samples were posted a $50 grocery voucher when the project office received their blood results from Canterbury Health Laboratories.

Participant feedback

All participants who provided a blood sample were sent a personalised letter reporting selected results and providing a generic explanation of their significance (see Appendix 2). If any result was outside the expected range, they were advised to approach their doctor to discuss these but an abnormal pattern of results was checked by a registered medical specialist. Where these abnormal patterns indicated presence of a medical condition of serious concern the participant was contacted by the medical specialist.

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 to the project office via a secure connection.

The names and addresses of the people who participated in the survey were not stored with response data. Unit record data were stored in a secure area and were only accessible on a restricted ('need to know') basis.

2.3 Instruments

Multiple-pass 24-hour diet recall

A 24-hour diet recall is the dietary assessment method used in most national nutrition surveys because it is more cost-effective and imposes less respondent burden than a diet record. A 24-hour diet recall is used in the United States National Health and Nutrition Examination Survey (NHANES), and was used in the 2004 Canadian Community Health Survey (Nutrition Cycle) and the 1995 Australian National Nutrition Survey.

The multiple-pass 24-hour diet recall for the survey was interviewer administered using the LINZ24© module of the Abbey Research software package (LINZ® Health and Activity Research Unit, University of Otago, Dunedin, New Zealand). LINZ24© was used for both the 1997 National Nutrition Survey (Parnell et al 2001; Quigley and Watts 1997) and the 2002 National Children's Nutrition Survey (Ministry of Health 2003a). The approach is analogous to the US Department of Agriculture Automated Multiple-Pass Method, which is used to collect dietary data in NHANES without the 'forgotten foods list' step (Blanton et al 2006).

The multiple-pass 24-hour diet recall collected quantitative information on all foods and drinks consumed by the participant in the previous day (from midnight to midnight), including foods and drinks consumed both at and away from home. The 24-hour diet recall was conducted in four stages using a standardised computer-prompted protocol.

1. A 'quick list' of all foods, beverages and dietary supplements consumed during the preceding day (midnight to midnight) was obtained.
2. Detailed descriptions were obtained of all items consumed, using specific questions and prompts, including cooking method, recipe for mixed dishes (where known), any additions made before consumption, brand and product name, time consumed and where the food was sourced. Brand and product name were determined using a bar code scanner for food items where the composition was brand specific and packaging was available.
3. Estimates were made of amounts of items consumed, wherever possible (eg, cups, tablespoons), using food photographs, shape dimensions, food portion assessment aids (eg, dried beans) and packaging information.
4. All items were reviewed in chronological order. Any additions and changes were made at this point.

On completion of the 24-hour diet recall, the interviewer asked the participant to show them any container in which salt used by the household was purchased. Once it had been sighted the interviewer recorded whether or not the salt was iodised.

Questionnaire

The questionnaire collected information on dietary habits, use of dietary supplements, nutrition-related health, food security and sociodemographic information. The interviewer recorded participant responses directly into a laptop computer using computer-assisted personal interview (CAPI) software. Questionnaire modules are briefly outlined below (see the Methodology Report for more detail). The full questionnaire is available at www.moh.govt.nz.

Dietary habits

The Dietary Habits Questionnaire consisted of a series of questions on dietary habits associated with diet quality and/or nutritional status. The questionnaire focused on key dietary patterns or habits, particularly those associated with the Ministry of Health's priority areas at the time of the survey design, including the consumption of selected foods and food groups, the use of low-fat and -sodium foods, food preparation and cooking practices, breakfast consumption, and the use of salt.

Dietary supplements

Dietary supplements were defined as anything the participant considered to be a supplement to their diet. Therefore, supplements included a range of substances, from vitamins and minerals to 'others' such as flaxseed oil, garlic, and spirulina. Participants were asked to recall all dietary supplements consumed in the past 12 months. Each supplement was then classified into one of the following categories: single vitamin, single mineral, multi-vitamin, multi-mineral, multi-vitamin and multi-mineral, oil, or other supplement (eg, ginkgo, St John's Wort, meal replacement).

Nutrition-related health

The nutrition-related health questionnaire included questions on long-term health conditions and risk factors such as smoking, alcohol consumption and adult weight gain. Participants were asked if they had been diagnosed by a doctor with any of the following long-term health conditions: heart disease, stroke, diabetes, osteoporosis, high blood pressure or high blood cholesterol.

Food security

Household food security was determined using the series of statements that had been used in the 1997 National Nutrition Survey and the 2002 Children's Nutrition Survey. The statements aimed to determine whether participants considered that their household had a compromised food intake for financial reasons. For example, participants were asked to report how often a statement such as 'Food runs out in my/our household due to lack of money' applied to them.

Sociodemographics

Sociodemographic information about participants is vital to help analyse the various determinants of health outcomes, and to monitor inequality and changes in health disparities. This module included questions on basic demographics (age, sex and ethnicity), education, personal and household income, income support and employment, labour force status, and household composition.

Blood pressure

Blood pressure was measured using an OMRON HEM 907 automated instrument. Three measurements of blood pressure were taken for each participant, with the mean of the second and third measurements used to calculate diastolic and systolic blood pressure. Blood pressure was not measured in pregnant women because pregnancy alters a woman's blood pressure.

Anthropometric measurements

Anthropometric measurements were made using professional equipment and standardised protocols (see the Methodology Report for more detail). Two measurements of weight, height and waist circumference were made on each participant (excluding pregnant women). If the first two measurements of height, weight and waist circumference differed by more than 1%, the interviewer was prompted to take a third measurement. Body measurements were made in the home, so measurements were made with the participant wearing light clothing and without shoes.

- Height was measured to the nearest 0.1 cm using a portable stadiometer (Seca 214).
- Weight was measured to the nearest 0.1 kg using electronic weighting scales (Tanita HD-351).
- Waist circumference was measured to the nearest 0.1 cm using a tape measure (W606PM anthropometric measuring tape).

Blood and urine samples

Participants gave specific consent at the interview to provide blood and urine samples. Each participant who gave informed consent to provide blood and urine samples was provided with a specimen collection kit and a list of Canterbury Health Laboratory affiliated laboratories in their area. The blood and urine indices measured are listed in Table 2.1.

Table 2.1: Blood and urine samples

Nutritional indicators	Indices
Blood lipids	Total cholesterol, HDL cholesterol
Iron status	Serum ferritin, C-reactive protein, zinc protoporphyrin, transferrin saturation
Folate status	Whole blood folate, serum folate, red blood cell folate
Diabetes	HbA1c
Electrolytes	Urinary sodium, potassium and creatinine
Iodine status	Urinary iodine, thyroglobulin†
Vitamin D status	Serum 25-hydroxyvitamin D†, parathyroid hormone†

† Analysis is not complete at the time of report writing.

2.4 Analysis of nutrient data

Conversion of foods/beverages to nutrient intakes

Foods and beverages from the 24-hour diet recall were matched to food composition data to calculate nutrient intake. The main source of food composition data was the New Zealand Food Composition Database (NZFCDB), which includes more than 2740 foods and complete data for 55 core nutrients.

The Ministry of Health contracts the New Zealand Institute of Plant and Food Research Ltd to maintain and develop the NZFCDB. FOODfiles (August 2010), an electronic subset of data from the NZFCDB, was used to calculate nutrient intake and additional nutrient lines were added as required. Analytical techniques for nutrients in the NZFCDB are summarised in Appendix 3.

Key steps for matching food composition data to nutrient data are briefly outlined below. See the Methodology Report for more detailed information on the food/nutrient matching process and Appendix 4 for the summary flowcharts.

Matching foods to a nutrient line in a food composition database

- Direct match to a nutrient line in FOODfiles.
- Foods commonly consumed in the 2008/09 NZANS but not included in FOODfiles were prioritised for analysis as part of the ongoing development of the NZFCDB. If the food could not be analysed, a recipe was created (see below).
- Where appropriate, foods were matched to a nutrient line from an overseas database, including databases from Australia, the United States, Britain, Asia and the Pacific.

Creating a composite nutrient line or recipe

- When a food or beverage was not completely described by the participant (eg, type of milk), it was matched to a composite nutrient line based on data from FOODfiles, weighted to reflect use in the survey.
- If a food was a single ingredient, it was matched to a raw ingredient in FOODfiles and a recipe was created based on the cooking method (allowing for fat added during cooking, and weight and nutrient loss during cooking).
- If the food was a mixed food item, it was matched to a recipe and the nutrient composition of the recipe was calculated using data from FOODfiles (allowing for fat added during cooking, and weight and nutrient loss during cooking).

Fortified foods

- If fortificant values in FOODfiles were not based on up-to-date analytical data, then fortificant information was sourced from the 2008 Manufactured Food Database.
- If foods were not included in the Manufactured Food Database, fortificant information was sourced from product packaging and/or food manufacturers.

Food composition data are presented as the nutrient amount per 100 g of food. Therefore, all food intake data were converted to intakes in grams (see Appendix 4, Figure A4.4). Food intake data were converted from volume to grams by applying a density factor.

Accuracy of nutrient estimates

The accuracy of nutrient estimates depends on two factors: the accuracy of information provided by the participants in the 24-hour recall, and the accuracy of the food composition data. Key considerations related to these two potential sources of error are outlined below.

Misreporting of a food intake, especially under-reporting, is a well-known problem in all types of dietary surveys regardless of the dietary assessment method used. If food intake is under-reported, energy and nutrient intakes may also be underestimated, and estimates of inadequate intake may be overestimated. It is difficult to quantify under-reporting, but research shows that the degree of under-reporting varies according to personal characteristics and across types of foods. For example, under-reporting is more common in those with a high BMI, in females, and in some groups (Livingstone and Black 2003). Certain foods are more likely to be under-reported, especially those perceived as less healthy (eg, cakes, biscuits, desserts, fats).

The NZFCDB includes more than 2740 foods and 55 core nutrients. Approximately 70% of foods in the NZFCDB are sampled from New Zealand sources and 50% of nutrient values are New Zealand analytical values (actual or derived), with the remaining values derived from other sources such as overseas databases. During the 2008/09 NZANS, the University of Otago worked closely with Plant and Food Research Ltd to match food consumption data to an appropriate nutrient line. Where food composition data were considered insufficiently reliable or incomplete (as was the case for iodine, folate, sodium and vitamin D), nutrient intake data have not been presented in this report.

Nutrients from food groups

In order to calculate sources of nutrients by ‘food type’, food items reported in the 24-hour diet recall were allocated to food groups (Table 2.2).

Table 2.2: Food groups used in the 2008/09 New Zealand Adult Nutrition Survey

Food group	Examples of food items included
Grains and pasta	Rice (boiled, fried, risotto, sushi, salad), flour, pasta/noodles, bran, cereal-based products and dishes (pasta and sauce, lasagne, pasta salad, noodle soup, chow mein)
Bread	All types of bread (rolls, pita, foccacia, garlic), bagels, crumpets, sweet buns
Breakfast cereals	All types (muesli, wheat biscuits, porridge, puffed/flaked/extruded cereals)
Biscuits*	Sweet biscuits (plain, chocolate coated, fruit filled, cream filled), crackers
Cakes and muffins*	All cakes and muffins, slices, scones, pancakes, doughnuts, pastry
Bread-based dishes	Sandwiches, filled rolls, hamburgers, hotdogs, pizza, nachos, doner kebabs, wontons, spring rolls, stuffings
Puddings and desserts	Milk puddings, cheesecake, fruit crumbles, mousse, steamed sponges, sweet pies, pavlova, meringues
Milk	All milk (cow, soy, rice, goat and flavoured milk), milkshakes, milk powder
Dairy products	Cream, sour cream, yoghurt, dairy food, ice-cream, dairy-based dips
Cheese	Cheddar, edam, specialty (blue, brie, feta, etc), ricotta, cream cheese, cottage cheese, processed cheese
Butter and margarine	Butter, margarine, butter/margarine blends, reduced-fat spreads
Fats and oils	Canola, olive, sunflower and vegetable oils, dripping, lard
Eggs and egg dishes	Poached, boiled, scrambled and fried eggs, omelettes, self-crusting quiches, egg stir-fries
Beef and veal	All muscle meats (steak, mince, corned beef, roast, schnitzel, etc), stews, stir-fries
Lamb and mutton	All muscle meats (chops, roast, mince, etc), stews, stir-fries, curries
Pork	All muscle meats (roast, chop, steak, schnitzel, etc), bacon, ham, stews, stir-fries
Poultry	All chicken, duck, turkey and muttonbird muscle meats and processed meat, stews and stir-fries
Other meat	Venison, rabbit, goat, liver (lambs fry), pâté (liver), haggis
Sausages and processed meats	Sausages, luncheon, frankfurters, saveloys/cheerios, salami, meatloaf and patties
Pies and pasties	All pies including potato top, pasties, savouries, sausage rolls, quiche with pastry
Fish and seafood	All fish (fresh, frozen, smoked, canned, battered, fingers, etc), shellfish, squid, crab, fish/seafood dishes (pies, casseroles and fritters), fish/seafood products
Vegetables	All vegetables (fresh, frozen, canned) including mixes, coleslaw, tomatoes, green salads, legumes and pulses, legume products and dishes (baked beans, hummus, tofu), vegetable dishes
Potatoes, kumara and taro	Mashed, boiled, baked potatoes and kumara, hot chips, crisps, hash browns, wedges, potato dishes (stuffed, scalloped potatoes), taro roots and stalks
Snack foods	Corn chips, popcorn, extruded snacks (burger rings etc), grain crisps
Fruit	All fruit, fresh, canned, cooked and dried
Nuts and seeds	Peanuts, almonds, sesame seeds, peanut butter, chocolate/nut spreads, coconut (including milk and cream), nut-based dips (pestos)
Sugar and sweets	Sugars, syrups, confectionery, chocolate, jam, honey, jelly, sweet toppings and icing, ice-blocks, artificial sweeteners
Soups and stocks	All instant and homemade soups (excluding noodle soups), stocks and stock powder
Savoury sauces and condiments	Gravy, tomato and cream-based sauces, soy, tomato and other sauces, cheese sauces, mayonnaise, oil & vinegar dressings, chutney, marmite

Food group	Examples of food items included
Non-alcoholic beverages	All teas, coffee and substitutes, hot chocolate drinks, juices, cordial, soft drinks, water, powdered drinks, sports and energy drinks
Alcoholic beverages	Wine, beer, spirits, liqueurs and cocktails, ready-to-drink alcoholic sodas (RTDs)
Supplements providing energy*	Meal replacements, protein supplements (powders and bars)
Snack bars*	Muesli bars, wholemeal fruit bars, puffed cereal bars, nut and seed bars

Some foods may not be assigned to the same food groups as in the 1997 National Nutrition Survey so care should be taken when making direct comparisons. For example, Muesli bars were assigned to biscuits in the 1997 National Nutrition Survey, but to snack bars in the 2008/09 New Zealand Adult Nutrition Survey.

* Comparable with 2002 National Children's Nutrition Survey but not comparable with 1997 National Nutrition Survey.

Mixed dishes were classified as follows. If the participant was able to provide a recipe or detailed description for a mixed dish, then the individual ingredients were assigned to their separate food groups. If no recipe or detailed description could be provided, a generic recipe that most closely matched the description of the food was used and the dish was assigned to the food group of its main ingredient. For example, macaroni cheese would be assigned to *Grains and pasta*, because pasta is its main ingredient, although it contains cheese and milk.

Determining usual intake distribution

An individual's day-to-day diet is likely to be highly variable, so the distribution of intake for a dietary component measured on a single day will be wider than the distribution for their Usual daily intake. To determine the distribution of usual intakes for a group, the distribution of observed intakes from a single 24-hour diet recall needs to be adjusted to remove the effects of within-person (or intra-individual) variability. This can be achieved by collecting two 24-hour recalls from a representative sub-sample of the group. In the 2008/09 NZANS, a random sample of 33% of participants was asked to complete a second 24-hour diet recall within a month of the first interview. One-quarter (1180) of the participants completed a repeat 24-hour diet recall, slightly more than the expected 20%.

The software package PC-SIDE (Version 1.0, developed by Iowa State University) was used to estimate the distribution of usual intakes of dietary components. This software can be used when daily intake observations are repeated at least once on a subsample of individuals in the survey population.

PC-SIDE carries out four main steps when estimating usual intake distributions for dietary components: preliminary data adjustments, semi-parametric transformation to normality, estimation of within and between individual variances for intakes, and finally back transformation into the original scale. PC-SIDE adjusts for day of the week.

Detailed information describing the PC-SIDE methodology can be found in Nusser et al 1996, Dodd 1996 and Carriquiry 2003.

Determining nutrient adequacy

For the 2008/09 NZANS, reference values to determine nutrient adequacy were sourced from the nutrient reference values (NRVs) for Australia and New Zealand (NHMRC 2006). The NRVs are presented as a range of recommendations for nutrient and energy intake aimed at avoiding deficiency and excess/toxicity, as well as guidance on the dietary patterns needed to reduce the risk of chronic disease.

Estimated average requirements (EARs) were used as the yardstick to determine the adequacy of nutrient intake in the 2008/09 NZANS (Table 2.3). The EAR is a daily nutrient level estimated to meet the requirements of half of the healthy individuals in a particular life stage and gender group.

The adequacy of protein, vitamin A, riboflavin, vitamin C, thiamin, niacin, vitamin B_6, vitamin B_{12}, iron, calcium, zinc and selenium intakes were evaluated by probability analysis (Subcommittee on Interpretation and Uses of Dietary Reference Intakes and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine 2000). Comparison with the EAR (shortcut probability approach) was used to evaluate nutrient intake in all populations, except iron intakes in women aged 15–50 years. Iron requirements for these women were assumed to be highly skewed as a result of menstruation, so the iron intake of this age group was evaluated using full probability analysis.

Probability analysis compares nutrient intakes with the corresponding requirement distribution and calculates the likelihood (probability) that a particular nutrient intake would fail to meet the requirement. Lower nutrient intakes are associated with a higher probability of inadequacy because they are less likely to meet the requirement, while higher nutrient intakes have a low probability of inadequacy. This approach is preferable to making direct comparisons with recommended intakes because the variation in requirement between individuals is taken into account: an individual may meet their own requirement but not consume the recommended intake.

The probability of intake being inadequate was calculated using nutrient intakes, adjusted to remove the effects of day-to-day (intra-individual) variation using PC-SIDE software, as described above. This is important because on any given day a number of people will have low or high intakes that do not reflect their ‘usual’ intake. Nutrient requirements, however, represent the required long-term average (usual) intakes, not amounts that must be consumed each day. Without adjusting for intra-individual variation the prevalence of inadequate intakes would be over- or underestimated depending on where the intake distribution lies in relation to the requirement distribution.

Table 2.3: Estimated average requirements (EARs) per day used in the probability analysis

Nutrient	Age group (years)	EAR	
		M	F
Protein (g)	15–18 19–70 71+	49 52 65	35 37 46
Vitamin A (µg RE)	15–18 19+	630 625	485 500
Vitamin C (mg)	15–18 19+	28 30	28 30
Thiamin (mg)	15+	1.0	0.9
Riboflavin (mg)	15–70 71+	1.1 1.3	0.9 1.1
Niacin (mg NE)	15+	12	11
Vitamin B_6 (mg)	15–18 19–50 51+	1.1 1.1 1.4	1.0 1.1 1.3
Vitamin B_{12} (µg)	15+	2.0	2.0
Folate (µg DFE)	15–18 19+	330 320	330 320
Calcium (mg)	15–18 19–70 19–50 71+ 51+	1050 840 – 1100 –	1050 – 840 – 1100
Iron (mg)	15–18 19+ 19–50 51+	8 6 – –	8 – 8 5
Zinc (mg)	15–18 19+	11 12	6 6.5
Selenium (µg)	15+	60	50

Source: Nutrient reference values for Australia and New Zealand (NHMRC 2006).

2.5 Weighting estimation

Most national surveys have complex sample designs, such that different groups have different chances of being selected in the survey. To ensure that no group is under- or over-represented in estimates from the survey, 'weights' are calculated for every survey participant. The 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.

A method called 'calibrated weighting' (Deville and Sarndal 1992) was used for the 2008/09 NZANS. The benchmarks used were the estimated resident population aged 15 years and over living in permanent private dwellings at 30 June 2007. The Methodology Report contains more information on weighting in the 2008/09 NZANS.

2.6 Response rates

The final weighted response rate for the 2008/09 NZANS was 61%. The refusal and non-contact rates were 31% and 8%, respectively. Because the number of respondents who gave blood and urine samples was lower, the final weighted response rates were calculated separately for the blood and urine samples, and they were both 44%. These response rates are considered good for a national nutrition survey, which imposes high respondent burden.

Note that it was not possible to calculate the overall response rate by demographic subgroups such as sex, ethnic group, age group and NZDep2006 due to the unavailability of such information for some participants at the recruitment stage. However, partial response rates by demographic subgroups are presented in the Methodology Report.

2.7 How to interpret the results

This report presents key descriptive results from the 2008/09 NZANS. Explanatory notes for the results are outlined below. Crude data are presented in this report.

Weighting

Weights were used in all analyses so that estimates of means, medians, percentiles and proportions presented in this report can be said to be representative of the total resident population (aged 15 years and over) of New Zealand.

Small numbers

Small sample numbers can affect both the reliability and the confidentiality of results. Problems with reliability occur when the sample becomes too small to adequately represent the population from which it has been drawn. Problems with confidentiality can occur when it becomes possible to identify an individual, usually someone in a subgroup of the population within a small geographical area.

The study has been designed so that there are approximately 30 or more people in each of the key categories analysed in this report. Generally speaking this ensures the survey data presented are reliable and also protects the confidentiality of the participants. In addition, for the estimates which are the focus of the commentary confidence intervals are published. This gives readers a more explicit assessment on the level of sampling error affecting these key measures.

There are some exceptions to this quality assurance practice which are explained below:

- There were 29 respondents who were Pacific males aged 15–18 years. Although this was strictly below the sample size minimum, results were included in the report because the key estimates have confidence intervals presented, so that readers can judge when these estimates are affected by large sample errors.
- There were only 13 Pacific male respondents aged 15–18 years and 15 Pacific female respondents aged 15–18 years who gave blood samples. This was judged to be too small a sample to use, so results were suppressed.
- For the estimates of the inadequate intake proportions a method for consistently producing plausible confidence intervals was not available. Instead an asterisk (*) is displayed where the estimates were considered to be imprecise due to a large relative sampling error (Note: if the estimates were close to zero and had a standard error less than 2.5% they were not asterisked as in these cases the readers can be confident the estimated proportion with inadequate intake is less than 5%).
- There were a very small number of estimates where no standard error could be produced. This can occur when some of the model assumptions in the usual intake analysis are violated, which can be due to daily intakes being very skewed or variable. In these cases the estimates were marked with a hash (#).
- For the dietary habits section, results have not been output for ethnic group (stratified by age group and sex) or for NZDep2006 (stratified by sex). This was because for many of the questions there were up to eight response options. When there were no specific recommendations regarding the amount or frequency of consumption of a particular food or drink, it was not possible to aggregate responses in a meaningful way. Without aggregating categories, the number of responses for each response category was often too small to present results by the full range of sociodemographic variables used in other sections of this report.
- For estimates which are not presented with a confidence interval or are not estimated inadequate intake proportions, readers can make some assessment of the reliability by looking at the sample size underpinning the different categories analysed (see Table A5.1), and also by taking into account that these sample sizes are likely to be affected by the clustering and weighting processes used for this study. Generally speaking it is sensible to assume a ‘design effect’ of 2 for these sorts of complex survey designs. This means that the ‘effective sample sizes’ are about half the actual sample sizes given in Table A5.1.

Confidence intervals

In tables, 95% confidence intervals are shown in parentheses after the point estimate (for key estimates only). In graphs, 95% confidences are shown as error bars. Differences in means, medians and proportions between subgroups were considered to be statistically significant if the 95% confidence intervals surrounding the two estimates did not overlap. It should be noted that testing for a significant difference between two subgroups using the above method is conservative compared to testing at the two-sided 0.05 level.

Only statistically significant differences have been discussed in the text. However, if there was no statistically significant difference between subgroups, this does not necessarily mean that there were no differences; it could be because the sample size was too small to detect a significant difference at the 95% level based on non-overlapping confidence intervals.

Age groups

Age was derived from date of birth and the interview start date, or reported age. Age was grouped according to the NRVs for Australia and New Zealand (NHMRC 2006) age groups: 15–18, 19–30, 31–50, 51–70, and 71+ years. For analyses by ethnic group, the latter two age groups were aggregated to 51+ years to account for the small numbers of Māori and Pacific adults aged 71+ years. For comparability this was also done for the New Zealand European and Other (NZEO) ethnic group.

Ethnic group

Ethnicity was output to the following three ethnic groups: NZEO, Māori, and Pacific. The 'Other' ethnic group (comprising mainly Asian, Middle-Eastern, Latin-American and African ethnic groups) has been combined with 'European' due to small numbers. The 'total response standard output' was used to classify ethnicity, with participants counted in each of the three output ethnic groups they identified with. As a result, the sum of the ethnic group populations exceeds the total New Zealand population.

Using total response standard output means ethnic groups overlap, so it is not appropriate to make comparisons *between* ethnic groups. Comments in the text are limited to age group differences *within* ethnic groups. No comments were made with respect to the New Zealand European and Other ethnic group because this is similar to the total population. Supplementary reports presenting results for Māori compared to non-Māori and Pacific compared to non-Pacific will be released in late 2011.

Neighbourhood deprivation

Neighbourhood deprivation refers to the New Zealand Index of Deprivation 2006, which measures the level of socioeconomic deprivation for each neighbourhood (meshblock) according to a combination of the following 2006 census variables: income, benefit receipt, transport (access to car), household crowding, home ownership, employment status, qualifications, support (sole-parent families), and access to a telephone (Salmond et al 2007).

Results are presented for NZDep2006 quintiles. Quintile 1 represents the 20% of areas with the lowest levels of deprivation (least deprived areas) and quintile 5 represents the 20% of areas with the highest level of deprivation (most deprived areas).

Differences between NZDep2006 quintiles were examined and discussed in the text if the 95% confidence intervals surrounding the two estimates did not overlap. In addition to examining significant differences between NZDep2006 quintiles, the data from all quintiles were used to calculate a line of best fit (regression line), adjusted for age group, sex and ethnic group. This additional analysis was undertaken because ethnicity (and to a lesser extent age) confounds the relationship between socioeconomic deprivation and nutrition outcomes. By also adjusting for sex, this method gave an overall test for trend (gradient) by neighbourhood socioeconomic deprivation.

For nutrient intake, comparisons between NZDep2006 quintiles are adjusted for intra-individual variation using PC-SIDE, whereas to simplify analyses the overall test for trend (gradient) is not adjusted for intra-individual variation. Note that this shortcut method gave the same results when tested for selected nutrients.

Time trends

Where possible, comparisons between the 2008/09 NZANS and 1997 National Nutrition Survey have been reported in the 'Have we Changed?' chapter. Time trend analyses were restricted to nutrition indicators that were considered comparable across surveys (see Chapter 9 for more information). Crude data are presented in the tables. Changes in nutrition indicators from 1997 to 2008/09 are summarised in the table as follows: no change (nc), significant increase (↑), or significant decrease (↓).

Because the age and ethnic structure of the New Zealand population has changed since 1997, time trends were re-examined after adjusting for age group and ethnic group. In most cases this adjustment did not affect the results. However, for a few indicators, adjusting for age and ethnicity meant time trends were no longer statistically significant or became statistically significant. When this occurred, a table note is added.